MOLDOVA STATE UNIVERSITY
Center of Functional Genetics, Institute of Genetics, Physiology and Plant Protection,
Doctoral School in Natural Sciences,
Faculty of Biology and Geosciences,
Scientific Association of Geneticists and Breeders of the Republic of Moldova

NATURAL SCIENCES IN THE DIALOGUE OF GENERATIONS

The National Conference with International Participation, edition VII

September 12-13, Chisinau, Republic of Moldova, 2024

ABSTRACT BOOK

CHISINAU – 2024
Editura USM

082
N 26

Abstract Book ***National Conference with international participation „Natural sciences in the dialogue of generations”***, September 12-13, 2024, Chisinau, Republic of Moldova (*coordinated by Scientific Council, minute no 9, date 19.06.2024*).

Editorial Production:
Acad., dr. hab., prof. univ. Duca Maria, Moldova State University
Dr., conf. cercet., Clapco Steliana, Moldova State University
Dr., conf., Port Angela, Moldova State University
Dr. Mutu Ana, Moldova State University
Severin Maricela, Moldova State University

Note!
The Authors of Abstracts submitted to the Conference *„Natural sciences in the dialogue of generations”* take full responsibility for their content/originality and for English language.

The Conference is organized within the subprogramme *011101 Genetic and biotechnological approaches to the management of agroecosystems in the conditions of climate change,* funded by the Ministry of Education and Research.

DESCRIEREA CIP A CAMEREI NAŢIONALE A CĂRŢII DIN REPUBLICA MOLDOVA

"Natural sciences in the dialogue of generations", national conference (7 ; 2024 ; Chişinău). The National Conference with International Participation "Natural sciences in the dialogue of generations", edition 7, September 12-13, Chisinau, 2024 : Abstract Book / scientific committee: Duca Maria (chair) [et al.]. – Chişinău : Editura USM, 2024. – 273 p. : fig., tab.

Antetit.: Moldova State University, Center of Functional Genetics, Faculty of Biology and Geosciences, Doctoral School in Natural Sciences, Scientific Association of Geneticists and Breeders of the Republic of Moldova. – 30 ex.

ISBN 978-9975-62-756-6.
082

N 26

SCIENTIFIC COMMITTEE

CHAIR

DUCA Maria, ORCID: 0000-0002-5855-5194, *Doctoral School of Natural Sciences, Moldova State University (MSU),* ***Republic of Moldova***.

MEMBERS

ARICU Aculina, ORCID: 0000-0001-7201-2519, *Institute of Chemistry, MSU,* ***Republic of Moldova.***
BEJAN Iurie, ORCID: 0000-0001-5141-0315, *Institute of Ecology and Geography, MSU,* ***Republic of Moldova.***
BEJENARU Luminita, ORCID: 0000-0001-5409-7248, *„Alexandru Ioan Cuza" University of Iaşi,* ***Romania.***
CAPATANA Gheorghe, ORCID: 0000-0002-3897-6637, *Faculty of Mathematics and Informatics, MSU,* ***Republic of Moldova.***
CEPOI Liliana, ORCID: 0000-0002-7516-948X, *Institute of Microbiology and Biotechnology, Technical University of Moldova,* ***Republic of Moldova.***
CIOCHINA Valentina, ORCID: 0000-0003-0741-505X, *Institute of Physiology and Sanocreatology, MSU,* ***Republic of Moldova.***
CLAPCO Steliana, ORCID: 0000-0001-7147-2740, *Moldova State University,* ***Republic of Moldova.***
CRISTEA Stelica, ORCID: 0000-0001-5757-0504, *University of Agronomic Sciences and Veterinary Medicine of Bucharest,* ***Romania.***
GACEU Ovidiu Razvan, ORCID: 0000-0003-0605-2752, *Faculty of Geography Tourism and Sport, University of Oradea,* ***Romania.***
GLADCHI Viorica, ORCID: 0000-0002-5847-4466, *Faculty of Chemistry and Chemical Technology, MSU* ***Republic of Moldova.***
HANCU Boris, *Faculty of Mathematics and Informatics, MSU,* ***Republic of Moldova.***
JOITA-PACUREANU Maria, ORCID: 0009-0009-2797-6672, *Center for Study and Research for Agroforestry Biodiversity "Acad. David Davidescu",* ***Romania.***
KAYA Yalcin, ORCID: 0000-0002-9297-8633, *Plant Breeding Research Center, Trakya University,* ***Turkey.***
MEREUTA Ion, ORCID: 0009-0003-2151-9928, *Institute of Physiology and Sanocreatology, MSU,* ***Republic of Moldova.***

PORT Angela, ORCID: 0000-0003-3994-8918, *Center of Functional Genetics, MSU,* ***Republic of Moldova.***
ROSCA Ion, ORCID: 0000-0002-1304-8033, *National Botanical Garden (Institute) "Alexandru Ciubotaru", MSU,* ***Republic of Moldova.***
SHIKIMAKA Olga, ORCID: 0000-0003-4055-3761, *Institute of Applied Physics, MSU,* ***Republic of Moldova.***
SOCHIRCA Vitalie, ORCID: 0000-0003-3924-2253, *Faculty of Biology and Geosciences, MSU,* ***Republic of Moldova.***
UNGUREANU Laurentia, ORCID: 0000-0003-4576-2810, *Institute of Zoology, MSU,* ***Republic of Moldova.***
VATAVU Sergiu, ORCID: 0000-0001-7328-126X, *Faculty of Physics and Engineering, MSU,* ***Republic of Moldova.***
ZHAO Jun, *Inner Mongolia Agricultural University, Huhhot,* ***China.***

ORGANIZING COMMITTEE

CHAIR

DUCA Maria, Moldova State University

MEMBERS

BILETCHI Lucia, Institute of Zoology, MSU
BIVOL Ina, Center of Functional Genetics, MSU
CHERDIVARA Ala, Center of Functional Genetics, MSU
CLAPCO Steliana, Center of Functional Genetics, MSU
COCU Maria, Institute of Chemistry, MSU
MUTU Ana, Center of Functional Genetics, MSU
PORT Angela, Center of Functional Genetics, MSU
POTLOG Tamara, Faculty of Physics and Engineering, MSU
RUDACOVA Angela, Center of Functional Genetics, MSU
SEVERIN Maricela, Doctoral School of Natural Sciences, MSU
SMEREA Svetlana, Institute of Genetics, Physiology and Plant Protection, MSU

SUMMARY

D. CHEMISTRY AND PHYSICS

Session A

BIOTECHNOLOGY AND ENVIRONMENTAL SCIENCE

UDC: 573.4/.6

ACTINOMYCETES - POTENTIAL BIOCONTROL AGENTS AND PLANT GROWTH PROMOTERS

Artiomov Laurenția, ORCID: 0000-0002-4478-4375

Institute of Microbiology and Biotechnology, Moldova Technical University Chisinau, Republic of Moldova

E-mail: *laurentia.artiomov@imb.utm.md*

The article is a review of scientific articles that reflect the use of soil microorganisms in some biotechnologies. The paper examines actinomycetes as a potential source of microorganisms for use in promoting plant growth and biocontrolling agents of phytopathogens. Concern over plant pathogenic diseases is becoming increasingly serious due to the expansion of intensive cropping. Actinomycetes possess potential to control various plant pathogens, besides acting as plant growth promoting agent. These bacteria can substantially replace harmful chemicals, and have now started finding a place with an important contribution in to farming practices.

Actinomycetes of the genus *Streptomyces* exhibit a broad antifungal spectrum through several mechanisms of antibiosis, such as the production of natural antifungal compounds, siderophores, extracellular activation of the plant defence enzyme system, and hydrolytic activation of the enzyme system. Numerous investigations approach strains of actinomycetes with potential beneficial effect from the rhizospheric soil or among the endophytes of different crops. Often, researchers study the actinomycetes of healthy plant roots to find strong endophytic actinomycetes, but diseased plants also deserve attention. Good results could give the isolation of rare actinomycetes and yet unexplored actinomycetes genera.

Actinomycetes have also been isolated from environments (seas, lakes, rivers) and aquatic sediments. Many researchers found that strains of *Micromonospora* were dominant in lake silt (mud) samples. *Micromomospora* has an essential role in the carbon turnover of chitin, cellulose and lignin. This genus of actinomycetes has attracted the interest of researchers also because it promotes plant growth through phytostimulation either by direct or indirect methods. Rare actinomycetes of *Actinomadura* genus from extreme and particular ecosystems showed antimicrobial activities against toxinogenic fungi. In our research strains of *Streptomyces*, *Micromonospora* and *Actinomadura* from water and mud demonstrated moderate antifungal activity against phytopathogens *Alternaria alternata*, *Botrytis cinerea and Fusarium solani*. Research targets should be actinomycetes that inhibit one pathogen affecting multiple crops and broad-spectrum ones that inhibit different pathogens. Multifunctional actinomycetes are effective through its protective activity against phytopathogenic fungi and the ability to act as plant growth-promoting bacteria.

Acknowledgments: *The work was carried out within the research subprogramme 020101 InBioS - "Innovative biotechnological solutions for agriculture, medicine and environment", funded by NARD*

Keywords: *actinomycetes, phytopathogens biocontrol, plant growth promoting agents*

UDC: 573.4:546.72

EFFECT OF THE IRON SALTS ON THE GROWTH RATE OF BACTERIA

Balan Ludmila*, ORCID: 0000-0002-8319-6808
Slanina Valerina, ORCID: 0000-0002-9833-7933
Bogdan-Golubi Nina, ORCID: 0000-0003-2199-4414

Technical University of Moldova, Institute of Microbiology and Biotechnology
Chisinau, Republic of Moldova

*E-mail: *ludmila.batir@imb.utm.md*

Iron is an essential element for bacteria due to its participation in the tricarboxylic acid cycle, electron transport, amino acid and pyrimidine biosynthesis, DNA synthesis, and other critical functions. Although iron is the fourth most abundant element in the earth's crust, its availability is very low due to its low solubility in aqueous solution. Bacteria have evolved complex mechanisms to ensure that iron requirements are met but not exceeded. Siderophore-mediated transport of iron is one of the mechanisms used by bacteria to uptake iron from their environment.

The increase of siderophores content, in the culture medium of bacteria as a result of supplementation with iron salts, is important due to their effect on the phytostimulation of plant growth and chlorophyll content, following the processing of seeds with microbial preparations. Therefore, the first index for monitoring the effect of iron is its influence on the growth of bacteria, which is presented in this study.

Three strains of bacteria from g. *Bacillus* and 3 from g. *Pseudomonas* with biotechnological interest selected for this study from National Collection of Nonpathogenic Microorganisms. Strains there cultivated on nutrient agar and King B agar, at temperature of $+36\pm1^0$C, for 48 hours, in the presence of iron salts $FeSO_4 \bullet 7H_2O$ and $FeCl_3 \bullet 6H_2O$, in a concentration of 10, 20 and 30 mg/L.

that CFU count increased insignificantly in comparison to the control by about 5%, in the presence of 10 mg/L concentration, but in the present of concentrations 20-30 mg/L the CFU count decreased by about 8%. A positive result with stimulatory effect was obtained in cultivation of *Pseudomonas* in the presence of iron sulfate in all studied concentrations, with an increase of over 33%. Effect of ferric chloride was variable in the control limits.

The iron salts added in the culture medium have a more pronounced stimulatory effect on the growth rate for *Pseudomonas*. For *Bacillus* strains the minimum concentrations were optimal and increasing salt concentration caused to decreasing CFU count.

Acknowledgments: *This study was supported by the research project 020101-InBioS „Innovative biotechnological solutions for agriculture, medicine and environmental protection”, funded by National Agency for Research and Development.*

Keywords: *bacteria, iron, growth.*

UDC: 573.6:577.112

HYDROGELS WITH BIOMEDICAL APPLICATIONS - TISSUE ENGINEERING OF SOFT TISSUES

Băncilă Ioana-Cristina, ORCID: 0000-0002-4950-7991

Faculty of Electrical Engineering and Information Technology, Vienna University of Technology, Vienna, Austria

E-mail: *e12102406@student.tuwien.ac.at*

This study investigates the development of new biomaterials based on natural polymers that meet the requirements for use in skin tissue engineering and controlled drug delivery systems.

The practical component of the experiment involved the creation of a hydrogel, which was a mixture of two components. The initial system comprised a 1% collagen solution in conjunction with a 1% CMC solution, while the second system consisted of a mixture of a gelatin solution and a 2% CMC solution. The materials were characterised and their capacity to interact with cells was evaluated.

Lyophilisation was employed to minimise chemical decomposition, remove water without excessive temperatures, stabilise the resulting dried product well, and ensure minimal difficulty in processing, handling, and compatibility with sterile operations. However, the lyophilisation process is time-consuming, volatile compounds can evaporate, and reconstruction requires sterile diluents.

The characterisation of the support utilised Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM), with the degree of swelling determined. The biocompatibility of the hydrogels was evaluated by means of the MTT testing protocol, which enables the quantification of viable cells and provides an overview of the hydrogels' biocompatibility. The MTT assay is a widely used method for determining cellular metabolism activity. It involves the use of tetrazolium salts as oxidised substrates for mitochondrial dehydrogenases.

Scanning electron microscopy data indicated that collagen/gelatin and carboxymethyl starch-based supports exhibited macroporous characteristics, with interconnected pores and an average pore size of 200 μm.

The physicochemical characteristics of the resulting hydrogels were evaluated in terms of their structure, morphology, and retention of biologically relevant fluids. The results of the studies confirmed the macroporous and percolated structure of the hydrogels, demonstrating a good water absorption capacity typical of biomedical applications. The swelling of gelatin-CMC mixtures exhibited a reduction at low CMC proportions, followed by a significant increase.

Keywords: *hydrogels, biomaterials, lyophilization, tissue engineering, biocompatibility, collagen, gelatin, crosslinking*

UDC: 573.6:633.16

VERNALIZATION REQUIREMENT OF *HORDEUM SPONTANEUM* ACCESSIONS AND THEIR DERIVATIVES

Bilynska O. V.*, ORCID: 0000-0003-1963-3679
Bohuslavskyi R. L.

Yuriev Plant Production Institute, Ukraine

E-mail: bilynskaov@gmail.com*

H. spontaneum C. Koch. Thell. is known to be a progenitor of *H. vulgare* L. This wild relative is used as a source of valuable traits for cultivated barley improvement. In particular, *H. spontaneum* accessions are the carriers of genes for resistances to diseases, salinity and drought as well as genes related to grain quality. Since genes from *H. spontaneum* to *H. vulgare* are transferred via hybridization, information of growth habit and agronomic traits of wild barley is of great applied interest for cross design development. The purpose of investigation was to determine vernalization requirements and some important agronomic traits of *Hordeum spontaneum accessions* and DH-lines derived from intercross hybrids.

Nine accessions of *H. spontaneum* from the collection of the National Centre of Plant Genetic Resources of Ukraine originated from Syria, Azerbaijan, Israel and two introgressive lines obtained by anther culture *in vitro* on the basis of cross *H. vulgare DH00-126×H. spontaneum* IU 30009 were involved in the experiment. Experimental design included sowing in the third decade of November, in the optimal term (the third decade of March), in the late term (the third decade of April), vernalization of germinated seeds and seedlings for 14 and 28 days at 5 °C and transferring seedlings to the soil in the late term. All plants were grown under field conditions.

Results of the experiment showed that none accession survived under winter conditions in Kharkiv (50º10' N latitude, 36º13' E longitude). All timely-sown accessions were headed in the range of 69–84 days after seedling emergence. Only two accessions (IP 30009, Syria) and (IU067214, Azerbaijan) formed ears in the third decade of July when seeds were sown in the late term. After vernalization for 14 days all accessions were headed in the range of 53–73 days. Increased duration of vernalization (up to 28 days) resulted in the acceleration of plant growth and development. In particular, in all accessions number of days to heading varied from 40 to 53. Doubled haploid line DH18-12 inherited vernalization requirement and a high protein content (24 %) from *H. spontaneum* IU 30009. The latter genotype is considered to be promising for the use in barley breeding also due to its long grain (15.5 mm) and less brittle spikes.

Acknowledgment: *the research was carried out within the project "Androgenetic doubled haploid production in spring barley on the basis of intervarietal and interspecific crosses and replenishment of trait collections by addition of introgressive lines" (Nr. 0121U100569), financed by National Academy of Agrarian Sciences of Ukraine.*

Keywords**:** *Hordeum spontaneum, H. vulgare, DH-line, vernalization requirement, protein content.*

UDC: 579.873.7

PLANT GROWTH PROMOTION PROPERTIES OF STREPTOMYCETES ISOLATED FROM MOLDOVAN SOILS

Bîrsa Maxim*, ORCID: 0000-0003-3068-1719
Burțeva Svetlana, ORCID: 0000-0001-7412-7897

Technical Universiy of Moldova, Chisinau, Republic of Moldova

*E-mail: *maxim.birsa@imb.utm.md*

Today microorganisms associated with plants represent a reliable source of phytohormonal substances. In plant growing, phytohormones are used as bactericides, insecticides, herbicides, and plant growth stimulants. All these characteristics are suitable to metabolites of genus *Streptomyces*. Strains of various types of streptomycetes are indole-3-acetic acid producers and could be applied agriculture as plant growth-promoters.

The aim of the research was to study the phytostimulating properties of streptomycetes strains (*S. mauvecolor* CNMN-Ac-12, *S. plicatus* CNMN-Ac-13, *S. gougerotii* CNMN-Ac-14) from National Collection of Nonpathogenic Microorganisms of Institute of Microbiology and Biotechnology of Technical University of Moldova on winter wheat variety "Coreator".

For obtaining the complex of exometabolites (EM), the strains were cultured in liquid complex medium M-I. To determine the phytostimulating activity of EM of the studied strains, the winter wheat seeds variety "Creator" were treated with aqueous solutions of culture supernatant.

The experiments showed changes in some physiological parameters, which differed from the control. For example, under the influence of aqueous solutions of the EM strain *Streptomyces* Ac-12, Ac-13, and Ac-14 the number of formed roots was higher than control sample (5,36-23,97%), best results were obtained by using 0,5% EM concentration. The length of the formed roots after treating seeds with EM solutions increased. Most of all, the length increased under the influence of EM of CNMN-Ac-14 at a concentration of 0,5 % and was more by 19,32 % in comparison with control. The dry weight of the wheat roots after treatment with EM solutions increased by 18.98-80.75 % in comparison with control sample.

The experiments showed that the treatment of winter wheat seeds variety "Creator" with aqueous solutions of EM of streptomycetes isolated from the soil of Republic of Moldova contributed to the development of the root system to a greater degree: an increase in the length of the roots and their mass.

Acknowledgments: *This study was supported by the research project 020101 "Innovative biotechnological solutions for agriculture, medicine and environment", funded by National Agency for Research and Development.*

Keywords: streptomycetes, exometabolites, winter wheat, length of roots, weight of roots.

UDC: 632.111.6:633

THE IMPACT OF THE UNUSUAL AGROMETEOROLOGICAL CONDITIONS OF THE WINTER 2023-2024 ON THE WINTERING OF THE MAIN AGRICULTURAL CROPS

Boian Ilie: ORCID 0000-0002-7632-2562

Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova

E-mail: *ilie.boian@usm.md*

The paper analyzes the wintering conditions of autumn crops and perennial plantations in the 2023-2024 winter season, which was abnormally warm. For the described season, the average air temperature in the territory was +1.6...+3.9ºC, being 3.9-4.9ºC higher than the norm and ranked second in the entire period of instrumental meteorological observations. In the Republic of Moldova, the 2023-2024 winter season was abnormally warm and with a significant deficit of precipitation over a large part of the territory. For the described season, the average air temperature in the territory was +1.6...+3.9ºC, being 3.9-4.9ºC higher than the norm and ranked second in the entire period of instrumental meteorological observations. The absolute minimum air temperature during the season was -18.6ºC in the territory of the republic (January 10, SM Bravicea), and the absolute maximum reached +19.0ºC (February 11, SM Tiraspol). Very hot weather was observed in most of December, when the average air temperature was +1.3...+3.8ºC, being 3.0-3.5ºC higher than the norm. The maximum air temperature on December 26 in the territory rose to +18.5ºC (SM Ceadâr-Lunga), which in this decade is attested for the first time in the entire period of observations. The average air temperature for the period January 1-7 was +3.0...+6.5ºC, which is 6.0-8.5ºC higher than the norm. Abnormally hot weather was also reported in February, when the average monthly air temperature was +5.2...+7.2ºC, which is 6.5-8.5ºC higher than the norm and is recorded for the first-time data from the entire period observations.

Autumn crops and multi-year plantations during the 2023-2024 winter period were predominantly in a state of vegetative rest, but weak vegetation was periodically reported in the respective crops during the daytime hours. Towards the end of February, isolated to the early varieties of apricot, sour cherry and cherry, swelling of the buds was reported. In order to establish the state of autumn crops, fruit trees and vines during the winter period, on February 12, 2024, the State Hydrometeorological Service collected samples for their growth and analysis. The results of the growth of autumn crops showed that the wintering process went well, the loss of autumn crops in general was not detected. On most of the researched territory, in the main fruit crops, there was no loss of flower buds, in isolation their loss constituted only 1-6%. The results of the growth of the vine shoots demonstrated that in most of the researched territory, the loss of the meshes of the technical varieties of the vine was not observed, isolated their loss was 4-10%.

Acknowledgments: *Proiectul instituțional 010801 Sporirea securității ecologice și reziliență geo-ecosistemelor la modificările actuale de mediu.*

Keywords: *Absolute minimum temperature, absolute maximum temperature, condition of agricultural crops, vegetative rest, average snow cover thickness.*

UDC: 579.86:631.833

THE EFFECT OF COPPER SALT ON THE GROWTH OF *BACILLUS*

Bogdan-Golubi Nina*, ORCID: 0000-0003-2199-4414
Balan Ludmila, ORCID: 0000-0002-8319-6808
Slanina Valerina, ORCID: 0000-0002-9833-7933

Technical University of Moldova,
Chisinau, Republic of Moldova

*E-mail: *nina.bogdan@imb.utm.md*

Copper is an essential microelement for plants, is need for various important physiological functions such as photosynthesis, respiration, antioxidant response, but excess copper is also toxic leading to the severe oxidative stress in various plant species and to the damage of proteins. Biocontrol agents tolerant to pesticide are preferred in integrated pest control treatment. The aim of this study was to determine potential of some *Bacillus* strains to synthesis of bioactive substances in the presence of copper.

Three strains of bacteria *Bacillus* selected from National Collection of Non-pathogenic Microorganisms were cultivated on nutrient agar at temperature 36°C for 48 hours in the presence of $CuSO_4*7H_2O$ in concentration of 1 mg/L, 5 mg/L and 10 mg/L.

The results from the present study revealed that tolerance capacity of selected strains to grow at studied concentrations of copper salt varied with the strains, concentration of 1 mg/L, 5 mg/L and 10 mg/L influenced the CFU count of strains. Concentration of copper salt 10 mg/L demonstrated the most pronounced stimulatory effect on two strains. However, for one strain 5-10 mg/L concentrations were toxic and caused decrease CFU count and inhibitory effect on growth of the culture. Therefore, application of copper salt in culture medium of *Bacillus* had both stimulating and inhibitory effects, one strain proved to be sensitive to copper. Selected biotechnologically relevant strains will be considered for further research for application in agriculture.

Acknowledgments: *This study was supported by the research project 020101 InBioS - Innovative biotechnological solutions for agriculture, medicine and environment, funded by National Agency for Research and Development.*

Keywords: *copper, growth, Bacillus.*

UDC: 551.5:632.111.5(478)

COMPARATIVE ANALYSIS OF INTERPOLATION METHODS SUITABLE FOR THE TERRITORY OF THE REPUBLIC OF MOLDOVA: APPLICATION TO DANGEROUS FROSTS

Botnari Aliona, ORCID: 0000-0002-7930-3746

Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova

E-mail: *lionkabotnari@gmail.com*

This paper analyzes the validity of different hazard frost maps obtained by several interpolation methods. The study was carried out for the entire territory of the Republic of Moldova. The temperature variable and several interpolation methods were analyzed used in climate mapping: global interpolators (regression models), local interpolators (inverse distance weighting, spline), geostatistical methods (simple kriging, ordinary kriging, directional kriging, universal kriging and co-kriging) and mixed methods (combined global, local and geostatistical methods).

The validity of the maps and the quality of the models was checked by comparing the measurement values from the weather stations of the State Hydrometeorological Service with the values obtained by interpolation.

The results show that some interpolations methods are very similar. The precision measurements obtained by the different interpolation methods change significantly depending on the climate variable mapped.

The best results for hazard frost mapping were obtained using mixed methods, using regression-based geostatistical methods.

Acknowledgments: *This study was supported by the research project: subprogram 010801, Sporirea securității ecologice și rezilienței geo- ecosistemelor la modificările actuale de mediu, funded by Institute of Ecology and Geography, Moldova State University.*

Keywords: *hazard frost, frost mapping interpolation, kriging***.**

UDC: 582.232:547.5

ANTIOXIDANT ACTIVITY OF SOME EXTRACTS OBTAINED FROM NATIVE AND PRETREATED BIOMASS OF *ARTHROSPIRA PLATENSIS*

Cepoi Liliana*, ORCID: 0000-0002-7516-948X
Tașcă Ion, ORCID: 0000-0002-4053-3296
Valuta Ana, ORCID: 0000-0003-1233-9362
Iațco Iulia, ORCID: 0000-0003-1233-9362
Chelmenciuc Viorica, ORCID: 0009-0006-6143-3709

Institute of Microbiology and Biotechnology, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *liliana.cepoi@imb.utm.md*

The pre-treatment methods applied to the biomass of *Arthrospira platensis* (spirulina) induces the modification of the cell membrane structure, which can influence the antioxidant properties of the extracts obtained from it. The antioxidant activity of some extracts obtained from native spirulina biomass and treated with microwaves by extraction with 45% alcohol, with extraction duration of 1, 2 and 3 hours, was evaluated. In the study, as antioxidant tests were used: capacity to reduce ABTS (2,2-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)) and DPPH (2,2-diphenyl-1-picrylhydrazyl) radicals, as well as the reducing of iron power (PRFe). The ABTS and DPPH antioxidant test values expressed in % radical reduction, and PRFe was expressed in mg of ascorbic acid. In the extract obtained from native biomass by extraction with 45% alcohol for 1 hour, the antioxidant activity was 85% ABTS inhibition, 33% DPPH inhibition, and 0.112 mg/ml PRFe ascorbic acid. In the extract obtained by 45% alcohol extraction for 2 hours, the antioxidant activity was 91% ABTS inhibition, 49% DPPH inhibition, and 0.116 mg/ml PRFe ascorbic acid. In the extract obtained with 45% alcohol for 3 hours, the antioxidant activity was 79% DPPH inhibition and 0.118 mg/ml PRFe ascorbic acid. For extracts obtained from biomass pretreated with microwaves, the antioxidant activity decreased depending on the duration of microwave treatment. The most favorable result was established for the extract obtained by extraction with 45% alcohol for 3 hours, where the antioxidant activity was 42-48% ABTS inhibition, 10-32% DPPH inhibition, and 0.12-0.22 mg/ml PRFe ascorbic acid.

Thus, the study demonstrated that extracts from native spirulina biomass can be technologically used to obtain products with antioxidant properties.

Acknowledgments: *This study was supported by the Research Subprogram 020101, Institutional financing contract no. 4/FI of 22 February 2024.*

Keywords: *Spirulina, biomass, microwave, biologically active extracts, antioxidant activity.*

UDC: 504.064.3:574:504.3.054

ASSESSING AIR QUALITY THROUGH MOSS BIOMONITORING: INSIGHTS INTO HEAVY METAL POLLUTION AND ITS VARIABILITY ACROSS REGIONS

Chaligava Omari[1,2], ORCID: 0000-0002-7231-9534

[1]Doctoral School Biological, Geonomic, Chemical and Technological Science, Moldova State University, Chisinau, Republic of Moldova
[2]Sector of Neutron Activation Analysis and Applied Research, Division of Nuclear Physics, FLNP, Joint Institute for Nuclear Research, Dubna, Moscow Region, Russian Federation

E-mail: *o.chaligava@gmail.com*

Biomonitoring offers a unique approach to assess air quality by using mosses as bioindicators of heavy metal pollution. This method is both cost-effective and easily accessible, and provides a direct link between terrestrial ecosystems and atmospheric conditions, offering valuable data on air quality and its potential health impacts.

Different regions may experience varying degrees of pollution. By comparing moss samples from different geographical locations, patterns and variations in heavy metal concentrations can be identified. This variability can be attributed to local industrial activities, natural geological formations, atmospheric deposition processes and etc. Such insights enhance the understanding of how these factors interact and influence the bioaccumulation of heavy metals in mosses.

The results from the latest moss survey conducted in Georgia were compared with those from prior survey. The comparison indicates a general decrease in median values for most elements. However, this trend is not applied uniformly to Cadmium (Cd), Manganese (Mn), and Zinc (Zn), whose median values remained stable across both surveys.

The comparison of the data with other countries reveals that Georgia has higher concentrations of elements typically associated with soil. This suggests that the background concentration of these elements in Georgia may also be elevated, due to the effects of wind erosion.

Keywords: *Moss biomonitoring, Air pollution, Moss survey, Heavy metals, Wind erosion.*

UDC: 582.232:663.1

SOME SPIRULINA BIOMASS TREATMENT TECHNIQUES AND THE EFFICIENCY OF THE PROCESS FOR OBTAINING A VALUABLE BIOLOGICAL ACTIVE EXTRACTS

Chiriac Tatiana *, ORCID: 0000-0003-2933-0751
Rudi Ludmila, ORCID: 0000-0002-0752-8153
Djur Svetlana, ORCID: 0000-0001-8093-3510
Rotari Ion, ORCID: 0000-0002-3540-0181
Zosim Liliana, ORCID: 0000-0003-0510-8064
Rudic Valeriu, ORCID: 0000-0001-8090-3004

Institute of Microbiology and Biotechnology, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *tatiana.chiriac@imb.utm.md*

Arthrospira platensis (spirulina) is known as a source of valuable biologically active compounds. Conditioning the spirulina biomass used as a raw material is important in the extraction processes of various biologically active compounds. This study investigated how some biomass processing techniques influence the extraction of biologically active compounds. Two biomass pre-treatment techniques were applied: 1) pre-treatment with ultrasound and 2) pre-treatment with microwaves. In the first variant, the spirulina was treated with ultrasound at a frequency of 22 kHz, applying three intensity regimes: 3, 5, and 7 W/cm^2, with a process duration of 10, 20, and 30 sec. The highest content of biologically active compounds was found in the 45% hydro-alcoholic extracts of the biomass pretreated with ultrasound at 7 W/cm^2 for 10, 20, and 30 sec.: 0.68-0.79 mg/ml proteins, 0.37-0.45 mg/ml peptides, and 0.180 mg/ml carbohydrates. In this variant, the ultrasound intensity determined the efficiency of the obtaining process of the biologically active components from spirulina biomass. In the second variant, the biomass was pretreated with microwaves at powers of 100, 180, and 300 W, with process durations of 3, 5, and 10 sec. The microwave power proved to be decisive in this case well. The 45% hydro-alcoholic extracts from the pretreated spirulina biomass, in the optimal regime determined - power of 300 W, duration of 3 and 5 sec., contained 1.02mg/ml proteins, 0.3-0.33 mg/ml peptides, and 0.06-0.15 mg/ml carbohydrates. For both techniques applied to spirulina biomass, the extracted content of biologically active compounds was 2.2-2.7 times higher compared to using native spirulina biomass. Thus, the biomass pretreatment techniques applied in this study can be used to condition the biomass for obtaining various biologically active compounds from spirulina.

Acknowledgments: *This study was supported by the Research Subprogram 020101, Institutional financing contract no. 4/FI of 22 February 2024.*

Keywords: *Spirulina, biomass, ultrasounds, microwave, biologically active compounds.*

UDC: 582.282.123.4:663.1

CHARACTERIZATION OF AMILOLYTIC PREPARATIONS PRODUCED BY THE MICROMYCETE *ASPERGILLUS NIGER* CNMN FD 06

Ciloci Alexandra[1]*, ORCID 0000-0003-3888-7869
Clapco Steliana[2], ORCID 0000-0001-7147-2740
Dvornina Elena[1], ORCID 0000-0002-0015-6131
Labliuc Svetlana[1], ORCID 0000-0002-5692-5649
Bulimaga Valentina[1], ORCID 0000-0002-5042-2952

[1]*Institute of Microbiology and Biotechnology, Technical University of Moldova*
[2]*Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova*

*E-mail: *alexandra.ciloci@imb.utm.md*

Due to their properties, such as thermostability, pH profile, pH stability, and Ca-independency fungal amylases can be used in a wide number of industrial processes (food, fermentation and pharmaceutical) and obtaining higher amylase yields is of great interest. Present study was focused on the characterization of three amylolytic preparations obtained under the submerged cultivation of the micromycete *Aspergillus niger* CNMN FD 06 in standard conditions (control) and in the presence of chemical stimulators – nanoparticles of TiO_2 (preparation I) and coordination compound of Sr with a polydentate ligand (preparation II).

Amylase from the culture filtrate of *A. niger* CNMN FD 06 was purified by 96% ethylic alcohol precipitation, gel-filtration on the PAD-10 column, and ion exchange chromatography on the Hi-TrapTMQ column. The yield and specific activity of amylases were by 25% and 45.6% higher than in the control in preparation I and, by 17% and 42.5% - in preparation II. After the purification, amylolytic activity has been increased by 6.5 times in the control and of 5.7, respectively, 5.6 times in the variants with TiO_2 and Sr component compound.

As revealed by SDS-PAGE analysis, the summary extract of the control sample has in its composition about 20 polypeptide fractions with apparent molecular masses in the range of 15 - 130 kDa. In the purified control fraction, 3 bands with molecular masses of 40, 65 and 70 kDa were detected. The summary extracts of samples with stimulators have a varied number of polypeptide bands and after purification the band with a molecular mass of 65kDa is highlighted, especially in the case of using stimulation with the Sr (II) coordination compound.

Acknowledgments: *This study was supported by the research subprogram: 020101 „Inovative biotechnological solutions for agriculture, medicine and environment protection" and the research project 20.80009.5007.28.*

Keywords: *amylases, micromycete, gel-filtration, ion exchange chromatography*

UDC: 615.015:547.1

SELECTION OF THE OPTIMAL METHOD FOR SYNTHESIS OF DIHYDROPYRIMIDIN-2-ONES(THIONES) USING VARIOUS CATALYSTS

Ciobanu Natalia*, ORCID: 0000-0002-1321-9277
Macaev Fliur, ORCID: 0000-0002-3094-1990

Institute of Chemistry, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *karakuianat@mail.ru*

The relevance of pyrimidines is well known due to their wide range of biological activities due to the different pharmacophoric moieties of their constituent structures. Since dehydropyrimidines play an important role in human life and their use in the field of drug research has stimulated the expansion of the range of synthetic methods of preparation, laboratory availability and their chemical transformations, especially in conditions of respect for the protection of ecology and the environment in general. Monastrol and related compounds that bind proteins other than tubulin may have less toxicity and fewer side effects than the tubulin-binding substances currently in use. In the synthesis of dihydropyrimidines, the goal is to select reagents and test different catalysts and conditions, especially in developing strategies to approach eco-friendly catalytic conditions for further use in the work. Eutectic alloys can serve as an alternative to toxic and expensive modern catalysts for such synthesis.

To carry out syntheses under the conditions of the Biginelli reaction, benzaldehydes, ethyl acetoacetate and thiourea or urea were taken in equimolar quantities. Identification of the chemical structure of the products was carried out using modern physicochemical methods of analysis.

One of the important products of the three-component reaction under the conditions of the Biginelli reaction is monastrol (ethyl-6-methyl-4-(3-hydroxyphenyl)2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxyl).

Eutectic mixtures were synthesized in proportions of imidazolium salts and thiourea or urea, such as (1:1) and (1:2) and used in the reaction to obtain dihydropyrimidines such as monastrol and oxymonastrol (ethyl-6-methyl-4-(3-hydroxyphenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxyl).

The advantages of this method are: the availability of the reagents used, the simplicity of the method of synthesis and purification of the final product, compliance with the theoretical principles of modern ecology, and the features of maximally approaching environmentally favorable catalytic conditions. The production of oxymonastrol under identical conditions is more efficient than the production of monastrol: the synthesis proceeds faster in time and the yield of the final product is higher.

Keywords: *monastrol, eutectic alloys, dihydropyrimidines.*

UDC: UDC: 632.126:630.384.2

THE GEOMORPHOLOGICAL IMPACT OF DEFORESTATION ON THE STABILITY OF THE GEOGRAPHICAL ENVIRONMENT

Ciobotaru Ana-Maria, ORCID: 0000-0002-3018-3448

Technical College „Gheorghe Bals”,
Adjud, Romania

E-mail: *ciobotaruanamaria@yahoo.com*

Deforestation is a complex phenomenon that affects the characteristics of the environment both from a climatic and ecological point of view, as well as through multiple geomorphological processes. It is reflected in considerable financial costs but also in the emergence of major ecological and environmental problems. Deforestation leads to changes in land use, intensification of erosion processes, surface erosion and sediment transport.

The objective of the study was to analyze the connection between the rate of deforestation and the geomorphological processes in the Carpathian area in Romania.

The results of our study led to the idea that soil erosion is closely related to the age and intensity of deforestation in Carpathian Mountains from Romania.

We concluded that the stability of forest ec osystems is affected by severe geomorphological problems (landslides, seepage, slope, slope, surface erosion). Deforestation leads to the acceleration of land degradation and the increase of the erosion rate.

Keywords: *deforestation, landslides, erosion, land degradation.*

UDC: 635.714:632.111

ORIGANUM TYTTANTHUM GONTSCH. – BIOLOGICAL PECULIARITIES UNDER *EX SITU* CONDITIONS

Ciocarlan Nina, ORCID: 0000-0002-9477-5848

"Al. Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

E-mail: *nina.ciocarlan@yahoo.com*

Origanum L. species, commonly named Oregano, is a universal crop used in a variety of fields as a medicinal, spicy-aromatic and ornamental plant.

The paper refers to *Origanum tyttanthum* Gontsch. (Turkish oregano), a new medicinal species introduced in the National Botanical Garden (Institute) (NBGI) and its biological peculiarities under *ex situ* conditions. It is a perennial, herbaceous species, differing from common oregano (*O. vulgare*) in the shape of the inflorescence, the size of the flowers and the abundance of secretory glands. The use of *O. tyttanthum* in folk and modern medicine is similar to that of the common oregano, even surpassing it in terms of phenolic content and oil yield. It is also very appreciated as a spice, as an ornamental and honey plant.

The research is carried out at the experimental field of the Medicinal Plant Collection of NBGI. The plants were obtained, by the international seed exchange (*Index Semminum*) from the Prague Botanical Garden (Czech Republic).

Briefly describing the progress of ontogenesis of *O. tyttanthum* under *ex situ* conditions (specific to Republic of Moldova) it can be mentioned that the species follows the type of non-obviously polycentric biomorphs and pass the following ontogenetic periods and stages: *embryonic* (latent stage), *pre-generative* (plantlet (*pl*), juvenile (*j*), immature (*im*) and virginal (*v*) stages), *generative* (early generative (g_1), middle generative (g_2), and late generative (g_3) stages), *post generative* (senile (*s*) stage). Towards the end of the first period of vegetation, the largest number of individuals achieves the early generative stage. In the second growing season, the plants develop up to 10-15 generative shoots, their number increasing 2-3 times each subsequent year, ensuring sufficient quantities of raw material. The generative period results with abundant fruiting, which demonstrates the high adaptability to local pedo-climatic conditions.

The introduction into the culture of new oregano taxa will expand the assortment of medicinal plants and contribute to creating a source of raw material alternative to common oregano (*O. vulgare*), an indigenous plant with similar therapeutic effects, intensively harvested from the spontaneous flora.

Acknowledgments: *The research is carried out within the framework of Subprogram 010101 "Ex situ and in situ research and conservation of plant diversity in the Republic of Moldova".*

Keywords: *Origanum tyttanthum, medicinal plant, biological peculiarities.*

UDC: 579.8:577.212

RECOVERING A LOST SEQUENCE – pH6EX3

Ciurlic Maria Paula*
El- Sabeh Amada, ORCID: 0000-0001-7216-7326
Munteanu Iustin-Tiberius, ORCID: 0000-0003-3609-5841
Mihasan Marius, ORCID: 0000-0003-4439-4251

BioActive Research Group,
Alexandru Ioan Cuza University of Iasi, Romania

*E-mail: *ciurlicmp@gmail.com*

Purpose: pH6EX3 is an expression vector that directs the synthesis of a fusion protein with an N-terminal 6-His tag, simplifying the purification of the overexpressed protein using IMAC. pH6EX3 is derived from pGEX-2T and provides very robust and strong protein overexpression. Since its publication in 1992, pH6EX3 has been extensively used, but as its sequence was not deposited to any publicly available databases has been lost. Hence, our aim is to recover its sequence and share it with the community. We used nanopore sequencing to assemble the pH6EX3 sequence and add it to Addgene.

Plasmid DNA from bacteria grown on LB (50 μg/ml ampicillin) was isolated with the Qiagen Plasmid Miniprep kit. The ONT SQK-RAD004 kit was used for library prep and long-read sequencing was performed on an ONT MinION device coupled with a Flongle flowcell. After basecalling with Guppy 6.5.7, the epi2me-labs/wf-clone-validation pipeline was employed for QC, assembly, and annotation.

1129 reads with a median read length of 4805 bp were acquired with a median Q-score of 10. The circular plasmid was successfully assembled with a mean quality of 33.55 and a reported size of 4856 bp. pLannotate identified correctly all the sequence features described in the original paper.

Long-reads sequencing allowed the almost-complete sequencing of the pH6EX3 plasmid in a single read. The circular plasmid sequence and its features are in good agreement with the original report. The sequence is available in Addgene, Plasmid #216723 *(https://www.addgene.org/216723/)* and can be used for cloning and purification of various recombinant proteins in *Escherichia coli* strains.

Keywords: *plasmid, vector, sequencing, bioinformatics.*

UDC: 338.48(478):004

THE ROLE OF DIGITAL TEHNOLOGIES IN THE DEVELOPMENT OF THE TOURISM SECTOR IN THE REPUBLIC OF MOLDOVA

Colesnicova Vlada, ORCID: 0000-0001-9916-212X

Vladimir Andrunachievici Institute of Mathematics and Computer Science,
Moldova State University,
Chisinau, Republic of Moldova

E-mail: *colesnicova70@gmail.com*

Digital transformation in tourism has revolutionized the industry. Companies are increasingly adopting digital signage software to ensure better communication with tourists. Digital technology in tourism industry facilitates this by enabling personalized recommendations through advanced content management systems. Nevertheless, there are a number of difficulties in this area.

One of the significant challenges of implementing digital tourism is the high initial costs associated with setting up the necessary infrastructure, developing digital solutions, and training staff. To overcome this challenge, businesses can consider phased implementations.

As digital tourism collects and utilizes vast amounts of traveler data, privacy concerns become prominent. Travelers worry about their personal information being misused or exposed. To address these concerns, businesses should prioritize data security and privacy compliance.

This article analysis of information technologies implementation in the tourism industry. Also, the tourism industry analysis, statistics, trends, data and forecasts using latest information from UN World Tourism Organization (UNWTO) are carried out in this paper. The following researches methods were used in this paper: analysis of the statistical data, synthesis, logical method, monographic method, comparative analysis, etc. The analysis in this research is based on data from the latest reports of UNWTO and on examination the opinions of experts from the tourism industry.

Acknowledgments: *This study was supported by the research project* ***(011301 SIBIA, Informational Systems based on Artificial Intelligence****), funded by* ***(ANCD****).*

Keywords: *digital tourism, digital solutions, digital signage, necessary infrastructure, initial costs, traveler data.*

UDC: 546.296:614(478)

CONTRIBUTIONS TO THE RESEARCH OF RADON EXPOSURE UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA IN RELATION TO THE IMPLEMENTATION OF EC DIRECTIVE 2013/59/

Coreţchi Liuba[1]*, ORCID: 0000-0001-5758-3831
Ababii Aurelia[1], ORCID: 0000-0002-9481-5993
Răileanu Valentin[2], ORCID: 0000-0002-2000-8216
Romanciuc Parascovia[1], ORCID: 0000-0002-6620-1767
Capaţina Angela[1], ORCID: 0000-0001-7074-3334

[1]National Agency for Public Health,
[2]State University of the Republic of Moldova, Chisinau, Republic of Moldova

*E-mail: *coretchiliuba@gmail.com*

The purpose of the work consisted in researching the distribution of indoor radon concentrations on the territory of the Republic of Moldova. In order to implement the EC Directive No.2013/59/ measurements of indoor ^{222}Rn concentrations and in the water and soils were performed by passive/active methods. The map of indoor radon distribution is presented in the UTM coordinate system WGS84 zone 35N with the central meridian 270 at a scale of 1:1500000. The general characteristic of natural radioactivity is presented. The data of assessment of the concentration of natural radionuclides in building materials, indoor air of different types of housing and public buildings in rural and urban areas are presented. For the study of occupational exposure to radon, the concentrations of radon and its descendants were determined both in the indoor air of public medical institutions in Chisinau, as well as in early education institutions/primary, secondary and high schools in the country. Special attention was paid to the sanitary-hygienic assessment of the concentration of radon and its descendants in the main components of the environment: different types of soils and waters. At the same time, the results of monitoring the variation of the external gamma fund on the territory of the country are presented. It was interesting to study in dynamics the incidence of morbidity due to different types of cancer in the population, in relation to the risk factors associated with ionizing radiation. In addition, data regarding the regulation of the radiation exposure of the population from natural sources, including radon, are presented. Attention shall be paid to both remedial measures, including the management of indoor radon exposure and workplace in accordance with national/international rules, and the actions that may be included in the national radon remediation program. The data for calculating the risk of exposure of the population to natural sources of ionizing radiation are presented. The study established the health risk caused by radon exposure, its documentation through the levels of radiation of the population from natural sources of ionizing radiation, including radon; incidence/prevalence of morbidity from various types of cancer, including bronchopulmonary cancer, proposal for measures to regulate the radiation exposure of the population from natural sources, including radon, and remedial measures.

Acknowledgments: *This study was supported by the research Project nr.20.80009.8007.20 „Quantification of the risk to health, associated with exposure to ionizing radiation, in the context of the EURATOM directive No. 2013/59/", funded by National Agency for Research & Development.*

Keywords: *Radon, Public Health, Exposure.*

UDC: 556.535:621.22(478)

ANALYSIS OF THE INFLUENCE OF THE HYDRO POWER COMPLEX ON THE HYDROLOGICAL REGIME OF THE DNIESTER RIVER

Coronovschi Alexandru*
Prepeliță Dinu
Isac Aliona, ORCID: 0009-0006-1023-5470
Serviciul Hidrometeorologic de Stat, Chisinau, Republic of Moldova

*E-mail: *alexandrucoronovschi@gmail.com*

The purpose of this study is to research the influence of the Dnestrovsk and Dubăsari Hydropower Complex (HC) on the hydrological regime of the Dniester River. The researches were focused on the impact on the multiannual average flow values and their trends over certain characteristic periods. As a criterion for establishing the existence of the negative impact, the dynamics of the leakage formation tendency was used. The research was carried out by the method of comparing the hydrological regime (multiannual values of flows and their temporary trend) of the Dniester river until and after the construction of Dnestrovsk and Dubăsari HC for all characteristic periods. The research results prove that the Dnestrovsk HC in complex/individually with Dubăsari HC did not produce and does not produce a negative impact on the formation trends of the hydrological regime of the Dniester river. The research results disproved the initial hypothesis, that the Dniester river is drying up because of Dnestrovsk HC. As proof is the fact that the trends in the formation of the regularized hydrological regimes researched in the paper correspond to the natural ones in most of the studied periods. Although at the Zaleșciki Hydrometric Station, in natural time periods, the variation of multiannual average water flow compared to the period 1860-1960 is within the limits of water flow measurement accuracy (approx. 10%), the variation of water flow at the Tighina Hydrometric Station can be observed that during the 1960s -1980 the multiannual average water flow increased compared to the natural version by about 15%, which is significant. However, if we compare the trend of the hydrological regime during this period at the Tighina Hydrometric Station with that at the Zaleșciki Hydrometric Station, we come to the conclusion that this increase is the result of natural phenomena that occurred in the river's hydrographic basin during that period. From the data, we notice that among the periods researched at the Tighina Hydrometric Station, two periods with different regularization time levels are most similar to the natural one: 1880-1980 (with mixed regularization period) and 1956-2021 (the entire regularized period). Considering the mentioned results, it is necessary to change the data string that is currently used (1885-2022) with another data string (1956-present), because downstream of the HC we no longer have a completely natural data string. The use of the current data string can lead to significant errors in the case of its use in hydraulic calculations of hydrotechnical constructions. However, to achieve these changes, complex research and modeling are required.

Keywords: *hydrological regime, influence, hydropower complex, characteristic periods, temporary trends.*

UDC: 573.6:634.11:632.25

BIOLOGICAL PRODUCTS IMPACT ON POWDERY MILDEW INTENSITY AND PROGRESS ON APPLE

Curiev Loredana*, ORCID: 0000-0002-1927-8358
Pinzaru Boris, ORCID: 0000-0001-7323-4770

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *loredana.curiev@sti.usm.md*

Powdery mildew is one of the most hazardous diseases of apple trees. Especially it is dangerous for young plants in the nurseries. The aim of this study was to estimate the impact of biological preparations on the apple powdery mildew (*Podosphaera leucotricha*) intensity and progress. The experiments were carried out at the experimental plot of the IGFPP (MSU), on the apple var. Reinette Simirenko during the 2022 and 2023 vegetation periods. There were 8 variants, 3 repetitions, with 3 trees per repetition in the trials (table 1).

Table 1. Impact of biological preparations on the apple powdery mildew intensity and progress.

Variant	Dosa	2023		2022	
		Disease progress	Disease intensity	Disease progress	Disease intensity
Martor		13,6%	6,4%	11,0%	4,8%
Jeck pot	0,4 l/h	4,7%	1,3%	4,3%	0,8%
Trichodermin SC	7 l/ha	5,3%	1,7%	5.0%	1,3%
Trichodermin SC	10 l/ha	6,7%	1,2%	4,6%	1,1%
Rizoplan	7 l/ha	7,3%	1,5%	7,0%	1,5%
Rizoplan	10 l/ha	7,0%	1,1%	6,0%	1,2%
Trichodermin SC +Rizoplan	7 l/ha	4,3%	1,6%	6,7%	1,4%
Trichodermin SC +Rizoplan	10 l/ha	3,1%	1,0%	6,3%	1,0%

Despite the fact that, at the phenological growth stage BBCH 67 (flowers fading: majority of petals fallen) the chemical preparation Jeck Pot was the most effective against apple powdery mildew at the experimental plot during the vegetation periods of the 2022 and 2023, the disease progress in the variants with biological products treatments was about two times lower than in the variant without any treatments. Furthermore, the disease intensity in the variants with biological preparations Trichodermin SC and Rizoplan application was quite close to the chemical standard assays data. Therefore the biological plant protection products used in the study could be recommended in the sustainable apple cultivation.

***Acknowledgments**: Research was carried out within the subprogramme 011103: "Development of environmentally friendly means of reducing the impact of harmful organisms on agricultural crops against the background of climate change" funded by the National Agency for Research and Development.*

***Keywords:** powdery mildew, apple variety Reinette Simirenko, intensity, progress.*

UDC: 582.232:582.4

ALGAE OF THE *NOSTOC* GENUS AS STIMULATORS FOR GERMINATION OF *ECHINACEA PURPUREA* L. SEEDS

Dobrojan Sergiu[1]*, ORCID: 0000-0003-0040-5836
Jigău Gheorghe[1], ORCID: 0000-0002-4778-2105
Dobrojan Galina[1]
Melnic Cristin[2]
Ciolacu Tatiana[3], ORCID: 0000-0002-9972-9314
Ciobanu Eugeniu[4], ORCID: 0000-0003-3595-4421

[1]State University of Moldova,
[2]GȚ "Melnic Cristin",
[3]Institute of Ecology and Geography,
[4]"Ion Creangă" State Pedagogical University,
Chisinau, Republic of Moldova

*E-mail: *sergiudobrojan84@yahoo.com*

Stimulating the germination of plant seeds has been, is, and will be of primary interest both in scientific research and in the practical cultivation of these plants. Due to the continuous growth of the Earth's human population, the intensification of environmental degradation processes, climate change, and other environmental issues, the health status of the human population is precarious. The population has increasingly started using chemical preparations that have adverse effects on the human body. To improve or maintain the health of people, it is necessary to widely use preparations, teas, and other by-products of plant origin obtained from the biomass of medicinal plants. Among the medicinal plants of major interest is the species *Echinacea purpurea* L., which is widely used as a medicinal plant with biostimulant, antiviral, antitumor, immunostimulant, healing, anti-inflammatory, diuretic, adaptogenic, antifungal effects, and does not cause any side effects when administered in normal doses. However, the use of *Echinacea purpurea* L. biomass collected from the wild flora cannot meet the demand for it. To ensure the necessary biomass of *Echinacea purpurea* L., the plant is cultivated, and to obtain a significant yield, biological stimulation of the seed germination process is necessary. Currently, many substances that stimulate seed germination are known and used, most of which are of chemical origin, negatively affecting the quality of *Echinacea purpurea* L. biomass. Thus, to obtain safe, high-quality, and beneficial products for humans, the germinative stimulants of *Echinacea purpurea* L. seeds must be of biological origin.

Cyanophyte algae present a significant source of biostimulators for the germination of *Echinacea purpurea* L. seeds, possessing a substantial content of auxins, cytokinins, gibberellins, amino acids, macro and micro elements, and can be used in production practice. Some research based on the use of cyanophyte algae species for stimulating the germination of medicinal plant seeds exists, but these are predominantly focused on using the biomass of a single algae species. In our view, to strengthen and achieve

significant results, it is necessary to obtain algal biostimulators by combining multiple species of cyanophyte algae.

Thus, we aimed to obtain and experiment with new germinative biostimulators from the combined biomass of the cyanophyte algae *Nostoc gelatinosum, Nostoc punctiforme,* and *Nostoc linckia.* The biostimulators were obtained by combining equal amounts of biomass collected from cultures in the exponential growth phase on Drew nutrient medium. Solutions with concentrations of 1-4% were used in the experiments, obtained by diluting the algal biomass with distilled water. To activate the biostimulatory substances, the obtained solutions were exposed to high temperatures for 60 minutes, then cooled and used to treat the seeds. One hundred *Echinacea purpurea* L. seeds were exposed to the prepared solutions for 1-3 hours, with seeds exposed to distilled water for the same time serving as the control. For studying the germination process, the seeds were placed in Petri dishes on filter paper moistened with distilled water under natural light and a temperature of 24°C. During the research, the germination capacity of *Echinacea purpurea L.* seeds was determined.

As a result of using the algal biostimulators, an intensification of the germination process of *Echinacea purpurea* L. seeds was noted. Seeds treated with the algal biostimulators began to germinate in significantly higher numbers from the 4th day of exposure, and by the 5th day, the best results were obtained with 1% algal biostimulators exposed for 1 hour (90% germination capacity), 2% exposed for 1 hour (86.67% germination capacity), and 4% exposed for 3 hours, where 99% of the total seeds experimented germinated. In the control variant, the highest germination capacity of *Echinacea purpurea* L. seeds (70%) was noted in the batch exposed to distilled water for 2 hours. It should be mentioned that seeds treated with combined algal biostimulators from the *Nostoc* genus showed an increase in germination capacity by *Echinacea purpurea* L. 16.67%-29% compared to the control variants.

In conclusion, we find that algal biostimulators obtained from the combined biomass of algae from the *Nostoc* genus have a significant effect on stimulating the germination of *Echinacea purpurea* L. seeds and propose them for practical applicability in the plant cultivation process.

Acknowledgments: *This study was supported by the research project (code 23.70105.7007.07T), funded by the National Agency for Research and Innovation.*

Keywords: *algae biostimulators, seed, germination, Echinacea purpurea L.*

UDC: 582.232:551.583

ALGAE - NATURAL SOLUTIONS FOR MITIGATING CLIMATE CHANGE

Dobrojan Sergiu[1]*, ORCID: 0000-0003-0040-5836
Jigău Gheorghe[1], ORCID: 0000-0002-4778-2105
Dobrojan Galina[1]
Melnic Victor[1]
Melnic Cristin[2]
Ciolacu Tatiana[3], ORCID: 0000-0002-9972-9314
Ciobanu Eugeniu[4], ORCID: 0000-0003-3595-4421

[1]Moldova State University,
[2]GȚ "Melnic Cristin",
[3]Institute of Ecology and Geography,
[4]"Ion Creangă" State Pedagogical University,
Chisinau, Republic of Moldova

*E-mail: sergiudobrojan84@yahoo.com

Global climate change presents one of the most serious environmental issues that human society has ever faced. The effects of this problem are felt in all of Earth's ecosystems, creating severe imbalances, and the most threatening aspect is that its escalation could lead to the extinction of the human species. Humanity is obligated to take measures to prevent the progression of climate change, reduce its intensity, and stabilize or improve the quality of atmospheric air. It is well-known that carbon emitted into the atmosphere contributes the most to the Earth's global warming, so humanity is in a position where it must identify optimal, efficient, and rapid solutions for managing it. Current human actions are focused on reducing carbon and other greenhouse gas emissions and capturing it for storage or use as a source for obtaining benefits. It is worth mentioning that actions to reduce greenhouse gases will yield beneficial results over an extended period, and to prevent the rapid progression of this issue, actions to capture carbon from the atmosphere followed by its economic utilization are necessary.

To identify optimal solutions for carbon capture and economic utilization through its return to the economic cycle in the form of benefits, it is necessary to understand and apply the principles of life's evolution on Earth and extensively engage organisms that had the greatest contribution to oxygen elimination on Earth. Photosynthetic algae appeared in the Proterozoic era, capturing carbon from the atmosphere, which was present in significant concentrations, and releasing the oxygen necessary for life's evolution. At that evolutionary stage, nature indicated to us the solution of carbon capture and oxygen elimination through algae, followed later by the development of other life forms. This "*phenomenal*" experience must be adopted and applied in the current situation for capturing the continuously increasing carbon. Among algae, the most efficient are microalgae that inhabit phytoplankton. This is supported by the enormous quantities of oxygen released by the planetary

ocean's phytoplankton (approximately 34,2 billion tons annually), which, according to calculations, exceed even the amount of oxygen released by land plants. Some estimates indicate that Earth's phytoplankton algae absorb around 37 billion tons of CO_2, which is 40% of the total CO_2 emitted into the atmosphere, equivalent to the CO_2 absorbed by 1,7 trillion trees or 70 times more than all the trees in the National and State Redwoods Parks in the United States absorb annually. The more phytoplankton there is, the more carbon is absorbed. Despite the fact that algae biomass is only 1% of Earth's total biomass, they release about 50% of the total oxygen on Earth, which argues for their colossal capacity to photosynthesize and utilize atmospheric carbon. Algae transform carbon dioxide into biomass at a relatively rapid pace. On average, 1 kg of algal biomass (water-free) absorbs 1,83 kg of carbon dioxide daily, while 1 kg of mature trees absorbs approximately 0,003-0,012 g of CO_2 daily. As we observe, algae biomass, per kilogram, fixes much larger amounts of carbon from the atmosphere than mature trees, making them preferable for a rapid solution to the problem. Additionally, algae have the capacity to fix the Carbon-13 isotope, which cannot be assimilated by higher plants and is highly toxic.

The importance of carbon sequestration through algae is not only due to the rapid absorption of the toxic gas but also to the significant added value that can be obtained from their biomass, which can be converted through use in medicine, pharmaceuticals, agriculture (as fertilizers, nutritional supplements, biostimulants, antifungal agents, etc.), food production, biodiesel production, etc. However, carbon capture by microalgae varies depending on the species and their physiological characteristics. Some microalgae, such as *Chlorella vulgaris*, *Spirulina platensis*, *Scenedesmus quadricauda*, *Haematococcus pluvialis*, *Dunaliella salina*, *Chlamydomonas reinhardtii*, etc., are the most efficient for capturing carbon from the atmosphere, and the development of these systems involves the industrial cultivation of microalgae on inexpensive nutrient media (such as wastewater, animal waste, human feces, chemical fertilizers, natural soils and rocks, saline waters, etc.), thereby ensuring the recovery of nutrients and obtaining valuable algal biomass with potential economic return. The proposed solution, in addition to mitigating the problem of climate change, will serve as an example of the efficient applicability of circular economy, generating multiple benefits. Thus, the rapid and efficient solution to the problem of carbon dioxide capture from the atmosphere can be achieved by creating natural filters based on the establishment of industrial microalgae cultivation systems and the utilization of the obtained biomass in various branches of the economy.

Acknowledgments: *This study was supported by the research project (code 23.70105.7007.07T), funded by the National Agency for Research and Innovation.*

Keywords: *algae, climate change, carbon capture.*

UDC: 582.998.2:551.524

ASPECTS OF THE RELATIONSHIP BETWEEN MAXIMUM AIR TEMPERATURES AND SUNFLOWER CROP YIELD

Domenco Rodion, ORCID: 0000-0002-2419-5602

Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova

E-mail: *rodion.domenco@usm.md*

Despite the low temperature requirements in the first period after sowing, in the later stages sunflower needs a large amount of heat for normal growth and development. However, excessive heat (T > 30°), associated with drought, can affect the vitality of pollen, causing the flowers to abort. High temperature also negatively influences the accumulation of linoleic acid.

In this study we looked at the relationship between temperatures above 30°C and the average sunflower crop yield for the period 2000-2023. The number of cases with temperatures above 30°C was calculated for July – the month when sunflowers usually bloom – at 18 stations in the State Hydrometeorological Service network.

It was observed that in the years when in July there were several days with maximum temperatures above 30°C, the harvest was smaller. For example, in 2001 and 2002 there were, on average, 16-18 days with temperatures higher than 30°C, and the harvest in these years was 12 q/ha. However, the most obvious situations are in 2007, 2012 and 2020, when the harvests were among the weakest in the analyzed period. During these years, the number of days with maximum temperatures above 30°C varied between 13 and 25 (a. 2007); 18...28 (a. 2012) and 7...24 (a. 2020). In each of the three situations, the highest number of days with temperatures above 30°C was recorded in the southern half of the country, with maximums at the Tiraspol station.

Another thing worth mentioning is the upward trend in the number of days with values higher than 30°C. If at the beginning of the study period, at national level, in July there were 7.8 days with maximums of over 30°C, then in recent years (2020, 2021, 2022) the average number has reached 17.7.

Under the conditions described above, it is important to be aware of the importance of environmental factors on the productivity of the sunflower crop. It is therefore necessary to carry out research on the delimitation of favorable regions for sunflower cultivation in the new environmental conditions and to identify mechanisms for adapting agricultural crops to extreme temperatures and other meteoro-climatic risks.

Acknowledgments: *This study was funded by the project of the State Program 010801- Increasing the ecological security and resilience of geo-ecosystems to current environmental changes.*

Keywords: *temperature, sunflower, harvest.*

UDC: 582.772.2:615.89(498)

THE USE OF THE MAPLE TREE BY THE ROMANIAN PEOPLE

Dudnicenco Nicolae, ORCID: 0000-0002-1789-5301

National Museum of Ethnography and Natural History, Chisinau, Republic of Moldova

E-mail: *nicudud@yahoo.com*

Among the most valuable forest trees in the world, including in the Romanian space, is the maple. In the universal culture the maple tree is the symbol of restraint. The occultists believe that it is connected with the planet Jupiter. In many cultures each month is represented by a flower, in Japan the month of November is represented by the maple flower. To the Japanese as well as to the Chinese, the maple leaf symbolizes the autumn. The maple leaf in the universal culture is the emblem of lovers. The maple leaf is represented on the Canadian flag. Among the Romanian people, maple has not really been researched. Thus, in this material we have proposed to present some aspects of the usefulness of the maple tree to the respective people. In the Romanian space, the maple tree was valued by woodworkers for its homogenous wood, white with yellowish shades and with a silky appearance, used for the manufacture of furniture, tools and household objects, such as pieces from the loom, swings for babies, and *toaca* (the slate that is beaten rhythmically with one or two small hammers, to announce the beginning of certain moments at the monastery). Maple twigs were used to make fences for gardening, grape. In some regions of the Romanian space, ”maple butterflies” (flucts with divergent wings) boiled in water, were used against dysentery. In other areas, the decoction of maple bark or the solution of maple bark in brandy is drunk to get rid of diarrhea, dysentery. Those medicines were also used against wounds. The Romanians, like other peoples, in the spring, by notching the maple stems and draining them, obtain a consistent sweet sap that is consumed by the villagers. Maple bark contains saponins. Black, red, greenish-yellow dyes are prepared from the bark, young maple branches. On the day of the Ascension of Christ (Ispas), churches, graves and people's houses are decorated with green branches, flowers, and maple leaves, which are then kept in the house over the year, because they would be good, to smoke with them against lightning. At the end of this material, we find that the maple had vast uses for the Romanian people.

Keywords: *maple, folk medicine, natural dyes, household.*

UDC: 633.878:615.89(498)

THE USE OF THE POPLAR TREE BY THE ROMANIAN PEOPLE

Dudnicenco Nicolae, ORCID: 0000-0002-1789-5301

National Museum of Ethnography and Natural History,
Chisinau, Republic of Moldova

E-mail: *nicudud@yahoo.com*

Among the most widespread trees on the globe is the poplar, which is also found in the area inhabited by Romanians. In ancient China poplar was considered a water tree. Due to the fact that its stem, branches, leaves are of two colors, it represents a duality, the poplar symbolizes yin and yang, the side of the moon and the sun, as well as all other dualistic pairs.

In Ancient Greece and Ancient Rome, the white poplar symbolizes the union of the Sky god and the Earth goddess, thunder and lightning. Due to its value, the coat of arms of several USA featured the poplar tree, such as Indiana, Nebraska. Poplar is also used in naturalistic magical practices as protection against evil forces and provides intellectual abilities. Parts of this plant (for example, a leaf, a piece of a branch) are worn by a person when he wants to find peace from unhappy love and heal the wounds of his heart. Poplar has not really been researched in the Romanian area. Thus, in this material we have proposed to present some aspects of the utility of the poplar tree for Romanians. In the respective people, the poplar is the symbol of the man haunted by a deep sadness.

It is believed that it is not good to plant poplar in the household fence, because it is a ”damage tree”. On the Saturday before the day called Rusaliile, the boys from the villages of Dolj bring poplar and linden branches from the locality, used to decorate the windows and doors of the houses, they are considered to have enormous powers against evil forces, extremely active at Rusaliile, when they try to enter the in household, the house, in order to cripple people and animals. On Saint Toader's day, the girls prepare a grease consisting of poplar bark with oil, ash from walnut shells and hazelnuts, mix them all with lard, after which they anoint their hair with the aim of making their hair grow and being protected from any disease of the head. A yellow dye was extracted from poplar bark.

The spoons, spindles, beds and beams used in the construction of mud houses were made of poplar wood. Poplar branches were used to make large brooms for sweeping the fence, because they were stronger and did not take a long time to blunt. Mushrooms that grow near poplars (for example *Tricholoma populinum*) were used in the diet of Romanians. Currently, poplar wood is used in the manufacture of matches, veneers, in the pulp industry. The poplar is planted in public parks and gardens, near water, on islands. Thus we find that the poplar was a useful tree for the Romanian people.

Keywords: *poplar, folk medicine, natural dyes, household.*

UDC: 628.54:574(478)

MUNICIPAL SOLID WASTE LANDFILLS – ONE OF THE BIGGEST ENVIRONMENTAL PROBLEMS OF THE IALOVENI DISTRICT

Dudnicenco Tatiana, ORCID: 0000-0003-0484-6372

Faculty of Biology and Geosciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *dudnicenco@yahoo.com*

Waste storage represents one of the important problems faced by the Republic of Moldova, including the Ialoveni district, in environmental protection activities. Until now, the evacuation of municipal solid waste in so-called „landfills" still prevails, which are in fact pits originating either from natural geographic depressions, or resulting from land excavations or construction quarries. Recently, these pits around the localities remain fewer and fewer, using less fertile land for agriculture, some of which are arranged in such a way that the municipal waste is stored vertically, in depth and in height - compared to the level the surface of the respective land. These lendfills, especially those that do not meet the sanitary-ecological requirements, cause numerous ecological problems.

There are 25 town halls and 34 localities in the district. Of the 28 landfills, only two correspond to sanitary-ecological conditions, being located in the Ialoveni and Dănceni localities. The location of the landfills was selected and operated according to the Decisions of the Local Councils. The total area is 35,61 ha. Out of 25 town halls of the Ialoveni district, 15 provide municipal waste collection services. In the localities: Ialoveni, Bardar, Dănceni, Rusestii Noi, Răzeni, Sociteni, communal housing enterprises are organized. The equipment for collecting, sorting and transporting waste is available to: Municipal Enterprise „Gospodăria Locativ Comunală Ialoveni", ME „Apă-Canal Răzeni„ and ME „Dănceni-Service".

An acute problem with waste storage remained during 2024 in the village of Ulmu. The village landfill is near the gymnasium. The land selected by the Decision of the City Council still does not have access. During 2023 year, 72 landfills were detected with a total area of 6,04 ha, including: green spaces – 1,03 ha; agricultural land – 0,65 ha; public lands – 2,87 ha; non-productive land – 0,64 ha; forest strips – 0,85 ha. All these landfills have been definitively liquidated.

Seven landfills in the Ialoveni district are located at a distance of less than 500 m from the housing sector: Ialoveni (150 m); Gangura (400 m), Dănceni (40 m), Horăști (400 m), Malcoci (370 m), Răzeni (200 m), Ulmu (20 m). Three landfills are located in the protection zone of water bodies: Ialoveni (150 m from the Işnovăț river), Țîpala (230 m from the stream feeding the pond), Răzeni (500 m upstream from the village pond).

Those mentioned only superficially reflect the problem addressed, and not solving it has serious consequences for the environment.

Keywords: *waste, landfills, waste storage, environment.*

UDC: 582.2/.3:628.16

ALGAE FOR LIVESTOCK WASTEWATER TREATMENT

Dudnicenco Tatiana, ORCID: 0000-0003-0484-6372

Faculty of Biology and Geosciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *dudnicenco@yahoo.com*

In agrarian countries, including the Republic of Moldova, there are a number of problems related to the treatment of wastewater from livestock farms.

Most often, physical and chemical methods are used in the treatment of these wastewaters, which are actually expensive and do not have the expected results. For this reason, the basic and most cost-effective method of wastewater treatment on livestock farms remains the biological method. In the results of biological treatment, many of the waste compounds are transformed into neutral products and biomass. The biological process of wastewater treatment is the passage of organic substances and other substances from water into cells and vice versa. The advantage of the biological method lies in its simple application and its cheapness compared to the chemical method. Another important advantage of the biological method by applying algae is obtaining biomass, which can be used as a food supplement for the same birds and animals.

Many algae strains have been selected for the treatment of wastewater from animal farms. The best effect in wastewater treatment was obtained by using *Synechocystis salina* and *Microctynium pusillum*. They currently reach maximum development in water of 270-350 mg N/l. In second place in terms of tolerance is *Chlorella vulgaris*, *Scenedesmus acutus*, which activates photosynthesis in an environment with a hydrogen content of up to 170-210 mg/l.

The process of treating wastewater with the use of different species of algae can be divided into three stages. In the first stage where the highest concentration of nitrogen, phosphorus and other substances is found in the water, algalization is done by strains of *Synechocystis salina* and *Chlorella vulgaris*. At this stage primarily the unpleasant odors of waste water. In the second stage, algalization is carried out with species *Clamydomonas reinhardii*, *Scenedesmus acutus*, *S. quadricauda* and in the last stage with species from the genera *Cladophora, Chaetomorpha, Hydrodiction* and it is also possible to use some species of *Vaucheria, Spirogyra* et al.

Following the step-by-step use of different species of algae, the nitrogen content is also reduced by 96-97% and the biomass obtained can be used as a food supplement for animals and birds.

Keywords: *algae, algalization, wastewater, livestock.*

UDC: 582.282.23:547.5

REGULATION OF ANTIOXIDANT ENZYMES AT *SACCHAROMYCES* BY THE INDUCED OXIDATIVE STRESS

Efremova Nadejda*, ORCID: 0000-0002-9664-346X
Chiselița Natalia, ORCID: 0000-0002-6943-8129
Chiselița Oleg, ORCID: 0000-0001-7298-1512
Magaz Pavel, ORCID: 0009-0008-7772-3051
Rozlovan Ana, ORCID: 0009-0001-5367-1743

Institute of Microbiology and Biotechnology, Technical University of Moldova,
Doctoral School of Natural Sciences, Moldova State University
Chisinau, Republic of Moldova

*****E-mail: *nadejda,efremova@imb.utm.md*

This paper demonstrates the relevance of studying the regulation of enzymes activity with antioxidant properties in yeasts under induced oxidative stress. Superoxide dismutase (SOD) and catalase (CAT) are the major antioxidant enzymes that scavenge a lot of free radicals. For most remedies and bio-additives containing SOD and CAT, raw materials of animal (bovine erythrocytes) or plant (melon) origin are commonly used as a source of enzymes. The technology of obtaining enzyme preparations requires expensive equipment and reagents. *Saccharomyces cerevisiae* (baker's yeast) strain was used in this study as a test system to investigate of the response to ROS action. The aim was to investigate the CAT and SOD activities in *Saccharomyces cerevisiae* CNMN-Y-11 under the influence of two oxidative stress-inducing agents: menadione and hydrogen peroxide.

Superoxide dismutase and catalase activities were determined spectrophotometrically.

The results indicated that both menadione and hydrogen peroxide have had a beneficial action on catalase activity in *S. cerevisiae* CNMN-Y-11 strain. Maximum enhancement of catalase activity by 58-62% (4526-4605 U/mg protein) compared to the reference sample (2858 U/mg protein), was observed using hydrogen peroxide and menadione at optimal concentrations of 15 mM and 10 mM, respectively. Analysis of the results demonstrated that hydrogen peroxide and menadione significantly enhanced superoxide dismutase activity in *S. cerevisiae* CNMN-Y-11 strain. When administered at optimal concentrations of 10 mM and 15 mM, the maximum increase in superoxide dismutase activity was 135% and 154%, respectively, relative to the control.

Thus, using hydrogen peroxide and menadione as oxidizing factors significantly enhances the activity of antioxidant enzymes activity in *Saccharomyces cerevisiae.*

Keywords: *catalase, superoxide dismutase, yeasts, oxidative stress, antioxidants.*

UDC: 576.8:574

ECOLOGICAL PROBLEMS OF THE CURRENT PARASITOLOGY

Erhan Dumitru*, ORCID: 0000-0001-9722-4382
Rusu Ştefan, ORCID: 0000-0002-3204-5436
Gherasim Elena, ORCID: 0009-0005-6931-1135
Zamornea Maria, ORCID: 0000-0001-8987-3390

Moldova State University, Institute of Zoology,
Chisinau, Republic of Moldova

*E-mail: *dumitru.erhan@sti.usm.md*

Argumented ecological prophylaxis of parasitic diseases is based on the results of fundamental research from various field. This directions in parasitology have a general biological, medical-veterinary, medical-sanitary and agronomic significance. Currently, in modern veterinary parasitology, under the conditions of the restructuring of zootechnical technologies, the ecological orientation of research is increasingly manifested. Environmental aspects refer primarily to the parasitic pathogens, whose biological cycle is closely linked to the environment. The global pollution of the environment associated with anthropopresion forces the establishment of integrated methods of struggle. The complexity of solving the problem of the parasitosis consists in the diversity of parasite species, their high resistance to environmental factors, as well as in the expansion of the range of intermediate hosts in a changing environmental situation. The high level of survival of helminths and of the protozoa, as well as resistance to the defense of the host's body, is explained by the fact that the parasites in their molecular structure of proteins reproduce the structure of a number of immunoregulatory proteins of the host and suppress its immunity. At the same time, they are survive and develop successfully. In recent years, toxoplasmosis, cryptosporidiosis, sarcocystosis, trichinellosis, echinococcosis and other larval cestodoses have acquired an epizootic and epidemic significance. Such helminthoses as fasciolosis, ascariasis, hymenolepidosis, strongyloidosis, cysticercosis specific to the farm animals, as well as helminthosis diphyllobothriasis and opisthorchosis in fish, are transmitted to the humans. These cases are numerous. The problem of the parasitic zoonoses, especially of the zooanthroponoses, is relevant for the whole world. The essence of the thesis is confirmed - invasion opens the gates of infection. Thus, the cases of human enterobiosis are associated in the etiopathogenesis of appendicitis, but the bronchopulmonary cryptosporidiosis with AIDS, etc. The problem of preventing non-specific parasitosis, which occurs according to the *larva migrans* phenomenon, is also current. The representats of the ascaris species in pigs and dogs, non-specific for other animal species, in humans cause pathological changes in the body in the invasive larval stage, in the process of their migration to the liver, lungs and lymph nodes. Therefore, the methods of integrated prophylaxis, at the moment, are recognized as more rational, based on the use of biological, mechanical, ecological, sanitary, immunological, genetic and regulatory methods with minimal use of the chemicals.

Acknowledgments: *This study was supported by the research project "Assessment of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the welfare of the population" (no. 23.00208.7007.05/PDII), subprogram no. 010701, USM.*

Keywords**:** *parasitology, ecology, treatment, prophylaxis.*

UDC: 632.7:632.934

CYDIA POMONELLA – SWITCHING FROM MONITORING TO MASS CAPTURE OF THIS PEST

Erhan Tatiana*, ORCID: 0009-0008-2538-0368
Jalbă Svetlana, ORCID: 0009-0007-9756-2059
Odobescu Vasilisa, ORCID: 0009-0006-6827-9126

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *tatiana.erhan@sti.usm.md*

The initial techniques using traps with synthetic sex pheromone in agriculture worldwide, offered the possibility of monitoring development of populations of various pests. The trap with synthetic sex pheromones is made up of a Delta-shaped box, sticky plate and a rubber septum loaded with synthetic sex pheromone, which represent either a single compound or a blend of organic compounds - analogs of the natural composition, which attracts only males.

In order to control populations of invasive pests, beside monitoring method is necessary to use mass trapping method. This method involves capture in the same trap both males and females. At the moment many researches are carried out in this direction and the tendency to move from the use of only pheromonal compositions to pheromonal compositions with the addition of natural compounds or even compositions of attractants-natural compounds is taking shape. In monitoring of population of *Cydia pomonella* pest was used widspread only the main active compound of the sex pheromone - E8,E10-C12:OH. Subsequent studies have improved the knowledge about composition of this sex pheromone. Minor compounds were identified such as following organic compounds E8,E10-C12:Ald, E8,E10-C12:Ac, E9-C12:OH, C12:OH and saturated compounds C14:OH, C16:OH, C18:OH, C18:Ac, C20:Ac. Many studies were performed to improve pheromonal composition by adition of this minor compounds. On the other hand, various studies describe attractants as monocompounds or combinations of natural compounds emitted from different parts of apple trees (leaves, green fruits). Within the compositions determined in various researches, the following compounds were found: Z,E-α-farnesene; Z,E-α-farnesene and E,E-α-farnesene; E2,Z4-C12:COOCH3; C9:Ald, methyl-salicylate, C10:Ald, Z,E-α-farnesene, E,E-α-farnesene, E1,3,7-4,8diMe-C9 to E2,Z4-C12:Ac.

The transition from monitoring to combating by mass capture of this pest requires extensive studies in order to establish new compositions either of attractants or of a composition of sex pheromone and attractants.

Acknowledgments: *This study was supported by the research project: EcoProt Fundamental Project 011103: "Elaboration of ecologically harmless means of reducing the impact of harmful organisms of agricultural crops against the background of climate change." 2024-2027, funded by National Agency for Research and Development.*

Keywords: *Cydia pomonella, pest, sex pheromone, attractant, natural compounds.*

UDC: 581.9:556.54(478)

FLORA OF THE COASTAL WATER STRIPE OF TRIBUTARIES IN THE TERRITORY OF THE REPUBLIC OF MOLDOVA

Eroshenkova Victoria*, ORCID: 0009-0006-0781-7840
Bulimaga Constantin, ORCID: 0000-0003-1288-0140
Grabco Nadejda, ORCID: 0000-0002-3138-3548

Moldova State University,
Chisinau, Republic of Moldova

**E-mail: erosencova@mail.ru*

The purpose of this study was to study the floristic diversity of the lower section of the river. Dniester and its tributaries, which was carried out at 12 stationary sites, of which 4 were located in the coastal water zone of the tributaries: Reut, Ikel, Byk, Botna, near the mouths of these rivers, and 8 sites were located approximately 100 m above and below the confluence of the tributaries from r. Dniester.

Methods: Field research was carried out using the linear trace method. The identification of the discovered plant species was carried out in laboratory conditions according to the Key to Higher Plants of the Moldavian SSR, author T.S. Heydeman.

Results. In the stations under study, we identified: 113 species from 103 genera belonging to 55 families of higher plants (*Magnoliophyta*). The greatest diversity is found in the families Asteraceae (21 species) and Poaceae (8 species), mostly growing in the coastal zone. The remaining families are mostly represented by 1-3 plant species. In the aquatic environment near the shore, we found free-swimming species: *Lemnaminor, Ceratophyllumdemersum, C. Submersum* and fixed on the bottom: *Vallisneria spiralis, Alismaplantago-aquatica, Sparganiumerectum, Phragmitesaustralis, Butomusumbelatus*, etc.

Conclusions. Based on the results of the analysis of the data on the floristic composition of the studied tributaries, the following conclusion can be drawn: in all river sections, Spontaneous and Ruderal species predominate, indicating a high anthropogenic load in these ecosystems, and as a result, the amount of species diversity decreases, for example, in the mouth of the Botna the lowest percentage was identified species diversity, and the highest percentage was determined for the Reut site. This different ecological situation is associated with different anthropogenic load and geographical location.

***Acknowledgments**: This study was supported by the research project "Increasing ecological security and resilience of geo-ecosystems to current environmental changes". Code 010801.*

***Keywords:** flora, specia, family, diversity.*

UDC: 579.821.2:631.445.41(478)

ARCHAEA - THE NEW DOMAIN OF LIFE – COMPONENT PART OF THE PROKARYOTIC COMMUNITIES OF THE TYPICAL CHERNOSEM IN THE REPUBLIC OF MOLDOVA

Frunze Nina, ORCID: 0000-0001-7263-5863

Technical University of Moldova,
Chisinau, Republic of Moldova

E-mail: *ninafrunze@mail.ru*

The goal of our research was to identify archaea and establish their ecological role in the prokaryotic community of a typical low-humus chernozem. Taxonomic identification was carried out in 2020-2022 according to high-throughput sequencing of the 16S rRNA gene. The selected arable land options belonged to the fodder crop rotation: 1 - unfertilized background (control); 2 - mineral background; 3 - organic background (cattle manure). The standard was the uncultivated soil of the forest belt. The standard was the uncultivated soil of the forest belt.

Nucleotide analysis showed that the spectrum of the studied prokaryotes consists of 12 phyla, 11 of which belonged to the *Bacteria* domain and one phylum to the *Archaea* domain - *Thaumarchaeota*. The abundance of archaea ranged from 8.7 to 11.82%, with the highest values in the mineral background and the lowest in the reference control soil. The soil of organic (11.2) and unfertilized background (11.63) occupied an intermediate position. Ranking of all phyla according to the individual "significance" of frequency of occurrence revealed a distinctive hierarchical ecological role in the prokaryotic community, despite the relatively lower representation of archaea. Despite the different importance, in 2020, archaea occupied third place among the leading phyla of plowed soil and fourth place in the soil of the natural background. In 2021, was especially dry, they lose their status as the dominant phylum in the soil of the mineral and natural background, and in the soil of the unfertilized and organic background, they lose the third hierarchical position of the dominant phylum and move to the fourth. In 2022, *Thaumarchaeota* of the mineral background not only regains its status as the dominant phylum, but becomes the leader among the dominant ones. *Archaea* of an organic background are also not only regainning the lost hierarchical position, but even rise to the second dominant hierarchical position. Representatives of the unfertilized and natural background are regaining their lost hierarchical positions. This indicates that, being represented by one single phylum, archaea occupy a leading position among prokaryotes with a dominant ecological role and are possibly involved in the most important processes of the studied chernozem.

Aknowledgments: *The work was carried out within the framework of the PS project "Efficiency of the use of soil resources and microbial diversity through the use of elements of biologic farming".*

Keywords: *archaea, prokaryotic communities, chernosem, Republic of Moldova.*

UDC: 070:551.583

MASS MEDIA AND CLIMATE CHANGE

Gaceu Ovidiu*, ORCID: 0000-0003-0605-2752
Baias Ștefan, ORCID: 0000-0003-1323-2313
Morar Cezar, ORCID: 0000-0003-0211-5883

University of Oradea, Department of Geography, Tourism and Territorial Planning, Oradea, Romania

*E-mail: *ogaceu@uoradea.ro*

The paper shows the mass media perspectives regarding the climate events in the last 150 years. The authors identified three periods, a warmer one between the 1920s - 1930s, a colder one between the 1960s - 1980s, and again a warmer one between the 1990s - present, in which the press of the time made serious, imperative, threatening statements about climate change, from warm to cold and back to warm. Noting that the mass media was obviously wrong about climate change in the first two periods, the question if the press is about to do the same mistake rises, due to the fact that the current warming period does not exceed that of the 1920s – 1930, especially because then the anthropic influence was considerably lower, almost insignificant. Finally, it is concluded that the climate had significant variations from warm and dry years with significant droughts, with heat waves that generated thousands, tens of thousands of deaths in the 1920s-1930s, to the cold periods evidenced by the recording of absolute minimums after the 1940s. Moreover, we mention the long and hard winters with the frequent freezing of inland rivers and seas in the temperate and cold areas in the 1960s - 1980s, as well as the warming accompanied by the decrease in precipitation, together with the appearance of some dry intervals, or some dangerous weather phenomena, both in winter and summer. In the same time, we add the melting of the glaciers, especially in the Arctic, but also the retreat of the mountain glaciers. Thus, in the last 150 years, serious questions were raised about the potential change of the climate, as the evidences showed the same manifestations without changing the bio-pedo-geographical zoning.

Keywords: *mass media, climate change, climate variability, bio-pedo-climatic zones.*

UDC: 599.735.3:502.1(478)

POPULATION DYNAMICS OF RED AND SIKA DEER FROM THE "CODRII" RESERVE, MOLDOVA

Glavan-Caranghel Teodor*, ORCID: 0009-0004-5496-2288
Nistreanu Victoria, ORCID: 0000-0002-9726-9684
Sitnic Victor, ORCID: 0000-0002-0449-1527

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *teodor.glavan.caranghel@sti.usm.md*

In the Codrii reserve from the Republic of Moldova, red deer (*Cervus elaphus*) occur in sympatry with populations of the congeneric sika deer (*Cervus nippon*), an alien species introduced in the 1960s (P. Cegorca, 1984). At high densities, both species can have negative impacts on habitats of natural heritage importance, for example preventing the regeneration of native woodlands (Scott et al. 2000). In this context sika can build up higher densities than red deer and could cause greater environmental damage. Additional concerns arise because sika could mate with *Cervus elaphus* and produce fertile hybrids, so the introgression can compromise the genetic integrity of red deer stocks. On this basis highlighting the population dynamics of the two species is required for the elaboration of efficient conservation measures. In the current study, we aimed to compare the population dynamics of the red and sika deer from the "Codrii" reserve over the last few decades. The data have been collected from the scientific archives included in the "Annals of nature" of the "Codrii" reserve, Republic of Moldova. Thus, starting with 1975 the dynamics of deer populations in the Codrii reserve had an upward trend starting from a few dozen specimens to over 100 at the end of the 70s. Most of the specimens were identified as belonging to the *Cervus elaphus* species, the sika deer being represented by a small number that varied between 5-25 individuals. In the 80s, their number increased to over 300 exemplars, period when the populations of the two species were more or less equal. The data from 1995 reveal a significant decrease in the herd of cervids in the reserve (around 80 individuals) with the predominance of sika deer. Starting with the 2000s was recorded a relatively constant increase of the populations with over 500 individuals in 2024. At the same time, during this period was observed a continuous decrease rate of the *Cervus elaphus* population, at the moment being registered around 50-60 specimens of this species. The gap between the populations of the two species could be explained by the fact that sika are often reported to be better competitors than red deer and possible by the presence of interspecific hybrids that could be identified as *Cervus nippon*. Although the number of hybrids could be small, individuals containing a mixture of two species genetic material might be morphologically indistinguishable from those containing an intact genome and the presence of hybrids may go undetected until demonstrated by DNA analysis. In this context, it may be necessary that these conservation issues to be the subject of a scientific expertise that is based on genetic studies.

Acknowledgments: *this study was supported by the research project no. 010701 ZOOAQUATERRA, funded by the National Agency for Research and Development.*

Keywords: *red deer, sika deer, population dynamics, interspecific hybrids, Codrii.*

UDC: 581.142:635.928

GERMINATION OF COMPONENTS OF LAWN GRASS MIXTURES

Golosna Lesia[1,2], ORCID: 0000-0002-6276-8256
Holubec Vojteh[1], ORCID: 0000-0001-8113-0111

[1]Crop research institute, Czech Republic, Prague
[2]Institute of plant protection NAAS, Ukraine, Kyiv

E-mail: *lgolosna16@gmail.com, holubec@vurv.cz*

Lawn grasses have become an integral component of the urban environment in recent decades. The main objective of the study was to select lawn components from the collection of the Gene Bank of the Crop Research Institute (CRI), Prague. The selected species had to be resistant to unfavorable factors of the urban environment. The universal mixture included 12 species of grasses and 25 species of dicotyledonous plants, including 9 species of legumes.

One of the important factors in assessing the quality of the mixture was checking the germination of the selected components. The germination ability was determined in the Laboratory of Genetics and Breeding Methods of CRI according to ISTA methods.

Conditions for germination were adjusted, depending on the plant type, additional stimulation was carried out with KNO_3 or pre-cooling. Suitable conditions were found in ISTA for 18 species, for the rest, they were selected based on literature or according to the closely related species. The duration of germination depended on the species and ranged from 7 (*Trifolium incarnatum*) to 30 days (*Filipendula vulgaris*).

As a result of our studies, it was found that the species *Cichorium intybus* (93%), *Medicago sativa* (92%), *Medicago lupulina* (89%), *Trifolium pratense* (89%), *Securigera varia* (88%), *Phleum phleoides* (87%) are characterized by a high germination ability, *Trifolium incarnatum* (81%), *Melica transsylvanica* (78%), *Lotus corniculatus* (77), *Stipa capillata* (74%), *Matricaria chamomilla* (75%), *Plantago lanceolata* (74%) had lower germination.

Most of the species used in this mixture of lawn grasses (*Festuca pallens, Festuca rupicola, Helictochloa pratensis, Koeleria pyramidata, Poa compressa, Poa pratensis, Onobrychis viciifolia, Achillea millefolium, Dianthus carthusianorum, Filipendula vulgaris, Hypericum perforatum, Leontodon hispidus, Origanum vulgare, Potentilla argentea, Sanquisorba minor, Silene vulgaris)* had medium to lower germination rates (from 30 to 70%).

The species *Bothriochloa ishaeum, Phleum bertolonii, Astragalus cicer, Echium vulgare, Plantago media* and *Thymus pulegioides* germinated poorly in laboratory conditions even with the use of KNO_3 stimulation - no more than 25%. It was not possible to achieve germination of *Phleum bertolonii* and *Betonica officinalis*.

When composing mixtures of lawn grasses, it is necessary to take into account the germination of each component, as this affects the percentage of species in the grass stand. Obtaining reliable results from laboratory analysis of seeds for germination requires an individual approach to each species using additional stimulation conditions.

Keywords: *germination, lawn grass, germination conditions*

UDC: 664.292:547.458.88

LOW-ESTER PECTIN AS RECYCLABLE GREEN CATALYST FOR ECO-FRIENDLY SYNTHESIS OF (±)-MONASTROL

Gorincioi Elena*, ORCID: 0000-0002-5087-2777
Ciobanu Natalia, ORCID: 0000-0002-1321-9277
Macaev Fliur, ORCID: 0000-0002-3094-1990

Institute of Chemistry, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *elena.gorincioi@sti.usm.md, elena.gorincioi@ichem.md*

Pectin is a heterogeneous plant colloid with a ubiquitous spread that possesses multifunctional applications, *e.g.* in food industry, the health and pharmaceutical sector. It is an easy access to it since the main source for its commercial extraction is apple and citrus fruits, wastes from processing industries being also appropriate for augment of pectin production. This sustainable biopolymer consists mainly of α-1,4-galacturonic acid chains, which are esterified at the C6-position with a methyl moiety to a varying extent and by the degree of esterification pectin can be classified as high-ester pectin (HEP, DE ≥ 50%) and low-ester pectin (LEP, DE < 50%).

(±)-Monastrol- a cell-permeable synthetic compound has stimulated the interest of chemists since 1999, when Mayer *et al*. have demonstrated that it arrests cell cycle during mitosis by inhibition of the motor activity of the mitotic kinesine Eg5. This discovery opened new avenues for targeted anticancer drug design.

The purpose of the current work was to develop an alternative to the known, sustainable approach for the preparation of (±)-Monastrol by using Biginelli multicomponent reaction (MCR) and employing LEP as ready available and recyclable catalyst. Aimed at this, a modification of classic Biginelli MCR has been elaborated focused on the use of catalytic amounts of LEP instead of BrØnsted acid. Equimolar amount of thiourea and ethyl acetoacetate and a slight excess of benzaldehyde were utilized, reaction being performed under conventional heating in EtOH or AcOEt as eco-friendly solvents. Usual work-up, followed by crystallization from EtOH furnished (±)-monastrol, the spectral data of which were identical with the reported ones. Importantly, green catalyst could be repeatedly recycled and reused with a slight drop in the catalytic activity - 79% product yield (the first catalytic cycle), 58% - (the fifth catalytic cycle).

Advantages of the proposed method are: operational simplicity and acceptable yield; avoidance of hazardous organic solvents, toxic catalyst and tedious purification step; convenient work up procedure and employment of natural, efficient, readily available and recyclable catalyst.

Acknowledgments: *This study was supported by the research project Chemical study of secondary metabolites from local natural sources and valorization of their application potential basing on broadening molecular diversity with multiple functionality (MetNatVal), code 01060), funded by Ministry of Education and Research of the Republic of Moldova.*

Keywords: *Green chemistry, low-ester pectin, catalysis, Biginelli reaction, (±)-monastrol.*

UDC: 633.15:582.288.4

ASSESSING THE RESISTANCE OF MOLDAVIAN INBRED MAIZE LINES TO *FUSARIUM* SPP.

Grajdieru Cristina*, ORCID: 0000-0003-1560-7924
Bilici Elena, ORCID: 0000-0002-2360-5518
Mitina Irina, ORCID: 0000-0001-7103-6084
Mitin Valentin, ORCID: 0000-0001-9328-9672
Tumanova Lidia, ORCID: 0000-0001-5664-871X

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *cristina.grajdieru@sti.usm.md*

Maize is one of the main cereal crops satisfying human needs in nutrition worldwide and plays essential role in Moldavian agriculture and economics. Several *Fusarium* species are aggressive maize pathogens that are associated to devastating diseases – fusariosises. Depending on maize immune status, agricultural practices, year conditions *Fusarium* fungi can cause up to 50% of overall yield losses due to stem and ear rots.

Nineteen maize inbred lines (Laboratory of Plant Genetic Resources of Institute of Genetics, Physiology and Plant Protection) were tested for accumulation of Fusarium fungi and their associated mycotoxins in grain. Qualitative and quantitative analysis using PCR-assays of the main causal agents of Fusarium rots in mature kernels revealed that most of the tested genotypes showed low to medium susceptibility to *Fusarium spp*. Nine lines showed resistance to F. *graminearum* – 'MAN2526', 'MAN2425', 'MAN2452', 'MAN2424', 'MAN2488', 'MAN2493', 'MAN2491', 'MAN2470', while eight inbred lines manifested high rates of accumulation of *F. verticillioides*. 'MAN2526', 'MAN2488', 'MAN2493', 'MAN2470' showed low propagation of *F. verticillioides* in maize kernels. Only 'MAN2459' was susceptible to *F. proliferatum*. Overall data revealed that four inbred lines 'MAN2526', 'MAN2488', 'MAN2493' and 'MAN2470' were resistant to *Fusarium spp*. accumulation in tissues and a significant impact of maize genotype on fungi propagation was observed at $p<.05$. Fumonisin B1, zearalenone and deoxynivalenol levels in kernels were lower than limit of detection values for the ELISA kits. Concentrations of the T-2 toxin in kernels did not reach the maximum allowable levels established by EU and Moldavian legislation and no significant genotype impact on accumulation of this mycotoxin in maize grain was observed.

Acknowledgments: *This study was supported by the research project 011101 Genetic and biotechnological approaches to agroecosystem management under climate change conditions, funded by Ministry of Education and Research of the Reppublic of Moldova.*

Keywords: *maize, Fusarium, PCR, fumonisin B1, zearalenone, deoxynivalenol, T-2 toxin.*

UDC: 574.5:551.583

INCREASING ECOLOGICAL SECURITY AND RESILIENCE OF GEO-ECOSYSTEMS TO ACTUAL ENVIRONMENTAL CHANGES

Grigoras Mihail, ORCID: 0009-0006-6713-6190

Doctoral School of Natural Sciences, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *mihail.grigoras@meteo.gov.md*

The study presents the analysis of the natural conditions that contribute to the occurrence of wildfires and approaches to identify effective solutions for the supervision and operation of wildfire early warning systems. In the long run this will help to protect peoples' and property from disasters caused by unfavorable weather events and will contribute to the sustainable development of the country.

The research methodology involved identifying areas prone to wildfires using national climate change communications, specialized information from the State Hydrometeorological Service, and statistical reports from the General Inspectorate for Emergency Situations. Key geo-spatial data used included variables such as the presence of combustible material (land cover/use maps), moisture levels (precipitation maps), and the density of recorded wildfires (2020-2023). These data were reclassified into five classes, from very low to very high, and combined using the SMART technique and the Raster Calculator in QGIS.

The study's results, consolidated into a Vegetation Fire Hazard Risk Map, indicate a high medium probability of vegetation fires in Moldova. However, the social impact of these disasters is minimal, as they typically occur in sparsely populated areas primarily affecting pastures, uncultivated agricultural land.

In Moldova, most natural fires are triggered by human activity and favorable climatic conditions (high temperatures, water deficits, and strong winds). Meteorological conditions are the most significant factor favoring natural fires, with climate change exacerbating their occurrence.

To mitigate the risks associated with vegetation fires, the study suggest the need of application of scientific methods into the disaster risk management for the wildfires in the Republic of Moldova and calls for a coordinated approach to risk management and prevention, response organization, and recovery according to the principles of the Sendai Framework for Action till 2030

Keywords: *disaster risk management, wildfires, early warning systems, QGIS.*

UDC: 665.347.8:547.39

CONTENT OF OLEIC ACID IN HIGH-OLEIN SUNFLOWER OIL DEPENDS ON FERTILIZERS

Hutianskyi Roman*, ORCID: 0000-0002-5953-9428
Suprun Oleh, ORCID: 0000-0002-7708-093X

Yuriev Plant Production Institute of the National Academy of Agrarian Sciences, Kharkiv, Ukraine

*E-mail: *rammale@ukr.net*

The purpose of this study is to determine the content of oleic acid, as the main factor, in the oil obtained from high-oleic sunflower seeds, depending on the use of mineral fertilizers, microfertilizers and biological preparation in the conditions of the Eastern Forest-Steppe of Ukraine.

Field, laboratory and statistical methods were used. Sowing of the high-oleic classic sunflower hybrid 'Yaskravyi', selection of the Yuriev Plant Production Institute, was conducted in 2021 on a typical medium-humus slightly leached chernozem in the conditions of the Kharkiv district of the Kharkiv region. Mineral fertilizers ($N_{30}P_{30}K_{30}$) were applied before pre-sowing cultivation, and foliar fertilizing of the hybrid was carried out with microfertilizer (Avanhard R Soniashnyk, 2.0 l/ha), and biopreparation (Orhanik-Balans, 0.5 l/ha) at the stage of 3–5 leaves and 6–8 leaves of culture. The plot area was 33.6 m^2. Experiments were replicated four times. The content of oleic acid in the oil was determined according to the modified Peiskera method on a "Selmikhrom-1" gas chromatograph with a flame identification detector. The data of studies were processed by the dispersion method.

According to the results, depending on the feeding variant, the following variation of the oleic acid content in the oil obtained from the seeds of the classic high-oleic sunflower hybrid 'Yaskravyi' was determined: 1) control I, without fertilizers (87.61%); 2) the application of microfertilizer (87.20%); 3) the application of biological preparation (85.42%); 4) control II, the application of $N_{30}P_{30}K_{30}$ (86.63%); 5) the application of $N_{30}P_{30}K_{30}$ plus microfertilizer (86.56%); 6) the application of $N_{30}P_{30}K_{30}$ plus biological preparation (86.84%). According to the data of the dispersion analysis, statistically evident impact of the investigated factors on the share of oleic acid in the oil was not found.

Therefore, the application of fertilizers in crops of the high-oleic hybrid sunflower 'Yaskravyi' did not affect the content of oleic acid in the oil from the grown seeds of the hybrid.

Acknowledgments: *This study was carried out at the expense of the budget of the Yuriev Plant Production Institute of the National Academy of Agrarian Sciences of Ukraine ("0121U100576" Management of the production process in sunflower agrocenoses in the conditions of the eastern part of the Forest-Steppe of Ukraine).*

Keywords: *sunflower, mineral fertilizers, microfertilizer, biopreparation, oleic acid content.*

UDC: 633.111:582.288

ASSESSING THREE TRITICALE CULTIVARS BASED ON THEIR RESISTANCE TO FUNGAL PATHOGENS

Ignatova Zoia*, ORCID: 0000-0003-1171-5928
Cuznețova Irina, ORCID: 0000-0001-5810-6244

Institute of Genetics, Physiology and Plant Protection,
Moldova State University, Chisinau, Republic of Moldova

*E-mail: *zoia.ignatova@sti.usm.md*

Triticale is a cereal crop used for flour and as animal feed. Triticale seeds may contain pathogenic fungi that penetrate the seeds before or after harvest. Some of these pathogens can synthesize secondary metabolites - mycotoxins, which pose a serious health hazard. Fungi of the *Fusarium, Aspergillus* and *Penicillium* genera play a major role in the infestation of triticale seeds. During the seed storage in warehouse conditions, some of these fungi can multiply and affect the quality of the seeds. The purpose of the work is to show the possibilities of using the nested-PCR method with species-specific primers to determine the health of agricultural crops and ensure food safety.

DNA testing of triticale seeds of three varieties (Ingen 40, Ingen 54 and Ingen 93) of the 2022 growing season before and after storage in a warehouse for the presence of pathogenic fungi was carried out using the nested-PCR method with species-specific primers. The following toxicogenic fungal pathogens were identified: *Fusarium oxysporum, F. nivale, F. verticillioides, F. avenaceum, F. culmorum, F. equiseti, F. sporotrichioides, F. proliferatum, F. pseudograminearum; Aspergillus flavus, A. parasiticus, A. ochraceus, Penicillium expansum, P. citrinum, P. chrysogenum.* PCR results were assessed using electrophoretic separation of amplification products in a 1.5% agarose gel followed by visualization in UV-light.

Analysis of the data obtained allows us to state that during the growing season, *F. sporotrichioides* became most widespread, which was identified in the samples of freshly harvested seeds of all triticale varieties studied. After storage in a warehouse at low temperature and unregulated humidity for six months, the variety Ingen 40 turned out to be the most susceptible to damage by fungal pathogens. *Fusarium proliferatum, F. culmorum, F. sporotrichioides, Penicillium citrinum* and *Aspergillus flavus* were found in its DNA out of 15 tested pathogens. The pathogens *Fusarium avenaceum, F. pseudograminearum* and *Penicillium expansum* were identified in the DNA of triticale variety Ingen 93. Two *Fusarium* species were identified on the samples of Ingen 54 seeds: Fusarium avenaceum and *F. proliferatum*, as well as *Penicillium expansum*.

During the analyzed period, the dominant pathogen in triticale crops was *Fusarium sporotrichioides.* During storage of triticale seeds, "storage molds" are added to this pathogen: *Penicillium expansum, P. citrinum* and *Aspergillus flavus*. The variety Ingen 40 was the most affected by fungal pathogens.

Acknowledgments: *This study was supported by the research project 011101 "Genetic and biotechnological approaches of management of agroecosystems under climate change conditions", funded by the Ministry of Education and Research.*

Keywords: *Fusarium, Aspergillus, Penicillium, triticale, nested-PCR, grain storage***.**

UDC: 556.55(282)(478)

THE SCIENTIFIC-METHODICAL BASE FOR RESEARCH OF THE BOTNA HYDROGRAPHIC BASIN

Isac Aliona, ORCID: 0009-0006-1023-5470

Moldova State University, Chisinau, Republic of Moldova

E-mail: *isacaliona0224@gmail.com*

The history of hydrological observations on the territory of the Republic of Moldova begins in 1878, with the organization of the first hydrological station on the Dniester River, located in the perimeter of the city of Tighina. Starting from the 40s of the 20th century, several scientific and methodical works were developed in the field of meteorology, climatology, hydrology, etc., with the establishment of the Department of Economy and Geography (1946), then the Department of Geography (1965) and later of the Institute of Geography of the Academy of Sciences of Moldova (1992).

The Russian school has a rich experience in studying the morphometry of riverbeds (Makkaveev N., 1955).

In the second half of the 20th century, studies related to research in the field of hydrology are attributed to American researchers, A. N. Strahler (1952, 1956, 1957, 1958, 1964), S. A. Schumm (1956), J. T. Hack (1957), M. A. Melton (1958), M. E. Morisawa (1959 , 1962, 1967) and British, R. J. Chorley (1962), R. J. Chorley, P. Haggett (1967), R. J. Chorley, B. A. Kennedy (1971).

Romanian geographers used morphometric indices to solve some problems of limnology (Gâștescu, 1971), cited by I. Zăvoianu (1978), and territorial generalization (Morariu, Savu, 1954, 1959; Ujvari, 1959, 1972).

In the Republic of Moldova, similar researches were applied in the characterization of river bed processes and the typification of rivers (Nicoara., 1992). Morphometric studies were carried out by G. M. Bilinchis (1978), A. T. Levadniuc (1983), I. Codreanu (2014).

The first studies dedicated to leakage were carried out by: Melniciuc O., Boian I., Cazac V., Mihailescu C., Bejenaru Gh., Lalîkin, N., Arnaut N., Shvets V., etc.

The study of water resources under the influence of climate change is more modest. The hydrographic characterization of the Botna river basin was carried out by Rozloga I. and Parașciuc V. In the context of the development of the Management Plan for the Botna river basin, during 2020, two expeditions were carried out in the basin of this river.

The research objectives will be achieved by using the classic methodology for geographical studies. From the SHS archive, factual and material data will be analyzed regarding the hydrological parameters in the Botna river basin, from the Căușeni hydrometric station, for the period of the end of the 20th century - the beginning of the 21st century. The collected database will be structured within the Microsoft Excel program. In the statistical processing of this information and in the spatio-temporal presentation, other programs will be used, such as ArcGIS, Qgis, etc.

Keywords: *hydrographic basin, Botna river, hydrological research, climate change.*

UDC: 595.76:574.4(478)

A MALAISE TRAP SURVEY OF BEETLES IN STEPPE ECOSYSTEMS OF THE REPUBLIC OF MOLDOVA

Istrati Sorina*, ORCID: 0000-0001-5581-6320
Munteanu-Molotievskiy Natalia, ORCID: 0000-0001-5796-3236
Moldovan Anna, ORCID: 0000-0001-8829-6640

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *istratisorina98@gmail.com*

Steppes are among the world's most impacted and under-protected biome. These ecosystems serve as habitats for diverse organisms and require urgent comprehensive assessment and conservation efforts. Beetles are highly sensitive to environmental changes, making them excellent bioindicators for ecosystems. In long-term studies, beetle communities, as well as other flying insect orders, can be effectively collected using the Malaise trap. This trap is represented by a two-color tent-like structure that captures insects in a collecting jar with a preservative. Ethanol is commonly used as a preservative, ensuring DNA integrity and allowing subsequent analysis of specimens by DNA barcoding.

The aim of this research was to assess the effectiveness of the Malaise trap in studying the diversity of beetles in the steppe ecosystems of the Republic of Moldova. Malaise traps were set up in five localities, three in the northern (Taul, Napadeni and Draganesti) and two in the southern (Chirsova and Opaci) parts of the Republic of Moldova with a single trap per locality. The sampling season, spanning from May to early October of 2023, ensured a comprehensive collection of data. The collection jars were emptied weekly, and the samples were stored in 96% ethanol at –20°C. The morphological identification of the specimens was carried out using dichotomous keys. As a result, 65 samples were obtained from 19 weeks of collection, with a total number of 1093 collected beetles. On average, one trap catches eight beetles per day. The largest number of specimens was collected in Opaci, followed by Taul, Napadeni, and Chirsova. The Draganesti trap, which was vandalized, was not included in the calculations.

According to the results obtained and in accordance with studies carried out by other researchers, the Malaise trap has shown to be effective in collecting Coleoptera, but their number in the sample is lower compared to that of Diptera, Hymenoptera, Lepidoptera, and Hemiptera.

Acknowledgments: *This study is carried out within the doctoral research project funded by the Ministry of Education and Research of the Republic of Moldova, and partly supported by the project 20.80009.7007.12, funded by the National Agency for Research and Development and subprogram 010701 ZOOAQUATERRA, Institutional funding.*

Keywords: *Malaise trap, Coleoptera, steppe, Republic of Moldova.*

UDC: 577: 546.65:582.232

INDICES OF ORGANIC CARBON SEQUESTRATION IN THE STRUCTURAL AGGREGATES OF ARABLE CHERNOZEMS, PRINCIPLES OF SUSTAINABILITY

Jigău Gheorghe*, ORCID: 0000-0002-4778-2105
Dobrojan Sergiu, ORCID: 0000-0003-0040-5836
Dobrojan Galina
Turchin Boris
Stadnic Angela, ORCID: 0000-0003-3784-121X
Plăcintă Nina
Moşoi Iurie

State University of Moldova,
Chisinau, Republic of Moldova

*E-mail: *gheorghe.jigau@gmail.com*

According to calculations, approximately 23% of greenhouse gas emissions come from soil resource use in agriculture, accounting for approximately 214 ± 67 PgC, comparable to the amounts (270±30 PgC) from fossil fuel combustion (Hicks Pries et al., 2017). The major proportion of these emissions comes from highly fertile soils, which, due to this characteristic, are extensively utilized in intensive agricultural practices. Among these soils are chernozems, which, despite covering only a small area (2,5% or 2,3•10 km^2) of biologically productive land surfaces, contribute to over 15% of cultivated land (Soils, 2006). Relative to their initial reserves, humus losses constitute 20-30% in Haplic Chernozem and 40-60% in Luvic Chernozem (Smagin, 2011). Our recent research has shown that the main cause of humus losses is the degradation of the aggregate structure of chernozems, which contain approximately 90% of the soil's organic carbon (Corg). Of these, about 70-80% are contained in aggregates > 0,25 mm.

Aggregates with maximum Corg quantities (3,88-3,17%) are characterized by granular aggregates 2-1 and 3-2 mm, while those with minimal content are formations > 10 mm and < 0,25 mm. Based on the content of structural aggregates (dry fractionation), the major proportion (40-48%) of carbon sequestration belongs to aggregates 5-1 mm, 5-10 mm (23-29%), and 1-0,25 mm (<20%). At the same time, it has been established that the decisive role in the formation of the carbon-protective (carbon-stabilizing) function belongs to hydro-stable aggregates 3-1 mm and 1-0,25 mm (80-85%). Aggregates > 3 mm, due to their extremely low hydro-stability, have a carbon-protective proportion of < 8-10%.

Organic carbon contained in hydro-stable aggregates determines the basic properties and regimes of chernozems, especially their resilience to climate change and anthropogenic impacts. Additionally, these aggregates concentrate reserves of mobile humic substances (0,24-0,29%; 7,5-9% Ct) and easily mineralizable humic substances (0,11-0,14%; 4,0-4,9% Ct), which play a decisive role in the reproduction of aggregate structure and the establishment of nutrition regimes for soil biota and plants.

The main cause of the degradation of chernozem aggregate structure is the disturbance of the interdependent and undetermined functionality of the functional system [bioenergetic system] ↔ [aggregate system] within current agricultural technologies, which, at best, can only stabilize humus content at the newly established bioenergetic level through minimizing work and sustainable management of organic matter reserves in the soil, but not unidirectionally increase these reserves.

Alternative agricultural systems with pedoconservative elements (chisel plowing, shallow tillage, no-tillage) involve mechanisms for regenerating the processes of humus formation and accumulation and create conditions for restoring the interdependent and undetermined functionality of the pedo-functional system [bioenergetic system] ↔ [aggregate system], which constitutes the essence of the chernozemic soil formation process. However, our research has shown that a period of 5-7 years recommended for the unidirectional restoration of arable chernozem aggregate structure is insufficient to ensure a unidirectional trend of structure stabilization and organic carbon sequestration-stabilization in the soil, as well as the unidirectional reproduction of health, fertility, and resilience to climate instability and severe weather phenomena induced by it, as the amounts of humus formed during this period are insufficient to achieve these pedogenetic effects.

The main factor limiting humus production with the unidirectional regeneration of the chernozem process is the high degree of physical degradation of arable chernozems, which do not provide a favorable internal pedogenetic environment for humification but also limit the low bioproductivity of agrophytocenoses and the production of sufficient amounts of plant residues for humus reproduction. This implies the need to optimize pedoconservative technological systems through their biologization and optimization of the physical condition of the agrogenic layer over a period adapted to the physical state of the soils, within two sub-periods: a) conservation, which involves preventing and combating degradative processes by adapting all components of agro-ecosystems to landscape-specific conditions and minimizing mechanical and technogenic pressures on the soils; b) pedoregenerative-based on the biologization of the pedogenetic process (optimization of agrophytocenosis structure, respect for crop rotations, cultivation of cover and intercropping crops, fallow land management, bioorganic-mineral fertilization). A basic element of these is bioorganic-mineral preparations (NEOFERT-M; NEOFERT-S) and algal preparations. Their combined use under conditions of minimized soil tillage, cultivation of cover crops, and incorporation into the surface layer (8-10 cm) of plant residues contributes to the unidirectional increase in the content of aggregates 5-0,25 mm through the more intensive formation of aggregates 1-0,25 mm, which constitute the "aggregate reserve" for the reproduction of chernozem structure.

Acknowledgments: *The research was conducted with the support of project number 23.70105.5107.06.*

Keywords: *organic carbon sequestration, structural aggregates, hydro-stable aggregates, pedoconservative agricultural systems, bioorganic-mineral fertilization.*

UDC: 577: 546.65:582.232

THE GENETIC-FUNCTIONAL ASPECTS OF ARABLE CHERNOZEMS IN THE AREA BETWEEN THE PRUT AND DNIESTER RIVERS IN THE CONTEXT OF SUSTAINABLE MANAGEMENT OF ORGANIC CARBON

Jigău Gheorghe*, ORCID: 0000-0002-4778-2105
Stadnic Angela, ORCID: 0000-0003-3784-121X
Dobrojan Sergiu, ORCID: 0000-0003-0040-5836
Dobrojan Galina
Turchin Boris
Plăcintă Nina
Moşoi Iurie

Moldova State University, Chisinau, Republic of Moldova

*E-mail: *gheorghe.jigau@gmail.com*

The organic carbon cycle in chernozems is determined by the interdependent and undetermined functionality of the pedo-functional system [bioenergetic system] ↔ [aggregate system] established at the pedological scale of time.Its unidirectional functioning ensures the functions of self-regulation, self-organization, and self-reproduction of chernozem ecosystems and supports the functions and ecosystem services materialized in the fertility and health of chernozems.

The circuit and regime of organic carbon in chernozems are materialized in the system of organic substances. In its composition, in native chernozems, 63-68% is attributed to humus, while another 32-37% belongs to the labile fraction of humic substances, including approximately 15-18% of mobile humic substances, which play a decisive role in aggregating-structuring the soil mass, plant nutrition, and soil biota.

The incorporation of chernozems into the agricultural cycle has led to a unidirectional and accelerated degradation of the organic substance system, manifested in the intensive mineralization, particularly in the first 20-30 years, of labile organic substances, especially humus detritus, and the establishment of overcultivation processes. The organic system of arable chernozems is characterized by low (3-4%) and very low (2-3%) organic carbon content, which is inversely proportional to the degree of overcultivation. In the composition of the organic system of arable chernozems, the proportion of humus significantly increases from 92,8% in lightly overcultivated chernozems to 96,2% in heavily overcultivated ones. The proportion of the labile fraction decreases from 6,7% in lightly overcultivated chernozems to 5,2% in moderately overcultivated ones and 3,8% in heavily overcultivated ones. In their composition, the proportion of the non-humified fraction is lower compared to non-plowed chernozems by approximately 8-9 times in lightly overcultivated chernozems and by approximately 12-13 times in moderately and heavily overcultivated ones. The proportion of the mobile fraction is 2-4 times smaller depending on the degree of overcultivation.

Based on the above, we consider that the organic substance system of arable chernozems represents inert agrogenic formations that practically lack the capacity to ensure the unidirectional functioning of the humiferous profile of chernozems. This has led to the loss of approximately 25-30%/30-40% of the total humus content and its stabilization over time at a lower bioenergetic level, which to a small extent is receptive to current measures of sustainable management of the organic carbon cycle. From this perspective, we consider that the reduction in humus content in arable chernozems is a genetically determined phenomenon resulting from their inclusion in the agricultural cycle. After the establishment of this bioenergetic state in soils, humus losses under agroecosystem conditions, without the involvement of external factors, especially erosion, are insignificant.

The state of newly created humus in arable chernozems is accompanied by changes in the composition of their humic system caused by agrogenesis-induced alterations in all stages of the humus formation process, creating a less favorable functional framework for the formation of complex and stable humic substances characteristic of the chernozemic soil formation process. Consequently, in the composition of the humic system of arable chernozems, the relative content of free humates and those formed with stable forms of sesquioxides and clay minerals increases, the content of calcium humates decreases, the synthesis processes of "aggressive" fractions (Af1a and Af1) of fulvic acids intensify, the total content of fulvic acids increases by about 1,2-1,3 times, and the CaH ratio is significantly reduced to values (1,37-1,18) atypical for chernozems in the area between the Prut and Dniester rivers.

The interdependent and undetermined functioning of the [bioenergetic system] is accompanied by the evolution of the [aggregate system] of arable chernozems, manifested in the degradation of their structural-aggregate composition, the essence of which consists of the total loss of hydro stability of aggregates > 5 mm and moderate loss of those 5-3 mm, accompanied by a significant reduction in the capacity for organic carbon sequestration and, especially, stabilization in chernozems. In their natural state, these soils play a primary role in organic carbon sequestration-stabilization after marsh soils. The intermittent degradation of the bioenergetic system, as a biotic modulator of the abiotic aggregate system, leads to the degradation of environmental-modulating and pedogenetic functions, transforming chernozemic areas from carbon-sequestration-stabilizing surfaces into territories with intensive CO2 emissions into the atmosphere.

Acknowledgments: *The research was conducted with the support of project number 23.70105.5107.06.*

Keywords: *organic system, humic system, humiferous profile, organic carbon sequestration, organic carbon stabilization, structural aggregates.*

UDC: 633.111:581.169

POPULATION STRUCTURE OF UKRAINIAN COMMON WHEAT VARIETIES BASED ON MARKER LOCI

Kozub Natalia1,2*, ORCID: 0000-0002-3572-1786
Sozinova Oksana1,2, ORCID: 0000-0002-0981-3433
Sozinov Igor1, ORCID: 0000-0002-3621-5746
Bidnyk Hanna1,2, ORCID: 0009-0002-9521-7618
Demianova Natalia1,2, ORCID: 0009-0009-4712-8275
Blume Yaroslav2, ORCID: 0000-0001-7078-7548

[1] Institute of Plant Protection NAAS of Ukraine, Kyiv, Ukraine
[2] Institute of Food Biotechnology and Genomics NAS of Ukraine, Kyiv, Ukraine

*E-mail: *natalkozub@gmail.com*

Storage protein loci and disease resistance genes are important functional markers of wheat. Storage protein alleles are directly associated with the level of bread-making quality. Long-standing studies of storage protein variation have demonstrated specific sets of alleles in groups of varieties developed in different countries or their regions as a result of selection under certain soil and climate conditions. The purpose of the investigation was to study the population structure of the group of Ukrainian winter common wheat varieties bred in different institutions in different periods of time.

The group of 228 wheat common wheat varieties included those developed in the Myronivka Remeslo Institute of Wheat NAAS (MIW), the NSC Institute of Agriculture NAAS (IA), the Plant Breeding and Genetics Institute (PBGI, Odessa), the Poltava State Agrarian University (PSAU), as well as PSAU breeding lines. APAG electrophoresis and SDS-electrophoresis of seed proteins were performed to determine alleles at the storage protein loci *Glu-A1, Glu-B1, Glu-D1, Gli-A1, Gli-B1, Gli-D1*, and *Gli-A3*. PCR analysis of the markers for the disease resistance genes *Tsn1, Lr34/Yr18/Pm38/Sr57/Bdv1,* and *TDF_076_2D* was performed. Genotypes were recorded using the binary system (0, 1)

Analysis of the population structure of the group of 228 varieties (with a total of 58 alleles) using the Bayesian algorithm of the STRUCTURE software and the method of Evanno et al. revealed that the optimal number of subpopulations was K = 2. The IA and MIW varieties of different periods of breeding were assigned for the most part to the first cluster. The PBGI varieties belonged predominantly to the second cluster. The group of PSAU genotypes separated into two clusters with the similar proportion of membership, which may indicate two different lines of breeding in this institution situated in the Eastern Forest-Steppe of Ukraine. Thus, based on the multilocus analysis of the markers, the majority of varieties were assigned to two clusters corresponding to two agroecological zones of Ukraine, the Central Forest-Steppe (MIW and IA) and the Steppe (PBGI), supporting the adaptive value of polymorphism of the functional markers.

Keywords: *Triticum aestivum, storage proteins, resistance genes, alleles.*

UDC: 632.11:633.49

INFLUENCE OF TEMPERATURE AND LIGHT CONDITIONS ON TUBERISATION OF POTATO IN VITRO

Kupriianova Tetiana*, ORCID: 0000-0002-1039-9348
Kupriianov Serhii, ORCID: 0000-0001-5390-5573

Institute for Potato Research, Nemishaieve, Kyiv region, Ukraine

*E-mail: *kyptm@meta.ua*

The influence of various factors on in vitro morphogenesis in many potato varieties has been studied by several authors. The research works are mostly devoted to solving and studying specific methodological issues. However, for almost every variety it is necessary to select individual conditions for in vitro morphogenesis. Therefore, the study and optimisation of in vitro plant cultivation conditions to enhance tuberisation is a relevant and important part of potato seed production. Light intensity and temperature are considered to be among the most important factors in the cultivation of microtubers in vitro. In 2021-2022, the Department of Biotechnology and Biotechnical Systems of the Institute for Potato Research of the National Academy of Agrarian Sciences of Ukraine conducted research to study the effect of temperature and light intensity on the growth, development and productivity of plants of the early ripe potato variety Skarbnytsia. The scheme of the experiment included growing the plant in vitro at three temperature conditions of 16, 21 and 25°C and light conditions of 1500, 2000 and 2500 lux (lx).

As a result of the studies, it was found that on the 20th day of cultivation, the light intensity had practically no effect on tuberisation and only 5.5-8.9 % of plants in vitro formed microtubers. There was also no significant effect on the number of stolons formed. On the 40th day of observation, the highest number of plants (52.9 %) that formed microtubers was at a light intensity of 1500 lux. On the 60th day of observation, the number of plants that formed microtubers under the light regimes of 1500, 2000 and 2500 lux, on average, was 66.5, 70.0 and 66.2 %, respectively. It should be noted that on the 80th day of plant cultivation, the percentage of microtubers was almost the same among all the studied variants and ranged from 85.9-87.7%, i.e., the light intensity had almost no effect on the formation of microtubers by plants in vitro of the early ripe potato variety Skarbnytsia. Characterising the interaction of factors, it should be noted that the largest number of microtubers was formed by plants on the 80th day of cultivation at a temperature of 16°C and a light intensity of 2000 lux – 96.1-98.9%.

Thus, the research has established that the optimal productivity indicators are provided by growing test-tube plants at a cultivation temperature of 16°C and a light intensity of 2000 lux. At the same time, the number of microtubers per plant was 1.6 pcs, the weight of the average microtuber was 248.3 mg, the weight of microtubers per plant was 358.2 mg.

Keywords: *potatoes, mini-potatoes, tuber formation, light intensity, cultivation.*

UDC: 581.169:633.49(477)

IDENTIFICATION OF *Ry_{adg}* AND *Ry_{chc}* GENES IN UKRAINIAN POTATO VARIETIES AND LINES

Kyrychenko S.O.[1]*, ORCID: 0000-0002-4325-4022
Sozinov I.O.[1], ORCID: 0000-0002-3621-5746
Bondus R.O.[2], ORCID: 0000-0002-2367-5225
Kozub N.O[1], ORCID: 0000-0002-3572-1786

[1]Institute of Plant Protection, NAAS, 33, Vasylkivska Str., 03022, Ukraine
[2]Ustymivka Experimental Station of Plant Production of the IPP n.a. V.Ya. Yuriev, NAAS, 15, Akademika Vavilova Str., Ustymivka, 39074, Poltava obl., Ukraine

*E-mail: *syvatoslavkirichenko@gmail.com*

Potato virus Y (PVY) is currently the most harmful and widespread virus, decreasing potato yield and its quality. Cultivation of potato varieties with PVY extreme resistance (ER) genes is the most efficient way to prevent yield losses caused by the virus. The objective of our investigation was to identify two PVY ER genes *Ry_{adg}* and *Ry_{chc}* in potato varieties and lines of Ukrainian breeding.

We analyzed 38 potato varieties registered between 1983 and 2015 from the collection of the Ustymivka Experimental Station of the Institute of Plant Production, NAAS and 40 breeding lines developed by the Polissia Experimental Department of the Potato Research Institute NAAS. The molecular markers RYSC3 and Ry186 were used to identify the *Ry_{adg}* and *Ry_{chc}* genes, respectively. DNA was isolatied from potato samples by the Silica-based technique. PCR products were analyzed by agarose gel electrophoresis. Visual assessment of the degree of resistance of potato varieties to PVY was carried out in the field under the natural infection background in 2021-2023 at the Ustymivka Experimental Station.

Five cultivars, Oksamyt, Horlytsia, Lybid, Ivankivska-Rannia, and Ikar, and 19 lines showed the *Ry_{chc}* marker. The amplicon indicating the Ry_{adg} gene was detected in one cultivar (Obriy) and eight breeding lines. Six breeding lines carried the combination of the *Ry_{adg}* and *Ry_{chc}* gene markers. However, field evaluations indicated false-positive results for the presence of ER genes in the varieties Obriy and Lybid. Taking into consideration the field tests, the frequency of presumable carriers of the *Ry_{adg}* gene is 20 % in the sample of breeding lines and zero among the Ukrainian varieties tested. The frequency of the carriers of the *Ry_{chc}* gene deduced from the presence of the Ry186 marker is 47.5 % in the sample of breeding lines and 10.5 % in the sample of varieties.

Thus, the frequency of carriers of the PVY ER genes *Ry_{adg}* and *Ry_{chc}* was considerably higher in the sample of breeding lines than in the sample of the varieties, namely 52.5 %, and 10.5 %, respectively. The lines with the markers for both resistance genes are a promising material for PVY ER breeding.

Keywords: *Solanum tuberosum, potato virus Y, extreme resistance, Ry_{adg}, Ry_{chc}, molecular markers.*

UDC: 615.014:582.572.222

FORMULATION AND PRODUCTION OF AN EMULGEL WITH ANTIOXIDANT PROPERTIES UTILIZING *ALOE VERA*

Lis Angela*, ORCID: 0000-0003-1111-7485
Gladchi Viorica, ORCID: 0000-0002-5847-4466
Panainte Valeria, ORCID: 0009-0003-2199-4390

Faculty of Chemistry and Chemical Technology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *angela.lis@usm.md*

The gel inside the *Aloe Vera* leaf contains 99.5% water, with the remaining 0.5-1% representing the total solids content, composed of several compounds. These include polysaccharides (55%), sugars (17%), minerals (16%), proteins (7%), lipids (4%), and phenolic compounds such as anthraquinones and flavonoids (1%). This study aims to determine *Aloe Vera* gel's antioxidant activity and explore its utilization in formulating an emulgel with antioxidant properties.

In this study, an extract from 3-year-old Aloe Vera leaves, obtained through manual extraction, was utilized. To evaluate *Aloe Vera* gel's antioxidant activity, the *DPPH* and *ABTS* methods were used. The formulation of the emulgel with *Aloe Vera* extract has been optimized without requiring heating for emulsion formation, thereby preventing the decomposition of biologically active substances. The gel preparation process involved initially preparing the gel base by adding a gelling agent to the aqueous phase, followed by the incorporation of the mucilaginous extract of *Aloe Vera*. Subsequently, through continuous homogenization, the other ingredients necessary for emulsion formation within the gel base were gradually added.

The results obtained from inhibiting the $ABTS^{\bullet+}$ radical cation demonstrate that *Aloe Vera* gel exhibits a relatively high antioxidant capacity, with values (0.86 - 1.00) ± 0.04 mM ET. The free radical scavenging capacity (% *ABTS* inhibition) ranged from 85.6% to 97.2%. The antiradical power of *Aloe Vera gel*, as determined by inhibiting the *DPPH* free radical, was found to be 0.2. The values for the free radical scavenging capacity of *Aloe Vera* gel using *DPPH* ranged from 10.9% to 45.2%.

In the obtained emulgel using the method described above, 10% of *Aloe Vera* gel was incorporated. The results indicate that the emulgel meets the standard required and exhibits high quality. It appears homogeneous, glossy, and free from inclusions, white creamy color and a pleasant, light fragrance. The pH of the topical emulgel is 6.8, and its consistency is lightweight. The emulgel demonstrates colloidal and thermal stability, and resilience under temperature-stress conditions. The spreading capacity (Sr) of the emulgel was determined to be 4418 mm.

Acknowledgments: *This study was supported by the research project nr. 010603, Advanced research in computational and ecological chemistry, identification of technological procedures for treatment, formation of water quality and quantity, funded by the Institute of Chemistry of the Moldova State University.*

Keywords: *Aloe Vera, antioxidant activity, DPPH radical, ABTS radical cation*.

UDC: 581.169:633.11:632.2

WHEAT GENOME AND RESISTANCE TO POWDERY MILDEW AND SEPTORIA LEAF SPOT

Lisova Halyna[1]*, ORCID: 0000-0002-2045-4857
Rymar Yuliia[2], ORCID: 0000-0003-3051-3774
Morgun Bogdan[2], ORCID: 0000-0001-7041-6894

[1]Institute of Plant Protection, National Academy of Agrarian Sciences of Ukraine, Kyiv, Ukraine
[2]Institute of Cell Biology and Genetic Engineering, National Academy of Sciences of Ukraine, Kyiv, Ukraine

*E-mail: *mail_gl@ukr.net*

Long-term selective pressure has led to a decrease in wheat diversity and its adaptation to fungal pathogens. The purpose of research was to identify, potential carriers of genes for resistance to pathogens of powdery mildew and septoria leaf spot. A collection of wheat and its wild relatives of different ecological and geographical origins (bread wheat, durum wheat, common wheat, spelt, rye, triticale and so on) with different genomes (25 samples) from the National Center for Plant Genetic Resources of Ukraine (Yuriev Plant Production Institute of the NAAS of Ukraine). Wheat stability was evaluated according to Babayantz et al., 2014. Field studies conducted in 2022–2023. Lesions were registered during the period of disease maximum development in milk-wax maturity phase. Varieties "Podolyanka" and "Natalka" (*Triticum aestivum*, ABD genome) were the resistance level control – weak sensitivity to powdery mildew (5 points) and resistance (6 points) to septoria leaf spot.

Samples with group D chromosomes in genome had weak susceptibility-susceptibility to the pathogen of powdery mildew and resistance to the pathogen of septoria leaf spot. Chromosomes of group D might contain effective genes for resistance to this pathogen. The presence in the genome of a group of chromosomes with ABR rye or individual rye chromosomes contributes to the manifestation of very high resistance and even immunity to the action of the two pathogens. A sample with the ABDR genome showed complete immunity to the action of local populations of the two pathogens and confirmed the value of involving rye chromosomes in the breeding program to increase plant resistance. The AB gene of durum wheat was a rather "successful combination" too contributing to the manifestation of resistance to two pathogens.

It was found the greatest resistance to the pathogens of powdery mildew and septoria leaf spot was detected in samples combining rye-wheat genomes (ABR and ABDR), and the combination of two AB subgenomes in durum wheat.

Keywords: *wheat genome, resistance, pathogen, powdery mildew, septoria leaf spot.*

UDC: 633.11:632.3

RESISTANCE OF WINTER WHEAT VARIETIES ON ENHANCED ARTIFICIAL INFECTION BACKGROUNDS

Lisova Halyna[1]*, ORCID: 0000-0002-2045-4857
Konovalova Svitlana[1], ORCID: 0009-0009-8234-9049
Kyrylenko Vira[2], ORCID: 0000-0002-8096-4484

[1]Institute of Plant Protection, National Academy of Agrarian Sciences of Ukraine, Kyiv, Ukraine
[2]The V. M. Remeslo Myronivka Institute of Wheat, National Academy of Agrarian Sciences of Ukraine, v. Tsentralne, Kyiv region, Ukraine

*E-mail: *mail_gl@ukr.net*

To determine and reveal the resistance potential of wheat varieties, artificial infectious backgrounds of pathogens are used. The methods of using such backgrounds are widely known for one of the most common pathogens of wheat, winter leaf rust (*Puccinia recondita*) and septoria leaf spot (*Zymoseptoria tritici*).

The purpose of the research was to determine the modern manifestation of the resistance of known wheat varieties of MIW selection, using a wide range of races of the causative agent of brown rust and a mixture of pure cultures of the causative agent of septoriosis of wheat leaves, different in morpho-cultural development, typical for the zone of the Right Bank Forest Steppe of Ukraine.

As materials, 10 varieties of winter wheat Podolyanka (St), MIP Knyazna, MIP Yuvileyna, MIP Fortuna, MIP Nika, MIP Feeriya, MIP Dnipriyanka, Bilyava, Europe, Aurora Myronivska were used. A mixture of races of the causative agent of leaf rust was developed from the collection of races of the pathogen of the laboratory with different levels of virulence and was close to the natural one. Pure cultures of the causative agent of septoria leaf spot from the collection of the laboratory had different morpho-cultural development of the mycelium, top for the zone of the Right Bank Forest Steppe of Ukraine. Artificial infection backgrounds were created in the flag leaf phase, according to generally recognized methods.

All varieties and the standard have reduced resistance to the causative agent of septoria leaf spot. Infection with a mixture of races with a high level of virulence of the causative agent of leaf rust showed that the MIP Feeria and Aurora Myronivska varieties showed high resistance (score 8, urediniopustules with an intensity of up to 5% per leaf). The Bilyava variety was stable at the level of 7 points, the intensity of urediniopustules up to 10%. All other varieties and the standard were resistant to the action of the pathogen at the level of 6 points, the intensity of urediniopustules on a leaf was up to 15%.

The studied varieties of winter wheat maintain resistance to the causative agent of leaf rust and show its reduction in the phase of milk-wax ripeness under the conditions of action of populations of both pathogens with a high level of virulence.

Keywords: *wheat varieties, resistance, pathogen, leaf rust, septoria leaf spot.*

UDC: 547.79:632.35

ANTIFUNGAL ACTIVITY OF SOME VINYL-TRIAZOLE DERIVATIVES

Lupascu Lucian[1]*, ORCID: 0000-0001-5006-5265
Lupascu Galina[2], ORCID: 0000-0003-3363-3595
Fliur Macaev[1], ORCID: 0000-0002-3094-1990

[1]Institute of Chemistry, Moldova State University
[2]Institute of Genetics and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *lucianlupascu75@gmail.com*

The fungus *Fusarium oxysporum* is a major root rot pathogen in common winter wheat and other grassy cereal crops. Having a high fermentative activity, the pathogen utilizes various biochemical substrates, which is why it has a wide range of host plants. Since the fungi of the Fusarium genus, like many other micromycetes, easily adapt to the chemical preparations used in plant protection measures, the researches regarding the identification of new compounds with antifungal activity are particularly current, which presented the purpose of the present investigations.

Purpose. Establishing the activity of the vinyl-triazole derivatives: EPS-869, EPS-877, EPS-880, EPS-892 against *F. oxysporum* phytopathogen.

The vinyl-triazole derivatives were supplemented to the nutrient medium Potato Dextrose Agar (PDA) in concentrations of 0,01; 0,005; 0,0025; 0,00125%. Fungal inoculation: a PDA disk with fungal mycelium of 4 mm in diameter in the center of the Petri dish. Cultivation was carried out at a temperature of 24°C. Colony diameter recording was done after sowing on the 3-7 – for the medium-growing fungus – *F. oxysporum*.

A strong inhibitory effect of vinyl triazole derivatives was observed during the 7 days of data recording. Thus, if on day 3 of growth the diameter of the colonies varied within the limits of 31,86-46,25%; 37,97-43,10%; 22,98-32,35%; 27,66-34,22% of the control, on day 7 this parameter recorded 20,12-31,02%; 25,94-28,39%; 20,12-26,32%; 23,50-28,95% of the control, respectively, for the EPS compounds-869, EPS-877, EPS-880, EPS-892.

The high activity of the mentioned vinyl-triazole compounds in relatively low concentrations present good opportunities for their use in the wheat plant protection system against the root rot pathogens.

Acknowledgments: *This study was supported by the research subprograms 010601"Chemical study of secondary metabolites from local natural sources and harnessing their applicative potential based on broadening molecular diversity with multiple functionality (MetNatVal)") and 011102 "Expansion and conservation of genetic diversity, improvement of gene pools of agricultural crops in the context of climate change ", financed by Minister of Education and Research.*

Keywords: *vinyl-triazole, Fusarium oxysporum, root rot, wheat, inhibition.*

UDC: 575.224:635.64:575.826

ADAPTABILITY OF MUTANT FORMS OF TOMATO TO ABIOTIC STRESSES ON MICROGAMETOPHYTE

Makovei Milania, ORCID: 0009-0009-5039-6270

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

E-mail: *m_milania@mail.ru*

The gene pool of tomato (*Solanum lycopersicum* L.) differs by a set of forms having both wide and narrow range of adaptability to varying environmental conditions, which is expressed in different degrees of variability of their quantitative traits. That is why the search and selection of source material with a stable genetic basis for the most important quantitative traits is the purpose of research to create new highly productive, ecologically plastic heterosis F_1 hybrids. Twenty-eight mutant forms of tomato are involved in the research. Their adaptability is studied using genetic and statistical methods on the traits of male gametophyte (pollen viability, pollen tube length, resistance to pollen germination and tube growth on artificially created stress backgrounds - high, low temperatures and drought). The indicators of stability, ecological variability and adaptability are: plasticity (Vi) – degree of trait variability; stability (Sqi) – preservation of trait indices in different years of research.

Results revealed single-marker and multi-marker mutant samples: Mo 500; Mo 519; Mo 593; Mo 620; Mo 637; Mo 651; Mo 670; Mo 791; Mo 924; La 3013, whose pollen under three stress backgrounds (high, low temperature, drought) showed high overall adaptive capacity (Vi - 68.2... 91.7%) with insignificant variability of traits (Sqi - 1.1...9.6%) under the influence of different environmental factors, which indicates genetically determined character of resistance of these genotypes to the studied stress factors. Another group of mutant forms: Mo 308; Mo 316; Mo 341; Mo 451; Mo 584; Mo 588; Mo 606; Mo 638; Mo 722 showed high sensitivity of their pollen to the action of tested stressogens. They had low general (2.1...19.4%) and specific adaptive capacity (3.4...36.9%) with consistently low indices of all traits under different stress backgrounds (Sgi - 0.8...11.6%). Mutant samples - Mo 36, Mo 409, Mo 446, Mo 632, Mo 723, Mo 732, Mo 833, Mo 838, La 2921 - had a wide range of variability (Vi) of pollen traits (from 5.1% to 67.0%) under the influence of different stress factors in different years of research, including from genotype features (1.0...98.7%) within this group.

The results of the research show the ambiguous reaction of pollen of the studied mutant forms to the action of abiotic stress factors, which can become a criterion for the selection of resistant genotypes for the creation of new varieties and heterosis hybrids F_1 of tomato with a lower response to the action of unfavorable environmental factors.

Achnowledgments: *The research was carried out within the Subprogram 011102 Increasing and conservation genetic diversity, agricultural crop breeding in the context of climate change financed by the Ministry of Education and Research.*

Keywords: *tomato, mutant forms, trait, male gametophyte, adaptability, variability.*

UDC: 582.2/.3:663.12/.14

MORPHO-CULTURAL CHARACTERS OF SOME BAKER'S YEAST STRANS IDENTIFIED FROM DIFFERENT ISOLATES, MEDIA AND PRODUCTS

Magaz Pavel[1]*, ORCID: 0009-0008-7772-3051
Chiselița Natalia[2], ORCID: 0000-0002-6943-8129
Chiselița Oleg[2], ORCID: 0000-0001-7298-1512
Efremova Nadejda[2], ORCID: 0000-0002-9664-346X
Chiriac Tatiana[2], ORCID: 0000-0003-2933-0751

[1]*Doctoral School of Natural Sciences, Moldova State University*
[2]*Institute of Microbiology and Biotechnology, Technical University of Moldova*
Chisinau, Republic of Moldova

*E-mail: *pavlikmaqaz@gmail.com*

In Moldova, considerable quantities of bakery products are produced annually. However, the local production of baker's yeast is not well developed in the country. The strains necessary for manufacture of these products are imported at a high cost. Therefore, it becomes important to identify and introduce into the technological circuit some new native strains with valuable technological properties.

In this study, 9 strains of *Saccharomyces cerevisiae* (baker's yeast) were identified from collection yeasts and isolates obtained from different media and bakery products and their morpho-cultural characters were evaluated. The strains were isolated through passages in liquid and solid media. Cultivation was carried out in Erlenmeyer flasks (0.25L) with beer wort liquid nutrient medium (0.1L), on a shaker with a rotation speed of 200 rpm, at a temperature of +27 - 28°C, for 96 hours. After cultivation in a liquid medium, the strains were seeded on an agar medium using the loop exhaustion method and transferred to a thermostat at +28°C, for 96 hours.

The study of the morpho-cultural characters established that in the liquid medium, the isolated strains do not form a film but instead form a characteristic ring on the walls at the interface between the liquid and gas phases, and a sandy sediment at the bottom of the flask. On the solid medium, the isolated strains form circular (S-shape), smooth, glistening colonies. The colony elevation is convex or umbonate, the colony edge is entire or wavy, the colony color is yellowish-white or white-beige, with a pasty consistency. The size of the colonies is 2-5mm. The strains can be included in further research to explore their bioproductive potential in the perspective of their use in bakery production units.

***Acknowledgments*:** This study was supported by the Research Subprogram 020101, Institutional financing contract no. 4/FI of 22 February 2024.

Keywords: *Saccharomyces cerevisiae (baker s yeast), strains, morpho-cultural characters.*

UDC: 581.169:633.14

SELECTION OF NUTRITIONAL MEDIUM FOR INDUCTION OF NEOPLASMS IN THE CULTURE OF ISOLATED ANTHERS OF WINTER RYE

Mazur Zoya, ORCID: 0000-0002-3701-804X

Verkhnyachka Experimental Breeding Station of the Institute of Bioenergy Crops and Sugar Beet of NAAS, Shkilna str. 1, Verkhnyachka village, Uman district, Cherkasy region, 20022, Ukraine

E-mail: *zoya.mazur777@gmail.com*

Winter rye is of great importance in the agriculture of a number of countries in northern and central Europe. The intensification of agriculture leads to the need to develop new biotechnological areas in breeding, especially haploidy, which will significantly reduce the time required to create source material for breeding programmes.

An important issue of the problem today is the application of biotechnology for obtaining dihaploid plants using isolated anthers. As for such studies on rye, they have hardly been carried out in Ukraine, although there is a need for these works.

Materials and methods of the study. Four genotypes of winter rye were used in the work on testing of haplotypic capacity: № 24, № 25, № 36, № 37. Pretreatment of cut shoots was carried out in water for 3–5 days at a temperature of 2-4 °C in the dark. The ears were surface sterilized with a solution of the commercial preparation "Bilyzna" with the addition of the surface-active substance TWIN 80 for 40-60 min. After that, the sterilizing agent was drained and the ears were soaked for 10 min with 0.01 n HCl solution. Finally, the material was washed five times with sterile distilled water. Isolated anthers were planted on two variants of nutritional induction medium: W14 and 190-2. The following substances were added to both variants of the medium: vitamins according to MS prescription, 2,4-D — 5 mg/l, kinetin — 0.5 mg/l, glutamine — 500 mg/l, mesoinositol — 100 mg/l, maltose — 60 g/l, herbal gel — 3.2 g/l. The planted anthers were cultivated for the first 3 days in the dark at 32 °C, then at 28 °C until the appearance of neoplasms. The formed macrostructures were transplanted onto MS medium at half the salt concentration with the addition of IOK (0.5 mg/l) and kinetin (1.0 mg/l), sucrose (30 g/l) and cultured in the dark for 3–4 weeks until the appearance of regeneration centres, then at 24 °C and under 16-h photoperiod conditions, with a light intensity of 10 thousand lux until the formation of plants. The cytological control of the stage of microspore development in anthers was performed by preparing temporary anther microsections stained with acetocarmine.

It is known that for successful androgenesis in vitro, the optimal stage of development of a vacuolated uninucleated microspore is the mid-late stage. The cytological control of the microspore development stage showed that only one third of the transferred plant material was in the optimal developmental phase, while most

of the microspores of the studied genotypes were already two- and three-nucleated, i.e. developed further along the gametophytic pathway.

It should be noted that all the rye material was extremely infected in rainy weather conditions during the field selection, therefore, in order to determine the optimal sterilization time, we tested three variants of the ear sterilization time — for 40, 50 and 60 minutes. The degree of bacterial infection of the rye ears was extremely high. Sterilization by the standard method was not suitable (40 minutes) because all the material was infected. Increasing the time of exposure to the sterilizing agent to 50 minutes and an hour allowed to obtain a "clean" culture of rye anthers. However, proportionally with the increase of sterilization time, the probability of negative effect of chlorine on microspores in anthers increases, which affects their morphogenetic activity during androgenesis.

Cytological examination of microspores on the 15th day of cultivation showed that microspores of most genotypes were characterized by weak turgor and partial plasmolysis. On the fifteenth day of cultivation, complete lysis of the content of most of the microspores of all genotypes on both nutritional mediums was observed. However, in rye samples No. 24, No. 25 and No. 36, among empty microspore cells, microspores with plasmalemma (pl) features, well-stained with acetocarmine multinucleated (MN) and multicellular (MC) formations were observed, while in rye sample No. 37 no such phenomena were observed. The frequency of occurrence of multinucleated and multicellular microspores during cultivation on both studied nutritional mediums was the same, so it is impossible to distinguish any of them.

The results of the evaluation of the morphogenetic activity of microspores of four rye genotypes showed a rather high sensitivity of three forms (except for rye genotype No. 37) to the provided conditions of anther cultivation in vitro. It should be noted that a significant level of neoplasm formation was obtained both on one and on the second nutritional medium. The highest level of formation of neoplasms in medium 190-2 was observed in rye No. 24 – 21.52±3.27 pcs./per 100 anthers, and in medium W14 in rye No. 36 – 8.22±3.21 pcs./per 100 anthers.

Conclusions. In the in vitro culture of winter rye anthers under the experimental conditions, three out of four genotypes turned out to be sensitive to androgenesis in vitro — No. 24, 25, 36. The highest morphogenetic capacity (number of neoplasms) was characterised by genotype No. 24 – 21.52±3.27 per 100 anthers. It has been shown that both nutritional medium 190-2 and W14 are suitable for the production of neoplasms in the anther culture of winter rye of Ukrainian selection. Five albino regenerant plants were obtained.

Acknowledgement*: Research and funding on the topic of the scientific work is an integral part of the thematic plan of the Department of Cereal Breeding and Seed Production of the Verkhnyachka Experimental Breeding Station of the Institute of Bioenergy Crops and Sugar Beet. The work was carried out in accordance with the Scientific and Technical Programme of the Ukrainian Academy of Agrarian Sciences "Cereals" under the task "Improvement of the method of obtaining hybrids of winter rye on a fertile and sterile (CSF) basis with dominant and recessive short stem, with high yields, adaptive to growing conditions in the Forest-Steppe zone and immune to disease" (state registration number 0116U002191).*

Keywords: *rye, androgenesis in vitro, new growth, regeneration.*

UDC: 528.88:502.57(478)

APPLYING EARTH OBSERVATION DATA TO IDENTIFY DESERTIFICATION TRENDS IN MOLDOVA

Melnicenco Ecaterina, ORCID: 0000-0002-2706-9417

Doctoral School of Natural Sciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *katea.melnicenco@gmail.com*

The current study presents research on methods and approaches applicable to identifying the desertification process within the Republic of Moldova. Desertification is a phenomenon caused by multiple factors, including climate change and human activities, leading to various forms of land degradation. Therefore, identifying trends requires a complex methodology that incorporates a variety of factors, including geographical, climatic, environmental, social, and economic data.

Given its complexity, the desertification phenomenon should be addressed using various parameters. However, many countries often need more continuous sets of geo-referenced data for analysis. Remote sensing products and GIS applications can help overcome these limitations, but validating the results using nationally available data is essential to ensure their accuracy. NDVI, Evapotranspiration, and albedo can be extracted from the earth observation data.

A review of the existing approaches for identifying the status and trend of desertification was done, and such approaches were analyzed: an index for analyzing the advance of areas undergoing desertification using satellite data, identification of the significant trends of relevant biophysical parameters using the Principal Component Analysis, as well as the "Trends.Earth" tool developed by the UN Convention to Combat Desertification.

Comparing methods, the country context the study suggests focusing on the critical aspects of the SDG 15.3.1 indicator, using the following sub-indicators: land productivity, land cover and soil organic stocks. However, to develop measures to improve soil quality, adding other data sets, such as human settlements, pollution sources, and economic activities, is necessary. Such assessment can provide valuable insights for improving the land management practices.

Keywords: *Desertification, remote sensing, earth observation, Moldova.*

UDC: 577.112:577.213/.217

IMPACT OF 3D-PRINTED MOLECULAR MODELS ON TEACHING PROTEIN AND DNA STRUCTURE

Mihășan Marius[1]*, ORCID: 0000-0003-4439-4251
Boiangiu Răzvan-Ștefan[1], ORCID: 0000-0002-2602-4882
Popa Laura Nicoleta[2], ORCID: 0000-0002-2427-4618

[1]BioActive Research Group, Faculty of Biology, Alexandru Ioan Cuza University of Iași, Romania
[2]Faculty of Psychology and Educational Sciences, Alexandru Ioan Cuza University of Iași, Romania

*E-mail: *marius.mihasan@uaic.ro*

The structure-to-function relationship is the hallmark of biochemistry and molecular biology. Although very useful and convenient, the two-dimensional structural formulae that students usually first encounter in the chemistry class are not able to picture the complexity of macromolecular structures such as proteins and nucleic acids. Object-based learning stands out as an approach that gives students a tangible way to view and manipulate physical structures in three dimensions, strengthening learning by providing a more complete sensorial experience and allowing students to better overcome the problems associated with the translation of 2D formulae into 3D space. To test this hypothesis, atomically accurate physical models of macromolecules generated from Protein Data Bank (PDB) data have been fabricated using cheap consumer grade 3D printers and integrated into two lectures dealing with DNA and protein structure. Second-year bachelor students enrolled in the Molecular Biology class were randomly allocated to two groups. Both groups attended independently the two lectures and were alternatively control and intervention groups. Before and after each lecture, both groups received the same pre- and post-test consisting of a total of 23 questions evaluating the following key biomolecular visualization learning goals (Dries et. al. (2016) Biochem. Mol. Biol. Educ. 45(1), 69–75): AR2.01; AR2.02; AG3.01; AG3.02; MA1.01; MR1.01; TC1.01; TC1.02; TC2.06; TC3.01; SF1.02. Presenting the physical molecular models in the class and allowing students 3-5 minutes to handle them individually or in small groups was shown to be enough to convert low gain lectures (mean g_{ind} around 0.2) into medium gain lectures (mean g_{ind} around 0.4). The physical models were received by students as being helpful because it allowed them to better focus, to engage the visual memory and because it provided a hands-on advantage. In conclusion, the usage of physical models of molecules fabricated using 3D printing is great way of improving bio-molecular education with low costs, including in low-income countries where teaching materials are scarce.

Keywords: *3D printing; physical models, macromolecules; teaching.*

UDC: 615.322:633.15:658.567

APPLICATION OF CORN SILK FOR PHARMACEUTICAL PURPOSE: PAIRING HEALTH BENEFITS WITH POTENTIAL AGRICULTURAL WASTE UTILIZATION

Milovanović Danka*, ORCID: 0000-0002-6915-2606
Žilić Slađana, ORCID: 0000-0001-8299-9185
Nikolić Valentina, ORCID: 0000-0002-5834-6683
Simić Marijana, ORCID: 0000-6719-7982
Sarić Beka, ORCID: 0000-0001-5918-6151

Maize Research Institute Zemun Polje, Slobodana Bajica 1, Belgrade, Serbia

**E-mail: dmilovanovic@mrizp.rs*

Maydis stigma, also known as corn silk, has a long history of use in traditional herbal medicine and functional food in many countries worldwide. Corn (*Zea mays* L.) encompasses a variety of bioactive compounds in its stigma, including flavonoids, polysaccharides, steroids, tannins, alkaloids, proteins, and vitamins. Numerous reports have indicated that it contains anti-diabetic, diuretic, anti-inflammatory, antibacterial, antifungal, anti-tumor, anti-fatigue, and antioxidant properties. The color of corn silk may vary from yellow to green, from pink to purple. The content of bioactive compounds as well as the antioxidant capacity of the corn silk depends on the day of its sampling in stages after emergence from the corn ear. A prior investigation carried out at the Maize Research Institute, Zemun Polje, revealed that fresh corn silk had a higher total phenolic and flavonoid content than several examined medicinal herbs. Our current research focuses on investigating the full bioactive profile of corn silk from different maize hybrids for pharmaceutical applications directed toward its antidiabetic and diuretic properties. Furthermore, *Maydis stigma* represents a by-product of industrial corn processing, it is usually discarded or used for animal feed. By utilizing corn silk for pharmacological purposes, a part of agricultural waste would be redirected toward zero-waste food production, helping to conserve the environment and increase ecological awareness.

Acknowledgments: This study was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).

Keywords: *corn silk, pharmaceutical application, bioactive properties, antioxidants, agricultural waste utilization.*

UDC: 582.28:635.657

DETECTION OF POTENTIALLY MYCOTOXIGENIC FUNGI IN CHICKPEA BEANS

Mitina Irina*, ORCID: 0000-0001-7103-6084
Mitin Valentin, ORCID: 0000-0001-9328-9672
Curşunji Dmitrii, ORCID: 0009-0006-2928-9583

Institute of Genetics, Physiology and Plant Protection of the Moldovan State University

*E-mail: *irina.mitina@sti.usm.md*

Chickpea is a grain legume characterized by a high content of protein, fat, vitamin and minerals, and relatively low content of carbohydrates making it a good alternative protein source. Native to Middle East, it is well adapted to grow in warm semi-arid areas, which is essential in the conditions of changing climate. Its ability to fix nitrogen in the soil reduces the need for synthetic nitrogen fertilizer and makes it a perfect crop to include in crop rotation. All these make chickpea a perfect choice for sustainable agriculture. For this reason, chickpea-based food has become increasingly popular worldwide as a part of a healthy diet. Thus, it is important to test chickpea beans for the presence of pathogens, including those capable of synthesizing mycotoxins. Micotoxins are secondary metabolites of some fungi which can naturally contaminate many types of food. They are very toxic for humans and animals.

This work studies the presence of the pathogens capable of synthesizing mycotoxins in mature chickpea beans. Genes involved in mycotoxin biosynthesis were used for primer design for real time PCR. For detection of the microorganisms capable of aflatoxin production, aflR gene cluster was used. For detection of the microorganisms capable of fumonisin production, fumonisin biosynthetic polyketide synthase (FUM1) gene was used. Fungi capable of producing T2 and DON were detected by Tri11 trichothecene biosynthetic gene cluster (Tri11). Fungi capable of producing ochratoxin A were detected by ochratoxin A non-ribosomal peptide synthetase gene. Potential patulin-producing fungi were detected by isoepoxydon dehydrogenase gene. Potential zearalenon producers were detected by PKS13 polyketide synthase (PKS13) gene. Of all the analyzed genes, only FUM1 sequences, involved in fumonisin biosynthesis, and Tri11 sequences involved in T2 and DON biosynthesis, were detected in chickpea beans. This may mean that in the conditions suitable for pathogen growth, fumonisin and T2 or DON could be produced and thus contaminate the beans. However, it does not exclude the presence of other mycotoxin producing fungi in quantities below the detection level of real-time PCR, and subsequent analysis is needed to monitor fungal growth.

Acknowledgments: *The research was supported by the Subprogram 011101 "Genetic and abiotechnologicl approaches to agroecosystem management under conditions of climate change" funded by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *chickpea, mycotoxins, real time PCR, fungi.*

UDC: 577.112:579.8

WHOLE-CELL PROTEIN PROFILE ANALYSIS OF PAENARTHROBACTER NICOTINOVORANS GROWN ON RELATED MEDIA

Mlești Andreea-Mihaela, ORCID: 0000-0002-2735-5229
Petrila Bianca-Daria
Mihășan Marius*, ORCID: 0000-0003-4439-4251

BioActive research group, Biology Faculty, Alexandru Ioan Cuza University of Iași, 700506 Iasi, Romania

*E-mail: *marius.mihasan@uaic.ro*

Interest for nicotine degrading microorganisms has grown along with the need for a sustainable way to regulate the pollution determined by this toxic alkaloid. *Paenarthrobacter nicotinovorans* has become of great interest for this due to its' ability to degrade nicotine. There has been substantial research undertaken to characterize the strain, consisting of genomic, transcriptomic and proteomic analyses. Previous studies of proteomics failed to identify any transcriptional factors or transmembrane proteins known to be expressed in the nicotine metabolism, attributing the failure to potentially inadequate harvesting and processing of the cells to yield the total protein extract.

The aim of this study is to further improve the methods previously used in the proteomics analysis in correlation with the already existing data. A combined quantitative and qualitative approach was used to compare the growing rates of *Paenarthrobacter nicotinovorans* ATCC 49919 on different media (citrate with yeast extract, citrate with biotin, minimal medium with biotin). In a 24 hours frame, 3 samples were collected at a specific OD_{600}: 0.25 - just at the beginning of the log phase, 0.6 – middle of the log phase, and >0.6 – at the mark of the final 24^{th} hour, aiming for the late stationary phase. Samples were lysed in the presence of SDS and β-mercapto-ethanol and loaded on Maxi gradient gel (Bio-Rad Protean XL). After electrophoresis and staining with Comassie Brilliant Blue R-250, the gels were photographed and analyzed with BioRad Image Lab. Protein molecular weights and concentrations were extrapolated from calibration curves generated using ROTI Mark Standard Markers.

This analysis revealed qualitative differences in protein profiles, particularly when nicotine was present in the growth medium. These findings suggest that this gel-based proteomics approach holds promise for future studies aimed at a more comprehensive understanding of protein expression during nicotine degradation by *Paenarthrobacter nicotinovorans*.

***Acknowledgements**: This study was supported by PNIII-P4-ID-PCE2020-0656 research project financed by the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania.*

***Keywords:** Paenarthrobacter nicotinovorans, nicotine, proteomics, bacterial growth profile.*

UDC: 547.587.26:542.9

CATALYTIC OXIDATION OF GALLIC ACID UTILIZING FENTON AND PHOTO-FENTON REACTIONS

Mocanu Larisa*, ORCID: 0000-0003-3306-5292
Gonta Maria, ORCID: 0000-0003-3476-0967

Laboratory Physical and Quantum Chemistry,
Institute of Chemistry of the Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *lmdordea@gmail.com*

This paper investigates the catalytic oxidation of gallic acid utilizing Fenton and Fenton/UV reactions, focusing on elucidating the mechanisms, kinetics, and byproducts of the oxidation processes.

Gallic acid, a naturally occurring phenolic compound, presents both health benefits and environmental challenges due to its persistence and potential toxicity. The Fenton and Fenton/UV reactions have gained attention as effective methods for oxidizing organic pollutants like gallic acid (GA). These processes generate highly reactive hydroxyl radicals (•OH), initiating the oxidation of GA and leading to its degradation. The generated •OH attack the aromatic ring of GA, initiating its oxidation.

The degradation kinetics of GA ($1.47 \cdot 10^{-4}$ M) in Fenton and Fenton/UV reactions can be described by pseudo-first-order kinetics. The rate of degradation/mineralization depends on factors such as the concentrations of ferrous ions, hydrogen peroxide, and GA, as well as pH and temperature. Fenton and Fenton/UV reactions offer efficient means for the oxidation of GA, leading to its degradation (50%) and mineralization (30%) after 5 min of reaction. The results, show a slight increase in the COD removal after 60 min of reaction. Based on the data acquired, the most effective degradation and mineralization of AG from the aqueous solution occurred when utilizing Fenton's reagent. Thus the best initial operating conditions, for practical purposes, are $[H_2O_2] = 5 \cdot 10^{-4}$ M, $[Fe^{2+}] = 1 \cdot 10^{-5}$ M, and pH = 3.0. It was found that the conversion kinetics of gallic acid is carried out at the average rate constant ($k_{avg.}$) is $5.7 \cdot 10^{-3}$ s^{-1}, the average reaction rate ($\Delta c/\Delta t_{avg.}$) is $6.7 \cdot 10^{-7}$ Ms^{-1} during 118 s ($\tau_{1/2}$).

During the oxidation of GA by Fenton reactions, various intermediate and byproducts are formed, including: i) hydroxylation products resulting from the attack of hydroxyl radicals on the aromatic ring; ii) cleavage products such as formic acid, oxalic acid, and acetic acid; iii) carbon dioxide and water: complete mineralization of GA to harmless byproducts, indicating the complete oxidation of the organic substrate.

Acknowledgments: *This study was supported by the research project Nr. 010603, Advanced research in computational and ecological chemistry, identification of technological procedures for treatment, formation of water quality and quantity, funded by the Institute of Chemistry of the Moldova State University.*

Keywords: *natural polyphenols, Gallic acid, catalytic oxidation*.

UDC: 579.873.2:636.084.4

MYCOTOXIN CONTAMINATION IN SUDANESE POULTRY FEED: A COMPREHENSIVE REVIEW

Mohamed Asawir Esamaldeen Ebrahim[1]*
Boiu-Sicuia Oana-Alina[1,2], ORCID: 0000-0001-7830-4109
Cornea Călina Petruța[1], 0000-0003-0818-7220

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Biotechnologies, 59 Mărăști Blvd., PC 011464, Bucharest, Romania
[2]Research - Development Institute for Plant Protection, 8 Ion Ionescu de la Brad Blvd., PC 013813, Bucharest, Romania

*E-mail: *asawiresam7@gmail.com*

The contamination of mycotoxins in poultry feed poses a significant threat to the health and productivity of poultry in Sudan. This review looks at the types and sources of fungal toxins in Sudanese poultry feed, as well as their impact on poultry health and performance.

Many fungi, such as *Aspergillus* and *Fusarium* species, are discussed in terms of their ability to produce fungal toxins and contaminate nutrients. The paper also shows the regulatory frameworks and mitigation strategies implemented to manage mycotoxin contamination in poultry feed in the Sudan. Furthermore, it explores the challenges of controlling and controlling mycotoxin levels in feed ingredients and provides insights into future research trends to ensure safe and high-quality poultry production in the region. This review aims to contribute to the understanding of mycotoxin contamination in Sudanese poultry feed and facilitate the development of effective prevention and control strategies.

Keywords: *Mycotoxin, Poultry feed, Sudan, Regulatory frameworks, Mitigation strategies.*

UDC: 582.24:579.6

OPTIMIZATION OF THE CULTIVATION CONDITIONS OF THE FUNGAL STRAIN *TRICHODERMA ATROBRUNEUM*

Moldovan Cristina*, ORCID: **0000-0003-1634-0344**
Sirbu Tamara, ORCID: **0000-0001-7809-9870**
Turcan Olga, ORCID: 0000-0002-7103-5986

Institute of Microbiology and Biotechnology, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *cristina.moldovan@imb.utm.md*

Agriculture is the main branch of the Republic of Moldova, on which the well-being of people depends, but nowadays it is under constant threat due to variable weather conditions, as well as pests. The main weapon against pests remains chemical pesticides but an eco-friendly alternative to solving this problem are microbial preparations, which are used as methods of biological control. One of the best biological agents currently used in agriculture are micromycets of the genus *Trichoderma.* Thus, it is appropriate and necessary to identify new strains producing bioactive substances for the agricultural branch.

Five strains of micromycetes of the genus *Trihoderma* were tested for antimicrobial properties on pathogens: *Alternaria alternata*, *Aspergillus niger*, *Botrytis cinerea*, *Fusarium oxysporum*, *F. solani*, *Agrobacterium tumefaciens* (*Rhizobium radiobacter*) 8628, *Bacillus subtilis* B-117, *Clavibacter michiganensis* (*Corynebacterium michiganense*) 13[a], *Erwinia carotovora* (*Pectobacterium carotovorum*) 8982, *Xanthomonas campestris* 8003[b]. Antimicrobial activity was determined by disk diffusion test (Egorov, 2004). As the result it was selected strain *Trichoderma atrobruneum* CNMN FD 25 with significant antimicrobial potential over tested phytopathogens.

Optimal cultivation conditions have been identified: cultivation time, temperature and pH of the nutrient medium. To identify the optimal conditions for cultivation of the strain *Trichoderma atrobruneum* it was grown on the previously selected nutrient medium with the composition (g/l): glucose – 30,0; $NaNO_3$ –1,0; KH_2PO_4 – 1,0; $MgSO_4x7H_2O$ – 1,0; yeast extract – 10,0; $CaCO_3$ – 1,0. Three temperature regimes were tested (°C): 28-30, 26-28, 30-32; duration of cultivation after 4 days, 5 days, 6 days and 7 days; initial pH value in the nutrient medium: 5.8 - 6.0; 6.0 - 6.2; 6.2 - 6.4; 6,4 - 6,6; 6,6 - 6,8. The obtained results have demonstrated that the optimal conditions for the cultivation of the fungal strain *Trichoderma atrobruneum* are: the temperature of cultivation – 28-30°C, the duration of cultivation – 6 days, pH value of the nutrient medium 6.0 - 6.2.

Acknowledgments: *This study was supported by the research project 020101 "Innovative biotechnological solutions for agriculture, medicine and environment", funded by National Agency for Research and Development.*

Keywords: *fungi, nutrient medium, antimicrobial activity, cultivation time.*

UDC: 577.112:633.11

EFFECT OF *GPC-B1* GENE ON PROTEIN CONTENT OF WINTER BREAD WHEAT GRAINS

Morgun Bogdan*[1,2], ORCID: 0000-0001-7041-6894
Sandetska Nadiia[1], ORCID: 0000-0002-0558-2295
Velykozhon Liudmyla[1,2], ORCID: 0000-0002-5935-9363

[1]Institute of Plant Physiology and Genetics of the National Academy of Sciences of Ukraine, 31/17, Vasylkivska St., Kyiv, 03022, Ukraine
[2]Institute of Cell Biology and Genetic Engineering of the National Academy of Sciences of Ukraine, 148, Akademika Zabolotnoho St., Kyiv, 03143, Ukraine

*E-mail: *molgen@icbge.org.ua*

The issue of improving grain quality is an urgent problem of wheat breeding. The transfer of genes from wild relatives is one of the directions of wheat genetic improvement. The *Gpc-B1* gene is of particular interest in this direction. The purpose of our work was to determine the effectiveness of the *Gpc-B1* gene in the genetic environment of the Ukrainian variety 'Kuyalnyk' on grain protein content, yield and bread-making characteristics. The *Gpc-B1* gene originated from wild wheat, dicotyledons *Triticum turgidum* ssp. *dicoccoides* from the national germplasm funds (Prof. Dubcovsky, the University of California at Davis) and located in chromosome 6B. There has been identified wild-type allele *Gpc-B1* (grain protein content, NAM-B1) (2n = 4x = 28) with genomic formula A^uA^uBB, which significantly increases the content of protein and several key trace elements in the grain without affecting the yield. Dominant and codominant molecular genetic systems of DNA markers were developed to detect the *Gpc-B1* gene from *T. turgidum* ssp. *dicoccoides* in bread wheat lines. Analysis of grain of F_5–F_9 plant generations showed that the *Gpc-B1* gene caused a 3% increase in protein content compared to the original 'Kuyalnik' variety. The productivity of lines carrying the *Gpc-B1* gene in field conditions was analyzed too. The results of our research showed that the influence of the *Gpc-B1* gene on grain yield was practically absent on the background of the genetic environment of the zoned Ukrainian variety 'Kuyalnik'. The influence of this gene on the baking characteristics of common wheat was studied as well. Lines with the *Gpc-B1* gene and without it had almost the same sedimentation rate. The applied methods of marker-assisted selection have ensured the development of promising wheat breeding material. It is ready to transfer to the state variety testing, with high protein content in the grain in combination with high economic and valuable plant properties.

Acknowledgments: *This study was supported by the research projects No. 6541030 and 0122U001512, funded by National Academy of Sciences of Ukraine.*

Keywords: *Triticum aestivum L., Gpc-B1 gene, Triticum turgidum ssp. dicoccoides, molecular markers, grain protein content, sedimentation rate.*

UDC: 579.87:579.25

APPLICATION OF CRISPR SYSTEM TO A PROMISING ACTINOBACTERIUM, *PAENARTHROBACTER NICOTINOVORANS* ATCC 49919

Munteanu Iustin-Tiberius*, ORCID: 0000-0003-3609-5841
Mihășan Marius, ORCID: 0000-0003-4439-4251

BioActive Research Group, Faculty of Biology,"Alexandru Ioan-Cuza" University of Iasi, Blvd Carol I no. 20A, Romania

*E-mail: *tibimunteanu897@gmail.com*

Paenarthrobacter nicotinovorans ATCC 49919, a nicotine-degrading microorganism (NDM), holds biotechnological promise for the synthesis of industrially and pharmaceutically relevant compounds such as 6-hydroxy-L-nicotine. Our study aims to develop a genetic manipulation tool using the CRISPR system to facilitate and optimize genomic editing in *P. nicotinovorans* and thus increase its biotechnological potential. Our goal is to inactivate or significantly reduce the expression of 6-hydroxy-L-nicotine oxidase (*6hlnO*), the central enzyme responsible for the conversion of 6-hydroxy-L-nicotine (6-HLN) to 6-hydroxy-methylmyosmine (6-HMM).

Two distinct strategies have been tried to inactivate the target gene. The first approach is based on of the CRISPR-Cpf1 system, which allows inactivation of the *6hlnO* gene by deletion. The CRISPR-Cpf1 gene was isolated by PCR from pJYS3-ΔcrtYF plasmid and inserted into the pART2 vector by Gibson assembly, resulting pART2-Cpf1.

In the second approach, the CRISPR/dCasi9 system was used, which consists of a catalytically inactive protein that blocks the RNA polymerase activity and thus expression of the *6hlnO* gene. For this purpose, a 20 bp spacer with the sequence complementary to the *6hlnO* gene was cloned into the pCasiART vector expression using the Golden-Gate assembly and the pCasiART-Δ6hlnO have been obtained.

Experiments are currently underway to evaluate the efficacy of *6hlnO* gene inactivation using the two constructs: pART2-Cpf1 and pCasiART-Δ6hlnO. This involves sampling liquid citrate broth cultures at regular intervals and then analyzing them by HPLC to quantify nicotine and 6HLN levels.

Acknowledgments: *This work was supported by a grant from the Romanian Ministry of Education and Research, CNCS – UEFISCDI, project number PN-III-P4-ID-PCE-2020-0656, within PNCDI III.*

Keywords: *P. nicotinovorans, nicotine metabolism, CRISPR system, genetic engineering.*

UDC: 578.76:615.831

NEW METHODS OF PATHOGEN INACTIVATION USING UV-C RADIATION

Munteanu Ion[1,2], ORCID: 0000-0002-5685-8888
Ciobanu Nellu[2], ORCID: 0000-0002-8153-8237

[1]Quantum Optics and Kinetic Processes Lab., Institute of Applied Physics, Moldova State University, Republic of Moldova
[2]Department of human physiology and biophysics, State University of Medicine and Pharmacy "Nicolae Testemițanu", Chisinau, Republic of Moldova

*E-mail: [1]*cnellu@gmail.com*,
[2]goretz19@yahoo.com

The action of UV-C radiation for the decontamination of pathogens is a very actual subject to be studied, as a result of the recent pandemic (Covid-19), in finding new effective methods of inactivating pathogens (viruses, bacteria, etc.). Many researches demonstrate that the inactivation of pathogens is nothing more than the direct action of DNA denaturation induced by UV-C photons on the nucleic acid base.

Investigation the action of UV-C radiation (254 nm) on the molecular sizes of yeast fungi and on their surface properties. Due to their eukaryotic cellular constructions, Baker's yeast solution is not contagious, can be used in laboratory condition, offers better resistance to UV-C radiation compared to pathogenic prokaryotic colonies. Materials and methods. The UV disinfection technology is known for the disinfection of pathogens from surfaces, air and water, for several decades. Ultraviolet radiation range are especially damaging to cells because they are absorbed by nucleic acids. But the germicidal effectiveness of UVC peaks at about 260–265 nm, which corresponds to the peak of UV absorption by bacterial DNA. The ultraviolet germicidal irradiation (UVGI) damages the DNA of viruses and bacteria, rendering it incapable of replicating. The most damage in ultraviolet (UV)–irradiated DNA is the cyclobutane pyrimidine dimer that is formed between adjacent thymine bases. For these reasons, the Baker solution was exposed to the action of UVC radiation with the help of the Q-Smart laser from Quantel, in order to investigate the effects of the decontamination rate. Microscopic and spectroscopic analysis were investigated for different irradiation times.

From the spectral analysis data, it was observed that with increasing of the exposure time of the yeast solution under the action of UV-C, the intensity of the absorption spectrum decrease. From the images obtained with the help of the electron microscope, we also see a decrease in the number of pathogens with the exposure time.

The effectiveness of the method of inactivating the Baker's yeast solution by the action of UV-C radiation for different doses of radiation was demonstrated, and the obtained results clearly demonstrate this.

Keywords: *UV-C radiation, pathogens, absorbsion spectra, decontamination.*

UDC: 665.52/.54:621.373

ENCAPSULATION OF ESSENTIAL OIL IN ALGINATE MICROCAPSULES BY ELECTROSPRAY METHOD

Narozhnyi Stanislav[1]*, ORCID: 0000-0001-9690-0203
Golosna Lesia[1,2], ORCID: 0000-0002-6276-8256
Sevastianov Stanislav[1], ORCID: 0000-0002-6204-3386
Bobrova Olena[1,2]*, ORCID: 0000-0001-9100-1823

[1]Institute for Problems of Cryobiology and Cryomedicine NAS of Ukraine, Kharkiv, Ukraine
[2]Crop Research Institute, Prague, Czech Republic
[3]Institute of plant protection NAAS of Ukraine, Kyiv, Ukraine

*E-mail: *helen.bobrova.77@gmail.com, stas.narozhnyi@gmail.com*

In recent years, research in the field of biopesticides has focused on discovering new substances for the protection of agricultural crops. One potential alternative to synthetic biopesticides is essential oils, due to their properties of safety, bioactivity, and biodegradability. The oregano essential oil has pronounced fungicidal properties and can be used against fungal plant diseases. Therefore, the purpose of this study was to investigate the encapsulation of oregano essential oil in alginate microcapsules using coaxial electrospray, which would expand its application in agriculture.

To create alginate microcapsules, we used an electrospray equipment developed in the Department of Biophysics of IPC&C of the NAS of Ukraine. The device was equipped with a two-channel infusion pump, and a coaxial needle was used as an extruder (the internal diameter of the first channel was 216 ± 15 μm, and the second channel was 64 ± 5 μm). For encapsulation, we used *Origanum vulgare* essential oil obtained through extraction with liquefied gases. To create the alginate microcapsules, a solution of *Origanum vulgare* essential oil (100 mg/ml) was supplied through channel II, while 2% solution of low-viscosity sodium alginate was supplied through channel I. The infusion rate was 5±0.1 ml/h. The distance between the device contacts varied from 10±0.5 mm to 30±0.5 mm, and the voltage ranged from 5000±126 V to 8500±142 V. A 2% calcium chloride solution was used as a gelling solution.

During the study, we successfully obtained sodium alginate microcapsules encapsulating oregano essential oil. It was observed that at a voltage of 5000±126 V, droplet sputtering occurred, resulting in microcapsules with an average diameter of 29.96±8.54 μm. Increasing the voltage by 30% led to the formation of an electrospray cone and a 3% decrease in the average diameter of the microcapsules.

We determined that the optimal distance between the device contacts is 20±0.5 mm, as this resulted in a polydispersity coefficient of 0.84 for the obtained microcapsules. The roundness coefficients of the resulting microcapsules ranged from 0.82 to 1, indicating a uniform shape, with most microcapsules being spherical.

***Keywords**: alginate microsphere, electrospray, essential oil, Oríganum vulgáre.*

UDC: 632.7:595.786

SEASONAL MONITORING OF *AGROTHIS SEGETUM* PEST DEVELOPMENT IN DIFFERENT AGRICULTURAL CROPS USING PHEROMONE TRAPS

Nemerenco Olesea, ORCID: 0000-0002-0028-4547

Moldova State University, Chisinau, Republica Moldova

E-mail*: olesea.nemerenco@sti.usm.md*

The field of plant protection has witnessed significant progress, highlighted by the discovery and application of new modern methods in pest control, the diversification of phytosanitary products, the use of modern application equipment, and, most importantly, the reevaluation of the entire control system based on an ecological perspective.

The use of sexual pheromones, introduced in biological control systems of harmful insects over the last two decades, serves to alert chemical treatments, establish precise spread areas, and monitor pest population levels.

The purpose of this study was to conduct seasonal dynamic monitoring of the *Agrothis segetum* pest in various agricultural crops using pheromone traps.

According to the results obtained throughout the vegetation period in sunflower and soybean crops, using pheromone traps, the development of three generations of the *A. segetum* pest was observed According to the results obtained throughout the vegetation period in sunflower and soybean crops, using pheromone traps, the development of three generations of the *A. segetum* pest was observed.

The results obtained have shown that soybean crops are more preferable for this pest compared to sunflower crops during the development of the second and third generations. The dynamic monitoring of the *A. segetum* moth population activity has revealed that there were no significant differences regarding the duration of the development of the three generations in both crops. The dynamic monitoring of the *A. segetum* moth population activity has revealed that there were no significant differences regarding the duration of the development of the three generations in both crops.

Thus, the flight began in the second decade of May and lasted until the second decade of September. For soybeans, the first generation was observed in the first decade of May and lasted until the beginning of the second decade of June. The second generation of both sunflower and soybeans reached its peak flight activity in the second decade of July. The third generation of sunflower reached its peak at the end of the second decade of August, while in soybean crops, it peaked in the first decade of August.

The researches were carried out within the Subprogram 011103 Development of ecologically harmless means of reducing the impact of harmful organisms of agricultural crops against the background of climate change, financed by the Ministry of Education and Research.

Keywords: *Generations, Agrothis segetum, monitoring, mopulation.*

UDC: 613.2:633.1:577.1

A STEP TOWARDS ZERO WASTE FOOD PROCESSING: USING SOYBEAN AND MAIZE BY-PRODUCTS IN FUNCTIONAL FOODS

Nikolić Valentina*, ORCID: 0000-0002-5834-6683
Simić Marijana, ORCID: 0000-6719-7982
Žilić Slađana, ORCID: 0000-0001-8299-9185
Perić Vesna, ORCID: 0000-0001-8269-017X
Milovanović Danka, ORCID: 0000-0002-6915-2606
Sarić Beka, ORCID: 0000-0001-5918-6151
Srdić Jelena, ORCID: 0000-0002-5117-5076

Maize Research Institut Zemun Polje, Slobodana Bajica 1, Belgrade, Serbia

*E-mail: *valentinas@mrizp.rs*

Maize and soybean crops are more popular than ever considering the growing need for nutraceuticals, plant-based protein, functional meals, and vegetarian food products. Due to the nutritious value of soybeans and maize, many food products are currently offered. Stalks, husks, cobs, and leftover baby corn ears are examples of high-fiber agricultural waste produced while growing and processing maize. Nutrient- and antioxidant-rich byproducts of soy processing include soy hulls from grain processing, soymeal from soy oil processing, okara from soy milk processing, and soy whey from tofu processing. However, because there isn't an accessible, long-lasting food processing system, a large number of these byproducts are discarded as waste on soil surfaces and water bodies, used as animal feed, or exploited for industrial uses. The solution to ending malnutrition and conserving the environment from the negative effects of waste may lie in the value-adding of soy and maize by-products. The primary objective of this research was to create functional food products with enhanced antioxidant properties by processing hulls rich in anthocyanins from a black soybean variety. Powdered black soybean hulls and baby corn cobs were used to make pickled baby corn in a red brine enhanced with anthocyanin extract, while leftover kernels from processing sweet maize were utilized to make a sweet jam-like spread. The product's chemical makeup, biochemical characteristics, and sensory assessment were all evaluated. The results indicated that enhanced antioxidant properties and superior sensory quality were obtained. The Serbian Ministry of Science, Technological Development, and Innovation approved these products through two technical solutions, recognizing them as food items with added value that may affect sustainable food production.

Acknowledgments: *This study was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).*

Keywords: *maize, soybean, functional foods, bioactive components, by-products, agricultural and food waste utilization.*

UDC: 543.2:615.451.16:635.72

INVESTIGATION OF METAL NANOPARTICLES UPTAKE IN *MENTHA SPICATA* L. AND THEIR TRANSFER IN HERBAL INFUSION

Peshkova Alexandra[1,2]*, ORCID: 0000-0001-5020-0500
Zinicovscaia Inga[1,3,4], ORCID: 0000-0003-0820-887X
Cepoi Liliana[4], ORCID: 0000-0002-7516-948X

[1]Joint Institute for Nuclear Research, Dubna, Russia
[2]Doctoral School in Natural Sciences, Moldova State University, Chisinau, Moldova
[3]Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Măgurele, Ilfov, Romania
[4]Institute of Microbiology and Biotechnology, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *peshkova.alexandra92@gmail.com*

The increasing use of nanoparticles in different fields, including agricultural sector, contributes to the release of nanosized metal particles (NPs) into the environment and creates risks of their trophic transfer. *Mentha spicata* L. are used in the food industry, pharmacology, medicine and as flavoring agents, was chosen as the object of study. The main goal of the research was to identify the ability of spearmint plants to accumulate metal nanoparticles from soil, and assess the risks of their transfer from mint leaves into the herbal infusion.

Mentha Spicata L. plants were exposed to copper (CuNPs), silver (AgNPs) and gold (AuNPs) nanoparticles in a concentration range of 1-100 mg/L during 28-day experiment under root irrigation conditions. At the end of the experiment, dried crushed spearmint leaves were used to prepare herbal infusions. To determine gold content in plant segments and soil *k0*- based neutron activation analysis was applied, silver was determined using atomic absorption spectroscopy, of copper content using inductively coupled plasma optical emission spectrometry. Transmission electron microscopy showed that NPs were of the spherical shape and size of 1-5 nm for AuNPs, 1-2 nm for AgNPs and 15-70 nm for CuNPs.

Differences in the uptake of metal nanoparticles by spearmint plants and their distribution in segments were revealed. Gold was mainly accumulated in roots, with the maximum values of 454 mg/kg; transfer to the leaves was observed only at AuNPs concentrations 50 and 100 mg/L. Under the same experimental conditions, the highest accumulation of silver was in leaves (16.9 mg/kg) when applying 100 mg/L of AgNPs solution. The content of silver in roots was comparable with its content in leaves 1-50 mg/L of AgNPs were used. In spearmint plants, irrigated with CuNPs in concentrations of 1-50 mg/L, copper was accumulated mainly in root system (10.6 -90.6 mg/kg). The copper content in stems and leaves was no more than 3 times higher than in the control. However, when irrigated with a solution of CuNPs in concentration 100 mg/L, the content of copper in leaves increased sharply (up to 137 mg/kg), corresponding to the content in the roots (150.5 mg/kg). The percentage of gold, silver and copper extraction into the herbal tea varied depending on the concentration of the initial solutions of nanoparticles used for irrigation. Thus, the extraction of gold from leaves into the infusion was 2-45%, of copper on the level of 3-33% and of silver less than 1%.

The results of the study demonstrate differences in accumulation and translocation of gold, silver and copper NPs in *Mentha Spicata* L. segments when applied root irrigation and are of great interest for plant nanotoxicology and assessment of health risks.

Keywords: *metal nanoparticles, spearmint, root irrigation, ICP-OES, AAS, k0-based neutron activation analysis, herbal infusion.*

UDC: 595.79:632.7(430)

WASPS GOING NORTH? THE FIRST RECORD OF *TRITELEIA PEYERIMHOFFI* (*SCELIONIDAE*) IN GERMANY

Pîrvu Ecaterina[1]*, ORCID: 0000-0003-1055-5264
Vasilița Cristina[2], ORCID: 0000-0003-0140-3859

[1]"Alexandru Ioan Cuza" University, Iași, Romania
Faculty of Biology
[2]Stuttgart State Museum of Natural History, Germany

*E-mail: *pirvukate@gmail.com*

Triteleia peyerimhoffi (Kieffer) is a species of parasitoid wasps, with Palearctic distribution, described in the family Scelionidae (Platygastroidea), that parasitizes orthopterans, such as *Uromenus brevicolis* (Fisher), from eggs of which it was first reared and described. *Triteleia peyerimhoffi* presents high intraspecific morphological variability, potentially explained by the wide circum Mediterranean distribution area.

The superfamily Platygastroidea is one of taxonomic groups called "dark taxa", that present difficulty in identifying and differentiating in between the species, lack fundamental information such as biology and distribution and were largely excluded from conservation efforts and red lists. The German Barcode of Life III: Dark Taxa project aims to complete the DNA databases for dark taxa insects, parasitoid wasps and flies in particular, allowing further research through integrative taxonomy, as well as including these groups in ecology and biodiversity conservation studies.

The study material was captured using various techniques, (such as Malaise traps, yellow pan traps, sweep net and entomological aspirator). COI DNA barcodes were obtained through PCR by Sanger sequencing or using the Oxford Nanopore MinION portable sequencing device. Voucher specimens are deposited in the collection of the Stuttgart State Museum of Natural History, Germany.

The aim of this study is to update the distribution of *Triteleia peyerimhoffi*, which was found in Germany for the first time, this being the northernmost point of this species distribution, as well as investigate the morphological and genetical intraspecific variability through barcode data. Additionally, the first photographs and barcode data are made available publicly for *Triteleia peyerimhoffi*.

Acknowledgments: *This study was possible thanks to Ovidiu Popovici's input. This study was realized within the "German Barcode of Life III: Dark Taxa" project (FKZ 16LI1901C), funded by (Bundesministerium für Bildung und Forschung).*

Keywords: *Parasitoid wasps, barcodings, distribution, dark taxa.*

UDC: 577.112:551.521.17

COOPERATIVE EFFECTS OF UV-IRRADIATED PROTEIN MOLECULES

Podoleanu Diana, ORCID: 0009-0006-9087-6445

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *podoleanu.d@yahoo.com*

Proteins, when exposed to radiation, respond collectively. These cooperative effects can affect protein structure, function, and stability. Depending on the intensity and duration of exposure to UV radiation, proteins can undergo denaturation, which involves breaking chemical bonds and disrupting their three-dimensional structure. In cooperative effects, proteins in a group can denature more easily or more severely when other proteins in the group are already denatured. Proteins involved in DNA repair can also become denatured due to the formation of thymine dimers in DNA molecules. Protein complexes in DNA repair systems work in a coordinated manner to repair the damage.

The study aims to ascertain the optimal intensity and duration of irradiation necessary to induce irreversible denaturation in bacterial proteins and pathogenic DNA, while ensuring human safety and achieving effective, risk-free decontamination. Additionally, it explores effective packaging methods for irradiated metamaterials.

It is proposed to use a combination of metamaterial repacking methods to increase the contact surface between the irradiating elements and the samples exposed to radiation.

Analyzing the obtained results, it becomes obvious that no less important than the intensity and duration of irradiation in the denaturation of biomolecules, is the packaging method of the metamaterials.

Acknowledgments: *this study was supported by the doctoral research project, funded by Moldova State University.*

Keywords: *UV- radiation, cooperative effects, molecules.*

UDC: 632.25:546.22

EFFICACY OF LIQUID SULFUR IN COMBATING *U. NECATOR* IN ECOLOGICAL AGRICULTURE SYSTEM

Popa Alexei*, ORCID: 0009-0002-4965-6572
Todiras Vladimir, ORCID: 0009-0008-6766-5652
Gusan Ana, ORCID: 0009-0003-6438-2466
Sitnic Victor, ORCID: 0000-0002-0449-1527

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

E-mail: alexei.popa@sti.usm.md*

In the Republic of Moldova, agriculture is a branch of the national economy, contributing annually to the formation of the GDP by approx. 12-13%. Together with the processing industry of agricultural raw materials, this index is approx. 24%, which constitutes approx. 60% of the total volume of exports. Perennial plantations occupy an area of about 288.9 thousand ha, including orchards – 138.9 thousand ha and vines – 150.0 thousand ha. Cryptogamic diseases such as downy mildew, powdery mildew and gray rot of grapes are the most dangerous and common diseases of grapevines. The powdery mildew (*Uncinula necator*) is one of the most damaging grapevines diseases in the Republic of Moldova, as it considerably reduces the crops and wine quality. The pathogen attacks all the aerial organs of the plant: leaves, grass shoots, bunches and berries. Crop losses due to this disease can range from 10% to 80%.

The application of the sulfur-based product is one of the ecological methods of combating powdery mildew on grapes. Considering the low level of toxicity and risk for the environment, this group of preparations is of particular interest as biorational fungicides. Our research is directed towards the development of a new liquid preparation form in combating powdery mildew on vines.

The researches was carried out during the years 2022-2023, in the central area of the Republic of Moldova, at the Institute of Genetics, Physiology and Plant Protection of the Moldova State University. The experiments were carried out on the Rosfor grapes variety and consisted of 6 treatments applied with a portable sprinkler. The experimental scheme included 5 variants. Each variant consisted of 3 repetitions. As a result of the statistical processing of the experimental data, the highest biological efficacy was recorded for the chemical standard Kumulus (sulfur powder) - 90.3%. In the potassium bicarbonate variant - 6.0 kg/ha, the biological efficacy was 87.2%, while in the liquid sulfur version - 6.0 l/ha - 86.0%. At the same time the neem extract showed a biological efficacy of 82.2%.

Analyzing the obtained results, we can conclude that the product based on liquid sulfur - 6.0 l/ha demonstrated an essential efficacy and can be used in the prevention and combating of powdery mildew on grapes in ecological agriculture system.

Acknowledgments: *Research was carried out within the State Program project nr. 20.80009.5107.19: "Strengthening the capacities for forecasting and combating harmful organisms and phytosanitary risk analysis in integrated plant protection", funded by the National Agency for Research and Development of Republic of Moldova (ancd.gov.md).*

Keywords: *Uncinula necator*, viticulture, sulfur, fungicide, biological efficacy.

UDC: 631.417.2:631.872(478-21)

THE CONTENT OF HUMUS IN THE SOILS OF BĂLȚI CITY, REPUBLIC OF MOLDOVA

Portarescu Anastasiia, ORCID: 0000-0001-7620-7049
Bulimaga Constantin*, ORCID: 0000-0003-1288-0140

Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *cbulimaga@yahoo.com*

The soil represents the upper part of the lithosphere, consisting of a complex system of phases, located in a permanent interdependence from a physical and chemical point of view. The acceleration of urbanization contributes to the intensification of the processes in which permanent morphological changes of the soil cover take place. The soil found predominantly in urban areas represents a variety of soil strongly differentiated from the soils of natural ecosystems, integrated within the radius of a locality and strongly affected by human activities. Due to anthropogenic activities, there is soil compaction, pollution, inversion of horizons, which contributes to the degradation and decrease of soil fertility. An essential role for soil fertility is the humus content in its composition. In order to assess the condition of the soils as a priority issue, several researches were carried out regarding their condition.

The purpose of this paper is to evaluate the anthropogenic impact on the soil quality and the assessment of the humus content in the soil layer (0-20cm) within the Balti urban ecosystem. The soil samples were taken from 9 resorts (8 - from the banks of water bodies, within the radius of the city of Balti and one - from the nearby airport, the so-called "control resort"). The analysis of humus content (organic matter, %) was carried out in the accredited laboratory of the Environment Agency, Chisinau.

As a result of the analysis of the humus content, it was established that it is between the values of 3.04 - 4.77% (Raut river, upstream of the city - 3.04; Copaceanca tributary - 3.52%; Rautel river - 3 ,75%; Vanatorilor & Pescarilor lake - 4.28%; Raut river, downstream BES - 4,61%; Locomotivelor str. - 4.77%), which indicates the type of chernozem from weakly humiferous to moderately humiferous. The data on the humus content indicated in most of the researched sites, according to the scale of the levels of nutrient elements in the soils of the Republic of Moldova, according to Cerbari (2010), that the soil has an average degree of supply with organic matter. This indicates that the ecological footprint persists within the city. Humiferous chernozem is present only at the airport resort, with a value of 5.26%. Taking into account the fact that the airport near the city has not been functional for several years, the authorities of Balti municipality could improve on this territory both as agricultural land and for planting an orchard, park or forest.

Acknowledgments: *This study was supported by the research project* ***(20.80009.7007.11 (2020-2023): Assessing the stability of urban and rural ecosystems in order to ensure sustainable development****), funded by (****State command****).*

Keywords: *urban soil, Bălți city, humus content, organic matter.*

UDC: 504.064.3:574:556.55(478-21)

ASSESSMENT OF SURFACE WATER QUALITY: A CASE STUDY ON PONDS IN THE BĂLȚI URBAN ECOSYSTEM

Prodan Petru, ORCID: 0000-0002-4661-7757
Bulimaga Constantin*, ORCID: 0000-0003-1288-0140

Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *prodanpetru90@gmail.com*

Stagnant water bodies have a more complex and fragile ecosystem compared to flowing water bodies, because the self-purification process is low, therefore, various pollutants produced by anthropogenic activities easily accumulate.

In general, the quality of water bodies in the Republic of Moldova, is characterized by a high degree of pollution class IV-V, especially with organic substances, nutrients and a low oxygen content, which varies seasonally depending on the self-purification ability of the aquatic body.

Thus, the present study aims to evaluate the physico-chemical quality of three ponds in the Bălți urban ecosystem: Vânătorilor și a Pescarilor pond; Orășenesc pond and Chirpicinoe pond. Water samples were taken quarterly during 2022, for which the following water quality parameters were analyzed: pH, mineralization (TDS), chemical oxygen demand (COD-Cr), biochemical oxygen demand (BOD_5), matters in suspension (MS), ammoniacal nitrogen (N/NH_4^+), nitrite nitrogen (N/NO_2^-), nitrate nitrogen (N/NO_3^-), total phosphorus (P_{tot}), chloride (Cl^-), total hardness (Th). Standard methods were used to perform the laboratory tests. Based on the results obtained, the quality assessment of water bodies was carried out in accordance with Government Decision no. 890 of 12.11.2013.

During the warm period of the year, a mass development of phytoplankton is found in the investigated water bodies, which leads to a global increase in oxygen and a decrease in carbon dioxide. The aquatic biota is affected, in the hot season there is a mass die-off of fish.

According to the data set obtained, the water of the ponds is characterized by an alkaline pH (>8.5); high TDS (>1000 mg/l); a high degree of pollution with organic substances (MS >25 mg/l, COD-Cr > 30 mg/l, BOD_5 >6 mg/l); N/NH_4^+ (>0.4 mg/l); Th (>9 mmol/l); Cl^- (>100 mg/l). As a result, the obtained experimental data indicate a high degree of pollution of surface water bodies (quality class V, highly polluted). Thus, major deviations of the physico-chemical values from the natural background of the water quality were found, the biological components. The physico-chemical characteristics and phytoplankton biomass of water bodies are not constant and fluctuate according to seasonal variation as well as the degree of pollution.

Acknowledgments: *This study was supported by the research project nr. 20.80009.7007.11, Bulimaga Constantin, funded by Ministerul Finanțelor.*

Keywords: *body of water, quality parameter, quality class, pollution, self-purification.*

UDC: 576.316:611.013.1:616.697

Y CHROMOSOME MICRODELETIONS IN INFERTILE MEN WITH NON-OBSTRUCTIVE AZOOSPERMIA

Racoviță Stela[1]*, ORCID: 0000-0002-0900-0096
Moșin Veaceslav[2], ORCID: 0000-0002-1209-525X
Sprincean Mariana[1], ORCID: 0000-0002-3619-1924

[1]Department of Molecular Biology and Human Genetics,
[2]Department of Obstetrics and Gynecology, Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova

*E-mail: *stela.racovita@usmf.md*

Introduction: Male infertility has a multifactorial etiology, with spermatogenesis disorders being a common cause. Genetic factors, accounting for about 30% of cases associated with azoospermia and severe oligozoospermia, play a significant role. Y chromosome microdeletions are among the most prevalent molecular genetic causes of severe spermatogenesis impairment.

The Purpose: To investigate the frequencies and types of Y chromosome microdeletions in infertile men and to analyze the relationship between spermatogenesis disorders and Y microdeletions.

Materials and methods: The study was carried out on infertile men with non-obstructive azoospermia recruited among infertile couples referred for reproductive treatment. All patients signed an informed consent. The endocrine markers: FSH (Follicle-stimulating hormone); LH (Luteinizing Hormone); and testosterone were evaluated. Genomic DNA was isolated and used to analyze AZF microdeletions by multiplex PCR (Polymerase chain reaction). Multiplex PCR was performed using Y-specific markers for AZF region: AZFa (sY84, sY86, DBY1, sY620), AZFb (sY117, sY127, sY134, SY143), and AZFc (sY254, sY255, sY153, SY158). The detections of sY14 (SRY) and ZFX/ZFY were employed as internal controls.Ten non-obstructive azoospermic men had Y chromosomal microdeletions. Six Y-microdeleted men underwent microsurgical observation of testicular architecture and quantitative histology of spermatogenesis in a strip of testicular tissue. The results were compared with the different type of Y microdeletion.

Results: Deletions of the Y chromosome were found in 10 (9.9%) out of 99 patients with azoospermia. The FSH level of these patients were 6.4 ± 3.5 mIU/ml (95% CI: 3.9 – 8.9; median 6.3); LH 6.2 ± 3.2 mIU/ml (95% CI: 3.9 – 8.5; median 7.1); and testosterone 3.3 ± 1.4 ng/ml (95% CI: 2.3 – 4.3; median 3.1). Deletions of the AZFc locus were observed in five out of ten azoospermic patients (50%). In two out of ten patients (20%), deletions of the AZFb region were detected. Deletions affecting both the AZFb and AZFc loci were found in two patients (20%) with non-obstructive azoospermia. Microdeletions were detected in only one case, 10 % (1/10) in each region of AZFa; AZFb; AZFc and presence of the SRY gene, in the patient with XX male syndrome. In all men with AZF microdeletions of the Y chromosome we found severe spermatogenic defects: however, we also didn't found, in all of them, mature sperm sufficient for ICSI. The patients were advised to use sperm from the donor for ICSI and IVF.

Conclusions: Screening for Y chromosome microdeletions is crucial for diagnosing severe spermatogenic defects in infertile men. This diagnostic approach can offer more effective solutions to couples with longstanding infertility, potentially before resorting to assisted reproductive techniques (ART).

Keywords: *male; infertility; microdeletion; AZF region; azoospermia.*

UDC: 579.222:577.117:663.12

BIOSYNTHESIS POTENTIAL OF CAROTENOIDS OF SOME PIGMENTED YEAST STRAINS

Rozlovan Ana, ORCID: 0009-0001-5367-1743
Chiselița Natalia*, ORCID: 0000-0002-6943-8129
Tofan Elena, ORCID: 0000-0002-0186-4391
Daniliș Marina, ORCID: 0000-0003-0601-7746
Efremova Nadejda, ORCID: 0000-0002-9664-346X
Chiselița Oleg, ORCID: 0000-0001-7298-1512

Institute of Microbiology and Biotechnology, Technical University of Moldova Chisinau, Republic of Moldova

*E-mail: *natalia.chiselita@imb.utm.md*

Yeasts of the genus *Rhodotorula* and genus *Sporobolomyces* are group of yeasts with increased potential of the biosynthesis of carotenoid pigments such as β-, γ-carotene, torulene and torularhodin. These compounds possess a high potential of application in food, feed, health products and cosmetics. The demand of natural carotenoid pigments is increasing and significantly boosts the use of microorganisms for obtaining natural products.

The purpose of the research was to evaluate the productive and biosynthetic potential of carotenoids of some pigmented yeast strains from the genera *Rhodotorula* and *Sporobolomyces*. As the object of the research 8 yeast strains of different species from the genera mentioned above, stored in the National Collection of Nonpathogenic Microorganisms and the Collection of Fungal Biotechnology Laboratory of the IMB of the UTM, were served. Cultivation in depth was carried out in Erlenmeyer flasks (1L) with YPD nutrient medium, with pH-5.5, on a stirrer with a rotation speed of 200 rpm., at the temperature of +27-28°C, for 120 hours. Gravimetric and spectrophotometric methods were used to evaluate biomass productivity and content of carotenoids.

As the result, it was established that the biomass productivity of strains varied insignificantly between 7.48±0.09 and 8.31±0.51 g/L d.w. Maximum value was recorded for the *Rhodotorula rubra* CNMN-YS-09 strain. The content of total carotenoids in the biomass of different yeast strains varied significantly between 78.27±7.46 and 361.01±38.22 µg/g d.w., depending on the species and genus. Maximum biosynthesis potential was established in *Rhodotorula gracilis* CNMN-YS-06 and *Sporobolomyces pararoseus* CNMN-YS-01 strains of 293.23±20.28 respectively 312.28±10.52 µg/g d.w.

In conclusion, we can mention that autochthonous pigmented yeast strains possess high biomass productivity and content of carotenoids and can serve as an excellent natural source for obtaining of pigments for various fields.

Acknowledgments: *This study was supported by the research project 020101 InBioS „Innovative biotechnological solutions for agriculture, medicine and environment" funded by Ministry of Education and Research.*

Keywords: *pigmented yeast, biomass productivity, carotenoids.*

UDC: 581.142:577.112:632.112

DEHIDRINS AS FACTOR OF PLANT RESPONSE TO ABIOTIC STRESSES

Rudacova Angela*, ORCID: 0000-0001-9638-2151
Cherdivară Ala, ORCID: 0000-0003-1276-4959

Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova

E-mail: rud-as@mail.ru

In response to stressful environmental conditions - moisture deficiency, low temperatures, salt stress, etc., dehydrin proteins, belong to the group of LEA (Late Embryogenesis Abandant) proteins, class LEA II, are synthesized in the seeds and leaves of plants. Dehydrins are characterized by high hydrophilicity, thermal stability and low structural folding. The primary structure of the dehydrin molecule contains a number of conservative segments (K, S, Y and F), based on the presence of which in several repeats, 6 subclasses of dehydrins are defined. The primary structure and physicochemical characteristics of the segments determine the diversity of functions of dehydrins in various processes in plant cells in response to various stresses. Thus, the K-segment, present in all known dehydrins, is involved in interaction of dehydrin molecule with other proteins, phospholipid membranes, and prevents protein aggregation, including during drought. The presence of the Y-segment in the structure makes dehydrins highly hydrophilic, which promotes the accumulation and retention of water. Of interest is the F segment, found in dehydrins not only of angiosperms, but also of gymnosperms, which suggests its more ancient origin compared to the Y segment, which is present only in angiosperm dehydrins. The putative function of the F segment is to participate in membrane and protein binding. In general, an increase in gene expression and accumulation of dehydrins in various parts of plants has been shown in response to the main stressful environmental conditions - drought, low temperatures, salt stress, etc. Studies of plant varieties with different levels of drought resistance have shown a positive correlation between the level of expression of dehydrin genes and the physiological response. For example, based on the results of analysis of the expression of dehydrin genes in tolerant and sensitive sunflower varieties, an effective and easy-to-use prescreening test system was proposed to determine the level of drought resistance in sunflower plants during the breeding process. These properties suggest the possibility of using dehydrins as indicators of the level of plant resistance to various stresses in breeding programs.

Acknoledgements: *work completed according to the research subprogram 011101: Abordări genetice și biotehnologice de management al agroecosistemelor în condițiile schimbărilor climatice.*

Keywords: *dehydrins, abiotic stress, plant response.*

UDC: 546.73:547.979.8:582.232

EFFECT OF COBALT(II) ACETATE ON THE PRODUCTION OF β - CAROTENE AND ASTAXANTHIN BY GREEN MICROALGA *HAEMATOCOCCUS PLUVIALIS*

Rudi Ludmila*, ORCID: 0000-0002-0752-8153
Plîngău Ecaterina, ORCID: 0009-0006-0421-4796
Cepoi Liliana, ORCID: 0000-0002-7516-948X
Miscu Vera, ORCID: 0000-0003-0774-2085
Tașcă Valentina, ORCID: 0000-0002-3955-011X

Institute of Microbiology and Biotechnology, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *ludmila.rudi@imb.utm.md*

In this study assessed the effect of cobalt (II) acetate – Co $(OAc)_2$ on the production of β-carotene and astaxanthin by green microalga *H. pluvialis* at different stages of its life cycle. Compound was added to the nutrient medium of *H. pluvialis* on the first day of the cultivation cycle. The microalgae biomass was collected according to some conventional stages of the life cycle.

At *green cell stage* of *H. pluvialis* life cycle, the level of β-carotene in the biomass obtained under cultivation conditions in the presence of Co $(OAc)_2$ increased by 17-24% when using Co $(OAc)_2$ in concentrations of 1.5, 2.0 and 2.5 mg/L, the maximum value being recorded at a concentration of 1.5 mg/L. The yield of β-carotene in the algal suspension in these variants increased by 75%, 68% and 56%, respectively, and amounted to 12.3-13.8 mg/L. A high level of β-carotene in the biomass may be the result of induced oxidative stress, since β-carotene modulates intracellular redox status, protecting cells from free radicals. A different algae response was identified when *H. pluvialis* passed through the *brown cyst stage*. Co $(OAc)_2$ concentrations of 1.5 and 2.0 mg/L stimulated the synthesis of β-carotene in the biomass, as well as the yield of β-carotene of microalgae culture, which amounted to 37-50 mg/L. It was found that at the end of the cultivation cycle, characterized by the formation of *red aplanospores*, Co $(OAc)_2$ concentrations enhanced astaxanthin content in both microalgae suspension and algal biomass samples. Thus, concentrations of 1.5 and 2.0 mg/L induced an increase in the content of astaxanthin in biomass by 24-35% and the yield of pigment in it by 80%. In these variants, the amount of biomass increased by 35-44%. Thus, cobalt (II) acetate can be used in the biotechnology of *H. pluvialis* as a stimulator for the production of carotene and astaxanthin.

Acknowledgments: *This study was supported by the Research Subprogram 020101, Institutional financing contract no. 4/FI of 22 February 2024.*

Keywords: *Haematococcus pluvialis, Cobalt (II) acetate, β-carotene, astaxanthin.*

UDC: 595.754:632.936.1

ASSESSMENT OF THE EFFECTIVENESS OF PHEROMONE AND LIGHT TRAPS FOR SEASONAL MONITORING OF THE *HALYOMORPHA HALYS* STINK BUG

Rusu Iuliana*, ORCID: 0000-0002-6551-0955
Zavatin Maria, ORCDI: 0009-0001-2877-7757
Nastas Tudor, ORCID: 0000-0002-0322-710X

Institute of Genetics, Physiology and Plant Protection, Chisinau, Republic of Moldova

*E-mail: julianarusu@gmail.com

The invasion of species beyond their historical habitats is of critical socio-economic and environmental importance to the entire world community. With the advent of the stink bug *Halyomorpha halys*, more and more world researchers are aiming to study the biological features of the pest in the places of its invasion and in this context, the development and evaluation of effective methods for monitoring the abundance of *H. halys* has become a key task in controlling the distribution of this species. One of the most economical and accurate ways to detect and estimate the population density of many harmful insect species is to use pheromone and light traps.

To evaluate the effectiveness of pheromone traps for seasonal monitoring of the stink bug *H. halys*, we used traps complete with aggregation pheromone from «EcoCenter». Based on the test results obtained, it should be noted that the pheromone composition attracts not only adults, but also larvae of this pest, which significantly increases the efficiency of its use. In parallel with this experiment, we also carried out monitoring on light traps.

From the analysis of the data obtained, it was established that the regular attraction of adults to the light trap occurs in the period from the III decade of July to the III decade of August and on average 55 adults of *H. halys* are attracted per trap per season. It was noted that 45.4% more males are attracted to the light than females, while 8% more females are attracted to the pheromone trap than males. In total, during the growing season, on average, 117 *H. halys* adults were caught per pheromone trap, which is 2 times higher than the catch using a light trap.

Thus, it was found that the pheromone trap is the most effective for monitoring and attracting *H. halys* stink bugs, because:

- Stink bugs are attracted to pheromone throughout the entire growing season, and therefore at all phenological phases of crop development;
- The number of adults attracted to the pheromone is 2 times higher than the number of adults attracted to light traps, with a slight difference in the sex ratio - 8%;
- Not only adults, but also nymphs, starting from the second instar, are attracted to the aggregation pheromone. In total, on average, 117 adults and 98 nymphs were caught per pheromone trap during the growing season.

Acknowledgments: *Research was carried out within the Subprogram 011103 «Development of ecologically harmless means of reducing the impact of harmful organisms of agricultural crops against the background of climate change», financed by the Ministry of Education and Research.*

Key words: *Pheromone traps, light traps, stink bug, phenological phases.*

UDC: 574.1:330(498)

METHODS OF ECONOMIC VALUATION OF THE DANUBE DELTA

Simion Petruța-Simona*, ORCID: 0000-0001-7397-5704
Ciornei Laurențiu, ORCID: 0000-0002-9381-5051
Todirică Ioana-Claudia, ORCID: 0000-0002-5191-4043
Petcu Victor, ORCID: 0000-0002-7126-4324
Joița-Păcureanu Maria: ORCID: 0009-0009-2797-6672

Center for Study and Research for AgroForestry Biodiversity "Acad. David Davidescu", Bucharest, Romania

*E-mail: *simona.simion@cscbas.ro*

The Danube Delta represents a complex and valuable ecosystem, hosting vast biodiversity and providing multiple ecosystem services. In the context of economic and ecological pressures on this region, it becomes essential to evaluate and understand the impact of human activities on the Danube Delta. This article aims to analyze the various economic valuation methods applied to the entire delta ecosystem.

The article investigates and compares traditional and innovative economic methodologies, highlighting their advantages and limitations in the specific context of the Danube Delta. Traditional methods such as cost-benefit analysis, contingent valuation, and natural capital valuation are discussed in the deltaic context, emphasizing how they can accurately reflect the ecological value of the Delta.

Additionally, the article presents emerging approaches, such as insurance value assessment, resilience assessment, and the integration of geospatial data for economic valuation, exploring how these methods can complement and enhance current perspectives.

By offering a detailed overview of the various economic valuation methods used in the Danube Delta, the article underscores the importance of an integrated approach that combines economic and ecological aspects for an accurate assessment of the ecosystem's value. The conclusions of this study will provide relevant guidance for sustainable decisions and appropriate policies aimed at protecting and sustainably managing the Danube Delta's resources.

Keywords: *Danube Delta, biodiversity, economic assessment.*

UDC: 582.28:573.4

POTENTIAL AQUATIC FUNGI PRODUCERS OF BIOACTIVE SUBSTANCES

Sirbu Tamara[1]*, ORCID: 0000-0001-7809-9870
Moldovan Cristina[1], ORCID: 0000-0003-1634-0344
Ruginescu Robert [2], ORCID: 0000-0002-0461-1437
Enache Madalin[2], ORCID: 0000-0003-2070-8439

[1]Technical University of Moldova, Chisinau, Republic of Moldova
[2]Romanian Academy Institute of Biology - Bucharest, Bucharest, Romania

*E-mail: tamara.sirbu@imb.utm.md

Studies were carried out to determine the antimicrobial (antifungal, antibacterial) and enzymatic (amylase, catalase, lipase, cellulase) capacity of the new strains of mycelial fungi isolated from the water basins of Chisinau Municipality. Phytopathogens were used as test cultures: *A. niger*, *A. alternata*, *B. cinerea*, *F. solani*, *F. oxysporum*, *B. subtilis*, *X. campestris*, *C. michiganensis*, *A. tumefaciens*, *E. carotovora*. Antimicrobial activity was determined by disk diffusion method. Determination of enzyme capacity was carried out using specific indicators.

Strains possessing high antimicrobial activity (diameter of phytopathogen inhibition zones being 25-40 mm) were detected, as well as amylase, catalase, cellulase and lipase of medium (++) activity, and in some high (+++) activity. As a result of the research, 10 strains were selected that possess high antimicrobial and enzymatic properties.

The morpho-cultural characteristics of the selected strains were studied, and the identification to species of these 10 fungal strains was carried out by the molecular biology method (ITS amplification and sequencing) at the Institute of Biology, Bucharest, Romania.

As a result, it was found that the studied strains belong to the genera *Talaromyces* and *Trichoderma*. Most of the strains in the genus *Talaromyces* were identified as *T. purpureogenus* CBS 286.36 (3 strains), the 16S rRNA sequences showed a similarity from 98.62 to 98.95%. Also, from the genus *Talaromyces*, 1 strain was identified as *T. tumuli* (similarity 99.57%), and 1 strain as *T. adpressus* (similarity 99.81%). Five strains from those studied were identified as representatives of the genus *Trichoderma*. Among them, 2 strains belong to the species *T. atrobrunneum* (similarity 99.81%; 98.82%), 2 strains to the species *T. longibrachiatum* (similarity 99.48; 99.64%) and 1 strain *T. simmonsii* (similarity 99.63%).

Thus, the identified fungal strains supplied the National Collection of Nonpathogenic Microorganisms with new strains of biotechnological interest.

Acknowledgments: *This study was supported by the research project 020101 "Innovative biotechnological solutions for agriculture, medicine and environment", funded by National Agency for Research and Development.*

Keywords: *fungi, antimicrobial activity, enzymatic activity, 16S rRNA sequences.*

UDC: 577.213/.217:579.8

IN SILICO AMPLIFICATION OF *T. CRISTATUS* AND *T. DOBROGICUS* MITOCHONDRIAL DNA

Sitnic Victor*, ORCID: 0000-0002-0449-1527
Nistreanu Victoria, ORCID: 0000-0002-9726-9684
Turcan Vladimir, ORCID: 0000-0002-1136-135X
Popa Alexei, ORCID: 0009-0002-4965-6572

Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *victor.sitnic@sti.usm.md*

The *Triturus cristatus* superspecies represents a group of few closely related species of which two are found in the Republic of Moldova: great crested newt *(Triturus cristatus)* and Danube crested newt *(Triturus dobrogicus).* Reliable monitoring of these taxons is crucial for conservation actions and single species environmental DNA analysis is an efficient tool for this purpose. Since these two taxa are closely related and in the past *T. dobrogicus* was considered a subspecies of *T. cristatus (Triturus cristatus dobrogicus)* we proposed to test bioinformatically if eDNA primers created for the identification of *T. cristatus* (*TCCBL*/*TCCBR*, Thomsen et al. 2011) could amplify *T. dobrogicus* mitochondrial DNA. Thus, the *RefSeq* mitogenomes of both species have been extracted from *GenBank* (NCBI Reference Sequences: NC_015790.1, 16564 bp and NC_015791.1, 16425 bp, Wielstra et al. 2011) and amplified *in silico* using *ecoPCR* algorithm (Ficetola et al. 2010) and above mentioned primers (*TCCBL*/*TCCBR).* The results allowed the amplification of *T. cristatus* mtDNA, being obtained the expected 81 bp size amplicon (primer binding regions - 50 bp and variable region - 31 bp, ACATCCACGCTAACGGGGCCTCGCTATTTTT) with no mismatches. At the same time, a negative result has been obtained for the amplification of *T. dobrogicus* mtDNA, which confirms that studied primers, differentiates between the two closely related species.

Due to the limited detectability of newt taxa, which often live in difficult-to-access or season-dependent aquatic environments, accurate estimate of their presence and distribution with traditional methods is difficult and time-consuming. Single species eDNA monitoring would facilitate the detection of these rare and protected organisms and would improve the data collection strategies regarding their presence and distribution.

Conclusion: The primers used for the identification of *Triturus cristatus* (*TCCBL*/*TCCBR*, Thomsen et al. 2011) doesn't amplify *in silico* the mitochondrial DNA of *Triturus dobrogicus* and would differentiate between these two closely related species.

Acknowledgments: *this study was supported by the research project no. 010701 ZOOAQUATERRA, funded by the National Agency for Research and Development, Republic of Moldova.*

Keywords: *crested newt, eDNA, primers, single species detection, in silico PCR.*

UDC: 573.4:546.47

THE INFLUENCE OF ZINC SALTS ON THE GROWTH RATE OF BACTERIA STRAINS

Slanina Valerina*, ORCID: 0000-0002-9833-7933
Balan Ludmila, ORCID: 0000-0002-8319-6808
Bogdan-Golubi Nina, ORCID: 0000-0003-2199-4414

Technical University of Moldova, Institute of Microbiology and Biotechnology
Chisinau, Republic of Moldova

*E-mail: *valerina.slanina@imb.utm.md*

Zinc has been shown to play a significant role in bacterial cells as a major structural protein and catalytic cofactor. Besides the crucial role of zinc for many bacterial cellular processes in high concentrations, this metal ion is toxic for the cells. This study was initiated in order to identify some strains of bacteria with the potential to synthesis of bioactive substances for agriculture, especially with a view to stimulating the antimicrobial activity or obtaining a phytostimulation effect on crop plants.

Material and method. Three strains of bacteria from g. *Bacillus* and 3 from g. *Pseudomonas* with biotechnological interest selected from National Collection of Nonpathogenic Microorganisms. Strains were cultivated on nutrient agar and King B agar, at temperature of $+36\pm1^0$C, for 48 hours, in the presence of iron salts $ZnSO_4 \bullet 7H_2O$ and $ZnCl_2$, in a concentration of 10, 20 and 30 mg/L.

Results. The results obtained from the cultivation of different bacterial strains in the presence of zinc sulfate and zinc chloride demonstrated that they do not have an inhibitory effect on bacterial growth in concentration of 10-20 mg/L for *Bacillus* and 10-30 mg/L for *Pseudomonas*. It has been proved that *Bacillus* strains are more sensitive to the 30 mg/L concentration, insignificant decrease of the CFU count up to 6% in comparison to the control. For other microorganisms, zinc salts did not influence on the growth. Another effect such as the antimicrobial activity, which represents the characteristic property and major biotechnological interest of the studied strains, will be tested later.

Conclusions. Zinc salts added in the culture medium of bacteria in concentrations of 10-30 mg/L, do not negatively influence on their growth, exception being a strains from g. *Bacillus*, which in the presence of zinc chloride reached lower values up to 6% of the CFU count. Also, the difference between types of salt involved in the research was not observed.

Acknowledgments: *This study was supported by the research project 020101-InBioS „Innovative biotechnological solutions for agriculture, medicine and environmental protection", funded by National Agency for Research and Development.*

Keywords: *bacteria, zinc, growth.*

UDC: 37.015.3:001.2:504

THE ROLE OF BLENDED LEARNING IN TEACHING NATURAL AND ENVIRONMENTAL SCIENCES

Sochirca Vitalie*, ORCID: 0000-0003-3924-2253
Ciubuc Natalia, ORCID: 0000-0002-9007-9300

Biology and Geoscience Faculty, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *vitalie.sochirca@usm.md*

In a changing world, academic environment can`t remain the same. It has to adapt to new challenges such as globalization, increased mobility, the technological revolution, the necessity of lifelong learning etc. Blended learning, also known as hybrid learning, is an approach to education that combines different educational materials and opportunities for interaction face-to-face or on-line interaction with traditional teaching methods. It offers the opportunity to learn in a proper rhythm, in a way that works for every student. Special attention is paid to didactic materials, which must meet certain requirements such as: complexity, interactivity, accessibility. The role of the lecturer in a blended learning system, is not only to teach, but to facilitate the self-learning process, to guide students through virtual and in-person activities, to create content for learning and auto-evaluation.

Within the "Moldova Eco-Tourism Blended Learning Training Program" project financed by US Forest Service, we have the opportunity to experience the blended learning methods on a group of over 20 specialists employed in domain of natural protected areas. The expectations of the trainees were evaluated before the course. They noticed that no one of them have the competences necessary for effectively manage of touristic activities in protected areas. The purpose of the program was to train the formables in issues related to the organization and management of tourist activities in natural protected areas. In this sense were developed curricula, the methodological guide regarding the training course, ppt presentations, multimedia products, quizzes, tests, worksheets and other resources, helping to enhance understanding of complex concepts. All trainees mention that the training helps them to understand the legal aspects, the role of ecotourism activities in natural protected areas and the role of education and local communities in providing sustainable tourism activities. Particularly was mentioned the format of the course, the possibility to study at distance, but being in permanent contact with mentors, and performing in own rhythm; that no other format would have allowed them to carry out such an extensive and multilateral study, taking into account the fact that all the students are employed.

In conclusion, it can be said that the application of blended learning is the perfect solution for the training of adults, for the organization of continuous training or retraining courses.

Acknowledgments: *This study was supported by the research project Federal Grant 23-IC-11132762-107 "Moldova Eco-Tourism Blended Learning Training Program", funded by USDA Forest Service, International Programs.*

Keywords: *blended learning, natural protected areas, tourism.*

UDC: **572:902/903"638":631.471**

ANTHROPOGENIC PHENOMENA IN THE IRON AGE SOIL PROFILES

Sochirca Vitalie*, ORCID: 0000-0003-3924-2253
Nagacevschi Tatiana, ORCID: 0000-0002-2897-4785

Faculty of Biology and Geosciences, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *vitalie.sochirca@usm.md*

The pedological research was carried out at the archaeological sites from the Iron Age in the Saharna microzone, Rezina district, the Republic of Moldova.

Their ***main purpose*** was to estimate the anthropogenic impact on the soils of the Iron Age sites. The applied ***analysis methods***: granulometric composition - by the pipette method according to N.A. the Kacinski; humus - by the I.V. method Tiurin, with the modification of V.N. Simakov; P_2O_5, K_2O, NO_2 – by the photometric method. The soils in the perimeter of the Saharna archaeological sites are in raw land, and those located in the proximity of the sites, analysed as control profiles – are arable. The results of the laboratory tests demonstrate that the arable soil profiles in the vicinity of the archaeological sites have typical features for a genetically unmodified soil profile, with a normal settlement of the horizons, non-anthropized, with physical and chemical parameters according to the known norms. While the profiles in the archaeological sections have obvious traces of anthropogenic changes, usually from the depth of 50-60 cm down, both morphologically and analytically, according to the physical and chemical parameters. The density of the solid phase of the soil in the sites falls, as a whole, within acceptable limits, but the general legitimacy of the increase of the value with depth is disturbed in the layers at the depth of 50-100 cm. The granulometric composition shows no unnatural changes on the profile, except for the increased dust content in the 50-100 cm range, probably due to the ash content in the soils of the sites, which has the same diameter as the dust (0.05-0.001 mm). The soil in the sites, compared to the bordering soil, has a relatively high humus content - over 4-8% at a depth of up to 30 cm in the soil profile, with a natural tendency to decrease with depth. However, of particular interest is the humus content at depth in the C horizon – the solification rock, which exceeds 1%, which is not characteristic of a natural profile. This proves that the presence of matter of organic origin at the depth of 110-150 cm can be explained by the influence of anthropic activity in a distant period of time, from the burning of plant remains and other matter following anthropic activity. Also, at the depth from 50-80 cm to 110-130 cm, an increased content of phosphorus (P) and potassium (K) is observed, compared to the neighboring profiles: the content of P is 2-3 times higher, and that of K 1.5-2 times higher.

Acknowledgments: *This study was supported by the research project 20.80009.1606.14 „The archaeological heritage of the Iron Age in the Middle Dniester region and the Cogâlnic River basin: interdisciplinary research and scientific development".*

Keywords: soil profiles, the iron age, anthropogenic phenomena, archaeological sections.

UDC: 631.523:633.11:632.934

ANALYSIS OF THE *PINA* GENE OF THE *TRITICUM BOEOTICUM* VAR. *BAYDARICUM* ACCESSION

Sozinova Oksana[1, 2]*, ORCID: 0000-0002-0981-3433
Blume Yaroslav[1], ORCID: 0000-0001-7078-7548

1 Institute of Plant Protection NAAS of Ukraine, Kyiv, Ukraine
2 Institute of Food Biotechnology and Genomics NAS of Ukraine, Kyiv, Ukraine

*E-mail: *sozinovaoksana1@gmail.com*

Wheat hardness is an important grain quality trait. Common wheat cultivars are divided into soft and hard ones depending on the endosperm texture, which is predominantly determined by puroindolines (a and b), low molecular weight cysteine- and tryptophane-rich seed proteins. In common wheat their genes are located at the *Ha* locus on chromosome 5D, whereas they are absent on 5A and 5B. The *Ha* locus of the einkorn wheat (A^mA^m) contains the puroindoline genes, which may be used for developing common wheat cultivars with new properties. The objective of our investigation was to analyze the sequence of the *Pina-A^m1* gene in the Ukrainian accession of the wild diploid wheat *Triticum boeoticum* var. *baydaricum*, (syn. *T. monococcum* var. *aegilopoides*).

We analyzed the accession UA0300333 of *T. boeoticum* var. *baydaricum* from the National Center of Plant Genetic Resources of Ukraine (Kharkiv). The accession originates from the Baydar valley of the Crimean Peninsula. DNA was isolated from single seeds by the silica-based procedure. Amplicons obtained with the primers developed by Massa et al. (2006) were used for sequencing the coding sequence of the *Pina-A^m1* gene. Chromatograms after sequencing from the forward and reverse primers were analyzed using the software Chromas v.2.6.6 and the sequences were aligned with MEGA 11. The puroindoline a sequence (the allele *Pina-D1a*) DQ363911.1. of the common wheat cultivar Chinese Spring (CS) from the NCBI database was used as the reference sequence.

The alignment of sequences revealed the following sites with differences of the *T. boeoticum* var. *baydaricum* gene from the CS sequence (positions are given from the beginning of the coding sequence): 24, 70, 81, 121, 230, 249. 257. BLAST analysis of the partial *Pina* sequence of the accession UA0300333 (from positions 11 to 447) showed its 100% identity to several *T. monococcum Pina* sequences, including HQ696585.1, EU307585.1, DQ269819.1, which correspond to the allele *Pina-A^m1b.*

Thus, the Ukrainian accession UA0300333 of *T. boeoticum* var. *baydaricum* carries the allele *Pina-A^m1b.* This information can be used for population-genetic studies of this species as well as for planning wide crosses with common wheat for introgression of new puroindoline alleles.

Keywords: *Triticum monococcum* var. *aegilopoides, puroindoline a, Pina-A^m1.*

UDC: 579.852.1:504.03

THE POTENTIAL OF MICROBIOLOGICAL PREPARATIONS TO REDUCE ENVIRONMENTAL IMPACTS

Stingaci Aurelia*, ORCID: 0000-0001-6621-9919
Zavtoni Pantelimon, ORCID: 0000-0003-1841-0086

Institute of Genetics, Physiology and Plant Protection of The State University of Moldova

*E-mail: *aurelia.stingaci@sti.usm.com*

Many countries worldwide stimulate the development of a bio-based economy to mitigate climate change and to lower their dependency on fossil-based resources. At the European level, the Bio-Economy Strategy was developed to guide Europe towards a sustainable bio-based economy, which was reinforced in the European Green Deal for achieving climate neutrality by 2050 (European Commission, 2022). Though microorganisms contribute to the negative effects of climate change, they can also help mitigate its impacts. Biopesticides, including microbial pesticides are receiving increased exposure in scientific.

The present paper gives information of *Bacillus spp*, we discuss how evolution, host range determination and pathogenesis have contributed to their inherent safety for non-target organisms including humans. The entomopathogenic microorganisms also can accumulate themselves in the environment and the host population, and it can control the pest insects for a long term by forming epidemic disease in the pest insect population through the external environment stimulation. The quite stable food chain relation of plant-pest insect- natural enemy can be gradually established. Thus it can reduce the risk of the pest insect continuous outbreak and realize the persistent control of pest insects.

Product of microbial origin can be the basis for organic farming and plant resistance to unfavorable environmental factors inducing, as well as for the crop yield increasing. It was shown that the use of *Bacillus spp.* with the addition of the para-aminobenzoic acid derivatives solutions, leads to an improvement in the functional state of plants, contributing to the activation of the active resistance mechanisms to the action of the stress factors. The results obtained demonstrate the possibility of using entomopathogenic bacteria in a tank mixture with PABA for the creation of biological preparations as alternatives to pesticides and the development of biological methods of plant protection.

This study advances the key understanding of the effects of microbiological preparations, which provides a new framework for better pest management in agriculture and the natural environment.

Acknowledgements. *Research was carried out within the subprogramme 011103: "Development of environmentally friendly means of reducing the impact of harmful organisms on agricultural crops against the background of climate change" funded by the National Agency for Research and Development.*

Keywords: *Bacillus spp, microbiological preparations, PAVA.*

UDC: 577.175.1:576.35:634.73

MICROPROPAGATION AND RHIZOGENESIS *IN VITRO* OF BLUE HONEYSUCKLES (*LONICERA CAERULEA* L.)

Tabăra Maria*, ORCID: 0000-0001-5057-115x
Ciorchină Nina, ORCID: 0000-0002-5792-5587
Glijin Aliona, ORCID: 0009-0008-2665-2249
Trofim Mariana, ORCID: 0009-0006-6896-8837
Chițan Raisa, ORCID: 0000-0003-2519-801x
Ghereg Melania, ORCID: 0000-0001-7406-4347

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *maria.tabara@gb.usm.md*

Fruit tree species contribute to nutritional and health security by providing micronutrients (vitamins, mineral salts) and due to their high content of antioxidants, as well as their resistance to temperature variations, as well as their ability to utilize less productive land. The increase in consumer interest in organic fruits, high quality in terms of taste and nutritional content mentioned above, motivates farmers to establish new plantations of fruit bushes with quality planting material.

Based on these considerations, we set out in this work to obtain high rates of shoot proliferation and rooting *in vitro* of blue honeysuckle (*Lonicera caerulea* L.).

The results obtained showed that shoot proliferation occurred only from apical meristems placed on *Murashige and Skoog* (MS) medium supplemented with 0.5 mg/L thidiazuron (TDZ) and 6-benzylaminopurine (BAP). The phytohormone TDZ led to a high multiplication rate (15-18 shoots) compared to BAP (5-8 shoots per explant). *In vitro* rooting of the obtained microshoots was stimulated on MS medium supplemented with different concentrations of auxins: indole-3-acid butyric acid (AIB), indole-3-acetic acid (AIA) and naphthylacetic acid (ANA) with low concentrations (0.1 -0.2 mg/L). The auxin AIB proved to be the most effective in stimulating rhizogenesis, the highest percentage of rooting (98%) and the average length of roots per explant (4.0 cm).

In this study, based on the results obtained, two work protocols were developed for the *in vitro* micropropagation (microcloning and rhizogenesis) of five cultivars of blue honeysuckle.

Acknowledgments: *This study was supported by the research project ("Introduction and development of conventional and microclonal cultivation technologies of species of new woody plants" 2020-2023 (20.80009.7007.19), funded by the National Agency for Research and Development, with the continuation of research out within the research and innovation project of the State Program Subprogram 010101 "Ex situ and in situ research and conservation of plant diversity in the Republic of Moldova", financed by the State Budget.*

Keywords: *Lonicera caerulea L, phytohormone, micropropagation, rhizogenesis.*

UDC: 575.13:577.21

COMPARATIVE ANALYSIS OF 61 PLASMIDSRELATED TO PAO1

Tanas Mihaela
Mihăşan Marius*, ORCID: 0000-0003-4439-4251

BioActive Research Group, Alexandru Ioan Cuza University of Iasi, Iasi, Romania.

*E-mail: *marius.mihasan@uaic.ro.*

pAO1 megaplasmid of *Paenarthrobacter nicotinovorans* is a conjugative catabolic megaplasmid. It has a modular structure, consisting of a backbone with genes for plasmid core functions and one gene cluster responsible for nicotine degradation that was acquired by horizontal gene transfer. pA O1 is used as amodel for studying the molecular evolution of nicotine catabolic pathway and and its spread among related genera of soil nicotine-degrading bacteria: *Paenarthrobacter, Arthrobacter, Rhodococcus and Nocardioides*. This study performs a comparative analysis of all the available plasmids from these related genera in an attempt to shed light on the evolution of the pAO1 megaplasmid and on the origin of the nicotine pathway.

A number of 61 complete and circular plasmid sequences were identified as belonging to related soil nicotine-degrading bacteria and have been downloaded from Genbank. dDDH values were calculated using GGDC 3.0 and ANIvalues with OrthoANI. Hierarchical clustering was performed by average linkage andEuclidean distances were calculated. Data was visualized with Heatmapper.

dDDH values from the pairwise comparisons of the 61 plasmids allowed us to identify one major cluster containing 9 plasmids with highly similar sequences. These plasmids belong to *Arthrobacter* and *Paenarthrobater* strains and are similar with pAO1. A second smaller cluster containing plasmids pA, pB, pC from *P. urefaciens* strain AT, pADNL1 from *P. urefaciens* strain DnL1-1, and pTC1 from *P. aurescens* strain TC1 can also be described. ANI data shows the existence of two major plasmid clusters – one contains plasmids belonging to *Arthrobacter/ Paenarthrobacter*, and another belonging to *Rhodococcus* strains.

Conclusions: Albeit a clear ancestor of the pAO1 plasmid cannot beidentified, we showed that there are two different plasmid lineages in Arthrobacter and *Paenarthrobater* and that the pAO1 lineage is the most abundant.

Acknowledgments: *This work was supported by PNIII-P4-ID-PCE2020-0656 research project financed by the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania; FK was supported by AUF through Eugen Ionescu scholarship program.*

Keywords: *61 plasmids, pAO1 megaplasmid, Paenarthrobacter nicotinovorans, horizontal gene transfer, Genbank, dDDH, ANI, Evolution of pAO1.*

UDC: 574(234.421)

EXPLORING WETLAND AREAS IN THE CARPATHIAN REGION: CHARACTERISTICS, DISTRIBUTION, AND ECOLOGICAL SIGNIFICANCE

Tudor Alina-Adriana, ORCID: 0009-0007-0486-0402

Vasile Alecsandri Secondary School, Braila, Romania

E-mail: *alina1tudor@yahoo.com*

This study examines the characteristics, distribution, and ecological significance of wetland areas in the Carpathian region of Romania. The Carpathians cover approximately 28% of the country's surface area and exhibit a diverse range of elevations, from around 200 meters in the valleys to the towering peak of Moldoveanu at 2544 meters. The study focuses on two main altitude zones: the upper alpine and subalpine zones, and the lower forested and depressional zones.

In the upper zones, which constitute approximately 11% of the Carpathians, small-scale wetland areas with a high moisture content are prevalent. These areas exhibit a distinctive combination of vegetation types, including alpine meadows and hygrophilic species, along with skeletal soils. The landscape comprises a variety of relief forms, including nival niches and microdepressions, which play a pivotal role in water accumulation and biodiversity. Furthermore, linear stone rivers and debris flows facilitate the expansion of wetland areas, particularly in the lower sections of the terrain.

In the lower forested and depressional zones, which encompass the majority of the Carpathian region, wetland areas are abundant and diverse. The aforementioned areas, which are situated in concave landforms, river valleys, and morfostructural contacts, exhibit considerable variation in size, morphology, and evolutionary stage. It is noteworthy that microdepressions on deforested slopes or grasslands, as well as wetlands along valley floors, are particularly prevalent. Furthermore, human activities, such as deforestation and road construction, have also influenced the development of wetlands in these regions.

This study continues to investigate the hydrological dynamics and ecological functions of wetland areas within the Carpathian region. It examines the seasonal variations in water accumulation, considering factors such as precipitation patterns, snowmelt, and groundwater recharge. Furthermore, the research assesses the role of wetlands in water retention, flood mitigation, and groundwater replenishment, highlighting their significance in maintaining hydrological balance and ecosystem resilience. By elucidating the intricate relationships between wetland ecosystems and water resources, the study provides valuable insights for the development of sustainable water management strategies and climate change adaptation in the Carpathian region.

Keywords: *Carpathian region, environment, wetland characteristics, system, anthropogenic changes.*

UDC: 606:632.937.1.05 + 573.6:579.64

THE ACTION OF SOME COORDINATIVE COMPOUNDS AND THE EXOMETABOLITES SOLUTION OF *SACCHAROMYCES CEREVISIAE* ON THE CULTIVATION OF THE *TRICHODERMA ATROBRUNNEUM* STRAIN

Turcan Olga, ORCID: 0000-0002-7103-5986
Sirbu Tamara, ORCID: 0000-0001-7809-9870
Moldovan Cristina, ORCID: 0000-0003-1634-0344
Chiselita Oleg, ORCID: 0000-0001-7298-1512
Chiselita Natalia, ORCID: 0000-0002-6943-8129

The National Collection of Non-Pathogenic Microorganisms, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *olga.turcan@imb.utm.md*

Trichoderma is the genus of cosmopolitan fungi, common in different types of environments or agroecosystems. It is used as a biocontrol agent against phytopathogenic organisms, stimulates plant growth, improves nutrient use efficiency etc. The object of study was *Trichoderma atrobrunneum* CNMN FD 25, stored in the National Collection of Nonpathogenic Microorganisms, UTM. *T. atrobrunneum* is well known for its ability to stimulate plant resistance to a variety of pathogens, such as *Verticillium, Fusarium* and *Pythium*, stimulate root growth, condition the decomposition of organic matter.

It was studied the action of the nutrient medium on the productivity of the *T. atrobrunneum* CNMN FD 25 strain. Thus, several variants in which sucrose or glucose served as the carbon source, and coordinative compounds were tested as a supplement: salicylate of iron ($Fe\text{-}Sr_2$) – and furoate of iron (Fe_2MnO) THF in concentrations of 1,0; 5,0; 10,0 mg/l as well as the exometabolites solution of strain *Saccharomyces cerevisiae* in concentrations of 5,0 10, 20 ml/l and exometabolites of *S. cerevisiae* with cobalt (5 mg; 10 mg; 20 mg) - 10 ml/l each. The strain was cultivated for 6 days, at a temperature of 28-30°C, on a shaker with 160-180r/min. Thus, as a result of the research, high productivity values were recorded in the case of growing the strain on sucrose medium supplemented with exometabolites of *S. cerevisiae* with 60 - 113% more than the control in all administered concentrations, and in the variants with exometabolites of S. cerevisiae with cobalt, the productivity was higher by 20 - 66.67% in the variants with 5 and 10 mg/l of Co. In the case of the cultivation of the *T. atrobrunneum* strain in the presence of furoate and iron salicylate, a decrease in productivity was observed compared to the control, and in the variant with 10 mg/l of furoate, the productivity increased insignificantly (4%).

The obtained results demonstrated that the supplementation of exometabolites of *S. cerevisiae* in the nutrient medium with sucrose stimulates the productivity of the *T. atrobrunneum* strain.

Acknowledgments: *This study was supported by the research project 020101 "Innovative biotechnological solutions for agriculture, medicine and environment", funded by National Agency for Research and Development.*

Keywords: *Trichoderma, medium of cultivation, productivity.*

UDC: 582.26(478)

DIVERSITY OF PLANKTONIC ALGAE IN THE DUBASARI RESERVOIR

Ungureanu Laurentia, ORCID: 0000-0003-4576-2810
Tumanova Daria*, ORCID: 0009-0002-3589-8933

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *dariatumanova@gmail.com*

The article presents the results of the investigations on diversity of planktonic algae in Dubasari Reservoir within the Republic of Moldova during 2015-2023. Detailed description of the phytoplankton of the reservoir was presented in the studies of Șalaru V., Ungureanu L., Ungureanu G. and Tumanova D., which describes composition of the species, as well as the seasonal dynamics of phytoplankton abundance and biomass. The sample processing was performed according to unified methods for the collection and processing of hydrobiological samples in field and in laboratory. Phytoplankton samples were collected and microscopically analyzed from the upper, middle and lower sector of the Dubasari Reservoir. In phytoplankton compositions 109 species were identified, which refer to 6 taxonomic groups: Cyanophyta (Cyanobacteria)-8, Bacillariophyta-49, Chrysophyta-1, Pyrrophyta-5, Euglenophyta-9, Chlorophyta-37. The floristic basis of the phytoplankton was made up of the representatives of the Bacillariophyta and Cyanophyta groups. The highest diversity of phytoplankton was attested in the middle sector of Dubasari. In the composition of the phytoplankton of the reservoir, the most frequently encountered species were: *Aphanizomenon flos-aquae* (L.) Ralfs, *Oscillatoria lacustris* (Kleb.), *Synechocystis aquatilis* Sanv. from Cyanophyta algae; *Cyclotella Kuetzingiana* Thw., *Cymatopleura solea* (Breb.) W.Sm., *Nitzschia sigmoidea* (Ehr.)W.Sm., from Bacillariophyta; *Ceratium hirundinella* (O.F.M.) Bergh., *Glenodinium gymnodinium* Penard. from Pyrrophyta; *Euglena polymorpha* Dang., *Trachelomonas hispida* (Perty) Stein., *Trachelomonas intermedia* Dang. from Euglenophyta; *Monoraphidium contortum* Thur., *Scenedesmus quadricauda* Turp. from Chlorophyta group. During the investigations, it was established that in the formation and development of phytoplankton in the Dubasari depends on the quality of the phytoplankton that comes from Dniester River.

Acknowledgments: *This study was supported by the research project (Eutrophication processes of the Dubasari reservoir under climate change conditions. 23.70105.7007.09T), ("Determination of changes in the aquatic environment, assessment of migration and the impact of pollutants, establishment of the legitimacy of the functioning of hydrobiocenoses and prevention of harmful consequences on ecosystems" 20.80009.7007.06), and (Evaluation of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population 010701) funded by (Ministry of Education and Research).*

Keywords: *planktonic algae, diversity, Dubasari Reservoir*.

UDC: 502.175

ASSESSMENT OF AIR POLLUTION IN AGRICUTRUAL AREA USING MOSS BAGS TECHNIQUE

Vergel Konstantin[1, 2], ORCID: 0000-0001-8158-5589

[1]Sector of Neutron Activation Analysis and Applied Research, Division of Nuclear Physics, FLNP, Joint Institute for Nuclear Research, Dubna, Moscow Region, Russian Federation
[2]Doctoral School Biological, Geonomic, Chemical and Technological Science, Moldova State University, Chisinau, Republic of Moldova

E-mail: *verkn@mail.ru*

Moss bags biomonitoring technique using the species *Sphagnum girgensohnii* was used to examine atmospheric deposition of potentially toxic elements around the agricultural fields of sunflowers and grape in Ciorescu (Republic of Moldova) and in fields of potato Dmitrov, (Russia). Moss-bags were exposed for 2-months period (June –August 2023). In Dmitrov were selected eight representative sites, while in Ciorescu bags were exposed at six sites. The content of 16 elements: Al, Cu, Cd, Co, Pb, Zn, Ba, Cr, Mn, Fe, Sr, V, Ni, S, P and Hg were determined using ICP-OES and direct mercury analyzer. In Moldova, according to relative accumulation factor index there were no elements accumulation at all exposure sites. In Dmitrov's agricultural zone it was observed significant accumulation of Al, Zn, V, Ba, Cr and Fe at some exposure sites. Transport can be considered as the main source of metals' emission in the investigated areas. Active biomonitoring proved to be a useful, cheap and efficient tool to assess pollution in agricultural zones.

Keywords: *biomonitoring, moss bags, agricultural enterprises.*

UDC: 504.5:628.3(478)

THE ANTHROPOGENIC IMPACT ON WASTEWATER CHARACTERISTICS IN THE REPUBLIC OF MOLDOVA

Vișnevschi Alexandru, ORCID: 0000-0003-2049-8312

Moldova State University, Institute of Chemistry
Chisinau, Republic of Moldova

E-mail: *alexandru.visnevschi0@gmail.com*

In the context of accelerating the process of association with the European Union, it is essential to harmonize environmental protection legislation with the requirements of EU Directives. The requirements of the EU Directive and the partially harmonized legislation in the field of wastewater treatment from human settlements propose a prompt strategy for the elimination of biogenic substances, such as nitrogen and phosphorus compounds, which are sources of eutrophication and primary factors in the degradation of the aquatic environment. This is a particularly pressing issue for the Republic of Moldova, which has a relatively poor river network and a tendency toward aridification.

According to statistical data from the Ministry of the Environment, 211 out of the 272 wastewater treatment plants in the Republic of Moldova are operational, of which only 31 perform adequate treatment to remove carbon compounds (BOD_5) and suspended solids, including the wastewater treatment plants in the municipalities of Chisinau and Balti. It is noteworthy that of these 31 functional plants, only a few fulfill the function of nitrogen removal, which has severely aggravated the degree of eutrophication of the country aquatic environment.

Nitrogen and phosphorus are essential biogenic elements, and their role in biological treatment processes is very important. One of the current trends in the environment is anthropization, associated with the rapid increase in concentrations of inorganic and organic species of nitrogen and phosphorus, which changes the carbon/nitrogen and carbon/phosphorus ratios. Reporting the C/N/P parameters, which are essential for the pollutant content and at the same time are nutrients necessary for the biological treatment process of wastewater, is the primary criterion in selecting methods for their elimination. All these changes are the result of lifestyle evolution, domestic technological progress, rational water use, and other factors.

Thus, the changes in the characteristics of the collected wastewater impose specific conditions for choosing treatment methods and technologies, especially since human settlements in the Republic of Moldova are small (≤ 2000 PE) and medium-sized (≤ 15000 PE), with the exception of municipalities like Chisinau, Balti, and others. Modern technologies for removing nitrogen compounds from wastewater, which are complex and use substrates as carbon sources (methanol, ethanol, glycerin, acetate), are not widely applicable. Therefore, there is a need to explore new technological approaches in wastewater treatment to minimize the impact of these biogenic substances on the aquatic environment.

Acknowledgments: *This study was carried out within the Institutional Research Program of the State University of Moldova for the period 2024-2027, subprogram "Advanced Research in Computational and Environmental Chemistry, Identification of Technological Treatment Processes, Formation of Water Quality and Quantity", code 010603.*

Keywords: *nitrogen, phosphorus, wastewater treatment plants.*

UDC: **544.3:661.152.3:628.3**

THERMODYNAMIC ASSESSMENT OF STRUVITE FORMATION FROM WASTEWATER

Visnevschi Alexandru, ORCID: 0000-0003-2049-8312
Spinu Oxana, ORCID: 0000-0002-3166-1931
Povar Igor*, ORCID: 0000-0003-2536-6706

Moldova State University, Institute of Chemistry
Chisinau, Republic of Moldova

*E-mail: *ipovar@yahoo.ca*

Nutrient management is increasingly recognized as a significant global issue that will shape progress in nutrient recovery in the near future. In recent years, extensive research has been focused in this area, particularly in practical circumstances of nutrient recovery. The current study addresses the difficulty of phosphorus recovery from wastewater through struvite precipitation, employing an original thermodynamic methodology to examine complex chemical equilibria in both homogeneous and heterogeneous multicomponent systems under experimental conditions. Struvite precipitation, a chemical process involving $MgNH_4PO_4 \cdot 6H_2O$, stands out among other technologies due to its simplicity, cost-effectiveness, and safety, becoming an increasingly preferred method. This precipitate acts as a valuable slow-release fertilizer. The focus of this research lies on the thermodynamic parameters associated with struvite precipitation.

The developed thermodynamic framework integrates unique mass balance equations to encompass both soluble and insoluble species. The study has been investigated various chemical interactions in aqueous solutions, encompassing metal ion hydrolysis, ligand protonation, and complex formation, with a particular emphasis on the influence of pH on thermodynamic functions. It is proved that the efficacy of the precipitation method depends significantly on the chemical composition of wastewater, especially the presence of complexing agents that bind heavy metals in stable complexes. The developed thermodynamic approach was utilized to identify the optimal component concentrations in wastewater effluents for maximizing struvite precipitation. The optimal conditions for struvite precipitation are pH in the area 9.0-9.5, the equimolar ratios of struvite components or $C^0_{Mg^{2+}} < C^0_{PO_4^{3-}} = C^0_{NH_4^+}$.

The developed and used approach demonstrates the ability to address the simultaneous formation of two insoluble species containing magnesium (or any metal) ions. The proposed thermodynamic methodology can be expanded to encompass more complex systems involving additional reactions and complex formations.

Acknowledgments: *This study was carried out within the Institutional Research Program of the State University of Moldova for the period 2024-2027, subprogram "Advanced Research in Computational and Environmental Chemistry, Identification of Technological Treatment Processes, Formation of Water Quality and Quantity", code 010603.*

Keywords: *chemical thermodynamics, Gibbs energy, heterogeneous aqueous system, struvite, wastewater.*

UDC: 581.135.1:633.812:615.33

TESTING THE ANTIBACTERIAL ACTIVITY OF SOME ROSEMARY ESSENTIAL OILS

Visternicu Mălina-Mihaela[1,2]*
Boz Irina[3], ORCID: 0000-0002-1743-9816
Dunca Simona Isabela[1], ORCID: 0000-0003-4793-1702

[1]Faculty of Biology, „Alexandru Ioan Cuza" University, 700506, Iasi, Romania,
[2]Preclinical Department, Apollonia University, Pacurari Street 11, 700511 Iasi, Romania,
[3]Faculty of Medicine and Biological Sciences, „Ștefan cel Mare" University, Suceava, Romania.

*E-mail: *malina.visternicu@yahoo.ro*

Antibiotic resistance is becoming more widespread in infectious diseases and efforts to discover new antibacterial substances are hampered by the rapid development of this resistance. In recent years, studies have shown that the use of combinations of antibiotics or antibiotics and other potentially bioactive substances could significantly contribute to the treatment of infections. In this context, rosemary essential oil attracts attention due to its remarkable antibacterial activity, contributing to the inhibition of the growth of microorganisms and suggesting considerable potential in the development of alternative antimicrobial therapies.

Salvia rosmarinus Spenn. (previously known as *Rosmarinus officinalis* L.) is a medicinal plant originating from the Mediterranean region, being cultivated worldwide due to its therapeutic properties. Rosemary essential oil is a light yellow liquid with a fresh and intense smell that turns into a woody and balsamic aroma that can be extracted from all the organs of the plant, but with a higher quality from the leaves.

The aim of this study was to evaluate the antibacterial activity of different types of rosemary essential oil against *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 25923 strains. Four types of essential oils were studied: two were obtained in the laboratory by hydrodistillation (from stems and leaves), while the other two were purchased from different commercial suppliers. The antibacterial activity was tested using both qualitative techniques, by the Kirby-Bauer diffusimetric method to observe the zones of inhibition of the growth and development of microorganisms, and quantitative techniques, by determining the minimum inhibitory concentration (MIC).

The results obtained by the diffusimetric method demonstrate the antibacterial effect of the analyzed rosemary samples against the test microorganisms *Escherichia coli* and *Staphylococcus aureus*. The established MICs showed values varying between 6.25 µl/mL - 12.5 µl/mL in the samples obtained by hydrodistillation and 3.125 µl/mL - 12.5 µl/mL in the case of commercially purchased samples.

The confirmation of the data from the literature regarding the antimicrobial potential of rosemary oil allows its recommendation as a therapeutic alternative in the treatment of bacterial infections.

Keywords: *Essential oil, antibacterial activity, Kirby Bauer method, Minimum inhibitory concentration (MIC).*

UDC: 573.6:634.72/.73:332.142.6

ELEMENTS OF CIRCULAR BIO-ECONOMY - FULL VALORIZATION OF BLUEBERRIES AND CURRANTS FROM ECOLOGICAL CERTIFICATION

Vlăsceanu Gabriela[1*], ORCID: 0000-0002-4489-2528
Apetrei Andrei[2]
Bica Mircea[3]
Petculescu Nicole[1]
Nicolae Floarea[1]

[1]Bioterra University from Bucharest, Romania
[2]Alcos Bioprod Ltd., Romania
[3]Biosfera Fruct Lts, Romania

*E-mail: *ga.vlaceanu@yahoo.com*

Blueberries and currants, appreciated for their nutritional qualities and pleasant taste, offer multiple opportunities for full utilization following the principles of the circular bio-economy.

The purpose of the study covers two main stages.

Materials and methods: in the first stage, extraction procedures such as lyophilization and maceration in honey are applied to preserve and protect the sensitive active principles of the fruits (blueberries and currants), such as flavonoids, polyphenols (resveratrol), anthocyanins and vitamins A, C and E. These active principles show high antioxidant and anti-inflammatory properties, contributing significantly to supporting the immune system and general health.

In addition to nutritional benefits, fruits (obtained from certified organic crops) are an important source of potassium, essential for the optimal functioning of the heart and circulatory system. Having a low energy value, blueberries and currants can be eaten fresh, frozen, or dried and integrated into a variety of food recipes, offering an acidic and refreshing taste. In the second stage of the study, the optimization of the circular economic valorization of organic blueberries and currants is explored. Their processing by non-invasive methods does not generate waste, but valuable by-products used in obtaining dyes, gelling agents (pectins), and fermented alcoholic beverages. Also, the beneficial health effects can be amplified by combining them with plant extracts, medicinal mushrooms, and bee products.

In conclusion, these natural mixtures contribute to strengthening the body's defense system, maintaining the health and vitality of the individual, under the principles of the circular bioeconomy.

Keywords: *circular bio-economy, blueberries, currants, ecological culture, valorization*

UDC: 577: 546.65:582.232

PRASEODYMIUM (III) REMOVAL FROM AQUEOUS SOLUTIONS USING LIVING AND NON-LIVING *ARTHROSPIRA PLATENSIS* BIOMASS

Yushin Nikita[1,2]*, ORCID: 0000-0001-5650-4337
Zinicovscaia Inga[1,3], ORCID: 0000-0003-0820-887X
Cepoi Liliana[4], ORCID: 0000-0002-7516-948X
Chiriac Tatiana[4], ORCID: 0000-0003-2933-0751
Rudi Ludmila[4], ORCID: 0000-0002-0752-8153
Grozdov Dmitrii[1], ORCID: 0000-0002-0297-324X

[1]Department of Nuclear Physics, Joint Institute for Nuclear Research, 141980 Dubna, Russia
[2]Doctoral School of Biological, Geonomic, Chemical and Technological Science, State University of Moldova, MD-2009 Chisinau, Moldova
[3]Department of Nuclear Physics, Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, MG-6, Magurele, 077125 Ilfov, Romania
[4]Laboratory of Phycobiotechnology, Institute of Microbiology and Biotechnology, MD-2028 Chisinau, Moldova

*E-mail: *ynik_62@mail.ru*

Praseodymium, the sixth-most abundant rare-earth element, is widely used in the aircraft industry for the elaboration of refractory substances, coloring materials, lighting equipment, and fiber optical cables. Living and non-living Arthrospira platensis biomass was applied for Pr(III) removal from aqueous solutions. In bioaccumulation experiments, the effect of Pr(III), introduced into the medium in a concentration range of 10–30 mg/L, on biomass productivity, biochemical composition, and antioxidant activity was assessed. The biomass showed high accumulation capacity (more than 99%) toward Pr(III). Supplementation of the cultivation medium with Pr(III) led to a decrease in carbohydrate and lipid content, but it did not significantly influence biomass productivity or the content of proteins and pigments. In experiments with non-living biomass, the effect of pH, Pr(III) concentration, temperature, and contact time on the efficiency of metal removal was investigated. The maximum uptake of Pr(III) was achieved at pH 3.0 after 3.0 min of interaction. The equilibrium data were explained using the Langmuir and Freundlich models, while the kinetics of the process was described by applying pseudo-first-order, pseudo-second-order, and Elovich models. The maximum sorption capacity of Arthrospira platensis biomass calculated from the Langmuir model was 99.3 mg/g. According to the thermodynamic calculations, the process of Pr(III) removal was spontaneous and exothermic in nature. The obtained data can be used for the development of environmentally-friendly technology for Pr(III) recovery from wastewater as well as to understand the effect of Pr(III) on aquatic organisms.

Keywords: *praseodymium; biosorption; bioaccumulation; spirulina.*

Session B

HUMAN AND ANIMAL BIOLOGY

UDC: 595.444.3:591.9(478)

TARANTULA *LYCOSA SINGORIENSIS* (LAXMANN, 1770) (*ARANEAE*) IN THE FAUNA OF THE REPUBLIC OF MOLDOVA

Avram Alexandru, ORCID: 0000-0001-5823-4895

Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

E-mail: *alex.avram989@gmail.com*

Spiders are a widespread group of arachnids, which currently includes about 52 thousand described species. The most numerous suborder is *Opisthothelae*, which includes forms with the placement of spinnerets in the posterior part of the abdomen. The body sizes of spiders vary between 14-27 mm (male) and 18-31 mm (female), among which the Lycosidae family stands out. This family groups the so-called wolf spiders, whose name comes from their way of hunting from ambush. The given species does not use a net to hunt prey, but uses the silk threads for signaling and lining the internal walls of the gallery. The spider fauna of the Republic of Moldova includes 294 species, including 30 from the Lycosidae family, of which the largest representative is *Lycosa singoriensis* (Laxmann, 1770). This species was reported for the first time on the current territory of the Republic of Moldova in 1895 by the researcher Peter Schmidt who identified 2 females collected in Bessarabia, but without indicating the localities of collection. It is one of the earliest known species of spiders from the Republic of Moldova. Later, this species was recorded by several authors, between 1941-1984, from the localities of Hârbovăț, Sucleia, Băcioi, Purcari and others. In 2023, a male of the given species was reported in the riparian area of the Işnovăț river in Băcioi-locality, during the summer period. In the spring of 2024, a 29 mm female was identified in a 21 cm deep gallery in an agricultural field. The spider's body consists of the cephalothorax, abdomen, four pairs of legs, and one pair each of pedipalps and chelicerae. The cephalothorax is black-brown, the cephalic part colored light brown, forming an angle. The foveal spot with a stellate appearance, whitish-light gray, from which open striations start radially, alternating with narrow gray-white stripes. Dorsally, on the black-brown abdomen, a black lanceolate spot can be distinguished, bordered by several round white dots. The legs in transverse stripes, dorsally with black and yellow. The sternum, coxae, trochanters and the ventral part of the abdomen are black. In young specimens the abdomen is yellow. The basal article of the chelicerae has a red-orange lateral spot. The length of the male body varies between 14-27 mm, and the female - 18-31 mm. The ecological preferences of the species *Lycosa singoriensis* are more towards hygrophilic habitats. Spiders dig tunnels in the wet soil of riverine or lake ecosystems, and during periods of drought they migrate to wet places over long distances. Spring floods adversely affect spider populations, forcing them to migrate to dry land, including females with nymphs attached to the female's body. The high ecological plasticity of lycosides is noteworthy, which are excellent swimmers crossing the waters, with the cocoon attached to them, excellently orienting themselves towards the shore. Their food is insects, regulating their population in the habitats where they live. This species is vitally active between March and November. At the end of October they deepen their burrow preparing for the winter. Juveniles and females overwinter. The lifespan of males is one year, of females - up to 2 years. The *Lycosa singoriensis* species is widespread in Europe, being present in Austria, the Czech Republic, Romania, Russia, Ukraine, Hungary, including as far as the Far East: Azerbaijan, China, Republic of Korea, Georgia, Kazakhstan, Turkey. The conservation status of the species at the international level includes the presence in the Red Book of the Czech Republic, the Republic of Udmurtia (Russian Federation) in the category of critically endangered species (CR).

Acknowledgments: *The study was studied as part of the doctoral project.*

Keywords: *Araneae, Lycosa singoriensis, distribution, Republic of Moldova.*

UDC: 616-056.25

STUDY OF THE ACIDOPOIETIC FUNCTION AND THE MOTILITY OF THE STOMACH IN RELATION TO THE HYPERSTHENIC TYPE OF CONSTITUTION

Babileva Anastasia, ORCID: 0000-0002-1126-172X

Institute of Physiology and Sanocreatology of the Moldova State University, Chisinau, Republic of Moldova

E-mail: *anastasia.babileva@gmail.com*

The objective of the research is to study the particularities of the acidogenesis function of the stomach in people with the hypersthenic type of constitution. The acidopoietic activity is determined with the help of probes with two olives and with acidogastrometer AGM-10-01. The atropine test made it possible to distinguish basal humoral and reflective nature acidogenesis (0.1 mg atropine / 10 kg subcutaneously).

According to the study findings, the pH in the stomach's body decreased from 1.40±0.5 to 1.53±0.17 in the tenth minute following atropine administration, from 1.45±0.10 to 1.48±0.19 in the twentieth minute, from 1.48±0.08 to 1.50±0.19 in the thirty-first minute, and from 1.35±0.05 to 1.40±0.10 in the fortieth minute ($p>0.05$). The variations in pH that were detected although they were not substantial. Acidity in the region of acid-forming glands without atropine differs from atropine-containing indices by no more than 0.5 pH units, and this test is categorized as having a neutral atropine reaction since it has no effect on the secretory and digesting systems. The findings of the study demonstrated that people with a hypersthenic type of constitution exhibit a neutral reflex link in stomach acidogenesis. People with hypersthenic constitution are primarily influenced by the endocrine-humoral system in the processes involved in acidogenesis. These lead to the classification of the secretion type as humoral-endocrine in those with the psychophysiological hypersthenic type of constitution, which is conditioned by the body's hypometabolic reaction. The research that was conducted enabled the discovery of the connection between the metabolic characteristics of hypersthenic individuals and gastric secretion. It was found that the acidogenesis function of the stomach in a functional sense has a tendency towards hyperacidity, because all the acidity indices were at the limit of the maximum allowed norms. The primary mechanism involved in acidogenesis in hypersthenic individuals with a hypometabolic body status, is the humoral-endocrine system.

Therefore, the acidity of the gastric contents around the acid-forming glands in people with hypersthenic type of constitution was stable in the indicated area of hyperacidity (1.35-1.48 pH). The atropine test was used to differentiate and identify the key link in the regulatory process of acidogenesis in hypometabolic individuals and did not reveal significant changes in acidity: the pH variation in the atropine test was 1.35-1.53 compared to 1.35-1.48 without atropine, which indicates a neutral reaction of the reflex link of the cholinergic system to the secretory process..

Keywords: *hypersthenic type, constitution, acidogenesis, atropine test.*

UDC: 616.379-008.64:615.322

THE IMPACT OF HERBAL REMEDIES ON URINE pH AND ITS ROLE IN DIAGNOSING AND MONITORING DIABETES

Bacalov Iurie*, ORCID: 0000-0002-1651-9056
Crivoi Aurelia, ORCID: 0000-0002-1917-1278
Chiriţa Elena, ORCID: 0000-0002-9717-8133
Druţa Adriana, ORCID: 0000-0002-5961-6518

Physiology of Stress, Adaptation and General Sanocreatology Laboratory, State University of Moldova, Chisinau, Republic of Moldova

*E-mail: *iurabacalov@mail.ru*

Urine pH in diabetes can be influenced by several factors and can provide important information about the metabolic state of a person. Such factors include hyperglycemia, the presence of ketones, and urinary infections. Diagnosing and monitoring of urine pH, can be useful in studying diabetes complications, such as diabetic ketoacidosis or urinary tract infections. Abnormal urine pH can serve as an important indicator for adjusting diabetic treatment, including managing blood glucose levels and insulin regimens.

Research has shown that certain herbal remedies can influence urine pH in diabetes through various mechanisms. Primarily, those with alkalizing potential, such as birch leaves or certain medicinal plants rich in alkaline minerals like potassium, fall into this category. Regular consumption of these plants can lead to a slight increase in urine pH, which can be beneficial when diabetes is associated with increased acidity in the body. Herbal remedies used to control blood glucose levels can indirectly influence urine pH. For instance, plants like ginseng or artichoke have beneficial effects on blood glucose regulation. Maintaining stable blood glucose levels can help reduce glucose excretion in urine and, consequently, contribute to maintaining a more balanced urine pH. Additionally, some herbal complexes have strong anti-inflammatory and antioxidant properties. Diabetes is often associated with chronic inflammation and oxidative stress. Reducing inflammation and oxidative stress can positively impact kidney function and urine pH.

In conclusion, urine pH in diabetes provides valuable information about metabolic status and disease control. It is important that the researched herbal remedies can be used as supplements in managing diabetes because they can have beneficial indirect effects on urine pH through various mechanisms, which is crucial for ensuring treatment efficacy.

***Acknowledgments**: This study was supported by the research project "Development of the applied scientific framework for the modernization of technologies for sustainable soil health assurance in nursery plantations under conditions of climate change" (23.70105.5107.06), funded by (ANCD).*

***Keywords:** diabetes, pH, urine, herbal remedies.*

UDC: 616.8:615.8

NEUROPROTECTION AND NEUROREHABILITATION PROGRAM BASED ON ENVIRONMENT, DAILY ACTIVITY AND ECO-FRIENDLY NUTRITION

Baciu Anatolie, ORCID: 0000-0003-1966-4176

Institute of Physiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

E-mail: *anatolikbacio@gmail.com*

The Program of neuroprotection and neurorehabilitation was developed, in which the multimodal combination of environmental factors determines the maintenance of neuroplasticity. Step 1 "Ensuring Sufficient Functional Gas Exchange in the Human Body". Step 1 includes procedures to optimize gas exchange by aerobic training and adaptation to moderate intermittent hypoxia, and in the external environment by optimizing the partial pressure of oxygen and carbon dioxide in the gas mixture inhaled. Mandatory biophilization of the environment, characterized primarily by increased favorable interaction and human unity with the ecosystem, biodiversity, sustainability, landscaping and afforestation. Through aerobic training we launch a chain of adaptive transformations of the entire respiratory-circulatory system. Step 2: "Extending the limits of neuroplasticity and neuroprotection by individualizing the combination of daily activity with diet and optimizing the ratio of adipose and muscle tissue." The combination of activity with an optimized diet ensures the adaptive remodeling. Step 3: "Extending the limits of neuroplasticity by balancing circadian rhythms from the external environment with internal biorhythms of homeostasis". Step 4: "Inclusion in the daily diet of adaptogen plant products, a powerful modulator of neuroplasticity and neuroprotection." Adaptogen plants have a strong modulation of protective processes. Step 5: "Inclusion in the daily diet of organic food produced by ecological agriculture". Step 6: "Strengthening neuroprotection and neurorehabilitation, prevention of early neurodegeneration based on balancing and integration of sensorimotor activity." Step 6 envisages development not only by improving diagnosis, treatment, rehabilitation, but also by improving technologies for detecting early indicators of overwork, mental and physical fatigue, and reduced work productivity. Step 7: "Implementation of biomedical engineering in the technical solution of neuroplasticity problems, prevention of neurodegeneration". Step 8: "The development of interdisciplinary interaction for bioinspiration and the biophilization of environment" manifests the beneficial actions on neuroprotection and neurorehabilitation.

Acknowledgments: *This study was supported by the research project (22.00208.7007.08/PD II Neuroprotection and neurorehabilitation program based on the combined multimodal action of environmental factors, individual daily activity and ecological nutrition), funded by (National Agency for Research and Development, NARD).*

Keywords: *environment, neuroprotection, neuroplasticity, intermittent hypoxia, adaptogens.*

UDC: 638.1:502.2

THE IMPORTANCE OF BEEKEEPING IN THE RELATIONSHIP OF COMPONENTS OF THE NATURAL ENVIRONMENT

Bacu Gheorghe*, ORCID: 0000-0003-5829-2764
Balacci Sergiu, ORCID: 0000-0001-9961-6806
Cretu Roman, ORCID: 0009-0007-9172-6462

Institute of Fisiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *bacugheorghi@gmail.com*

Beekeeping has been since ancient times, one of the important branches of the agricultural sector with an economic role and performs important ecosystem and agricultural functions by pollinating flowers. Through pollination, bee colonies ensure balance within ecological and agricultural systems and will continue to act as important providers of environmental conservation services, thus ensuring the sustainable development of biodiversity. The development and increase of the productivity of beekeeping in the modern world is possible only through a deep study of the living conditions of bees, their reproductive, biological and physiological characteristics, both of each individual and of the family as a whole. In parallel with their qualities as pollinators and producers of numerous products for human consumption, bees are also of great environmental, economic and health importance. Urban ecosystems can host richer bee communities than intensive agricultural areas. At the same time, beekeeping also plays a particularly important role in terms of links and relationships between ecosystem components. Management practices in the field of incipient beekeeping refer to relatively simple technologies, but as this branch of production develops, we encounter quite complicated procedures, and equipment and technologies become more and more sophisticated. Bees, through their way of life, are dependent on the natural environment especially through food and reproductive behavior, man having the responsibility to ensure its protection and sustainable management, by ensuring a healthy environment and minimizing risks to the existence and welfare of the species, ensuring its economic efficiency in pollination and production. By pollinating cultivated and spontaneous plant species, the honey bee contributes to increasing the productivity of agricultural crops, but also to the conservation, restoration and protection of biodiversity by pollinating spontaneous flora, being a basic link in the food chain of all species. Ensuring a clean environment obliges us to conserve natural resources, given the relationship between biodiversity and human life. Bees are considered biological resources of vital importance, in terms of ecological-trophic relations, being essential for the existence of public health and the environment, and therefore, if we want to continue to maintain these relations, it is necessary to save beekeeping as an important branch of biodiversity.

Keywords: *bees, ecosystems, pollination, conservation, biodiversity.*

UDC: 591.343:502.2

CORRELATION OF ENVIRONMENTAL FACTORS ADAPTIVE CAPACITY AND RESISTANCE OF CARP LARVAE

Balacci Sergiu*, ORCID: 0000-0001-9961-6806
Cretu Roman, ORCID:0009-0007-9172-6462
Bacu Gheorghe, ORCID: 0000-0003-5829-2764

Institute of Fisiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *sergiobalacci@gmail.com*

Fish, like all other organisms living in water, are in close interaction with environmental factors. The external environment affects all life processes, taking place in the organism of a fish: respiration, nutrition, hematopoiesis and blood circulation, nervous activity, reproduction, growth and development. Therefore, the environment determines not only the speed of chemical reactions, which take place in the organism of fish, but also the shape of the body, its distribution and behavior. Fish at different stages of development and at different periods of life react differently to environmental conditions. Water temperature is the universal and determining environmental factor that decisively impacts the vital functions of fish, determining its growth and development. The heat generated by metabolic processes is not maintained in the fish because they do not have mechanisms that can regulate thermolysis. As a result, the body temperature is not constant, in most cases, it is close to the ambient temperature. The temperature requirements of fish are determined by a set of adaptations that they use in different periods of their life cycle. The main form of temperature adaptation is considered acclimatization, associated with compensatory changes in metabolism at the cellular level. In this context, there is a high degree of correlation between the thermoneutrality zone and the ecological-physiological optimum, which ensures the thermal comfort of fish in the vital activities of the species at different fluctuations in water temperature, especially carp. The timing of maturation, spawning, embryonic development, larval development and survival depend on water temperature. Low temperature leads to a decrease in the number of erythrocytes, a slight increase in blood glucose, as well as a weakening of nonspecific immunity. Thermal adaptation in the organism of fish occurs at the cellular level. Accordingly, critical temperatures are the limit of resistance of body cells to the external influence of the environment. Carp belongs to the group of eurythermic organisms, that is, capable of existing within the framework of large temperature fluctuations. Fish have a well-developed mechanism of adaptation and specific and nonspecific immune defense. Thus, the rate of development of a stress reaction depends on the strength of the stress factor, the level of metabolism, the state of the endocrine system, responsible for reproduction and the body's response to stress, and the mobilization of all the body's defense capabilities.

Keywords: *environmental factors, carp larvae, adaptation, defense.*

UDC: 57.086.13:612.616

REGULATED AND ACCIDENTAL CELL DETERIORATION ELEMENTS IN SPERM CRYOPSERVATION

Balan Ion*, ORCID 0000-0002-5431-6057; Roşca Nicolae, ORCID 0000-0003-4705-5618; Buzan Vladimir, ORCID 0009-0004-0770-4374; Balacci Sergiu, ORCID 0000-0001-9961-6806; Osipciuc Galina, ORCID 0009-0000-6165-6490; Furdui Vlada, ORCID 0000-0002-2232-3236; Harea Vasile, ORCID 0009-0009-9442-4253; Ţurcanu Parascovia, ORCID 0000-0002-9326-6785; Popa Valerian, ORCID 0009-0004-8706-7255; Vîhrist Ecaterina, ORCID 0000-0002-2217-8331

Institute of Fisiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *balanion@rambler.ru*

Cryobiology of semen has currently made considerable progress in optimizing the cryopreservation protocol and improving the characteristics of reproductive cells. However, many damaging mechanisms of gamete biology still remain unclear, limiting the development and promotion of research in this area. One of the essential components of cryodamage is the occurrence of structural changes, produced by intracellular ice crystals, that lead to sperm death, which is why future research remains forward-looking. Sperm death during the cryopreservation process is caused by intracellular ice crystals, oxidative stress, and other damaging factors. The initial damage begins with the physical disassembly of plasma membranes, then spreads to other cellular structures that maintain important cellular functions and homeostasis. Intracellular crystallization changes are considered the most destructive and are removed by applying glycerin, although its inducing mechanisms remain elusive. Therefore, exploring other factors in sperm cryopreservation research may be very relevant in avoiding damage, including oxidative stress, dehydration and osmocity, which are potential areas of investigation in semen freezing damage research. Oxidative stress causes deterioration of sperm when freezing with the production of oxidative free radicals in the plasma and mitochondrial membrane with an important role in cell signaling and tissue homeostasis. At the same time, oxidative stress causes oxidative modification of lipids in biological membranes, in particular, lipid peroxidation and is an important regulator of cellular destiny. Lipid peroxidation can also lead to cell death through the phenomenon of feroptosis, which has not yet been mentioned in sperm damage studies. This process evolves through a lethal level of iron-dependent lipid peroxidation, and thus oxidation-reduction and iron regulation comprise the central framework of feroptosis. The reduction of membrane lipid peroxides by feroptosis is essential for the survival of thawed sperm. Consequently, membrane lipid peroxidation serves as a significant indicator of damage through sperm cryopreservation, therefore understanding the role of damaging elements in sperm freezing may be key to improving thawed sperm quality and provides insights for future research on frozen semen.

Keywords: *sperm, cryopreservation, deterioration.*

UDC: 634.23:631.55

YIELD AND QUALITY OF CHERRY FRUIT IN INTENSIVE CULTIVATION SYSTEM

Balan Valerian*, ORCID:0000-0001-9875-8888; Manziuc Valeriu, ORCID:0000-0002-8877-3627; Pește anu Ananie, ORCID:0000-0002-8985-7101; Bîlici Inna, ORCID:0009-0000-8971-092X; Ivanov Igor, ORCID:0000-0002-4093-5666; Șarban Vasile, ORCID:0000-0001-5740-9112; Vamasescu Sergiu, ORCID:0000-0001-5537-0306; Stanislav Russu, ORCID:0009-0005-9115-5589; Buza Corneliu, ORCID:0009-0004-9050-214X; Talpalaru Dumitru, ORCID:0009-0003-7098-4535

Department of Horticulture and Forestry, Technical University of Moldova, Chisinau, Republic of Moldova

E-mail: valerianbalan@gmail.com*

In modern fruit growing, assortment is the main factor in the culture system available to the producer and the consumer. Another prominent issue is driven by applied technology and climate change. The assortment of vegetative rootstocks of low and medium vigor allowed the use of cherry plantations at high densities, fusiform crowns, orchards with high yield per hectare and low production costs.

The purpose of the research is to increase the productivity of cherry plantations and ensure sustainable production, by identifying highly productive cultivar-portaltoi associations, which correspond to the climatic conditions, the biological production potential of the orchard, the technological procedures used to manage the trees, the degree of mechanization and the consumption of manual labour and management of pursued economic interests.

The experiments were carried out in the years 2010-2023 using various cherry varieties, such as Valerii Cikalov, Record, Ferrovia, Kordia, Regina, Stella, Skeena, Bigarreau Burlat, Lapins, grafted on Cerasus mahaleb rootstocks, L. and Gisela-6, in various combinations and planting distances. The trees grafted on the rootstock of Cerasus mahaleb, L., showed rapid growth and an average fruit yield of 15.58-16.12 t/ha during the period of full productivity. The harvest of trees grafted on Gisela 6 and MaxMa 14 rootstock was early and amounted to 12.50-14.58 t/ha. The varieties Bigarro Burlat, Ferrovia and Lapins, planted at a distance of 5x1.5 m, gave a yield of 17.98-20.07 t/ha, which is 12.2-24.9% higher than the of trees that were planted at a distance. of 4x2.5 m..

Acknowledgments: *This study was supported by the National Agency for Research and Development, project 20.8000.5107.04 „Adaptation of sustainable and ecological fruit production technologies in terms of quantity and quality in accordance with the integrity of the crop system and climate change", founded at the State Agrarian University of Moldova.*

Keywords*: sweet cherry variety; cultivation system; rootstock; density; crown shape.*

UDC: 612.015.3:616.36

PECULIARITIES OF ORNITHINE METABOLISM IN PATIENTS WITH CHRONIC HEPATOPATHIES

Berezovscaia Elena, ORCID: 0000-0003-0360-745X

The Laboratory of Gastroenterology within the Abdominal Pathology and Transplantation Center 080401-21, of the Nicolae Testemițanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova

E-mail: *elenaberezovskaia69@gmail.com*

Chronic hepatopathy present one of the most important issues in contemporary medicine. It is known that chronic liver diseases cause different metabolic disorders in human body, including impairment of amino acid metabolism.

The aim of this study was to evaluate the ornithine amino acid levels in blood serum of patients with chronic liver diseases of viral HBV and metabolic etiology.

The ornithine levels were evaluated in 12 patients with chronic viral hepatopathy of HBV etiology (HBV), 12 patients with metabolically associated steatotic liver disease (MASLD) and in 12 apparently healthy people - the control group (CG). The laboratory analysis of ornithine level was made using liquid chromatography.

It was found that the ornithine level in chronic hepatopathy patients was significantly lower compared to the CG. Persons with HBV had the lowest ornithine level and it was significantly lower compared to patients with MASLD ($p<0.05$) and CG ($p<0.01$), showing in HBV people 3.79 ± 0.63 mcM / dL vs 5.90 ± 0.96 mcM / dL – in patients with MASLD and 8.08 ± 0.99 mcM / dL in CG. Given the fact that ornithine is a non-essential amino acid, having a series of other important metabolic functions such as urea synthesis and nitrogen detoxification, it's level turns to be an important factor involved as in the general health as in the state of mental health of the chronic hepatopathy patient.

Conclusions: in chronic hepatopathy patients of viral as well as metabolic etiology, some metabolic disorders are observed with decreased levels of ornithine. However, it is necessary to continue the study on a larger sample with other amino acids levels evaluation in patients with chronic liver pathology of viral HBV and metabolic etiology.

Acknowledgments: *This study was supported by the research project "Metabolic, nutritional and psychosocial interactions in steatotic liver disease associated with metabolic dysfunction, the role of bioethical principles in patient management" (080401-21).*

Keywords: *Chronic hepatopathy, ornithine, metabolic disorders.*

UDC: 597.2/.5:616.894:581.135.1

PROMNESIC, ANXIOLYTIC AND ANTIOXIDANT EFFECTS OF MYRTUS COMMUNIS ESSENTIAL OIL IN A ZEBRAFISH (DANIO RERIO) MODEL OF DEMENTIA

Boiangiu Răzvan Ștefan[1]*, ORCID: 0000-0002-2602-4882
Brînză Ion[1], ORCID: 0000-0003-3103-9728
Orhan Ilcay Erdogan[2], ORCID: 0000-0002-7379-5436
Hrițcu Lucian[1], ORCID: 0000-0001-6981-4174

[1]BioActive research group, Department of Biology, Alexandru Ioan Cuza University of Iasi, Iasi, Romania
[2]Department of Pharmacognosy, Faculty of Pharmacy, Gazi University, Ankara, Türkiye

*E-mail: *razvan.boiangiu@uaic.ro*

Alzheimer's disease (AD) is the main cause of dementia, accounting for 60-80% of all cases, and is quickly becoming the most expensive, lethal and burdening disease of the century. The AD core symptoms consist of memory impairment and cognitive deficit, but neuropsychiatric symptoms such as anxiety and depression were commonly observed during the clinical course of the illness. The main pathological hallmarks of AD consist of the deposition of amyloid-β (Aβ) in the brain parenchyma and the cerebral vasculature, together with the presence of intraneuronal neurofibrillary tangles and the gradual loss of synapses. *Myrtus communis*, also known as Myrtle, is a flowering plant native to the Mediterranean region that was traditionally used to treat diarrhea, headache, pulmonary and skin diseases. Myrtle was also shown to possess antioxidant and anti-inflammatory properties and can lower Aβ levels leading to cognitive improvement. This study aims to characterize the Myrtle essential oil (MEO) and evaluate its pro-cognitive, anxiolytic and antioxidant potential in a zebrafish model of AD induced by scopolamine (SCOP). For this, the MEO was analyzed by GC-MS and chronically administered to zebrafish previously treated with scopolamine. The cognitive performances and anxiety-like behavior were assessed in specific in vivo tasks. The oxidative stress parameters and acetylcholinesterase (AChE) specific activity were measured from the brain tissues and correlated with the behavioral scores. Following the GC-MS analysis, a total number of 14 compounds were detected in MEO with α-pinene, 1,8-cineole, limonene, α-terpineol and linalool found in the greatest quantity. The behavioral assessment showed that MEO significantly ameliorated the SCOP-induced cognitive deficits and anxiety and mitigated the brain oxidative stress and reduced the specific activity of AChE. Taken together, our data suggests that MEO could be used effectively in the amelioration of dementia-related conditions.

Acknowledgments: *This work was supported by a grant of the Alexandru Ioan Cuza University of Iasi as part of the Research Grants program, Grant UAIC, code GI-UAIC-2022-08.*

Keywords: *Myrtus communis, Alzheimer's disease, memory, anxiety, oxidative stress.*

UDC: 616.15-008.9-07

ISOELECTRIC FOCUSING OF SERUM TRANSFERRIN IN SCREENING OF CDG

Boiciuc Chiril[1], ORCID:0000-0002-7273-2492
Blanita Daniela[1], ORCID:0000-0001-7736-3406
Lefeber Dirk[2], ORCID:0000-0001-7770-8398
Usurelu Natalia[1], ORCID:0000-0001-8685-3933

[1]Institute of Mother and Child, Chisinau, Republic of Moldova
[2]Translational Metabolic Laboratory, RadboudUMC, Nijmegen, Netherlands

E-mail: *tervenom@gmail.com*

Congenital disorders of glycosylation (CDG) represent a significant family of diseases caused by errors in the assembly, synthesis, and/or processing of glycoproteins due to genetic defects involved in glycan biosynthesis. Despite various diagnostic methods for CDG, isoelectric focusing (IEF) of serum transferrin remains the "gold standard." This study aims to implement the IEF method and perform selective screening using IEF in patients suspected of having CDG.

Materials and Methods: The study was conducted on 327 serum samples from patients suspected of CDG, ranging in age from 2 months to 15 years, who presented with hypotonia, seizures, psychomotor retardation, and multisystemic involvement with dysmorphic features. Isoelectric focusing of serum transferrin was performed using the CSL-IEF chamber from Cleaver Scientific Ltd, UK, the "Blue power 3000" power source, and reagents (IEF gels pH 3-10, anode and cathode buffer solutions for IEF, electrode wicks) from SERVA, Germany. The protocol followed the guidelines provided by the reagent manufacturer.

Results: The implementation process faced several challenges, which were overcome through consultations with the RadboudUMC team and SERVA. To date, 149 out of 327 serum samples have been screened by IEF. Abnormalities in transferrin glycosylation were observed in 2.68% (n=4) of the tested samples. According to the CDG diagnosis protocol, IEF-positive patients were tested for Galactosemia and Fructosemiain order to eliminate the secondary cause of abnormal glycosylation. As a result, one patient was diagnosed with Galactosemia due to the p.E203L mutation in the GALT gene, and two patients were diagnosed with Fructosemia due to the c.113-1_115del mutation in the ALDOB gene. Further genetic testing is required to identify the specific type of CDG in the fourth patient.

Conclusion: The IEF method has been successfully implemented, marking the first step in the diagnosis of glycosylation disorders in patients from Moldova. This has permitted the identification of four patients with abnormal glycosylation profiles.

Acknowledgments: *This study was supported by the research project „Medicina Genomică și Metabolomică în serviciul profilaxiei maladiilor genetice pentru generații sănătoase în Republica Moldova" [SCREENGEN, Cipher: 20.800009.8007.22].*

Keywords: *CDG, IEFT, glycosylation, screening.*

UDC: 597.2/.5:591.2:581.135.1

EXPLORING THE THERAPEUTIC POTENTIAL OF CORIANDRUM SATIVUM ESSENTIAL OIL IN MITIGATING COGNITIVE IMPAIRMENT AND OXIDATIVE STRESS: INSIGHTS FROM A ZEBRAFISH MODEL

Brînza Ion*, ORCID: 0000-0003-3103-9728
Boiangiu Răzvan Ștefan, ORCID: 0000-0002-2602-4882
Dumitru Gabriela
Hrițcu Lucian, ORCID: 0000-0001-6981-4174

Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University of Iasi, 700506 Iasi, Romania

*E-mail: *ionbrinza995@gmail.com*

The essential oil derived from *Coriandrum sativum* is widely recognized for its diverse pharmacological properties, including antioxidant, antimicrobial, antibacterial, antifungal, antidiabetic, anticonvulsant, anxiolytic-antidepressant, and anti-aging effects. The main aim of this study was to investigate the therapeutic mechanism of *Coriandrum sativum* var. microcarpum essential oil (CSEO) in mitigating cognitive impairment and cerebral oxidative stress using a zebrafish model induced by scopolamine (SCOP).

Zebrafish were subjected to different concentrations of CSEO (25, 150, and 300 μL/L) over a 21-day timeframe, alongside the introduction of SCOP (100 μM) to trigger cognitive impairment. The examination of behavioral reactions was executed by employing the Y-maze and novel object recognition (NOR) assessments, with the objective of evaluating spatial memory, responsiveness to novelty, and memory recognition. The appraisal of anxiety-associated conduct was carried out using the novel tank diving test (NTT). Moreover, the inquiry encompassed the scrutiny of the cholinergic system's functionality and the quantification of cerebral oxidative stress indicators.

The outcomes of our study illustrated that the introduction of SCOP resulted in compromised memory and anxiety-related behavior in zebrafish, whereas the usage of CSEO significantly improved memory performance in behavioral tests. Furthermore, the implementation of CSEO alleviated the oxidative stress in the brain caused by SCOP and decreased the functionality of acetylcholinesterase (AChE).

The findings of this study provide important insights into the potential therapeutic effects of CSEO in mitigating memory deficits and cerebral oxidative stress associated with dementia. The research underscores the promising role of CSEO as a natural remedy for addressing cognitive impairment and disorders related to oxidative stress.

Keywords: *Coriandrum sativum, essential oil, spatial memory, zebrafish, oxidative stress.*

UDC: 616.895.8:616.31-083

INTEGRATING DENTAL CARE IN SCHIZOPHRENIA TREATMENT: THE IMPACT OF DENTAL IMPLANTS AND OXIDATIVE STRESS MARKERS

Burlui Ecaterina [1,2]*
Burlui Vasile [2]
Ciobica Alin [1,2,3,4]

[1]Doctoral School of Biology, Faculty of Biology, "Alexandru Ioan Cuza" University of Iași, Carol I Avenue, 20A, Iasi, Romania
[2]Preclinical Department, Apollonia University, Pacurari Street 11, 700511 Iasi, Romania
[3]Center of Biomedical Research, Romanian Academy, no 8, Carol I Avenue, 700506 Iasi, Romania
[4]Academy of Romanian Scientists, no 54, Independence Street, Sector 5, 050094 Bucharest, Romania

E-mail: *burluiecaterina@gmail.com*

Schizophrenia is a complex mental disorder marked by deteriorating thought processes and inappropriate emotional responses. Individuals with schizophrenia are at a higher risk of developing various dental diseases, such as dental caries, periodontal disease, oral mucosal diseases, and conditions related to oral resonance, compared to the general population. This summary underscores the importance of the connections between schizophrenia and dental illnesses, the significance of oxidative stress markers in schizophrenia, and the role of dental treatments, particularly dental implants. The findings underscore the urgent need for an intervention program to enhance oral health in patients with schizophrenia, focusing on prevention and prosthetic treatment. Dental implants emerge as a favorable option, offering both aesthetic and functional benefits for treated schizophrenic patients. A carefully developed surgical plan is essential, necessitating collaboration between psychiatry, oral and maxillofacial surgery, anesthesiology, and prosthodontics departments.

Keywords: *oxidative stress, superoxide dismutase, glutathione peroxidase, dental conditions, schizophrenia.*

UDC: 634.23:631.811.98

THE EFFECT OF GROWTH REGULATORS ON THE GROWTH AND FRUITING OF CHERRY VARIETIES

Buza Corneliu*, ORCID:0009-0004-9050-214X
Russu Stanislav, ORCID:0009-0005-9115-5589
Talpalaru Dumitru, ORCID:0009-0003-7098-4535

Department of Horticulture and Forestry, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *buza-cornel@mail.ru*

Management of growth regulators is a determining element of technology in fruit production in the Republic of Moldova. Favorable conditions are found for cherry (Prunus avium L.) cultivation in all fruit-growing areas, but we have elements of restriction from a thermal point of view, the late spring frosts and the heat during the summer which quite often affect the fruit harvest.

The aim of the work is to increase the productivity of cherry plantations by reducing the vegetative growth and the freezing point of the floral organs of the plants, whose resistance to frost decreases as the vegetation advances.

The investigations were organized in the center area, Criuleni district. The orchard was established with the varieties Skeena, Lapins, Blak Star, grafted on Maxma 14. The trees were planted in 2014 at 5 x 3 m spacing. The growth regulator Paclobutrazol, applied to the soil as a water around the tree trunk, as well as the antifreeze product Cropaid NPA were evaluated. Scheme of the experiment: V1-Control, untreated; V2-Application of growth regulator Paclobutrazol (2 ml/tree), in the vegetative rest phase; V3-Application of Cropaid NPA preparation 2 days before frost; V4-Application of growth regulators Paclobutrazol (2 ml/tree) in the vegetative rest phase + Cropaid NPA preparation (5 l/ha).

The varieties investigated have formed 1-2 m from the ground, 70-80% of flower buds are healthy. Paclobutrazol and Cropaid NPA increase the photosynthetic potential in cherry, by increasing the leaf surface by 2-4% (25-30 thousand m2/ha) and the concentration of pigments in the leaves. Practically, the plants better resist the unwanted external factors, thanks to the leaves that become thicker and healthier. In 2022, the application of Cropaid NPA (5 l/ha) and Paclobutrazol (2 ml/tree) during the vegetative rest phase protected the crop from late spring frosts and reduced tree growth and as a result, the fruit yield was 16.5 t/ha in the Lapins variety and 18.5 t/ha in the Skeena variety.

Acknowledgments: *This study was supported by the National Agency for Research and Development, project 20.8000.5107.04 „Adaptation of sustainable and ecological fruit production technologies in terms of quantity and quality in accordance with the integrity of the crop system and climate change”, founded at the State Agrarian University of Moldova.*

Keywords: *cherry; variety; rootstock; growth regulator.*

UDC: 599.4(478)

THE CURRENT STATUS OF THE CHIROPTERA COMMUNITIES IN THE UNDERGROUND SHELTERS AT HOLERCANI

Caldari Vladislav*, ORCID:0000-0002-8114-6751
Nistreanu Victoria, ORCID:0000-0002-9726-9684
Larion Alina, ORCID:0000-0002-5313-4518
Dibolscaia Natalia, ORCID:0000-0001-9516-7476

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *dalvcald@gmail.com*

On the territory of the Republic of Moldova, the abandoned limestone mines represent one of the most important shelters for chiropteran species from the Republic of Moldova, for hibernation and reproduction. The research carried out in 2020 – 2021 in the stone mines of Holercani on the right bank of the Dniester River (47°19'38"N, 29°04'21"E). 3 bat species were recorded*: Rhinolophus hipposideros*, *Myotis daubentonii* and *M. bechstenii* from two families (Rhinolophidae and Vespertilionidae). The most numerous are individuals of the species *Rh. hipposideros*. Species diversity is low with a relatively large number. Bat numbers are lower in september during mating season than in february when bats hibernate. This is due to the active period in September and alternative shelters. During the mating period in september, only 6 bats were identified, while during the hibernation period in february 33 individuals. As we can see from the data obtained, the site is important for bats during the hibernation period.

During the hibernation stage, the numerical herd is higher because there are optimal conditions for chiroptera. In September bats are in other shelters that are near the mine. The low population and diversity is due to the type of mine, it is dug by hand and does not have cracks and holes in the ceiling where bats can roost compared to mines dug by power saw. Another factor is human activity in the mine, the burning of tires and garbage, as well as incidental to the mine. Anthropogenic and climatic factors are decisive and have negatively influenced the presence of chiroptera in these sites. The site and the bats require protection to preserve the diversity of the fauna because the importance of chiroptera as insectivores is irreplaceable in the trophic chains.

Acknowledgments: *This study was supported by the Evaluation of the structures and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population (010701) funded by Moldova State University.*

Key-words*: bats, hibernation, diversity, abundance, rock mines.*

UDC: 614.2:614.876

EVALUATION OF MEDICO-BIOLOGICAL EFFECTS OF ACCIDENTAL IONIZING RADIATION

Coreţchi Liuba*, ORCID: 0000-0001-5758-3831
Gîncu Mariana, ORCID: 0000-0001-5082-8250
Sacară Victoria, ORCID: 0000-0001-9200-0494
Capaţina Angela, ORCID: 0000-0001-7074-3334
Bahnarel Ion, ORCID: 0000-0002-7206-5490

*National Agency for Public Health,*Institute for Mother and Child, Chisinau, Republic of Moldova*

*E-mail: *coretchiliuba@gmail.com*

The purpose of the work was the detection of stochastic effects in people accidentally exposed to ionizing radiation (IR). Methods. Subjects participating in the reduction of the consequences of the Chernobyl nuclear accident (PRCCNA) and their descendants served as study material. Retrospective, cross-sectional and descriptive studies were carried out based on the evaluation/analysis of clinical aspects, the incidence of morbidity and mortality through exposure to accidental IR sources, and on studying the profile of the immunological reaction, genetic effects, including molecular, because of a nuclear accident. The evaluation of the aspects of the general morbidity structure in 785 PRCCNA, under the supervision of the family doctor in the State Polyclinic of the Ministry of Health of the Republic of Moldova and about 400 children, under the supervision of the family doctor in the Polyclinic of Mother and Child Institute elucidated that the most common diseases were diseases of the gastrointestinal, central nervous and endocrine systems, considered as target systems of the IR exposure response. At the same time, increased sensitivity to infectious diseases was found in children, compared to the control group. The basic indicators in the characterization of immunity under the conditions of IR action were CD3, CD4 and CD8, but more representative the CD4/CD8 co-ratio. By using TREC/KREK genetic-molecular methods of DNA by PCR Multiplex analysis of the second generation descendants, the cellular and humoral immunity have been studied. Immunoglobulin analysis found some differences compared to the control group. It has been shown that the micronucleus test can be a reliable method for evaluating the induction of defects in the structure of chromosomes, thus allowing the creation of a suitable dosimeter for estimating the in vivo exposure of the whole body to IR. The results of the cytogenetic study in the offspring demonstrated that chromatid/chromosomal aberrations were detected in both the experimental and control groups, but the frequency within the research groups was different. In the experimental group, the incidence of dicentrics was higher, compared to the control group. Dicentrics are considered markers of RI. An individual evolution was observed for each type of aberrations in dynamics during 30 years of study.

Based on the clinical, immunological, cytogenetic and genetic-molecular investigations of those exposed to IR, the algorithm for monitoring/reducing the health risk caused by the radiation factor was developed.

Acknowledgments: *This study was supported by the research Project nr.20.80009.8007.20 „Quantification of the risk to health, associated with exposure to ionizing radiation, in the context of the EURATOM directive No. 2013/59/", funded by National Agency for Research & Development.*

Keywords: *Accidental ionizing radiations, biological dozimetry, immunology, Citogenetic investigatation.*

UDC: 599.323:616.89

INFLUENCE OF ACUTE CHRONIC STRESS OF VARIOUS NATURE ON THE BEHAVIOR OF RATS IN OPEN FIELD

Corlăteanu Alexandr, ORCID: 0009-0009-2061-3262

Department of Basic and Clinical Sciences
Faculty of Veterinary Medicine, Technical University of Moldova,
Chisinau, Republic of Moldova

E-mail: *alexandrcorlateanu52@gmail.com*

Exploratory behavior is an important component of the interaction of an animal organism with the environment. It represents a complex set of reactions, the purpose of which is to obtain information regarding the conditions of existence. Exploratory behavior, often associated with excessive physical activity, causes stress reactions. In this regard, the purpose of the study was to investigate the influence of muscle load on the characteristics of exploratory behavior and resistance to stress (RS).

Rats' behavior was tested in an open field. There were recorded the patterns of behavior, which characterize exploratory behavior, emotionality, and grooming. Stress was modeled by making animals swim during 7 days for 60 minutes at a water temperature of +25°C. According to the level of horizontal motor activity the following differentiation of animals was revealed: 33% had a high level, 23% had an average, and 44% had a low level of horizontal motor activity. In addition, during the first testing, the level of horizontal motor activity correlated with a high level of vertical motor activity. The mentioned features of exploratory behavior indicate the different nature of nervous processes of animals exposed to new conditions of existence. Chronic physical activity caused a generalized decrease of indicators characterizing exploratory behavior of all animals.

An assessment (RS) based on registration of ethological parameters showed that rats with medium and low levels of horizontal and vertical activity are characterized by the same index (RS), whereas physical activity causes the greatest decrease of this index in rats with a high level of exploratory activity. The obtained data indicate dysfunction of the nervous processes that ensure adequate exploratory behavior.

Acknowledgments: *This study was supported by the research project 011001 Mechanisms for regulating the organism's homeostasis and health and the elaboration of procedures and measures to maintain it), funded by Institutul de Fiziologie și Sanocreatologie.*

Keywords: *open field, exploratory behavior, stress, horizontal and vertical motor activity.*

UDC: 595.76:582.683.2(478)

PRELIMINARY DATA ON COLEOPTERA DIVERSITY (INSECT: COLEOPTERA) FROM RAPE CROP, REPUBLIC OF MOLDOVA

Crețu Irina[1,2]*, ORCID:0009-0009-5820-9417
Bacal Svetlana[2], ORCID:0000-0002-8774-7718
Bușmachiu Galina[2], ORCID:0000-0002-9724-2414

[1]*Doctoral School of Natural Sciences,*
[2]*Institute of Zoology, Moldova State University,*
Chisinau, Republic of Moldova

*E-mail: *irina.cretu.1991mail.ru*

Rape (*Brassica napus*) is an oilseed crop of significant importance for the food and technical industries worldwide. Rape cultivation in the Republic of Modova started in the 2000s and currently covers an area of about 34 thousand ha (https://statistica.gov.md/). Rape is a food source for many insect species, including various species of Coleoptera, throughout the growing season, especially during the flowering period. Increasing the areas cultivated with rape, especially as a monoculture, favors the accumulation of large numbers of harmful insects from the Coleoptera family, which cause great damage to this oilseed crop. The aim of this work was to highlight the coleopteran species associated with the rape crop în the Republic of Moldova.

The collection of insects from rapeseed flowers was carried out on 01 May, 05 May, 18 May 2023, and from plants sown in autumn, on 23 October 2023. A total of 311 specimens of Coleoptera were collected in the rape crop, belonging to 14 species, 12 genera and 8 families. The most representative were the families Curculionidae and Coccinellidae with 3 species each, followed by the families Scarabaeidae and Cantharidae - 2 species each, Chrysomelidae, Tenebrionidae, Nitidulidae, Apionidae - 1 species each. The distribution of specimens by localities was as follows: Bulboaca (113), Băcioi (66), Slobozia Mare (66), Telița Nouă (62) and Zuzulenii Noi (4). The following species were collected in the rape crop: *Ceutorhynchus pallidactylus* (Marsham, 1802) (136 specimens), *Tropinota hirta* (Poda, 1761) (63), *Apion* sp. (35), *Omophlus lepturoides* (Fabricius, 1787) (22), *Coccinella septempunctata* (Linnaeus, 1758) (11), *Hypera postica* (L. Gyllenhal, 1813) (10), *Brassicogethes aeneus* (Fabricius, 1775) (8), *Entomoscelis adonidis* (Pallas, 1771) (6), *Cetonia aurata* (Linnaeus, 1758) (5), *Sitona lineatus* (Linnaeus, 1758) (5), *Cantharis obscura* (Linnaeus, 1758) (4), *Hippodamia variegata* (Goeze, 1777) (4), *Cantharis livida* (Linnaeus, 1758) (1) and *Propylea quatuordecimpunctata* (Linnaeus, 1758) (1). Among the collected coleoptera species, 8 species are pests: *Ceutorhynchus pallidactylus*, *Tropinota hirta*, *Apion* sp., *Hypera postica*, *Brassicogethes aeneus*, *Entomoscelis adonidis*, *Cetonia aurata*, *Sitona lineatus*, which cause serious damage to rape crops. Five coleopteran species, identified in rape crop, are beneficial, feeding on aphids and other pest insects, including 3 species of coccinellids: *Coccinella septempunctata*, *Hippodamia variegata*, *Propylea quatuordecimpunctata* and 2 species of cantharids: *Cantharis livida*, *Cantharis obscura*. A tenebrionid species feeding on flower pollen - *Omophlus lepturoides* - has also been identified.

Acknowledgments: *This study was carried out from institutional funding Nr. 010701 "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population - ZOOAQUATERRA ".*

Keywords: *coleoptera, species, agriculture, rape crop, pests.*

UDC: 599.325.1:636.082.453

PROSPECTS OF ARTIFICIAL INSEMINATION IN INDUSTRIAL RABBIT BREEDING

Cretu Roman*, ORCID: 0009-0007-9172-6462
Balacci Sergiu, ORCID: 0000-0001-9961-6806
Bacu Gheorghe, ORCID: 0000-0003-5829-2764

Institute of Fisiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *roman_cretu@yahoo.com*

Rabbits have great reproductive and productive potential, and rabbit breeding is a promising branch of animal husbandry. With the industrial system of rabbit reproduction, the breeding stock is inseminated artificially on a strictly fixed day of the week on the 4th-11th day of lactation. Only clinically healthy and well-fed females are allowed to insemination. It has been shown that with an intensive rhythm of herd reproduction, 40-65 rabbits can be obtained from one rabbit annually. The advantages of rabbit breeding include a small investment. The body of rabbits differs from the organism of other species of farm animals in a number of biological and physiological features. Knowledge of these features is crucial for successful rabbit breeding. There is no pronounced seasonality in the reproduction of rabbits. The ability to fertilize in rabbits is restored a day after the birth (5-8 days). Practical possibilities of introducing the method of artificial insemination of rabbits are used according to the following scheme: obtaining sperm from sires; assessment of the quality of germ cells; dilution and storage of sperm outside the body; stimulation of sexual activity and detection of females' desire for insemination; injection of sperm into the female's genital tract with drug induction of ovulation. Sperm from male producers is obtained using an artificial vagina once a week - two cages with an interval of at least 15 minutes. 48 hours before artificial insemination, suckling females are injected with a gonadotropic drug (folligon). The selection of rabbits for artificial insemination is carried out according to the signs of estrus and sexual heat. Exogenous gonadotropic stimulation through the central nervous system-hypothalamus-pituitary gland complex induces cyclic growth of follicles, synchronizes the manifestation of sexual activity of females and increases the effectiveness of insemination. The technique of artificial insemination of rabbits is carried out using a syringe with a removable disposable plastic catheter. Sperm is injected into the cranial part of the vagina in a volume calculated from the concentration of germ cells (0.5-1.0 ml). The catheter is removed and the female is injected with an ovulatory dose of a gonadostimulator. This method of insemination allows up to 150 rabbits to be inseminated in 1 hour. Thus, artificial insemination is a promising method of rabbit reproduction, which allows the most complete realization of the reproductive and productive potential of male producers and breeding stock.

***Keywords**: rabbit breeding, sperm, artificial insemination.*

UDC: 616-056.7-07

COMPARISON OF AFLP AND REPEAT-PRIMED PCR IN PATHOGENIC STR EXPANSION RESEARCH

Dorif Alexandr*, ORCID: 0000-0003-4269-4066
Sacara Victoria, ORCID: 0000-0001-9200-0494

Laboratory of Human Molecular Genetics, Institute of Mother and Child, Chisinau, Republic of Moldova

*Email: *dorif.alexandr@mama-copilul.md*

Repeat-expansion disorders are very important type of disorders, having huge impact on affected person's life quality. These diseases have huge amount of phenocopies and their signs and symptoms may progress between generations due to so-called anticipation effect, when once expanded allele becomes unstable and more prone to further expansion. In this paper we summarize our experience in development and application of test systems intended for pathological short tandem repeat (STR) expansion detection.

We used amplified fragment length polymorphism (AFLP) and repeat-primed PCR (RP-PCR) methods to assess number of repeat units. Fragments separation was carried out by capillary electrophoresis using ABI 3500 Dx system. Data were analyzed using GeneMapper 5.1 and FragalyseQt software.

AFLP once again proved its simplicity both in preparation and analysis, however it gave not very good results in GC-rich regions and cannot detect fragment larger than 1200 nucleotides (sizing limit of ABI 3500 Dx). RP-PCR being not so easy to analyze, however, provides possibility to detect expansions with STR locus size more than upper limit of sizing and we showed its excellent performance in GC-rich regions. Even more – RP-PCR permits detection of repeat interruptions and complex repeats, providing important information in some cases, especially in cases of Huntington disease, fragile X syndrome, spinal and bulbar muscular atrophy (SBMA) and spinocerebellar ataxia type 3 (SCA3). Using these methods new individuals affected by repeat expansion disorders were found.

Despite AFLP simplicity, we have to conclude that RP-PCR is much more advanced technology for pathogenic STR studies. It behaved exceptionally well in cases of *HTT*, *ATXN3* and *AR1* genes polyglutaminic expansions study.

Keywords: *RP-PCR, AFLP, capillary electrophoresis, fragment analysis, STR, neurodegeneration, repeat expansion.*

UDC: 595.76:502.1(478)

CONTRIBUTIONS TO THE KNOWLEDGE ON CEOPTERAN FROM THE COSAUTI LANDSCAPE RESERVE, REPUBLIC OF MOLDOVA

Enciu Elena*, ORCID: 0009-0006-4573-9265

Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *elena.enciu@usm.md*

There are 43 Lanscape Reserves on the territory of the Republic of Moldova, occupying an area of 32804. One of them is the Cosauti Landscape Reserve (48°13′N 28°17′E) with a surface of 585 ha, situated near the village of the same name in Soroca district, on the right bank of the Dniester River, with hills and terraces at 40-160 m height. The Reserve is assigned to category V Habitat/Species Management Area according to the International Union for Conservation of Nature (IUCN).

The objective of the present study was to investigate the species of Coleoptera collected on the soil surface and their ecological preference.

The studies were performed in vegetation period of 2022 in 2 wood types from the Cosauti landscape reserve: oak forest (*Quercus robur* L.) and ash forest (*Fraxinus excelsior* L.). The land beetles were collected using traditional entomological methods: Barber traps (10 traps were placed in two lines), and manual collection from various species of plants (trees, shrubs, grasses), from litter and soil. In total, there were collected and analyzed by the mentioned methods over 930 samples.

In the research conducted, the beetle's fauna collected in forest ecosystems investigated consists of 39 species belonging to 26 genera and 6 families (Carabidae, Silphidae, Scarabaeidae, Cantharidae, Lucanidae, Cerambycidae). Three species of rare and endangered coleopterans were found in the investigated resorts: *Carabus ullrichi* Ill. (Carabidae), *Oryctes nasicornis* L. (Scarabaeidae) and *Lucanus cervus*. L. (Lucanidae), these being included in the Red Book of the Republic of Moldova (3rd edition).

Examining the composition of beetles in forest types investigated, it was found that after the trophic spectrum, the beetles' fauna is divided into 5 trophic groups: zoophagous, phytophagous, necrophagous, coprophagous and xylophagous. Phytophagous are the majority group with 21 species (43%), followed by zoophagous with 19 species (41%).

Coleopteran species collected from the Cosauti landscape reserve, according to the distribution area belong to 8 zoogeographic elements, with the dominance of the European ones (17 species) and Trans-Palearctic (15 species), which constitute more than 50% of all collected species.

The obtained data confirms that the forest ecosystem, being a self-regulating system, has a rich fauna of beetles.

***Acknowledgments**: This study was supported by the research project 010701 "Evaluation of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population.*

***Keywords:** coleopteran fauna, trophic spectrum, distribution area.*

UDC: 612.821.2:599.323:616-092.9

FEATURES OF LEARNING AND MEMORY IN WHITE RATS IN THE MORRIS WATER MAZE UNDER THE INFLUENCE OF BIOMASS OF STREPTOMYCETES ISOLATED FROM SOILS OF THE REPUBLIC OF MOLDOVA

Garbuzneac Anastasia*, ORCID: 000-0003-0649-7006
Sheptitsky Vladimir, ORCID: 0000-0002-6306-7021

Institute of Physiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *11_lav_11@mail.ru*

The aim of the work is to investigate the effect of long-term consumption of biomass strains of Streptomyces massasporeus CNMN-Ac-36 and Streptomyces fradiae CNMN-Ac-11, isolated from the soil of the central part of Moldova, on the process of spatial learning and memory in white rats in the Morris water maze.

The studies were performed on Wistar rats of both sexes. Animals of the experimental group for 90 days as a food supplement to the standard diet received daily at a dose of 250 mg/kg of live weight dried biomass of two local strains of streptomycetes - Streptomyces massasporeus CNMN-36 or Streptomyces fradiae CNMN-Ac-11, grown on a nutrient medium with previously determined amino acid and lipid composition. 90 days after the start of consumption of streptomycetes biomass by animals and when they reached the age of 6 months, they began to study spatial learning and memory. Rats kept on a standard diet served as controls. To study the process of spatial learning and memory, Maurice's water maze was used, which is a reliable tool for studying working and long-term spatial memory in white rats under controlled conditions.

It was found that the long-term consumption of biomass of local strains of streptomycetes - Streptomyces massasporeus CNMN-36 and, to a greater extent, Streptomyces fradiae CNMN-Ac-11 leads to a noticeable decrease in such indicators, recorded during the training of animals in the Morris water maze, as the duration of the latent period of the animals the platform, the length of the path to the platform and the duration of the animal's stay in the non-target sectors of the maze, while the duration of the animals' stay in the target sector of the maze increased significantly both during training and during the study of working and long-term spatial memory.

Thus, the biomass of Streptomyces massasporeus CNMN-36 and, to a greater extent, Streptomyces fradiae CNMN-Ac-11 strains of streptomycetes contributes to the intensification of the process of spatial orientation learning, improvement of working memory and the process of consolidation of spatial memory in white rats of both sexes, and these strains are promising for further research in order to isolate and identify substances with neuroprotective and nootropic properties.

Keywords: *spatial learning and memory, working and long-term memory, Morris water maze, streptomycetes, biomass.*

UDC: 582.572.4:573.6

THE INTRODUCTION OF THE SPECIES *LEUCOJUM AESTIVUM* L. IN TISSUE CULTURE

Ghereg Melania*, ORCID: 0000-0001-7406-4347
Ciorchină Nina, ORCID: 0000-0002-5792-5587
Chitan Raisa, ORCID: 0000-0003-2519-801X

„Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *melania.ghereg@gb.usm.md*

***Leucojum aestivum* L.** (summer snowflake) is a perennial, bulbiferous, ephemeral plant of the Amaryllidaceae family. In the Republic of Moldova, it is a critically endangered species, protected by law, included in the Red Book (3rd edition). It is propagated by seeds and bulbils. Its habitat is in floodplain forests with white poplars and depressions with high humidity. It grows in the floodplain of the Prut River, near the commune of Cioara, Hîncești district, and the village of Sărata-Răzeși, Leova district. Beyond the country's borders, it occurs in the Caucasus, Central, Western and South-Eastern Europe. Populations in natural habitats are exterminated because of the increased interest in the ornamental and medicinal properties of this species.

The goal of our work is to mobilize plant material for the multiplication of the species *Leucojum aestivum* by tissue culture. The plant material for the research was collected from the natural habitat of the researched species. Four types of sterilizing reagents (sodium hypochlorite, calcium hypochlorite, ethyl alcohol and mercury chloride) were tested to achieve aseptic conditions. Optimal results were achieved in the version with mercury chloride, the viability rate of the seedlings being 70%. The use of the other sterilizing reagents resulted in a high percentage of contamination in most of the inocula. The aseptic plant material was inoculated on three types of growth medium supplemented with the cytokinin 6-benzylaminopurine (BAP), in different concentrations *(1.0 mg/l; 2.0 mg/l; 3.0 mg/l)*.

As a result of the research carried out, the sterilization regime and the growth medium that cause the initiation of regenerative microclones in the species *Leucojum aestivum* were established: MS 100% with added BAP cytokinin in concentration of 3.0 mg/l, obtaining 3-4 microclones per explant.

The research was carried out within the research and innovation project of the State Program, Subprogram 010101 "*Ex situ* and *in situ* research and conservation of plant diversity in the Republic of Moldova", financed by the State Budget.

Keywords: *Leucojum aestivum, critically endangered species, tissue culture.*

UDC: 591.69:597.551.2

THE IMPACT OF MONO- AND POLIINVASIONS ON HAEMATOLOGICAL INDICES IN SOME ASIAN CARPS

Gologan Ion*, ORCID: 0000-0002-8463-2093
Rusu Ștefan, ORCID: 0000-0002-3204-5436
Erhan Dumitru, ORCID: 0000-0001-9722-4382

Institute of Zoology , Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *gologanionel@gmail.com*

In order to evaluate the impact of mono- and poliinvasions on the haematological indices blood samples were collected from 4 species of fish: *Cyprinus carpio* Linnaeus, 1758 - Common carp, *Carassius gibelio* (Bloch, 1782) - Prussian carp, *Hypophthalmichthys molitrix* (Valenciennes, 1844) – Silver carp and *Hypophthalmichthys nobilis* (Richardson, 1845) – Bighead carp.

After the blood samples had been collected, the parasitological examination of the internal organs and muscle tissue was carried out in order to establish the degree of infestation. The Common carp and Prussian carp specimens were divided into four groups: group I – uninfested, group II – specimens infested with the monogenean *Dactylogyrus extensus* (monoinvasions), group III – specimens infested with the cestode *Khawia sinensis* (monoinvasions), group IV – specimens infested with both *Dactylogyrus extensus* and *Khawia sinensis* (poliinvasions).

Also, the specimens of Silver carp and Bighead carp were divided in four groups: group I – uninfested, group II – specimens infested with the monogenean *Dactylogyrus* sp. (monoinvasions), group III – specimens infested with the trematode *Diplostomum spathaceum* (monoinvasions), group IV – specimens infested with *Dactylogyrus* sp. and *Diplostomum spathaceum* (poliinvasions).

For this purpose, the following hematological indices were analyzed: hemoglobin, red blood cells and hematocrit.

As a result of the evaluation of the impact of mono - and poliinvasions on the hematological indices, it was determined that the level of hemoglobin, hematocrit, as well as the number of red blood cells in the poliinfested groups decreases significantly, compared to the uninfested group.

Thus, the number of red blood cells was reduced by 26,8% in Common carp, by 41,45% in Prussian carp, by 15,02% in Silver carp and by 29,06 % in Bighead carp; the level of hemoglobin decreased by 13,5% in Common carp, by 19,31% in Silver carp, by 22,61% in Bighead carp; the hematocrit level decreased by 17,98% in Common carp, by 22,66% in Prussian carp, by 17,41% in Silver carp, by 13,89% in Bighead carp.

It was also established that the values of the hematological indices recorded in the monoinfested groups vary insignificantly compared to group I.

Keywords: *fish, monoinvasion, hemoglobin, hematocrit*.

UDC: 616-092.9:577.152.34

ACTIVITY OF AMYLOLYTIC ENZYMES OF THE PANCREAS AND SMALL INTESTINE DEPENDING ON THE TYPE OF CONSTITUTIONAL STRESS REACTIVITY AND THE CALORIC DIET COMPOSITION

Grosul-Raileanu Olesea*, ORCID: 0000-0002-4305-3503
Sheptitsky Vladimir, ORCID: 0000-0002-6306-7021

Institute of Physiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *railianu.radu@yandex.com*

The aim of this work is to study the activity of pancreatic α-amylase and the total activity of carbohydrases in the small intestine of white rats with different levels of constitutional stress reactivity.

The rats were divided into three groups depending on the level of constitutional stress reactivity: 1 – high stress reactivity; 2 – average stress reactivity; 3 – low stress reactivity. Constitutional stress reactivity was assessed using a set of behavioral tests and an analysis of histopathological differences in the tissues of the stomach, thymus and adrenal glands in some of the animals in each group after immobilization stress. To study the effect of the calorie structure of the diet on the activity of amylolytic enzymes, rats in the experimental groups were kept for 6 weeks on diets with a high (78.2% of energy consumed) or low (27.9% of energy consumed) carbohydrate content, or on a carbohydrate-free diet. Animals kept on a standard diet served as controls. Enzyme activity was determined in homogenates of the pancreas and small intestinal mucosa.

It was found that the activity of pancreatic α-amylase and the total activity of small intestinal carbohydrates depend on the level of constitutional stress reactivity of the organism. The highest activity of pancreatic alpha-amylase is observed in animals with a high level of constitutional stress reactivity, and the lowest in animals with an average level of constitutional stress reactivity. In contrast, the highest total activity of small intestinal carbohydrases is observed in animals with an average level of constitutional stress reactivity, and in animals with low and high levels of constitutional stress reactivity it is practically no different. Noticeable differences were discovered in the response of the enzyme systems of the pancreas and small intestine of animals with different levels of constitutional stress reactivity to changes in the structure of the calorie content of the diet, which to a certain extent shed light on the mechanisms of regulation and maintenance of the constitutional specificity of enzyme systems.

Thus, the results obtained demonstrate the existence of a connection between the genetically determined stress reactivity of the body and the digestive functions of the pancreas and small intestine.

Keywords: *pancreas, small intestine, amylolytic enzymes, constitutional stress reactivity.*

UDC: 597.2/.5:591.2:573.6

NEUROPROTECTIVE POTENTIALS OF ETHANOL EXTRACTS FROM *SOLANUM MACROCARPON* PLANT

Guliev Corina-Ioana*
Brînză Ion, ORCID: 0000-0003-3103-9728
Hrițcu Lucian
Tăușan Ioan, ORCID: 0000-0002-9599-1761

Lucian Blaga University of Sibiu, Faculty of Sciences, Sibiu, Romania

*E-mail: *corina.guliev@gmail.com*

Alzheimer's disease (AD) is a progressive neurodegenerative disorder leading to memory loss, cognitive decline, and behavioral changes, predominantly affecting the elderly. The global prevalence of AD is increasing due to aging populations, with predictions suggesting over 150 million affected individuals by 2050. Risk factors for AD include advanced age, environmental exposures, genetics, cardiovascular problems, and gender. Characteristic neuropathological features of AD include amyloid plaques, tau tangles, oxidative stress, synaptic dysfunction, chronic inflammation, and extensive neuronal death resulting in brain atrophy.

This research examines the potential neuroprotective properties of ethanol extracts derived from the Solanum Macrocarpon plant (SMEE). Solanum Macrocarpon, a plant in the Solanaceae family, is cultivated in tropical Africa for its medicinal benefits, including antimicrobial, antioxidant, and anti-inflammatory properties.

We investigated the impact of SMEE on dementia symptoms induced by Scop using the zebrafish model, which shares key characteristics of Alzheimer's disease. Zebrafish received SMEE treatment at doses of 1, 3, and 6 µg/L following Scop exposure. Behavioral assessments included the Novel Tank Diving Test (NTT) to assess anxiety levels and the Y-Maze Test to evaluate spatial memory.

Results indicated that SMEE significantly reduced Scop-induced anxiety and improved locomotion in the NTT. SMEE-treated zebrafish showed enhanced exploration and decreased latency to explore the upper part of the tank. In the Y-Maze Test, SMEE significantly mitigated memory deficits induced by Scop, as evidenced by improved spontaneous alternation, line crossings, turn angle, and time spent in the new arm.

Statistical analysis involved conducting one-way ANOVA followed by Tukey's post hoc test, with a significance level of $p < 0.05$.Research showed that extended SMEE treatment successfully reversed Scop-induced neural damage, cognitive decline, and memory loss in zebrafish. Moreover, SMEE neutralized anxiogenic effects of Scop while enhancing locomotor activity.

In conclusion, SMEE exhibits promising neuroprotective effects, improving memory degradation and providing potential therapeutic benefits for dementia-related symptoms in AD models. More research is needed to explore its applicability in clinical settings for neurocognitive enhancement and anxiety reduction in dementia patients.

Keywords: N*europrotection, Alzheimer's Disease, Solanum Macrocarpon, Zebrafish , Ethanol Extracts.*

UDC: 579.842.1/.2:616.34-008.314.4

DYNAMICS OF THE SPREAD OF MICROORGANISMS FROM THE FAMILY ENTEROBACERIACEAE WITH ETIOLOGICAL ROLE IN ACUTE DIARRHEA DISEASES

Guțu Nadejda, ORCID:0000-0002-0010-7700

Doctoral School of Natural Sciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *nadejdagutu3@gmail.com*

Acute diarrheal disease (ADD) is caused by microorganisms of the Enterobacteriaceae family and represents a major public health problem. Microorganisms from this family represent the largest taxonomic unit and count 44 genera, including 25 that are involved in human pathology. The identification of enterobacteria serves to detect the sources of infection and apply an effective treatment. The aim of this study was to identify the microorganisms from the Enterobacteriacea family with an etiological role in acute diarrheal diseases and the dynamics of the spread in MTA Buiucani Public Health Medical Institution, Chisinau.

The research was carried out in the 2011 – 2023. In total, 2393 strains (17.9%) of enterobacteria were isolated and identified from the 13359 clinical samples received in the Microbiological Laboratory of the Public Health Medical Institution AMT Buiucani, for the diagnosis of cases of ADD. The basis of bacteriological analyzes is obtaining the pure culture of the pathogen and its subsequent study. The etiological confirmation of the disease was carried out on the basis of coprological culture, according to the methodological indication "Microbiological diagnosis of intestinal infections" recommended by the Ministry of Health of the Republic of Moldova.

During the study period, 10 microorganisms from the Enterobacteriaceae family were identified – 8 conditionally pathogenic agents (*Klebsiella* spp., *Enterobacter* spp., *Proteus* spp., *Citrobacter* spp., *Escherichia coli* with hemolyzing properties, *Morganella* spp., *Serratia* spp. and *Providencia* spp.), with a share of 94.15% and 2 pathogens (*Shigella* spp., *Salmonella* spp.), with a share of 5.85%. The etiological spectrum of conditionally pathogenic agents was dominated by *Klebsiella* spp. (43.71%), of pathogenic ones – by *Salmonella* spp. (5.35%). The highest circulation of microorganisms from the Enterobacteriaceae family was highlighted in the period 2011 – 2014 (10.2% - 1.58%), the lowest – in 2020 (3.97%).

During the study period, the dynamics of the circulation of microorganisms from the Enterobacteriaceae family registered a slow decrease, the etiological spectrum was dominated by *Klebsiella* spp. Continuous surveillance and the implementation of infection prevention strategies are necessary to mitigate acute bacterial diarrhea.

Acknowledgments: *This study was supported by the doctoral project "Pathogenic agents of acute diarrheal diseases - morpho-cultural features, methods of identification, antibiotic resistance and the dynamics of spread in Chisinau city" funded by the Ministry of Education and Research.*

Keywords: *acute diarrheal diseases, microorganisms, Enterobacteriaceae.*

UDC: 581.135.5:635.71

BIOLOGICAL PROPERTIES AND COMPOSITION OF ESSENTIAL OIL DERIVED FROM *ORIGANUM MAJORANA* L. CULTIVATED IN THE SOUTHERN STEPPE

Hlushchenko Lyudmila[1]*, ORCID: 0000-0003-2329-5537
Svydenko Lyudmila[2], ORCID: 0000-0002-4043-9240
Svydenko Andrew A.[2], ORCID: 0000-0002-7143-4872

[1]Research station of medicinal plants of the Institute of Agroecology and Nature Management of the NAAS
[2]Institute of climate smart agriculture by the NAAS

*E-mail: *L256@.ukr.net*

Origanum majorana L. is a perennial undershrub of the Lamiaceae family which has been widely used as a herb, medicinal and decorative plant. Marjoram is indigenous to the Mediterranean region of Europe and Africa.

Here we have investigated the cultivar *O. majorana* 'Прекрасний', which was introduced from Nikita Botanical Garden. We have quantified the essential oil fraction during the mass-flowering phase using hydro-distillantion with a Clevenger apparatus. The composition of essential oil was determined by gas–liquid partition chromatography (GLPC).

Seeding was performed in the Kherson region (Ukraine) in the second decade of April. Plants are typically flowering and producing fruit in the first year of vegetation. Mass-flowering starts in the second decade of July. In the Southern Steppe the flowering of *O. majorana* lasts for one month. Plants reach the size of 40-45 cm in height and 20-30 cm in width during the mass-flowering phase. Mass-fruiting occurs in the end of the second and the start of the third decade of August. Vegetation of these plants lasts for 160 days during the first year of life. In the Southern Steppe, without a special treatment, 70-80% of plants cannot sustain the low temperatures in the winter months and are destroyed by frost. Therefore, we have covered them with soil by the first autumn frosts. Additionally, we have seeded and cultivated the plants in the cold seedbeds without coverage. In both cases we have achieved 98-100% successful overwintering of the plants.

The yield of raw material from one plant was on average 230 grams. Mass fraction of essential oil was 0,17-0,20 % of the mass of freshly-collected raw material and depends on the weather conditions of the year. We have identified 12 terpenoids in the essential oil of *O. majorana*, of which the majority components are monocyclic terpene alcohol terpinen-4-ol (31,4%), linalool (13,9%), g-terpinene (10,49%), sabinene hydrate (6,3%), α-Terpinene (5,0%), alpha terpineol (4,9%). Assuming the open market price for the oil, the calculated rate of return on cultivating *O. majorana* in the Southern Steppe should reach 42%.

This study demonstrates that *O. majorana* can be cultivated as a perennial plant in the Southern Steppe. This cultivar has a good crop capacity of raw material and acceptable yield of essential oil which contains valuable components such as terpinen-4-ol, linalool and g-terpinene.

Keywords: *marjoram, developmental biology, essential oil, GLPC, cultivation.*

UDC: 599.323:616.894

6-HYDROXY-L-NICOTINE ALLEVIATES COGNITIVE IMPAIRMENT IN 5XFAD TRANSGENIC MICE

Hritcu Lucian*, ORCID: 0000-0001-6981-4174
Boiangiu Razvan Stefan, ORCID: 0000-0002-2602-4882
Honceriu Iasmina, ORCID: 0000-0001-8935-9519
Brinza Ion, ORCID: 0000-0003-3103-9728
Mihasan Marius, ORCID: 0000-0003-4439-4251

Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University of Iasi, 700506 Iasi, Romania

*E-mail: *hritcu@uaic.ro*

6-hydroxy-L-nicotine (6HLN) is a nicotinic derivative from the nicotine metabolism within *Paenarthrobacter nicotinovorans* that possess cognitive-improving abilities and antioxidant properties, eluding the side-effects of nicotine, the parent molecule. The present study was conducted to examine the effects of 6HLN on cognitive impairments in 5XFAD transgenic mice with five familial Alzheimer's disease (AD) mutations. 6HLN (0.3 mg/kg and 0.6 mg/kg, b.w., i.p.) was administered daily to 5XFAD mice for 7 days and 30 min before behavioral testing. Cognitive function was evaluated using Y-maze and radial arm maze tests, while anxiety-depressive-like behaviors were assessed by elevated plus maze and forced swimming tests. To elucidate the possible mechanism underlying the memory improving effects of 6HLN in 5XFAD mice, Aβ1-42 and DNA fragmentation levels in mice hippocampus were evaluated. Vehicle-treated 5XFAD mice exhibited hippocampus-dependent memory deficits as compared with non-transgenic mice, which were reversed in 6HLN-treated 5XFAD mice. In addition, reduced hippocampal Aβ1-42 and DNA fragmentation levels in 6HLN-treated 5XFAD mice as compared to non-transgenic mice were noticed, indicating positive effects of 6HLN on cognitive function. Collectively, findings from this study support the positive effects of 6HLN against AD.

Acknowledgments: *This work was supported by a grant of Ministery of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-III-P4-PCE-2021-1692, within PNCDI III.*

Keywords: *6-hydroxy-L-nicotine, memory, 5xFAD mice, Alzheimer's disease*.

UDC: 597.2/.5:616.89-008.46:582.892

FOENICULUM VULGARE MILL. REDUCES MEMORY IMPAIRMENT IN SCOPOLAMINE ZEBRAFISH MODEL

Hritcu Lucian*, ORCID: 0000-0001-6981-4174
Brinza Ion, ORCID: 0000-0003-3103-9728
Boiangiu Razvan Stefan, ORCID: 0000-0002-2602-4882
Todirascu-Ciornea Elena, ORCID: 0000-0002-1478-5529
Dumitru Gabriela, ORCID: 0000-0003-2074-1394

Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University of Iasi, 700506 Iasi, Romania

*E-mail: *hritcu@uaic.ro*

Foeniculum vulgare Mill. (Apiaceae) is an aromatic plant with anti-inflammatory, antispasmodic, antiseptic, carminative, diuretic, and analgesic effects. The purpose of this study was to evaluate the impact of the *F. vulgare* Mill. essential oil (FVEO, 25, 150, and 300 μg/L) on cognitive performance and brain oxidative stress in scopolamine (SCOP, 100 μM) - induced a zebrafish model of cognitive impairment and further predicted the pharmacokinetic properties of the main compounds identified in FVEO by integrated approaches of *in silico* analysis using platforms such as SwissADME, pKCSM, PASS online, and ADMETlab 2.0. Zebrafish behavior was analyzed by using novel tank diving test (NTT), Y-maze, and novel object recognition (NOR) tests. The acetylcholinesterase (AChE) activity and the brain oxidative stress were also examined. The results revealed a remarkable improvement in behavioral performance following exposure of SCOP-given zebrafish to FVEO, while the activity of the cholinergic system and brain oxidative stress were normalized also. These findings underscore the prospect of using *F. vulgare* to ameliorate memory impairment and reduce brain oxidative stress associated with cognitive disorders, including Alzheimer's disease (AD).

Acknowledgments: *This work was supported by a grant of Ministery of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-III-P4-PCE-2021-1692, within PNCDI III.*

Keywords: *Foeniculum vulgare*, memory, zebrafish, Alzheimer's disease.

UDC: 57.084:597.2/.5:616-006.6

THE BENEFITS OF USING ZEBRAFISH IN CANCER RESEARCH: AN INNOVATIVE MODEL FOR THERAPEUTIC DISCOVERIES

Ionescu Cătălina[1,2]*, ORCID: 0009-0008-4979-1057
Ciobîcă Alin[1,2,3,4]
Burlui Vasile[2,4]
Rarincă Viorica[1,2,5], ORCID: 0000-0003-0256-8911

[1]Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University of Iasi, Bd. Carol I no. 20A, 700505 Iasi, Romania
[2]Clinical Department, Apollonia University, Păcurari Street 11, 700511 Iasi, Romania
[3]Center of Biomedical Research, Romanian Academy, Iasi Branch, Teodor Codrescu 2, 700481 Iasi, Romania
[4]Academy of Romanian Scientists, Str. Splaiul Independentei no. 54, Sector 5, 050094 Bucharest, Romania
[5]Doctoral School of Geosciences, Faculty of Geography and Geology, Alexandru Ioan Cuza University of Iasi, No 20A, Carol I Avenue, 700505 Iasi, Romania

*E-mail: *catalinaionescu81@yahoo.com*

The zebrafish (*Danio rerio*) has emerged as a crucial vertebrate model organism in biomedical research. Initially used for studies in genetics and vertebrate development, the zebrafish model has evolved into a robust system for investigating various human diseases, including cancer. Zebrafish are increasingly becoming a preferred model for cancer research due to the high conservation of genetic pathways involved in cancer between zebrafish and humans. The ease of genome manipulation in zebrafish allows for the rapid creation of transgenic animals, enhancing their utility as a model organism. Moreover, the capability to image cancer cells and study the biology of tumors in their natural environment makes zebrafish an invaluable tool for understanding tumorigenesis and screening new cancer therapies. The application of zebrafish in cancer research spans several key areas: (1) creating cancer models through carcinogenic chemicals, genetic technology, and xenotransplantation; (2) assessing tumor angiogenesis; (3) investigating tumor metastasis; and (4) screening anti-tumor drugs and evaluating drug toxicity. Recent advancements in zebrafish xenotransplantation studies and drug screening have demonstrated that zebrafish is a reliable model for studying human cancer. This model is particularly effective for assessing the invasiveness of patient-derived xenograft cells. The ability to quickly and extensively evaluate in vivo drug responses and kinetics in zebrafish could significantly contribute to new applications in personalized medicine and combination therapies.

***Keywords**: zebrafish, cancer, xenograft, xenotransplantation.*

UDC: 633.854.78:631.8(477)

FORMATION OF SUNFLOWER PRODUCTIVITY DEPENDS ON FERTILIZER IN THE WESTERN FORESTS OF UKRAINE

Kurach Oksana, ORCID: 0000-0002-1343-097X

Institute of Agriculture of the Western Polissia of the National Academy of Sciences of Ukraine, c. Shubkiv, Rivne district, Rivne region, st. Rivnenska, 5, 35325, Ukraine

E-mail*: kyrach18@gmail.com, rivne_apv@ukr.net*

The aim of the study. Develop a balanced system of plant nutrition to increase the productivity of sunflower hybrids, which will ensure the maximum possible realization of their biological potential for the conditions of the region.

Research methods. The research is based on field experiments using the following methods: counting and weighing - to determine the parameters of the crop structure and seed yield; chemical - to determine the content of nutrients in the soil, oil content; mathematical and statistical - to assess the reliability of research results; calculation and comparative - to determine the economic efficiency of growing technologies.

As a result of the conducted research, the technology of growing sunflowers in the conditions of Western Polissia has been improved, which will ensure the maximum possible realization of their biological potential for the conditions of the region.

The largest basket diameter of 24,3 cm and the number of baskets of 6,1 pcs./m^2 was noted in the hybrid Feeder for the $N_{90}P_{60}K_{120}$ fertilization system in combination with two-time foliar fertilizing of Vympel 2 plants (0,5 l/ha) in phase 3-4 and 5- 6 leaves, while on the version without fertilizers and water treatment (control), the indicators were significantly lower, 18,9 cm and 4,4 pcs./m^2, respectively.

For hybrids Huslyar, Integral, and Feeder, the mass of 1000 seeds was the largest and was 49,8 g, 43,6 g, 52,6 g for the $N_{90}P_{60}K_{120}$ fertilization system in combination with two-time foliar fertilizing of plants Vympel 2 (0,5 l/ha) in the phase of 3-4 and 5-6 leaves, and the lowest value of the studied indicator (38,8 g, 33,5 g, 40,4 g) was recorded on the variant without fertilizers and water treatment. According to the results of the research, the highest yield of sunflower seeds was obtained in the hybrids Hodavniki – 3,18 t/ha, Guslyar – 2,44 t/ha, and Integral – 2,35 t/ha, respectively, under the $N_{90}P_{60}K_{120}$ fertilization system compatible with foliar fertilizing Vympel 2 (0,5 l/ha) in the phase of 3-4 and 5-6 leaves.

It was established that the highest oil yield of 1,22-1,73 t/ha of the investigated sunflower hybrids was observed in the variant with the introduction of $N_{90}P_{60}K_{120}$ in combination with foliar fertilizing Vimpel 2 (0,5 l/ha) in phase 3-4 and 5-6 leaves

Keywords: *sunflower, doses of fertilizer, growth stimulant, foliar fertilization, productivity.*

UDC: 591.54:599.323.4

INFLUENCE OF CLIMATE FACTORS ON THE POPULATION OF THE SPECIES MUS SPICILEGUS PETENYI (RODENTIA, MURIDAE) IN DIFFERENT TYPES OF AGROCENOSES

Larion Alina*, ORCID: 0000-0002-5313-4518
Nistreanu Victoria, ORCID: 0000-0002-9726-9684

Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

*E-mail:*alina.larion@sti.usm.md*

The mound building mouse (*Mus spicilegus*) is one of the dominant species of rodents in the agrocenoses of the republic, sensitive to the action of climatic factors (instability of the weather, sudden and short-term temperature fluctuations, etc.). The purpose of this work is to highlight the action of climatic factors on the population of the species in various types of agrocenoses.

The research was carried out during 2008-2024 on cereal fields (wheat, corn), sunflower, perennial plants and fallow ground. In the studied period the climatic conditions were different, in several years (2009, 2011, 2015, 2019, 2020) the mean temperature was higher and with low amount of precipitations. *M. spicilegus* is distributed unevenly on the territory of its spreading area, inhabiting only the open biotopes. The highest density of the species can be observed in the autumn period, after the construction of the mounds, when the abundance of the species reached about 60% from the rodent communities with an ecological significance of 23.9%. The highest relative abundance was recorded on cultivated lands: in cornfields the abundance varied between 17.2% - 56.9%, in cereals - 8.6% - 43.9%, in sunflower - 1.54% - 34.5% and in fallow ground - 12.9% - 36.8%. This species is characteristic or constant in these types of biotopes, having an ecological significance of - 7.9% - 44.4%. The lowest relative abundance was recorded in orchards – 1.3% - 4.6%, being an accessory species, with the ecological significance of – 3.8%.

During the study period, the population of *M. spicilegus* increased its number from 10-16 ind./ha in spring to several dozens in autumn after a long reproduction period. In the cold season the survival of the individuals varied from 35% to 67%, is different from one year to another and depends on climatic conditions. Thus, the annual abundance of the species does not differ significantly from year to year. The correlation of the dependence of the density of the mounds on the aridity of the climate is negative and not significant. The abundance of the species largely depends on the agrotechnical measures used in the agricultural ecosystems, especially in autumn, when the mound can be destroyed, which lead to the increased individual mortality.

Acknowledgments: *The studies were conducted within the subprogram 010701 "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population", funded by the Ministry of Education and Research.*

Keywords: *Mus spicilegus, climatic conditions, abundance, ecological significance.*

UDC: 57.084:591.51

SYNCHRONIZATION OF EATING BEHAVIOR AND CIRCADIAN ACTIVITY AS AN EVOLUTIONARY-PHYSIOLOGICAL MEANS FOR THE ACTIVATING AND REWARDING SYSTEMS BALANCING

Listopadova Lyudmila

Doctoral School of Biological, Geonomic, Chemical and Technological Sciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *listopadovaliudmila@gmail.com*

The increase in the number of severe functional disorders and diseases of the nervous system associated with a disorder in the regulatory systems of energy and plastic metabolism, nutrition and digestion in association with violation of the circadian work and rest regime. The goal is to experimentally test the possibility of balancing the activating and rewarding systems by purposefully synchronizing acts of eating behavior with forced circadian activity.

The subjects of the study were laboratory animals (rats) raised in vivarium conditions. A qualitative and quantitative assessment of acts of eating behavior and expression of emotions in the area of the animal's head was carried out. The activity of the centers of the activation and reward systems was modulated by electrical stimulation. Induction of motivated eating behavior was carried out by introducing products that have a hedonic effect on the background of preliminary daily food deprivation. Manipulations with changes in circadian activity were performed using forced induction of forced physical activity in a rotating cage. Animals fed a standard diet with normal daily activity served as controls. Statistical analysis was performed using Student's t test.

The results obtained indicate that after the start of daily sessions of electrical stimulation of the cellular elements of the orexinergic center, the number of various acts of eating behavior (searching and sniffing; approaches to the feeder; approaches to the drinking bowl; eating; gnawing on the grate) increases noticeably compared to the control (by 19.6; 23.4; 17.8 and 16.5%, $P < 0.05$, respectively). In addition, the total duration of acts of eating behavior and the average duration of each act increase when using products with hedonic effects. However, the number and total duration of behavioral acts of washing, grooming and relaxed lying down are somewhat reduced after the forced acceleration of physical activity during the rest period (during daylight hours). This important circumstance must be taken into account when planning and designing all areas of modern circadian working and educational activities.

Acknowledgments: *This study was supported by the research project (The role of the orexinergic system of the brain in regulating the sleep-wake cycle and nutritional behavior), funded by (Ministry of Education and Research).*

Keywords: *circadian rhythm, food behavior, activating system, reward system.*

UDC: 612.8:004.8

MAIN ELEMENTS OF THE ARTIFICIAL NEURAL NETWORKS BASED ON THE JOSEPHSON JUNCTION

Lupu Maria, ORCID: 0000-0001-6768-9357

Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D.Ghitu", Chisinau, Republic of Moldova

E-mail: *simplex.prof.nanotech@gmail.com*

The concept of neuronal development is associated with the concept of brain plasticity - the ability to adjust the nervous system in accordance with environmental conditions. It is plasticity that plays the most important role in the functioning of neurons as information processing units in the human brain. Similarly, in artificial neural networks, work is done with artificial neurons. In general, a neural network is a machine that models the way the brain processes a specific task. This network is usually implemented using electronic components or simulated by a program running on a digital computer. The technique of analyzing macroscopic quantum effects in multi-contact and multi-circuit superconducting quantum interferometers was used for the first time to study the possibilities of integrating artificial neural networks into digitized signal processing systems with built-in magnetic Josephson memory. The developed compact neurons allow for the operation (on subnanosecond time scales) "calculate" the activation function of a neuron. The proposed study is relevant due to the possibility of developing new energy-efficient computers with non-von Neumann architecture based on elements of superconducting spintronics.

***Acknowledgments*:** *This study was supported by the research project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201, funded by Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D.Ghitu".*

Keywords: *artificial intelligence, energy efficiency, Gauss-Newton method, magnetic Josephson memory.*

References:

S. Bakurskiy, M. Kupriyanov, N. Klenov, I. Soloviev, A. Schegolev, R. Morari, Yu. Khaydukov, A. Sidorenko, „Controlling the proximity effect in a Co/Nb multilayer: the properties of electronic transport", *Beilstein J. Nanotechnol.* 2020, 11, pp.1336–1345. https://doi.org/10.3762/bjnano.11.118

KLENOV, Nikolai V., SOLOVIEV, Igor I., BAKURSKIY, Sergey V., BOIAN, Vladimir, LUPU, Maria, MALCOCI, Cezar Casian, PREPELIȚA, Andrei, ANTROPOV, Evgheni, MORARI, Roman, SIDORENKO, Anatolie. Spintronic Functional Nanostructures for Artificial Neural Network. In: *Electronics, Communications and Computing*. Editia 12, 20-21 octombrie 2022, Chișinău. Chișinău: Tehnica-UTM, 2023, p. 24. https://ibn.idsi.md/vizualizare_articol/177456

UDC: 599.35/.38(478)

INSECTIVOROUS MAMMALS (MAMMALIA: EULIPOTYPHLA) FROM THE URBAN ECOSYSTEMS OF CHISINAU CITY

Nistreanu Victoria[1]*, ORCID: 0000-0002-972-96846
Larion Alina[1], ORCID: 0000-0002-5313-4518
Burlacu Victoria[2], ORCID: 0000-0002-8828-1585

[1]Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova
[2]National Agency for Public Health, Chisinau, Republic of Moldova

*E-mail: *victoria.nistreanu@sti.usm.md*

The insectivorous mammals have an extraordinary role in maintaining the ecological balance of urban habitats and serve as ecological indicators of urban ecosystem stability and status. The studies sere performed in 2010-2022 in various types of ecosystems of Chisinau municipality.

On the territory of the Chisinau city, six species of insectivorous mammals were registered: *Erinaceus roumanicus*, *Talpa europaea*, *Sorex araneus*, *S. minutus*, *Crocidura leucodon* and *C. suaveolens*.

In the urban ecosystems the white-breasted hedgehog density varied between 0.3 ind./ha and 5.3 ind./ha, being the highest in suburban area with gardens and parks and the lowest in the neighborhoods with blocks of flats. The mole density varied between 0-1 ind./ha in city parks to 4.4 ind./ha in pastures and meadows.

Among Soricidae, the dominant species for all years was *C. leucodon* (32.89%), followed by *C. suaveolens* (30.26%), while the *Sorex* species constituted less than 20% each, due to the fact that the forest ecosystems of the city are poorly represented.

The analysis of the level of anthropic adaptability showed the highest index of anthropic adaptation for *E. roumanicus*, which is an anthropophilic species – 10.53. In *T. europaea*, a neutral species with a hidden way of life, the anthropogenic adaptation index was 9.09. Among the shrews, the highest index was in *C. suaveolens* – 9.03, which can be considered an anthropophilic species, intensively populating cultivated lands and gardens in localities, but still has a hidden way of life. Less anthropogenically adapted is *C. leucodon*, with an index of 8.7 and is a neutral species, being also a vulnerable species listed in the Red Book of the Republic of Moldova. Both species of genus *Sorex* have lower indexes of anthropic adaptation – 8.33 for *S. araneus* and 7.69 for *S. minutus*, having strong preferences for natural habitats.

Shrew species are indicators of ecosystem stability, and the absence of *Neomys milleri* species in urban habitats, as well as the low share of *Sorex* species denotes that most of the city's ecosystems are still changing and have not reached a stable equilibrium.

Acknowledgments: *This study was supported by the research project no. 010701 "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population", funded by the Ministry of Education and Research.*

Keywords: *insectivorous mammals, urban ecosystems, density, anthropic adaptation*.

UDC: 591.157:568.1(498)

EXPLORING COLOR ABERRATIONS: THREE CASES OF ABNORMAL PIGMENTATION IN FREE-RANGING REPTILES FROM ROMANIA

Petreanu Ionuț-Cătălin

Faculty of Biology, „Alexandru Ioan Cuza" University of Iași, Iași, Romania

E-mail: *icpetreanu@yahoo.com*

The Grass Snake (*Natrix natrix*), the Eastern Green Lizard (*Lacerta viridis*) and the Smooth Snake (*Coronella austriaca*) are three very well-studied species of European reptiles with wide ranges, the Grass Snake presenting various color morphs. Sometimes, color aberrations, such as melanism, albinism, leucism or erythrism, can occur in reptiles. Melanism refers to great amounts of melanin being produced, while albinism refers, generally, to the partial or complete lack of it. There is also piebaldism, sometimes considered a form of partial albinism, a phenotype which is characterized by leucodermic patches. My work presents an observation of an albino juvenile Grass Snake (*Natrix natrix*) photographed in a park in Bucharest, Romania (recorded with the aid of citizen science) and a personal observation of a melanistic Eastern Green Lizard (*Lacerta viridis*), found at Valea lui David, Iași, Romania, as well as a record of a piebald Smooth Snake (*Coronella austriaca*) recorded with the aid of citizen science as well. The albino *N.natrix* had no pigment visible, in contrast with already published records which presented xanthophores or other pigments. This means this record represents the first ever wild observation of a completely albino *Natrix natrix*. The melanistic *L.viridis* represents the first observation of melanism in this species recorded from Romania. To my knowledge, there have been no published observations of piebaldism in *Coronella austriaca*, this being the first one.

Keywords: *albinism, chromatophores, phenotypes, Natrix natrix, color aberrations, melanism, piebaldism.*

UDC: 577.181:577.164.3:57.084

THE IMPACT OF AMPICILLIN AND QUERCETIN ON ZEBRAFISH SOCIAL BEHAVIOR: A COMPARATIVE STUDY OF THE SINGLE AND COMBINED EFFECTS

Rarinca Viorica[1,2,3]*, ORCID: 0000-0003-0256-8911
Nicoara Mircea[1,4], ORCID: 0000-0002-9755-6771
Burlui Vasile[3]
Ciobica Alin[1,4,5,6]
Ionescu Catalina[3,4], ORCID: 0009-0008-4979-1057

[1]Doctoral School of Geosciences, Faculty of Geography and Geology, Alexandru Ioan Cuza University of Iasi, No 20A, Carol I Avenue, 700505 Iasi, Romania
[2]Doctoral School of Biology, Faculty of Biology, "Alexandru Ioan Cuza" University of Iași, Carol I Avenue, 20A, Iasi, Romania
[3]Preclinical Department, Apollonia University, Pacurari Street 11, 700511 Iasi, Romania
[4]Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University of Iasi, No 20A, Carol I Avenue,700505 Iasi, Romania
[5]Center of Biomedical Research, Romanian Academy, no 8, Carol I Avenue, 700506 Iasi, Romania
[6]Academy of Romanian Scientists, no 54, Independence Street, Sector 5, 050094 Bucharest, Romania

*E-mail: *rarinca_viorica@yahoo.com*

Zebrafish (*Danio rerio*) are one of the most popular model organisms used in research due to their complex social behavior and the similarity of their nervous system to that of humans. Ampicillin is an antibiotic of the beta-lactam class, which is used in the treatment of bacterial infections. It can reach the environment through the excretion of animals treated with this antibiotic or through the elimination of drug residues. Quercetin is an organic compound involved in cellular metabolism and has antioxidant properties. It can be found naturally in some foods and is also available as a dietary supplement. Studies have shown that quercetin can have beneficial effects on the nervous system, including protection against oxidative stress and supporting cognitive function. Regarding the effects on social behavior and the nervous system in zebrafish, administration of ampicillin was associated with disturbances in social behavior such as increased aggressive behavior and decreased social behavior. These effects were also observed in our study, following acute administration and the measurement of parameters at the initial moment and after 6, 12, 24, 48, 72 and 96 hours after administration. On the other hand, quercetin has shown the potential to alleviate oxidative stress and improve nerve function in various species, including zebrafish. In the case of single administration, quercetin was observed to improve social behavior, by increasing the time spent in the left arm where the stimulus is located. In the case of administration with ampicillin, the reduction of aggressive behavior induced by ampicillin and the improvement of social behavior were observed. In addition, the observations in this study demonstrate the zebrafish as an in vivo model for evaluating the neuroprotective actions of antibiotics and antioxidants.

Keywords: *quercetin, zebrafish, social behavior, ampicillin.*

UDC: 613.2:616.34

IMPACT OF DIETARY INTERVENTION IN A PATIENT WITH INTESTINAL DYSBIOSIS: A CASE STUDY

Ratea-Pop Camelia, ORCID: 0000-0003-2828-8707

Moldova State University, Chisinau, Republic of Moldova,
Doctoral School of Natural Sciences

E-mail*: nirasteancamelia@yahoo.com*

The imbalance of microbial communities in the gut has been increasingly recognized for its role in various health issues, including chronic fatigue. Dysbiosis, or the disruption of the normal microbiota, can trigger an inflammatory response in the body. The gut-associated lymphoid tissue (GALT) is a critical component of the immune system, and an imbalance in the gut microbiota can lead to increased permeability of the gut lining, known as "leaky gut." The gut microbiota plays a crucial role in maintaining overall health by aiding digestion, supporting the immune system, and influencing the central nervous system through the gut-brain axis. It is also involved in the metabolism of nutrients and the production of short-chain fatty acids like butyrate, which are essential for energy metabolism. Dysbiosis can lead to a reduction in the production of these vital metabolites, resulting in metabolic imbalances and decreased energy production, which contributes to fatigue. When the balance of these microorganisms is disrupted, it can lead to various symptoms and health conditions, including chronic fatigue. Research has shown that individuals with chronic fatigue syndrome often have an altered gut microbiota composition compared to healthy controls, with decreased levels of beneficial bacteria and increased levels of pathogenic bacteria.

The main aim of this study was to highlight the link between diet intervention and intestinal dysbiosis with chronic fatigue symptoms.

This case study examines the impact of a dietary intervention on a 42-year-old female experiencing a range of gastrointestinal and systemic symptoms such as bloating, chronic fatigue, insomnia, increased cravings for sweets, and brain fog. These symptoms were significant enough to warrant a detailed analysis of her gut microbiota to identify potential imbalances.

The initial stool analysis was assessed using a commercial kit, results were conducted in a laboratory in Germany,Ganzimmun Diagnostics GmbH, on September, 2023, revealed several imbalances in her gut microbiota. Key indicators such as fecal pH and the concentrations of various bacterial and fungal species, including *Escherichia coli*, *Bifidobacterium*, *Enterococcus*, *Geotrichum*, and *Candida krusei*, were outside the normal reference ranges. To address these imbalances, the patient underwent a comprehensive dietary intervention for 8 months. This intervention included the use of probiotics, enzymes, monolaurin, CBD oil, oregano oil, and garlic. The goal was to restore a healthy balance in her gut microbiota, alleviate her symptoms, and improve her overall well-being. After the dietary intervention and the use of supplements, the following improvements were observed in the fecal analysis values: fecal pH decreased from 7 to 6.5, entering the normal range, the concentration of Escherichia coli significantly decreased, approaching the normal range. Following the intervention, a second stool analysis was performed on April 8, 2024. The results (chart 1,2) showed

significant improvements in the levels of various gut microorganisms, reflecting a positive response to the dietary changes and supplementation.

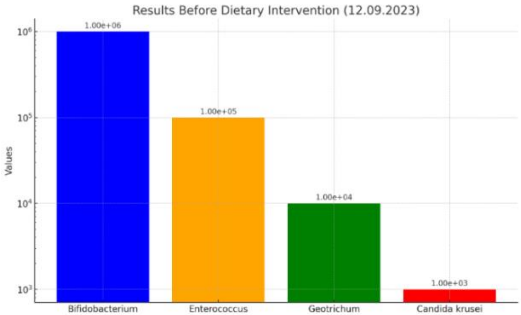


Chart 1. Bacterial distribution levels before diet intervention

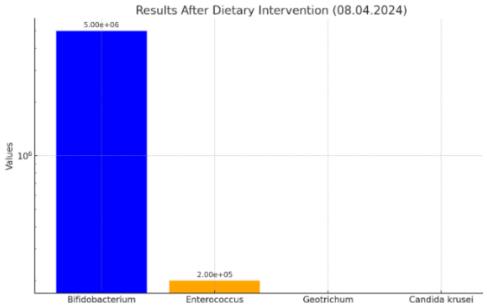


Chart 2. Bacterial distribution levels after diet intervention

This case study highlights the importance of gut health in managing chronic symptoms and the potential benefits of targeted dietary interventions in restoring microbiota balance. Clinical data and observations from patient records demonstrate a significant link between dietary interventions and improvements in symptoms. Additionally, food supplements such as probiotics, monolaurin (500 mg), oregano oil (carvacrol 80%), CBD oil (5% full spectrum), garlic extract (500 mg), and enzymes play an important role in alleviating gut dysbiosis and reducing chronic fatigue.

Keywords: *gut dysbosis, leaky gut, diet intervention, chronic fatigue, probiotics, oregano oil.*

UDC: 613.2:616-008.9

IMPACT OF DIETARY INTERVENTION IN A PATIENT WITH REFSUM DISEASE: A CASE STUDY

Ratea-Pop Camelia, ORCID: 0000-0003-2828-8707

Moldova State University, Chisinau, Republic of Moldova ,
Doctoral School of Natural Sciences

E-mail: *nirasteancamelia@yahoo.com*

Refsum disease is a rare genetic and neurological disorder characterized by the accumulation of phytanic acid in tissues. Symptoms can vary depending on the level of phytanic acid accumulation: vision problems, hearing problems, ataxia, peripheral neuropathy, dermatological problems, bone deformities, cardiomyopathy. Current therapies include a diet low in phytanic acid. It has been demonstrated that dietary control of the disease depends not only on a diet low in phytanic acid but also on a high-calorie diet, which prevents the mobilization of phytanic acid from fat stores.

The main aim of this study was to highlight the link between diet intervention, dysbiosis, pyruvate levels and phytanic acid in improving the life of a patient with Refsum. The secondary aim was to assess the nutritional supplements needed to improve the lack of nutrients in their diet.

The case study focuses on a female patient age 55 diagnosed with the rare Refsum disease, evaluated at the Pronutrition Prevention Center in Târgu-Mureș, Romania on March 3, 2022. She presented to a licensed clinical dietitian with chronic bowel evacuation problems, associated intestinal dysbiosis, loss of appetite, chronic fatigue where nutritional anamnesis revealed eating disorders. The dietary intervention was observed during a period of six months.

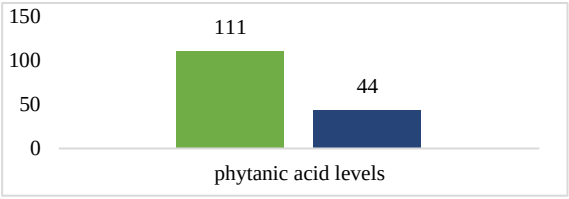


Chart 1. Phytanic acid levels during diet intervention

Following the analyses evaluated before starting the diet and re-evaluated after six months of supervision and nutritional intervention, the patient showed improvements in phytanic acid plasma levels, from 111mg/L to 44mg/L as well as a higher levels in pyruvate levels in blood from 4,02µmol/L to 6,69µmol/L. This indicates a possible improvement in the patient's mitochondrial function and energy metabolism. The patient had also the alleviation of intestinal dysbiosis symptoms, such as bloating and slow transit, improved in her chronic fatigue and reported an improvement in vision and sleep quality.

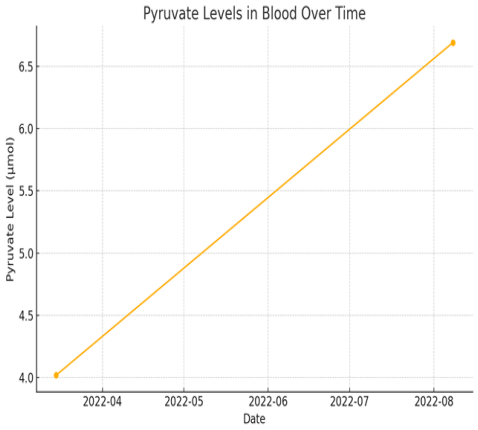


Chart 2. Pyruvate levels during diet intervention

Clinical data and observations from patient records demonstrate a significant link between dietary interventions and improvements in symptoms. Additionally, food supplements: probiotics, and antioxidants such as zeaxanthin, lutein, D-ribose, and enzymes play an important role in alleviating gut dysbiosis, improving vision, and reducing chronic fatigue. Dietary interventions not only help manage the accumulation of phytanic acid but also optimize cellular metabolic processes, thereby contributing to a comprehensive therapeutic response.

Keywords: *Refsum disease, gut dysbosis, pyruvate, phytanic acid, diet intervention, chronic fatigue.*

UDC: 598.235.2(478)

FIRST RECORD OF THE DALMATIAN PELICAN (AVES: PELECANIFORMES) THE LOWER DNIESTER

Romanovich Nikolai, ORCID: 0009-0008-0566-0776

Doctoral School Natural Sciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *ecoterrapmr@mail.ru*

Dalmatian pelican (*Pelecanus crispus* Bruch, 1832) is a critically endangered species [CR], included in the Red Book of Moldova, Birds Directive (Annex I), Bern Convention, 1979 (Annex II). This species in the territory of modern Moldova was recorded only in the lands confined to the Danube basin, namely in the estuary of the Prut River on Congaz lakes, Taraclia from lunca r. Ialpug. The Dalmatian pelican nested in the Dniester delta until the middle of the 20th century and now rarely appears in the Odessa region (Ukraine) during summer migrations.

During the spring field studies of 2024, 2 individuals of the Dalmatian pelican were found in the Ramsar site «Lower Dniester» (No 1316 on the Ramsar List). On 27.03 and 13.05. they fed on the temporary reservoir of the island of Kutsa, near the village of Nezavertailovka. These were adults, probably arriving from the surrounding reservoirs of the Lower Dniester. This is the first registration of the species in this location.

Kutsa Island is located in the northern part of the Ramsar Site "Lower Dniester", between the left bank of the Turunchuk arm and the Aksentievo Girlo Channel below the village of Nezavertailovka, 10 kilometers south of the city of Dnestrovsk, and with sufficient water supply, favorable conditions for limnophilic birds are created here.

The presence of the Dalmatian pelican on a river island in the lower reaches of the Dniester River may indicate an improvement in the state of populations of this species in general and its possible nesting in the Dniester delta in particular.

Figure 1. Dalmatian pelicans on the reservoir of Kutsa Island

Acknowledgments: *This study was supported by the doctoral project „Ecological-ethological peculiarities of aquatic and semi-aquatic bird species in the Lower Dniester area", funded by Ministry of Education and Research.*

Keywords: *Dalmatian pelican, Pelecanus crispus, Lower Dniester, wetland birds, rare species.*

UDC: 597.2/.5:591.53(498)

THE TROPHIC SPECTRUM OF CERTAIN FISH SPECIES FROM THE DAMBOVNIC RIVER

Rusu Angelica[1]*, ORCID: 0000-0003-0471-0862
Maxim Roxana[1]
Ureche Dorel[3], ORCID: 0000-0001-9488-9055
Plavan Gabriel[2], ORCID: 0000-0002-1194-1768
Cojocaru Ion[2]
Nicoară Mircea[1,2], ORCID: 0000-0002-9755-6771

[1]"Alexandru Ioan Cuza" University of Iasi, Doctoral School of Geosciences, Faculty of Geography and Geology, Bd. Carol I, 11, 700505, Iasi, Romania
[2]"Alexandru Ioan Cuza" University of Iasi, Department of Biology, Faculty of Biology, Bd. Carol I, 11, 700505 Iasi, Romania
[3]"Vasile Alecsandri" University of Bacau, Department of Biology, Ecology and Environmental Protection, Faculty of Sciences, Marasesti St., 157, 600115 Bacau, Romania

*E-mail: *rusu_angelica@yahoo.com*

Macroinvertebrates play a significant role in freshwater ecosystems as a trophic resource. Depending on the types of macroinvertebrates found in a stream, predictions can be made about water quality because different types of macroinvertebrates tolerate different flow conditions and pollution levels. The study aimed to analyze the diversity of macroinvertebrates present in the food of fish populations living in the Dambovnic River from the Argeș River basin. The sampling of fish was carried out by the electronarcosis method in the spring-summer of 2006. Through the quantitative and qualitative analysis of the macroinvertebrates from the stomachal content of 7 species of freshwater fish counting 212 individuals, 8 species or groups of macroinvertebrates were identified, and their specimens counted. The macroinvertebrates in the stomachal content were identified to the smallest possible taxon, while their importance in fish feeding was represented by ecological indicators: the Shannon-Wiener index and the Pielou index. Regarding the presence of macroinvertebrates in the digestive contents of fish, the dominance of the Class Insecta was observed, generally over 90% to 100% in all fish species studied. The larvae from the Order Diptera, Family Chironomidae, were the most numerous, representing 74% of the total number of individuals identified. In second place were the larvae from the Order Coleoptera, respectively the Order Ephemeroptera with a percentage of 5.6% and 5.3%. The analysis showed that *Carassius gibelio*, *Alburnus alburnus*, *Squalius cephalus*, and *Lepomis gibbosus* have a broad food spectrum and generalist feeding mode.

Keywords: *macroinvertebrates, stomach contents, microplastic, feeding mode, Shannon-Wiener index, Pielou index.*

UDC: 577.2:616-880.9

BIOCHEMICAL AND MOLECULAR EVALUATION IN 100 PATIENTS WITH SUSPECTED MITOCHONDRIAL DISORDER

Secu Doina[1,2]*, ORCID: 0000-0002-8571-0524
Blăniță Daniela[1,2], ORCID: 0000-0001-7736-3406
Ușurelu Natalia[1], ORCID: 0000-0001-8685-3933
Dorif Alexandr[1], ORCID: 0000-0003-4269-4066
Sacară Victoria[1], ORCID: 0000-0001-9200-0494

[1]Molecular Human Genetics Laboratory, Institute of Mother and Child,
[2]State University of Medicine and Pharmacy "Nicolae Testemițanu"
Chisinau, Republic of Moldova

*E-mail: *secudoina95@gmail.com*

Mitochondrial disorders (MD) are a group of rare hereditary disorders caused by mutations in nuclear or mitochondrial DNA (mtDNA), impairing cellular energy production. With an incidence of about 1 in 5,000 live births, MDs present a broad spectrum of symptoms, affecting multiple organ systems and complicating diagnosis and management. Accurate and timely genetic diagnosis is of paramount importance for managing mitochondrial disorders, determining prognosis, and providing effective counseling.

The purpose of the study is to elucidate the biochemical and molecular genetic spectrum in pediatric patients showing symptoms suggestive of MD.

A cohort of 100 patients with symptoms indicative of MD was screened for seven prevalent pathogenic mtDNA point mutations using quantitative PCR high-resolution melting (qPCR-HRM) analysis, followed by Sanger sequencing. Additionally, quantitative assays for plasma amino acids and urinary organic acids were conducted.

Upon enrollment, all patients were evaluated using the Nijmegen MD scoring system. In the cohort, 24 patients were classified as possible MD, 39 as probable MD, and 37 as definite MD. All patients with definite MD exhibited elevated serum lactate, and 19 of these patients also had elevated alanine levels. Abnormal urinary organic acid analysis was found in twelve patients. Using the qPCR-HRM technique, four patients were identified with mtDNA pathogenic mutations (m.3243 A>G, m.8993 T>G in two patients, and m.11778 G>A). Sanger sequencing of 21 mtDNA genes was conducted on 55 patients, revealing pathogenic or potentially pathogenic mutations linked to mitochondrial pathology in 19 individuals (34%).

Conclusions. In the cohort of 100 patients referred for clinical evaluation due to suspected MD, pathogenic and potentially pathogenic variants correlating with the patients' phenotype were detected in 23 patients.

Acknowledgments: *This study was supported by the research project „Medicina Genomică și Metabolomică în serviciul profilaxiei maladiilor genetice pentru generații sănătoase în Republica Moldova" [SCREENGEN, Cipher: 20.800009.8007.22].*

Keywords: *mitochondrial disorder; mitochondrial DNA; HRM technique; Sanger sequencing.*

UDC: 577.3:612

BIOMARKERS OF LONGEVITY

Septitchi Alexandr*, ORCID: 0009-0002-2948-3600
Ciochina Valentina, ORCID: 0009-0003-0741-505X

Institute of Physiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *alex99shep@gmail.com*

Despite its critical importance and extensive study in model organisms, a comprehensive understanding of the molecular changes that occur during human aging remains elusive. Characteristics of aging are heterogeneous, even among long-lived individuals. Associations between specific clinical or genetic biomarkers exist, but there is unlikely to be a single biomarker predictive of long life.

This study aimed to review the modern literature that describes and compares biomarkers among individuals who eventually become long-livers and their shorter-lived peers, investigates the association between specific biomarker values and the likelihood of reaching age 90, and examines the extent to which long-livers exhibit homogenous biomarker profiles earlier in life. There is limited knowledge about how the biomarker profiles of long-livers differ from those of non-long-livers at comparable ages earlier in life.

Biomarkers of longevity are classified into three broad categories: molecular, physiological, and cellular. Molecular biomarkers of longevity can be derived from omics technologies (such as epigenomics, proteomics, or metabolomics) or individual molecules (like circulating levels of interleukin-6 and insulin-like growth factor 1). Physiological biomarkers of longevity include measures of functional performance (such as cardiorespiratory fitness, VO_2 max, gait speed, timed walking distance, grip strength) as well as physical characteristics (such as BMI). Cellular-level biomarkers of longevity include telomere length, which shortens with each cell division; cellular senescence, marked by the accumulation of non-dividing cells; and mitochondrial dysfunction, characterized by reduced energy production and increased oxidative stress. Such biomarkers as epigenetic clocks, proteomic clocks, changes in processing speed, episodic memory, fine motor ability and brain glucose metabolism are linked to cognition and mental health. Careful observations in the oldest old offer some empirical strategies that favor increased health span and life span, identification of lifestyle behaviors that promote identification and measurement of more reliable markers associated with longevity.

While research on longevity biomarkers has led to significant progress and applications, further investigations are necessary. It is anticipated that future breakthroughs in this field will involve exploring the underlying mechanisms of longevity, developing universal biomarkers by integrating new technologies, and validating the clinical value of both existing and emerging biomarkers through extensive longitudinal studies.

Keywords: *biomarkers, aging, longevity, centenarians.*

UDC: 599.322/.324

EVOLUTIONARY TRENDS OF MAMMALS IN CONDITIONS OF ANTHROPIC CHANGES

Sîtnic Veaceslav*, ORCID: 0000-0003-3919-9232
Caldari Vladislav, ORCID: 0000-0002-8114-6751
Caraman Natalia, ORCID: 0000-0002-2506-3556

Moldova State University, Institute of Zoology
Chisinau, Republic of Moldova

*E-mail: *veaceslav.sitnic@sti.usm.md*

Of great importance for elucidating the laws of population ecology is the study of mammal communities. Knowledge of these laws is necessary for the development of measures to combat outbreaks of infectious diseases, the transmitters of which are animals, of pests in agriculture and forestry. The purpose of the research was to elucidate the diversity and structure of mammal communities and their evolutionary trends. This will allow the development of protection measures for rare species. The researches were carried out in various ecosystems on the territory of the Republic of Moldova, using the relative density assessment methods. The process of degradation of mammal populations is amplified under the influence of the anthropic factor, namely extensive and intensive agriculture, exploitation of improved lands, sanitation of wetlands, poaching. The area of forests has shrunk 4 times in the last century. XIX and the beginning of the century. XX, the fauna of forest ecosystems was strongly affected. Agrobiocenoses in the period aa. 50-60 century. XX occupied 70-80% of the republic's surface, the steppe and wetland ecosystems being strongly affected. The intensification of soil processing processes has had a catastrophic impact on terrestrial vertebrate species. The number of harmful species, namely rodents, has increased, and an intense process of synanthropization has been registered. The harmful activity of *Ratus norvegicus, Apodemus sylvaticus, Microtus arvalis, Mus spicilegus* etc. species has intensified. The presence of predatory mammal species *Mustela lutreola, Lutra lutra, Martes martes, Felis silvestris*, rodents *Spermophilus suslicus, Spermophilus citellus* is quite rare. The surface of aquapalust habitats favorable for wild animal species has decreased by 70%, and of forests in 2022 by 16,000 ha. The main causes of the decrease in the number of mammals and the number of species are the reduction of favorable habitats and their hunting**.**

Acknowledgments: *The work was carried out within the subprogramme "Evaluation of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population". Subprogram code: 010701*

Keywords: *population, diversity, communities, synanthropization.*

UDC: 591.54:598.115.33:591.157

TESTING THE THERMAL MELANISM HYPOTHESIS FOR ADDERS (VIPERA BERUS) USING CITIZEN SCIENCE

Spaseni Petronel[1]*, ORCID: 0009-0005-7477-605X
Gherghel Iulian[2], ORCID: 0000-0001-7963-6498
Sahlean Tiberiu C.[3], ORCID: 0000-0001-9014-9084
Strugariu Alexandru[2], ORCID: 0000-0001-7866-6732

[1]Faculty of Biology, Institute of Interdisciplinary Research, Alexandru Ioan Cuza University of Iași, Iași, Romania
[2]Department of Exact and Natural Sciences, Institute of Interdisciplinary Research, Alexandru Ioan Cuza University of Iași, Iași, Romania
[3]Institute of Biology Bucharest, Romanian Academy, Bucharest, Bucharest, Romania

*E-mail: *awpe94@gmail.com*

Animal coloration is a highly adaptive trait influenced by various selection pressures, including climatic variations. According to the thermal melanism hypothesis, ectotherms in colder geographic areas should exhibit darker pigmentation due to its thermoregulatory advantages. Adders (*Vipera berus*) are among the most studied reptiles regarding color polymorphism (i.e. the occurrence of two or more color morphs in the same population), especially the appearance and maintenance of melanism. Here, we used a dataset of approximately 6000 georeferenced photographs from citizen science platforms to investigate whether intraspecific color variation in adders supports the thermal melanism hypothesis. Each adder's dorsal coloration was recorded, and we analyzed the relationship between snake coloration and climate variables at the specific locations. We predicted that darker individuals would be present in colder regions and higher elevations, consistent with the thermal melanism hypothesis. Our results strongly suggest that temperature is a key predictor of darker individuals, especially melanistic ones, supporting thermal melanism. Elevation and the lack of precipitations are also predictive of color, but their effects are smaller compared to temperature. Overall, melanistic adders are significantly more likely to be found in colder regions, while lighter-colored ones are more prevalent in warmer areas with higher solar radiation. Our study underscores the importance of temperature in determining the distribution of melanistic adders, aligning with the thermal melanism hypothesis. The use of community-contributed data has been instrumental in providing a comprehensive understanding of how climatic factors shape the phenotypic traits of this species.

Acknowledgments: *This study was supported by the research project PN-III-P1-1.1-TE-2021-1452 (funding contract TE 115/ 2022) funded by Romanian Executive Agency for Higher Education,Research, Development and Innovation Funding (UEFISCDI).*

Keywords: *coloration, thermal melanism, citizen science, Vipera berus, adder, snakes, climate.*

UDC: 591.52:598.115.33:591.57

HABITAT USE AND ACTIVITY PATTERNS IN MELANISTIC VS PATTERNED VIPERS FROM A POLYMORPHIC POPULATION

Strugariu Alexandru[1]*, ORCID: 0000-0001-7866-6732
Spaseni Petronel[2], ORCID: 0009-0005-7477-605X
Sahlean Tiberiu C.[3], ORCID: 0000-0001-9014-9084
Gherghel Iulian[1], ORCID: 0000-0001-7963-6498
Zamfirescu Ștefan R.[2], ORCID: 0000-0002-8746-5120

[1]Department of Exact and Natural Sciences, Institute of Interdisciplinary Research, Alexandru Ioan Cuza University of Iași, Iași, Romania
[2]Faculty of Biology, Institute of Interdisciplinary Research, Alexandru Ioan Cuza University of Iași, Iași, Romania
[3]Institute of Biology Bucharest, Romanian Academy, Bucharest, Bucharest, Romania

*E-mail: *alex.strugariu@gmail.com*

Animal colorations represent adaptations to different biotic or abiotic environmental factors and play crucial roles in predator avoidance (via crypsis, aposematism, or mimicry), inter – and intraspecific communication and sexual selection. In ectothermic animals, coloration may also be important for thermoregulation. Colour polymorphism (i.e. the occurrence of two or more phenotypic morphs in the same population) is present along numerous animal lineages, and melanism is probably the most studied type. In several Eurasian viper species of the genus *Vipera*, populations greatly vary with regards to the frequency of melanistic individuals, and the maintenance of polymorphism have been attributed to either adaptive or non-adaptive processes. Current theory would predict that melanistic vipers should be more frequent in colder environments (normally higher latitudes or altitudes), and this is mostly confirmed for the Asp Viper (*Vipera aspis*). Here we tested the hypothesis that differential habitat use and activity patterns could explain the maintenance of colour polymorphism in a viper population from warmer environment. In accordance with the thermal melanism hypothesis, we would expect melanistic vipers to predominantly use less open habitats and/or be more active at cooler temperatures, as they should be thermoregulatory superior to patterned (zigzag) individuals. Overall, our results show a weak support for the differential habitat use hypothesis, with only one habitat characteristic (microhabitat exposure) being significantly associated with morph, but only for females. However, observational data does suggest that activity patterns do differ, with melanistic vipers being especially active during overcast and rainy periods, although no differences were observed between basking site temperatures. Other adaptive as well as non-adaptive hypotheses require testing before we can gain a deeper understanding of maintenance of melanism in vipers from warmer environments.

Acknowledgments: *This study was supported by the research project PN-III-P1-1.1-TE-2021-1452 (funding contract TE 115/ 2022) funded by Romanian Executive Agency for Higher Education,Research, Development and Innovation Funding (UEFISCDI).*

Keywords: *coloration, adaptation, aposematism, crypsis, snakes, reptiles.*

UDC: 582.232:593.17

EVALUATION OF THE ROLE OF MICROALGAE AS A FOOD SOURCE FOR CILIATES (*PARAMECIUM CAUDATUM* EHRENBERG 1833)

Toderas Ion, ORCID: 0000-0003-1599-838X
Ungureanu Laurentia, ORCID: 0000-0003-4576-2810
Roscov Elena*, ORCID: 0000-0003-3356-151X
Tumanova Daria, ORCID: 0009-0002-3589-8933

Moldova State University, Institute of Zoology, Chisinau, Republic of Moldova

*E-mail: *elena.roscov@sti.usm.md*

Introduction. The study looks at how various species of microalgae, including *Chlorella vulgaris* Beijerinck 1890 *(*Phylum *Chlorophyta (Green algae))* and *Oscillatoria amphibia* C. Agardh ex Gomont 1892 *(*Phylum *Cyanophyta (Blue-green algae))*, they can be used as potential food sources for the population *Paramecium caudatum.* It is found that moderate use of *Clorella vulgaris* can stimulate growth and productivity in the short term, while *Oscillatoria amphibia*, in high concentrations, can have a negative impact on reproduction and cell division. These researches are significant for understanding the potential used of algae as food for ciliates, with important implications for aquatic ecology and ecosystem health.

Materials and methods. The classical cultivation methods were proposed by Sadchikov A. P (2009), Kokova V. (1982), Yashin Ya. (2017). Paramecia was exposed to the action of microalgae cultures in concentrations of 0.1 mg/l, 0.5 mg/l, 1 mg/l and 10 mg/l, for 24, 48, 72, 76, 120 and 144 h and monitored their response. Parameters such as density (Nt), reproduction rate (Cw), number of cell divisions (n), division speed constant (v) and generation time (g) of *Paramecium caudatum* ciliates were analyzed.

Conclusions. Both studies suggest that algae can influence the density and reproductive rate of *Paramecium caudatum*, although the effects may vary depending on the microalgal species and concentration used. It is observed that the most significant differences compared to the control group are recorded for *Chlorella vulgaris* tested at concentrations of 0.5 mg/l and 1 mg/l, especially at hours 72 and 120 of the tests. High concentrations of *Oscillatoria amphibia* 0.5 mg/l, 1 mg/l and 10 mg/l caused the decrease in the reproduction rate of ciliates compared to the control. At 0.1 mg/l, the effect was smaller, but still a difference from the control was observed.

Studies suggest that microalgae can influence cell division (n) and generation time (g). Thus, *Chlorella vulgaris* at concentrations of 0.5 mg/l and 1 mg/l had a beneficial effect on cell division (n) in paramecia, accelerating the rate of division and increasing n and g values, while *Oscillatoria amphibia* at concentrations of 10 mg/l, 1 mg/l and 0.5 mg/l had a significant negative impact, reducing the rate of division and decreasing the values of n and g.

Acknowledgments: *The cost for this study were covered by Subprogram 010701: "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population" within the Institute of Zoology, MSU.*

Keywords: *microalgae, Clorella vulgaris, Oscillatoria amphibia, Paramecium caudatum, numerical population, reproduction rate.*

UDC: 616-006-085:633.88

PROSPECTS FOR THE DEVELOPMENT OF NUTRACEUTICALS BASED ON GUT MICROBIOTA AND LOCAL ANTICANCER MEDICINAL PLANTS

Tolstenco Dorina, ORCID: 0000-0001-5644-6114
Leorda Ana*, ORCID: 0000-0002-2923-8843

Institute of Physiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *leorda-ana64@mail.ru*

Some recent studies provide evidence for the antitumor effect of some plant-based nutraceuticals, which have demonstrated a potential benefit due to their ability to modulate gene expression through epigenetic mechanisms. These biocompounds are effective in several biological functions such as cell cycle arrest, cell proliferation, induction and inhibition of apoptosis in tumor cells. On the other hand, the category of nutraceuticals also includes probiotics and prebiotics, necessary for the health of the digestive system, because the imbalance of the gut microbiota is associated with various diseases, including cancer.

The current study was designed to elucidate the possibility of compiling the potential of plants with anticancer and prebiotic activity with representatives of beneficial gut microbiota in order to identify possibilities for the development of adjuvant microbial preparations in the management of cancer. Previously, the antimicrobial properties of 5 native anticancer medicinal plants (*Chelidonium majus, Viscum album, Artemisia absinthium, Xanthium spinosum* and *Acorus calamus*) were highlighted, against agents of the *E. coli* genus, and the most effective form of their preparation was highlighted.. In subsequent *in vitro* research, the multiplication capacity of some strains of bifido- and lactobacteria, isolated from the intestinal content of rats was tested using nutrient media based on decoction (*Chelidonium majus, Acorus calamus*), infusion (*Artemisia absinthium, Viscum album, Xanthium spinosum, Acorus calamus*), alcoholic tincture (*Artemisia absinthium*) and cold maceration (*Viscum album, Xanthium spinosum, Acorus calamus*), prepared from the mentioned medicinal plants, compared to classic nutrient media. The obtained results indicate the following ranking of the studied plants regarding the multiplication capacity of bifidobacteria: *Chelidonium majus* > *Viscum album* > *Artemisia absinthium* > *Xanthium spinosum* > *Acorus calamus*, and in the case of lactobacteria – *Artemisia absinthium* > *Chelidonium majus* > *Viscum album* > *Acorus calamus* > *Xanthium spinosum*. Despite the fact that all medicinal plants included in the study demonstrated prebiotic capacity, however, it differed substantially in quantitative terms.

Thus, the microbial strains of the genera *Bifidobacterium* and *Lactobacillus*, isolated from the intestinal content of rats and cultivated on culture media based on native medicinal plants with anticancer properties, can be the basis for the prospective development of some nutraceuticals, useful due to their therapeutic and nutritional effects.

Keywords: *nutraceuticals, gut microbiota, native anticancer medicinal plants, prebiotic capacity.*

UDC: 573.6:632:378.126

MANIFESTATION OF SYNERGISM BETWEEN RESEARCH AND EDUCATION IN PLANT PROTECTION

Volosciuc Leonid*, ORCID: 0000-0002-7475-4310
Lungu Andrei, ORCID: 0000-0002-5024-5765

The Institute of Genetics, Physiology and Plant Protection MSU, Chisinau, Republic of Moldova

*E-mail: *leonid.volosciuc@usm.md*

Starting from the trends of aggravation of the impact of harmful organisms on the background of climate change and the successes registered towards the application of natural mechanisms for regulating the population density of phytosanitary agents, the development of technological procedures for plant protection becomes imminent. The broad implementation of the achievements recorded remains indispensably linked to the broad involvement of agricultural producers with a high degree of theoretical and practical training. It is becoming increasingly obvious the need to apply training activities through research, as a priority of contemporary education. In the field of plant protection, taking into account the rapid evolution of the process of acquiring information and deepening the requirements for knowledge of new technologies, particularly biotechnological, and for developing capacities for rational analysis of problems with a solving them.

Combining over several years scientific research activities and training highly qualified specialists in plant protection, we managed to obtain recognized scientific results in particularly important fields, verifying the results of innovation investigations, technology transfer and implementation, as well as consulting higher and decision-making bodies, training companies and public authorities to actively contribute to the development of sustainable and inclusive by developing and implementing modern biotechnologies to solve phytosanitary problems.

In the research process with the involvement of young specialists (students, master students, PhD students, researchers at the initial stages of investigation) we managed to record impressive results and the implementation of biological, ecologically harmless means of plant protection, but also to deliver new solutions for integrated pest management systems, oriented to the development of collaborative partnerships with enterprises in conventional and organic agriculture. This contributed to increasing motivation of young specialists to carry out scientific research, solving technological problems, strengthening the content of study programs.

The combination of innovative and educational activities records the manifestation of sinergic phenomena regarding the stimulation of research and innovation activities, as well as the efficiency of pedagogical activities.

Acknowledgments: *This study was supported by the research Subprogram 011103 Development of ecologically harmless means of reducing the impact of harmful organisms of agricultural crops against the background of climate change, funded by the Ministry of Education and Research.*

Keywords: *Biotechnology, Ecology, Education, Research, Sinergy, Strategy.*

UDC: 616.89:616.1

PSYCHO-EMOTIONAL STATUS, DEPRESSION AND ANXIETY IN SUBJECTS WITH CARDIOVASCULAR DISORDERS

Zainea Pușica, ORCID: 0000-0003-1807-756X

Doctoral School of Natural Sciences, Moldova State University, Chisinau, Republic of Moldova

E-mail: *pusipusi67@yahoo.com*

People with various somatic diseases are frequently affected by various psycho-emotional disorders, such as depressive or anxiety symptoms. This is also characteristic for people with various cardiovascular disorders and diseases. Thus, the aim of the study was to highlight the psycho-emotional status, the manifestation of depression and anxiety in people admitted to the Emergency County Clinical Hospital of Braila, Romania.

The study included subjects with heart rhythm disturbances (tachycardia) and hypertension (values greater than 140/90mmHg). General state and psycho-emotional status were investigated using a specially designed survey, which included indices of physiological, emotional, psychological and behavioural testing (general state, emotional state, spiritual state, behaviour, mental state, cognitive state, sleep, work capacity, heart rate, appetite). The presence and expression of symptoms of depression and anxiety were studied according to the HADS test.

Investigations were conducted during 2021-2023 on subjects aged 30-80 years, male and female, with signed informed consent. The results of the investigations showed that: 57,1 % of the subjects showed general irritable, aggressive or depressive mood; 100 % – unpleasant emotions; 71,4 % – emotional apathy; 85,7 % showed worsening spiritual state; 28,6 % showed changes in behaviour; 100 % showed more tense mental state; 85,7 % had worsened thinking and attention; 78,6 % had insomnia; 85,7 % had worsened work capacity and fatigue; 57,1 % had a flexible heart rate; 50% had decreased and 50 % had increased appetite.

Analysis of the expression of anxiety in the hospitalized subjects shows that 92,9% of them showed an abnormal degree of anxiety (a high degree of anxiety) and 7,1% – a moderate degree. Depression in the same subjects was manifested to a high degree in 78,6 %, to a moderate degree in 14,3 % and not at all in 7,1 %. Comparative analysis of psycho-emotional status, expression of depression and anxiety by age and gender revealed no essential differences.

Comparative analysis of psycho-emotional status, expression of depression and anxiety by age and gender revealed no essential differences.

Acknowledgments: *This study was supported by the research project „Consequences of psychogenic stress in emergency department patients". Many thanks to the subjects who agreed to be included in the study.*

Keywords: *psycho-emotional status, somatic disorders, anxiety, depression, behaviour.*

UDC: 599.322/.324(478)

DRYOMIMUS ELIOMYOIDES (GLIRIDAE, RODENTIA) FROM THE EARLY PLIOCENE LOCALITY PRIOZERNOE

Zakharov Denis, ORCID: 0009-0001-9359-9256

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

E-mail: *zakharov-8@mail.ru*

The purpose of the presented research was to identify and characterize fossil remains of rodents of the family Gliridae based on the materials of our own collections from the Early Pliocene Priozernoe locality in the Dniester valley.

The genus *Dryomimus* and the species *Dryomimus eliomyoides* were described by M. Kretzoy in 1959 year from the Pliocene of Hungary (locality Csarnóta-2). *D. eliomyoides* is also known from other Pliocene-Pleistocene localities in Hungary, Bulgaria, Greece, Turkey and southern Ukraine. In Moldova, this species was previously identified from a single find from the Early Pliocene (locality Lucești - 2).

From the Priozernoe locality, the only find of an isolated upper posterior root tooth M1 or M2 belongs to the genus *Dryomimus*, which was assigned to the species *Dryomimus* cf. *eliomyoides* (Fig. 1).

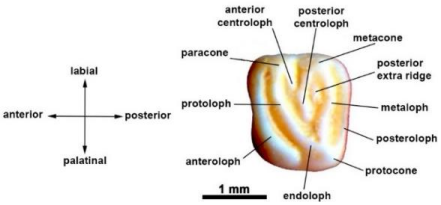


Figure 1.
Upper maxillary tooth of M1-2 *Dryomimus* cf. *eliomyoides*, Priozernoe, Early Pliocene (biozone MN14b-15a)

The molar from Priozernoe is large, 1.5 mm long and 1.8 mm wide, and is most similar in size to a specimen from the Early Pliocene of Bulgaria - Muselevo locality.

Acknowledgments: *The author would like to thank A.S. Tesakov, Leading Researcher of the Geological Institute of RAS, Doctor of Geological and Mineralogical Sciences, for his help in identifying the presented materials.*

This study was supported by the research project no. 010701 "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population", funded by the Ministry of Education and Research, and were performed within the doctoral project "Fossil fauna complexes and the evolution of vertebrate fauna in the early stages of the formation of the Dniester Valley (Pliocene-Early Pleistocene)".

Keywords: *Gliridae, Dryomimus eliomyoides, Early Pliocene, biozone MN 14b-15a, Priozernoe.*

UDC: 619:616.995.1:636.52/.58(478)

ECTOPARASITE SPECIES RECORDED IN CHICKEN (*GALLUS GALLUS DOMESTICUS*) FROM THE REPUBLIC OF MOLDOVA

Zamornea Maria*, ORCID: 0000-0001-8987-3390
Erhan Dumitru, ORCID: 0000-0001-9722-4382
Rusu Ștefan, ORCID: 0000-0002-3322-9173
Gliga Olesea, ORCID: 0000-0002-4917-5156
Botnaru Nicolai, ORCID: 0000-0001-5308-8307

Institute of Zoology, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *mariazamornea@gmail.com*

On a global level, poultry meat has gained an important position among foods of animal origin, due to its nutritional qualities and the low costs of obtaining and processing, compared to other sources of animal proteins (Fletcher, 2002).

Aviculture is important in that it allows the breeding of many species of domestic birds (chickens, ducks, geese, turkeys, guinea fowls, quails) and semi-domestic birds (pheasants, partridges, ostriches), which gives breeders the opportunity to choose the most suitable species, in relation to the conditions offered and the demand of the consumer market (Usturoi, 2015).

Parasitic diseases, through the particularities of the ecological niche of the causal agents, through the evolutionary particularities of the determined entities, especially the high prevalence, the significant economic losses produced and the zoonotic nature of many of them, require a continuous "anti-parasitic fight". This fight is achieved through parasitological control and the eradication of parasites (Mitrea I., 2002). At the same time, parasitological studies of domestic birds have a multilateral importance. The parasite composition of the majority of domestic birds can considerably influence the dynamics of their populations. Only in rare cases are birds attacked by only one parasite. Gamasid mites and some species of malophages, which parasitize domestic and wild birds, also fulfil the role of vectors of dangerous pathogens (Toderas I. et al, 2008).

The investigations, regarding the establishment of parasitic agents in chickens (Gallus gallus domesticus), were carried out in the year 2020-2023, in the laboratory of Parasitology and Helminthology, of the Institute of Zoology of the USM. The biological samples were collected from private households in various areas of the Republic of Moldova. Samples were collected individually and in groups. Special methods were used to collect ectoparasites in birds according to Dubinin M. (1955) and Luncaşu M., Zamornea M. (2007). The collected material was examined using the МБС-9 (ob.14x2) magnifier and the Novex Holland B ob. microscope 20-40 WF 10x Din/20mm.

In domestic birds, the chickens (Gallus gallus domesticus) in the 324 biological samples collected, 9 species of malophages were recorded (Cuclotogaster heterographus, Eomenacanthus stramineus, Goniocotes gallinae, Goniocotes

maculatus, Goniodes dissimilis, Lipeurus caponis, Menopon gallinae, Menacanthus cornutus, Menacanthus pallidulus), 2 species of fleas (Ceratophylus gallinae, Ceratophylus hirundinis) and 2 species of gamasid mites (Dermanyssus gallinae, Dermanyssus hirundinis). In the structure of malophagian polyparasitism, the species Eomenacanthus stramineus occupies a dominant position (EI – 62.5%, II 54 – 925 ex.). The seasonal dynamics of the invasion with ectoparasites is characterized by the increasing the level of the extensiveness of infestation (EI - 80.0-100.0%), starting in autumn and lasting all winter. In the months of July-August, there was a decreasing of the extensiveness of infestation (EI - 35.0%), given the fact that during this period the birds moult, at the same time as the feathers fall, some of the ectoparasites leave the host

Therefore, the results of the conducted study will allow to establish the structure and dynamics of ectoparasites associations in birds, their interaction in the parasite-host system, and as a result they will be able to be used in improving the methods of prophylaxis and treatment of ectoparasites infestations in domestic birds from the Republic of Moldova.

Acknowledgments: *This study was supported by the research project: Diversity of hematophagous arthropods, zoo- and phyto-helminths, their vulnerability and tolerance strategies to climatic factors and elaboration of innovative procedures for integrated control of species with socio-economic value: 20.80009.7007.12; Assessing the structure and functioning of animal life and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and population welfare: 010701.*

Keywords*: chickens, malophages, fleas, gamasid mites.*

Session C

PLANT BIOLOGY

UDC: 582.998.2

EVALUATION OF SUNFLOWER GENOTYPES FOR RESISTANCE\TOLERANCE TO DROUGHT AND HEAT

Anton Florin Gabriel[1]*, ORCID: 0000-0003-3016-7998
Păcureanu Maria Joița, ORCID: 0009-0009-2797-6672

[1]National Agricultural Research and Development Institute Fundulea, Călăraşi County, Romania
[2]Romanian Academy, Center of Study and Research for Agroforestry Biodiversity "Acad. David Davidescu", Bucharest, Romania

*E-mail: *gabi22mai@yahoo.com*

Drought and heat significantly reduce sunflower seed yield in years with low rainfall and high temperatures during the phenophase of growth, flowering and seed filing. In this paper, we present behavior of 33 sunflower genotypes, from S1 to S33 and resistant check for drought, sunflower hybrid FD15E27, in green house, in normal irrigated conditions (I-three watering's a week) and less irrigated conditions (II-two watering's a week).

The highest temperatures registered in green house was 45.5 ^{o}C, 47.9 ^{o}C, 49.9 ^{o}C, 52.2^{o}C and 59.6 ^{o}C in flowering and seed filing time and all sunflower genotypes survive but pollen was affected and seed yield was very low. Plant height, head diameter and root development were measured. Head diameter were between 5 cm at sunflower genotype S1 I and 13 cm at S27 I, in normal irrigated conditions and between 5 cm at sunflower genotype S1 II and 11 cm at S27 II in less irrigated conditions. Plant height were between 65 cm at sunflower genotype S19 I and 155 cm at S2 I, in normal irrigated conditions and between 45 cm at sunflower genotype S11 II and 155 cm at S9 II in less irrigated conditions.

The best developed root system was the genotypes S7, S12, S24, S27 and S29. Some sunflower genotypes tested for resistance/tolerance to heat and drought did not have any viable seeds and others recorded very poor productions of 1-4 grams/sunflower plant. Among all tested genotypes, the most resistant/tolerant at drought and heat were S24 and S27, which are descendants from interspecific hybridization with the wild species *Helianthus argophyllus*.

Keywords: *sunflower, drought stress, heat stress, Helianthus argophyllus.*

UDC: 532.38:633.491(478)

MOLECULAR DIAGNOSIS OF STOLBUR INFECTION AT SOME POTATO GENOTYPES IN MOLDOVA

Bahsiev Aighiuni*, ORCID: 0000-0002-1915-7652
Zamorzaeva Irina, ORCID: 0000-0002-6302-2069
Melian Lolita, ORCID: 0000-0002-9192-0560

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *aighiuni.bahsiev@igfpp.md*

Stolbur (the causal agent '*Candidatus* Phytoplasma solani') is a systemic disease that infects a wide range of plant species. Tomato, grapevine, and pepper are among the crops known to be infected by phytoplasma in the Republic of Moldova. However, the presence of phytoplasma infection may also occur in other economically significant agricultural crops. This highlights the importance of monitoring new potentially infected with '*Ca*. P. solani' agricultural crops in the republic. Among the crops affected by stolbur phytoplasma in some clously located countries as Romania, Russia, Hungary, etc., potato is included. '*Ca*. P. solani' reduces the quality of tubers and seeds in infected potato plants. Economic losses caused by stolbur can reach 30 -80% in potato. The purpose of the research was to determine the presence or absence of phytoplasma infection in growing in Moldova potato genotypes.

The molecular diagnosis of the '*Ca*. P. solani' infection was conducted on plants of different potato genotypes collected in the field at the end of June and in mid-August 2023. Eleven potato genotypes grown on the experimental plots of IGPPP, MSU were analyzed. DNA isolation was performed using the rapid boiling method in an alkaline solution from thin leaf sections. To determine the presence of the pathogen '*Ca*. P. solani' in the potato genotypes, chaperonine cpn421 F/R (PCR) and cpn200 F/R (nested-PCR) primers were used. Visualization of the results was carried out in 1.5% agarose gel electrophoresis (UV). The nested-PCR analysis results show an absence of phytoplasma infection in all potato genotypes at the end of June. The presence of the pathogen was determined in mid-August in 5 out of 6 analyzed potato genotypes. Subsequently, to determine the spread of '*Ca*. P. solani' in the field, the individual plants of the infected genotypes were studied. For this, 5 - 10 individual leaves were collected for each genotype. As result, a low spread of phytoplasma infection in the field was established. The average percentage of potato plants infected with stolbur phytoplasma was 14.6%.

Thus, the large number of genotypes infected with '*Ca*. P. solani' was shown in the study, nevertheless the average level of infestation in the potato field was insignificant in the conditions of 2023.

Acknowledgments: *This study was supported by the research project 011101 "Genetic and biotechnological approaches of management of agroecosystems under climate change conditions", funded by the Ministry of Education and Research.*

Keywords: '*Candidatus Phytoplasma solani', stolbur, nested-PCR, distribution, potato.*

UDC: 633.88

CREATION, EVALUATION OF THE INITIAL IMPROVEMENT MATERIAL FOR THE SPECIES *SALVIA SCLAREA* L.

Balmuș Zinaida*, ORCID: 0000-0002-1164-6435
Cotelea Ludmila, ORCID: 0009-0006-1395-2440
Butnaraș Violeta, ORCID: 0009-0003-9747-7568

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *zinaida.balmus@sti.usm.md*

The importance of aromatic and medicinal plants is determined by the multiple uses of the essential oil in medicine, perfumery, cosmetics, aromatherapy, etc. for this reason, research was focused on *Salvia Sclarea* L. on the diversification of the initial breeding material, the improvement of the assortment of hybrids and cultivars. F_0 hybrids of *Salvia sclarea* L., have been created in 38 combinations and 703 F_1 – F_{18} hybrids as well as 380 inbred lines S_5–S_{16} with exceptional tolerance to drought, low temperatures and diseases were evaluated. F_1 hybrids exhibit heterosis in a number of quantitative bio morphological characters. The effect of heterosis on the character, *inflorescence length*, compared with both parental forms, was found in 58% simple and triple hybrids, and in 28% – double and triple hybrids, the heterosis in oil content, in comparison with both parental forms, varies from +9.4% to +87.9%. Twenty-six hybrids with very high oil content, 1.436 – 2.071%, were selected and reproduced, including: F_1–2, F_2– 9, F_3– 3, F_4– 3, F_7– F_{18}– 9. The lines S_5–S_{16} of *S. sclarea* L., not being subject to degeneration, are valuable sources of germplasm. It has been demonstrated that the obtained genetic material of *S. sclarea* L. (hybrids, lines) exhibits resistance to drought, overwintering and diseases. The research on Clary sage during the reported period was completed with the selection of 17 hybrids of different types and generations (5 – simple, 3 – triple and 9 – hybrid combinations in steps and complex) with valuable agronomic characters and high content of essential oil – 1.404 – 2.703% (dry. matter). The qualitative and quantitative analysis of the essential oil obtained from the inflorescences of the inbred line AP 97–11S_6, which in the reference year accumulated essential oil – 2.076% (dry. matter), detected 11 main components: linalyl acetate, 74.751%; linalool, 16.893% and sclareol 2.169%. Testing the varieties in the 1st and 2nd year of vegetation confirmed the very high resistance to drought, due to the high essential oil content.

Acknowledgments: *This study was supported by the research project 011102 Increasing and conservation genetic diversity, agricultural crop breeding in the context of climate change, funded by Ministry of Education and Research.*

Keywords: *Salvia sclarea L., inbreed lines, hybrids, heterozis, essential oil.*

UDC: 632.4:633.853.74

MOLECULAR IDENTIFICATION OF FUSARIUM SPOROTRICHIOIDES IN SESAME (*SESAMUM INDICUM* L.) LEAVES

Belousova Galina*, ORCID: 0000-0002-9977-1248
Mogilda Anatolii, ORCID: 0000-0001-9159-6038

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *belousovagalina@mail.ru*

Sesame *(Sesamum indicum L.,* 2n = 26*)* is cultivated since Ancient history for its seeds rich in edible oil with quality similar to olive oil. However, cultivation of this crop encounters certain difficulties associated with productivity, quality, and resistance to biotic and abiotic stresses. Among biotic agents, fungi cause serious diseases resulting in yield quality and quantity losses. Many fungi including *F. sporotrichioides* affect the crop. Twelve sesame samples - VN 11 MC 889, Oro 9/7, Cadet, K-1257, Cubaneț 93, Oro Shot, Margo Tall, Delco, Dulce, VN 11 MC 1, Zaltsadovzri, Djerelo were analyzed in the current study. Plant leaves collected from the experimental fields of Institute of Genetics, Physiology and Plant Protection of the Republic of Moldova served as plant material. The leaves were collected in July 2023. Total DNA was extracted from sesame leaves of the each cultivar using 5% SDS (sodium dodecyl sulfate) extraction buffer. Extracted DNA was tested via molecular protocols for infection of *F. sporotrichioides.* Standard nested-PCR protocols and many analyses with specific primers to causal agents of fungal infections were performed. Phytopathogen *F. sporotrichioides* was identified with primers homologous to *tef1* (translation elongation factor 1 alpha) sequence. Primers fr. CAGACTTGGCGGGGTAGTTTC, rev. AGCGTCTGGTAGGCATGTT were used in the first round of the amplification. Number of cycles was 35, each of 50 seconds long.
Primer pair fr. CTCTCATACGACGACTCGACAAG, rev. TGTGTGGGAAGG GCAAAAGC was used in the second round of the amplification. Number of cycles was 34, each of 35 seconds long. Annealing temperature was 61°C in round I and 60°C in round II. Nested-PCR products were separated in 1,5% agarose gel and then photographed in UV light, which permitted identifying a 135 bp amplicon corresponding to the estimated length of the amplicon generated by round II primer pair in one sample – Margo Tall. The remaining eleven samples were free of *F. sporotrichioides*.

Acknowledgments: *This study was supported by the research project 011101 "Genetic and biotechnological approaches of management of agroecosystems under climate change conditions", funded by the Ministry of Education and Research.*

Keywords: *sesame leaves, nested polymerase chain reaction, Fusarium sporotrichioides.*

UDC: 633.34

THE USE OF CO_2 SENSORS IN THE STUDY OF RESPIRATORY METABOLISM OF SOME SOYBEAN VARIETIES

Bîrsan Ana*, ORCID: 0000-0003-1696-080X
Frunză Maria, ORCID: 0000-0003-3668-956X
Ganea Ion, ORCID: 0000-0002-9346-2575
Vladinova Alina, ORCID: 0009-0006-4974-4627
Guțu Costel, ORCID: 0009-0005-2606-6002
Evtodiev Silvia
Iacobuță Maria

Biology and Ecology Department, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *ana.birsan@usm.md*

The accurate and timely measurement of respiratory gases is crucial for effectively managing crops. Various physicochemical methods and direct as well as indirect techniques are available to measure gas fluxes in plants to estimate respiratory metabolism intensity. However, methods based on using CO_2 capture sensors are more practical, require smaller amounts of material, offering greater data accuracy. These sensors are preferred due to their high detection sensitivity, ability of real-time monitoring of phenomena, and non-invasiveness.

This research aims to evaluate the respiratory activity of *Glycine max* seeds during the germination stage using CO_2 sensors.

Two indigenous soybean varieties, Aura and Moldovita, were selected for the study. Respiratory activity was assessed by measuring the concentration of carbon dioxide (CO_2) in a gas mixture using PASCO Technologies. Changes in CO_2 levels were monitored using model PS-3208 wireless CO_2 gas sensors. The experiments were conducted in controlled laboratory conditions at the temperature of 25°C.

Analysis of CO_2 levels had been performed 4, 8, 24, and 48 hours after the start of the experiment. The obtained data demonstrated higher CO_2 content per gram of seed mass in the Aura variety, suggesting a more intense respiratory activity in the seeds compared to the Moldovita variety. The heightened respiratory activity in the Aura variety was positively correlated with greater thousand kernel weight, higher germination energy and germination capacity of the seeds. The obtained CO_2 data highlights the seeds' ability to mobilize reserve materials during germination. This information can be valuable in elucidating differences in the fundamental processes of seed germination among crop varieties, with consideration given to environmental conditions.

Keywords: *soybean, germination, respiratory activity, CO_2 sensors.*

UDC: 577.21:582.998.2

MOLECULAR-GENETIC IDENTIFICATION OF STERILITY IN SUNFLOWER LINES

Bivol Ina[1]*, ORCID: 0000-0002-6052-1540
Gisca Ion[2]
Mutu Ana[1], ORCID: 0000-0001-8603-142X
Galeata Gabriela[1]
Parnov Emilia[1]

[1]Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova
[2]Seedeco Semences SRL, Chisinau, Republic of Moldova

*E-mail: *bivolinga@yahoo.com*

Breeding for heterosis in many crops, including sunflower, currently requires the creation of parental inbred lines. This type of breeding material is represented by maternal lines with cytoplasmic male sterility (CMS), paternal lines carrying nuclear Rf genes (restorers of pollen fertility), and lines - fixers of pollen sterility, necessary for the reproduction of CMS lines. In production breeding, the assessment of the purity of hybrid seed and cytoplasmic genomes is based on the evaluation of morphological traits in a representative sample of plants at the flowering stage only. This way, stocks of hybrid seed are stored until the next growing season to await the results of field trials, causing seed companies to lose large sums of capital. Another disadvantage of this approach is the unfavorable climatic conditions, which make it impossible to properly assess the results of such labor-intensive work. To solve these problems, technologies based on marker-assisted selection (MAS) have been developed for CMS. These have made it possible to intensify commercial seed production by testing a large number of samples compared to classical methods and facilitating the identification of orfH and Rf gene carriers.

The main aim of our study was to identify sterility in 8 sunflower lines. Plant material grown under controlled laboratory conditions was ground to a fine powder in liquid nitrogen to isolate individual genomic DNA using the GeneJET Kit #K0791 following the manufacturer's instructions (Thermo Scientific). The specific primers orfH522 were used to assess the presence of the mitochondrial sequence in sunflower lines with cytoplasmic androsterility. Molecular tests carried out with the orfH522 primers for the studied lines showed a degree of sterility ranging from 93 to 100%. Material homogeneity was demonstrated only for lines A, A1, A6, A7, A9, and A10, which showed a degree of sterility of 100%. The other two lines (A2 and A5) were a mixture of fertile and sterile plants with a degree of sterility of 93%. Thus, it can be concluded that the proposed rapid and accurate MAS- method for the presence/absence determination of the mitochondrial sterility gene marker in sunflower can significantly accelerate and reduce the cost of breeding this crop compared to the classical method.

Acknowledgments: *This study was part of sub-program 011101 "Genetic and biotechnological approaches to the management of agroecosystems under climate change", funded by the Ministry of Education and Science".*

Keywords: *sunflower, breeding, mitochondrial gene, cytoplasmic sterility, specific primers, marker-assisted selection.*

UDC: 632.3:634.23

RESULTS OF RESEARCH NEW FUNGICIDES FOR COMBATING INVASIVE DISEASES IN CHERRY IN THE CENTRAL REGION

Bivol Alexei, ORCID: 0009-0003-5709-7173
Bădărău Sergiu, ORCID: 0009-0009-5542-4373
Iurcu-Străistaru Elena*, ORCID: 0000-0003-3499-0084
Bivol Elisaveta

Technical University of Moldova, Institute of Zoology, USM Chisinau, Republic of Moldova

E-mail: iurcuelena@mail.ru*

Cherry plantations and fruit production are frequently disadvantaged, being severely affected by numerous species of harmful organisms that invasively attack all parts of the trees, causing significant annual damage to both the trees and the fruits. In this context, key diseases with economic importance to cherries arise, influenced by unstable environmental factors and the effect of monoculture, which creates favorable conditions in orchards for the permanent establishment of pathogens, with pathological effects, which are directly proportional to the age of the plantations.

We have observed the severe invasive impact, frequency, and extensiveness caused by the following diseases: anthracnose, leaf spot, and fruit rot, which are decisive limiting factors in increasing fruit productivity.

Based on the relevance of the research program conducted in the years 2022-2023, the purpose and objectives were: comparative investigation of new remedies with fungicidal action against pathogenic fungi *Coccomyces hiemalis, Clasterosporium carpophilum, Monilia laxa, Monilia cinerea*, and other associative pathogens established in productive cherry plantations.

As a result of the testing and comparative analysis of the values obtained regarding the consecutive aspects of the experimental variants and applied doses, the biological efficacy of the fungicides Score 250 EC and Chorus 50 in combating anthracnose, shot hole disease, and moniliosis in cherries was determined to be between 82.4% and 91.8%, compared to the untreated variant and advantageous values at the level of the standard fungicide Luna Sensation SC 500, established during the outbreak periods of the noted diseases.

Thus, the new preparations, Score 250 EC and Chorus 50 fungicides, have been tested for cherry orchards against *Coccomyces hiemalis, Clasterosporium carpophilum, Monilia laxa, Monilia cinerea fungi*, and their efficacy was proven depending on the doses applied and the severity of the disease compared to the standard variant.

Score 250 EC and Chorus 50 fungicides are recommended as effective chemical products in the integrated protection system for cherry orchards and are recommended according to the economic damage threshold of the attack degree indices, in 2-3 treatments during the cherry growing season.

Acknowledgments: *The investigations were carried out with the support of the institutional project - State Program with the theme: "Diversity of hematophagous arthropods, zoo- and phytohelminths, vulnerability and strategies for tolerating climatic factors. Development and implementation of innovative methods for the integrated control of species of community interest," with the code: 20.80009.7007.12 F, and the Subprogram with the code 010701 "Assessment of the structure and functioning of biocenoses, aquatic and terrestrial habitats under the influence of biotic and abiotic factors in the context of ensuring ecological security and population well-being," within USM.*

Keywords: *cherry orchards, fungicides, plants disease, integrated protection system, biological control, biological efficiency.*

UDC: 635.7

BIOLOGICAL AND PHYTOCHEMICAL STUDY ON THE AROMATIC SPECIES *AGASTACHE RUGOSA* (FISCH. & C.A.MEY) KUNTZE

Bogdan Alina*, ORCID: 0000-0002-2069-0454
Colțun Maricica, ORCID: 0000-0001-8470-3616

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *alinkabog@gmail.com*

Agastache Gronov is a genus in *Lamiaceae* family, which includes 22 species of aromatic plants. In the Botanical Garden, 4 species were introduced and researched: *Agastache rugosa (*Fisch. & C.A. Mey.), *Agastache nepetoides* (L.) Kuntze**,** *Agastache foeniculum* (Pursh) Kuntze, *Agastache urticifolia* (Benth.) Kuntze. The present work includes the ecological, biological and phytochemical study of the species *Agastache rugosa (*Fisch. & C.A. Mey.) Kuntze, which is an aromatic, seasoning, medicinal and honey plant. The investigations were carried out in 2020-2023, in the Collection of Aromatic Plants of Plant Resources Laboratory.

Agastache rugosa – perennial, aromatic plant with strong anise-like smell, cultivated for medicinal and cosmetic purposes. It can be propagated vegetatively – by division, and generatively – by seedlings grown in the greenhouse or by sowing the seeds directly in the field in early spring. The plants tolerate soils with low moisture, as well as temperature fluctuations. Under the pedoclimatic conditions of R. Moldova, it develops a bush consisting of 3-6 erect stems reaching 0.5-1.5 m tall, with oval, toothed leaves. The inflorescences are shaped as dense spikes with small flowers in shades of white and purple. It blooms from July to the end of summer. The full flowering stage lasts 70 days, *A. rugosa* being a plant with high potential for honey production. The seeds ripen at the beginning of October, being small and brown. The introduced plants, under the conditions of the Republic of Moldova, go through the entire development cycle, which lasts 200-220 days.

A. rugosa plants accumulate essential oil during the entire growing season, but its amount depends on the developmental stage, organ and age of the plant. On average over the reference years, the maximum content of essential oil was found in 3-year-old plants, in the full flowering stage 0.60-0.66% d.m., and in inflorescences – 0.80-0.89% d.m. The essential oil has high content of pulegone (60.8%), followed by iso-menthone (16.9%) and limonene (12.3%). Pulegone offers the essential oil the insecticidal properties, so, it can be recommended for the biological protection of plants. Limonene is used as raw material to produce perfumes and other cosmetic products. Thus, *A. rugosa* is a promising aromatic species for aromatherapy, beekeeping, phytocosmetics and phytotherapy. It can also be successfully used as an ornamental plant. The cultivation of this species is an opportunity to expand the assortment of aromatic plants requested in various fields of the national economy.

Acknowledgments: *The study was supported by the Subprogram 010101 "Research and ex situ and in situ conservation of the plant diversity of the Republic of Moldova", financed by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *Agastache, aromatic plants, conservation, collection, essential oil, content.*

UDC: 633.491

FORMATION OF TRAINING COLLECTIONS OF THE POTATO GENE POOL

Bondus Rosina*, ORCID: 0000-0002-2367-5225
Mischenko Lidiya, ORCID: 0000-0003-0697-6971
Furdyha Mykola, ORCID: 0000-0003-0407-1474
Hordiienko Valentyna, ORCID: 0000-0002-9398-0487
Hordiienko Oleksandr, ORCID: 0000-0002-9389-1935
Koval Vita, ORCID: 0000-0002-2721-2463

[1]*Ustymivska experimental station of plant production of Plant production institute named after V.Y. Yuryev National academy of agrarian sciences of Ukraine, Ustymivka, Ukraine*
[2]*Taras Shevchenko National University of Kyiv, Ukraine, lmishchenko@ukr.net*
[3]*Institute of Potato Research of the National Academy of Agrarian Sciences of Ukraine, Nemishaieve, Ukraine, beky@i.ua*

*E-mail: *bondus1971@gmail.com*

The national security of Ukraine depends on food security, which is closely linked to the work of the National Bank of Plant Genetic Resources of Ukraine (National Genebank). The task of the Genebank is to provide users with the gene pool of cultivated plants and their wild-related species and forms. According to the FAO Commission on Genetic Resources for Food and Agriculture in 2022, even though the number of genebanks is increasing, the number of qualified staff and the amount of appropriate resources required for sustainable collection management remain a challenge. The effective operation of genebanks must take into account periodic changes in user demands, which requires highly qualified plant genetic resources specialists. For example, new breeding trends are emerging due to people's interest in healthy eating. In recent years, potato tubers with a solid anthocyanin colour of the flesh (blue, purple, red) have become increasingly popular, or restaurant chains need varieties with small potato tubers for baking whole with the skin on in foil, etc. One aspect of training future qualified staff and technicians to work with genetic resources is the creation of training collections. This type of collections is formed in accordance with the educational programmes of higher and secondary specialised educational institutions and is used as a visual aid for programmes in such disciplines as plant genetic resources, plant breeding, botany, genetics and several other biological specialities.

***Keywords**: potato, GenBank, gene pool, educational collections, study.*

UDC: 581.19:633.88

STUDIES ON MORPHO-ANATOMICAL CHANGES IN RELATION TO PEDOCLIMATIC CONDITIONS FOR THE ANALYSIS OF BIOACTIVE COMPOUNDS FROM THE *O. BIENNIS* SPECIES

Bota Viviane Beatrice[1,2,3]*, ORCID: 0000-0002-3874-3198
Olah Neli-Kinga[4,5], ORCID: 0000-0001-5204-6885
Burtescu Ramona[4], ORCID: 0000-0003-4370-4668
Nicula Alexandru-Sabin[3,6], ORCID: 0000-0002-9772-8588
Ivănescu Lăcrămioara[1], ORCID: 0000-0003-2695-8738
Zamfirache Maria-Magdalena[1], ORCID: 0000-0002-1514-7246
Mathe Endre[7], ORCID: 0000-0002-9011-177X
Turcuș Violeta[2,3], ORCID: 0000-0002-2595-739X

[1] Doctoral School of Biology, Faculty of Biology, "Alexandru Ioan Cuza" University of Iași, Romania
[2] Faculty of Medicine, "Vasile Goldis" Western University of Arad, Romania
[3] National Institute for Economic Research "Costin C. Kiritescu" of the Romanian Academy, Centre for Mountain Economy (CE-MONT), Vatra Dornei, Romania
[4] SC PlantExtrakt SRL, Radaia, Cluj, Romania
[5] Faculty of Pharmacy, "Vasile Goldis" Western University of Arad, Romania
[6] Centre for Research on Settlements and Urbanism, Faculty of Geography, Babes-Bolyai University from Cluj-Napoca, Romania
[7] Institute of Nutrition, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, Hungary

*E-mail: *viviane.beatrice@gmail.com*

Oenothera biennis L. is a medicinal and edible plant used in traditional medicine, cosmetic, pharmaceutical, and food industries. Native to the Americas, initially it was used for its vegetative parts, and after its introduction to Europe and Western Asia the seeds became the mainly used part of the plant, so the vegetative organs remained less studied. Environmental factors may also have a significant influence on the anatomy, phytochemical composition, and biological activity of the plant. In this study we aimed to analyze the impact of pedoclimatic conditions on the morpho-anatomy and phytochemical profile of the vegetative organs of *O. biennis*, collected from two different locations in the Romanian wild flora, revealing significant variations.

Vegetative organs were assessed histologically by optical and electron microscopy, while chemical analysis was based on LC/MS. The results were analyzed in relation to the pedoclimatic data corresponding to the locations of samples collection.

To the best of our knowledge, this is the first comparative analysis contextually reporting histology, phenolic profile, and geographical location in *O. biennis* species.

Keywords: *Oenothera biennis* L., *Evening Primrose, morpho-anatomy, phytochemistry, polyphenols, flavonoids*.

UDC: 633.812

THE STUDY OF THE QUANTITATIVE TRAITS OF F_1 LAVENDER HYBRIDS FROM DIFFERENT VEGETATION YEARS

Butnaraş Violeta*, ORCID: 0009-0003-9747-7568
Balmuş Zinaida, ORCID: 0000-0002-1164-6435
Cotelea Ludmila, ORCID: 0009-0006-1395-2440
Botnarenco Pantelimon, ORCID: 0009-0002-1229-1565

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*****E-mail: *violeta.butnaras@ sti.usm.md*

The proposed goal was to study and obtain heterotic F_1 hybrids with early, medium, and late maturity periods, resistant to frost and wintering, with high essential oil content that allow the creation of new clonal varieties with high productivity, adapted to the pedoclimatic conditions of cultivation in the Republic of Moldova.

The research included 476 F_1 lavender hybrids across various years of vegetation: 280 hybrids in the second year of vegetation from the maternal form of the 'Aroma Unica' and 196 genotypes in the seventh year originating from 6 maternal forms: Fr.8; Fr.1; Fr.5; Cr.13, Cr.26, VM-10.

The quantitative traits influencing productivity were evaluated for most genotypes from the seventh year of vegetation: plant height, diameter, and number of floral stems per plant. The height of the plants varied from 63.5 to 85.0 cm, the diameter from 80.0 to 145.0 cm, and the number of floral stems per plant ranged from 650 to 2100 units. The essential oil content was determined in 60 hybrids originating from 4 maternal forms Fr.8; Fr.1; Fr.5; and Cr.13, including: 40 hybrids (Fr.8) with a content of 2.543 – 5.834% (dry matter); 8 (Fr.1) 4.438 – 5.987%; 4 (Fr.5) 5.097 – 6.133%; and 8 hybrids (Cr.13) 2.008 – 3.512%. The F_1 hybrids from the third year of vegetation develop plants with a height of 45.0 – 65.5cm; diameter - 90cm; number of floral of 165 – 421 unity, with a floral spike up to 13.5 cm long. The variation in essential oil content in the evaluated hybrids registers values from 2.113% to 5.608% (dry matter). Twenty-one hybrids were highlighted with content from 4.023- 4.923 % and seven hybrids with content ranging from 5.099% to 5.608%.

The researches obtained in the evaluation of lavender hybrids have shown us that they are resistant to unfavorable cultivation factors, have different flowering-ripening terms (early, medium and late), 28 hybrids of *L. angustifolia* from the 2nd year of vegetation were selected, which were highlighted by the most developed plant waist, the longest inflorescences, floral stems, floral spike and the largest number of vertices on the floral spike, including increased essential oil content from 4.226% s.u. up to 5.608% (dry matter).

Acknowledgments: *This study was supported by the research project 011102 Increasing and conservation genetic diversity, agricultural crop breeding in the context of climate change, funded by Ministry of Education and Research*

Keywords*: Lavander, aromatic plant, clone varieties, essential oil, inflorescence.*

UDC: 634.18:577

VALORISATION OF FRUITS AND NON-EDIBLE PARTS OF *ARONIA MELANOCARPA* (MICHX.) ELLIOT SPECIES FOR THERAPEUTIC AND COSMETIC PURPOSES

Calalb Tatiana, ORCID: 0000-0002-8303-3670

Department of pharmacognosy and pharmaceutical botany, Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova

E-mail: *tatiana.calalb@usmf.md*

Black chokeberry *A. melanocarpa* is known as a fruit-producing plant beneficial in nutrition and with valuable pharmacological properties (antioxidant, antimicrobial, anti-inflammatory, vitaminizing, hypotensive, antimutagenic, antidiabetic, hepatoprotective etc.). In recent decades phytochemical and pharmacological investigations on other organs of the plant have intensified, in particular, non-edible parts – leaves, stem bark, shoots, twigs and buds, promoted predominantly as an alternative to additional additives in cosmetics, food, soft drinks, etc.

The aim of the work was evaluation of chemical compound classes in fruits and non-edible organs of the black chokeberry *A. melanocarpa* species and chemical study of tannins in different organs of aronia, cultivated in the Scientific-Practical Centre for Cultivation of Medicinal Plants of *Nicolae Testemitanu* SUMPh.

The biological materials: young (1 year) and mature (3 years) shoots, their bark, young (flowering period) and mature (during fruit harvest) leaves, flowers and fruits were harvested in 2023 and 2024 years for chemical study of tannins.

The results show that the main chemical compounds in all black chokeberry organs are phenolic compounds with qualitative and quantitative differences. Anthocyanins, flavonols and phenolic acids (mg/100 g dry product) were estimated in methanolic extracts of black chokeberry fruits and leaves: fruits – cyanidin glycosides (0.3-323.2) and phenolic acids (chlorogenic – 16.3-273. 5 and neochlorogenic – 92.3-212.6), but leaf extracts have higher amounts of flavanols (quercetin, quercitrin and rutin – 62.1-367.0) as well as chlorogenic, neochlorogenic and rosmarinic acid (724.2; 482.7 and 154.7, respectively). Qualitative analysis by analytical staining and sedimentation reactions revealed the presence of condensed tannins. Determination of tannins by titrimetric method shows that black chokeberry organs accumulate different amounts (%) of tannins. Young (14.63) and mature (16.51) shoots and their bark (16.51) are characterized by maximum values, a little less in the bark of the young shoots (14.63). Intermediate values are in mature leaves – 9.77. For young leaves – 4.88 and fruits – 5.92 and flowers with – minimum values – 0.9.

The results from the literature data and our own results serve as an argument for the differentiated valorization of the fruits and non-edible parts of aronia according to the content of phenolic compounds, including tannins.

Acknowledgments: *This study was supported by the research project 080301"Development of new pharmaceutical products from local raw materia", funded by Nicolae Testemitanu SUMPh*

Keywords*: A.melanocarpa, friut, non-edible parts, tannins*

UDC: 633.88

SPECIES OF FILIPENDULA IN THE COLLECTION OF IGPPP OF MSU

Chisnicean Lilia*, ORCID: 0009-0000-6147-323X
Jelezneac Tamara, ORCID: 0009-0009-2056-5010
Vornicu Zinaida, ORCID: 0009-0005-9686-6259
Baranova Natalia, ORCID: 0009-0009-4719-2285

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *lilia.chisnicean@sti.usm.md*

In the collection of aromatic-spice plants of Institute of Genetics, Physiology and Plant Protection, MSU, the specimens of the species *Filipendula vulgaris* Moenh. and *F. ulmaria* (L.) Maxim, belonging to the Rosaceae family, have been studied.

The rhizomes of *F. vulgaris* contain flavonoids, the glycoside called gaultherin, tannins, a lot of starch and a small amount of ascorbic acid. In the aerial part, the plant contains essential oil and traces of hydrocyanic acid, in seeds – 6% fatty oil, in leaves – 0.25-0.29% ascorbic acid, carotene, tannins. The leaves contain from 250 to 291 mg% ascorbic acid. The bulbs formed on the roots contain starch, being edible, they have a pleasant taste. The flowers are aromatic due to the essential oil, being used for flavoring teas, beer and wine. The root and rhizome (lat. *rhizoma* et radix *Filipendulae hexapetalae*) are used as medicinal raw material, being harvested in autumn, at the end of the growing season. Bulbs have astringent, diuretic and anti-inflammatory effect on the mucous membrane of the gastrointestinal tract, and are used to treat kidney and urinary tract diseases, anacid gastritis and gastric ulcer.

The whole plant of *F. ulmaria* contains essential oil, gaultherin (which, by hydrolysis, decomposes to form the irritating methyl ester of salicylic acid (methyl salicylate)), spiraeoside, heliotropin, vanillin, tannins, vitamin C, wax and fats.

According to the literature, the raw material of the species possesses astringent, diaphoretic, diuretic, choleretic, regenerating, immune stimulating, sedative, analgesic, bactericidal and antiseptic properties. Since both species are valuable but difficult to find in the wild flora, measures were taken to quickly multiply them by seedlings grown in cell trays, on special substrate and under controlled conditions. The seeds, before sowing, were treated with plant-extracted growth stimulator, which facilitated the uniform and rapid emergence of most of seedlings. The seedlings emerged within 7-9 days and were ready for transplanting in 56-59 days. The plants were transplanted in open ground at the beginning of May, and most of the seedlings took root and bloomed in the same year. Each of the mentioned species has already formed viable seeds for the second consecutive year. Thus, the propagation and foundation of productive plantations of *F. vulgaris* and *F. ulmaria* species can be easily achieved, by multiplication under controlled conditions, fully maintaining the populations from the spontaneous flora.

Acknowledgments: *This study was supported by the research project: Increasing and conservation genetic diversity, agricultural crop breeding in the context of climate change; Nr. 011102; Moldova State University.*

Keywords*: filipendula, medicinal, rai material, seedlings*

UDC: 633.361:712.253(478):58

THE GENUS *ONOBRYCHIS* MILL. IN THE COLLECTION OF THE "ALEXANDRU CIUBOTARU" NATIONAL BOTANICAL GARDEN (INSTITUTE)

Cîrlig Natalia*, ORCID: 0000-0001-7712-865X
Teleuță Alexandru, ORCID: 0009-0009-5985-2340

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *nataliacirlig86@gmail.com*

The genus *Onobrychis* Mill., order *Fabales*, family *Fabaceae* Lindl. (syn. *Leguminosae* Juss.), includes over 130 plant species, spread over several geographical areas, including Western Asia, Europe, the United States and Canada In the spontaneous flora of the Republic of Moldova, there are 4 species of sainfoin: *O. alba* (Waldst. et Kit.) Dev.; *O. gracilis* Bess.; *O. viciifolia* Scop.; *O. arenaria* (Kit.) DC. In the collection of fodder and honey plants of the "Alexandru Ciubotaru" National Botanical Garden (Institute), currently, there are 2 species of the genus *Onobrychis* Mill.: *O. viciifolia* Scop. and *O. arenaria* (Kit.) DC.

Onobrychis viciifolia Scop. – develops erect stems, about 75-112 cm tall, fistulous, branched. The compound leaves with elliptical, elongated-ovate to lanceolate leaflets. The inflorescences are racemes, borne on long peduncles, exceeding the length of the leaves. The flowers are pinkish-purple. The fruits – single-seeded, indehiscent, semicircular pods, with short teeth on the edge. The life span of a plant is 3-5 years.

Onobrychis arenaria (Kit.) DC. (= *Onobrychis viciifolia* ssp. *arenaria* (KIT) TELL.) – sand sainfoin. It is a perennial, polycarpic plant. The stems are erect, about 75-95 cm tall, branched. The compound leaves are petiolate, with elliptic leaflets. The inflorescences are racemes with flowers arranged in acropetal order. The length of the inflorescences is 5-9 cm, and together with the peduncle 13-18 cm. The corolla is pinkish-purple. The pods, unlike *O. viciifolia*, have thorns on the sides and on the edge.

Both species are sun-loving plants, the growing season starts early – in the first days of March, when air temperature reaches +5..+8 °C. During the growing season, they go through the entire development cycle, flowering, fruiting and producing viable seeds. After being cut, under favorable climatic conditions, the plants regenerate quickly, so that they can bloom and produce seeds twice during one growing season. The flowering stage is long (25-35 days) and the flowers produce high amounts of nectar, attracting pollinating and honey-making insects. Fodder qualities are determined by such features as – high content of protein, mineral salts and amino acids.

Acknowledgments: *This study was supported by the research project 010102, Identification of valuable forms of plant resources with multiple uses for the circular economy, funded by Moldova State University, Ministry of Education and Research.*

Keywords: *Onobrychis viciifolia* Scop., *Onobrychis arenaria* (Kit.) DC.

UDC: 631.527.5:633.15

RESISTANCE OF MAIZE GENOTYPES UNDER DROUGHT AND SALINITY

Climenco Oxana, ORCID: 0000-0001-5223-6208

Institute of Genetics, Physiology and Plant Protection,
Moldova State University, Chisinau, Republic of Moldova

E-mail: *oxana.climenco@igfpp.md*

The highest values of the effect of the interaction of the "genotype"x"stress" factors were found in hybrid genotypes. The inbred lines were characterized by the highest values of the coefficients of determination (bifactorial ANOVA) for the studied characters. The highest number of significant positive correlations was mentioned in stressful conditions in hybrids. The coefficients of determination of the quantitative characters (in conditions of drought and high temperatures in the field) for all hybrid genotypes studied were at an average level from 0.3718* to 0.5307**. In conditions of drought (r = 0.9056***, b_{yx}=1.0425***) and salinity (r =0.7023***, b_{yx}=0.5235***) inbred lines were characterized by higher values of correlation and regression coefficients than hybrids (r =0.6795***, b_{yx}=0.8538*** and r =0.3834***, b_{yx}=0.2957***, correspondingly). In addition, correlations in hybrids were approximately 2 times weaker under saline stress conditions compared to the similar coefficient values under osmotic stress conditions (r =0.3834*** and r =0.6795***, correspondingly). The analysis of the growth characteristics of immature embryos demonstrated the significant dependence of the variability of the characteristics on the "genotype" and "stress" factors. After the high values under saline stress conditions, line 74, trilinear hybrid 57(1), synthetic population 47(1) were highlighted. The variability of productivity characters in conditions of drought and high air temperatures depended to a great extent on the "genotype" factor. The values of the coefficients of determination of the studied characters were high. The highest values of productivity characters were recorded in hybrids with maternal genotypes A285, B73, P165.

It was established that the correlation of the "pollen grain diameter" character values in the stress variants was significant, positive, weak (r = 0.119*). Also, both inbred lines and hybrid combinations were characterized by the higher average value of the character "pollen grain diameter" under osmotic stress conditions. The variability of the "pollen grain diameter" character significantly depended only on "abiotic stress" factor in genotypes with an early flowering period. In other genotypes, the variability of the studied character also depended significantly on the interaction of the "genotype"x"abiotic stresses" factors.

Acknowledgments: *Research was carried out within the subprogramme 011101 Genetic and biotechnological approaches to agroecosystem management in the context of climate change financed by Ministry of Education and Research.*

Keywords: *maize, drought, salinity, pollen, resistance.*

UDC: 631.527.5:633.15

EVALUATION OF SOME PRODUCTIVITY INDICATORS OF DIPLOID AND TETRAPLOID FORMS OF MAIZE

Cojocari Dumitru*, ORCID: 0000-0002-4353-2328
Batîru Grigorii, ORCID: 0000-0003-4585-6294
Comarova Galina, ORCID: 0009-0001-0063-4586

Faculty of Agricultural, Forestry and Environmental Sciences, Technical University of Moldova, Chisinau, Republic of Moldova

*E-mail: *dumitru.cojocari@am.utm.md*

Due to its multiple use and high plasticity, maize occupies a leading place in national and international production, used both in industry, animal husbandry and in human food. Plant breeding cannot be conceived without high genetic variability. One of the tools for increasing genetic variability is changing the number of chromosomes, i.e. - polyploidy, which can intensify the manifestation of characters of agronomic value. Understanding these manifestations and highlighting important characters determined by polyploidy is an important task for genetics and breeding.

The aim of the work was to assess some indicators that characterize the productivity of inbred lines of diploid maize and their tetraploid analogues, and to assess the interaction of the genotype with the ploidy level.

The research was carried out in the 2023 maize growing season, on the experimental sector of the Department of Agronomy and Environment, Technical University of Moldova.

As biological material, 6 inbred lines of maize and their tetraploid forms previously obtained by colchicinization were used.

The research methods mainly focused on cob measurements for the following characters: cob length, thickness and mass, rachis mass, yield. Statistical analyzes were processed in the Statgraphics program

The analysis of variance showed that the genotype had a significant influence ($P<0.05$) on the studied productivity indicators: cob length and thickness, cob and rachis mass and yield. Ploidy significantly affected cob length, cob mass, yield, and insignificantly for cob thickness and rachis mass. A significant level of interaction between genotype and ploidy level was noted for most characters except cob thickness.

The obtained results allow a deeper understanding of the polyploidy phenomenon in maize and genetic interactions, and can be used in genetic studies and maize breeding programs.

Keywords: *maize, diploid, tetraploid, productivity elements, variance analysis.*

UDC: 633.81:665.57

SOURCES OF ESSENTIAL OILS FOR THE COSMETIC AND PERFUME INDUSTRY

Colțun Maricica*, ORCID: 0000-0001-8470-3616
Bogdan Alina, ORCID: 0000-0002-2069-0454

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *maricicacoltun@gmail.com*

The collection of aromatic plants includes a gene pool of over 150 native and non-native species, investigated from biological and phytochemical point of view. The researched species contain high quality essential oil and can be proposed for implementation in the cosmetic and perfume industry. The conducted study was aimed at identifying valuable species of aromatic plants, making phenological observations, determining the content and chemical composition of essential oil. The investigations were carried out during the years 2020-2023, within the Plant Resources Laboratory.

Rosemary (*Rosmarinus officinalis*) is a pleasant-smelling species, with essential oil content of 0.5-1% d.m. Of the 13 components identified in the essential oil, the main ones are verbenone and geraniol, followed by borneol and linalyl acetate. The essential oil is valuable for the perfume and cosmetic industry, its perfume qualities being rated with 4.9 out 5.0 points. Besides, it successfully treats alopecia, by stimulating hair growth, softens the skin and prevents dandruff. Tarragon (*Artemisia dracunculus* L.) – its leaves and young branches contain 0.2-0.8% essential oil, rich in phenylpropene, anethole, menthol and other compounds, depending on the origin. Tarragon has rejuvenating, hydrating, softening and antibacterial effect on skin. Mint shrub (*Elsholtzia stauntonii* Benth.) is an introduced aromatic species, native to China and Pakistan. The essential oil content is 0.5-1.65%. The basic compounds identified in essential oil are: rosefuran epoxide, cinerone, eucalyptol, caryophyllene, acetophenone, 4-terpineol, geranial, α-humulene, spathulenol. The essential oil is valued in the perfume and cosmetic industry. The perfume ranking of the essential oil is 4.8 points. The subtle aroma reminds of the smell of balm, lemon, which determines its value in perfumery. Lavender (*Lavandula angustifolia* L) is one of the most popular natural ingredients in the beauty industry thanks to its delicate fragrance and aromatherapeutic benefits. The essential oil content is about 0.5-1.5%. The basic component is linalool, followed by geraniol, eucalyptol, isogeraniol, nerol, lavandulol, borneol, citronellol. Essential oil is a common ingredient in cosmetic products. Lavender is particularly effective in stimulating hair growth. Wild bergamot (*Monarda fistulosa* L.) is an introduced species from North America. Its main components are: carvacrol, limonene, germacrene, linalool, geraniol. Essential oil is a component of skin, hair and nail care products.

The researched species go through the entire development cycle, accumulate essential oil and are recommended for the cosmetic and perfume industry.

Acknowledgments: *The study was supported by the Subprogram 010101 "Research and ex situ and in situ conservation of the plant diversity of the Republic of Moldova", financed by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *botany, essential oil, aromatic plants, cosmetics, perfumery.*

UDC: 57.085.2:633.81:631.527

DETERMINATION OF STORAGE POTENTIAL OF CLARY SAGE COLLECTION ACCESSIONS (*SALVIA SCLAREA* L.)

Corlateanu Liudmila*, ORCID: 0000-0002-1018-1832
Mihaila Victoria, ORCID: 0000-0003-3984-9477
Ganea Anatolie, ORCID: 0000-0002-8658-6879
Balmus Zinaida, ORCID: 0000-0002-1164-6435

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

E-mail: lcorlateanu@yahoo.com*

The purpose of this research was to study the morphophysiological and biochemical parameters of clary sage seeds after accelerated aging (AA) test. These parameters allow characterization of storage potential (SP) of collective accessions in active collections of the gene bank with the purpose of their *ex situ* conservation. Clary sage genotypes should be grouped by their potential capability to preserve viability of samples exposed to high temperature and humidity.

Objects of our studies were collection accessions of clary sage (fam. *Lamiaceae*, genus *Salvia*, species *Salvia sclarea* L.) from active collection of the gene bank. SP of seeds was determined by two tests: test for AA of seeds by Hampton and TeKrony's method and test for electrical conductivity (EC) of solutions, both are included in the *International Rules for Seed Testing*. AA-test of salvia seeds was conducted under the increased air temperature (42ºC), air humidity (90-100%), aging time was 72 hours. After this test, various morphophysiological parameters of seeds and seedlings were measured according to the International Rules of ISTA: germinating power, germinability of seeds, radicle length, fresh biomass of radicles. The biochemical parameter, activity of the peroxidase enzyme was measured in radicles of seedlings. Data were processed using the software *Statistica* 7.

According to the set of different parameters of clary sage seeds after AA-test, the following clary genotypes had the middle storage potential*: Parfum Perfect, Balsam* and *Argentina.* Clary sage genotypes with high and low SP were not identified.

Conclusions: 1. Use of accelerated aging test of seeds and determination of their morphophysiological and biochemical parameters allowed assessment of storage potential of clary sage collection accessions from the active collection of the gene bank. 2. Significant positive correlation of germinability of clary seeds with germinating power, radicle length, fresh biomass of seedlings was revealed after conduction of test for accelerated aging of seeds.

Acknowledgments*: Research was carried out within the project of the State Program 20.80009.5107.11 "Long-term ex situ conservation of plant genetic resources in the Gene Bank using the methods of molecular biology for plant germplasm health testing", financed by the National Agency for Research and Development.*

Keywords: *clary, accelerated aging, germination, storage potential, electrical conductivity.*

UDC: 57.085.2:633.81:631.527

THE HETEROSIS EFFECT IN THE HYBRIDS CREATED BY *SALVIA SCLAREA* L. IN THE F_1 GENERATION

Cotelea Ludmila*, ORCID: 0009-0006-1395-2440
Balmuș Zinaida, ORCID: 0000-0002-1164-6435
Butnaraș Violeta, ORCID: 0009-0003-9747-7568
Botnarenco Pantelimon, ORCID:0009-0002-1229-1565

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*****E-mail: *ludmila.cotelea@sti.usm.md*

The heterosis phenomenon is successfully used in the improvement of many allogamous plant species, including Salvia sclarea L., a valuable aromatic and medicinal species due to the essential oil it contains in its inflorescences. The biological material used – 26 simple, triple and double F1 hybrids, as well as their parental forms, inbred lines of different genetic and geographical origin, hybrids of different complexity. The essential oil was obtained by hydrodistillation in Ginsberg apparatus. The heterosis effect was calculated in percentages in relation to the parental forms of each hybrid for the quantitative characters: plant height, inflorescence length, number of branches of the first and second order inflorescence, essential oil content.

Salvia sclarea hybrids were created, using for this purpose different types of hybridization – simple, trilinear, double. Most of the time, in order to gather in the same hybrid genotype several characters and attributes, such as resistance to adverse environmental conditions, high content of essential oil, flowering from the first year of vegetation, etc., they were carried out in turn a series of stepwise hybridizations that resulted in obtaining very complex hybrids. The evaluation of the F1 hybrids demonstrated that the character "plant height" 9 – registers heterosis in relation to both parental forms. For the character "inflorescence length", the highest heterosis - +24.5% and +17.4% respectively, recorded by one of the simple hybrid combinations. The number of second-degree ramifications varied from 15.2 to 25.8. The highest effect of heterosis (+35.4%), in relation to the maternal form was recorded in a simple hybrid and with the paternal form – in a double hybrid combination (34.8%). The essential oil content was 0.8 – 2.2% (s.u.), and the highest heterosis recorded by one of the simple hybrids was +183.9% and +69.6%, respectively, in relation to the maternal and paternal forms.

In conclusion, we can say that distinctive simple, triple, double hybrids of Salvia sclarea L. were created. The created hybrids have a high essential oil content – 0.863 – 2.286% (s.u.), and the heterosis effect in relation to both parental forms is from +3.9% to +183.9% in different hybrids. The created hybrids present a valuable material for the development of high-performance varieties of Salvia sclarea L.

Acknowledgments: *This study was supported by the research project 011102 Increasing and conservation genetic diversity, agricultural crop breeding in the context of climate change, funded by Ministry of Education and Research*

Key words: Salvia sclarea L., hybrid, the quantitative characters, essential oil, heterosis.

UDC: 633.1:581.154:632.4

VARIABILITY AND HERITABILITY OF WHEAT RESISTANCE TO *FUSARIUM LATERITIUM* NEES.

Cristea Nicolae*, ORCID: 0009-0008-7259-3884
Gavzer Svetlana, ORCID: 0000-0001-9435-1159
Lupascu Galina, ORCID: 0000-0003-3363-3595

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *nicolae.cristea@sci.usm.com*

Recently, in the conditions of the Republic of Moldova, one of the causative agents of wheat root rot – the *Fusarium lateritium* fungus has been detected with a higher frequency (10.6%) compared to other years.

Establishing the particularities of variability and capacity for hereditary transmission of the growth and development characters of the common winter wheat in the interaction with *F. lateritium.*

Seven wheat genotypes were used, the grains of which were treated for 18 hours with culture filtrates of 3 *F. lateritium* isolates prepared on the basis of Cszapek liquid medium. Organ biometric indices of growth and development were recorded in 6-day-old seedlings. The data were processed in the STATISTICA 7 software package.

Through factorial analysis, it was found that in the source of variability of germination, germinal radicle length, stem length, seedling length, vigor index, the weight of the *wheat genotype* was 31.0; 18.6; 36.8; 33.9; 28.2%, *fungal isolates* – 40.0; 62.1; 41.3; 41.9; 45.6%, and *genotype x isolated* interactions – 14.0; 11.9; 14.3%; 13.3%; 15.6%, respectively. The calculation of genetic parameters demonstrated that for germination, the length of the germinal radicle, the length of the stem, the length of the seedling, the vigor index, the *heritability coefficient in a broad sense* was 0.33; 0.56; 0.41; 0.35, and the *genotypic coefficient of variation* – 6.15; 10.03; 7.85; 7.57%, respectively. The *genetic progress* values ranged from 7.3 to 13.1%, the highest (13.1%) being recorded for stem length.

The heritability coefficient and the genetic progress with low-medium values reveal: i) the strong dependence of the growth organs of wheat on the fungal isolate virulence; ii) the need for repeated selections in programs to improve the resistance of common wheat plants to *F. lateritium.*

Acknowledgments: *The research was carried out within the Subprogramme 011102 "Extending and preserving genetic diversity, improving gene pools of agricultural crops in the context of climate change", financed by the Ministry of Education and Research.*

Keywords: *wheat, growing character, Fusarium lateritium, variability, heritability.*

UDC: 635.652

CONTROL OF STORAGE PATHOGENS OF COMMON BEAN

Deaghileva Angela, ORCID: 0000-0003-3659-2450

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

E-mail*: angela.deaghileva@sti.usm.md*

Penicillium spp. and *Aspergillus spp.* manifest predominantly as saprotrophs during the plant ontogenesis. It has been shown that certain species can act as antagonists of pathogens and can enhance plant growth and resistance (PGPF: plant growth promoting fungi) and are used as biofertilizers. However, their pathogenic potential reveals during crop storage. Most of the *Penicillium* and *Aspergillus* species produce mycotoxins that dangerous for human and animal health, reducing the quality of the yield. The aim of this study was the monitoring of *Penicillium* and *Aspergillus* infection in common bean depending on storage duration using *nested*-PCR assay.

Beans of some *Phaseolus vulgaris* L. genotypes from the IGPPP collection were used in the study (MDC202, MDC204, MDC209, MDC223, harvest 2015 and 2020). Total DNA was extracted from 0,5 g of plant material according to the CTAB protocols. The PCR was performed in a 25 µl mix as described in the manufacturer's user guide for DreamTaq DNA polymerase (Thermo Fisher Scientific). The first round of the *nested*-PCR included 95^0C – 40 sec, 60^0C – 40 sec, 72^0C – 40 sec during 30 cycles, final elongation - 7 min, the first cycle denaturation was 95^0C – 2 min. The second round was performed in the same conditions.

DNA samples were tested with the primers designed to the β-tubulin gene sequences specific for *Penicillium spp*.: *P. expansum, P. chrysogenum, P. citrinum, P. griseofulvum, P. verrucosum, P. brevicompactum.* Analysis revealed the highest infestation of beans of the 2015 harvest. *P. chrysogenum* was detected in genotype MDC202, *P. citrinum* - MDC204 and MDC209, *P. expansum* - MDC223. Single *P. chrysogenum*-bearing sample of the 2020 harvest was revealed in MDC204. In addition, *Aspergillus spp.* was identified only in the beans of the 2020 harvest. Primers for identification of *aflP* genes specific for *A. parasiticus* and *A. flavus* genomes were used. *AflP* genes are related to aflatoxin biosynthesis gene cluster, which is involved in the aflatoxin synthesis. As a result, *A. flavus* in two genotypes of *Phaseolus vulgaris* - MDC202 and MDC209 was detected.

Molecular analysis showed that the presence of toxigenic fungi in tested material requires observance of storage conditions that prevent the development of pathogens and the accumulation of their metabolic products – mycotoxins.

Acknowledgments: *This study was supported by the research project 011101 "Genetic and biotechnological approaches of management of agroecosystems under climate change conditions", funded by the Ministry of Education and Research.*

Keywords: *Phaseolus vulgaris* L., *Penicillium spp., Aspergillus spp., nested-PCR.*

UDC: 632.112:633/635

MECHANISMS OF PLANT RESPONSE TO HYDRIC STRESS

Duca Maria*, ORCID: 0000-0002-5855-5194
Clapco Steliana, ORCID: 0000-0001-7147-2740

Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *maria.duca@usm.md*

During evolution plants have developed various physiological, biochemical and genetic-molecular mechanisms to regulate water balance, manage dehydration and to survive under heat and drought stress.

The most common strategies of plant adaptation to water-limited conditions are:

- regulation of transpiration through the opening and closing of stomata;
- adjusting of photosynthetic rates to reduce energy utilization;
- accumulation of osmotically active molecules, such as sugars, amino acids, and secondary metabolites, which modify osmotic potential of the cell, facilitating water retention;
- synthesis of specific antioxidant enzymes and compounds (ex. pigments) able to neutralizing free radicals (ROS) and to mitigate oxidative damage;
- accumulation of dehydrins, which protect plants from cellular dehydration, maintain cell homeostasis and eliminate free radicals;
- changes in root system development (size, volume, density) to increase the water absorption capacity etc.

All these processes involved different groups of functional and regulatory genes, such as genes associated with the synthesis of ROS neutralizing compounds and osmolytes, genes coding Late embryogenesis abundant proteins (including dehydrins), molecular chaperones, aquaporins, signaling molecules and transcription factors etc. The prime moderator of drought is abscisic acid (ABA), which activate the cascade of adaptive metabolic responses.

However, different plants have different responses to drought stress, reflecting their adaptations to a specific environment. Some genes may be conserved across a wide range of species, while others are characteristic to certain taxa.

Understanding how resistance genes are regulated at the transcriptome level, contributing to differential synthesis of stress proteins and specific self-assembly in the proteome, as well as how they interact with other intra- and intercellular or endo- and exogenous factors, may provide insights important on how plants respond to abiotic stresses and can be used to improve their resistance to such stresses

Acknowledgments: *The researches were performed under the subprogramme 011101 Genetic and biotechnological approaches to the management of agroecosystems in the conditions of climate change, funded by the Ministry of Education and Research.*

Keywords: *drought, hydric stress, adaptation mechanisms, plants*

UDC: 633.854.78

IDENTIFICATION OF BIOLOGICALLY-ACTIVE COMPOUNDS, ISOLATED FROM DIFFERENT FLORAL PARTS OF SUNFLOWER

Maria Duca[1]*, ORCID: 0000-0002-5855-5194
Alexandru Ciocârlan[1], ORCID: 0000-0002-0776-5095
Svetlana Blaja[1], ORCID:0000-0002-4336-6809
Lidia Lungu[1], ORCID: 0000-0002-9495-2621
Ana-Maria Prelipcean[2], ORCID: 0009-0000-2607-3150
Ana Mutu[1], ORCID: 0000-0001-8603-142X
Oana Craciunescu[2], ORCID: 0000-0003-0625-3650

[1]Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova
[2]National Institute of Research & Development for Biological Sciences, Bucharest, Romania
*E-mail: *maria.duca@usm.md*

Sunflower (*Helianthus annuus* L.) is one of the world's major oilseed crops, with its cultivation area increasing fifteen-fold in the last few decades, now covering 25 million hectares. Since its introduction to Europe, numerous hybrid varieties have been developed, significantly increasing seed oil content from 28% to 50% and global seed production to 38 million metric tons. Besides edible oil, other parts of the sunflower plant have significant value, especially in a circular economy framework. Notably, sunflower petals and tubular flowers have practical applications. In 2011, 0.76 metric tons of petals and 3.8 metric tons of tubular flowers were harvested. The collection of these floral parts is considered economically viable, with potential income comparable to seed sales. To facilitate this, specialized machines and new methods for harvesting and drying sunflower petals and tubular flowers have been developed. The therapeutic value of petals and tubular flowers is largely determined by their chemical composition. Several studies have explored this aspect, confirming the complex chemical profiles of these plant parts and their various biological activities.

This study aimed to obtain and quantify different extracts from the ligulate and tubular sunflower flowers to identify new products with biomedical potential. Using available raw materials – sunflower petals, tubular flowers, pollen, and known extraction methods such as steam entrainment in Neo-Clevenger type extractors and conventional solvent extraction in Soxhlet type extractors, the following were obtained: volatile oil samples from petals with an average extraction yield of 0.19%; fatty oil samples from pollen (~9.23%); triterpene compound samples from petals (non-polar fraction - 6.47% and polar fraction - 26.42%); phenolic acid samples from petals (~40.9%) and tubular flowers (~34.03%).

Analysis of these extracts revealed specific plant compounds, which will be further investigated to determine their bioactive properties.

Acknowledgments: *This study was supported by the research project (PN-IV-P8-8.3-ROMD-2023-0269) Comprehensive valorization of Helianthus annuus L. by-products for the development of new products with biomedical potential, funded by UEFISCDI, Romania.*

Keywords: *Helianthus annuus L., flower, chemical profile.*

UDC: 631.53:582.632.2

INFLUENCE OF BIOREGULATORS ON THE EMERGING OF BEECH SEEDLINGS IN NATURAL CONDITIONS

Elisovetcaia Dina[1]*, ORCID: 0000-0003-0521-6428
Ivanova Raisa[1], ORCID: 0000-0002-2554-2039
Popovschi Ecaterina[1], ORCID: 0000-0002-6620-4597
Fedorenco Elena[2]
Brindza Jan[3], ORCID: 0000-0001-8388-8233

[1]Moldova State University, Institute of Genetics, Physiology and Plant Protection, Chisinau, Republic of Moldova; [2]The "Plaiul Fagului" Natural Reserve, Ungheni district, Radenii Vechi commune, Republic of Moldova; [3]Slovak University of Agriculture (SAU) in Nitra, Faculty of Agrobiology and Food Resources, Nitra, Slovak Republic

*E-mail: *elisovetcaia.dina@gmail.com*

The purpose of our work was to study the emerging of Fagus sylvatica seedlings of "Plaiul Fagului" origin under the influence of bioregulators and adaptation beech plants in the natural conditions.

Seeds of F. sylvatica were collected in October 2023 on the territory of the "Plaiul Fagului" Natural Reserve, Ungheni district, Radenii Vechi commune, Republic of Moldova. Characteristics of the collection site: forest composition – mixed beech-oak forest with an admixture of hornbeam, ash and linden; altitude – 225-310 m.; age of trees – 115 years. The seeds having viability of 80.80-87.32% were selected for winter sowing in the natural conditions. The beech seeds were pre sowing treated with solution of bioregulators: 0.01% genistifolioside, 0.01% Alginite (three fractions – no.2, 4 and 6, obtained from a liquid extract of 3% Alginite), and 0.00001% solutions of Alginite powder and nanopowder. Distilled water was used as a control, and 0.001% solution of gibberellic acid was used as a standard. The appearance and blossoming of cotyledons were defined as emerging of beech seedlings. The overall emergence of seedlings and their length a month after the appearance were determined.

Emergence of seedlings was from 35.73 to 47.47%, on average 41.75%. The highest emergence of seedlings in natural conditions was showed in the variant aqueous extracts Alginite (fraction no.6) and gibberellic acid – 16.03-16.05 cm. The average plant height 30 days after the emergence of shoots was 15.27 cm.

Acknowledgments: *Research was carried out within the Scholarship grant #52310291 (2023-2024), financed by International Visegrad Scholarship Fund and within the Subprogramme 011101 "Genetic and biotechnological approaches to agroecosystem management under climate change conditions", financed by the Ministry of Education and Research (MEC) of the Republic of Moldova.*

Keywords: *Fagus sylvatica, growth regulator, seedling emergence, seedling.* adaptation.

UDC: 633.11:575.113.2

EFFECT OF ALLELES OF *Ppd-1* GENES OF BREAD WHEAT

Fedorova Valentina, ORCID: 0000-0001-5251-9611
Pogrebnyuk Olena, ORCID: 0009-0004-3256-297X
Balashova Iryna, ORCID: 0000-0001-7855-1134
Fait Viktor, ORCID: 0000-0001-9994-341X

Plant Breeding and Genetics Institute – National Center of Seed and Cultivar Investigation, Odesa, Ukraine,

E-mail: *faygen@ukr.net*

In the control of diversity in photoperiodic sensitivity, the role of three main genes has been established: *Ppd-A1*, *Ppd-B1* and *Ppd-D1*, which are located on homologous chromosomes 2A, 2B and 2D respectively. Each of the *Ppd-1* genes is considered as a series of sensitive and insensitive alleles. The aim of the study is to assess the effects of alleles of *Ppd-1* genes on the duration of the period before heading and related agronomically valuable traits in the field conditions of the steppe of Ukraine. 45 varieties of winter bread wheat of different origins and 64 recombinant-inbred lines of the cross combination Orenburgskaya 48 // Cappelle Desprez / 2B Chinese Spring identified by the alleles of the *Ppd-A1*, *Ppd-B1* and *Ppd-D1* genes were used as starting material.

Varieties of winter bread wheat carriers of recessive alleles *Ppd-A 1_del303* or *Ppd-A1b* did not differ in the time of heading. Varieties bearing the dominant allele *Ppd-B1c* spiked on average significantly earlier than carriers of the alternative allele *Ppd-B1b* by 3.7 days. Varieties carrying the dominant allele *Ppd-D1a* spiked 2.3-4.7 earlier than those with the presence of any of the three recessive alleles (*Ppd-D1b*, *Ppd-D1c* or *Ppd-D1d*) of this gene in the genotype. The last three genotypes did not differ significantly from each other in this trait.

The use of a set of recombinant-inbred lines (RIL) Orenburgskaya 48 // Cappelle Desprez /2B Chinese Spring as a starting material generally confirmed the results on the influence of different alleles of the *Ppd-1* genes on the time heading, and also made it possible to assess their effect on grain yield and its components. Different combinations of alleles of the three *Ppd-1* genes significantly influenced the differences in genotypes in terms of frost resistance of seedlings, duration of the period before heading, grain weight of spike, thousand kernel weight, harvest index and yield. Allelic differences in the three *Ppd-1* genes caused 4.4 days (or 48.9%) differences in the duration of the period before heading out of 9 days of differences in the RIL population for this trait. In terms of grain yield, the genotype *Ppd-A1b Ppd-B1c Ppd-D1c* with a combination of alleles, each of them separately contributes to the growth of the crop, was distinguished. Replacement of even one allele of these three genes with an alternative one led to a decrease in grain yield. At the same time, the effects of the three *Ppd-1* genes determine 0.083 kg/m2 or 49.7% differences in grain yield in the RIL population.

Keywords: *bread winter wheat, photoperiod, genotype, heading, yield.*

UDC: 635.7

INTRODUCTION AND ACCLIMATIZATION OF ORNAMENTAL EVERGREEN BROADLEAF TAXA

Gropa Tatiana, ORCID: 0000-0001-7767-4431

Biological, geonomic, chemical and technological sciences,
Moldova State University, Chisinau, Republic of Moldova

*E-mail: *tbogaiciuc@mail.ru*

The flora and vegetation of the continents, and in particular – of the countries, is made up not only of autochthonous species, which appeared and evolved under the respective climatic and edaphic conditions, but a very large share is made up of introduced species. There is a direct correlation between the hardiness of the species, on the one hand, and the vitality, decorativeness and productivity of the phytocenoses that include the diversity of the respective species, on the other hand. That is why the problems of introduction and adaptation of new woody plants are always relevant. The introduction of plants in the territory between the Prut and the Dniester rivers has a long history and is linked, first of all, to economic interests.

As we mentioned, the acclimatization of woody plants is a key issue in the introduction process, for this reason the main purpose of the respective work directly provides for the research of the morpho-biological peculiarities of evergreen broadleaf species, under the climatic conditions of the Republic of Moldova, and it has been developed with the aim of contributing to improving the landscape design and development of rural and urban areas. Moreover, in this paper, emphasis will be placed on the theoretical and practical basis, the possibilities of adaptation and the ways of propagating the species and the organization of the growth of species of evergreen broadleaf plants to produce planting material.

The objectives of the research will follow the algorithm: selecting the species and varieties of evergreen broadleaf shrubs and vines, studying the biological peculiarities of growth and development, conducting the comparative study on the resistance of the varieties to abiotic and biotic factors, determining the resistance of the species to environmental factors under the conditions of the Republic of Moldova, identifying possibilities of using the researched species in green spaces.

To achieve the research objectives, a series of new scientific research methodologies will be used, for example: the determination of resistance to low and high temperatures and to limiting abiotic factors such as drought, the morphological method, the ecological method and the phyto-entomological method.

As mentioned above, the acclimatization of woody plants is a key issue in the introduction process. Our knowledge regarding the process of plant acclimatization is quite modest, despite the fact that a very rich factual material has been accumulated in this field. The current theories about acclimatization are, for the most part, one-sided and even controversial. This fact always puts the problem of acclimatization of "introduced plants" under discussion, presenting a great interest in terms of evolution, discussed even by the classics of the evolutionary theory, who recognized two ways by which acclimatization is achieved: obtaining varieties with a different organization and growing plants under new conditions without radical changes in their organization.

UDC: 635.64:631.52

EVALUATION OF THE IONIZING RAYS EFFECTS ON TOMATO MORPHOLOGICAL INDICES

Ionascu-Urechii Angela, ORCID: 0009-0002-4376-7466
Sahanovschih Marionela*, ORCID: 0009-0007-1317-7701

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova,

*E-mail: *marionela.sahanovschih@sti.usm.md*

The research aims to evaluate the effects of X-ray irradiation on 16 tomato genotypes, particularly for the establishment of the optimal doses to obtain a viable biological material. The seeds with a moisture content of about 12% were exposed to 6 doses of X-ray irradiation: 100-350 Gy with the scale of 50 Gy. The following parameters were evaluated: the germination rate and the reductions of 30 and 50 % in growth of the radicle, hypocotyl and seedling compared to the control.

The data obtained in the dynamics denotes that the genotypes reacted very differently and non-specifically to the effect of radiation after the seed germination rate. Evaluation on the fifth day of water immersion established a gradual decrease in the germination rate compared to the control with increasing of irradiation dose, and at doses of 300-350 Gy the suppression was up to 90%. At the same time, some genotypes did not show a clearly differentiated response after the germination rate depending on the irradiation dose, expressing a reduced sensitivity, with a decrease rate of 0-15% compared to the control and others on the contrary, being sensitive, with a decrease of 50-60% regardless of the applied dose.

The later stages evaluations usually established a significant decrease compared to the control of the radicle, hypocotyl and seedling growing indices with increasing of the irradiation dose, in dependence of genotype. The reduction dose of the radicle length by 30-50% compared to the control was 150-250Gy and for the seedling 150-350Gy. Although the dose of 350 Gy did not influence the final germination rate, however, the radicle length was reduced by 75–90% compared to the control, and that of the seedling by 47–100%. The depressive effect of dose 350 Gy was more pronounced on the seedling length compared to the hypocotyl, the reduction being 14-28%. The analysis of the dependence between the irradiation dose and produced impact on seedling length established a strong positive correlation in 8/16 of genotypes, $r \geq 0.5$, in 3/16 an average one ($0.3 \leq r < 0.5$) and a weak one in 5/16 ($r < 0.3$).

The aforementioned confirms the different reactivity of the genotypes depending on irradiation doses, but also the fact that some genotypes have a predictable response to the increase of irradiation dose and others have a potential to mitigate the depressive effects without attesting relationship between dose and effect.

Acknowledgments: *The research was carried out within the Subprogramme 011101 Genetic and biotechnological approaches to management of agroecosystems in the conditions of climate change, financed by the Ministry of Education and Research.*

Keywords*: Tomato, X ray, genotype, reactivity.*

UDC: 635.21-2

RESULTS OF COMPARATIVE ENTOMOLOGICAL RESEARCH ON INVASIVE INSECT PEST COMPLEXES IN OPEN FIELD POTATO CROPS

Iurcu-Străistaru Elena*, ORCID: 0000-0003-3499-0084
Bivol Alexei, ORCID: 0009-0003-5709-7173
Rusu Ștefan, ORCID: 0000-0002-3204-5436
Gliga Olesea, ORCID: 0000-0002-4917-5106
Railean Nadejda, ORCID: 0000-0001-7818-9200

Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: iurcuelena@mail.ru

Potato growth is one of the technical crops of agri-food and with industrial importance for the Republic of Moldova, whose value can increase faster if are stimulated significant activities related to the cultivation and the obtaining of good-quality tubers.

The entomo-phytoparasitic sensitivity of impact at potatoes during the vegetation period is provoked yearly by more than 22 species of insects, with adaptation and specialization ecologo-trophic. They are reported like invasive pests on various sectors of production in the obtaining of the potatoes tubers. Some of them trigger specific entomo-parasitic invasions that cause a great damage on these crop plants. Thus fact motivates as purpose and objectives the accomplishment of the phytosanitary inspection, with the establishment of the intensity of the attack degree, the abundance and frequency of diverse species of harmful insects and the adaptation of efficient prognostic procedures, used in the integrated protection system of potato plants. Regularly it was done the entomological evidence starting from the planting period until the tubers were reaped, in the semi-early and early potato plantations through route surveys, with the sampling of soil and symptomatically plants invaded by harmful insects, comparative on different sectors in the North, Center and South-East areas the country. As a result of the entomological investigations carried out on potatoes, it was established that the invasive fauna is represented by 22 species of 4 orders, very harmful with trophic specialization and different manner of affection. More significant the the phytoparasitic species by estimating the values of numerical density, the frequency and abundance of the level of affection and attack were the species of polyphagous insects detected early in the soil, with the planting: mole cricket - *Gryllotalpa gryllotalpa* L., fam. Grillotalpidae, ord. Orthoptera, spiny larvae of roach beetles - *Agrotes lineatus*, L., *A. ustulatus* L., fam. Elateridae, ord. Coleoptera, species - *Agrotis segetum* (Den et Schiff), *Autographa gamma* L., (Silver Y), *Agrotis exclamationis* L., *Agrotis ipsilon* (Hufnagel), *Helicoverpa armigera* (Hübner), fam. *Noctuidae*, ord. Lepidoptera, May beetles - *Melolontha melolontha*, L., fam. *Scarabaeidae*, ord. Coleoptera. Later (May-July) the potato bush formation-ripening phase, the Colorado beetle - *Leptinotarsa decemlineata* (Say), Hitchner et al., Fam. Chrysomelidae, Fam, Coccinellidae from the order. Coleoptera. Out of the total

species of aphids collected, only the species that have an economical importance in the potato cultivation were selected and identified and yearly cause significant damage to the plants. These dangerous species have been highlighted and estimated on plantations where the caring works are not respected, the following harmful species have been widely reported: *Aphis fabae* Scopoli, *Aphis frangulae* (Kaltenbach), *Aulacorthum solani* (Kaltenbach), *Macrosiphum euphorbiae* (Thomas), *Myzus persicae* (Sulzer), *Phorodon humuli* (Schrank), *Rhopalosiphum padi* (Linnaeus). The results of the phytosanitary researches realized at the potato growth in different areas of the Republic of Moldova, means the application and the contribution in elucidating the parasitical impact for the predicting and argumentation of the integrated protection measures on the open field.

Acknowledgments: *This study was supported by the institutional research project - State program: Diversity of hematophagous arthropods, zoo- and phyto-helminths, their vulnerability and tolerance strategies to climatic factors, elaboration and implementation of innovative procedures for integrated control of species with socio-economic value: 20.80009.7007.12 F; Subprogram - Evaluation of the structure and functioning of biocenoses, aquatic and terrestrial habitats under the influence of biotic and abiotic factors in the context of ensuring ecological security and the population well-being, 010701, from within Moldova State University.*

Keywords*: potato crops, pest insects, phytosanitary control.*

UDC: 633.15:631.527

PARENTAL POLYMORPHISM SCREENING IN MARKER ASSISTED PYRAMIDING OF *opaque2* AND *crtRB1* GENES

Kostadinović Marija*, ORCID: 0000-0001-7267-0730
Ristić Danijela, ORCID: 0000-0002-3145-4158
Perić Vesna, ORCID: 0000-0001-8269-017X
Ignjatović-Micić Dragana, ORCID: 0000-0003-3584-3887
Vančetović Jelena, ORCID: 0000-0002-8743-0454

Maize Research Institute Zemun Polje, Slobodana Bajica 1, Belgrade, Serbia

*E-mail: *kmarija@mrizp.rs*

Marker assisted selection (MAS) is a method of rapidly incorporating valuable traits into new cultivars. It is being used in breeding to select progenies with the desired genes. MAS based gene pyramiding could facilitate in pyramiding of multiple genes for the simultaneous expression of more than one gene in a single genetic background. The main advantages of this strategy for germplasm improvement are elimination of extensive phenotyping, controlling the linkage drag and reducing the breeding duration.

Quality protein maize (QPM) has high content of essential amino acids lysine and tryptophan that are deficient in standard maize. Maize Research Institute Zemun Polje has a marker assisted breeding (MAB) program aimed at conversion of standard maize to QPM, as well as to β-carotene rich genotypes, adapted to temperate regions. The aim of this study was to identify maize inbred lines that could serve as donors of *opaque2* and *crtRB1* favorable alleles. These genes can work together in the same genetic background to control the content of lysine, tryptophan, and β-carotene. Two SSR markers, umc1066 and phi057, linked to the *opaque2* gene and *crtRB1* 3′TE, linked to the *crtRB1*, were employed for parental polymorphism screening. Recurrent parents (RP) were clearly distinguishable with *crtRB1*-specific marker from the donor parents (DP). The donors carried the favorable allele of *crtRB1* (543 bp), while the recurrent parents exhibited the unfavorable *crtRB1* allele (296 bp). Out of six DP lines, only one was distinguishable with *opaque2*-specific markers from the RP lines. The phi057 amplified ~170 bp fragment in DP and ~160 bp fragment in RP, while umc1066 amplified ~150 bp fragment in DP and ~160-170 bp fragment in RP. Furthermore, the tryptophan and β-carotene content were higher in donor compared to recurrent parents. This maize inbred line is identified as a donor parent line for pyramiding of *opaque2* and *crtRB1* genes to obtain breeding materials with high contents of lysine, tryptophan and β-carotene, the key nutritional traits in maize.

Acknowledgments: *This work was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).*

Keywords: *maize, marker assisted gene pyramiding, lysine, tryptophan, β-carotene.*

UDC: 633.15:631.531

GERMINATION OF CORN SEEDS UNDER CONDITIONS OF LOW AND HIGH TEMPERATURE STRESS

Lutcan Elena*, ORCID: 0000-0001-9967-6665
Borovskaia Alla, ORCID: 0000-0002-7225-0186
Ivanova Raisa, ORCID: 0000-0002-2554-2039

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *elena.lutcan@sti.usm.md*

The purpose of the study was to determine the potential of corn resistance to extreme temperatures using a methodically accessible criterion of growth reactions and their relationship as an integral indicator of the metabolic efficiency of plants. The morphobiological traits (overall seed germination, root and shoot length, root and shoot biomass; root and shoot vigour and metabolic efficiency) of super sweet corn (P300), semi-flint corn (P402) and popcorn (P398) seeds exposed to non-optimal temperatures were examined. A part of seeds was germinated for 7 days at +10ºC (cold-test), after which they were transferred to optimal conditions, and other part of seeds was kept for 30 minutes at +50ºC before germination at 25ºC.

The initial overall seed germination of the studied hybrids was 89% (P300), 93% (P402), and 87% (P398) and varied depending on the internal resistance of the hybrid to temperature stress. Under the influence of 50ºC temperature, the overall germination decreased significantly only for popcorn seeds (by three times). The cold test had no effect on the germination of super sweet corn and popcorn; and contributed to an increase in the germination of semi-flint corn seeds by 6.5%. Popcorn roots showed the highest sensitivity to heat stress, their length was 38.3% lower, and root vigour decreased by 3.4 times. Cold-stressed popcorn and super sweet corn seeds also decreased in root length by 38.9% and 32.0%, respectively.

On the contrary, treatment of semi-flint seeds with low temperature contributed to a rise in roots growth by 1.8 cm. The metabolic efficiency of semi-flint corn seeds increased significantly at temperature of 50ºC by 29.8% and at 10ºC by 8.0%, which indicates an intensification of growth processes in seeds surviving temperature stress.

The metabolism activation under the influence of temperature changes in the P402 hybrid (semi-flint corn) specifies its high ability to adapt to stressful conditions. In popcorn seeds (P398), both cold and heat stress caused a decrease in the growth of roots and shoots, significantly reduced their vigour, which confirms its lower biological resistance to non-optimal temperature-growing conditions.

Acknowledgments: *This study was supported by the Subprogramme 011101 "Genetic and biotechnological approaches to agroecosystem management under climate change conditions" for 2024-2027, financed by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *non-optimal temperature, corn, seed, germination, morphobiological traits.*

UDC: 633.854.78

AGRONOMIC VARIABILITY OF THE PROTEIN AND OIL CONTENTS IN CONFECTIONARY SUNFLOWER

Makliak Kateryna*, ORCID: 0000-0002-9841-2454
Korkodola Maksym, ORCID: 0000-0003-1960-2039

Yuriev Plant Production Institute of the National Academy of Agrarian Sciences of Ukraine

*E-mail: *yuriev1908sunflower@gmail.com*

Confectionary sunflower (*Helianthus annuus* L.) occupies a rather large segment in Ukraine. To achieve high thousand seed weight (>90 g), confectionary sunflower is sown at a low plant density, from 20,000 plants/ha to 40,000 plants/ha. Our purpose was to evaluate the variability of oil and protein contents in seeds of confectionary sunflowers sown at various plant densities.

The study was conducted in an experimental non-irrigated field located in the Dnipropetrovska Oblast of Ukraine in 2019-2021, at the latitude 48°37'03.1"N, longitude 34°48'17.3"E. Three gradations of plant density were evaluated: 20,400, 31,700, 40,800 plants/ha. Three varieties-populations and one F_1 hybrid were investigated. The oil content in seeds was determined by nuclear magnetic resonance. The protein content in kernels was determined by Kjeldahl digestion.

The mean oil content was 45.5%; the mean protein content was 18.8%. The year-to-year difference in the oil and protein contents was 4.6% and 3.1% (significant at $P<0.05$), respectively. The highest contents of oil and protein were recorded under relatively wet and cool conditions of 2020.

The difference in the oil and protein contents between the plant densities was 3.3% and 3.2%, respectively. An increase in the plant density from 31,700 plants/ha to 40,800 plants/ha contributed the most to a reduction in the oil content in seeds, on average by 3.3%. However, the protein content in kernels decreased too, on average by 3.2% (significant at $P<0.05$). The protein content also increased significantly (on average by 1.4%) when the plant density was increased from 20,400 plants/ha to 31,700 plants/ha.

The inter-variety difference in the oil and protein contents was 8.2% and 6.9%, respectively (significant at $P<0.05$). The minimum oil content in seeds (35.4%) was recorded for variety-population 'Zaporizkyi Kondyterskyi' sown at a plant density of 40,800 plants/ha in 2020. The maximum protein content in kernels (28.5%) was detected in hybrid 'Hudvin' sown at a plant density of 31,700 plants/ha in 2020.

In general, in thinly-sown plants, the protein content changes regardless of the oil content. To achieve maximum levels of protein in kernels, one should first of all take into account features of a variety/hybrid.

Keywords: *confectionary sunflower, variety, hybrid, plant density, seeds, oil, protein.*

UDC: 633.15:631.531

STARCH USED BY CORN SEEDS FOR GERMINATION: IMPACT OF TEMPERATURE AND BIOREGULATORS

Mascenco Natalia, ORCID: 0000-0003-1869-4357
Popovschi Ecaterina*, ORCID: 0000-0002-6620-4597
Ivanova Raisa, ORCID: 0000-0002-2554-2039

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

E-mail: popovschi.ecaterin@gmail.com; ecaterina.popovschi@sti.usm.md*

One of the main causes of yield reduction of high-yielding crops in the Republic of Moldova is their insufficient resistance to unfavorable environmental factors (extreme temperatures, lack or excess of moisture, soil overwatering). The maximum yield of cultivated crops is possible by increasing their resistance to climatic, water and salt stress, pre-sowing seed treatment with natural growth regulators.

Starch, which makes up about 4/5 of the weight of the whole grain, is formed in corn seeds because of photosynthesis and is necessary for plants to store energy, which ensures the development of young plants. To determine the changes occurring in corn seeds as a result of heat shock and pre-sowing treatment with bioregulators of different nature and concentration, we examined corn samples for starch content using the Evers polarimetric method and determined starch consumption for germination and respiration. It was determined in corn hybrids P374, P427, P458, and P465 with varying degrees of resistance before and after heating at 48, 50 and 52°C for 30 min, as well as after seed treatment with bioregulators. As bioregulators were used: a) "Moldstim", approved for use in the Republic of Moldova, whose active substance is furostanol steroidal glycoside - capsicoside, extracted from *Capsicum annuum* seeds; b) genistifolioside, the sum of iridoid and flavonoid glycosides, obtained from the aerial part of *Linaria genistifolia*; c) extract from the aerial part of *Juniperus sabina*, containing of terpenoids, organic acids and phenols. It was found that unstable hybrids (P427) utilized more reserve substances for germination at raised temperatures. Seed treatment with bioregulators reduced the utilization of starch for further growth. In moderately resistant hybrids (P458), temperature has no significant effect on starch utilization. Thus, by determining the starch content of corn seeds used for germination, it is possible to determine the degree of resistance of the test variety already at a preliminary stage of selection. Natural bioregulators help increase the resistance of various corn hybrids to unfavorable environmental factors

Acknowledgments: *This study was supported by the Subprogram 011101 "Genetic and biotechnological approaches to agroecosystem management under climate change conditions" for 2024-2027, financed by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *natural bioregulators, starch content, corn seed, non-optimal temperature.*

UDC: 635.64

GENE EFFECTS INVOLVED IN THE INHERITANCE OF GROWTH CHARACTERS IN TOMATOES

Mihnea Nadejda*, ORCID: 0000-003-0304-3295
Lupașcu Galina, ORCID: 0000-0003-3363-3595
Rusu Vadim, ORCID: 0009-0000-7822-4061

Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *mihneanadea@yahoo.com*

The creation and implementation of performing genotypes requires the use of an initial material with a high capacity for hereditary transmission of valuable characteristics and increased adaptation to local ecological conditions.

Establishing the influence of gene actions and interactions (Gamble model) on the inheritance of tomato growth characters under optimal and heat stress conditions.

Parents, F_1, F_2, BC_1, BC_2 hybrids for tomato combinations Dolgonosic (D) x Mary Gratefully (MG), L 10B x Rufina (R), R x Flacăra (F). *Biometric parameters*: radicle length, stem length. *Conditions:* i) cultivation of seedlings for 7 days at the optimal temperature of 25ºC – control; ii) the action of temperatures of 40 and 42ºC for 6 hours on day 4 of growth. *Genetic parameters*: additive (*a*), dominant (*d*) actions, *aa, ad, dd* epistatic interactions. The data were processed in the STATISTICA 7 software package.

For the radicle and stem length characters, it was found that for each combination, in both variants – control (25ºC) and thermal stress (40ºC, 42ºC), positive (+) and negative (-) effects were manifested. Positive actions were attested in the control variant only at the D x MG combination for stem length (0.61), at 40°C – at R x F for radicle length (1.36), at 42°C – D x MG in both variants. Epistases *ad*, always contributed to the growth of the radicle and stem under optimal conditions and thermal stress, but their reduced variance (1.52... 2.63) reveals, as in the case of additive forces, the low weight in the general genetic variance. The *d, aa, dd* effects had the greatest importance in character control. In general genetic control, *dd* epistases recorded the highest magnitude at stress temperatures.

Actions *d* and *aa, dd* interactions constituted the basic forces in the general genetic variance that controls the reaction to stress temperatures, and among them, the biggest role belonged to *dd* epistases.

Studied combinations manifested duplicated epistasis, which reveals the need for long individual selections in order to obtain tomato genotypes resistant to high temperatures.

Acknowledgments: *The research was carried out within the Subprogramme 011102 "Extending and preserving genetic diversity, improving gene pools of agricultural crops in the context of climate change", financed by the Ministry of Education and Research.*

Keywords: *tomatoes, varieties, hybrids, gene effects.*

UDC: 635.16:531.529(477)

CROP OF YACON (*POLYMNIA SONCHIFOLIA*) IN UKRAINE UNDER CLIMATE CHANGE CONDITIONS

Mishchenko Lidiya[1]*, ORCID: 0000-0003-0697-6971
Dashchenko Anna[2], ORCID: 0009-0000-9943-0710
Hlushchenko Lyudmila[3], ORCID: 0000-0003-2329-5537
Mishchenko Ivan[2], ORCID: 0000-0002-2919-8546
Molodchenkova Olga[4], ORCID: 0000-0003-2511-0866
Bondus Rosina[5], ORCID: 0000-0002-2367-5225

[1]Taras Shevchenko National University of Kyiv, 64/13, Volodymyrska str., Kyiv, 01601, Ukraine,
[2]National University of Life and Environmental Sciences of Ukraine, Kyiv, 03041
[3]Research station of Medicinal plants of the Institute of Agroecology and Nature Management of the NAAS
[4]Plant Breeding and Genetics Institute – National Center of Seed and Cultivar Investigations, 3 Ovidiopolska doroga str., Odesa, 65036, Ukraine
[5]Ustymivska experimental station of plant production of Plant production Institute named after V.Y. Yuryev of NAAS

E-mail: *lmishchenko@ukr.net*

Today, the problem of type 2 diabetes and obesity has increased, so there is a growing interest in foods with a health-promoting effect, i.e. dietary foods. Plants containing inulin are becoming increasingly important. The most interesting plant is yacon, a rare and little-studied vegetable and medicinal crop.

We started introductory research on yacon in 2011, and developed a hypoglycemic herbal tea with yacon based on its raw materials. The purpose of this work was to continue studying the cultivation of yacon under conditions of climate change (global warming) in different soil and climatic zones of Ukraine. Our research also revealed a high content of vitamins C (from 20 to 90%), B1 (up to 0.358 mg/100 g) and B2 (up to 1.695 mg/100) and protein (over 7%), depending on the plant organ. The leaves and stems of yacon are especially rich in vitamin C. The leaves of yacon contain high concentrations of chlorogenic, caffeic acids, and selenium, which is why it has antioxidant properties. Previous studies have shown that yacon is more efficiently grown in the Kyiv region on gray forest soil, which is much lighter in texture than Poltava black soil. The average weight of root tubers from one plant grown in the Kyiv region was more than 3.5 kg, and in the Poltava region - 1.5 kg. And 10 years later, in 2023, we got the opposite results in terms of yacon productivity (yield). In Poltava region, the weight of only one root tuber reached more than 1.0 kg, and in Kyiv region - 80-150 g, with a total productivity of up to 1.0 kg per yacon bush. Our results and literature data provide indisputable evidence that yacon can indeed be used for healthy nutrition of the population and those who can withstand significant physical exertion.

Keywords: *yacon, introduction, climate change, crop productivity*.

UDC: 634.74(478)

BIOLOGICAL PECULIARITIES OF DEVELOPMENT OF THE SPECIES *AMELANCHIER ALNIFOLIA* NUTT. UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

Mîțu Vitalie*, ORCID: 0009-0008-9334-713X
Roșca Ion, ORCID: 0000-0002-1304-8033

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *mvitalie79@gmail.com*

Amelanchier alnifolia Nutt. – *Saskatoon serviceberry* – is a species in the *Rosaceae* Juss. family, *Pomoideae* Focke subfamily, native to the western regions of North America. In the Republic of Moldova, it is cultivated in the „Alexandru Ciubotaru" National Botanical Garden (Institute) (NBGI), in some forest enterprises and by some amateur horticulturists.

Saskatoon serviceberry is a shrub or medium-sized tree, with oval leaves with toothed margin. The shoots are smooth, red-brown and shiny. The buds – conical, not larger than 1-2 mm, pointed, with a few scales. In autumn, the leaves turn light yellow, then orange-red or bronze. The flowers are white, 6-30 mm across, rarely solitary, usually grouped in multi-flowered terminal racemes, often tomentose.

It bears fruit regularly for 40-50 years. The fruits are 8-15 mm in diameter, oval or spherical shaped, reddish at first, but when fully ripe – dark purple, almost black, covered with wax, with pleasant, sweet, raisin-like taste. The sweet, juicy fruits are harvested gradually, in 2-3 times. The seeds are 3.5-5 mm long and 2 mm wide, sickle-shaped, dark brown, shiny. The germination capacity of seeds is maintained for 1-2 years.

The most valuable features of this species are the frost hardiness and the early ripening of the fruits. The fruits ripen gradually from the end of June until the beginning of August, when practically no other local species bear edible fruits. The plant is not demanding to the growing conditions, so that it does not require special care. The growing season begins in the milled of April, with the budding stage, followed by the leaf development stage in the middle of April - the beginning of May, and the flowering stage – in the first half of May. The flowering stage lasts 10-15 days, depending on the weather conditions during this period. The growth of annual shoots lasts until the end of July. It withstands low temperatures, as well as heat waves and drought without major problems. It grows well on different types of soil from podzolic to brown earth, but prefers slightly acidic soils. It tolerates partial shade, but planting in full sun is better for a high productivity and an intense color of the leaves in autumn. Saskatoon serviceberry plants grow quickly and produce a lot of suckers, but the suckers do not spread far from the shrub.

Acknowledgments: *The research was conducted in the framework of the project no. 20.80009.7007.19 and continued in the subprogram no. 010101.*

Keywords: *Amelanchier alnifolia, growth, development.*

UDC: 633.11:631.527

THE STUDY OF THE WINTER BREAD WHEAT LINES - DERIVATIVES OF WIDE HYBRIDIZATION

Motsnyi Ivan, ORCID: 0000-0002-1812-9481
Nargan Tatiana, ORCID: 0000-0002-8134-7975
Lytvynenko Mykolai, ORCID: 0000-0002-8134-7975
Golub Evgenia, ORCID: 0000-0001-8897-259X
Solodenko Anzhella*, ORCID: 0000-0001-8719-5290
Molodchenkova Olga, ORCID: 0000-0003-2511-0866

Plant Breeding and Genetics Institute – National Center of Seed and Cultivar Investigation, Odesa, Ukraine

*E-mail: *angelika_solo@yahoo.com*

Solving the problem of increasing the resistance of plants and improving the grain quality of bread winter wheat (*Triticum aestivum* L.) has become especially important in connection with the disruption of economic and ecological stabilization in Ukraine, especially against the background of global climate changes and war, the reduction of yields and the deterioration of seed qualities of grain. In recent decades, breeding has been aimed at increasing productivity, which has not always been accompanied by an improvement in the quality of the grain and an increase in its resistance to diseases. The contradiction between the requirements for the breeding of modern cultivars, the increase in productivity and the increase in protein content, can be resolved by the involvement of new genetic sources created by hybridization of wheat with its wild and cultivated relatives.

The study is devoted to investigate the agronomic traits and resistance to the main diseases of bread wheat lines created by the method of wide hybridization of wild relatives with modern cultivars, in favorable and arid conditions of the Southern Steppe of Ukraine. Modern wheat varieties of PBGI–NCSCI were crossed with original sources of alien traits: collection samples, introgression strains, amphiploids of tetrapoid wheat species with *Aegilops tauschii* Coss. As a result of crosses, the advanced introgression stocks with alien genetic complexes for disease resistance, high protein content and morphological characters were developed. The resistance of the obtained stocks to *Blumeria graminis* (DC) Speer f. sp. *tritici* March., *Puccinia triticina* Erikss. & Henn., *Puccinia graminis* sp. *tritici* Erikss. & Henn., *Puccinia striiformis* West., *Septoria tritici* Rob. ex Desm. was studied on a natural and artificial infection background during the entire period of their creation and study. The total protein content, weight of 1000 kernels, grain quality were evaluated. Fifteen donor lines with resistance to diseases, high indicators of weight of 1000 kernels, protein content, productivity and drought resistance were selected for further breeding work.

Keywords: *wheat, wide hybridization, agronomic traits, resistance, breeding.*

UDC: 633.11:631.527

GRAIN CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF TWELVE DURUM WHEAT GENOTYPES

Nikolić Valentina*, ORCID: 0000-0002-5834-6683
Simić Marijana, ORCID: 0000-6719-7982
Žilić Slađana, ORCID: 0000-0001-8299-9185
Perić Vesna, ORCID: 0000-0001-8269-017X
Kandić Raftery Vesna, ORCID: 0000-0003-1999-2030
Milovanović Danka, ORCID: 0000-0002-6915-2606
Sarić Beka, ORCID: 0000-0001-5918-6151

Maize Research Institut Zemun Polje, Slobodana Bajica 1, Belgrade, Serbia

E-mail: valentinas@mrizp.rs*

Durum wheat (*Triticum turgidum* var. *durum*) accounts for 5% of world production, compared to all types of wheat (*Triticum* spp.). The grain is predominantly used as a raw material for producing pasta, bread, and couscous. Durum wheat, with more than 13% protein, enables the optimal structure of cooked pasta. Grain quality parameters directly affect the dough and functional properties of the final product. The improvement of the quality attributes of durum wheat has been at the center of the attention of researchers due to the increase in market demand. However, the breeding process is complicated by the fact that the qualitative properties of the grain are not only influenced by growing conditions and genetic variability but also by combined interactions between genotype and environment, as well as by the variability of climatic conditions.

This study aimed to investigate the chemical properties of two ZP and ten introduced durum wheat genotypes. A two-year trial was set up at the Zemun Polje, Serbia, location in 2020 and 2021. The results obtained from the analysis of the content of total proteins in the grain of the studied genotypes of durum wheat indicate that in some genotypes, the year of cultivation had a significant effect on the variations in the content, and differences were also observed depending on the genotype (from 12.26 to 17.36%). Starch content varied significantly among genotypes but also differed depending on the year of cultivation (from 60.41 to 67.49%). The content of individual fibers in the grain varied significantly depending on the genotype as well as the year of cultivation.

Although new wheat varieties obtained by applying modern breeding methods enable higher grain yields, the variability in the agronomic and technological properties of the introduced genotypes of durum wheat represents an excellent starting material for the creation of varieties with characteristics suitable for different uses in the food industry.

Acknowledgments: *This study was supported by the research project of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).*

Keywords: *durum wheat, chemical composition, nutritive value*.

UDC: 582.675.3:[712.28:58](478)

THE PECULIARITIES OF THE PROPAGATION OF SEVERAL *BERBERIS THUNBERGII* DC. TAXA IN THE "ALEXANDRU CIUBOTARU" NATIONAL BOTANICAL GARDEN (INSTITUTE)

Onica Elisaveta, ORCID: 0000-0001-6075-5518
Roșca Ion, ORCID: 0000-0002-1304-8033
Cutcovschi-Mușțuc Alina*, ORCID: 0000-0002-9005-6977
Tanachi Tatiana, ORCID: 0000-0002-4711-1053

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova

*E-mail: *alina.cutcovschi.mustuc@gb.usm.md*

The species and cultivars of the genus *Berberis* L., are valuable plants for landscape design, but they have been insufficiently researched and used in our country because of the absence of qualitative planting material with specific decorative features.

Five species, various cultivars and hybrid forms from different Botanical Gardens of Europe have been introduced in NBGI over the years. In recent years (2018-present) the collection of the genus *Berberis* L. has been completed and diversified with 24 new and promising taxa with a long period of flowering, fruiting, differing in the color of the foliage, fruits, shape and size of the fruits, habit.

Vegetative propagation is more efficient, by obtaining seedlings faster, in greater quantity and inheriting the desired characteristics from the parent plants. The prepared cuttings were treated with IAA rooting stimulators, with a concentration of 0.01%, for 20 hours, and planted in cold seedbeds in a substrate consisting of 3 parts sand and 1 part neutral peat, fully observing the technology during the rhizogenesis period. The rooting success of treated and untreated lignified cuttings was clearly higher as compared with that of semi-lignified cuttings. The rooting success of untreated cuttings of the investigated taxa varied insignificantly (0-5%), but the success of the rhizogenesis process correlates more directly with the treatment of the cuttings and the compliance with the thermal and water regime. The impact of rhizogenesis stimulators on lignified cuttings was more beneficial for the taxon *B. thunbergii* 'Red Pillar', the yield being 35%, and less beneficial for *B. thunbergii* 'Red Torch' - 15%, the other investigated taxa had average results (18-20 %).

The most effective variant of vegetative propagation of the newly introduced taxa of *Berberis thunbergii* 'Erecta', 'Red Pillar' and 'Red Torch' was through lignified cuttings treated with rhizogenesis stimulators. The lignified cuttings treated with a 0.01% IAA solution with a 20-hour exposure are of better quality, with more developed leaf and root system and a 15-30% higher percentage of rooting, as compared with the untreated ones.

Acknowledgments: *The research was conducted in the framework of the project no. 20.80009.7007.19 and continued in the subprogram no. 010101*.

Keywords: *Berberis* L., *taxa, growth, development*.

UDC: 631.523.4:633.853.52

DIVERSITY OF SOYBEAN GENOTYPES AS ASSESSED BY QUANTITATIVE TRAITS

Perić Vesna*, ORCID: 0000-0001-8269-017X
Nikolić Valentina, ORCID: 0000-0002-5834-6683
Simić Marijana, ORCID: 0000-6719-7982
Ristić Danijela, ORCID: 0000-0002-3145-4158
Kostadinović Marija, ORCID: 0000-0001-7267-0730
Tabaković Marijenka, ORCID: 0000-0002-4478-9088
Ranković Dejan

Maize Research Institut Zemun Polje, Slobodana Bajica 1, Belgrade, Serbia

*E-mail: *vperic@mrizp.rs*

The success of the breeding program depends on the evaluation of breeding sources. Multivariate techniques play an important role in the identification of genotypes simultaneously superior for a number of agronomically important traits.

The study encompassed 90 soybean genotypes originating from different parts of the world and maintained in collection of Maize Research Institute Zemun Polje-Belgrade, Serbia. A randomized block design with a 3 replications per genotype was applied. Field trials were conducted during two consecutive years, at two locations in Serbia. Following agronomic traits were observed: plant height (PH), number of nodes (NN), number of pods (NP), number of seeds per plant (NSP), seed weight per plant (SWP) and 1000 seed weight (TSW). Parameters of technological quality of the grain (protein and oil content) were measured by the NIR-analyzer. Data were subjected to PCA analysis, in order to examine correlations between the traits, to compare genotypes by multi- traits and identify potential breeding sources.

A large part of the total variance of quantitative traits (approximately 70%) was captured by the first two pc axes. Majority of genotypes were positioned around the biplot origin, being intermediary for most of the traits observed. Along the first axis, genotypes were mostly distributed on the basis of yield components and protein and oil content, while the second axis divided genotypes according to TSW. Genotypes were separated by protein content mostly along the first axis, with the genotypes of the shortest vegetation having the highest number of extremes with high protein content. Grouping pattern clearly represented belonging of the genotypes to different maturity groups, although the vegetation length was not included in the analysis. Grain yield was positively correlated with all yield components and oil content, while the protein content was negatively correlated with yield and yield components, except with TSW.

PCA has proven as an effective tool for to comparison of genotypes by multiple traits and identifying superior candidates that could be used as useful parental material in future breeding program.

Acknowledgments: *This study was supported by the research project of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).*

Keywords: *Glycine max, diversity, agronomic traits, multivariate analysis*

UDC: 634.51(478)

WALNUT EMBRIOLOGICAL RESEARCHES OF LOCAL AND INTRODUCED IN THE REPUBLIC OF MOLDOVA VARIETIES

Pintea Maria, ORCID: 0000-0002-5589-4158

Research and Practical Institute of Horticulture and Alimentary Technologies, Chisinau, Republic of Moldova

E-mail: *rmariapintea@yandex@ru*

The embryologic peculiarities of pistillate flower receptivity to pollination, intravarietal pollination and autopollination with dichogamous genotypes of dichogamous local and introduced varieties in the climatic conditions of Republic of Moldova .

Experimental researches where effectuated in the national collection of walnut (Experimental Station „Codrul", RIHAT), as well as in industrial orchards. Biologic material is represented by 5 introduced walnut varieties, being compared with 5, main created and promoted in Rep. Moldova, etc. Cytoembryiologically were investigated pollen and pistillate flowers for purposes of clarification of effective pollination and intraspecific compatibility of local and introduced varieties.

Walnut anemophily pollination is plentiful ensured, in the frame of Republic of Moldova, locally being large cultivated by seedless. The influence of some biotic and abiotic factors on the processes of morphogenesis of flower buds of local and introduced walnut varieties was investigated. Peculiarities of micro-and macrosporogenesis and gametogenesis, endospermo- and embryogenesis related to flowering period and type were revealed. Effectuated studies revealed the terms of more effective pollination of introduced varieties (especially protandrous ones) in the climatic conditions of Republic of Moldova. Specific cytoembryological peculiarities of autopollination of dichogamoous local varieties were established. Within the establishment of industrial plantations, based on introduced important for marketing variety, there are demonstrate the possibilities to utilize as pollinator mainly introduced protandrous ones with good resistance of flowers to unfavorable temperatures during fruits setting.

High degree and specific features of compatibility of all dichogamous introduced and local walnut varieties were established.

Acknowledgments: *This study was supported by the research project 200101„Crearea soiurilor și clonelor pomicole, viticole și legumicole, perfecționarea procedeelor agrotehnice de cultivare și elaborarea tehnologiilor de producere a vinurilor din soiuri de struguri locale și produselor alimentare de ultima generație." pe anii 2024-2027, ANCD*

Keywords: *walnut, Republic of Moldova, introduced varieties, embryology, pollination*

UDC: 632.481:633.11

DEVELOPMENT AND EVALUATION OF PRIMERS TO CONSERVED REGIONS OF Pm WITH THE INVOLVEMENT OF INTROGRESSIONS FROM WILD SPECIES TRITICINAE

Plyhun Viktoriia*, ORCID: 0000-0001-5987-3293
Antonyuk Maksym, ORCID: 0000-0002-5877-969X
Iefimenko Tetiana, ORCID: 0000-0001-7814-7588
Ternovska Tamara, ORCID: 0000-0002-9712-1516

Laboratory of Genetics and Cell Biology of the Biology Department, National University of "Kyiv-Mohyla Academy", Kyiv, Ukraine

*E-mail: *v.plyhun@ukma.edu.ua*

Powdery mildew resistance (*Pm*) genes have conserved sequences that encode: leucine-rich repeats (LRR), domains with kinase activity, nucleotide binding domains (Zou S, 2023). The presence of conserved sequences allows them to be used to develop primers suitable for amplification of the corresponding nucleotide sequences with subsequent analysis amplicon spectra for the presence of polymorphisms associated with the manifestation of plant resistance/susceptible to powdery mildew (PM) (Srichumpa P, 2005, Sánchez-Martín J, 2021).

The aim of the work was to develop primers for conserved sequences of *Pm*, effective for finding the difference in the nucleotide sequences of genes present in Triticinae amphidiploids and introgressive lines resistant to PM, and modern winter varieties of common wheat susceptible to the pathogen. The sources of DNA studied were resistant and susceptible components of crosses and plants from hybrid populations. Two approaches were used: 1) a pair of primers consists of primers that flank specific coding sequences of genes; 2) pairs were formed using the RGAP technique (Chen XM, 1997). Plant DNA from segregating populations was combined into two bulks by the BSA method (Michelmore RW et al., 1992). The amplification products were separated in a 2% agarose gel and visualized with ethidium bromide.

35 primer combinations were analyzed. Amplification spectra with pairs of primers flanking individual conserved regions of *Pm* are predominantly represented by a single amplicon with the same mobility. Polymorphism has been detected only with the participation of primers to LRR. The combination of primers in RGAP technique made it possible to obtain polymorphic spectra with different mobility of that predominantly single amplicon. An unambiguous correspondence between the presence of an amplicon in the spectrum and the characteristics of the plant has not been established. Therefore, in order to search for differences in amplicon spectra between resistant and susceptible genotypes in segregating populations with introgressions from different diploid Triticinae species, effective combinations of primers should be found exclusively individually, depending not only on the original genotypes that were used to develop introgressive lines, but also on the genotypes of the introgression lines themselves, which are then used when crossing with susceptible varieties of common wheat to develop the segregating populations.

Keywords: *mildew resistance, wheat wild relatives, primer development*

UDC: 581.1:634.22

THE INFLUENCE OF SOME FACTORS ON THE ACTIVITY OF PEROXIDASE, POLYPHENOLOXIDASE AND THE CONTENT OF PHENOLIC SUBSTANCES IN PLUMS

Popovici Ana*, ORCID: 0009-0000-9543-0625
Svetlicenco Valentina, ORCID: 0000-0002-7376-949X
Gâscă Alina

Institute of Genetics, Physiology and Plant Protection,
Moldova State University, Chisinau, Republic of Moldova

*E-mail: *anapopovici@sti.usm.md*

In the process of maturation in plum fruits, the intensity of physiological-biochemical processes increases, which in turn contributes to the modification of the properties of different chemical compounds, and consequently also of the physical and organoleptic properties of the fruits. In order to slow down the rate of hydrolytic decomposition of organic substances during the post-harvest period, it is necessary to create optimal storage conditions, which could reduce the intensity of the ripening-senescence processes of the fruits. In order to have such conditions, preservation methods were applied with the use of Fitomag ethylene synthesis inhibitor and controlled atmosphere (AC). At the same time, the positive effect of using the exogenous growth regulator together with microelements (B, Zn, Mn, Mo) during the vegetation period was demonstrated, which influences the increase of the harvest as well as the improvement of the quality and storage capacity of the fruits.

The aim of the research was to evaluate the activity of the enzyme peroxidase, polyphenoloxidase and the total content of phenolic substances in plum fruits according to the influence of SBA Reglalg, the microelements mentioned and the storage methods.

Over the course of four years, the activity of the enzyme's peroxidase (Ermacov A.I. et al., 1986) and polyphenoloxidase (Voscresenscaia O.L.si a., 2006) was determined in the fruits of four late varieties of plum preserved by three methods, as well as the total content of phenolic substances (Singleton V.L. et al., 1999).

Peroxidase activity was determined in the Stanley and Prezident varieties of foreign origin within two years. Based on the average of the results obtained over two years, the activity of this enzyme changed during storage depending on the conditions and methods applied, as well as the physiological-biochemical processes that took place during the full maturation of the fruits.

In the fruits kept in the usual atmosphere (AO) these processes took place more intensively and the peroxidase activity values in both varieties are higher. In the plum fruits stored with the ethylene synthesis inhibitor Fitomag and in those stored in the controlled atmosphere, these processes took place more slowly and the peroxidase activity values are lower. In the fruits preserved with

Fitomag, the activity of this enzyme was at s. Stanley depending on the variants with 9.5; 11.8% and in the village of Prezident with 28.2; 28.6%, and in the controlled atmosphere (AC) respectively in the village of President with 48.6; 48.7% less than in AO. The activity of the peroxidase enzyme also depended on the treatments carried out during the vegetation period. In the variant treated with SBA Reglalg+ microelements B, Zn, Mn, Mo and CaCl2, the average activity of this enzyme was in the village of Stanley, depending on the storage method, with 23.5; 27.7%, and in the village of President with 11; 12% higher than the control version.

The total content of phenolic substances during storage was determined in the fruits of the variety President, Stanley and two of local origin, Udlinennaia and Superprezident. From the average of the results obtained from the research of the total content of phenolic substances during two years, we find that it was higher in the fruits preserved in AO than in those preserved by the other two methods. In plum fruits preserved with the Fitomag substance and in AC, the content of phenolic substances was, depending on the variants and varieties, by 11.1 - 30%, and in those in AC by 36.3 52.9% lower than in the atmosphere usual. Analyzing the average of the total content of phenolic substances investigated in the plum fruits preserved by three methods in the treated variant, it was 14-44.2% higher than in the control variant, depending on the variety and the preservation method.

Analyzing the average activity of the enzyme polyphenoloxidase (PFO) researched during four years in the Stanley, s. President, s. Udlinennaia and Superpresident varieties, we obtained that in the fruits of these plum varieties the PFO activity was different and depended on the variety and the storage method. The activity values of this enzyme were higher in plum fruits kept in the usual atmosphere. In the fruits preserved by the other two methods, the PFO activity was lower. In those preserved with Fitomag, depending on the variety and variants, it was 18.1 - 28.6% more reduced than in those from AO, and in the fruits preserved in AC at Stanley village by 71.4; 77% and in the other three varieties with 21.2 – 36.2% lower compared to AO.

Averaging the activity of polyphenol oxidase for the years 2020-2023 in the plum fruits of the researched varieties, we found that in the treated variant depending on the variety and the storage method, the PFO activity was higher by 13.4 - 41.1% than in the control variant. It was higher in the fruits stored in AO of the Stanley and Prezident varieties. Depending on the biological particularities of the varieties, higher activity of the peroxidase enzyme was in S. Prezident, of polyphenoloxidase - in S. Stanley, and the total content of phenolic substances was higher in S. Superprezident.

During the storage of plum fruits over the course of four years, we found that the activity values of the peroxidase and polyphemoloxidase enzymes, as well as the content of phenolic substances, were higher in the fruits of the researched varieties stored in the usual atmosphere.

In the fruits stored with the ethylene synthesis inhibitor Fitomag and in the controlled atmosphere, these values were lower and the fruits were stored longer, preserving their taste qualities. In the fruits treated during the vegetation period with SBA Reglalg and microelements B, Zn, Mn, Mo, the values of the

investigated indices were higher than in the control variant. These substances positively influenced the activity and content of these indexes.

During the storage of plum fruits over the course of four years, we found that the activity values of the peroxidase and polyphemoloxidase enzymes, as well as the content of phenolic substances, were higher in the fruits of the researched varieties stored in the usual atmosphere. In the fruits stored with the ethylene synthesis inhibitor Fitomag and in the controlled atmosphere, these values were lower and the fruits were stored longer, preserving their taste qualities.

In the fruits treated during the vegetation period with SBA Reglalg and microelements B, Zn, Mn, Mo, the values of the investigated indices were higher than in the control variant. These substances positively influenced the activity and content of these indexes.

Acknowledgments: *The research was carried out within the project of the State Program 20.80009.5107.18 "Directed training of the quality and the immune system in the fruits of late varieties of plum intended for long-term storage", financed by the National Agency for Research and Development.*

Keywords: *activity of peroxidase, activity of polyphenoloxidase, content of phenolic substances, plums, SBA Reglalg, microelements, storage.*

UDC: 681.1:633.854.78

CROSSTALK BETWEEN GIBBERELLIN AND OXIDATIVE STRESS-RESPONSES IN POLLEN DEVELOPMENT

Port Angela, ORCID: 0000-0003-3994-8918

Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova

E-mail: *portang@yahoo.com*

Gibberellic acid (GA) is a relatively well-studied growth factor for its role in anther and pollen development. These hormones are involved in tapetum differentiation as well as in the initiation of programmed cell death in this tissue, which is vital for male fertility. Additionally, GAs crosstalk with other hormones in plant stress responses.

The perception of stress initiates several signaling complex networks, including the production of reactive oxygen species (ROS), quantitative changes of phytohormones, regulation of gene expression, various kinase/phosphatase cascades, etc.

In sunflowers, as in many other plant species, the most sensitive stages to deviations in internal or external stimuli are during the time of anther differentiation and before the meiotic phase of microsporogenesis.

Anther transcripts have been analyzed at different microsporogenesis stages (by RT-qPCR) to identify gibberellin responsive genes contributing to meiosis and male gametophyte development in sunflower. Treatment with gibberellic acid (GA_3, 0.01%) was carried out by spraying the inflorescence at the budding stage (premeiotic phase). Cytological samples and those with semi-thin anther sections were analyzed by light microscopy.

The data revealed that genes belonging to functional categories, i.e., oxidative stress, response to reactive oxygen species, cellular oxidant detoxification, signal transduction, were expressed differentially in anthers of plants with gibberellin-induced androsterility compared to those of fertile and sterile anthers (ASC-PET1). It is suggested that altering the redox status of generative cells and tapetum may be one of the common and, also, discriminative cellular events in the response among the ASI-AG_3, ASC, and ASC-AG_3 anther phenotypes in plants with different mitotypes (sterile/fertile) and allelic genotypes for the Rf genes.

The importance of understanding the complex interactions between ROS and gibberellins in early anther development, in physiological conditions, and particularly in plant response to stressful factors, is emphasized.

Acknowledgement: *The researches were performed under the subprogramme 011101 Genetic and biotechnological approaches to the management of agroecosystems in the conditions of climate change, funded by the Ministry of Education and Research.*

Keywords*: sunflower, gibberellin, oxidative stress, signal transduction, pollen development.*

UDC: 631.147:635.49(477)

BIOLOGICAL PRODUCTIVITY OF *TARAXACUM OFFICINALE* WIGG. FOR INDUSTRIAL CULTIVATION IN UKRAINE

Pryvedeniuk Nazar*, ORCID: 0000-0002-0748-8083
Hlushchenko Lyudmila, ORCID: 0000-0003-2329-5537

Research station of medicinal plants, Institute of agroecology and environmental management, NAAS of Ukraine, with. Berezotocha, Ukraine

*E-mail: *privedenyuk1983@gmail.com*

Taraxacum officinale F.H. Wigg. is a perennial plant of the *Asteraceae* family. Its medicinal raw materials include *Taraxaci officinalis radix, Taraxaci officinalis herba cum radice*, and occasionally flowers. Natural reserves of raw materials are significant. The species usually grows in diverse clusters, complicating raw material collection, especially of the leaves. The quality of raw materials from wild populations does not always meet current regulatory requirements.

Research station of medicinal plants, IAEM NAAS (Ukraine) is developing and improving elements of *T. officinale* cultivation technology to enhance the quality and yield of raw materials.

The research employed methodological approaches of medicinal plant practice. Experimental design schemes followed the methodology of Dospekhov B.O. Biometric measurements, phenological observations, and yield recording were conducted according to the methodology of Brykin A.I. The experimental field was established in the first decade of April, with a seed sowing rate of 6 kg/ha. Seed depth was 1 cm, and row widths were 25, 35, 45, 55, and 65 cm.

The results indicate that reducing the number of plants per unit area decreases crop productivity. In the first year of cultivation, the highest yield was achieved with a row width of 25 cm, yielding 2,30 t/ha of dry *T. officinalis herba* and 2,56 t/ha of dry *T. officinalis radix*. Increasing the row width to 45 cm reduced the yield of *T. officinalis herba* to 2,06 t/ha and *T. officinalis radix* to 2,17 t/ha, with the lowest yield of leaves at 1,18 t/ha and roots at 1,70 t/ha observed with a row width of 65cm.

In the second year, a row width of 25 cm yielded 4,20 t/ha of *T. officinalis herba*, while increasing the row width to 35 cm led to a higher yield of 4,67 t/ha. Further increases in row width decreased *T. officinale* productivity. The lowest yield of 2,96 t/ha was obtained with a row width of 65 cm. The highest yield of dry *T. officinalis radix*, 2,56 t/ha, was achieved with a row width of 25 cm, with increasing row width leading to decreased yield.

Therefore, for obtaining high yields of dry *T. officinalis herba*, *T. officinale* should be sown with a row width of 35 cm, and for maximum yield of *T. officinalis radix*, a row width of 25 cm is recommended.

***Acknowledgments**: This research was conducted within the framework of the scientific research program "Breeding, production, and use of medicinal, essential oil, and spice-aromatic raw materials," funded by the National Academy of Agrarian Sciences of Ukraine.*

***Keywords**: cultivation, Taraxaci officinalis radix and herba, row width.*

UDC: 575.21: 577.164.3:633.15

GENETIC VARIABILITY IN TOCOPHEROLS CONTENT IN MAIZE LANDRACES

Ristić Danijela*, ORCID: 0000-0002-3145-4158
Kravić Natalija, ORCID: 0000-0003-2153-1006
Kostadinović Marija, ORCID: 0000-0001-7267-0730
Vukadinović Jelena, ORCID: 0000-0003-0999-9677
Gošić Dondo Snežana, ORCID: 0000-0002-3905-3308
Perić Vesna, ORCID: 0000-0001-8269-017X
Anđelković Violeta, ORCID: 0000-0001-9746-1281

Maize Research Institute „Zemun Polje“, 11185 Beograd, Serbia

*E-mail: *dristic@mrizp.rs*

Improvement of maize grain composition is one of the most important breeding goals. Maize is generally characterized by low levels of vitamin E in its kernels. Still, its biofortification through breeding could provide sufficient vitamin E as a staple crop or seed oil. Tocopherols are particularly important due to their role in protecting the plant from oxidative stress and contributing to the nutritional quality of the grain. The highest biological activity is found in α-tocopherol and therefore is most interesting for maize breeding.

This work aimed to evaluate the whole kernel tocopherols composition of 54 maize landraces with different kernel colours and kernel types. High-Performance Liquid Chromatography (HPLC) was employed to quantify and determine the levels of α-tocopherol, γ+ß -tocopherol, and δ-tocopherol within these landraces. The detected ranges for tocopherols were 0.83 to 3.65 μg g^{-1} for α-tocopherol, 17.59 to 38.52 μg g^{-1} for γ+ß -tocopherol, and 1.52 to 11.43 μg g^{-1} for δ-tocopherol. The highest value of α-tocopherol was observed in the landrace with yellow flint kernels, while the highest γ+ß –tocopherol was measured in the landrace with orange semi-dent kernels. At the same time, landrace with yellow dent kernels had the highest δ-tocopherol. On the contrary, landraces with white dent and semi-dent kernels had the smallest values for all tocopherol types.

Genetic diversity of landraces has an important role in maize breeding and could significantly impact the improvement of new varieties as a valuable source of useful traits. The presence of a wide genetic diversity of landraces based on tocopherol content makes them more than suitable to be used for further maize breeding improvement programs.

Acknowledgments: *This study was supported by the research project (This study was supported by the research project of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200040).*

Keywords: *vitamin E, HPLC, grain, Zea mays L.*

UDC: 633.262:502.72(478)

BROMUS RAMOSUS HUDS. (*POACEAE*) IN THE FLORA OF THE "DOBRUȘA" LANDSCAPE RESERVE

Sfeclă Victor, ORCID: 0000-0003-0968-7016
Pînzaru Pavel, ORCID: 0000-0001-6116-930X

Moldova State University, Chisinau, Republic of Moldova

E-mail: *v.sfecla@gmail.com; p_panzaru@yahoo.it*

The genus *Bromus* L., includes around 160 accepted species, which are distributed worldwide, with a large number of species found in the temperate regions.

According to the floristic researches that were carried out during: 1954-2023, 11 species of the *Bromus* L. genus (Syn.: *Anisantha* K. Koch, *Bromopsis* (Dumort.) Fourr.) were highlighted on the territory of the Republic of Moldova (Gheideman, 1954, 1975, 1986; Negru, 2007; Pînzaru, 2023). During this period, the presence of the *Bromus ramosus* Huds. species, was not confirmed for the flora of the Republic of Moldova, although it was indicated in the works of the botanists I. Pacioski (1912, p. 89) near the Cornești and Otaci villages, and by Tr. Săvulescu & T. Rayss (1924, p. 37) near the Cornești, Bahmut and Rădenii Vechi villages.

Bromus ramosus Huds. [= *Bromopsis ramosa* (Huds.) Holub] is a perennial species, hemicryptophyte with a 50-150 cm height, mesophyte - mesohygrophyte, weak acid neutrophilic-neutrophilic. Widespread in the through the oak forests up to the sessile oak area and thickets. Arial being Europe, the Caucasus, South-West Asia, India and the Himalayas.

As a result of floristic research carried out recently in the "Dobrușa" landscape reserve, the *Bromus ramosus* Huds. species was recorded. This was identified in the forest areas "Dobrușa Mare" (plot 72C, altitude 305 m; plot 78E, altitude 286 m) and "Dobrușa Mică" (plot 18L, altitude 291 m). In this reservation's conditions, it grows in small groups of 5-10 specimens, in clearings in gorun phytocenoses with hornbeam from the *Carpino-Quercetum petraeae* Borza 1941 association. The tree layer consists of *Quercus petraeae* (Matt.) Liebl., *Carpinus betulus* L., *Fraxinus excelsior* L., *Acer platanoides* L., *Acer campestre* L. and *Tilia cordata* Mill., with a coverage between 70-85%, the shrub layer one is not developed and the herbaceous layer varies between 70-90% coverage. *Carex pilosa* Scop. or *Stellaria holostea* L. predominates in the herbaceous layer, also some rare species present here are *Galanthus nivalis* L. and *Epipactis purpurata* Sm.

This species is rarely encountered in this reserve, the respective populations needs to be protected and monitored in order to highlight their evolution.

Keywords: *"Dobrușa" landscape reserve, Bromus ramosus Huds.*

UDC: 633.33(477)

BREEDING PULSES FOR YIELD STABILITY IN THE STEPPE OF UKRAINE

Sichkar Vyacheslav*, ORCID: 0000-0003-0581-5068
Lavrova Halyna, ORCID: 0000-0002-3086-6572

Plant Breeding and Genetics Institute - National Center of Seed and Cultivar Investigation, Odesa, Ukraine

E- mail: bobovi.sgi@ukr.net*

Leguminous crops play an extremely important role in the agricultural sector of the planet and Ukraine, and therefore their sown areas and gross yields are constantly growing. Their importance is due to the extremely valuable composition of the seeds, which is characterized by a balanced protein, a rich set of useful minerals, vitamins and dietary fiber. When it is used for nutritional needs, people's general health significantly improves, they adapt better to environmental conditions, and life longevity in general increases. In addition, this group of crops is able to bind significant amounts of nitrogen from the air, using it for formation of their own yield, and also leave a significant part for the next crops in the crop rotation. Thus, legumes are one of the best precursors for almost all crops. Their sown area in the world in the period 2001–2021 increased from 67.6 to 93.2 million hectares, and the yield from 0.83 to 0.96 t/ha. Forecasts show that these positive trends in the production of pulses will increase significantly in the future.

Soybean breeding began in our institute in 1979. In a short period of time, phenological, phenotypic and economically valuable traits of more than 5000 accessions were studied, sources of drought resistance and other adaptive traits were identified. A detailed study of the world soybean collection made it possible to include in hybridization the most adapted to our conditions domestic and foreign genotypes, as a result of which 34 varieties of different ripeness groups were created.

In our institute, chickpea breeding began in 1995. It is based on collection material obtained from the International Research Institute of the Semi-Arid Tropics (ICRISAT, Patancheru, India) and the Center for Plant Genetic Resources of Ukraine (Kharkiv). Over the past period, more than 3 thousand genotypes have been analyzed for economically valuable traits and 12 varieties have been created, including a number of large-seeded varieties, which are not inferior in yield to the best varieties of world breeding. Chickpea varieties of our breeding belong to the group of drought-resistant.

The breeding program for pea in the institute is based on the use of genes that effectively affect the architectonics of plants (*def* – development funiculus, *af* – tendrilled type of leaves, *deh, Stb* – stem determinant), which significantly reduce losses during harvesting. During last year we created 7 varieties of this crop.

Keywords: *pea, chickpea, soybean, variety, yield, stability, adaptability.*

UDC: 581.1:635.65

PHYSIOLOGICAL RESPONSES OF PHASEOLUS SPECIES TO HEATS TRESS

Thierry Michel Tene, ORCID: 0000-0002-6404-0429
Fatih Cengiz Mehmet, ORCID: 0000-0002-6836-2708
Cengiz Toker*, ORCID: 0000-0001-7042-1132

Faculty of Agriculture, Akdeniz University, TR 07070 Antalya, Turkiye

*E-mail: *toker@akdeniz.edu.tr*

Heat stress due to climate change disturbs all physiological traits of the plants including photosynthesis, respiration, hormonal metabolism, growth and development, and decreases in yield and quality traits. Therefore, it is extremely vital to be aware of the stress-related physiological responses of plants to manage heat stress, which is predicted to continue to increase soon.

This study aimed to reveal the physiological responses of *Phaseolus* species including eight heat-tolerant and two heat-sensitive bean genotypes, common bean (*P. vulgaris* L.), tepary bean (*P. acutifolius* A. Gray), runner bean (*P. coccineus* L.), and lima bean (*P. lunatus* L.). Abscisic acid (ABA), jasmonic acid (JA), salicylic acid (SA), chlorophyll content (CC) and maximum quantum efficiency of PSII (Fv/Fm) were studied in the greenhouse under heat-stressed and non-heat-stressed conditions.

Stress-related phytohormones consisting of ABA, JA, and SA were significantly found to be different from heat-tolerant and heat-sensitive genotypes of *Phaseolus* species. ABA, JA, and SA levels were noticeably detected higher under heat-stressed conditions than those under non-heat-stressed conditions, while CC and maximum quantum efficiency of PSII were higher under non-heat-stressed conditions.

The higher levels of ABA, JA, and SA in the beans under heat-stressed conditions were commented on as a survival strategy. The genotype of *P. acutifolius* was identified as the most heat-tolerant among *Phaseolus* species. Heat-tolerant genotypes had developed unique adaptive physiological traits to cope with heat stress, probably during the evolutionary process.

Acknowledgments: *This study was supported by the Akdeniz University Scientific Research Project Coordination Unit (FDK-2022-5866). The authors are grateful to "Akdeniz University Scientific Research Project Coordination" for the financial support.*

Keywords: *heat stress, Phaseolus species, abscisic acid, salicylic acid, jasmonic acid, physiological parameters, climate change, chlorophyll content*.

UDC: 632.111.6:635.657

PRELIMINARY EVALUATION OF CHICKPEA COLD TOLERANCE

Vus Nadiia[1,2]*, ORCID: 0000-0001-7098-9158
Vasylenko Antonina[1], ORCID: 0000-0003-0081-5894
Raievska Irina[3], ORCID:0000-0003-3656-8178
Besuhla Olha[1], ORCID: 0000-0002-1458-1630

[1]Plant Production Institute named after V.Ya. Yuriev of NAAS, Kharkiv, Ukraine
[2] French National Institute for Agriculture, Food, and Environment (INRAE), Dijon, France
[3] V. N. Karazin Kharkiv National University, Kharkiv, Ukraine

*E-mail: *vus.nadezhda@gmail.com*

Under the conditions of global climate change, it is necessary to change both the composition of crops and the way they are grown. An increase in the frequency and intensity of droughts necessitates an earlier sowing date. However, this means that seeds will be exposed to lower temperatures during the germination period. According to long-term data from the National Centre for Plant Genetic Resources of Ukraine (NCPGRU), 17 out of 25 years had days with temperatures below 10°C during the chickpea germination period. This has increased the time from sowing to germination from 10 to 28 days. These challenges call for the creation of new varieties adapted to low temperatures in the early stages of vegetation, which requires an assessment of genetic diversity and the search for new sources of resistance. To this aim, a preliminary study was carried out to evaluate the response of chickpeas to the influence of cold. The research was carried out on the basis of the Faculty of Biology V.N.Karazin Kharkiv National University in 2021. 7 chickpea accessions from the reference collection of the NCPGRU were selected as the object of research. The evaluation of cold resistance was carried out by germination of chickpea seeds on filter paper at a temperature of +4 °C in a thermostat. Control +20 °C. On the 2nd, 5th, 8th and 13th day, the length of the roots and shoots and the biomass weight were measured. The study showed a high effect of stress on the germination of chickpeas of all genotypes. A delay in the germination of the accessions was observed: for 6-10 days compared to the control. It caused a significant depression of the main vegetative processes from 76 to 100%: root length (84%), shoot length (90%), biomass accumulation (89%). It has been found that a temperature of +4°C is too high stress for chickpea plants during the germination period and makes it impossible to differentiate accessions by resistance to it.

Thus, as a result of the experiments conducted, it has been demonstrated that low temperatures have a high negative effect on chickpea accessions in the period from sowing to germination. Further evaluation of cold hardiness and selection of resistant material for adaptation selection is recommended in the temperature range of 4 to 10°C.

Keywords: *Cicer arietinum, abiotic stress, genetic resources*.

UDC: 632.38:635.21

METHODS OF PROTECTION OF BASIC SEED POTATOES AGAINST VIRAL INFECTIONS IN THE FIELD

Vyshnevska Olha*, ORCID: 0000-0002-1089-6862
Levkivskyi Ihor, ORCID: 0000-0001-5773-2809
Riazantsev Mykhailo, ORCID: 0000-0002-3903-6604

Institute for Potato Research, Nemishaievo, Kyiv region, Ukraine

E-mail: olgavushnev_@ukr.net*

Pre-basic seed potatoes, which have been cured of diseases by *in vitro* meristem culture when grown in the field, are quickly affected by virus infections. Therefore, there is a need to find new methods of protecting plantations from virus infections.

The objective of the research is to investigate the effectiveness of potato plant treatments with Avatar-2 protection, a nanomaterial-based preparation, tops desiccant Reglone Super 150 SL, plant treatments with insecticidal preparations against aphids that transmit potato viruses in combination with spraying of plants with mineral oil OLEMIX® 84, EC in the Polissia zone of Ukraine. It was found that the treatment of potato tubers before planting and spraying of plants during the growing season with the nanopreparation of biological origin Avatar-2 protection at a dose of 200 ml/ha increased the yield of seed potatoes of Myroslava variety compared to the control variant without treatment by 2.7 t/ha or 6.94 %, and Fotynia variety – by 2.6 t/ha or 6.9 %. The use of potato desiccant Reglone Super 150 SL 2.0 l/h, treatments of potato plantations with Avatar-2 protection and mineral oil OLEMIX® 84, EC provided an increase in the yield of Myroslava variety by 3.3 t/ha or 9.5%. The method of enzyme-linked immunosorbent assay of seed potato tubers in the post-harvest period revealed that treatments of vegetative potato plants with the Avatar-2 Protection nanopreparation reduced the infection of seed potatoes with Potato virus Y by 0.5%, while the infection of plants in the control variant without treatment was 1.0%. The combination of plant treatments with the Avatar-2 Protection nanopreparation with desiccation of potato tops during three growing seasons provided a zero level of infection of potato plants with Potato virus Y, while the control variant without treatments had 1.0% of affected plants. When applying complex treatments of seed potato plantations with mineral oil OLEMIX® 84, EC in combination with insecticides, no plants affected by Potato virus Y were found.

The method of application of a multicomponent nanopreparation of biological origin “Avatar-2 protection”, complex spraying of plants with insecticides and mineral oil OLEMIX® 84, EC for the control of viral diseases in plantations of healthy potatoes is proposed.

Keywords: *potato yield, viral diseases, Potato virus Y infection, nanopreparations, mineral oil.*

UDC: 632.112:635.21(477)

EVALUATION OF POTATO VARIETIES FOR DROUGHT TOLERANCE IN CENTRAL POLISSIA OF UKRAINE

Zakharchuk Nataliia, ORCID: 0000-0002-8194-2491
Pysarenko Nataliia, ORCID: 0000-0001-6299-2170
Oliinyk Tetiana, ORCID: 0000-0002-7235-9413

Institute for Potato Research, Nemishaievo, Kyiv region, Ukraine

E-mail: *vs_potato@meta.ua*

The IPCC projections for 2023 for global warming and an increase in the frequency of high temperatures and droughts in Ukraine prompt us to study the response of potato varieties to these abiotic stresses. The data presented indicate that the rate of temperature increase, ranging from 0.4 to 0.6°C per decade, is higher than the average values observed in Europe and significantly higher than global indicators. It is noted that these changes have also affected the precipitation regime in the central part of Ukraine's Polissia region, where significant amounts of precipitation are observed in autumn and winter while the summer months are characterized by lower precipitation.

The research aimed to investigate the response of domestic potato varieties to stress caused by high air temperature and insufficient precipitation during the growing season by analyzing physiological parameters of drought tolerance. The study involved 40 potato varieties of different maturity groups. The response of potato varieties to stress was studied by analyzing the drought resistance coefficient at different stages of plant development.The research showed that during the growing season of the crop (May-August) the average value of the hydrothermal coefficient was HTC = 0.58, which indicates average drought conditions in the area. It was found that high values of the drought tolerance coefficient (DTC ≥ 70%) were found at the first recording (budding) in the following varieties: Radomysl, Serpanok, Tyras, Nahoroda, Mezhyrichka 11, Fanatka, Opillia, Charunka, Myroslava, Zhytnytsia, Basaliia and Dzhavelina. During the second recording (flowering), significant changes occurred, namely, the values of: Skarbnytsia, Shchedryk, Vzirets, Vymir, Podoliia, Vyhoda, Ariia, Avanhard, Misteriia, Rostavytsia, Sontsedar, Oleksandryt, Alians, Predslava, Synhaivka, Volodarka, Tradytsiia, Rodynna, Marfusha, Fotyniia, Slovianka, Ivankivska rannia increased. The third recording (formation and growth of tubers) was carried out under conditions of moderate moisture supply to the plants, but the DTC values were lower than in the previous recording. The fourth recording (intensive accumulation of tuber mass) occurred against the background of critically insufficient soil moisture and high air temperatures. However, the following varieties showed a positive DTC increase, namely: Vzirets, Vymir, Shchedryk, Podoliia, Melaniia, Mysteriia, Fotyniia, Ivankivska rannia, Tradytsiia, Marfusha and Rodynna. The average value of the four recordings was used to identify varieties with a high level of drought tolerance (DTC ≥ 60%): Skarbnytsia, Shchedryk, Vyhoda, Ariia, Misteriia, Marfusha, Zhytnytsia, Dzhavelina, Myroslava and Rodynna.

***Keywords**: potatoes, varieties, abiotic stress, drought tolerance coefficient.*

Session D

CHEMISTRY AND PHYSICS

UDC: 539.23:535.42

ENHANCED DIFFRACTION EFFICIENCY IN PEPC-SY3:AU: POLARIZATION AND CONCENTRATION DEPENDENCE ANALYSIS

Abaskin Vladimir, ORCID: 0000-0003-2814-2695
Achimova Elena, ORCID: 0000-0002-6017-1085
Losmanschii Constantin*, ORCID: 0000-0002-6990-7482

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

E-mail: constantin.losmanschii@ifa.usm.md*

The property of azopolymers to exhibit photoanisotropy, as well as the photoinduced chirality, is studied in detail for their potential applications. However, increasing attention is being given to azopolymer nanocomposites because they undergo a drastic change in physical-chemical parameters, such as the shifting of the bandgap, modification of the refractive index, alteration of photoinduced birefringence, and significant enhancement of diffraction efficiency for the gratings recorded in comparison with pure azopolymer films.

In the present work, a comparative analysis of the diffraction efficiency kinetics for the poly-N-epoxypropylcarbazole (PEPC) nanocomposite doped with Au nanoparticles (Au NP) is performed. The average diameter of the nanoparticles is 25 nm. Thin films of the PEPC-SY3:Au nanocomposite were obtained with nanoparticle concentrations of 0, 2, 4, 6, 8, and 10 μg/ml. For direct holographic recording, a two-beam optical setup (λ=473 nm) was used, with P:P beam polarizations. The kinetics of the diffraction efficiency was recorded in the zero and first diffraction orders.

The comparative analysis of the diffraction efficiency values of gratings recorded at P:P polarization configuration of interfering beams showed that the shape of the kinetics and maximum values of diffraction efficiency strongly depend on polarization of reading beam. But for all readout beam polarizations, doping of PEPC-SY3 azopolymer with Au nanoparticles enhances their diffraction efficiency significantly relative of pure azopolymer. The optimal performance observed with vertical polarization for a concentration of 8 μg/ml, achieving a maximum efficiency of 30.3%.

Additionally, high diffraction efficiencies were also observed for vertical polarization at lower concentrations (2, 4, and 6 μg/ml), indicating that Au NP doping is effective across a range of concentrations, with notable enhancements in optical properties.

Acknowledgments: *This study was partly supported by the research project ANCD 24.80013.5007.3TR.*

Keywords: *nanocomposite, nanoparticle, diffraction efficiency, photoanisotropy, polarization, surface relief gratings, birefringence.*

UDC: 539.374.6

DISTRIBUTION OF MICROHARDNESS VALUES IN Zr2.5Nb SPECIMENS SUBJECTED TO EQUAL-CHANNEL ANGULAR PRESSING

Alsheikh Hanan, ORCID: 0009-0000-5702-2567

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

E-mail: *hanan.alsheikh@ifa.usm.md*

Equal-Channel Angular Pressing (ECAP) is one of the most used methods of Severe Plastic Deformation, for obtaining bulk nanostructured materials. However, the process involves non-uniform deformation on the lower surface of the intersection channel area. Consequently, variations in mechanical properties distribution arise longitudinally and transversely across the processed material. To overcome this variation and enhance the properties of Zr2.5%Nb alloy, in this work a cylindrical billet was subjected to ECAP in combination with rotation at 90º around its longitudinal axis in one direction for six passes at 420º. Applying these conditions, we intended to ensure that the deformation is distributed more uniformly across all lateral sides of the cylindrical specimens. Thus, to validate the effectiveness of the chosen conditions, microhardness tests (HV0.1) were performed on the longitudinal/cross sections and the lateral (outer) surface. The longitudinal sections were divided into three specimens (SP-1, SP-3 – edges and SP-2 – middle part). For longitudinal specimens the HV was measured at varied distances from the billet longitudinal axis. On the cross section, the circular measurements were performed at incremental distances of 1mm from the center to the edges of the specimen.

The results reveal that HV on the longitudinal section is higher by 4% and 9% compared to the lateral surface and cross section, respectively. Furthermore, HV for SP-2 exhibits the highest value among the other parts of longitudinal section due to its deformation under most constant conditions. This increment is about 2% and 4% relative to SP-1 and SP-3, which experience fluctuating deformation conditions. In addition, HV for SP-3, shows 2% increase relative to SP-1, as it was measured closer to the billet's longitudinal axis where the HV is known to have maximal values. On the cross section, HV values decrease very slightly and exhibit more uniform distribution moving from the center to the outer surface. HV along the lateral surface varies insignificantly, all specimens being equidistant from the billet axis.

Despite these variations observed on the investigated sections, it can be concluded that the HV values are distributed rather uniformly in the billet of Zr2.5Nb alloy after ECAP combined with rotation. This conclusion is supported by low values of the coefficient of variation CV, ranging from 0.01 to 0.04 for longitudinal/cross sections, and lateral surface. $CV = \frac{standard\ deviation}{AVEAGE}$

Acknowledgments: *This study was supported by research Subprogram 011201 of the IAP USM, funded by the Ministry of Education and Research of Moldova Republic.*

Keywords: *Equal-Channel Angular Pressing, Zr 2.5% Nb, microhardness distribution.*

UDC: 535.37:621.315.592

OPTICAL PROPERTIES OF Cu_2ZnSnS_4 AND Cu_2CdSnS_4 QUATERNARY COMPOUNDS

Batîr Valentin*, ORCID: 0000-0003-4161-9339
Zalamai Victor, ORCID: 0000-0002-1882-2622
Arushanov Ernest, ORCID: 0000-0002-5859-4943

Institute of Applied Physics, Moldova State University,Chisinau, Republic of Moldova

*E-mail: *batir.valentin@usm.md*

Nowadays, the efficiency of Cu_2ZnSnS_4 (CZTS) thin-film solar cells is still limited by various factors such as: electronic disorder, secondary phases and the presence of antisite defects. In order to avoid this limitations, the Zn substitution by heavier atoms like Cd was proposed, as it may inhibit the formation of antisite defects, thereby increasing the minority carrier lifetime and reducing electronic disorder in the system.

In this study, we have investigated the optical properties of Cu_2ZnSnS_4 (CZTS) and Cu_2CdSnS_4 (CCTS) quaternary compounds. We examined the reflectance, transmittance and photoluminescence spectra recorded over a wide temperature range (from 10 to 300 K) for single-crystal samples obtained via the chemical vapor transport method.

As is well-known for direct band gap semiconductors, the square of the absorption coefficient is proportional to the band gap energy. By plotting the dependence of $(\alpha h\nu)^2$ on energy and performing a linear approximation of the linear region, the energy of the band gap can be determined by extrapolating to the ordinate axis. As a result, the optical band gap width for the CZTS sample, determined at room temperature, was found to be 1.46 eV.

In the reflectance spectra of CCTS compound, both the ground and excited states of the A exciton were observed. Thus, the ground state ($n^A=1$) was located at 1.326 eV, while the excited state ($n^A=2$) was observed at an energy of 1.374 eV. Accordingly, the estimated value of the Rydberg constant (Ry) is 64 meV and the band gap width (E_g) is about 1.39 eV.

Furthermore, in the reflectance and photoluminescence spectra at higher energies, maxima corresponding to the ground ($n^B=1$) and excited ($n^B=2$) states of the B exciton were observed. The ground state ($n^B=1$) was located at an energy of 1.434 eV, while the excited state ($n^B=2$) was detected at 1.490 eV. Based on these data, the Ry is estimated to be 75 meV and the continuum energy is around 1.51 eV.

Acknowledgments: *This study was supported by the National Agency for Research and Development of the Republic of Moldova under the projects: 23.70105.5007.14T and research sub-programme 011201.*

Keywords: *Cu_2ZnSnS_4, Cu_2CdSnS_4, Tauc plot, band gap, single crystals, reflectance spectra, photoluminescence spectra, excitons.*

UDC: 574.5:544.52:577.164.1

COMPARISON OF THE INTENSITY OF PHOTOLYSIS OF SOME B VITAMINS IN AQUEOUS SYSTEMS

Cisteacov Maxim*, ORCID: 0000-0001-6486-616X
Blonschi Vladislav, ORCID: 0000-0001-8628-6756
Gladchi Viorica, ORCID: 0000-0002-5847-4466

Moldova State University, Chisinau, Republic of Moldova

*E-mail: *cisteacov.maxim@usm.md*

Vitamins, being secondary metabolites, are part of natural waters, and their sources can be both biochemical processes and waste from the pharmaceutical industry. Riboflavin (vitamin B_2), pyridoxine (vitamin B_6) and cyanocobalamin (vitamin B_{12}) were chosen as objects of study. Based on the fact that these vitamins are natural components of natural waters, it can be assumed that they take part in various processes of chemical self-purification of waters. Thus, the aim of this study is to investigate the process of direct photolysis of vitamins B_2, B_6, and B_{12}, as well as to compare the intensity of their degradation.

A solar simulator model Oriel 9119X with an AM0 filter, with maximum intensity in the visible region of the spectrum, was used as a radiation source. Changes in vitamin concentrations were observed using the direct spectrophotometric method.

The obtained kinetic data, namely the half-life values, indicate that all vitamins undergo photolysis. Photolysis of vitamin B_6 (τ = 21 min. 28 s.) is more intense compared to other vitamins. During photolysis, pyridoxine is converted into orthoquinone methide, which, being unstable, decomposes into products with a lower molecular weight. The half-life of vitamin B_{12} during its photolysis was 52 min. 30 s. It was found that during the process of photochemical transformation, vitamin B_{12} is converted into the form of hydroxocobalamin. The intensity of photolysis of vitamin B_2 is the lowest (τ = 1 hour 10 min. 49 s.). The main products of riboflavin photolysis are lumichrome (LC), lumiflavin (LF) and formylmethylflavin (FMF).

Thus, vitamins B_2, B_6 and B_{12}, in natural water conditions, will undergo photochemical transformations. Vitamin B_6 undergoes direct photolysis with the greatest intensity, while vitamin B_2 undergoes it with the least intensity.

Acknowledgments: *This study was supported by the research project nr. 010603, Advanced research in computational and ecological chemistry, identification of technological procedures for treatment, formation of water quality and quantity, funded by Institute of Chemistry of the Moldova State University*.

Keywords: *natural waters, photolysis, B vitamins, chemical self-purification.*

UDC: 547.791

OBTAINING HETEROCYCLIC COMPOUNDS FROM THE CARAN SERIES

Cojocari Sergiu*, ORCID: 00000-0001-6825-5390
Bilan Dmitri, ORCID: 00000-0003-4283-2510
Sucman Natalia, ORCID: 00000-0001-8733-3040
Macaev Fliur, ORCID: 00000-0002-3094-1990

Institute of Chemistry, Laboratory of Organic Synthesis, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *sergiucojocari98@gmail.com*

The presented study aimed at the selective synthesis of a new class of optically active heterocyclic 1,2,3-triazole of the caran series, using the cycloaddition reaction [3+2] of different 1,3-dipoles. 1,2,3-Triazole derivatives are used as biologically active substances with various effects, they have antibacterial [1], anticancer and anti-inflammatory [2] activities.

The key synthesis step involves the production of 1,2,3-triazole, which can be achieved using a variety of methods like Banert Cascade [3], cyclisation of nitrogen derivatives of 1,2-dicarbonyl compounds [4], reactions of azides with substituted acetylenes [5], and *etc.* but we stoped at the reaction described above.

Triazole **3** (1-(4,7,7-trimethylbicyclo[4.1.0]hept-4-ene-3-yl)ethyl 5-methyl-1-(4-nitrophenyl)-1*H*-1,2,3-triazole-4-carboxylate) was synthesized using acetoacetatearene **1**, 1-azido-4-nitrobenzene **2**, and diethylamine as a catalyst, as illustrated in Figure 1.

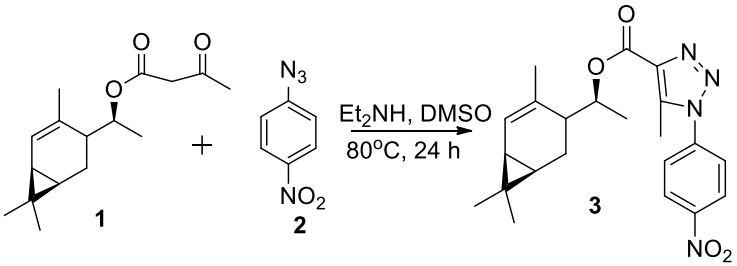


Figure 1. The synthesis of triazole **3** using acetoacetatecarene **2** with 1-azido-4-nitrobenzen

To the solution of compound **1** (500 mg, 1.9 mmol) in DMSO (5 ml) was added 3 drops of diethylamine. and after that was added compound **2** (790 mg, 4.8 mmol). The reaction occurred for 24 hours at a temperature of 80°C. After completion of the reaction (confirmed by TLC), the mixture was poured into water and extracted with ethylacetate and left under Na_2SO_4. Subsequently, the solvent was evaporated, and the resulting residue was recrystallized from ethanol.

The structure of the final compound was confirmed with different physicochemical methods.

Following the interaction of 1-azido-4-nitrobenzene with acetoacetatecarene, triazole **3** was obtained, containing functional groups that may be possible to transform in the future.

Keywords: cycloaddition [3+2], acetoacetatecarene, 1-azido-4-nitrobenzen, 1,2,3-triazole

Acknowledgments: *This study was supported by the research project 010601 „Chemical study of secondary metabolites from local natural sources and capitalization of their applicative potential based on the broadening of molecular diversity with multiple functionality ”.*

1.Shalini Aitha et. all *Bis 1, 2, 3-Triazoles Linked Deoxybenzoin Hybrids as Antimicrobial Agents: Synthesis, In Vitro and In Silico Screening* ChemistrySelect, April 2023, 8, http://dx.doi.org/10.1002/slct.202300405

2.Deniz Lengerli, Kübra Ibis, Yahya Nural & Erden Banoglu *The 1,2,3-triazole "all-in-one" ring system in drug discovery: a good bioisostere, a good pharmacophore, a good linker, and a versatile synthetic tool* Expert Opinion on Drug Discovery, September 2022, 17, http://dx.doi.org/10.1080/17460441.2022.2129613

3.Banert, Klaus *Reactions of Unsaturated Azides, 6. Synthesis of 1,2,3-Triazoles from Propargyl Azides by Rearrangement of the Azido Group. – Indication of Short-Lived Allenyl Azides and Triazafulvenes*. Chemische Berichte. May 1989, 122 (5): 911–918. doi:10.1002/cber.19891220520.

4.N E Alexandrou, S Adamopoulos Synthesis 482 (1976) doi:10.1055/s-1976-24097

5.O Dimroth, G Fester Ber. Dtsch. Chem. Ges. 43 2219 (1910)

UDC: 578.76:615.831

THE INFLUENCE OF ULTRAVIOLET AND RED RADIATION ON THE VIABILITY OF *SACCHAROMYCES CEREVISIAE*

Costisen Igor, ORCID: 0009-0008-8675-2110
Bizgan Sergiu
Enaki Nicolae, ORCID: 0000-0002-4571-7457

Quantum Optics Laboratory, Institute of Applied Physics, Moldova State University, Chisinau, Moldova

E-mail: *igor@ed-alumni.net*

There is a large non-taxonomic group of unicellular fungi, uniting about 1500 species, called yeast. Among them are both yeast used in food technology and yeast living in the bodies of humans and other animals, including pathogenic ones. The purpose of this work was to create an experimental installation that irradiates with ultraviolet and red radiation yeast wort that is opaque to light. It is expected that the results of the study will be extended to other unicellular organisms, including prokaryotic ones. In the future, the installation is supposed to be used to disinfect liquids containing pathogenic microorganisms. Since irradiation of wort even with ultraviolet radiation caused its strong heating, it was proposed to use for cooling the wort a direct Liebig condenser, which has been widely used for similar purposes in chemistry since the 19th century. There were used quartz fibers and balls of different diameters to improve the penetration of radiation into the wort. Baker's yeast, consisting mainly of Saccharomyces cerevisiae, was used as the object of the study. Yeast survival was monitored using an optical microscope at 40x magnification and hemocytometers with improved Neubauer Counting Chambers. Methylene blue dye was used as an indicator of dead cells. Live aerobic cells bleached the dye that entered them, while dead cells were permanently stained blue. The study showed that both ultraviolet irradiation and combined ultraviolet and red irradiation caused the death of Saccharomyces cerevisiae. Cell survival decreased with a decrease in the wort volume and, accordingly, the total number of cells, despite the constancy of the wort volume simultaneously exposed to radiation. Since ultraviolet radiation causes mutations in the genetic apparatus of cells, the next stage of the study will be calculations on the effect of the mentioned above types of radiation on chemical transformations in DNA nanostructures, they cause.

***Keywords**: Saccharomyces cerevisiae, yeast, cell viability, quartz fibers, quartz balls, ultraviolet radiation, red radiation, methylene blue.*

UDC: 661.744.2

SYNTHESIS AND CRYSTAL STRUCTURE OF NOVEL SUBSTITUTED OF PHTHLAZINE COMPOUND

Cuba Lidia*, ORCID: 0009-0003-3540-2712
Bourosh Paulina, ORCID: 0000-0002-3418-531X
Bulhac Ion, ORCID: 0000-0002-2437-2875

[1]*Institute of Chemistry, MSU, Chisinau, Republic of Moldova*
[2]*Institute of Applied Physics, MSU, Chisinau, Republic of Moldova*

*E-mail: *lidia.cuba@sti.usm.md*

It know that isoniazid is drug used to treat tuberculosis of all forms of localization; the phthalaldehyde forms highly fluorescent products upon reaction with primary amines in the presence of 2-mercaptoetanol. Isonicotinoylhydrazide of phthalic acid exhibits hypoglycemic, antidiabetic and antiarrihythmic activity and has been proposed to use as a drug to reduce the content of free fatty acids, cholesterol, and triglycerides. Some phthalazine derivatives have chemiluminescent properties and exhibit antimalarial, antituberculosis and hypotensive activity.

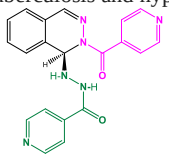


Fig. 1. Chemical structure of the **1**

In this contribution, we report the synthesis and characterization of the crystal structure of novel N-derivatives aromatic nitrogen-containing heterocyclic organic compound — $C_{20}H_{16}N_6O_2$ (**1**) (Fig. 1). The compound **1** was synthesized by the reaction of condensation between phthalaldehyde and isoniazid (molar ratio 1:2). The synthesis of **1** was carried out in the methanol solution (yield 60%) or in the acetonitrile solution (yield 80%). The white substance upon heating is soluble in DMSO, methanol, ethanol. *Anal*. Calcd. (%) for $C_{20}H_{16}N_6O_2$: C, 64.51; H, 4.33; N, 22.57. Found (%): C, 65.48; H, 4.17; N, 22.77. It is a racemic mixture of two enantiomers (*C14* is asymmetric carbon atom). The compound **1** crystallizes in monoclinic space group $P2_1/n$, a = 4.5101(2) Å, b = 20.0341(7) Å, c = 20.0350(7) Å, β = 91.830(4)°, V = 1809.36 Å^3. The molecular structure is presented in Fig. 2.

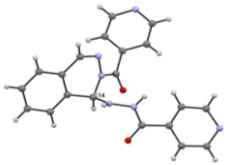


Fig. 2.Molecular structure of the **1**

Acknowledgments: *This study was supported by subprograms* ***010602*** *„ Synthesis and studies of new materials based on complex combinations with polyfunctional ligands and having useful application in medicine, biology and technology" and* ***011202*** *"Design and production of smart materials with advanced magnetic, adsorption, luminescent and biologically active properties", funded by MEC of RM.*

Keywords: isonicotinic hydrazide, phthalic dicarboxaldehyde, phthalazine, enantiomer

UDC: 547.852.7

SYNTHESIS AND CRYSTAL STRUCTURE OF NEW Mn(II) AND Co(II) COMPLEXES WITH PHTHLAZINE

Cuba Lidia*, ORCID: 0009-0003-3540-2712
Bourosh Paulina, ORCID: 0000-0002-3418-531X
Bulhac Ion, ORCID: 0000-0002-2437-2875

[1]*Institute of Chemistry, MSU, Chisinau, Republic of Moldova*
[2]*Institute of Applied Physics, MSU, Chisinau, Republic of Moldova*

*E-mail: *lidia.cuba@sti.usm.md*

It knows that some of coordination compounds containing phthalazine ($C_8H_6N_2$, **Phtz**) as ligand have luminescent properties and exhibit antimalarial, antitumoral activity. In coordination compounds Phtz is coordinated as a monodentate N-donor and an exo-bidentate $\mu_{(N,N)}$-donor ligand, resulting different structural architectures.

In the this work we present the synthesis, characterization and X-ray diffraction studies of two novel complexes containing as ligand molecules of Phtz.

The coordination compounds $[Co(Phtz)_2(NCS)_2]\cdot H_2O$ (**1**) and $[Mn(HPhtz)_2(NCS)_4]\cdot 3H_2O$ (**2**) has been synthesized by the template reaction of *3d* transition metals (Co(II) or Mn(II)) with *o*-phthalaldehyde and isoniazid in an acetonitrile or methanol solutions, respective. The composition of **1** was determinated by elemental analysis and infrared spectroscopy. FT-IR (ATR, cm^{-1}): $\nu(O\text{-}H)_w$ 3400 (br); $\nu(C_{ar}\text{-}H)$ 3062 (m); ν(NCS) 2061 (vs); $\nu(C_{ar}{=}C_{ar})$ 1599 (m); ν(N=N) 1464 (m).

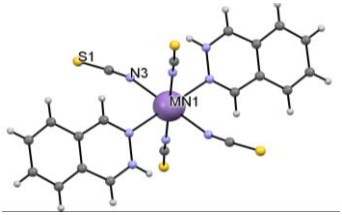


Fig. 1. Molecular structure of the **2**

Single crystal X-ray diffraction study of the compound **2** showed that it crystallizes in monoclinic space group I2/c, a = 13.728(2) Å, b = 14.485(2) Å, c = 15.573(2) Å, β = 114.09(1)°,V = 2827.06(2) Å3, and consists of one mononuclear molecular complex and three solvate water molecules. The coordination polyhedron of the central Mn1 atom in $[MnN_6]$ has a distorted octahedral geometry formed by two nitrogen atoms of two protonated $Hphtz^+$ ligands and four nitrogen atoms of four NCS-anions (Fig. 1).

Acknowledgments: *This study was supported by subprograms* ***010602*** *„Synthesis and studies of new materials based on complex combinations with polyfunctional ligands and having useful application in medicine, biology and technology" and* ***011202*** *„Design and production of smart materials with advanced magnetic, adsorption, luminescent and biologically active properties", funded by MEC of RM.*

Keywords: *structrure, isonicotinic hydrazide, phthalic dicarboxaldehyde, phthalazine.*

UDC: 546.47 + 678.7

CHARACTERIZATION OF SYSTEMS BASED ON TETRA CARBOXY SUBSTITUTED ZnPc-POLYMERS

Druta Alexandrina, ORCID: 0009-0004-0330-3039
Lungu Ion*, ORCID: 0000-0002-7117-672X
Potlog Tamara, ORCID: 0000-0003-1243-9371

**Doctoral School "Natural Sciences" Moldova State University*
Laboratory of Organic/Inorganic Material for Optoelectronics, Moldova State University

*E-mail: *ionlungu.usm@gmail.com*

The issue of solubility of metal phthalocyanines is crucial in PDT applications to investigate physical and chemical characteristics, but unfortunately, most of their show limited solubility, especially in water. For this purpose, we synthesized tetracarboxy substituted ZnPc via high-temperature cyclotetramerization reaction of a phthalonitrile, metal salt, and urea in fusion or in a solvent. However, ionic tetracarboxy substituted ZnPc exhibit reduced singlet oxygen quantum yields in aqueous solution. To solve the problems related to delivery of $ZnPc(COOH)_4$ in the physiological medium combined, this has been conjugated with different polymers (dextran (DX), chitosan (CH), polyvinyl pyrrolidone (PVP)). By using DMSO organic solvent and H_2O, water-soluble $ZnPc(COOH)_4$–polymers were successfully prepared with varying concentrations of $ZnPc(COOH)_4$ or different amounts of polymer at a fixed concentration of $ZnPc(COOH)_4$. The materials were characterized using 1H NMR, FTIR spectroscopy, and UV-Vis spectroscopy. The results confirmed the formation of the ZnPc(COOH)4-CH, $ZnPc(COOH)_4$-DX, and $ZnPc(COOH)_4$-STARCH systems. $ZnPc(COOH)_4$-CH showed good water solubility and caused a red-shift of the Q bands to around 700 nm. The absorption maximum at ~700 nm did not change with an increase in chitosan in the $ZnPc(COOH)_4$-CH system, but its intensity decreased. The molar extinction coefficient decreased from $3 \cdot 10^4$ $M^{-1}cm^{-1}$ to ~ $6 \cdot 10^3$ $M^{-1}cm^{-1}$ with the increase in chitosan, while increasing the amount of $ZnPc(COOH)_4$ led to an increase in the molar extinction coefficient of the $ZnPc(COOH)_4$-CH solution. The structure and absorbance properties of $ZnPc(COOH)_4$-DX and $ZnPc(COOH)_4$-STARCH systems were also discussed.

Keywords: *Photosensitizers, Photodynamic therapy, Metal phthalocyanines, Dextran, Chitosan, Polyvinyl pyrrolidone.*

UDC: 546.47:539.216

FABRICATION AND CHARACTERIZATION OF ZINC SELENIDE THIN FILMS

Gadiac Ivan*, ORCID: 0009-0001-9517-1499
Lungu Ion, ORCID: 0000-0002-7117-672X
Potlog Tamara, ORCID: 0000-0003-1243-9371

Doctoral School "Natural Sciences" Moldova State University
Laboratory of Organic/Inorganic Material for Optoelectronics, Moldova State University

*E-mail: *gadiac.ivan@usm.md*

Thin films of zinc selenide (ZnSe), which have unique physicochemical properties, are widely used in the semiconductor industry, for example, in photonics and optoelectronics, like light emitting diodes and laser diodes, photovoltaic solar cells, as buffer layers on solar cell, In luminescent devices, in manufacturing lenses for high power IR laser. The ZnSe wide band gap thin films are promising for solar systems due to its properties like direct band gap, transparency over a wide range of visible spectrum and relatively large value of nonlinear optical coefficient. Presently, high-efficiency Sb2Se3 solar cells use CdS as the electron buffer layer. However, the narrow band gap of CdS (~2.4 eV) causes parasitic absorption in the wavelength range below 520 nm, which reduces the light absorption of the Sb2Se3. This paper discuses ZnSe films fabricated by close space sublimation method (CSS) on SnO2/glass substrates to fabricate further ZnSe/SnO2/Sb2Se3 heterojunctions. The manufacturing parameters were optimized by varying substrate temperature and by the immersion in ZnCl2:H2O solution and annealing at 420oC. Structural investigations of the ZnSe films were performed using a Rigaku X-ray diffractometer with Cu/40 kV/40 mA radiation λ = 1.54056 Á. The morphology of the surface and cross section was studied using a scanning electron microscope. The optical transmission spectra were recorded using a JASCO V-670 spectrophotometer. The elemental composition was confirmed by energy dispersive X-ray analysis technique (EDAX). The SEM images and XRD patterns revealed that as-deposited ZnSe thin films were uniformly deposited by crystalline grains distributed over the entire SnO2/glass substrate. The XRD analysis of the ZnSe thin films established that activation in ZnCl2 results in a slight lattice-parameter decrease compared to the as grown ones. The transmission spectra depend on the substrate temperature and varies between 70% - 90%. The optical band gap values are dependent of the manufacturing temperatures. Also, effect of chemical and thermal annealing on the morphology and optical properties will be discussed.

Keywords: *ZnSe, CSS method, grain size, composition, absorption, band gap.*

UDC: 621.315.592:539.216

TRENDS AND CHALLENGES IN THE SYNTHESIS AND CHARACTERIZATION OF II-IV-N2 THIN FILMS

Ghileţchii Gheorghe*, ORCID: 0000-0002-0791-5567
Narloschi Igor, ORCID: 0000-0002-8895-0873
Rusu Marin, ORCID: 0000-0002-1429-0219
Vatavu Sergiu, ORCID: 0000-0001-7328-126X

Physics of Semiconductors and Devices Lab, Faculty of Physics and Engineering, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *ghiletchii.gheorghe@usm.md*

New absorber materials investigated for application in photovoltaic (PV) devices must meet several requirements, including low costs, Earth-abundancy, and lack of toxicity. II-IV-N_2 wide bandgap semiconductors (II-Zn, Be; IV-Si, Ge, Sn) meet these requirements. Current investigations show, that Zn-IV-N_2 are of wurtzite crystalline structure type P 6_3mc (186) and orthorhombic Pna2_1 (33) one. II-IV-N_2 compounds are efficient in optical absorption, with an absorption coefficient of about 10^5 cm^{-1}. The value of the bandgap (E_g) varies depending on the chosen calculation model and crystalline structure: $ZnGeN_2$ and $ZnSnN_2$ exhibit direct bandgap transitions, while $ZnSiN_2$ may have direct and indirect bandgap. The $ZnGeN_2$ E_g varies between 3.2 eV and 3.6 eV, for $ZnSnN_2$ between 1.6 and 1.8 eV, and for $ZnSiN_2$ between 5.4 and 6.5 eV. Due to its bandgap, $ZnSnN_2$ becomes one of the most attractive candidate for applications in photovoltaic cells. Ternary nitrides II-IV-N_2 such as $ZnSnN_2$, $ZnGeN_2$, and $ZnSiN_2$, which can be considered analogs of III-N nitrides with a wurtzite crystalline structure, and the elementary cell doubled and two elements from group III replaced with one element from group II and one element from group IV. Thus, properties similar to those of group III-N compounds can be expected. The main difficulty in obtaining the films is the incorporation of nitrogen. Various technologies were developed for obtaining polycrystalline and epitaxial Zn-IV-N_2.

DC reactive magnetron sputtering stands out from other preparation techniques for its ability to produce easy scalable thin polycrystalline films, making it applicable for industrial use. This technique allowed the deposition of Zn-IV-N_2 films using various atomic [Zn]/[Sn] ratios in target, in a nitrogen ambient providing flexibility in tuning the deposition parameters to achieve desired film properties. The films exhibit tunable surface properties as well as structural and compositional ones. This scalability and versatility make DC magnetron sputtering an attractive method for preparation of high-quality Zn-IV-N_2 films for various applications.

Acknowledgments: *This study was supported by the research subproject Abundant-element-based materials and structures for radiation detection and efficient energy conversion (#011207 DETCONV) funded by Ministry of Education and Research of Republic of Moldova and project 20.80009.5007.12 - Materiale și structuri multifuncționale pentru detectarea radiațiilor electromagnetice, funded by ANCD (NARD).*

Keywords*: thin films, ternary nitrides, DC magnetron sputtering, structural analysis.*

UDC: 544.142.3:547-304.6

ANTIOXIDANT EVALUATION OF 3d METAL COMPLEXES WITH 4-ALLYLTHIOSEMICARBAZONE

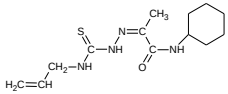
Graur Ianina*[1], ORCID: 0000-0002-3345-7539
Graur Vasilii[1], ORCID: 0000-0001-8153-2153
Tsapkov Victor[1], ORCID: 0000-0003-1732-3116
Garbuz Olga[2], ORCID: 0000-0001-8783-892X
Gulea Aurelian[1], ORCID: 0000-0003-2010-7959

[1]Laboratory of Advanced Materials in Biopharmaceutics and Technics, Institute of Chemistry, Moldova State University, Chisinau, Republic of Moldova
[2]Laboratory of Systematics and Molecular Phylogenetics, Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *ulchina.ianina@usm.md*

Thiosemicarbazones, which are chelating ligands, hold considerable biological significance. Their relevance in biology has been extensively investigated over time. Recent studies have shown that thiosemicarbazones possess the capacity to scavenge free radicals exhibiting potent antioxidant properties. Based on the above, the purpose of this research is to study the antioxidant activity of the new 4-allylthiosemicarbazone and its 3*d* metal complexes.

For this purpose, the *N*-cyclohexyl-2-oxopropanamide 4-allylthiosemicarbazone (HL) was synthesized by the interaction between 4-allylthiosemicarbazide and *N*-cyclohexyl-2-oxopropanamide in molar ratio 1:1.



HL

The coordination compounds of copper(II), nickel(II), iron(III) and cobalt(III) were obtained by the reaction of the corresponding salts with HL in ethanol in molar ratio 1:1 and 1:2. The composition of these compounds was determined using elemental analysis for metal: $[Cu(L)Cl]$, $[Ni(HL)_2](NO_3)_2$, $[Fe(L)_2]Cl$, $[Fe(L)_2]NO_3$, $[Co(L)_2]NO_3$. All synthesized complexes were studied using FTIR spectroscopy and molar electrical conductivity.

A standard $ABTS^{\bullet+}$ method has been used to determine the antioxidant properties of synthesized compounds. The coordination of HL to copper(II) and cobalt(III) atoms did not increase the activity of the resulting complexes. Nickel(II) and iron(III) complexes demonstrated good antioxidant activity, and the most active complex was $[Fe(L)_2]Cl$.

Acknowledgments: *This study was supported by the research projects 010602 "Sinteza și studiul materialelor noi în baza combinațiilor complexe cu liganzi polifuncționali și cu proprietăți utile în medicină, biologie și tehnică" and 010701 "Evaluarea structurii și funcționării lumii animale și ecosistemelor acvatice sub influența factorilor biotici și abiotici în contextul asigurării securității ecologice și bunăstării populației", funded by ANCD.*

Keywords: *coordination compounds; thiosemicarbazone; antioxidant activity.*

UDC: 547.56:638.135

ANTIOXIDANT ACTIVITY OF PROPOLIS EXTRACTS OBTAINED BY DIFFERENT METHODS OF EXTRACTION

Grigoras Carolina[1]*, ORCID: 0009-0006-7123-7453
Gonta Maria[1], ORCID: 0000-0003-3476-0967
Ciocarlan Alexandru[2], ORCID: 0000-0002-0776-5095

[1]Moldova State University
[2]Institute of Chemistry, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *carolina.grigoras@usm.md*

Propolis, which is a beekeeping product, considered to be a potential source of natural antioxidants capable of reducing the effects of oxidative stress underlying the pathogenesis of numerous diseases. It is known that phenolic compounds belong to the classes of substances with a high capacity to trap free radicals and are mainly responsible for the antioxidant capacity of propolis.

The purpose of this research was to establish the influence of the extraction method and the concentration of ethyl alcohol on the concentration of phenolic compounds of the extracts and antioxidant activity.

Nineteen samples of hydroethanolic extracts of propolis (EEP) were evaluated to their phenolic concentration and antioxidant activity (Tab.1). The total phenolic content was determined by the Folin-Ciocalteau method, and the ability of antioxidants to reduce the concentration of free radical DPPH and ABTS radical cation in the reaction medium was evaluated spectrophotometric method by monitoring the decrease in absorbance at a characteristic wavelength (517 nm and 734 nm).

Tab. 1 Results of analysis of hydroethanolic extracts of propolis

Test sample	**TPC, mg GAE/g**		**DPPH I,%**		**ABTS TEAC, mM**	
Method of extraction	M	UAE	M	UAE	M	E
EEP-EtOH 60%	271,13±14	329,41±22	61,39±8	52,79±1	170±4	144±4
EEP-EtOH 70%	424,10±6	418,34±12	88,65±1	58,96±23	183±4	119±7
EEP-EtOH 80%	429,40±17	203,70±33	73,56±6	31,98±3	190±2	82±4
M (Maceration, ratio 1:10 (w/v), room temperature, 10 days) UAE (Ultrasound-assisted extraction, ratio 1:10 (w/v), 25 kHz, t=40°C, 30 min)						

The data analysis reveals that the EEP-EtOH 70%, obtained by maceration, has a high content of polyphenols (424.10±6 mg GAE/g) and a more pronounced antioxidant activity compared to the other extracts, having a DPPH radical inhibition capacity of 88, 65% and 183±4 mM TEAC value. Although the EEP-EtOH 80% shows insignificantly higher results than in the case of EEP-EtOH 70%, an essential decrease of TPC and antioxidant activity is observed when the ultrasound assisted method is used.

Keywords: *propolis extract, phenols, antioxidant activity.*

UDC: 537.312.53:547.96

COOPERATIVE EFFECTS OF UV-IRRADIATED PROTEIN MOLECULES

Podoleanu Diana, ORCID: 0009-0006-9087-6445

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

E-mail: *podoleanu.d@yahoo.com*

Proteins, when exposed to radiation, respond collectively. These cooperative effects can affect protein structure, function, and stability. Depending on the intensity and duration of exposure to UV radiation, proteins can undergo denaturation, which involves breaking chemical bonds and disrupting their three-dimensional structure. In cooperative effects, proteins in a group can denature more easily or more severely when other proteins in the group are already denatured. Proteins involved in DNA repair can also become denatured due to the formation of thymine dimers in DNA molecules. Protein complexes in DNA repair systems work in a coordinated manner to repair the damage.

The study aims to ascertain the optimal intensity and duration of irradiation necessary to induce irreversible denaturation in bacterial proteins and pathogenic DNA, while ensuring human safety and achieving effective, risk-free decontamination. Additionally, it explores effective packaging methods for irradiated metamaterials.

It is proposed to use a combination of metamaterial repacking methods to increase the contact surface between the irradiating elements and the samples exposed to radiation.

Analyzing the obtained results, it becomes obvious that no less important than the intensity and duration of irradiation in the denaturation of biomolecules, is the packaging method of the metamaterials.

Acknowledgments: *this study was supported by the doctoral research project, funded by Moldova State University.*

Keywords: : *UV- radiation, cooperative effects, molecules.*

UDC: 544.313.2:630*114.28

THERMODYNAMIC PRINCIPLES OF THE BUFFER ACTION THEORY IN SOIL SOLUTION

Povar Igor*, ORCID: 0000-0003-2536-6706
Spinu Oxana, ORCID: 0000-0002-3166-1931

Moldova State University, Institute of Chemistry, Chisinau, Republic of Moldova

*E-mail: *ipovar@yahoo.ca*

This paper aims to enhance the quantitative understanding of buffer action theory in heterogeneous aqueous systems containing soil minerals and to derive expressions for buffer capacities for all components, including pH buffer capacity, using formal chemical thermodynamics. While buffering in aqueous solutions is typically governed by homogeneous equilibria, the intensive thermodynamic properties of natural soil systems are controlled by heterogeneous equilibria between solid and liquid phases.

Our previously developed thermodynamic methodology to investigate complex chemical equilibria under realistic conditions, accounting for intricate formation reactions in multicomponent heterogeneous systems has been applied. The systems under investigation are described as two-phase systems, consisting of a "solid phase - saturated aqueous solution", where numerous simultaneous reactions occur, with each reaction contribution depending on the chemical composition of the system, particularly the concentration ratio of its components. This approach essence lies in thermodynamically analyzing process conditions based on main thermodynamic characteristics.

This study marks the first demonstration that the examined heterogeneous soil systems exhibit buffer action towards all reactant components, not just in relation to the pH of the soil solution. Using derived equations, the research evaluates the buffer action of "natural mineral - soil solution" systems involving both soluble and insoluble species. The buffering action of systems containing soluble and insoluble inorganic and organic species in mineral - soil solution systems is assessed. A comprehensive analysis, encompassing various common minerals found in natural environments, has been undertaken.

By utilizing the findings of this research, it becomes possible to anticipate changes in soil composition and reactivity in response to increased anthropogenic stress. This paper also provides valuable insights into the mechanisms underlying soil buffering and its implications for soil science, ecology, and environmental management.

Acknowledgments: *This study was carried out within the Institutional Research Program of the State University of Moldova for the period 2024-2027, subprogram "Advanced Research in Computational and Environmental Chemistry, Identification of Technological Treatment Processes, Formation of Water Quality and Quantity", code 010603.*

Keywords: *buffer action, chemical thermodynamics, Gibbs energy, heterogeneous aqueous system, soil solution.*

UDC: 535.37:544.773.42

ESTABLISHMENT THE OPTIMUM SYNTHESIS CONDITIONS FOR Ag COLLOIDAL SOLUTIONS BY THE CHEMICAL REDUCTION METHOD

Suman Victor*, ORCID: 0000-0003-3309-9476
Ghimpu Lidia, ORCID: 0000-0002-5268-9407

**Doctoral School "Natural Sciences", Moldova State University*
Institute of Electronic Engineering and Nanotechnology, Technical University of Moldova

*E-mail: *victor.suman@iien.utm.md*

Nanotechnology offers solutions in various fields such as medicine, catalysis, industrial activities and agricultural activities, and their synthesis and processing are key aspects of nanotechnology. An important area of research in nanotechnology is the synthesis of NPs with different chemical compositions, sizes and morphologies, and controlled dispersity. Ag colloidal solutions were prepared by chemical reduction method. Silver nitrate served as the metal precursor, glucose and hondroitin as the reducing agent, and sodium citrate was used as the stabilizer. For theoretical evaluation of the size of spherical AgNPs the The growth of silver nanoparticles was performed in the temperature range 293-343 K. Energy dispersive spectroscopy (EDX), X-ray diffraction (XRD), SEM scanning electron microscopy, and UV-VIS spectroscopy were used to study the colloidal solutions. A methodology combining theoretical calculations based on Mie theory with experimental UV-VIS spectra was used in this study. UV-VIS spectroscopy revealed the formation of Ag nanoparticles by showing typical surface plasmon absorption maxima from 426 nm to 445 nm. Comparison between the theoretical results according to the Mie theoretical model and the experimental results showed that the radius of silver nanoparticles in the colloidal solution is in the range of 8-14 nm. The EDX method of nanoparticle dispersion confirmed the presence of elemental silver signal and no peaks of other impurities were detected. SEM images indicate that the nanoparticles consist of well-dispersed agglomerations of the former with a narrow size distribution (30-40) nm. Analysis of the results and theoretical calculations indicate that particle formation involves a long micellar-growth period at T = 343 K with a constant number of particles. Experimental UV-VIS absorption spectra of colloidal Ag solutions correlate well with Mie theory predictions.

Keywords: *Silver nanoparticles, glucose, chondroitin, UV-VIS spectroscopy.*

UDC: 535.37:621.315.592

PHOTOLUMINESCENCE SPECTRA OF II-VI AND II-IV-N2 TYPE SEMICONDUCTORS

Varzari Alexandru*, ORCID: 000-0002-3391-6723
Cliucanov Alexandr, ORCID: 0000-0002-4175-5261
Vatavu Sergiu, ORCID: 0000-0001-7328-126X

Physics of Semiconductors and Devices Lab, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *alexandru.varzari@usm.md*

II-VI and II-IV-N_2 type semiconductor materials have wide applicability in the fields of modern optoelectronics and photonics. II-VI semiconductors have successfully positioned in optoelectronics, in photovoltaics and particularly as detectors of X-ray and infrared radiation. II-IV-N_2 semiconductors are promising for photovoltaics due to the abundant natural availability of their constituent elements.

Photoluminescent (PL) analysis is a powerful research tool for studying the band structure, optical, and electrical parameters of semiconductors. Different regions of the PL spectrum are related to various mechanisms of radiative recombination: band to band recombination, radiative annihilation of excitons, recombination at impurity centers, donor-acceptor pairs (DAPs), etc.

For the theoretical analysis of the nature of radiative recombination, the Green's Function Method is used within the framework of the Fluctuation-Dissipation Theorem (FDT), the Random Phase Approximation (RPA), and second quantization. Within the developed theoretical model, a numerical analysis is performed using parameters specific to the corresponding semiconductors, along with a comparative analysis with experimental PL data.

A wide band of radiative recombination originating from impurity centers with numerous phonon replica and a narrow band of exciton radiative annihilation are considered, within the framework of the Green's function method. An exciton is a bound state of quasiparticles, which, in the first approximation, exhibits hydrogen-like behavior. In order to calculate the exciton binding energy, it is necessary to consider temperature and correlation effects, as well as the Coulomb screening. According to the Kubo formula, the rate of radiative recombination depends on the correlation function (causal Green's function). Impurity photoluminescence considers also bound phonon-plasmon pairs.

Acknowledgments: *This study was supported by the research subproject Abundant-element-based materials and structures for radiation detection and efficient energy conversion (#011207 DETCONV) funded by Ministry of Education and Research and project 20.80009.5007.12 - Materiale și structuri multifuncționale pentru detectarea radiațiilor electromagnetice, funded by ANCD (NARD).*

Keywords: *Green's Function Method, exciton, phonon, plasmon*

UDC: 544.142.3:547.792

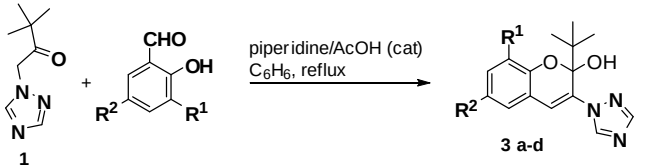
3,3-DIMETHYL-1-(1H-1,2,4-TRIAZOL-1-YL)BUTAN-2-ONE IN THE SYNTHESIS OF DERIVATIVES OF THE 2H-CHROMEN-2-OL CLASS

Zveaghintseva Marina*, ORCID: 0000-0003-1553-5246
Stingaci Eugenia, ORCID: 0000-0003-0731-3424
Sucman Natalia, ORCID: 0000-0001-8733-3040
Macaev Fliur, ORCID: 0000-0002-3094-1990

Institute of Chemistry, Moldova State University,
Chisinau, Republic of Moldova

*E-mail: *marina.zveaghinteva@ichem.md*

The paper presents a method for the synthesis of new derivatives of the 2H-chromen-2-ol class under conditions of aldol-crotonic condensation reaction. Cyclization takes place with the participation of salicylic aldehyde. Due to the influence of methyl *tert*-butyl group on the carbonyl polarization at the carbon atom, a partial positive charge will be concentrated, and a negative charge will be present on the oxygen atom, making the bond more polarized. Interaction between the oxygen of the hydroxyl group and the carbon of the carbonyl group leads to the formation of a six-membered oxygen-containing cycle. The yield of final products depends on the influence of substituents of salicylaldehyde in the third and fifth positions according to the scheme.



3a $R^1=R^2=H$, $R^3=NO_2$ 40%
3b $R^1=H$, $R^2=Br$ 70%
3d $R_1=H$, $R^2=OMe$ 61%

The nitro group, being a meta-director, reduces the basicity of the hydroxyl group in the fifth position, making the cyclization more difficult (yield 40%). Whereas the influence of an ortho-para-director such as bromine increases the basicity of the hydroxyl group, resulting in easier cyclization of the chromenol ring (70%).

***Acknowledgments*:** *This study was supported by the research project "Chemical study of secondary metabolites from local natural sources and valorization of their application potential basing on broadening molecular diversity with multiple functionality (MetNatVal)", № 010601, funded by the Ministry of Education and Research of the Republic of Moldova.*

Keywords: *1H-1,2,4-triazol, 2H-cromen-2-ol, cyclocondensation.*

Session E

MATHEMATICS AND COMPUTER SCIENCE

UDC: 630(498)

THE USE OF SUCCOLARITY IN THE ANALYSIS OF FOREST CONNECTIVITY IN THE EASTERN CARPATHIANS

Andronache Ion[1,2], ORCID: 0000-0001-7693-9098

[1] *Research Center for Integrated Analysis and Territorial Management (CAIMT), University of Bucharest, Romania*
[2]*Gymnasial School "Vasile Alecsandri", Brăila, Romania*

E-mail: *ion.andronache@geo.unibuc.ro*

This study investigates the use of succolarity to analyse the connectivity of forest patches in the Eastern Carpathians between 2000 and 2021, a mountainous region affected by significant deforestation due to economic activities such as timber production for export, residential expansion and other developments.

During the study period, the connectivity of forest patches estimated by succolarity decreased by 8.6% due to intensive deforestation, particularly in the Northern and Central Groups. Succolarity has proven to be an exceptional analytical tool for the study of Carpathian forests, offering significant advantages in measuring fragmentation and connectivity. By providing detailed insights into structural changes within forested landscapes, succolarity allows more accurate predictions and assessments of ecological impacts. This is particularly valuable for understanding the complex dynamics of forest ecosystems and designing interventions to mitigate habitat fragmentation. Furthermore, succolarity's ability to quantify connectivity loss helps to identify critical areas where conservation efforts should be focused.

In conclusion, the results of this study highlight the importance of succolarity as a critical element in environmental management and conservation planning. In addition to supporting the sustainable management of the Romanian Carpathians, the method is flexible enough to be applied to ecosystems worldwide. Its versatility makes it a valuable tool for promoting the long-term resilience of forest areas worldwide. In summary, the results highlight the importance of succolarity as an essential component of environmental management and conservation planning to ensure the sustainable use and conservation of forest resources for future generations.

Acknowledgments: *This study was supported by the research project PN-III-P2-2.1-SOL-2021-0084, funded by PNCDI III, the grant of the Ministry of Research, Innovation and Digitization, CNCS/CCCDI-UEFISCDI.*

Keywords: *forests, forest connectivity, spatial analysis, Eastern Carpathians, biodiversity conservation, ecological restoration.*

UDC: 615.281.9:547.655.6

OPTIMIZATION OF THE 2-DIMETHYLAMINO-5-HIDROXY-NAPHTHOQUINONE SYNTHESIS

Batanov Alexandr*
Feldman Danil
Pogrebnoi Vsevolod, ORCID: 0000-0002-4882-3140
Macaev Fliur, ORCID: 0000-0002-3094-1990

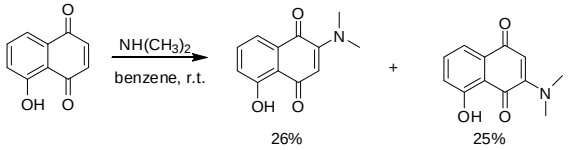
Laboratory of Organic Synthesis, Institute of Chemistry, Moldova State University, Chisinau, Republic of Moldova

E-mail: *tci21batanov.alexandr@gmail.com*

It is known that 5-hidroxy-naphthoquinone is a natural substance exhibiting herbicidal and antimicrobial properties, which makes it a starting material for the synthesis of new organic compounds with potential biological activity.

By treating the benzenic solution of juglone with aqueous dimethylamine, two new compounds were formed (according the TLC). The analysis of NMR spectra of isolated compounds showed that final products are structural isomers: 2- and 3-dimethylaminojuglone. To investigate the regioselectivity, we carried out some experiments in different solvents and used different variants.

The highest yield was observed when the solution of dimethylamine is added rapidly (26% for 2-dimethylaminojuglone and 25% for 3- dimethylaminojuglone). If the addition of dimethylamine takes place dropwise within an hour, the yield is decreased (10.3% and 11.9%, respectively). While the methanol is used as the solvent, a significant drop in yield is observed: 13.3% for 3-dimethylaminojuglone and only 2% for 2-dimethylaminojuglone. Comparing the ^{1}H and ^{13}C NMR spectra of the obtained compounds, the 3-dimethylaminojuglone shows a shift of the hydroxy group into a stronger field in contrast with 2-dimetilaminojuglone.



The optimal conditions for the synthesis of 2 isomeric aminojuglones with moderate yield were selected. The structures of the obtained compounds were confirmed by spectral methods.

Acknowledgments: *This study was supported by the research project "Studiul chimic al metaboliților secundari din sursele naturale locale și valorificarea potențialului lor aplicativ în baza lărgirii diversității moleculare cu funcționalitate multiplă", cod: 010601, funded by Moldova State*

Keywords: *organic synthesis, juglone, 5-hidroxy-1,4-naphthoquinone, dimethylaminojuglone, optimization.*

UDC: 004.89:51

BENEFITS OF USING INTELLIGENT E-LEARNING PLATFORMS IN MATHEMATICS LEARNING

Brănoaea Gabriela Cristina, ORCID: 0000-0003-1319-664X

Doctoral School of Natural Sciences, Moldova State University
Chisinau, Republic of Moldova

E-mail: *branoaea.cristina@yahoo.com*

In an era of digital technology, making use of digital resources is unavoidable in the era of digital technology and has been verified and implemented in educational institutions in various fields. In recent years, *artificial intelligence* has been increasingly used to accelerate and deepen learning for students of all ages.

In the past, students usually had to spend a lot of time learning mathematics in an abstract and dry way. Often this process was difficult and took a long time, instead, *artificial intelligence* allowed a new level of abstraction and speed in teaching mathematics.

An acceptable solution to the exposed problem would be the development of an ICT-based technology that would assist teachers in developing and solving with minimal effort any required number of individual tasks for students, with their import on an e-Learning platform for repeated implementation of learning-evaluation sessions.

This paper presents the relevance of artificial intelligence in the teaching of mathematics by using an Intelligent Support System made in Wolfram Mathematica. This system allows the design of an unlimited number of personalized items necessary for the training of students passionate about mathematics. Neuroscience research in collaboration with artificial intelligence can lead to deeper and faster personalized math learning, increasing the potential of every student.

Acknowledgments: *This study was supported by the research project"Intelligent support system for acceleration of mathematical acquisitions in high school students" of the Doctoral School of natural sciences from the State University of Moldova, under the guidance of the scientific leader Prof. Univ. Dr. Ing. Căpăţână Gheorghe.*

Keywords: *artificial intelligence, custom tasks, intelligent support system, problem composer.*

UDC: 512.548

DEVELOPMENT AND RESEARCH OF HASH FUNCTIONS, INCLUDING QUASIGROUP-BASED

Cernov Vladimir, ORCID: 0009-0004-7695-1141

Laboratory Algebra and Topology, Vladimir Andrunachievici Institute of Mathematics and Computer Science, Moldova State University, Chisinau, Republic of Moldova

E-mail: *volodya.black@gmail.com*

Hashing plays a key role in modern information technologies, providing efficient storage, retrieval and integrity checking of data. Traditional hashing methods such as MD5, SHA-1 and their variants, although widely used, face limitations in the case of large data volumes and increased security requirements.

In recent years, there has been an increased interest in alternative hashing methods based on abstract algebraic structures. Quasigroups and groupoids are important representatives of these structures with unique properties for hashing applications. The high degree of uniqueness of hash values and computational efficiency of their use should be especially noted.

This research is aimed not only at studying hashing functions based on quasigroups, but also at analyzing the potential of using the constructed functions in various applications. The relevance of the study is due to the need to create more secure and efficient hashing methods capable of meeting modern requirements for data processing and protection.

The following tasks were set and partially realized: development of an effective cryptographic algorithm; writing programs that implement the work of hash systems based on quasigroups; conducting attacks on all constructed hash functions; comparative analysis of the conducted attacks.

A hash function "hash_function" based on a given quasigroup and parameter k was developed. The order of the quasigroup can be chosen arbitrarily. The constructed framework uses the definition of the hash function to compute a hash value based on the quasigroup and demonstrates how the hash function can be applied to create hash values. The proposed method demonstrates that the hash function can be effectively used to create unique hash values. This approach can be useful in applications that require fast and reliable data matching and integrity checking.

Keywords: *quasigroup, Latin square, encryption, one-way function, cryptology, block cipher, symmetric-key encryption..*

UDC: 512.548.7

RECURSIVELY DIFFERENTIABLE FINITE QUASIGROUPS

Cuznețov Elena, ORCID: 0009-0004-3092-3786

Faculty of Mathematics and Computer Science, Moldova State University, Chisinau, Republic of Moldova

E-mail: *lenkacuznetova95@gmail.com*

Recursive differentiability of k-quasigroups is studied, where $k \geq 2$. We give necessary and sufficient conditions of recursive 1-differentiability (respectively, r -differentiability) of the k-group (Q, B), where $B(x_1, \dots, x_k) = x_1 \cdot x_2 \cdot \dots \cdot x_k$, $\forall x_1, x_2, \dots, x_k \in Q$, and $(Q, \cdot)$ is a finite binary group (respectively, a finite abelian binary group). A generalization of a known criterion of recursive r -differentiability of finite binary abelian groups and a method of construction of recursively r -differentiable finite binary quasigroups of high order r are given. The maximum known values of the parameter r for binary quasigroups of order up to 200 are presented.

We consider the Bruck and Belousov constructions of prolongation of finite quasigroups and give necessary and sufficient conditions when such prolongations are recursively 1-differentiable. Examples of finite quasigroups with recursively 1-differentiable prolongations have been constructed.

Also, a new method of prolongation of finite quasigroups, using two transversals which intersect in a single cell, is qiven. In particular, it is shown that there exist 240 possible prolongations of latin squares of order five, using two transversals which intersect in a single cell, one of which is the main diagonal.

Acknowledgments: *This work was partially supported by the Institutional Research Program 011303 "SATGED" for 2024-2027, Moldova State University.*

Keywords: *k-ary quasigroup, recursive derivative, recursively differentiable quasigroup, transversal, prolongations of quasigroups.*

UDC: 004.7:373.013

USING UNITY PLATFORM TO DEVELOP EDUCATIONAL GAMES FOR MULTIDISCIPLINARY LEARNING

Adina Duca[1]*, ORCID: 0009-0005-9181-3406
Bumbu Tudor[2], ORCID: 0000-0001-5311-4464
Caftanatov Olesea[3], ORCID: 0000-0003-1482-9701

Vladimir Andrunachievici Institute of Mathematics and Computer Science, Moldova State University, Chisinau, Republic of Moldova

*E-mail: *adina.duca@math.usm.md*

In the context of concerns raised by educators, psychologists, and specialists regarding video game addiction in children, recognized as a mental health disorder, this study explores the potential of video games as educational tools. Video games are appealing to children due to well-designed reward systems that stimulate dopamine release, keeping them engaged. The study proposes channeling this interest to create educational games that transform the learning process into an enjoyable and motivating activity. By incorporating gamification elements, games can reduce the stress associated with traditional assessments, avoiding psychological discomfort and learning barriers. Moreover, games can integrate all learning styles, providing context and practical applicability for acquired knowledge. These features not only enhance the educational process but also stimulate curiosity, perseverance, and problem-solving skills in students.

We propose developing educational games in Unity for multiple school subjects. For example, a game teaching the history of alphabets, with a focus on the Romanian Cyrillic alphabet, would include interactive levels that cover its origins, evolution, and modern usage. Another example could be a math game where players solve problems to advance through levels, or a science game that involves virtual experiments and simulations. These games will feature captivating narratives and characters to keep players engaged, ensuring efficient information absorption and educational effectiveness.

Incorporating AI into these educational games can further enhance the learning experience. AI can simulate dialogues and interactions with virtual characters, offering a more realistic and engaging learning experience. For example, AI-based chatbots can respond to players' questions and provide additional explanations, while virtual game characters can use AI to offer instructions and guide players through educational activities. AI can also personalize learning, offer immediate feedback, generate content, analyze progress, and enhance interactive elements, making the games more adaptive and responsive to individual learning needs.

Acknowledgments: *This study was supported by the research project (011301 SIBIA, Informational Systems based on Artificial Intelligence), funded by (ANCD).*

Keywords: *gamification, storytelling, unity development, multidisciplinary learning, artificial intelligence, learning styles.*

UDC: 004.77:378.018.43

OPTIMIZING THE LEARNING BY INTEGRATING CALCULATED ITEMS

Ieşeanu Dumitru, ORCID: 0000-0003-2189-1466

Moldova State University, Chişinau, Republic of Moldova

Email: *dumitruieseanu77@gmail.com*

In the constantly changing world in which we live, one of the priority and innovative directions is the use of digital tools in the educational process.

And online evaluation on different platforms is becoming an increasingly used and practiced tool. Currently, there is a growing emphasis on "calculated" items, so to speak on items where content generation takes place, especially content with mathematical or formalizable, parameterizable meaning. So, each student has in front of him his own unrepeatable version, which is no longer found in other peers, which creates an incentive to test knowledge with a greater degree of precision in the sense that there are fewer possibilities of copying, or it becomes easier to learn than to copy.

Identifying opportunities to organize and carry out the student evaluation process with the help of calculated items from the Moodle platform's item bank, which autonomously generates its content, especially the mathematical one, so that students have less chances to copy.

The paper contains a brief analysis and synthesis of the implementation of calculated items in the process of developing summative or formative assessments. It elucidates the current state, challenges, trends, good practices and viable solutions for implementing methodologies for creating assessments with several variants of items created simultaneously, which saves the resource of time and increases the student's degree of success because each student has in front of him his evaluation variant that is not repeated in any colleague.

At the present, calculated items are successfully implemented in different types of formative, summative assessments, semester theses, etc. The attempt to implement calculated items in the evaluation process has an innovative and promising character. The most important product of the educational process is the well-trained/trained students, based on which would be well-determined and predetermined tools for an accurate and closer knowledge assessment to their capabilities.

ICT-mediated teaching, learning and assessment technologies and methods require substantial changes in the education system, new skills for teachers and students. It is necessary to refocus activities, scenarios for the development and efficient use of online tests, etc. The development, organization and administration of qualitative educational platforms only in the traditional, manual way no longer meets the requirements. Innovative and sustainable approaches are needed, with affordable time and resource costs.

In conclusion, the electronic test is currently the most widespread link in (self) evaluation. The elaboration of items and the generation of tests for computer-assisted (self) evaluation is a crucial stage in the process of (self-)training, which involves creativity, originality, methodology and professional ethics.

Keywords: *e-learning platform Moodle, course, test, calculated item.*

UDC: 697.948:61

AIR DISINFECTION SYSTEM MEDICAL DEVICES SDMA UVAC NON-OZONE
Global Medical Device Nomenclature (GMDN) 65418 AIR DISINFECTION SYSTEM SDMA UVAC NON-OZONE

Micu Alexandru, ORCID:0009-0006-5059-3213

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

E-mail: *alexandru.vasile.micu@ifa.usm.md*

Medical Device SDMA UVAC-250 has been designed/elaborated by scientific researchers of the Institute of Applied Physics - PhD student in physics and material technology Alexandru Micu, Senior Research Scientist of the Laboratory of Physics of Semiconductor Compounds „Sergiu Radautan" (Head of the Laboratory – Academician Leonid Culiuc, Prof. PhD in physical and mathematical sciences) in collaboration with the Departament of General Hygiene, State University of Medicine and Pharmacy „Nicolae Testemitanu" (Head of the Department - Prof. PhD in medical sciences Ion Bahnarel), and developed/manufactured in partnership with the Company LABROMED LABORATOR (General Director - Alexandr Ermicev).

Medical Devices SDMA UVAC are a scientific innovation designed for air disinfection in closed spaces by physical methods, without ozone emission.

The devices use a performance technology, representing the result of the collaboration between scientific researchers from the academic environment and and private field.

➢ The strategic objective of developing and producing the Air Disinfection System SDMA UVAC was established, resulting from the need to ensure the protection of the population's health and the prevention of aerosol transmission of contagious diseases caused by pathogens: viruses, bacteria, fungi, etc., including Coronavirus infection.

The model SDMA UVAC-250 Medical Device for Air Disinfection has been produced in accordance with European Directives, European ISO and US International Norm (the page of this product can be accessed on the website www.labromed.md).

➢ Ultraviolet bactericidal lamps with UV-C radiation for medical use with a wavelength of UV-253.7 nm, equipped with a reflector for concentrating and amplifying the power of UV-C radiation, which destroys living microorganisms, eliminating their ability to reproduce, have a germicidal effect of up to 99%.

➢ To neutralize the microorganisms in the air, the UV-C radiation produced by the lamps penetrates the cell membrane, passes through its contents and destroys the cellular DNA and RNA, causing damage that prevents the activity of the germs and their ability to reproduce. In this way, the cell membrane is no longer a threat to the human organism (macroorganism)

Devices of the SDMA UVAC group, designed to work in the presence of people, are closed-tipe medical devices for air disinfection.

➢ Unlike ultraviolet ray devices that exist to date, SDMA UVAC medical devices do not produce ozone and are absolutely harmless to the human body.

Acknowledgments: *This study was supported Company LABROMED LABORATOR (General Director - Alexandr Ermicev).*

Keywords: *Air Disinfection System, SDMA UVAC 250.*

UDC: 621.315.592

DEVELOPMENT OF TECHNOLOGY FOR GROWING LAYERED SEMICONTUCTORS USING CHEMICAL VAPOR TRANSPORT TECHNIQUE TO OBTAIN 2D-FLAKES OF TRANSITION METAL DICHALCOGENIDES WITH REPRODUCIBLE PHYSICOCHEMICAL PROPERTIES

Micu Alexandru, ORCID: 0009-0006-5059-3213

Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova

E-mail: *alexandru.vasile.micu@gmail.com*

In recent years, the layered transition metal dichalcogenides (TMDs) i.e. TX_2 (T= Mo and W; X= S and Se) have attracted enormous attention due to their unusual optoelectronics properties, which are attributed to their two-dimensional (2D) structure [1].

The production of 2D atomic layers of these compounds with the most perfect structure is achieved by mechanical exfoliation from bulk TX_2 crystals, the growth of which is carried out by chemical transport reactions using halogens as a transport agent. The properties and crystalline perfection of the mechanically exfoliated ultrathin flakes are determined by the quality of the grown bulk DMD crystals.

The production of 2D atomic layers of these compounds with the most perfect structure is achieved by mechanical exfoliation from bulk TX_2 crystals (micromechanical cleavage technique), the growth of which is carried out by the method of chemical transport reactions using halogens as a transport agent. The properties and crystalline perfection of the mechanically exfoliated 2D flakes are determined by the quality of the grown bulk TMDs crystals.

This report presents the results of work on the development / improvement of technology for obtaining layered crystals of WS_2, WSe_2, MoS_2, $MoSe_2$, in order to ensure high reproducibility and long-term stability of technological regimes for the synthesis of compounds and crystal growth.

A detailed description is given of the features of the original design of the two-zone furnace with a high degree of thermal insulation, as well as of the developed electronic system for high-precision regulation (±0.1°C) of the temperature conditions of both zones of the furnace (up to 1200°C), programmed for the entire period of the technological cycle, lasting up to two to three weeks.

Samples of grown bulk crystals and 2D ultra-thin flakes of TMDs compounds are presented, as well as experimental results of structural, electrical and optical characterization of these samples.

Acknowledgments: *This study was supported by the research subprogram 011201 funded by Ministry of Education and Research of the Republic of Moldova.*

Keywords: *2D materials, transition metal dichalcogenides, chemical vapors transport.*

1. Yanping Liu, Siyu Zhang et al. Recent Progress in the Fabrication, Properties, and Devices of Heterostructures Based on 2D Materials. Nano Micro Lett. 11, 12 (2019).

UDC: 512.554.3

FUNCTIONAL BASES OF COMITANTS FOR TERNARY DIFFERENTIAL SYSTEM $S^3(1)$ AND THEIR CONNECTION WITH POLYNOMIAL BASES

Mușinschi Lidia, ORCID: 0000-0001-7341-2602

"Vladimir Andrunachievici" Institute of Mathematics and Computer Science, Moldova State University, Chisinau, Republic of Moldova

E-mail: *lidia.zdragat@mail.ru*

Consider the ternary linear differential system $s^3(1)$ in the tensorial form

$$\frac{dx^j}{dt} = a^j_\alpha x^\alpha \ \ (j,\alpha = \overline{1,3}), \tag{1}$$

where in indices α the complete convolution is done and centro-affine group of transformations of phase variables $GL(3,R)$.

In the School of Differential Equations from Chișinău are researched the polynomial systems of differential equations using centro-affine groups, which lead to the construction of invariant polynomials in relation to these groups (comitants and invariants), which depend on the coefficients and the phase variables of the given systems. The functional and polynomial bases of these elements are examined.

In this paper using Lie algebra which corresponds to the linear representation of the group of centro-affine transformations $GL(3,R)$ in the space of coefficients of the system (1), the following invariants are investigated

$$\theta_1 = a^\alpha_\alpha, \ \ \theta_2 = a^\alpha_\beta a^\beta_\alpha, \ \ \theta_3 = a^\alpha_\gamma a^\beta_\alpha a^\gamma_\beta, \ \ (\alpha,\beta,\gamma = \overline{1,3}) \tag{2}$$

It was proved that θ_1, θ_2, θ_3 form a functional (polynomial) basis of centro-affine invariants of the differential system (1).

The invariants (2) are examined together with the comitant

$$\sigma_1 = a^\alpha_\mu a^\beta_\delta a^\gamma_\alpha x^\delta x^\mu x^\nu \varepsilon_{\beta\gamma\nu} \ \ (\alpha,\beta,\gamma,\delta,\mu,\nu = \overline{1,3}) \tag{3}$$

where $\varepsilon_{\beta\gamma\nu}$ is the unit trivector with coordinates $\varepsilon_{123} = -\varepsilon_{132} = \varepsilon_{312} = -\varepsilon_{321} = \varepsilon_{231} = -\varepsilon_{213} = 1$ and $\varepsilon_{pqr} = 0$ $(p,q,r = \overline{1,3})$ otherwise. σ_1 is the particular integral of the differential system (1).

It was proved

Theorem 1. *The expressions* θ_1, θ_2, θ_3 *and* σ_1 *form a functional basis of centro-affine comitants of the differential system* (1).

Hypothesis 1. *The expressions* θ_1, θ_2, θ_3 *and* σ_1 *form a polynomial basis of centro-affine comitants of the differential system* (1).

Acknowledgments: *This study was supported by the research project 011303, funded by IMCS "Vladimir Andrunachievici".*

Keywords: *Lie algebras, centro-affine groups, functional* (*polynomial*) *basis of comita.*

UDC: 519.833.3

PARALLEL ALGORITHM TO SOLVING BLOCK PARTITIONED BIMATRIX GAMES

Țurcanu Călin, ORCID: 0009-0005-3480-6373

Moldova State Univesity, Chisinau, Republic of Moldova

E-mail: *calin.turcanu@usm.md*

Contemporary decision-making problems are very complex and require the processing of a very large volume of data. Thus, for the mathematical modelling of these processes, it is necessary to take into account the big data problems. The data is too big to be stored and processed by a single machine. In many large-scale solutions, data is divided into partitions that can be managed and accessed separately. In order to solve such problems in real time, parallel algorithms are built, and then implemented on various types of parallel computing systems. The basic parallel strategy consists of the following three main steps a) partition the input into several partitions of almost equal sizes. In this step, the parallelization at the level of data and operations is actually achieved, b) solve recursively the subproblem defined by each partition of the input, c) combine or merge the solutions of the different subproblems into a solution for the overall problem.

The success of such a strategy depends on whether or not we can perform the first and third steps efficiently

We consider the bimatrix game in the following strategic form $\Gamma = \langle I, J, A, B \rangle$ where $I=\{1,2,..,n\}$ is the set of strategies of the player 1, $J=\{1,2,..,m\}$ is the set of strategies of the player 2 and $A = \|a_{ij}\|_{i\in I}^{j\in J}$, $B = \|b_{ij}\|_{i\in I}^{j\in J}$, are the payoff matrices of player 1 and player 2, respectively. All players know exactly the payoff matrices and the sets of strategies. So, the game is incomplete and has imperfect information. Players intent to maximize their payoffs. The matrices A and B are called global matrices. We denote by $NE[\Gamma]$ the set of all equilibrium profiles in the game Γ.

Denote by R the set of processes (processors, computing elements) of a parallel computing system) and by I_r, respectively J_r the lines (columns) of the matrices A_r, B_r distributed to process $r \in R$.

Using the basic steps, a)-b) of a parallel we will construct the following algorithm.

A. *Data parallelization: using some matrix division and distribution algorithm each process $r \in R$ "gets" the pair of matrices A_r, B_r.*

B. *If, as a result of the division of matrices A and B, subgames $\Gamma_r = \langle I_r, J_r, A_r, B_r \rangle$ are generated, then $NE[\Gamma_r]$ are calculated and send these set to root process.*

C. *The root process, using the set $\{NE[\Gamma_r]\}_{r\in R}$ construct the set $NE[\Gamma]$.*

UDC: 635.652

EVALUATION OF TRITICALE SC_3 SOMACLONES ACCORDING TO THE MOST RELEVANT AGROBIOLOGICAL CHARACTERISTICS

Ciobanu Renata, https://orcid.org/0009-0007-0554-6845
Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chișinau, Republic of Moldova,
E-mail: *renata.ciobanu@sti.usm.md*

The study included triticale somaclones with valuable agronomic traits obtained through *in vitro* culture and exposed to gamma radiation from 3 triticale varieties: Ingen 35, Ingen 93 (standard), 188TR5021.

As a result of biomorphological evaluations, the significant variation in mean values at the 95-99% level was estimated for the agro-morphological traits of SC_3 triticale somaclones, depending on the genotype and the analyzed trait. The somaclones of the Ingen 93 genotype (*in vitro*), 188 TR (RAD), and 188 TR (i*n vitro*) were highlighted, with determining traits being: *plant height, main spike length, number of grains per spike, grain weight, and the weight of 100 grains*.

The evaluation of variability indicated low values, suggesting the similarity of individuals for the studied traits. Only for the trait *number of fertile tillers* did the coefficient of variation indicate a medium level of variability.

As a result of the analysis of variance of quantitative traits in the SC_3 triticale somaclones using the ANOVA test, it was found that genotype, radiation, *in vitro* culture, and the interaction between genotype and the analyzed factors made a significant contribution. The maximal effect was manifested by radiation (except for the trait *number of grains per spike*), for indices: *plant height* (37.58%), *last internode length* (35.10%), and *spike length* (11.53%), being 99.9% significant. The influence of *in vitro* culture reached values from 1.13–33.46%, with the highest value recorded for the trait *main spike length*.

The interaction between genotype and radiation, depending on the trait, recorded values from 4.37–36.00%. The maximal influence was recorded for the traits: *weight of 1000 grains* (36%), *number of grains per spike* (13.32%), and *plant height* (10.49%). The interaction between genotype and *in vitro* culture reached values from 3.41–11.68%, with the highest values noted for *the weight of 1000 grains* and *the number of grains per spike*. The influence of genotype reached values from 4.87–23.90%. The highest values of this index were recorded for the traits: *last internode length* (16.83%) and *plant height* (20.93%). The maximal influence was manifested by the genotype for the trait *weight of 1000 grains* - 23.90%.

Acknowledgments: *The research was carried out within the Subprogramme 011102 Expansion and conservation of genetic diversity, improvement of agricultural crop genotypes in the context of climate change, financed by the Ministry of Education and Research.*

Keywords*: triticale, somaclones, in vitro, radiation, quantitative traits.*

The Conference was attended by 497 participants from 22 universities and 64 institutes and research centers, representing 13 countries, including: Republic of Moldova (341), Ukraine (64), Romania (65), Serbia (18), Russian Federation (3), Czech Republic (1), Slovak Republic (1), Austria (1), Germany (1), Turkiye (4), Netherlands (1) Hungary (1), France (1).

UNIVERSITIES

1. Akdeniz University, Antalya, Turkiye
2. Alexandru Ioan Cuza University of Iasi, Romania
3. Apollonia University, Iasi, Romania
4. Bioterra University from Bucharest, Romania
5. Gazi,University, Ankara, Türkiye
6. Ion Creangă State Pedagogical University, Chisinau, Republic of Moldova
7. Lucian Blaga University of Sibiu, Sibiu, Romania
8. Moldova State University, Chisinau, Republic of Moldova
9. National University of "Kyiv-Mohyla Academy", Kyiv, Ukraine
10. National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine,
11. Nicolae Testemițanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova
12. Slovak University of Agriculture (SAU) in Nitra, Nitra, Slovak Republic
13. Ștefan cel Mare University, Suceava, Romania
14. Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
15. Technical College „Gheorghe Bals", Adjud, Romania
16. Technical University of Moldova, Chisinau, Republic of Moldova
17. University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania
18. University of Oradea, Oradea, Romania
19. V. N. Karazin Kharkiv National University, Kharkiv, Ukraine
20. Vasile Alecsandri University of Bacau, Bacau, Romania
21. Vasile Goldis Western University of Arad, Romania
22. Vienna University of Technology, Vienna, Austria

RESEARCH INSTITUTES

1. Academy of Romanian Scientists, Bucharest, Romania
2. Alcos Bioprod Ltd., Romania
3. BioActive Research Group, Alexandru Ioan Cuza University of Iasi, Iasi, Romania.
4. Biosfera Fruct Lts, Romania
5. Center of Biomedical Research, Romanian Academy, Iasi, Romania
6. Center of Functional Genetics, Moldova State University, Chisinau, Republic of Moldova
7. Center of Study and Research for Agroforestry Biodiversity "Acad. David Davidescu", Romanian Academy, Bucharest, Romania
8. Centre for Research on Settlements and Urbanism, Faculty of Geography, Babes-Bolyai University from Cluj-Napoca, Romania
9. Crop Researches Institute, Praha, Czech Republic
10. Doctoral School Natural Sciences, Moldova State University, Chisinau, Republic of Moldova
11. Doctoral School of Biology, Faculty of Biology, "Alexandru Ioan Cuza" University of Iași, Romania
12. French National Institute for Agriculture, Food, and Environment (INRAE), Dijon, France
13. GȚ "Melnic Cristin", Republic of Moldova
14. Gymnasial School "Vasile Alecsandri", Brăila, Romania
15. Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Romania

16. Institute for Potato Research of the National Academy of Agrarian Sciences of Ukraine, Nemishaieve, Ukraine
17. Institute for Problems of Cryobiology and Cryomedicine NAS of Ukraine, Kharkiv, Ukraine
18. Institute of Agriculture of the Western Polissia of the National Academy of Sciences of Ukraine, Ukraine
19. Institute of Agroecology and Nature Management of the NAAS
20. Institute of Applied Physics, Moldova State University, Chisinau, Republic of Moldova
21. Institute of Biology Bucharest, Romanian Academy, Bucharest, Bucharest, Romania
22. Institute of Cell Biology and Genetic Engineering of the National Academy of Sciences of Ukraine, Kyiv, Ukraine
23. Institute of Chemistry, Moldova State University, Chisinau, Republic of Moldova
24. Institute of climate smart agriculture by the NAAS
25. Institute of Ecology and Geography, Moldova State University, Chisinau, Republic of Moldova
26. Institute of Electronic Engineering and Nanotechnologies, Moldova Technical University, Chisinau, Republic of Moldova
27. Institute of Fisiology and Sanocreatology, Moldova State University, Chisinau, Republic of Moldova
28. Institute of Food Biotechnology and Genomics NAS of Ukraine, Kyiv, Ukraine
29. Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova
30. Institute of Interdisciplinary Research, Alexandru Ioan Cuza University of Iași, Iași, Romania
31. Institute of Mathematics and Computer Science, Moldova State University, Chisinau, Republic of Moldova
32. Institute of Microbiology and Biotechnology, Moldova Technical University, Chisinau, Republic of Moldova
33. Institute of Mother and Child, Chisinau, Republic of Moldova
34. Institute of Nutrition, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, Hungary
35. Institute of Plant Physiology and Genetics of the National Academy of Sciences of Ukraine, Kyiv, Ukraine
36. Institute of Plant Protection of the National Academy of Agrarian Sciences of Ukraine
37. Institute of Zoology, Moldova State University, Chisinau, Republic of Moldova
38. Joint Institute for Nuclear Research, Dubna, Russian Federation
39. Maize Research Institut Zemun Polje, Belgrade, Serbia
40. National Agency for Public Health, Chisinau, Republic of Moldova
41. National Agricultural Research and Development Institute Fundulea, Călărași County, Romania
42. National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova
43. National Institute for Economic Research "Costin C. Kiritescu" of the Romanian Academy, Centre for Mountain Economy, Vatra Dornei, Romania
44. National Institute for R&D in Physics and Nuclear Engineering, Măgurele, Ilfov, Romania
45. National Institute of Research & Development for Biological Sciences, Bucharest, Romania
46. National Museum of Ethnography and Natural History, Chisinau, Republic of Moldova
47. Plant Breeding and Genetics Institute – National Center of Seed and Cultivar Investigations, Odesa, Ukraine
48. Plant Production Institute named after V.Ya. Yuriev of NAAS, Kharkiv, Ukraine
49. Research - Development Institute for Plant Protection, 8 Ion Ionescu de la Brad, Bucharest, Romania

50. Research and Practical Institute of Horticulture and Alimentary Technologies,Chisinau, Republic of Moldova
51. Research Center for Integrated Analysis and Territorial Management, University of Bucharest, Romania
52. Research station of medicinal plants, Institute of agroecology and environmental management, NAAS of Ukraine, Ukraine
53. SC PlantExtrakt SRL, Radaia, Cluj, Romania
54. Seedeco Semences SRL, Chisinau, Republic of Moldova
55. Serviciul Hidrometeorologic de Stat, Chisinau, Republic of Moldova
56. Stuttgart State Museum of Natural History, Germany
57. The "Plaiul Fagului" Natural Reserve, Ungheni district, Radenii Vechi commune, Republic of Moldova
58. The National Collection of Non-Pathogenic Microorganisms, Technical University of Moldova, Chisinau, Republic of Moldova
59. The V. M. Remeslo Myronivka Institute of Wheat, National Academy of Agrarian Sciences of Ukraine, Kyiv, Ukraine
60. Translational Metabolic Laboratory, RadboudUMC, Nijmegen, Netherlands
61. Ustymivka Experimental Station of Plant Production of the IPP n.a. V.Ya. Yuriev, NAAS, Ukraine
62. Vasile Alecsandri Secondary School, Braila, Romania
63. Verkhnyachka Experimental Breeding Station of the Institute of Bioenergy Crops and Sugar Beet of NAAS, Ukraine

ABSTRACT BOOK NATIONAL CONFERENCE WITH INTERNATIONAL PARTICIPATION „NATURAL SCIENCES IN THE DIALOGUE OF GENERATIONS", September 12-13, 2024, Chisinau, Republic of Moldova

Bun de tipar 07.07.2024. Formatul 60x84 1/16

Comanda 60/23. Tirajul 30 ex.

Editura USM
str. Al.Mateevici, 60, Chişinău, MD-2009
e-mail: cep1usm@mail.ru