MOLDOVA STATE UNIVERSITY
Center of Functional Genetics, Faculty of Biology and Geosciences
Doctoral School in Biological, Geonomic, Chemical and Technological Sciences
Scientific Association of Geneticists and Breeders of the Republic of Moldova

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SUMMARY

E. CHEMISTRY AND CHEMICAL COMPOUNDS IN BIOLOGY, AGRICULTURE AND MEDICINE

Session A

PLANT GENETICS, BREEDING AND PROTECTION

UDC: 632.53: 633.854.78

SUNFLOWER BREEDING FOR BROOMRAPE RESISTANCE

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Broomrape represents the most important parasite that infested sunflower and produce low seed yield up to 70-80% in fields with races G, H or more. In south-east of Romania is identified the most virulent races of parasite Orobanche cumana, G, H and more. In location Braila, in year 2022, we tested 20 sunflower experimental hybrids belonging to National Agricultural Research and Development Institute Fundulea and differential set with sunflower genotypes for identified races of broomrape present in this area. All sunflower experimental hybrids was susceptible at races of broomrape and from differential set only one additional sunflower genotype was resistant at parasite broomrape, and this is old Romanian variety Neagra de Cluj (gene Or ???), accession Pl 650368, provided by North Central Regional Plant Introduction Station (NCRPIS), part of United States National Plant Germplasm System (NPGS). Old Romanian variety Neagra de Cluj, can be included in international set of differential for races G, H and I of parasite Orobanche cumana.

Keywords: *sunflower, broomrape, source of resistance*

UDC: 632.3: 635.64

DISTRIBUTION OF '*CANDIDATUS* PHYTOPLASMA SOLANI' IN LOCAL TOMATO VARIETIES

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'Candidatus Phytoplasma solani' is a pleomorphic microorganism that infects the phloem of many plant species worldwide. It is also known as stolbur phytoplasma. It affects more than 300 plant species, especially in the European region where it is considered as a quarantine pathogen. In Eastern Europe phytoplasma mainly infects solanaceous crops and grapes leading to severe disturbances in plant growth and affecting productivity indicators. It can cause up to 100% yield loss. Typical stolbur symptoms in tomato include virescence, proliferation of the shoots and generalized stunting, flower sterility and small fruits. Various factors make it difficult to control pathogen, such as the systemic nature of the disease, the complex life cycle, the unsuitability of application of some chemicals from an environmental point of view. Phytoplasma monitoring is an important tool for controlling the spread of the disease in the region. The aim of the research was to determine the presence of stolbur infection in local varieties of tomato using molecular methods.

Molecular analysis of 'Ca. P. solani' was carried out at the end of the 2022 growing season on five local tomato varieties: Desteptarea, Mary Gratefully, Prestij, Tomis and Exclusiv. Plants were grown in experimental fields of IGPPP. For analysis, fruits were taken from 12 plants of each variety. DNA was isolated by the alkaline method from a small section of tomato peduncles. Nested-PCR was performed using specific for 'Ca. P. solani' pairs of chaperonin primers: cpn421 F\R and cpn200 F\R. Molecular analysis demonstrates the presence of phytoplasma in all analyzed genotypes, however a low level of infection was found in all five varieties. Namely, the percentage of infection in the field reached 16.7% at the end of the growing season. The presence of 'Ca. P. solani' was determined in 8% of plants of the Mary Gratefully variety. The same percentage of the infection was determined in the Tomis variety. Tomato varieties Desteparea and Prestij show a higher level of infestation with phytoplasma - 25%. The average indicator of infestation with the pathogen was determined in the Exclusiv variety (16.7%).

Thus, the results obtained show a low distribution of phytoplasma in the field under the conditions of 2022. The data did not indicate which variety is resistant to 'Ca. P. solani'. Although there were established some trends in conditions of 2022 – higher resistance of Mary Greatefully and Tomis and lower resistance of Desteparea and Prestij. Monitoring the spread of phytoplasma is important as it remains a real danger in Moldova and neighboring countries.

Aknowledgements: 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", funded by financed by the National Agency for Research and Development.

Keywords: *'Candidatus Phytoplasma solani', tomato, nested-PCR.*

UDC: 581.1:635.714

NEW VARIETIES OF *ORIGANUM VULGARE SSP. VULGARE* L. - PANACEA AND *ORIGANUM VULGARE SSP. HIRTUM* -SAVOARE

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The relevance of the species *Origanum vulgare* L. is determined by its importance as a The relevance of the species O*riganum vulgare* L. is determined by its importance as a medicinal, aromatic and spicy plant, supported by the chemical composition that includes polyphenols, essential oil, bitter substances etc. The morphological characters were evaluated according to the methods in force. In order to determine the content of essential oil, the samples of fresh herbs, aerial part of the plant, were harvested in the morning hours at the flowering stage. The essential oil was isolated by hydro distillation for 60 minutes, using the Ginsberg apparatus: 50g of fresh aerial part per 200 ml of water. The content of essential oil was recalculated per dry matter. The qualitative and quantitative analysis of the essential oil was established by GC in tandem with mass spectrometry (GC– MS). GC GC– MS analysis showed that the essential oil from *O. vulgare ssp. vulgare* genotypes consist of 41 components. The essential oil of *O. vulgare* ssp *hirtum* are 24 – 31 compounds depending on the genotype, with the ratio of identification 99.07– 99.90%.

The creation of 2 varieties was completed: *O. vulgare ssp. vulgare, Panacea* variety is distinctive by: *Physiological properties*: It has very good winter hardiness; high drought resistance; high diseases resistance. *Quality features:* Essential oil content in the raw material (humidity, 60%): 0.107% and 0.267% (dry substance); Major components in essential oil: *Germacren* D, 31.13%; *β – Caryophyllene*, 15.785%; α– *Farnesene* – 11.41%. *Production capacity*: Fresh material production – 7.8 t/ha; Pharmaceutical *herba* production, humidity 13%, 1.51 t/ha; Essential oil production – 8.35 kg/ha; Yield – 1.1 kg/t. *Physiological properties: O. vulgare* ssp *hirtum, v*ariety *Savoare* has very good winter hardiness; high drought resistance; high resistance to diseases. *Quality features:* Raw material: essential oil content: 1.641% humidity 60%; 4.102% dry substance; essential oil (CG– SM) major components: *Carvacrol* – 82.87%; β– *Caryophyllene* – 15.79%; γ– *terpinene* – 2.89%; *Production capacity:* Raw material production (humidity, 60%): 9.3 t / ha; Pharmaceutical *herb* production (humidity 13%), 1.85 t / ha; Essential oil production – 152 kg/ha; Yield – 16.4 kg essential oil/t of raw material.

***Acknowledgments*:** this study was supported by the research project 20.80009.5107.07: "Reducing the consequences of climate change by creating, implementing varieties of medicinal and aromatic plants drought, frost, winter, disease resistant, which ensures sustainable development of agriculture and guarantees high quality raw material predestined to the perfumery, cosmetics, pharmaceuticals and food industry", funded by National Agency for Research and Development.

Keywords: *Origanum vulgare ssp. vulgare, O. vulgare ssp hirtum, varieties, essential oil, chemical composition emical composition.*

UDC: **577.217:633.15**

PROSPECTIVES OF DEVELOPING SPECIALTY MAIZE GERMPLASM

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The improvement of the maize seeds quality to the increased protein content, essential amino acids in the protein (lysine, tryptophan), amylopectin in the endosperm, and other biochemical compounds, constitute traditional strategic directions for over 50 years developed in our country, started by the genetics and breeding school of academician Palii Andrei. The basis of these researches were the successes recorded at the worldwide and national levels regarding the increase of the protein content in the seeds through pedigree selection, as well as the discoveries in the 60s of the last century the biochemical effects of some recessive genes such as opaque2 (o2) and floury2 (fl2). In the homozygous state, these genes determine a floury consistency of the endosperm and modify its chemical composition, causing an increased content of lysine and tryptophan in the seed protein. The research materialized through the creation of isogenic lines and special hybrids, in which genotype were incorporated mutant endosperm genes (o2, fl2, su1, su2, wx1, ae, etc.) that modify the protein and carbohydrate complex in the endosperm.

In the last decade, there has been an expansion and intensification of research activities in this direction in order to increase genetic variability. In 2016, the special maize collection was enriched with more than 30 lines and sources from research institutions of our country and abroad. Through the polyploidy method, tetraploid forms of maize carrying o2, wx1, fl2, su1, su1o2 genes were developed. As a result of collaboration with Iowa State University (USA), haploid inducers from which tetraploid forms were also obtained, completed our working collection. Germplasm development and study of genetic variability, in order to exploit it in fundamental and applied research, requires the approval of new methods for the identification of maize genotypes at the protein and molecular levels, complementary to the biochemical direction of the quality studying of the newly created genetic background. In this sense, based on the ongoing project 20.80009.5107.21, the Applied Genetics and Biotechnologies laboratory was created within Technical University of Moldova (Agronomy and Environment Department).

Therefore, the success of creating a new working genetic pool of mutant forms of maize for special purposes depends on the effectiveness of capitalizing on the rich experimental research initiated and carried out to date, as well as on the continuation of this research by using modern research methods and applying results in the agricultural science of the Republic of Moldova.

Keywords: *maize, endosperm genes, quality traits, germplasm improvement.*

UDC: 632.9:630*4(498)

INTEGRATED PEST MANAGEMENT IN DECIDUOUS AND RESINOUS FORESTS IN NEAMȚ COUNTRY

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The deciduous stands have suffered an important impact through the strong gradations developed by the defoliating caterpillars that remind the species, Lymantria disappear L., Operophtera brumata L., Erannis defoliaria Cl., Tortrix viridana L., Hyphantria cunea Drury, etc., making special efforts to avoid defoliation that, produced repeatedly, would have led to their drying.

International efforts to conserve the natural environment focus on vast ecosystems with high biodiversity, relatively untouched cosystems, or where they are endangered plant or animal species. The optics regarding the use of chemicals, which contribute to the pollution of the environment, have also changed, their alternative being the biological control , which lately has seen a strong development especially in the case of the application of bacterial treatments and the use of zoophagi.

Keywords: *defoliators, preservation, stands, threats.*

UDC: 581.4:633.15(478)

ZEIN POLYMORPHISM IN THE AID OF MAIZE SEED CERTIFICATION

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The Republic of Moldova annually exports more than 3 thousand tons of domestically selected maize seeds, mainly to countries such as Belarus, Kazakhstan and others. In addition to high cultural value indices, the exported seeds must also have a high varietal purity (at least 95%) determined by the electrophoresis method.

To facilitate this process, a research project was initiated in 2020 with the aim of molecular passporting of domestic maize hybrids that are certified for export, but also for the local market. The basis of the creation of these passports is the polymorphism of storage proteins from the maize grain (zeins) detected by electrophoresis on polyacrylamide gels in an acid environment, as well as the principle of co-dominance of the expression of the genes responsible for the synthesis of zeins when crossing the parental lines. Maize hybrids of domestic selection from different maturity groups were used as research material. The electrophoretic profiles of the parental lines and the hybrids resulting from their crossing were synthesized by the FOREZ 2 program in the following sequence of actions: 1) intensity binarization: band present (1) or band missing (0); 2) determining the border of the bands: rf_{in} and rf_{fin}; 3) formation of a text file with EF band limits [rf_{in} – rf_{fin}] for each analyzed genotype.

The following characteristics were automatically identified on the computer generated arrays: a) the quantitative specificity of the zein polymorphism for each genotype according to the molecular forms of zein (FMZ), represented by groups (bands) of "zein peptide subunits" (SPZ) on the matrix of the synthesized spectrum of the hybrid; b) quantitative binary labeling specificity of the intensity of "molecular forms of zein" (FMZ) of maize hybrids, which are components of EF bands ("peptide subunits of zein"-PSZ)

Since the initiation of the project until now, more than 50 autochthonous hybrids and their parental forms have been electrophoretically passported. This year the project will be completed with the creation of a catalog of electrophoretic passports for these hybrids to be used by originators in the certification and export process of maize seeds.

***Acknowledgments*:** this study was supported by the research project 20.80009.5107.21 *Creation of the catalog of electrophoretic passports of parental forms and hybrids of maize approved in the Republic of Moldova and intended for export*, funded by the National Agency for Research and Development of the Government of Republic of Moldova.

Keywords: *maize, zein polymorphism, electrophoretic matrix parameters.*

UDC: 632.4: 633.853.74

MOLECULAR IDENTIFICATION OF *P.CITRINUM* IN SESAME (*SESAMUM INDICUM L.*) SEEDS

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Sesame, known as *Sesamum indicum* (L.), has 2n = 26 chromosomes and a small genome of 354 Mb. It belongs to *Pedaliaceae Lindl* family. Sesame seeds are infected by fungi that present a threat for using the seeds for different purposes, especially the fungi of *Penicillium* genus. Mycotoxins, secondary metabolites, present a hazard for seeds as they spoil their quality. Current work focuses on identifying fungal pathogens in sesame seeds *(Sesamum indicum L.)* of twelve genotypes: Biolsadovski, Zaltsadovski, Leader, Manzhursky ulucsheny, Kubanets 57, Donskoy belosemyanny, Liano, Natasha, Margo, Solnechny, Gusar, Serebrysty. Pathogen identification was performed using molecular methods. For this purpose, total DNA was extracted from seeds using 5% SDS extraction buffer. Intact seeds with no visually distinguished symptoms of diseases were sampled for diagnostics. DNA samples were tested using nested-PCR assay and primers specific for fungal pathogens. The sensibility and specificity of identification of pathogen of interest in nested-PCR are significantly enhanced due to a second PCR round with inner primers. *Penicillium citrinum* was identified using primers to β-tubulin (btub) gene. In the first PCR round the following primers were used: fr. CCTTGATGGCGATGGACAGT, rev. CAGCACCGGATTGACCGAAA in 35 cycles. In the second PCR round the following primers were used fr. CTACAACGGAACCTCCGATCTC, rev. AGCACCGGATTGACCGAAAA in 30 cycles. Annealing temperature in the first round was 61^0C, in the second - 60^0C. As a result, in eleven samples pathogens were identified. Only variety Lider was not infected with *P. citrinum*. Seed testing for pathogen presence and their associated mycotoxins, transmitted via seeds, is an important step for preventing diseases' propagation and may lead to yield increase of the tested object and safe usage of sesame seeds in alimentation.

***Acknowledgments*:** this study was supported by the research project 20.80009.5107.11 "Long-term ex situ conservation of plant genetic resources in Gene bank, using molecular methods for testing of plant germplasm healthfulness", funded by National Agency for Research and Development.

Keywords: *nested polymerase chain reaction. P.citrinum, sesame, mycotoxins.*

UDC: **581.15:632.53**

ISSR MARKER APPLICATIONS IN THE DISCRIMINATION OF BROOMRAPE FROM MEDITERRANEAN REGION

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In recent years, molecular markers are indispensable tools for determination of genetic variation and identification of taxons with high levels of accuracy and reproducibility. Among the many types of molecular markers, ISSR can be useful for studying genetic diversity and phylogenetic relationships, DNA fingerprinting in the identification of closely related taxons, and also for genome mapping.

The main purpose of our study was to investigate the effectiveness and acceptability of ISSR marker system use to analyze the genetic diversity, explore genetic kinships and discriminate among 23 *Orobanche cumana* populations belonging to 3 races (E, H and G) collected in the territory of 4 countries from the Black Sea basin (Bulgaria, Romania, Moldova and Turkey).

Molecular profiles obtained for 23 populations based on 13 ISSR-markers has allowed revealing both the significant differences and similarities depending on the analyzed population or type of primer. As a result of the ISSR markers usefulness assessment for determining of broomrape population genetic diversity by means of the statistical indices (number of total loci from 4 to 36, percentage of polymorphism from 70 to 100%, PIC from 0.052 to 0.281, hj from 0.001 to 0.480, Rp from 3.583 to 17.333, MI from 0.120 to 8.280, EMR from 2.250 to 30.250), three dinucleotide ($(AG)_8YA$, BC857, BC841) and one trinucleotide ($(CAG)_5$) primers were identified as the most informative. ISSR analysis of the different race broomrape populations revealed quite high levels of DNA polymorphism (races E–87%, G–91% and H–94%). However, it should be noted that the specific loci were detected in all races: race E–11.63% or 15 loci out of 129, race G–8.88% or 23 loci out of 259, race H–5.44% or 16 loci out of 294. But as for the common loci, they were observed only in the race E.

Thus, this analysis detected that the race E contains the highest percentage of specific loci which possible evolutionarily distances her from the race G and H, as can be seen from our findings. Additionally, the frequency distribution allele analysis just confirms once again the conclusions that races G and H are more similar to each other, which means, that race E is more distant of races G and H in evolutionary time. And furthermore, the genome of race E is more stable than at the races G and H.

***Acknowledgments*:** this study was supported by the research project of the State Program 20.80009.5107.01–Genetic, molecular and biotechnological studies of the sunflower in the context of sustainable management of agricultural ecosystems.

Keywords: *Orobanche cumana, ISSR markers, population structure, genetic variability.*

UDC: **631.527:633.49(477)**

WORK WITH POTATO GENETIC RESOURCES IN UKRAINE

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Potato is one of the main strategic crops that form the basis of Ukraine's food security. The potato gene pool collected in the National Bank of Plant Genetic Resources of Ukraine includes 3,719 specimens of 70 botanical species (2 domestic and 68 related wild ones). To effectively work with it, the following stages have been outlined: 1) introduction and quarantine inspection; 2) ex situ preservation of the genetic authenticity of the potato collection; 3) comprehensive studies of the collection under the soil and climatic conditions of Ukraine; 4) selection of valuable sources of economically valuable features; 5) formation of different collections: basic, core, genetic, educational, doublet; and trait, the latter are categorized as special and working; 6) compilation of a pedigree database; 7) management of the "Plant Gene Pool" information system (IS); 8) provision of breeding, research and educational programs with valuable potato specimens and various collections.

Basing on results of multi-year research and aiming at targeted involvement and optimization of the qualitative and quantitative composition of the Plant Gene Bank of Ukraine, we have built up and certifiably registered the following items: 40 valuable unique potato accessions, a potato pedigree database for 301 accessions from 18 countries, and 6 different collections, viz. collection by yield capacity comprising 46 accessions from 8 countries; reference collection for starch content and technological characteristics consisting of 61 accessions from 5 countries; working reference collection for large tubers consisting of 121 accessions from 16 countries; working reference collection for resistance to viral diseases, which includes 31 accessions from 7 countries; and a reference collection by distinctness features comprising 568 accessions from 15 countries. The above-mentioned collections and valuable specimens of the potato gene pool are a concentrated reserve of valuable genes, the material and intellectual assets of the people of Ukraine, and they need to be preserved in a highly viable state and genetic authenticity.

Keywords: *potato, gene bank, gene pool, ex situ, collection*.

UDC: **632.112: 635.64**

THE PARTICULARITIES OF THE TOMATO MALE GAMETOPHITE IN CONDITIONS OF WATER DEFICIENCY

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Among the abiotic stresses that influence plants, drought is one of the most limiting, because it acts directly on the fruit development processes. Under natural conditions, plants at different stages of vegetation, including reproductive ones, are often subjected to the associated action of stress caused by drought and viral pathogens, which can significantly influence the reaction of plants. In relation to this, the purpose of the research was to study the influence of water deficit on the variability of the male gametophyte in tomato offspring, obtained from plants infected with the Tobacco Mosaic Virus (TMV) or Tomato Aspermia Virus (TAV).

The reaction of the male gametophyte of the offspring of virus-infected varieties and wild tomato species to the effect of water stress was studied. It has been shown that stress changes the activity of the male gametophyte, reducing the average values of its viability and the length of pollen tubes. Among the genotypes analyzed, the varieties Mary Gratefully and Tomis showed a high level of sensitivity, the viability of their pollen decreased 1.6 ... 1.9 times compared to the control, although in other genotypes the values of this character were more stable. Under conditions of water deficiency, most of the variability was determined mainly by the effect of water deficit and genotype. The analysis of the structure spectrum of variability for each genotype revealed the decisive contribution of water deficit in changing of the pollen tubes length in the majority of TMV/TAV progenies. The variability of pollen viability depending on the genotype was determined by the influence of infection or the effect of water deficit. Analysis of the structure of variation spectra by pollen tube length variability in each genotype established the major contribution of water deficit, although the change in pollen viability according to genotype was determined by water stress or viral agents. In most cases, the average level of resistance at the haploid level in the TMV/TAV descendants was lower than in the control. Based on the established variability, genotypes that possess resistance to water deficit at male gametophyte level were identified.

Acknowledgments: this study was developed in frame of doctoral project „The particularities of the male gametophyte in the screening of tomato genotypes to the action of phytopathogens and abiotic stress factors".

Keywords: *male gametophyte, pollen viability, phytopathogens, abiotic stress factors, tomato.*

UDC: **632.53: 633.854.78**

THE EFFECTS OF *OROBANCHE CUMANA* INFECTION ON SUNFLOWER SEED YIELD

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The negative effect of broomrape (*O. cumana*) on the sunflower crop is estimated in a large number of publications, however the quantification of the impact and its expression on different biochemical and morphological indices is a controversial topic. Thus we proposed to contribute to the elucidation of this problem.

In order to evaluate the degree of infestation with broomrape and its impact on the seed yield, 11 hybrids, from different maturity groups, grown on the experimental lots of the State Commission for Testing Plant Varieties (CSTSP) in the years 2020 and 2021 were studied.

Thus, we identified 4 susceptible hybrids that showed infection with parasitic angiosperm in both years in two out of four localities and presented between 95 and 507 broomrape shoots per 100 host plants. But the incidence of infection varies from year to year and from one hybrid to another. The data obtained demonstrate that the degree of resistance and the impact of the infection depends less on the maturity group to which the hybrid belongs and more on the producing company, respectively on the genotype of the hybrid but also on the interaction of the genotype with environmental factors.

In order to quantify the impact of broomrape infection on the seed yield, we compared the harvest of susceptible hybrids affected by broomrape with the yield of the same hybrids grown in localities where scab is absent. Thus, due to the infection we obtain a decrease in the harvest that varies from 26% to 41% depending on the locality and the year of cultivation. There is no correlation between the incidence of infection and the impact on the yield. The impact being conditioned by the complex interaction between parasite genotype-host genotype and environmental conditions.

Acknowledgments: this study was supported by the State Program 20.80009.5107.01 - Genetico-molecular and biotechnological studies of the sunflower in the context of sustainable management of agricultural ecosystems, funded by Government of the Republic of Moldova.

Keywords: *sunflower, seed yield, broomrape, impact of infection.*

UDC: **575(092)**

THREE LIFE STORIES

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Motto: *Don't look down on anyone,*
because you have something to learn from everyone.

During such meetings "between generations" everyone has something to learn from each other.

What I would like to share with you, and emphasize, is that we always have something new to learn from our parents, from school, mentors, from nature, and especially from our own mistakes.

We learned from Charles Darwin that organisms evolve with time passing; they learn to use the environment's abundance or hostility for their own benefit of survival, and therefore man's greatest achievement is self-improvement made in a conscientious manner. Apart from the primal instincts that we are continuing to work on regulating, we learn almost everything from our human fellows.

In my presentation, I would like to talk about three life lessons in which my teachers were everyday people, school teachers, college professors, and famous scientists.

Lesson 1. From everyday people, I learned to give "KINDNESS", to greet others, to enjoy the simplicity and to appreciate working hard. Out of self-respect, even today, when passing through corridors of the university, I greet both the known and the unknown people, without distinction. From them I learned to ENJOY the rain and the sun, which not only give us our daily bread, but also give us hope for the better. I learned to appreciate everyone's effort and to understand that it is not beneath my dignity to sow dig, and take care of the plants, and above all, to enjoy others and my own work. From these people I learned a lot. Even today I am thinking with gratitude of the days the laborers and technicians from Podul Modoș Farm of Timișoara, employed to working experimental fields. By their example and loyalty modeled for me a life in which respect for others is a major requirement.

Lesson 2. I attended the primary school classes in the country. What a beautiful word is COUNTRY. Our famous poet Lucian Blaga used to say that: *The eternity was born in the village*, which we call today country. At the country school, I had Mr. Ojog as a teacher. He was calm but uncompromising. He expected for us to thoroughly know multiplication tables, to be proficient in calligraphically and to recite poems. Later, I understood that these were the best exercises for development of the brain and critical thinking.

The boarding high school I attended was one of the most impressive and famous high schools in Timișoara, *Carmen Sylva*. A high school for girls, with special female teachers who, in addition to the academic knowledge, taught us good manners, the correct and suitable way to dress, what it means to be civilized in behavior and speech, and to become educated people. Whether they were "good" or "bad", as we used to describe them back then, from each of them

I gained something that was useful for my entire life.

Upon beginning college, I entered another world, another challenge. A distant institution where the students could do whatever they wanted. After 8 years of strict discipline in boarding school, I enjoyed freedom. The Associate Professor Vasile Bratu did notice my "research skills" and asked me to do some biometric measurements on wheat after winter frost. He didn't give me any instructions on what I should do. Then I remembered how the boarding school teachers used to tell us that *if you don't know something, look for it in the books, because surely you will find the answer*. So I went to the library, checked out a plant technology book, and that's how I knew what and how I had to do it. Then other teachers asked me to "help" them with different work in the field or laboratory. For me it was a true school of "trades", which I learned with pleasure from them. For me, these were my research models. Special gratitude goes to Prof. Maria Neagu, from whom I learned to use the microtome, the microscope, and plant histology. I loved this subject so much that in my doctoral thesis, I added studies in cytology and histology as a result of inbreeding and heterosis.

Lesson 3. The scientific community! A tremendous world, where I learned the meaning of fame, it's burden, and humility, which characterize great scientists. I have made true friends in the field. Seniors or young, I admired them for their talent and scientific ingenuity. Although they were famous and worked in big research stations, they welcomed me to write books, we share awards and enjoyed national and international scientific events together.

I had models of people from the country and from all over the world. Some were appreciated, others were contested, but they were all "teachers" for me. At the first international congress held in Moscow in1978 (ICG-XIV) which I was able to participate in, I met personalities from all over the world, but also from the Republic of Moldova (Acad. Vasile Siminel, Acad. Maria Duca).

Since then, on my own account and without any outside support, I have participated in 26.1% of the International Congresses of Genetics. In the 60s, I was among the few specialists who believed in triticale, which is why I regularly attended the International Triticale Conferences (90.91%). Here, on several occasions, I met famous triticalist Dr. B. Charles Jenkins whose tragic scientific life deeply impressed me. From him, as from others (Prof. Ștefan Popescu expelled from education of being steadfast to Mendelo-Morganist beliefs) from them I learned perseverence and that no matter how many injustices are done, you must go forward on your path.

I also met Nobel Prize winners, with whom I spoke as equals [Norman Borlaug (1970), George Emil Palade (1974), Barbara McClintock (1983), Philip Alen Sharp (1993), H. Robert Horvitz (2002), I had the opportunity to listen to James Watson (1962) and speak to many others. I got to know Ernest R. Sears well, the father of monosomy in plants. Being in his cement-floored laboratory, I asked him: *why don't you buy a carpet*? His answer was crushing: *instead of buying a carpet, I'd rather buy a microscope*. From the founders of chromosomal engineering in plant breeding, Ernest R. Sears and Sir Ralph Riley, but also from Sir Bent Skovmand, I learned that life should be valued. The scientific meetings or famous people do not bring concrete benefits to us, but they bring a bright joy that always accompanies us, especially when failure is present.

As a PhD supervisor (1990) I proposed topics that nothing was known about. It was unthinkable to study the reaction of plants to H_2 isotopes, the action of magnetic nanoparticles (MNP) or unconventional energies. In the world, the most honorable title is DOCTOR. Dear colleagues, future Doctor of Science, you must be happy that you have the opportunity to wear this honorable distinction.

UDC: **582.35/.99:502.1(478)**

THE DISTRIBUTION OF NEW VASCULAR PLANT SPECIES IN THE VALLEY OF THE LOWER PRUT

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During the floristic survey (in 2022-2023) of the "Lower Prut Lakes" Ramsar site territory, in order to investigate the state of rare species of vascular plants, the herbarium samples from fifferent natural and seminatural habitats were collected. These samples were identified as *Eclipta prostrata* (L.) L. (Asteraceae family); *Lathyrus cicera* L. (Fabaceae); *Polypogon monspeliensis* (L.) Desf., *Cenchrus longispinus* (Hack.) Fernald (Poaceae).

The samples of the collected herbaria from the studied area were critically processed in laboratory conditions using specific regional floras (the voucher specimens has been maintained in the Herbarium of the National Botanical Garden (Institute) of the Moldova State University).

Eclipta prostrata (L.) L. is an annual or perennial herbaceous, with succulent, erect, ascending or prostrate stems, up to 60 (-100) cm tall, registered from 3 localities – the border between the Crihana Veche commune and the Manta commune, the Manolescu canal, in the commune of Slobozia Mare and the shore of Lake Beleu in the water (plot 7).

Lathyrus cicera L. is an annual herbaceous, with glabrous, branched stems of 20-30 (-50) cm high, collected from a single locality in the vicinity of com. Slobozia Mare. It grows in small groups of several individuals in the lower part of the steep western slope as part of the phytocenosis of Ponto-Sarmatic steppes – *62C0 grasslands.

Polypogon monspeliensis (L.) Desf. is an annual, tufted, with culms erect or geniculate, up to 60 cm tall, collected from a a single locality in the vicinity of com. Crihana Veche. On the Ramsar site it grows in the floodplain of the Prut river on the wet shore of a water basin near the Manta lake in the composition of grassy floodplain meadow.

Cenchrus longispinus (Hack.) Fernald is an annual, tufted, sometimes decumbent, often with many branches arising from the base, up to 30 cm tall, collected in the vicinity of com. Brânza. Grows solitary or in small groups along the railway.

Acknowledgments: this study was supported by the research project 20.80009.7007.22 "Research and conservation of vascular flora and macromycobiota of the Republic of Moldova", funded by the NARD.

Keywords: *new species, vascular plants, Lower Prut Lakes Ramsar site*.

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REINTRODUCTION RESULTS ON RARE PLANT SPECIES IN LOWER PRUT LAKES RAMSAR SITE

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The high number of species threatened by threats ranging from habitat loss and degradation to the impact of invasive species and climate change means that their continued survival in the wild often requires a range of active management practices. The key method used for endangered taxa is population recruitment or reintroduction.

During 2020-2023, research on spontaneous vascular flora of the "Lower Prut Lakes" Ramsar site, in order to monitor and preserve the diversity of threatened plants and habitats they inhabit, the activities on repopulation of five endangered taxa were undertaken. All species were successfully repopulated within the boundaries of the "priority grassland habitat" *62C0 Ponto-Sarmatic steppes – one of the most species-rich plant communities in Europe. Plants were obtained in *ex situ* conditions (from seeds and rhizomes), within the experimental plot of rare plants (National Botanical Garden (Institute), MSU).

1. ***Achillea ochroleuca*** Ehrh. – perennial, rhizomatous, decorative and medicinal plant. Included in the Red Book of the Republic of Moldova (RBRM) as Critically Endangered. 2. ***Crambe tataria*** Sebeok – perennial, decorative and medicinal plant. Included in the RBRM as Endangered. On the second year of growth the survival rate is 75%. 3. ***Echium russicum*** J.F.Gmel. (=Pontechium maculatum (L.)Böhle et Hilger) – biennial, decorative plant. Included in the Habitats Directive, Annexes II, IV. Rare in the Republic of Moldova and in most European countries. 4. ***Eremogone cephalotes*** (M.Bieb.) Fenzl – perennial, rhizomatous, decorative plant. Included in the RBRM as Critically Endangered. 5. ***Sternbergia colchiciflora*** Waldst. et Kit. – a perennial, bulbous, ephemeral, decorative and medicinal plant. Blooms in September and fructifies in March-April. Included in the RBRM as Critically Endangered. On the third year of growth the survival rate is 80%.

The effective conservation of threatened species requires protection of the habitats and sites where they occur, usually supplemented by active conservation measures.

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Keywords: *rare species, reintroduction, vascular plants, Lower Prut Lakes Ramsar site*.

UDC: **573.6:634.54**

INITIATION OF HALLOWNUT *IN VITRO* CULTURE (*CORYLUS AVELLANA* L.)

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The purpose of the research was the introduction of hazelnut (*Corylus avellana* L.) in order to obtain uncontaminated, high-quality planting material in a relatively short time.

The research was carried out in the Embryology and Biotechnology Laboratory of the "Alexandru Ciubotaru" National Botanical Garden (Institute) of the USM.

According to specialized literature, the initiation of *in vitro* culture for *Corylus avellana* L is difficult due to a number of reasons: the high degree of bacterial and fungal contamination, the oxidation of explant tissues, the excess of phenols and the explant necrosis following the action of the substances used for asepsis. In the previous years for the inoculation of *Corylus avellana* L. in *in vitro* culture, several variants of asepsis the explants were tested, but the percentage of infested and necrotic inoculum was high, because the plant material was collected from the plantations, but according to the specialized literature for for the inoculation to proceed successfully, it is necessary that the donor plants are kept in the greenhouse, or protected land and that the treatment with fungicidal preparations is carried out beforehand. The donor plants from which the explants were taken were processed with the preparation Tank 70 WP, which contains methyl thiophanate and is a systemic fungicide. After 7 days, the biological material was taken, portions of shoots with apical buds were used as explants. The collected biological material was washed according to the protocol developed in the laboratory. After that, the explants were disinfected with a 0,1% diacid solution for 5 minutes and modeled in a laminated air flow, being inoculated on agarized nutrient medium, one inoculum in a test tube. After treating the donor plants with the fungicide preparation and sanitizing with 0,1% diacid for 5 minutes, we obtained about 50-60% viable inoculums.

Following the research we have determined that the preliminary treatment with the preparation Tank 70 WP and sterilization with 0,1% diacid for 5 minutes significantly increases the chance of obtaining viable inoculums, subsequently applied for the microcloning process.

***Acknowledgments*:** the research was carried out within the project: 20.80009.19 "Introduction and development of technologies for multiplication and cultivation by conventional techniques and in vitro cultures of new woody plant species".

Keywords: *tissue culture, explant, growth medium, asepsis*.

UDC: **632.4:633.11(437)**

RESISTANCE TO *FUSARIUM* HEAD BLIGHT AND BLACK POINT OF CZECH WINTER WHEAT VARIETIES

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Fusarium head blight is the most harmful disease of wheat. In addition to direct yield losses due to yield reduction, pathogens, fungi of the genus *Fusarium*, contribute to the accumulation of mycotoxins in grain. Their quantity is regulated in the European Union at the level of 1.25 mg per 1 kg. Breeding for resistance to this disease is carried out all over the world in order to obtain safe grain products and food products from it.

The Czech Crop Researche Institute annually conducts research on the resistance of wheat varieties to head blight at the stage of variety testing, together with the Central Institute for Supervising and Testing in Agriculture (CISTA). Artificial infection is carried out in the flowering phase, by spraying ears with a suspension of spores of the fungus *Fusarium culmorum*. The susceptibility of varieties is assessed in the field after infection, taking into account the number of affected grains, the impact on the yield and the accumulation of deoxynivalenol in the grain (IFA). Wheat seeds are also analysed for Black Point damage.

As a result of the research, it was found that, against an infectious background, the varieties RGT Telemark, Dagmar, Wiwa, Campesino, Mercedes showed the greatest resistance. The degree of their stability was at the level of 6-7 points according to the CISTA scale (9 points - very high resistance, 1 - very high susceptibility). The number of affected seeds in these varieties was in the range of 15.8-27.8, and the content of mycotoxin deoxynivalenol did not exceed 30 mg/kg. The average defeat of varieties was at the level of 5.7 points with 48% of grains affected by *Fusarium*. The maximum content of mycotoxins in susceptible varieties was 107 mg/kg.

The defeat of the Black Point on a provocative background of the disease (additional irrigation of crops) was at the level of 12.7%. The varieties Wiwa, Bohemia, Balitus, Fakir, Butterfly, Partner, Pallas, LG Orlice, Crossway were the least affected. The degree of damage to the seeds of these varieties did not exceed 5%.

Evaluation of yield indicators showed that *Fusarium* infection can reduce the weight of 1 000 seeds by up to 40% in highly susceptible varieties. Seeds affected by Black Point are generally larger and their weight compared to the control can be higher by an average of 14%.

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Keywords: *winter wheat, Fusarium head blight, Black Point, resistance, mycotoxins.*

UDC: 631.53.026:633.854.54

UTILIZATION OF THE ACCELERATED AGING TEST FOR DETERMINATION OF STORAGE POTENTIAL OF COLLECTION FLAX ACCESSIONS (*LINUM USITATISSIMUM* L.)

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The purpose of this research was to study the morphophysiological and biochemical parameters of flax seeds after accelerated aging (AA) test, which allow haracterization of storage potential (SP) of collective accessions in active collections of the gene bank with the purpose of their ex situ conservation, and to reveal genotypic differences of genotypes by this trait. Flax genotypes should be grouped by their potential capability to preserve viability of samples exposed to high temperature and humidity. Specify the necessity to restore viability of accessions.

Objects of our studies were collection accessions of flax (fam. *Linaceae*, genus *Linum*, species Linum usitatissimum L.) from active collection of the gene bank.

SP of seeds was determined by two tests: test for accelerated aging 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 flax seeds was conducted under the increased air temperature (42-43°C), 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, and germinability of seeds, radicle length, fresh and dry biomass of radicles. Electrical conductivity of solutions with normal and aged seeds was measured by conductometer. With regard to biochemical parameters, the 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 flax seeds after the AA of seeds, the following flax genotypes had the highest storage potential: Vizit, Batist, Argentina, and the middle SP was found in Belinca. Polesskiy 6 and Kaufmann.

Conclusions: 1. Use of accelerated aging test of seeds and determination of their morphophysiological and biochemical parameters allowed assessment of storage potential of flax collection accessions from the active collection of the gene bank.

2. Significant positive correlation of germinability of flax seeds with germinating power, radicle length, fresh and dry biomass of seedlings was revealed after conduction of test for accelerated aging of seeds.

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Keywords: *flax accelerated aging, germination, electrical conductivity, storage potential*.

UDC: **632.9:633.63**

EFFECT OF SUGAR BEET VARIETIES, FUNGICIDE APPLICATION AND THEIR INTERACTION ON ROOT ROTTING, CORRECTED SUGAR YIELD

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Differences in performance among sugar beet varieties are caused by the combination of genotype and cultivation condition. Leaf spot disease caused by *Cercospora beticola Sacc*. is the most destructive foliar pathogen of sugar beet worldwide. In addition to reducing yield and quality of sugar beet, the control of leaf spot disease by extensive fungicide application incurs added costs to producers and repeatedly has selected for fungicide tolerant *Cercospora beticola Sacc*. strains.

The purpose of this paper is to determine the influence of the protection of the leaves and variety and their interaction on the root rot and white sugar yield. Experiments were carried on from 2015 to 2018, on the North part of Moldova, under the conditions of natural infection. The results are based on 15 trials, the study of 27 varieties with and without fungal leaf protection, seeds that were genetically monogerm, pelleted, with the same insecticide and fungicide treatment.

After long-term testing, are highlighted the different sensitivities and tolerances of the varieties to the protection of the leaves. Is demonstrated the positive effect on the production and rot indices following the fungal control of leaf diseases.

The conditions of the year demonstrate the major influence on the manifestation of diseases on the leaf, and respectively, the weight of the influence on the yield and rotting.

On average for the period of 4 years, the percentage contribution of fungicide on root production is 3.36%; and on the production of white sugar - 3.0%.

Keywords: *Beta vulgaris, Cercospora beticola Sacc., leaves protection, sugar yield, environment*.

UDC: **579.852.11:632.4**

THE PERSPECTIVE OF APPLYING *BACILLUS SUBTILIS* AGAINST *ALTERNARIA ALTERNATA*

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Chemicalization of agriculture increases the resistance of pests to pesticides. Their aggressiveness is enhanced on all crops, including the walnut culture, an example could be the presence of the pathogen *Alternaria alternata* (Fr.) Keissl. To reduce the resistance and harmfulness of plant pathogens, it is important to use biological methods. According to the researchers, *Bacillus spp*. are among the most important biocontrol agents against fungal phytopathogens. The purpose is to determine the biological activity of bacteria *Bacillus subtilis* CNMN-BB-06 towards *Alternaria alternata*.

The object of research was the bacterium strain *Bacillus subtilis* CNMN-BB-06. Antagonistic activity against *A. alternata* was studied by method of dual culture on agar nutrient medium. A lawn of bacilli was obtained by seeding a suspension of a 3-day culture onto an agar plate. There was installed at the same time an agar block with grown culture of *A. alternata*. The index of pathogen inhibition by the bacterium *B. subtilis* was determined on the 3rd, 7th and 10th days (%).

As a result of the study, it was noted that the bacterial lawn significantly inhibited the growth of the pathogen and on the third day the inhibition rate was 33.3%. On the seventh day of the experiment, the bacterium inhibited the growth of the pathogen by 69.6%, on the 10th day - by 70.2%, compared to the control.

Tab.1 Diameter of microorganisms in dual culture and control

Nr.	Strain	The diameter of pathogenic mycotic microorganisms mm/d		
		3rd day	7th day	10th day
1.	*A. alternata* × *B. subtilis*	14 ±0,5	21± 0,5	25±0,2
2.	*A. alternata* control	21±0,1	69±0,2	84

It was determined that on the 10th day of the experiment, strain *B. subtilis* in a dual culture inhibited the growth of the *A. alternata* pathogen by 70.2% and can be recommended for further research as an agent of biocontrol against pathogen *A. alternata*.

Acknowledgments: research was carried out within the State Program project nr. 20.80009.7007.16. "Synergism between natural factors and ecologically harmless microbiological means of regulating the population density of harmful organisms for the protection of agricultural crops in conventional and ecological agriculture", funded by the National Agency for Research and Development of Republic of Moldova (ancd.gov.md).

Keywords: *Alternaria spp*., *Bacillus spp*., dual culture, antifungal activity.

UDC: **632.11: 633.854.78**

ASSESSMENT OF THE GENETIC POTENTIAL OF SUNFLOWER HYBRIDS IN DIFFERENT ENVIRONMENTAL CONDITIONS

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In the process of evaluating crop plant productivity, the interaction between genotype and environment is very important. In this study, a comparative analysis of the variation in dynamics, depending on the year (2015-2020) and locality (Visoca, Pelinia, Bacioi Grigorievca Svetlii), of the total seed yield obtained from 21 hybrids of different maturity stages was carried out, identifying performing sunflower hybrids (Helianthus annuus) as well as their degree of adaptability to the climatic conditions for a region during six years.

Generalizing the obtained results, the average values of the seed yield of hybrids from different stages of maturity did not show statistically significant differences, both within the same locality and between localities, in all 6 years studied (CV=15%, relatively homogeneous). During the 6-year study period , a general tendency to increase the seed productivity in Visoca and Pelinia and a slight decrease in Bacioi, Grigorievca and Svetlii is noted, with some exceptions (2020). The most stable values of the total seed yield of 21 hybrids during the six years studied are found at Grigorievca and Svetlii.

The highest sunflower seed yields (tonnes/hectare) in one year were for: Pelinia (3.36 in 2017; 3.58 in 2018; 3.88 in 2019), Visoca (4.28 in 2018; 3.81 in 2019 and 3.93 in 2020), Bacioi (3.54 in 2015; 3.39 in 2016; 3.91 in 2017), Grigorievca (3.00 in 2015; 3.31 in 2016; 3.11 in 2017) and Svetlii (3.42 in 2020). Therefore, in the first three agricultural years, 2015-2017, the highest seed yields were obtained in the central region of the Republic of Moldova (Bacioi), and in the following 2018-2020 period, a trend of increasing yield values from the south to the north is observed and varied between 2.45 t/ha at Grigorievca and 4.28 t/ha at Visoca.

Hybrids that showed higher seed yield values, depending on the region, year and genotype, and can be recommended for cultivation are: H6 in Visoca, H1 in Pelinia and Bacioi, H20 in Pelinia, Svetlii, Grigorievca, H8 in Bacioi, Svetlii, H5 and H14 in Grigorievca. At the same time, there are hybrids with high yields in one locality and low in another, for example: H4 can be recommended for cultivation in Bacioi and on the contrary had low performance in Visoca, H19 is superior to other hybrids in Pelinia and inferior in Băcioi, and H13 showed high seed yields in Pelenia, but low - in Bacioi and Grigorievca. The localities with the most favorable conditions regarding the genotype-environment interaction in the manifestation of heterosis are Visoca (for H2, H6, H11, H14, H15, H18, H19, H20) and Bacioi (for H1, H3, H4, H5, H10).

Acknowledgments: this study was supported by the research project 20.80009.5107.01 - Genetico-molecular and biotechnological studies of the sunflower in the context of sustainable management of agricultural ecosystems, funded by the project of the State Program.

Keywords: *hybrid, sunflower, seed yield, climatic conditions, locality.*

UDC: **576.353:635.25**

THE STUDY OF THE INTERACTION OF $TiSiO_4$ NANOPARTICLES WITH THE MODEL SYSTEM *Allium cepa* L.

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In the last decades, nanotechnology has developed continuously, having ever wider applications in various fields. The most well-known objects used in nanotechnology are metal nanoparticles and the nanoclusters they form. Nanoparticles (NPs) are currently found in more than 1000 items or product lines on the market. They are widely used in industry, electronics, medicine and agriculture, being used as additives for paper packaging, paints, ceramics, food, drug delivery, biosensors and cancer therapy.

Titanium nanoparticles, increasingly used in industrial, microelectronic, cosmetic and medical applications, are used to improve the characteristics of several products. The progressive increase in the use of titanium NPs leads to the potential release of nanoparticles into the environment, which could produce, over time, adverse effects on living systems, including humans. As there is limited and controversial knowledge regarding the effects of the interaction of nanoparticles with living systems, they need to be studied to enable the safe use of this technology.

The present study aimed to investigate the effects of the interaction of titanium silicate nanoparticles ($TiSiO_4$) with the meristematic cells of the Allium cepa roots, as an indicator system. $TiSiO_4$ NPs with dimensions ≤50 nm, in the form of white powder, with a purity of 99.8% (based on trace metal analysis), purchased from Sigma-Aldrich, were used for the experiments. Onion bulbs were placed for germination in aqueous $TiSiO_4$ NPs suspensions (dispersed by ultrasonic vibration (130 W, 20 kHz) for 30 min) of different concentrations (12.5 mg/l, 25 mg/l and 50 mg/l). Distilled water served as a control.

To determine the cytotoxic and genotoxic potential of titanium silicate nanoparticles, the following parameters were analyzed: root length, mitotic index, presence of chromosomal anomalies.

Exposure of onion bulbs to $TiSiO_4$ NPs caused a suppression of root growth and a decrease in the mitotic index in root meristems. Cytological analysis allowed the observation and quantification of chromosomal and nuclear abnormalities in meristematic cells, in all phases of the cell cycle, such as abnormal telophases and anaphases, fragmented or lost chromosomes or C-metaphases. Chromosomal aberrations, observed in root meristems exposed to increased doses of nanoparticles, confirmed the genotoxic effects of $TiSiO_4$ NPs on *Allium cepa*. This study suggests that exposure to $TiSiO_4$ NPs is capable of inducing cytotoxicity and genotoxicity in the model plant, which are directly dose-dependent.

Keywords: *nanoparticles, titanium silicate, mitotic index, cytotoxicity, genotoxicity.*

UDC: **632.11: 634.8.09**

THE IMPROVEMENT OF VITICULTURAL ASSORTMENT WITH HIGH-YIELD INTERSPECIFIC GENOTYPES BASED ON VITIS VINIFERA X MUSCADINIA ROTUNDIFOLIA

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In the last decades there are noticed more oftenly negative climate changes and an increasing frequency of natural disrupting phenomenas both during the vegetation period of the plants and in the state of vegetative rest. This fact affects the normal develompent of grapevine plants, their vegetation process and as a result the grape harvest. The main goal of modern viticulture is to obtain high quality production with minimal resource consumption. And because of this, there is an urgent need to revive the viticultural assortment and to adapt it to the changing environmental conditions. With this purpose, after many years of selection and hibridation there where obtained interspecifical hybrids of Vitis Vinifera and Muscadinia Rotundifolia with a very high adaptation capability to abiotical factors and also tolerant to most grapevine pests and diseases. These genotypes are an appropriate response to the ever-increasing needs of modern viticulture and grapevine production.

As object of study served interspecific rhizogenic grapevine genotypes with table grapes "Malena", "Nistreana" and "Algumax", as well as grapes for fresh consumption and processing: "Augustina", ”Alexandrina”, and ”Amethyst”. The respective genotypes are planted in the experimental grapevine sector of the institute.

Based on the results of monitoring environmental factors, it was found that climate changes are amplifying at global level. The generator of these changes was and is the technical-economic progress of society. Climate changes require the creation of plant varieties that ensure performance in different production conditions. The current requirements of the wine sector is the creation of new varieties with stable productivity potential, high quality of grapes and wine products. As a result of crossing the genotypes of V. vinifera L. (2n=38) x M. rotundifolia Michx. (2n=40) were obtained and homologated interspecific rhizogenic grapevine genotypes with table grapes: "Malena", "Nistreană" and "Algumax" and with grapes for fresh consumption and for processing: "Augustina", "Alexandrina", "Sarmis" and "Ametist". This genotypes have a high genetical plasticity and therefore can be grown even in the Northern areas of the republic and also they are tolerant to the main grapevine pest Phyloxera Vastatrix. Because of the tolerancy to phylloxera the plants can be multiplied by cuttings without the need of all the complicated and expensive grafting process. The rhizogenic plants obtained have a very high adaptability and the derived products obtained are of high quality, and also rhizogenic vine plants have a longer exploitation life compared to plants obtained through the grafting process.

The implementation of interspecific rhizogenic grapevine genotypes will contribute to the expansion of the grapevine cultivation limit towards the Northern area of the Republic of Moldova.The improvement of viticultural assortment can be achieved more easily with the cultivation of new interspecific, rhizogenic varieties, which show increased resistance to biotic and abiotic factors, including extreme climate factors.

Acknowledgments: research was carried out within the project of the State Program 20.80009.5107.03 “Efficient use of plant genetic resources and advanced biotechnologies to increase the adaptability of crop plants to climate change” financed by NARD.

Keywords: *viticulture, interspecifical genotypes, climate changes, resistance to phyloxera.*

UDC: **582.28:633.15**

CORRELATION BETWEEN FUNGAL INFECTION OF *FUSARIUM SPP.* AND *ASPERGILLUS SPP.* IN MAIZE SILKS AND KERNELS

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Fungal pathogens of *Fusarium* and *Aspergillus* genera present a significant threat for maize production worldwide causing ear rots during plant vegetation and grain spoilage during storage. Majority of these fungi are soil and seed-borne, cornfields and grain itself being natural reservoirs for subsequent fungal infection. Most devastating maize pathogens (*F. verticillioides, F. graminearum, A. flavus*) are able to infect kernels at blister stage via silks, which are a favorable media for pathogens' growth for their high moisture and organic compound content. Current work focuses on evaluating infection rate of several pathogens in maize silk and mature grain.

Seven inbred maize lines (MAN2488, MAN2493, MAN2491, MAN2483, MAN2470, MAN2466, and MAN2463) from collection of Laboratory of Plant Genetic Resources (IGPPP) served as objects of study. Plants were grown under weather conditions of 2022 on experimental cornfields of IGPPP. Mature kernels and silks were used for molecular studies. Total DNA was extracted using CTAB protocol with modifications. Molecular identification of fungal pathogens in maize organs was performed using PCR with primers specific to *aflP*, *PKS13*, *FUM6*, *TRI* core gene, which mediate mycotoxins' biosynthesis in *A. flavus, A. parasiticus, F. graminearum, F. verticillioides, F. proliferatum*. Correlation between infection rate in silks and kernels was estimated using Pearson's correlation coefficient.

Silk-emerging pathogens were identified in both maize silks and mature kernels. Only *F. proliferatum* and *A. flavus* were present in silk samples, while grain was infected with *A. flavus, F. graminearum, F. verticillioides, F. proliferatum*. Infection rate in silk samples was 19%, in kernels – 71%. There was no genotype-specific correlation between infection rate in silks and kernels, yet there was a weak positive correlation (r=0.32) between overall infection rate in silks and kernels. Therefore, maize silk cannot be considered main infection source for kernel contamination with pathogenic fungi. In addition, low percentage of infection does not allow using silks for estimating genotype's susceptibility to fungal infection.

***Acknowledgments*:** this study was supported by the research project 20.80009.5107.11 "Long-term *ex situ* conservation of plant genetic resources in Gene bank, using molecular methods for testing of plant germplasm healthfulness", funded by National Agency for Research and Development.

Keywords: *maize, PCR, Fusarium, Aspergillus, silk, kernels.*

UDC: **577.19:632.78**

EVALUATION OF THE BIOLOGICAL EFFECTIVENESS OF THE SEXUAL PHEROMONE OF *E. ZINCKENELLA*

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Pulse pod borer moth, *Etiella zinckenella* Tr., family (*Pyralidae*) is a dangerous pest of crops that produce pods, so it was recorded on more than 80 species of cultivated and wild legumes. The main damage is caused by second-generation caterpillars, which can lead to significant crop losses, which can exceed 50%. Monitoring the development of this pest can be carried out using sexual pheromone traps. By analyzing the captures, it is possible to accurately determine the start and dynamics of its flight. The influence of the geographical positioning of this pest led to the development of phenotypically variable populations with different pheromonal compositions.

In this work, we studied the effect of different concentrations of the major component in two-component pheromonal blends on the biological effectiveness of the synthetic pheromone, on native populations of RM. In the laboratory "Integrated Plant Protection", within the IGPPP, the major and minor component of the sexual pheromone of the *E. zinckenella*, were obtained. The variants with two-component pheromone blends were formed by addition of 3% of minor component Z9-14:Ac on all rubber septa, loaded whith the basic component Z11-14:Ac in 3 concentrations of 1 mg, 1,25 mg and 1,5 mg. Pheromonal trap sets were composed of a delta trap, sticky plate and a rubber septum lure.

In the summer of 2022, experiments were carried out on the experimental soybean fields of the IGFPP. Monitoring of pest development was first performed on acacias using sets of pheromone traps that were later placed on the experimental soybean plot, when the plants flowered. The observations were made every 5-7 days, stickly plates were changed every 15 days, rubber septa lures - once a month.

The analysis of the data obtained in the evaluated variants showed the biological effectiveness of the two-component pheromone blends of *Etiella zinckenella*. Pheromonal blends with concentrations of 1 and 1,5 mg of the main component was highly effective with close values, with the average catches of males higher by 78% and 79%, respectively than the variant with the mixture that contained 1,25 mg of the main component.

The pheromone blend containing 1 mg of the main component and 3% (0,03mg) of the minor component proved to be the most optimal in monitoring the native population of the pulse pod borer moth in the Republic of Moldova.

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Keywords: *pulse pod borer, E. zinckenella, sexual pheromone, biological effectiveness.*

UDC: **575.224.232.3:633.11**

IDENTIFICATION OF NOVEL WHEAT-RYE 1BL.1RS TRANSLOCATIONS USING PROLAMIN AND SSR MARKERS

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Wheat-rye translocations involving arm 1RS (1BL.1RS from the rye Petkus as in the cultivar Kavkaz and 1AL.1RS from the rye Insave as in Amigo) are among the most widespread introgressions of common wheat cultivars. They carry a number of disease resistance genes (McIntosh 2013) and genes associated with root length (Gabay, 2023). Because of the loss of efficiency of the resistance genes, a promising trend is the search for novel wheat-rye translocations. The objective of our study was identification of new wheat-rye translocations.

Common wheat cultivars and hybrid material were studied. Gliadins were analyzed by APAG electrophoresis. Sec-N secalins were analyzed by SDS-electrophoresis. Translocations were identified using the secalin loci Sec-1 and Sec-N, where Sec-N is located about 15 cM distally to Sec-1 (Kozub et al. 2014, 2018). Analysis of gliadins encoded by the Gli-A1 and Gli-B1 loci permitted to identify the translocation type (1AL.1RS or 1BL.1RS). Untypical translocations were analyzed by PCR with SSR markers for 1RS: proximal scm9 (Saal and Wricke, 1999) and distal Xtsm92 (Kofler et al. 2008).

In the cultivar Vyshyvanka with 1BL.1RS, the pattern encoded by Sec-1 is similar to that of Gli-B1l, but it has a novel allele at Sec-N encoding two secalins in the zone of 70 kDa. The line CWX with 1RS from the rye Voronezhske SGI has specific secalin patterns encoded by both Sec-1 and Sec-N. In the cultivars Homin and MV Táltos, we revealed 1BL.1RS, but with the secalin patterns as in the cultivar Amigo. In the above cultivars and CWX, PCR with scm9 revealed a 208-bp allele, as in Kavkaz-type 1BL.1RS carriers. The distal marker Xtsm92 produced 190-bp amplicons in Homin and MV Táltos, like in Amigo-type 1AL.1RS carriers, and no amplicons in Vyschyvanka and CWX, whereas Kavkaz-type 1BL.1RS carriers showed a 185-bp band.

Thus, in 1RS of the above cultivars and the line CWX, the pericentromeric portion derives from Petkus. In Homin and MV Táltos, 1RS is of recombinant origin involving the widespread Kavkaz and Amigo-type translocations. CWX and Vyshyvanka carry novel 1BL.1RS with specific alleles at the secalin and distal SSR marker loci, and they may be promising carriers of new disease resistance genes.

Keywords: *Triticum aestivum, secalin, 1BL.1RS, translocation, microsatellite marker.*

UDC: **632.11:633.854.78**

CORRELATED RELATIONSHIPS IN SUNFLOWER HYBRIDS

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Crop production needs to constantly take measures to adapt cultivated crops to climate changes.

The purpose of the work is to study the influence of weather factors on the formation of productive indicators of sunflower hybrids selected by the IOK NAAS. The study of Tur, Vilnyi, Myrnyi hybrids was carried out during 2019–2022 in the fields of selective crop rotation.

The average indicators of the vegetation period of the studied years had a significant excess in terms of temperature (2019 - 2020 by +3.0 C; 2021 by +2.0 C and 2022 by +1.9 C) in comparison with long-term indicators - 17,22 C. Precipitation was seasonally unstable and had indicators at the level of 2019 – 39.5 (-7.0) mm; 2020 – 34.8 (-11.7) mm; 2022 – 42.3 (-4.2) mm; and only in 2021 there was an excess of precipitation by 15.4 (61.9) mm compared to the long-term averages.

The best yield indicators of the Tur hybrid were formed in 2021 - 3.56 t/ha, the worst in 2020 - 1.60 t/ha, the average over the years was 2.55 (+0.40 to the standard) t/ha. Myrnyi hybrid had the best yield in 2021 – 3.15 t/ha, which is 0.65 t/ha more compared to 2020 and more than the multi-year average compared to the standard (+0.17 t/ha). The Vilnyi hybrid was the best, the average yield was 3.26 t/ha, which is higher than the standard hybrid by 1.11 t/ha. For three years, the Vilnyi hybrid produced a yield of 3.33-3.99 t/ha and 2.11 t/ha in 2020.

The worst year for the formation of a mass of 1000 seeds was 2020. The decrease in the indicator was: Tour in the range of 8.0 - 10.0 g, Myrnyi from 1.0 to 8.0 g and Vilnyi in the range of 8.0 - 11.0 g. The best indicators were in the hybrid Vilnyi, in 2019 and 2021 years - 60 g, in 2022 it will be three grams less. Hybrids Mirnyi and Tur had values at the level of 55.0-57.0 g and 48.0-55.0 g, respectively. The weight of 1000 seeds and yield have a high direct correlation in the hybrids Tur (r = 0.89), Vilnyi (r = 0.95), and in the hybrid Myrnyi - very low (r = 0.22).

The highest accumulation of fat in the seeds was in 2021, in the hybrid Myrnyi - 50.61%, Vilnyi - 50.21%, the hybrid Tur had an indicator of 49.11%. In 2019 and 2022, all three hybrids significantly exceeded the oil content standard. On average, the Vilnyi hybrid had the highest oil content - 49.01%, which is 1.48% higher than the standard. Tur, Mirnyi hybrids had oil content from 48.30 to 48.31%, respectively, which is 0.77 and 0.78% more than the standard. High correlations were established between oil content and weight of 1000 seeds in hybrids Tur r = 0.98, Vilnyi r = 0.95, Mirnyi had a correlation at a very low level, coefficient 0.11. Hybrids Myrnyi r = 0.99, Vilnyi r = 0.88 and Tur r = 0.82 have the greatest relationship between yield and oiliness.

Keywords: *sunflower, yield, oil content, weight of 1000 seeds, correlation coefficient.*

UDC: **665.345.4(478)**

DETERMINATION OF THE OIL CONTENT OF FLAX VARIETIES PRESERVED *EX SITU* IN THE REPUBLIC OF MOLDOVA

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Linseed oil, also known as flaxseed oil or flax oil (in its edible form), is a colorless to yellowish oil obtained from the dried, ripened seeds of the flax plants (*Linum usitatissimum* L.). The flaxseed oil consists of fatty acids *omega 3* and *omega 6* (50-64%), which are found in the form of alpha-linolenic acid (ALA), that is more than is contained in fish oil, making it the richest natural source for these fats. ALA polymerizes rapidly with exposure to oxygen and is therefore useful in varnishes, inks, linoleum, and other traditional industrial applications. The oil content in the seeds of flax would be of high potential as oil source for human consumption, but the body is not very efficient at converting ALA into the omega 3 fatty acids found in fish oils.

From international researchers is known that it appears to average oil content in flax seeds is 38-47% – of species *L. usitatissimum* L. convar. *mediterraneum** (Vav. et Ell.) Kulpa et Danert and ssp. *usitatissimum*** Czernom. et Stankev, but for convar. *elongatum*$^{+}$ Vav. et Ell. the oil content in the seeds is about 5% lower (32-36%).

The purpose of this study was to investigate the seeds oil content of flax varieties (*Linum usitatissimum* L.), grown *ex situ* under the conditions of the Republic of Moldova. The objects of the research were nine flax varieties of three intraspecific groups from the *ex situ* collection: MDI 05608*, MDI 05609*, *Blaringhem**, *Duflavin N5***, *Pskovskiy L 3-2***, *Dichl 8***, *Vizit*$^{+}$, *Rodnik*$^{+}$, *Belinka*$^{+}$. The oil content in the flaxseeds was determined by NMR relaxation method.

When determining the oil content in flaxseeds, by the NMR relaxation method it was established that the oil content depended on the seeds size and color. Yellow seeded flax (MDI 05608) had a higher seed weight and oil concentration than brown seeded flax. For MDI 05608 variety the oil content in seeds was 41.5%, MDI 05609 – 41.3%, *Blaringhem* – 40.1%, *Duflavin N5* – 38.7%, *Pskovskiy L 3-2* – 38.7%, *Dichl 8* – 37.4%, *Vizit* – 37.4%, *Rodnik* – 36.5% and 35.9% in *Belinka* genotype.

The averaged one thousand seeds mass was 7.67 g (MDI 05608), 6.89 g (*Blaringhem*), 5.66 g (MDI 05609), 6.27 g (*Pskovskiy L 3-2*), 5.95 g (*Dichl 8*), 5.25 g (*Duflavin N5*), 5.15 g (*Vizit*), 4.33 g (*Belinka*) and 4.00 g (of) in *Rodnik* variety.

In conclusion, it can be mentioned that the mean flaxseed oil content for convar. *elongatum* is 36.6%, in contrast to 38.3% in ssp. *usitatissimum* and 41.0% in convar. *mediterraneum*. And the 1000 seeds mass in selected genotypes ranged from 4.00 g to 7.67 g respectively. Environmental conditions and genetic diversity effect on the oil content. Concentration of flaxseed oil depends after seeds weight, size and after their color.

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Keywords: *flaxseed oil, flax, Linum usitatissimum L., ex situ, varieties.*

UDC: **631.526.32:633.11**

CREATION OF NEW VARIETIES OF WINTER TRITICALE

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The main objective of breeding winter triticale is to increase productivity, improve the biochemical and technological qualities of grain. The source material for breeding was created by the methods of intraspecific, interspecific and intergeneric hybridization. The best varieties of winter triticale were involved in crossing, which made it possible to enrich the genetic basis of the breeding material, giving it a complex of biological and economically valuable traits and properties. We used the following triticale breeding process scheme: study of the source material and obtaining hybrid populations from various types of crosses; study of hybrids and selection of the best lines; complex testing of new forms.

Over the past 3 years (2020–2022), 186 hybrid combinations have been carried out, of which 76 are intraspecific, 85 interspecific and 25 intergeneric. The percentage of set of hybrid grains was influenced by the climatic conditions of the year, the source material and the crossing method. The percentage of set in intraspecific crossing combinations was 41.5%, and the variation is very wide from 0.7 to 79.4%. Good results (50.4%) were obtained with interspecific crosses of triticale of different levels of ploidy with a variation of 28.1–66.2%. In intergeneric crosses, seed set was 7.3%, and the variation ranged from 0–17.6%. With an increase in the age of populations for all types of crosses, an increase in the number of output of morphologically aligned lines was observed.

The study of new lines in the control and competitive nurseries made it possible to select some of them that are superior to the best varieties in terms of yield and resistance to abiotic and biotic environmental factors. The yield of the best lines in the control nursery in 2021 varied from 8.7 to 10.9 t/ha, and in 2020 and 2022 - from 3.2 to 5.4 t/ha. In competitive variety testing, the harvest of the best lines in 2021 ranged from 7.5 to 9.1 t/ha, and in 2020 and 2022 - from 3.1 to 5.1 t/ha. In 2020 and 2022, the harvest was lower due to weather conditions, as the years were dry.

As a result of many years of work of breeders in our country, a number of new varieties of triticale have been bred, which are distinguished by good yield, drought resistance, resistance to powdery mildew, rust and fusarium, and also have high technological performance. Winter triticale varieties have been created: Ingen 93, Ingen 33, Ingen 35, Ingen 40, Ingen 54 and Costel. Protein content (15.6-17.4%) and gluten (25-30.7%). Grain content averaged 738 g/l. The vitreousness of the grain is 62.4% with fluctuations from 56 to 81%. The average yield for 3 years was 3.7-6.8t/ha. All varieties of triticale of our selection belong to varieties of food and fodder.

Thus, as a result of the studies carried out, an increase in the efficiency of cultivation of winter triticale in comparison with wheat was established in anomalous years in terms of climatic conditions.

Keywords: *breeding process, hybridization, variety, winter triticale.*

UDC: **632.11:633.15**

CHANGE IN VIGOR AND METABOLIC EFFICIENCY OF MAISE SEEDS UNDER THE INFLUENCE OF TEMPERATURE

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Among the variety of physiological criteria, seed vigor and metabolic efficiency are the most closely related to the overall resistance of plants to stress. Moreover, the methodological accessibility of their determination makes it possible to evaluate quickly the resistance of plants, in particular, to the influence of non-optimal temperatures.

Purpose of this study was to determine the resistance potential of the Porumbeni 374 (P374) maize hybrid to temperatures of 48, 50 and 52ºC. Hybrid P374 is triline hybrid, semi-early maturation (FAO 290), dentate seed, weight of 1000 seeds 290-300 g, the production potential 11- 12 t/ha. The total germination of intact seeds and seeds exposed to temperature, as well as roots and shoots length and biomass of individual components (roots, shoots and seeds) of germinated seeds were determined. Moreover, shoot vigor I, root vigor II and metabolic efficiency were calculated.

Vigor I and vigor II of intact seeds were 428.81 and 823.91, respectively. The vigor of seeds exposed to heat significantly decreased at 48ºC by 42.7 - 47.5% and at 52ºC by 62.2 -72.9% compared to intact seeds. Thus, the increase in temperature greatly affected the shoot and root vigor of maize seeds.

Physiological differences between intact and heat-treated seeds were expressed in the quantitative use of reserve substances for the growth of roots and shoots, which depended on the effect of temperature. After heat stress at temperature of 48ºC, the amount of reserve substances used for the growth of roots and shoots did not change. When the temperature increased to 50ºC, this index increased by 7%. The temperature of 52ºC contributed to the rise of reserve substances using by 9.81%. The hybrid was characterized by a significantly increased metabolic efficiency after the heat stress at 52ºC by 42.5% compared to the intact seeds, which indicates an increase in the intensity of the growth processes of the seeds that survived after the heat treatment.

The intensity of growth responses of maize seeds to temperature increase was studied. Based on the determined indices, the resistance degree of the P374 maize hybrid to such an unfavorable abiotic factor as a temperature exceeding the optimum was reliably assessed.

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Keywords: *maize ssed, heat stress, vigor, metabolic efeciency*.

UDC: **631.528.1:635.64**

MUTANT GENES CONTROLLING TRAITS OF THE REPRODUCTIVE SYSTEM OF TOMATO

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Gene mutations are the primary source of new alleles, which largely contribute to the expansion of the genetic variability of any trait. Therefore, to solve the problems that geneticists and breeders face at the present stage, collections of mutants are of great interest as a source of breeding-important traits. For tomato breeding, marker genes responsible for the manifestation of traits at the flower and inflorescence stages are of particular value. The procedure for their description, evaluation, detection and reproduction is the initial stage for subsequent active use in breeding and genetic research.

125 mutant tomato samples were studied. The description of the nature of manifestation and the degree of phenotypic expression of marker genes that control the signs of the reproductive system was carried out following the basic rules of tomato gene nomenclature [Zhuchenko, 1973, RTGC, 7/2020].

The collection contains mutant forms with very branched (*s, mult, mup, mux, mua*) or reduced inflorescences (*hg, di*), as well as single-flowered (*uf*) forms that limit their growth to a fasciated inflorescence. Pronounced differences between the mutants are noted: in the size of the flower; the number of its parts; the ratio of the calyx lobes and the number of corolla lobes, and their length; the presence of pubescence and color of flowers. Mutant forms with different types of sterility are described: Mo 544 (*ds*), Mo (*ex*), Mo 432 (*Ge*), Mo 638 (*ms*), Mo 787 (*ms-2*), Mo 779 (*ms-31*), Mo 732 (*psu*), Mo 504 (*s*), Mo 732 (*ste*), Mo 738 (*ste*), Mo 756 (*st*), Mo 822 (*spl*), which are carriers of these genes and have significant variability in the number of perianth and androecium elements.

The study and analysis of mutant forms of tomato made it possible to differentiate and systematize them into groups according to the nature of manifestation and the degree of phenotypic expression of the signs of the reproductive system (inflorescence type, shape, color of flowers, and position of the column relative to the stamen column in flowers of various types). The limits of their variability are set, represented by three categories: within one inflorescence, inflorescences of one plant; intrapopulation and variability caused by environmental factors.

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Keywords: *tomato, mutant marker genes, trait, variability, inflorescence, flower*.

UDC: **631.527.8:633.14**

THE NATURE OF INHERITANCE OF MORPHOLOGICAL TRAITS AND PRODUCTIVITY ELEMENTS IN WINTER RYE HYBRIDS USING A DONOR OF PURPLE SEED COLOUR

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Nowadays, the food market in a number of countries (China, India, South Korea, Australia, Canada, the USA, Japan, Austria, the Czech Republic, etc.) is growing in popularity of healthy food products based on unique varieties of cereals with coloured (black, blue, purple) grain. The authors of these studies called the appearance of cereals with coloured grains on the market the "second green revolution", since coloured grains as a means of their biofortification radically improve the nutritional (biological) status of grain and its processed products.

In recent years, research on the colour of cereal seeds, anthocyanins and polyphenols, as powerful plant antioxidants capable of neutralising free radicals, has been a relevant issue. They reduce the risk of dangerous diseases such as cardiovascular diseases, cancer, diabetes, hypertension, organ inflammation, obesity, and help slow down aging, protect the body from damaging UV radiation, etc. associated with oxidative stress.

The aim of the study was to determine the peculiarities of inheritance of the main breeding traits in lines - components of hybrids, the effectiveness of creating source material for heterotic breeding of winter rye on a linear basis using donors with purple seed colour and a complex of economically valuable traits and characteristics.

Field methods - hybridisation, individual selection, inbreeding - in the process of creating the source material; visual - for phenological observations; laboratory - measuring and weighing for crop accounting and determination of metric plant traits; statistical and mathematical - to determine the reliability of the experimental results, indicators of variation of economic and inheritance of valuable traits.

The character of inheritance of morphological traits of seed colour and productivity elements of F1 and F2 hybrids obtained by crossing (l.471 / l.44) and (l.471 / l. 4351N/4-1-22) of winter rye was studied. Quantitative parameters of productivity elements of F1 hybrids, such as the number of productive shoots, number of flowers in an ear, number of grains in an ear, weight of grain per ear, weight of grain per plant exceeded the parental average values. High rates of phenotypic dominance indicate the inheritance of these traits by intermediate, partially dominant and superdominant types. According to the characteristics of productivity elements and colour of pigments of the kernel layer, they were divided into phenotypic classes: purple pigments localised in the shell, purple pigments localised in the aleurone layer of the kernel, white colour of the kernel (no purple pigments) in the combinations of crosses (l.471 / l.44) and (l.471 / l.4351 N/4-1-22).

Among 689 plants studied in the second generation F2 as a result of crossing l.471 / l.44, 632 plants with normal colour of the aleurone layer of the grain, 35 plants with purple and 22 plants with intermediate colour were detected, and in the combination l.471 / l.4351 N/4-1-22, 340 out of 445 plants studied had normal colour, 30 - purple and 75 had intermediate colour.

The hybridological analysis showed that the actual results obtained are the result of a hybrid cleavage that reliably corresponds to the theoretical ratio of 12: 3: 1 (χ2f = 1.15 and 1.14, respectively).

Thus, in F2, there was a quantitative advantage of plants with normal colour of the aleurone layer of the grain over plants with intermediate and purple colour. The peculiarity of hybrid splitting is the appearance of an intermediate grain colour in hybrid plants, which was not seen in the parental forms. The purple colour of the grain of the original parental lines l.44 and l.4351 N/4-1-22 was recessive in relation to the normal colour, while it was dominant in l. 471 / l. 44 against intermediate colouration, and l.4351 N/4-1-22, on the contrary, was recessive against intermediate colouration. Perhaps in this case there is an epistasis of the cross combination l.471 / l.44 in the following sequence: normal > purple > intermediate, and in the cross combination l.471 / l. 4351 N/4-1-22 normal > intermediate > purple. Thus, irrespective of the genotypes of winter rye lines included in the crossing combinations, the trait of purple seed colour showed a monogenic recessive inheritance.

Conclusions. In F2 hybrids, there was a hybrid splitting into forms with colour: purple pigments localised in the kernel shell (purple), colour of the aleurone layer of the kernel (intermediate) and normal (white), with a quantitative advantage of normal kernel colour. Regardless of the genotypes of winter rye lines included in the combinations of crosses with coloured and normal colour, the monogenic recessive nature of inheritance was revealed for the trait of purple seed colour.

Gratitude. 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 research 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, adapted to growing conditions in the Forest-Steppe zone and immune to diseases" (state registration number 0116U002191).

Keywords*: winter rye, genetic analysis, inheritance, seed colour*.

UDC: **575.22:635.64**

VARIABILITY OF BIOCHEMICAL CHARACTERISTICS IN TOMATOES

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In all countries of the world, tomatoes are not only an economically important crop, but also a valuable food product in the human diet. The excellent taste qualities of tomatoes, the relatively low price and the undeniable health benefits make them popular and in demand among the population. One of the main conditions when growing tomatoes both indoors and in unprotected open fields is the quality of the fruit.

The aim of our research was the evaluation of 8 tomato lines based on the biochemical parameters of the fruits and the selection of the most valuable genotypes for their inclusion in the breeding process for the creation of new varieties with high taste properties

An important indicator of fruit quality is their biochemical composition. Regarding the chemical composition, the studied lines demonstrate a high fruit value and quality, especially in terms of dry matter content and sugar/acidity ratio. In the case of the assortment under study, the content of dry matter falls within the value range of 6.6-9.3%, the maximum content being found in line L 302 (9.3), followed by line L 305 (8.2%).

The taste of tomatoes depends a lot on the sugar/acidity ratio. The highest content in sugars was determined in the line L 302 (5.8), L 308 (6.0), L 307 (6.6 %). From the point of view of the sugar-acidity balance, L 307, L 308 can be highlighted, where the sugar/acidity ratio was 11.7 and 12.2, respectively. Analyzes of vitamin C content show higher values in lines 302 (32.9), 305 (31.1 mg/%)

The analysis of the obtained results demonstrates that the evaluated lines differ essentially also based on the content of lycopene and carotene. The lycopene content varied between 0.45-1.83 mg/100g wet weight depending on the genotype and their color. It is necessary to mention that the highest lycopene content was recorded in the red forms. Among the lines with increased lycopene content, we can mention: L 302, L 303, L 304, L 305, L 308, which recorded values of 1.83; 1.57; 1.38; 1.50; 1.77 mg/100g wet mass, respectively. The obtained data show that the evaluated lines showed a high variability in terms of the β-carotene content, which falls within the value range of 1.01-3.08 mg/100g wet mass, the maximum content being found in the L 309 line.

By classifying the genotypes based on the evaluated characters, it was found that lines 302, Л 305 formed a cluster with the highest values of biochemical characters (dry substance - 8.7%, sugars - 5.7%, acidity - 0.70, vitamin C - 32.0 mg%), thus showing interest in the breeding process to create varieties with high taste properties.

Research was carried out within the project of the State Program 20.80009.7007.04 "Biotechnologies and genetical processes for evaluation, conservation and exploitation of agrobiodiversity", financed by the National Agency for Research and Development.

Keywords: *tomatoes, variability, quality.*

UDC: **579.22:556.55(478-25)**

DIVERSITATEA MICROMICETELOR DIN LACUL VALEA MORILOR (MUNICIPIUL CHIȘINĂU)

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Șaptezeci și unu la sută din suprafața planetei noastre este formată din apă. Apele dulci sunt ca habitat sau gazdă pentru microorganisme, aproximativ 10% din toate animalele și mai mult de 35% din toate speciile de vertebrate din lume. Deși există dovezi din ce în ce mai concludente că diversitatea fungilor de apă dulce este mare, studiul biodiversității ciupercilor de apă dulce este încă la începuturile sale**.**

Scopul cercetarilor a constat in izolarea și identificarea fungilor filamentoși care convetuiesc in lacul Valea Morilor din municipiul Chișinău.

În calitate de obiect de studiu au servit fungii filamentoși izolați din bazinul acvatic Valea Morilor, din municipiul Chișinău. Au fost izolați și studiați fungii filamentoși din apă și nămolul acestuia. Pentru izolarea fungilor filamentoși sau utilizat 5 medii agarizate, specifice pentru acest grup taxonomic de microorganisme. Mediile utilizate fiind: Czapek, malt agar, agar nutritiv, Sabourand, Raistrik.

Identificarea apartenenţei specifice a fungilor filamentoși din probele prelevate s-a realizat la microscoape optice (Lomo Mikmed – 2; B-292; Optica) utilizând determinatoarele în vigoare (Билай В.И.(ред.), 1982; Благовещенская Е.Ю. 2015; Гарибова Л. В., Лекомцева С.Н., 2005; Мюллер Э., Лёффлер В., 1995).

În urma cercetărilor a fost identificată o varietate mare de fungi filamentoși care conviețuiesc în lacul Valea Morilor. S-a constatat că, tulpinile izolate de fungi se deosebesc între ele după particularitățile morfo-culturale, deci, aparțin diferitor genuri, reprezentate de diferite specii. Astfel, au fost identificați reprezentanți ai genurilor: Penicillium, Aspergillus, Trichoderma, Alternaria, Ulocladium, Fusarium, Mucor. In proportie de 90 % predomină speciile din genul Aspergillus. Au fost studiate 15 tulpini diferite, reprezentanți ai genului Aspergillus, care aparțin diferitor specii, dintre acestea 2 tulpini – A. niger, 3 tulpini – A. fumigatus și 2 tulpuini – A. flavus, restul altor specii neidentificate.

Din genul Penicillium au fost studiate 8 tulpini ce se deosebesc după proprietățile morfo-culturale, deci aparțin diferitor specii. În rezultatul examinării la microscop au fost identificate speciile: P. verrucosum și P. corylophilum.

Din genul Trihoderma au fost izolate 2 tulpini ce se deosebesc după proprietățile morfo-culturale. Ambele tulpini aparțin speciei T. viride.

Din genul Alternaria sau depistat diferite specii, printre care și specia Alternaria alternata. De asemenea a fost indentificate tulpini din genul Mucor, Fusarium,Ulocladium intr-un număr mai mic de specii.

Conform rezultatelor obținute putem concluziona că, în lacul Valea Morilor conviețuiesc fungi filamentoși ce aparțin diferitor genuri, reprezentate de diverse specii, dar predomină fungii filamentoși din genul Penicillium și genul Aspergillus.

Cuvinte cheie: *Micromicete, lacul Valea Morilor, proprietățile morfo-culturale.*

UDC: **632.38:633.11**

IMPACT OF WHEAT DWARF VIRUS ON REDOX REACTIONS AND DEFENSE RESPONSES IN WHEAT

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Wheat dwarf virus (WDV) is one of the most harmful viruses reported on cereal crops in many countries, including Ukraine (Mishchenko et al., 2021). Yield losses can reach up to 100% (Jones 2021).The goal of our research was to investigate the impact of WDV infection on the redox reaction, biochemical protective reactions and yield in wheat.

Methods. Identification of WDV was performed by ELISA and RT-PCR in wheat plants var. Aktor, Matrix (Vinnytsia region), Koloniya, Dagmar (Khmelnytsky region), breading lines D-12-1, D-12-2 (Kyiv region) in Ukraine. Biochemical characteristics were determinated by Kjeldahl method, anthron method, spectrophotometric methods, protein electrophoresis. Data processing was performed using Prism Graph 8 (USA).

Results. It is established that the content of proteins, chlorophyll *a* and *b* of WDV-infected plants decreased by 32.2%, 74.3%, 63.1%, respectively. Content of sugars, flavonoids increased by 28.9% and 26.6% compared to healthy plants, respectively. It has been shown that WDV caused an increase of hydrogen peroxide content, intensification of lipid peroxidation processes and activation of superoxide dismutase, decrease of some antioxidant enzymes activity (catalase and ascorbate peroxidase). WDV infection caused greater peroxidase activity in varieties Koloniya, Aktor. In Dagmar infected wheat slight decrease of peroxidase activity and increase of glutathione peroxidase activity were revealed. The changes in PR proteins activity (a significant increase in β-1,3-glucanase and chitinase activity in line D-12-1; decrease in chitinase activity by 1.7 times and increased of β-1,3-glucanase activity in line D-12-2) were established. It was found that WDV significantly reduced the number of seeds per spike, the weight of seeds per spike, while weight of 1000 grains was also decreased (Mishchenko et al., 2021, 2022). The obtained results shown that WDV infection causes yield reducing and wheat variety changes in biochemical characteristics associated with the formation of plant defense mechanisms (parameters of ROS-homeostasis, activity of PR proteins). These data will contribute to developing a technique for early diagnosing plant viruses and identification of resilient varieties to viral diseases.

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Keywords: *Triticum aestivum* L., WDV, *plant defense responses.*

UDC: **632.936.1:632.78(478)**

THE PEST MONITORING OF *HELIOTHIS ARMIGERA* Hbn. THROUGH THE USE OF LIGHT TRAPS

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Family (Noctuidae) numbers 300 in the Republic of Moldova now. However, the most important species from the economic point of view are those, which have a hidden way of life, such as Cotton bollworm (Helicoverpa armigera) (Hübner,1808).

One of the solutions for ensuring food safety and improving the environment can also serve the implementation of methods for monitoring the pest's development.

The purpose of the investigations was to determine the possibilities of *H. armigera* seasonal monitoring in the agroclimatic conditions of the Republic of Moldova using light traps.

Following the seasonal collection of the biological material, it was found that for two years a rather impressive number of imagos (about 3072 specimens) of the *H. armigera* flea were attracted to the light traps.

Based on the obtained results, we mention that the population density of the given pest can deviate from year to year, depending on climatic factors. Thus, it was found that the highest population density of the flea *H. armigera* was recorded during the vegetation period of 2022 with a total number of about 2656 imagos, which was 86% higher than the number of individuals attracted by the traps with light in the year 2021.

During the vegetation period of 2022, the maximum number (1670) of imago *H. armigera*, attracted to light traps, was recorded in the third decade of August. At the same time, it was demonstrated that during the same period of 2021, a total number of only 108 imagos were recorded, attracted to light traps. The analysis of the obtained results tells us that the population density of the flea *H. armigera*, in the corresponding period of 2021, was about 15 times lower compared to 2022

Thus, the results obtained during the vegetation periods of two years allowed us to find that with the help of light traps it is possible to monitor the development of the *H. armigera* flea population, and to assess the population density.

At the same time, based on the data collected during these two years, it was found that the pest *H. armigera* develops in III generations. It was mentioned that the appearance of the first imagos in 2021 (unfavorable climatic conditions) took place starting from the first decade of June and the development of populations lasted until the second decade of September. The favorable climatic conditions of 2022 conditioned the flight of the first imagos of the *H. armigera* flea to be recorded about a month earlier - from the first decade of May and lasted until the second decade of October, also by one month more than in 2021.

The obtained results allow us to conclude that light traps can be successfully applied as a methodological element for monitoring the development of the *H. armigera* flea population and assessing the population density in the agroclimatic conditions of the Republic of Moldova.

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Keywords: *Heliothis armigera, Hbn., monitoring, population, generations, light traps.*

UDC: **575.22:633.15(497.1)**

THE INFLUENCE OF GENOTYPE ON THE GRAIN PROPERTIES OF DIFFERENT MAIZE HYBRIDS FROM SERBIA

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Together with rice and wheat, maize (*Zea mays* L.) is one of the most significant cereal crops worldwide. Dent, flint, floury, popping, and sweet maize are the five main categories of commercially available maize hybrids. Along with white, yellow, and orange, red, blue, purple, and brown are other possible grain colors. Grain quality is only of secondary value in the hybrid maize breeding process because the focus is mostly on raising the level and consistency of the yield. The genetic basis of commercial maize hybrids has significantly narrowed as a result of the hybrid breeding process itself, as well as economic factors and rivalry between breeding companies. On the market at the same time, there are often just a few closely related hybrids with comparable technological and nutrient standards.

The aim of this study was to analyze how 33 maize hybrids' physical characteristics and chemical composition were affected by genotype. The hybrids were grown in 2022 at Zemun Polje, Serbia, and evaluated in the laboratory of the Department of Food Technology and Biochemistry of the Maize Research Institute "Zemun Polje". Manual dissection of the grains revealed that the yellow dent genotype ZP 6066 had the lowest content of pericarp fraction (5.77%), the popcorn genotype ZP 611k had the highest content of pericarp fraction (10.38%), the sweet hybrid genotype ZP 504*su* had the highest content of germ fraction (16.09%), and the popcorn genotype ZP 6119k had the highest content of endosperm (84.13%). A crucial physical parameter of grain quality, the 1000-kernel weight ranged from 120.98 g (popcorn hybrid ZP 617k) to 398.13 g (yellow dent ZP 7072). The results showed that the starch, protein, oil, crude fiber, and ash contents of 33 different maize genotypes varied between intervals: from 56.79% (sweet hybrid ZP 504*su*) to 70.38% (yellow dent hybrid ZP 4123); from 10.95% (yellow dent ZP 6566) to 13.28% (ZP 504*su*); from 3.14% (yellow popcorn ZP 611k) to 7.37% (ZP 504*su*). Standard deviations of the respective chemical properties were: 2.45%, 0.62%, 0.68%, 0.31%, and 0.08%. Future breeding initiatives aimed at developing novel and enhanced genotypes of maize hybrids with higher grain quality attributes for various applications may find considerable value in our findings. It is crucial to create new breeding programs that use more focused methods to produce hybrids of maize that are meant to serve particular functions. Enabling the production of hybrids with improved nutritional and technological quality of both the starting material as well as the parental lines should receive special consideration.

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***Keywords*:** *maize hybrids, grain quality, physical properties, chemical composition*.

UDC: **631.526.4:634.22(478)**

PROPERTIES OF SOME LATE RIPENING PLUMS IN THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

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Evaluation of biological and agronomical characteristics of development of late ripening local and introduced plum varieties regarding prolongation of fruits preservation, as well as using treatment with local BAP Reglalg, calcium and microelements during vegetation.

Studied 4 varieties (Stanley and President -introduced, Udlinenaia and Super President-local ones (created at the Moldovan Institute of Fruit Trees Growing), which are grafted on Myrobalan seedling rootstock. growing in Plum National collection of Res. Inst of Horticulture, Chisinau, as well as in industrial orchards of plum producers of different Pomological Zones of Rep. of Moldova. There are utilized approved pomological and breeding methodology.

Flowering begins in the second part of April, and it lasts for 7 - 10 days, earliest-Super President, the latest -Udlinenaia. Fruit ripening extended from late August to the midle of September. Comparing the years of studies, it can be concluded, that the differences in the time of maturity for the same varieties were not big (6 -10 days). The average fruit yield for President and Stanley was 47.4-78.1, 50,9-65,4 as well as 45,0-65,0 and 57,0 60,0 kg per tree for Super President and Udlinenaia. But the last ones there are distingueshed by high eating qualities of fresh and processed fruits, being proposed for organic production. The weight and size of fruit are the most important indicators of plum fruit quality. All studied cultivars could be classified like plums with large fruit size. The weight of fruit ranged from 63.4 g (Udlinenaia) to 40,52g. The Udlinenaia and Stanley varieties contain the biggest contents of soluble dry substance - respectively 23,10%, and 18,40%. The contents of total sugars in the cultivars varied from 14.70% (Stenley) to 11,83% (Udlinenaia). Taking into account, the best features among studied varieties preliminary were found that President, Stanley, Super President and Udlinenaia varieties there are fruits, with good capacities for long time preservation into controlled conditions. It should be noticed that BAP Reglalg, calcium and microelements, two time applicated (conc. 0,5mg) during intensive development of leaves and fruits have favorable influence regarding differentiation of floral buds, pollination and fruits set, resistance to specific for plum disease and pests, as well as to the formation of weight and fruits qualities.

Studied varieties had very good properties and could be very interesting for further promotion. Actually, in the context of harmonization of the conditions of Moldovan export of fresh fruits with EU, plums, traditionally cultivated within all pomological zones, including different level of production, enlargement of late ripening varieties there is very indispensable

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Keywords: plum, late varieties, behaviour, Rep. Moldova

UDC: **581.132.1:633.11**

CHLOROPHYLL INDEX AS A CRITERION FOR ASSESSING THE DEVELOPMENT OF *TRITICUM AESTIVUM* L.

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The chlorophyll index is used to calculate the total amount of chlorophyll in plants and plays an important role in agriculture. Chlorophyll is the pigment that gives plants their green color. It plays an important role in plant life because it absorbs sunlight, which is converted into sugar and starch through the process of photosynthesis. In other words, by determining the chlorophyll index, one can track the condition of plants, which finds its application in nutrient management throughout the season. The data obtained on the basis of the vegetation index allows planning in agriculture from season to season. The correct evaluation of data is of great value for agriculture, allowing you to increase productivity and yield, and, consequently, profit. The aim of the work was to study the change in the level of the chlorophyll index depending on the phase of development of winter wheat.

The object of the study were plants of winter wheat of Moldovan (Moldova 5, Lautar) and Ukrainian (Pysanka) selection, sown on the experimental field of IGFPP with a plot area of 0.024 acre for each variant. The chlorophyll index was measured throughout the growing season using a CM-1000 chlorophyll meter.

From the moment of leaving the winter dormancy, there is a sharp increase in the accumulation of chlorophyll, up to the earing stage. This indicator can serve as a criterion for assessing crops after overwintering. From the earing stage to grain growth stage, there is a sharp decrease in the level of chlorophyll, and differences between varieties were observed at this stage of development. This stage allows you to evaluate the energy of the development of varieties. From the stage of milky ripeness to the very death of wheat plants, a gradual decrease in the chlorophyll index was observed. This stage allows you to monitor the rate of maturation of varieties.

It has been established that changes in the level of the chlorophyll index do not proceed linearly and largely depend on the genotype, the phase of development of wheat plants and climatic conditions.

Research was carried out within the project of the State Program „20.80009.7007.07" "Determining the parameters that characterize the resistance of plants with the different level of organization to the action of extreme temperatures in order to reduce the effects of climate change.", financed by the National Agency for Research and Development.

Keywords: *Triticum aestivum* L., *chlorophyll index, productivity.*

UDC: **632.112:528.632.2**

COMPARATIVE EVALUATION OF CO2 EXCHANGE IN THE LEAVES OF OAK PEDUNCULATE (*QUERCUS ROBUR* L.) UNDER THE ACTION OF DROUGHT

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The rapid climate change towards warming is largely associated with a significant emission of greenhouse gases (carbon dioxide, methane, etc.), and therefore, forest plantations began to be considered in a completely different aspect for them. Preservation or expansion of forest areas is largely seen as a way to store atmospheric carbon to balance the powerful emissions of carbon dioxide into the atmosphere. The aim of the study was to study the effect of drought on the rate of CO_2 exchange in pedunculate oak leaves.

The object of the study was oak seedlings at the age of 2 months, grown in laboratory conditions from acorns under controlled conditions. After this period, one variant continued to grow with regular watering of 70% of the MMC (control), the second variant was kept without irrigation of 15% of the MMC (experiment). Fixation of CO_2 exchange in oak leaves was carried out under illumination of 800 FAR every 30 minutes on a photosynthesis monitor RTM-48A.

It has been established that a more intense CO_2 exchange is observed in the variant with periodic irrigation, and on average 3-6 μmol CO_2 / m^2 *s higher than in the variant without irrigation, which is largely determined by the stomatal conductivity of the leaf. In the variant with periodic irrigation, the stomatal conductivity averages 1.6 mm/s versus the variant without irrigation 0.36 mm/s. Apparently, this is due to the ability of the leaf surface to more intense transpiration, due to which both a decrease in leaf temperature (on average by 0.6–1.1°C) and maintenance of stomatal turgor occur.

With a strong lack of moisture, oak plants have a low level of CO_2 metabolism, which negatively affects their depositing ability. With a low intensity of CO_2 exchange, there is a weak accumulation of spare substances, which increases the risk of serious damage under the action of extreme ambient temperatures.

Research was carried out within the project of the State Prog-ram „20.80009.7007.07” “Determining the parameters that characterize the resistance of plants with the different level of organization to the action of extreme temperatures in order to reduce the effects of climate change”, financed by the National Agency for Research and Development.

Keywords: *Quércus róbur* L., *CO_2 exchange, drought.*

UDC: **632.112:633.854.78(498)**

THE INFLUENCE OF TILLING ON WATER ACCUMULATION AND BIOMASS DEVELOPMENT OF SUNFLOWER PLANTS IN THE DROUGHT AND HOT CONDITIONS OF SOUTHEAST ROMANIA

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The sunflower is one of the most cultivated oleaginous plants worldwide, especially in Romania. The oil extracted from sunflower seeds based on the fatty acids that it contains, is a raw material in various important industries, including the food industry and the production of biofuels. Hulled seeds are a rich source of protein and other nutrients, so their inclusion in a balanced diet benefits the human body. The pressure of the food industry on the production of sunflowers is even bigger now due to the drought and heat that have manifested in recent years because of environmental pollution. In agriculture, one of the methods of reducing pollution is soil work.

The aim of this paper is to compare the amount of water stored in the plant organs and the sunflower biomass, depending on the tillage, under the influence of the abiotic factors that stress plant growth in the southeast of Romania.

Regarding the stems, the maximum humidity (59.4%) was registered in the No-till plot, and the minimum humidity (26.3%) in the scarified plot. Concerning the leaves, the maximum and minimum humidities were 59% in the No-till soil and 46.1% in Paraplow.

Keywords: *sunflower, soil tillage, biomass, drought, heat.*

UDC: **632.11: 633.854.78**

RELEASING SUNFLOWER GENOTYPES HAVING CHARACTERISTICS WHICH CONFER GOOD SUITABILITY FOR CULTIVATION IN DIFFERENT SYSTEMS FOR A DURABLE AGRICULTURE IN PRESENT SITUATION OF CLIMATE CHANGE CONDITIONS

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Sunflower (*Helianthus annuus* L.) is increasingly exposed to negative impacts of climate change, especially to drought stress, high air temperature, low temperatures in germination and emergence time, soil degradation.

There are efforts of scientists, to develop genetic tools, for improving crop performance to support both resilience to climate stresses, and local adaptation to low-input agriculture.

As climatic conditions, crop practices and cropping systems are changing rapidly, for sunflower it is requires to improve some characteristics of current varieties, also to look for new traits, to make the crop better adapted to these emerging challenges.

Some characteristics as diseases resistance have been already improved by breeders, but the others must be considered more, for adapting sunflower to new environments and cropping systems.

When compared with other field crops, sunflower has moderate water requirements, because of a deep root system, also of efficiently regulate water transpiration from leaves. However, long term water deficit can severely affect grain yield, oil content and quality and other yield traits. The maximum yield reduction is observed when drought occurs during reproductive phase.

Using wild sunflowers, a significant number of inbred lines have been created by interspecific crosses, in order to be used as gene donors for important traits. By favourable genes transferring, there have been obtained genotypes with morphological and physiological characteristics, which confer a good adaptability to some important abiotic factors, including high air temperatures, in flowering time, also high soil salinity.

For the new obtained hybrids, it has been studied their performances in different pedo-climatic environments and with different crop practices, being identified the better adapted to special zones, including new ones, as a new possibility for cultivating sunflower, with good results.

Keywords: *sunflower; interspecific crosses; new characteristics; suitability; cropping systems.*

UDC: **582.61**

MOBILIZATION AND CONSERVATION OF INTERSPECIFIC BIODIVERSITY OF THE GENUS *BUDDLEJA* L.

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The collection of the genus *Buddleja* L. includes two species: *Buddleja alternifolia* Maxim and *Buddleja davidii* Franch. with 22 ornamental non-native taxa. The new introduced taxa of *Buddleja davidii* Franch are resistant to drought, frost and pollutants, they do not require special care, only trimming to maintain the desired shape and compliance with the technology throughout the growing season. The studied shrubs possess outstanding decorative features in summer-autumn, with diverse colour of the flowers ranging from white to lilac and purple of various shades, depending on the cultivated variety, abundant flowering, high density of flowers per stalk and long inflorescences, as well as at the beginning of autumn, when the ornamental value is due to the shade of the foliage, the shape and size of the habit, the appearance of fruits, the abundance of fruiting, the long period of flowering and fruiting.

The genus *Buddleja* L. totals about 100 species and a wide diversity of cultivars, as well as hybrids, spread in the tropical and subtropical areas of Asia, America and Africa. In the NBGI, two species have been introduced: *Buddleja alternifolia* Maxim, with purple flowers smelling like honey, and *Buddleja davidii* Franch, with 22 ornamental taxa with white, lilac or purple flowers, mobilized from various European centres, which need to be researched, evaluated under the new conditions and further used as ornamental plants. The research was done in 2019-2022, in the plant introduction nursery of the Dendrology Laboratory. Most of the taxa of *Buddleja* L. possess special ornamental value due to the wide range of colours of flowers, foliage, the abundance of flowering, the length of the flowering and fruiting periods, as well as the habit and shape and size of inflorescences. The representatives of this genus are precious honey plants, decorative in summer and autumn, due to the specific foliage and showy flowers, which being strategically placed in association with other contrasting dwarf species improves the aesthetic qualities of buildings, parks or architectural ensembles. The harmonization of plants, the dynamic alternation of taxa with showy flowers and brightly coloured foliage lead to a high aesthetic value of the landscape design.

They are recommended for cultivation in all the dendrological districts of the country in pure groups or together with other species on lawns, at the edges of parks and free or trimmed hedges of different heights in landscaping.

***Acknowledgments*:** this study was supported by the research project (20.80009.7007.19 "The introduction and development of technologies for propagation and cultivation of new species of woody plants by conventional techniques and tissue culture"), funded by (NARP).

Keywords: *Buddleja* L., *taxa, flower, growth, development.*

UDC: **631.524.85:633.174(478)**

PERSPECTIVES OF MOLDOVAN SORGHUM BREEDING FOR SALT RESISTANCE

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Salinizationis a great ecological problem in the world. The supraface of them in agriculture is more 6%. Also the 20% irigation soils have secondary salinization proces. Like the whole world this problem has place in our coiuntry. There are some way for it solution. One of them is the introduction of salt rezistant cultures.

Is known, the local varieties are more adaptive for enviroment.That's why moldavian sorghum genofond is coresponded for soil-climatic conditions of Republic of Moldova, too.In Republic of Moldova The sorghum researches have been implemented in Republic of Moldovasince 1974, when the Science Research Institute of Corn and Sorghum (today Institute of Crop Plants "Porumbeni") was created.All sorghum research realized in Republic of Moldova, including the sorghum cultures breeding, had been concentrated here. The base of successful researches period was prezented by closed cycle from creation to production of seed material of this culture and the technological support of new moldovan hybrids and varieties. Unfortunately, the physiological researches of different stress conditions in this period had not realized and reflected on introduction of sorghum in Moldova in long perspective. This direction was not continuedafter the sorghum breedingtransfer to Institute of Plant Protection subordinated by Moldovan Academy of Science at 2006. That's why, after recovery at 2021the sector of sorghum cultures in ICS "Porumbeni", the physiological researches of different stress conditions have been begun. The problem of salt resistant is one from them. Thus,the study of the genetic diversity of sorghum for salt tolerance is actually.

The aim of presented research is evaluation of different local sorghum varieties, lines and hybrids on salt resistance. The research objects are 2 varieties, 4 lines and 4 hybrids moldovan sorghum breeding. The salt stres had been realizated by 0,4 N NaCl solution.For the adequate interpretation was proposed the salt resistant coefficinet (SRC), namely:the raport of germination in 0,4 N NaCl on germination in H_2O.

The results obtained indicate an ambiguous response of sorghum cultures to salt stress. This reaction îs depending on the genotype. The sorghum lines have the largest range of salt resistancevariability. The second place of it have sorghum hybrids with indicated decrease ofsalt resistance variability. The great interes has the SRC using. It gives a possibility for optimization of salt resistant evaluation of different sorghum genotypes.Thus, sorghum lines are the best initial material with large range of theirsalt resistant variability for sorghum breeding. Thus, the following conclusions should be drawn based on the obtained results:

1.The presented research indicate the need to study salt tolerance by comparative assessment of the salt tolerance variability degree of homozygous and heterozygous sorghum forms according to the dynamics of increasing the range of salt concentrations corresponding to the natural level of soil salinity.

2. The sorghum lines have thelargest range of salt resistance variability. There is the valuable fact for sorghum salt resistance breeding.

3. Sorghum heterozygous forms have limited potential of salt resistance.

4.The SRC coefficient is very useful in breeding programs for creation the salt-tolerant sorghum. This parameter allows optimizing the comparative potential of salt tolerance for different sorghum genotypes.

Keywords: *sorghum, salt resistance, lines, hybrids.*

UDC: **632.936:595.754**

TEST VARIOUS DESIGNS OF PHEROMONE TRAPS TO MONITORING THE BROWN MARMORATED STINK BUG *HALYOMORPHA HALYS* STAL

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Invasive insect species established in the new territory can cause significant environmental and economic damage both to agriculture and to society as a whole. Monitoring is a key element in the identification of invasive pests and helps professionals and farmers to make further decisions to control them. The main component in insect monitoring are traps of various designs equipped with pheromones, which play a key role in the detection of invasive species.

Among the existing hundreds of species of pentatomide stink bugs (Hemiptera, Pentatomidae) is the brown-marble stink bug *Halyomorpha halys* Stal. Its natural range includes China, Japan, and the Korean peninsula. In the areas where it is established, the pest causes significant damage to agriculture, as its range of plants includes more than 275 species.

As a rule, various traps are used against certain pests, but the final layout includes three main components: a housing; a synthetic pheromone placed in a dispenser; and a device for catching attracted insects. Each type of trap takes into account the biological features of target insect species. As a result of our research, we selected traps, the designs of which, in our opinion, could be the most suitable for the detection and attraction of the *H. halys* stink bug.

Testing of various designs of pheromone traps was carried out with the purpose of seasonal pest monitoring, as well as establishing the possibility of using these designs for catching *H. halys* stink bugs, according to common methods. Experiments were carried out in the experimental garden of the Institute of Genetics, Physiology and Plant Protection in the period from the first decade of August to the first decade of September, when the pest is gaining the maximum population before wintering. In the experiments, three traps of different designs and colors were used: funnel-shaped (yellow) and barrier-type traps (black and blue) using an aggregation pheromone.

The traps were hung on fruit crops such as plum, apple and peach, at a distance of at least 50 m. in a chess order. Records were made weekly. The pheromone dispenser was replaced once every 15 days. Prior to posting, the dispenser was stored in the freezer at a temperature of -18 C. All individuals of the brown-marble stink bug (nymphs and imago) involved in traps, for study in the laboratory and further data processing were subject to collection and accounting. Based on the results, we noted that in the fruit gardens of IGPPP the most effective proved to be the design of a black barrier trap, the effectiveness of which amounted to 60.9% of all caught insects. Only 5 *H. halys* individuals were caught in the yellow funnel trap, which accounted for 21.7% of all the bugs caught. The blue barrier trap was the least effective - 17.4%.

Acknowledgments: research was carried out within the project of the State Program 20.80009.5107.27 “Elaboration of the alternative methods based on environmentally friendly means and procedures for harmful arthropods control in different agricultural crops”, financed by the National Agency for Research and Development.

Keywords: *Halyomorpha halys, traps, insects, new species, population.*

UDC: **632.937.15:634.14**

CONTROL OF FIRE BLIGHT BY BACTERIOPHAGES IN THE QUINCE ORCHARD

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Plant pathogenic microorganisms cause serious economic damage, not only because they directly destroy crops, but also because producers spend significant outlays for effective protection against the pathogens. A possible solution for to reduce economic losses without damaging the environment and at the same time maintain high crop quality is using the natural enemies for protection against pathogens. For instance, specific bacterial viruses - bacteriophages - can be used to control bacterial diseases.

The aim of the research was to compare the effect of *Erwinia amylovora* bacteriophages in the control of fire blight with the system of protection against the bacteriosis, used in the quince orchard.

For this purpose, experimental plants were treated with the *Erwinia amylovora* bacteriophages, which we had previously isolated from plants affected by fire blight and identified by the major capsid protein based multiplex PCR assay. The concentration of phages suspension was 10^6 PFU/l. Treatments with bacteriophages were carried out during full quince blossoming, critical for fire blight infection and when any treatments with pesticides are forbidden, and in the periods with the highest risk of the pathogen development. The other trees in the orchard were treated with Copflo super SC according to the recommended application scheme. Experiments were carried out in the quince orchard in the Central part of the Republic of Moldova.

No difference was observed between the degree of fire blight attack on the quince plants in the experiment and those treated with Copflo super SC preparation at the end of the growing season. As well as no difference in the fruit quality has been noticed between the plants in the experiment and in the other orchard.

Thus, the timely application of bacteriophages kept the development of the fire blight at the same level as the chemical means of the quince orchard protection provided.

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Keywords: *fire blight, bacteriophages, Erwinia amylovora, biological control, quince.*

UDC: **632.4:633.11**

STUDY OF THE IMPACT OF STRESS FACTORS ON SOME QUANTITATIVE TRAITS OF WHEAT

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Predictions associated with the global climate change assume a considerable yield loss but also a widespread distribution of pathogens associated with the fungal agent complex in cereal agroecosystems worldwide. Thus, the indices of diversity and dominance of *Alternaria*, *Drechslera/Helminthosporium* and *Fusarium* agents show increased harmfulness in the agrocenosis of cereal crops (Lupascu, 2016). The present study was carried out to estimate the response of local wheat genotypes to the simultaneous action of biotic and abiotic stress in the early stages of growth and to use sources with a high level of adaptability in endurance improvement programs.

The investigation was done on the local winter wheat genotypes Moldova 614, Moldova 66, L M5/M./O and L M79/M5. The seeds sterilized and treated for 18 hours with culture filtrates of strains of the fungi *A. alternata*, *D. sorokiniana* and *F. solani* were subjected to 2 treatments: water (control variant) and polyethylene glycol solution (PEG 6000, 20%). *Germination parameters*, *root length* and *stem length* were investigated. The integral *seed vigor index (SVI)* was calculated.

Genotype Moldova 614 and L M79/M5 showed medium resistance, but also sensitivity in response to FC *F. solani* and *D. sorokiniana*. Whereas, on the water-restricted background, only *D. sorokiniana* metabolites produced a strong reduction in root and stem length showing an increased sensitivity of the stem. The action of *F. solani* strains 1 and 3 facilitated the maintenance of the *IVS index* on PEG 20% background, which confirmed the previous results regarding the high stability of *F. solani* fungi under drought conditions.

Genotypes Moldova 66 and L M5/MO showed medium resistance and high resistance for the investigated characters in response to most of the targeted pathogens. The simultaneous action of the stressful agents produced the reduction of germination, but the growth of the stem at the level of the control variant. The phenomenon led to the stability of the *IVS index* both in the *FC variant*, but also in the *FC x PEG* interaction variant.

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Keywords: *wheat, culture filtrates, PEG 6000, germination, root length and stem length, seed vigor index.*

UDC: **632.11:635.656**

COMPARISON OF THE LEVEL OF DEPRESSION OF PEA UNDER HEAT AND DROUGHT STRESS

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Comparison of the degree of inhibition of growth processes of pea (*Pisum sativum*) accessions which were obtained by the method of laboratory heat test (heat resistance) and by the method of germination on PEG-6000 solution (simulation of soil drought).

Germination of pea genotypes on PEG-6000 solution was carried out at a solution concentration of 8.6%, control - on distilled water. During the thermal test, a water-filled thermostat was used, the temperature regime was 50°C and the exposure time was 40 minutes. The seeds were germinated at 21°C for 6 days. Roots and shoots were then measured. For experiment 8 samples of peas were used - Camelot, Maskara, Efektnyy, Malakhit, SL 12-20, Kharkivskyy yantarnyy, SL 11-25 and Damyr 2.

According to the results of germination on PEG-6000, the lowest level of depression of the indicators "root length" and "shoot length" was found in the Camelot (+47.1%/18.7%), Mascara (+32.0%/44.4%), Kharkivskyy yantarnyy (+7.73%/+34.1%) and SL11-25 (+96.3%/11.9%) cultivars. These accessions showed root growth on the PEG-6000 solution compared to the control. Damyr 2 (50.2%/53.7%), Efektnyy (19.9%/56.2%), Malakhit (+4.4%/30.6%) and SL 12-20 (+4.7/64.8%) did not show high resistance. The level of depression indicators obtained during the thermal test was higher for Maskara variety (68.8%/75.8%) and SL 11-25 (69.4%/53.0%). The Camelot (38.2%/+31.9%) and Kharkivskyy yantarnyy (65.7%/38.9%) varieties showed high resistance to the action of the thermal test. And, on the contrary, the varieties that did not have a high level of resistance to the action of PEG-6000 turned out to be resistant to elevated temperatures - Damyr 2 (29.9%/+7.4%) and Effectnyy (47.4%/31.2%). The genotypes Malakhit (57.6%/63.5%) and SL12-20 (76.0%/84.8%) did not show high resistance to high temperatures. Variety Camelot stands out, showing a high level of resistance in both studies, both to the effect of osmotic fluid and to the conditions of the thermal test.

The calculated Spearman coefficient (rs= - 0.48, t_{fact}= 1.34 with t_{tab}= 2.44) for the rows of the matrices was insignificant. This means that the results obtained reflect completely different mechanisms of response to these stress factors.

Keywords: *Pisum sativum, PEG-6000, thermal test, depression, growth processes*.

UDC: **632.9:634.22**

BIOINSECTICIDES IN SYSTEMS FOR ORGANIC PLUM PRODUCTION

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In modern conditions, the problem of developing biological protection of fruit and berry crops on the basis of a scientifically based combination of organizational-economic, agrotechnical, mechanical, genetic, biological and other measures aimed not only at limiting the harmfulness of diseases and pests, but also at improving the health of garden agrocenoses, environment safety and cultivation of competitive horticultural products. Strategies of biological control should be based on management of the populations of harmful organisms using their natural antagonists, biologically active and biological agents in order to stabilize the ecological balance in garden.

The research was conducted in 2019-2020 in the right-bank part of the western Forest Steppe of Ukraine. The following bioinsecticides were used: Naturgard (extract of Sophora seeds), Scarado M (Bacillus thuringiensis var. thuringiensis, B. thuringiensis var. kurstaki), Sezar (Pseudomonas B-306, Streptomyces avermitilis and chitosan). Experiments were carried out in plum plantations of Institute of Horticulture on cv. 'Stanley'. The main pests were gray bud weevil (Sciaphobus squalidus Gyllenhal), black plum sawfly (Hoplocampa minuta Christ.), plum seed wasp (Eurytoma schreineri Schreiner), plum fruit moth (Grafolita funebrana Tr.), mealy plum aphid (Hyalopteus pruni Geoffr.).

Biological insecticides showed high efficiency against gray bud weevil, black plum sawfly and mealy plum aphid. The most effective against gray bud weevil was Sezar (73-86%). Scarado M and Sezar showed high level of control of black plum sawfly (73-93%). Naturgard and Scarado M were the most efficient against mealy plum aphid 75-80%. Control of other pests was lower (upto 44-62%).

So, application of bioinsecticides can provide control of the main pests of plum to a large extent. They have the potential to be used in plant protection systems when growing organic products.

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Keywords: *plum, pests, bioinsecticides, organic production*.

UDC: **582.28:634.75(477)**

MYCOFLORA OF STRAWBERRY IN FOREST-STEPPE OF UKRAINE

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Strawberry (*Fragaria ananassa* Duch.) is valuable for its high taste, nutritional, medicinal and dietary properties of the fruits. The total area of strawberry plantations in Ukraine, according to the State Statistics Service, is 8200 ha. Numerous pests and diseases cause significant damage to strawberries and yield losses. The global climate changes pose great challenges to the agriculture, leading to shifts in species compositions of disease complexes. The aim of our investigations was to determine the current state of fungal pathogen complex of strawberry in Forest-Steppe of Ukraine.

Regular observations were carried out in the Right Bank Forest-Steppe of Ukraine (Cherkassy and Kyiv region) in 2021–2023. Plant samples were collected, labeled and examined in the laboratory. Microscopy techniques were used for the assessment of symptoms detected on plant parts and for fungal sporulation. Humid chamber and agar media were used to stimulate mycelium growth and improve sporulation.

In total, fungi from 27 genera were isolated. Nine of them belong to the pathogens of leaf diseases (*Pestalotia* sp., *Diplocarpon earlianum*, *Alternaria* spp., *Septoria fragarie*, *Paraphomopsis obscurans*, *Ramularia grevilleana*, *Colletotrichum* sp., *Gnomonia comari*, *Podosphaera aphanis)*, 3 – cause damage to fruits (*Botrytis cinerea*, *Sclerotinia sclerotiorum*, *Colletotrichum* sp.), 4 are associated with diseases of roots and crown (*Fusarium* spp., *Rhizoctonia* sp., *Rhizopus* sp., *Cylindrocarpon* sp.) and 2 cause wilt (*Fusarium* spp., *Verticillium* sp.). Also *Coniella fragariae, Aspergillus spp., Penicillium spp., Cladosporium spp., Acremonium sp., Trichotecium roseum, Chaetomium sp., Mucor sp., Epicoccum nigrum, Trichoderma spp., Doratomyces* sp. were isolated. Most often, *Alternaria* spp. (isolation frequency 85%), *P.aphanis* (82%) and *Fusarium* spp. (70%) were identified. *B.cinerea* and *P.obscurans* were found in 48% of samples. Gray mold prevailed on the fruits. These fungi were present at most or all stages of development of the plants. *R.grevilleana* and *D.earlianum* were most common in the second half of vegetation period.

The seasonal monitoring of fungi on strawberry provides a means for establishing the optimal periods for their control and developing effective disease protection system.

***Acknowledgments*:** this study was supported by the research project 24.01.02.08.P "Investigation of the main strawberry diseases of fungal etiology and measures for limitation of their development", funded by National Academy of Agrarian Sciences of Ukraine.

Keywords: *strawberry, pathogens, mycoflora, isolation frequency*.

UDC: **575.113:633.854.78(477)**

DNA-IDENTIFICATION OF DOWNY MILDEW INFECTED SUNFLOWER PLANTS

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Ukraine is one of the world's leaders in production of the sunflower seeds. Increasing the cultivated areas with sunflower in Ukraine led to spreading of the multiple pathogens infection, including Downy mildew. Developing hybrids, resistant to causal pathogen of Downy mildew (*Plasmopara halstedii* (Farl.) Berl. & de Toni), is one of the critical tasks in sunflower breeding. Breeding process includes field- and lab-tests of the initial material for resistance. Molecular markers have advanced breeding practice in the past decades, however there are still unmet needs for reliable high-throughput selection of the pathogen resistant starting material and differentiation of the plants infected by different pathogens. The aim of this study was to demonstrate the possibility of usage of specific sequence of *Plasmopara halstedii* genome as DNA marker for detection of pathogen in seedlings and tissues of sunflower plant. CTAB protocol was used for DNA isolation from the sunflower seedlings, the leaves of flowering plants with chlorosis and *Plasmopara halstedii* sporangium removed from infected samples. PCR was performed with primers PHAL-F and PHAL-R. We tested the known DNA marker (310 bp fragment from ribosomal DNA of *Plasmopara halstedii*) for detection of pathogen in different tissues of sunflower plant and at different stages of plant development. To accomplish molecular testing, we collected 60 seedlings when they were lab-tested and visible sign of *Plasmopara halstedii* infection started to occur. PCR-test results coincided with standart lab-test results. Specified DNA marker was re-validated in the total DNA, isolated from sporangium as well as from seedlings of infected pathogen resistant/susceptible inbred lines of Ukrainian breeding and 60 F_2 crosses. An independent set of field grown plants with unknown resistance to *Plasmopara halstedii*, having symptoms of the bacterial/fungal/viral pathology were used for marker screening. The genotypes, infected with downy mildew, were successfully identified. Pathogen appeared to be concentrated in the vessels of sunflower leaves, in contrast to parenchymal tissue. DNA-test might be useful to control the degree of contamination of sunflower plants with Downy mildew spores in the field, especially for diagnosis of the hidden disease. Our study demonstrates that PCR-test could be an addition to the lab-test of seedlings or an independent test of mature plants, grown in the field.

Keywords: *sunflower, Plasmopara halstedii, DNA marker, pathogen detection*.

UDC: **631.528.632:633.16**

EVALUATION OF THE MORPHOLOGICAL EXPRESSION OF THE BRANCHED SPIKE MUTATION IN SPRING BARLEY SOMACLONES

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Obtaining and selecting barley forms with valuable traits distinctive from the original genotypes is important from a scientific point of view, because the genetic diversity of crop plants represents the raw material for the development of varieties adapted to variable climatic conditions.

As a result of research aimed at expanding the variability and diversity of spring barley, forms of barley with branched spike were obtained. The branched spike mutation was revealed in the offspring of somaclones (SC_1), regenerated from immature embryos taken from donor plants (cv. Unirea, two-rowed spike), irradiated with gamma rays (100 Gy). Following the analysis of the offspring of plants with a branched spike in the SC_2-SC_3 generations, the instability of this mutation was highlighted, which was expressed with a frequency of 47.1% in the SC_2 (2014) and wasn't observed in the SC_3 (2015). Subsequently, as a result of the evaluation over three years (2020-2022) of the same generation, we determined that this mutant trait was expressed phenotypically in 2020 (40-48%) and 2022 (26.19-30.28%), regardless of the generation and of spike morphology from which the grains were taken (branched or unbranched spike). As a result of estimating the frequency of the branched spike trait for 6 years, we assumed that this index varies depending on the climatic conditions, a fact also mentioned by other researchers, but without certain details.

In order to establish the expression of this mutation, the database for the genes and genetic background of barley (NordGen) were detailly analyzed. Thus, we found that the branched architecture of the spike is determined by the recessive genes *compositum (com2, com1*), which determine the identity of the spike meristem and are involved in the thermoregulation of the morphology of the barley spike. In addition, these genes are expressed when seedlings are exposed to high temperatures (20-28 ^{0}C day and 15-23 ^{0}C night) starting from the initiation of inflorescence meristems to the spike morphogenesis stages. It was concluded that the mutation frequency increases simultaneously with the temperature during this vegetation period. This fact was confirmed following the evaluation of the temperature at the spike development stage of the mutant forms in different research years depending of the expression of mutation. Therefore, the scientific and practical importance of these mutant forms is highlighted and can be involved in spike architecture improvements.

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***Keywords*:** *spring barley, somaclones, gamma ray, branched spike.*

UDC: **635.92:582.998.2(478)**

CULTIVARS OF *CHRYSANTHEMUM INDICUM* L. OBTAINED ON THE BASIS OF THE COLLECTION OF "ALEXANDRU CIUBOTARU" NBGI, MSU

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Chrysanthemum indicum L. – commonly called Indian chrysanthemum, is a small-flowered chrysanthemum of the *Asteraceae* family, one of the oldest cultivated flowering plants. The creation of the chrysanthemum collection of "Alexandru Ciubotaru" NBGI started in 1954, with the beginning of the introduction of new cultivars from other countries. The work on breeding of chrysanthemums started in 1959, in the Floriculture Laboratory, under the leadership of N. L. Sharovaya. Since then, the ecological situation has changed significantly and it has become necessary to update and enrich the collection with new local cultivars that are resistant to the conditions of urbanization. Therefore, the goal of our research was to obtain our own cultivars of chrysanthemums of high ornamental value that would thrive under the conditions of Moldova. Our breeding work has been focused on obtaining early-flowering cultivars with low, compact, abundantly flowering bushes and with tall and vigorous shoots, on which numerous highly decorative inflorescences are formed. In our research, we used free cross-pollination of various groups of parent cultivars. As a result, mature seeds were obtained, from which 2000 seedlings with various characteristics and properties were subsequently grown, which made it possible to carry out interesting selections. Based on the results of studies that were carried out on the site for the State Variety Testing, during several years, the most promising breeding forms for obtaining cultivars were selected. The cultivars were tested according to the methods indicated by The International Union for the Protection of New Varieties of Plants, updated and adapted for use under our conditions. Thus, in 2016, certificates were obtained for the cultivar 'ZEFIR', and in 2017, the cultivar 'FĂCLIA', in 2019, the cultivar 'CAPITOLINA', in 2021, testing of the cultivar 'GINGĂȘIE', which were obtained on the basis of our collection. Our studies have shown that the most diverse and viable offspring of chrysanthemums is obtained by involving free cross-pollination of parental varieties. If their combination is successful, the offspring is obtained, being characterized by great diversity of shape and colour of inflorescences, height and habit of the bush, foliage and even flowering periods. The new local cultivars are highly decorative, resistant to diseases and pests, as well as adverse conditions, can be recommended for wide use in landscaping, container culture, as cut flowers.

The research was conducted in the framework of the project 20.8009.7007.14 "Research on the mobilization of the diversity of plants with ornamental potential for *ex situ* conservation".

Keywords: *Chrysanthemum, selection, parent pair, cultivar, selection.*

UDC: **599.742.75**

LYNX ISSIODORENSIS (FELIDAE, CARNIVORA) FROM THE EARLY PLIOCENE LOCALITY PRIOZERNOE IN THE DNIESTER VALLEY

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Remains of representatives of Carnivora in alluvial taphocenoses are quite rare. About 28 specimens of bone remains are known from the Priozernoe locality, some of which were attributed to the family Felidae to the genus *Lynx*. The large Issoire lynx, *Lynx issiodorensis* (Croizet et Jobert) was quite widespread in Europe from the Early Pliocene to the Early Pleistocene (Kurtén, 1978; Montoya et al, 2001).

One fragment of the left part of the mandible with a preserved premolar p4 sin (ex. no. Prz 10-12/2) was assigned to this species. The crown of the tooth is not worn. The height of the crown is 12.1 mm, the length is 14.7 mm, the greatest width is 7.3 mm. The tooth p4 is very large, most similar to *L. issiodorensis* (ex. no. TB-5) from the Lower Villafranchian of Greece, Tourkobounia locality (Symeonidis & De Vos, 1977), and corresponds to the maximum size of this tooth in a sample from Les Étouaires locality in France (Kurtén, 1978, tab. 4).

Two ulnae (ex. nos. Prz 10-12/3, 4), represented by proximal parts of varying degrees of preservation, and one first phalanx with partially damaged distal surface (ex. no. Prz 10-12/5) were also assigned to the genus *Lynx*. The fragmentary nature of the remains and the absence of comparative material allowed us to identify these specimens only to the genus *Lynx* sp.

The conducted studies showed that representatives of the genus *Lynx* in the association of the fauna of carnivorous mammals from the Priozernoe deposit were quite numerous, their share being more than 14%.

Acknowledgments: the author thanks the leading researcher of the Zoological Institute of the Russian Academy of Sciences, Doctor of Biological Sciences Baryshnikov G. F. for help in identifying the presented materials.

This study was supported by the research project no. 20.80009.7007.02 “Evolutionary changes of economically important terrestrial fauna, of rare and protected species in the conditions of anthropogenic and climatic changes”, 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: *Felidae, Lynx isseodorensis, Early Pliocene, Dniester valley, Priozernoe.*

UDC: **577.152.193:582.61**

SEASONAL ACTIVITY OF CATALASE IN THE LEAVES OF *BUXUS SEMPERVIRENS* L.

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Perennial plants, including *Buxus sempervirens* L., have evolved a range of adaptive mechanisms to cope with unfavorable environmental conditions during their growing season. These mechanisms involve a variety of physiological and biochemical processes that enable the plant to maintain its viability despite the adverse conditions. One such mechanism involves the regulation of the activity of certain enzymes, including catalase. Catalase is an antioxidant enzyme that plays a critical role in protecting the plant from the harmful effects of reactive oxygen species (ROS) generated by various stress factors. The purpose of these studies was to determine the activity of catalase in the leaves of boxwood depending on the growing season and temperature regime.

The leaves of boxwood from the first and second year of vegetation, collected in February, May, August, and November, were studied. Catalase activity was determined using a YSI 5300A laboratory dissolved oxygen analyzer. The leaves were homogenized in 2 ml of 0.2 M Tris buffer at pH 7.4 and centrifuged for 15 minutes at 4000 rpm. The activity of H_2O_2 decomposition, influenced by extracts from the leaves, was calculated per 1 mg of protein, determined according to the method.

It has been found that the activity of catalase varies depending on the season and different years of leaf development. The highest enzyme activity (from 1.25×10^{-2} to 2.5×10^{-2} U/mg fresh weight) is observed in the leaves of the first year of vegetation. Increased enzyme activity was noted in autumn and spring (from 2.0×10^{-2} to 2.5×10^{-2} U/mg fresh weight), which is responsible for the processes associated with plant preparation for winter dormancy and exit from it. The data obtained indicate that the change in temperature conditions significantly affects the course of physiological and biochemical processes, and, above all, the change in catalase enzyme activity, which almost halves in boxwood leaves during winter. This indicates that plants undergo corresponding physiological reorganization of tissues with an increase in their resistance to winter conditions during their preparation for winter, and that the transition of plants from active vegetation to winter dormancy is accompanied by a slowdown in enzymatic processes activity.

In conclusion, catalase activity in boxwood leaves is affected by the growing season and temperature. The leaves of the first year of vegetation exhibit the highest catalase activity, which increases during autumn and spring. These results provide insight into the resistance mechanisms developed by plants to maintain their physiological and biochemical processes necessary for survival in adverse environmental conditions.

Keywords: *Buxus sempervirens L., catalase, oximetry.*

UDC: **632.9:633.854.78(510)**

UNRAVEL BIOLOGICAL MECHANISM UNDER DECREASING DISEASE SEVERITY OF SUNFLOWER VERTICILLIUM WILT VIA DELAYING SOWING DATE

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Verticillium Wilt (VW) caused by *Verticillium dahliae* Kleb. is a serious disease in sunflower production in China. Integrated control of VW is rather difficult due to *V. dahliae* is a soilbrone pathogen. However, we found delaying the sowing date can reduce the occurrence of diseases based on data obtained from several locations in different years. However, the biological mechanism under this agronomy technique is still elusive.

The preliminary data indicated that the number of micorosclerotia detected by both Q-PCR and NP-10 selection medium decreased with delaying sowing date. Meanwhile, the total amount of biomass of *V. dahliae* colonized inside the sunflower roots reduced correspondingly. The results of high-throughput sequencing of soil samples collected from different sowing date indicated that the abundance of bacteria genus, such as *Pseudomonas*, *Azoarcus*, *Bacillus*, etc in the rhizosphere soil samples increased after delaying sowing date, predicting that the shift of the composition of microbial diversity at different sowing dates do affect the colonization ability of *V. dahliae* in the rhizosphere of sunflower. Also, the physical and chemical properties of soil at different sowing dates were also detected with Handheld soil rapid testing platform (JXBS-3001-SCPT-SC Ver 1.0) the most significant differences were observed in soil temperature and humidity. Therefore, more experiments need to be performed to unravel the effectivess of the variatation of soil temprature in different sowing date on changing of the microorganism population in rhizosphere soil and also on sunflower resistance aganist infection of *V. dahliae*.

Keywords: *Verticillium Wilt; Delaying Sowing Date; Reduced Disease Severity*.

Session B

PLANT, ANIMAL AND MICROBIAL BIOTECHNOLOGY

UDC: **631.81**

INFLUENCE OF SOIL FERTILIZATION ON THE TYPICAL CHERNOZEM MICROBIOME

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The aim of the work was to study the microbiome of the typical chernozem depending on the type of fertilization (post action). The research was carried out in the long-term field experiment on the "Biotron" Experimental Station of the Academy of Sciences of Moldova in two crop rotations (with and without alfalfa). Characterization of the compositional diversity of the soil microbiome was achieved by sequencing amplicons targeting the 16s rDNA gene of prokaryotes (Scientific Center "Genomic Technologies, Proteomics and Cell Biology" of FSBSI ARRIAM, St. Petersburg, Russia).

Soil fertilization used in agriculture has an important impact on soil and plant microbiomes. Chemical fertilization pollutes the environment and unbalances the soil microbiome. Long-term organic amendments contribute to a stronger functional potential and more interactions within soil microorganisms' communities than chemical fertilization, lead to a significant decrease in the relative abundance of fungal plant pathogens.

The microbiome of the organically fertilized soil contained microorganisms from 17 phyla, while that with mineral fertilization contained only 16 phyla. Representatives of the phylum Halobacteriota (Archaea) were detected only in the organically fertilized soil. The Shannon diversity index was higher for the organically fertilized soil microbiome. Genus richness in the alfalfa rotation as a function of fertilization was 83 genera in the mineral fertilization variant and 89 genera in the organic fertilization variant. In the rotation without alfalfa the richness of genera was lower, 50 and 64 genera, respectively. Soils with different types of fertilization were also characterized by certain specific genera. In the alfalfa rotation, the soil microbiome contained 18 specific genera in the variant with mineral fertilization and 22 in the variant with mineral fertilization. In the rotation without alfalfa, 18 genera were specific to the variant with mineral fertilization, and 20 to the variant with organic fertilization. Most of the genera specific to the fertilization variants differ in the 2 rotations. The specific genres, common to both crop rotations are the following: variant mineral fertilization: *Micrococcus (Actinobacteriota)*, *Fusobacterium (Fusobacteriota)* and variant organic fertilization: *Nonomuraea*, unclassified_*Thermoleophilia (Actinobacteriota)*; *Alloiococcus, Paenibacillus (Firmicutes)*. Mineral and organic fertilization leads to a significant increase in the abundance of some bacteria with copiotrophic nutrition strategies and a decrease in the abundance of oligotrophic ones.

Acknowledgments: the work was carried out within the project 20.80009.5107 «Efficiency of the use of soil resources and microbial diversity by applying the elements of biological (organic) agriculture», funded by NARD (ANCD)

Keywords: *soil microbiome, fertilization, microbiome diversity, genera richness.*

UDC: **638.145.54**

THE PROSPECTS FOR ARTIFICIAL INSEMINATION OF QUEEN BEES

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Honey bees are an important element of the ecological system. They account for 80-90% of pollinated entomophilous plants.

Artificial insemination of queen bees is one of the first and most developed biotechnological methods in beekeeping, without which genetic studies of honey bees are impossible. Artificial insemination of queen bees with the sperm of specially selected drones is a reliable way to control the transfer of genetic information to offspring, which is necessary in breeding work.

For artificial insemination of queen bees, high-quality sperm with high sperm concentration and motility is used. Indicators of motility and the number of live spermatozoa are not a sufficiently reliable criterion for assessing the quality of sperm, since they do not always correlate with the fertilizing ability of spermatozoa. An important indicator is the absolute survival of spermatozoa, expressed in hours. Since the period of sperm migration from the oviducts to the seed receptacle after artificial insemination is 24-48 hours. In addition, the result of artificial insemination depends on the fertilizing ability of spermatozoa and their concentration in the seminal receptacle of inseminated queens.

In general, the use of artificial insemination in the practice of beekeeping allows you to get the following number of significant advantages: no need to fly around queens; at the stage of insemination, it is sufficient to use micronuclei, the formation of which takes 8–10 times less bees; insemination is carried out regardless of the weather at the optimum time; loss of queens during overflights is excluded; a full guarantee of the reproduction of queens with a certain heredity is provided; it is possible to obtain hybrid bees of the 1st generation, characterized by increased productive qualities; the use of artificial insemination makes it possible to reduce to zero the probability of unsystematic cross-breeding of bees in apiaries, as well as to reduce the level of cross-breeding in all apiaries where it is used; it is possible to control the quality of drones and the amount of sperm injected into the genital tract of the uterus, which is especially important when varroatosis is widespread.

The main value of artificially inseminated queens lies in the fact that they guarantee purebredness, lineage, and successful selection work.

The use of artificial insemination will make it possible to create zoned breeds of bees and widely use promising options for industrial crossing.

Keywords: *queen bee, drone sperm, artificial insemination.*

UDC: **636.2.084-053.6:619**

INFLUENCE OF TEMPERATURE AND FOOD FACTOR ON SALINE METABOLISM IN CATTLE

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Calves in the period of postnatal ontogenesis are largely exposed to the influence of the external environment and animal husbandry technologies. Environmental factors act on the organism in most cases conjugate and the effect of the action depends on their nature and intensity. More than that, the effects that appear after their separate or conjugate action are different and are manifested by the depth of changes in various physiological processes, which condition the development and growth of the organism. Depending on the degree of exposure to environmental conditions, the organism of newborn calves responds to the action of these factors either through adaptation reactions or through non-adaptation reactions. Researches performed on animals in the first months of life showed that during this period a large number of diseases and functional disorders of the organism are registered. Some researchers state that in the first months after birth, 2/3 of calf deaths are caused by gastrointestinal tact disorders. The main cause of these disorders is the functional immaturity of the calves, which is determined by the lack of balanced fodder and the influence of technological factors on weaned cows, as well as on calves in the first days of life. The results of the biochemical research of the calves' blood show that a considerable number of macro- and microelements are below the recommended norms or at their lower limits. It is obvious that this state strains the systems, which ensure the internal homeostasis of the organism, leads to overload, dysfunction of some systems and the appearance of various ailments (Lorenz et al., 2011). In this case the basic food ration of the calves does not ensure the normal state of homeostasis and can be classified as a moderate stressor. As a result, functional disorders and conditions appear, the correction of which requires the development of procedures that would normalize homeostasis. The study of the action of environmental factors is of particular interest for determining the parameters that can be used as a way of increasing the resistance and adaptive capacities of the animal organism to the unfavorable action of the environment. Thus, following the evaluation of the action of the studied factors, applied either separately or conjugately, on the body of the calves in the postnatal ontogenesis, it is possible to conclude that they ensure a more optimal oscillatory blood level of calcium, phosphorus, potassium, sodium and magnesium. The changing character of the level of these elements in the blood plasma of experimental animals reflects not only their quantity, which arrives in the body through the food ration, but also the peculiarities of mineral metabolism.

Keywords: *calves, food factor, temperature, macroelements.*

UDC: **591.1:636.588**

THE INFLUENCE OF POLYPHENOLS ON THE FERMENTAL ANTIOXIDANT STATUS IN THE BLOOD SERUM OF COCKS

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This study aimed to determine the influence of dandelion polyphenols on the fermentative antioxidant status in the blood serum of breeding roosters, the animals were administered 1 ml of hydro-alcoholic extract for 30 days, with a total polyphenol content of 0.027mg/ml equivalent of gallic acid. For this study, two groups were created: control and experimental, which included 10 animals in each group. As a result of the research we obtained the following values for the control group 110.93±0.30 u/c and for the experimental group 127.5±0.4 u/c, obtaining an increase in superoxide dismutase of approximately 13%, which proves to us that dandelion polyphenols have a stimulating influence on this fermentative index of the antioxidant system.

Another link in the antioxidant protection against ROS are the enzymes that inactivate H2O2: catalase and peroxidase. In these studies, values of catalase were obtained for the control group 26.23±0.37 μM/L and correspondingly for the experimental group 29.2±0.82 μM/L, obtaining a difference of approximately 10%.

Among the glutathione-dependent enzymes, glutamyltranspeptidase (GTP), and glutathione-S-transferase modifications were investigated. Glutathione is an important regulator of intracellular metabolism. Among the endogenous antioxidants, glutathione is the most important, and in the enzyme system that transforms glutathione, it includes glutathione peroxidase, glutathione-S-transferase, and glutathione reductase. In the conducted research, the following values of GTP were obtained, for the control group 9.33±0.40 u/L, and for the experimental group 10.8±0.66 u/L, which demonstrates an increase in the value of the experimental group by approximately 14%. For glutathione-S-transferase, the value of the control group is 19.21±0.38 nM/sL, and for the experimental group a value of 30.41±0.52 nM/sL was obtained, which constitutes an increase in this index of 36%.

Finally, we can conclude that the extract of polyphenols from the dandelion has a stimulating effect on the indices of the fermentative antioxidant system, which in turn influences the physiological and biochemical indices of the organism of breeding roosters through mechanisms of detoxification, regeneration, and maintenance of homeostasis which is very important for the protection from the influence of stressors and other external and internal factors that have a negative influence on the organism.

Keywords: *antioxidants, free radicals, glutathione, catalase, superoxide dismutase.*

UDC: **616.623:616.98:579.873.2(478)″2020″**

PREVALENCE OF MICROBIAL INFECTIONS DETECTED IN THE URINE EXAMINATION IN PATIENTS IN THE AREA OF MOLDOVA IN 2020

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Urinary infections localized in any of the segments of the urinary system, from the urethra to the bladder are among the most widespread bacterial infections. They can occur in various causal situations, from an early age to old age. Following the centralization and analysis of the data, it was found that in 2020, the bacteria that produced bacterial infections identified at an analysis laboratory in the area of Moldova are: E coli in a proportion of 69%, Klebsiella spp. 9%, Proteus spp. 3% followed in a small percentage by: Enterobacter spp., Enterococcus spp., Staphylococcus spp., Citrobacter sp., etc. The method of diagnosis of bacterial infections was uroculture on selective media, supplemented with the performance of the antibiogram as appropriate.

Keywords*: urinary apparatus, microbial infection, selective media, antibiogram, prevalence*

UDC: **633.16:631.527:575**

PECULIARITIES OF ANTHER CULTURE IN VITRO APPLICATION IN BARLEY SPECIAL BREEDING PROGRAMS

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The ability to produce haploids in anther culture *in vitro* is a genetically determined and heritable trait. High performances in direct embryogenesis and plant regeneration are considered to be unique characters of certain genotypes. At the same time low androgenetic response of most hybrids, strongly restricts DH-line production. Besides of technique improvement, significant increase in the efficiency of haploid production may be reached by the involvement of highly responsive varieties and lines into hybridization. The investigation was aimed to test spring barley varieties and lines for response to haploid production in anther culture *in vitro* in order to find the most valuable genotypes combining high culture ability with important agronomic traits.

More than 100 spring barley genotypes were screened for reaction to cultivation of anthers in vitro. Among them there were varieties possessing hulless grain, waxy endosperm, awnless spikes, high protein content as well as resistance to loose smut and to covered smut. Cut tillers or isolated spikes were subjected to cold pretreatment at 4ºC in the dark for 5 days or 28 days respectively. Anthers were inoculated onto the inductive media containing N6 macro-, MS micronutrients, organic supplements (vitamins, amino acids), 2.0 mg/l 2,4-D 0.5 mg/l BAP, maltose (9.0%) and solidifying with agar or chemically modified starches.

Tested varieties responded in a different way however none of them exceeded model genotype DH00-126 (up to 145 green plants per 100 cultivated anthers). Most of genotypes had low androgenetic ability. The high percentages of morphogenic anthers were revealed in awnless variety Modern (47.00 %), in varieties Revansh (51.5 %), Signal (47.2 %), Rosalina (32.05 %) resistant to covered smut as well as in varieties Velikan (49.0 %), Yavir (31.2 %) possessed high protein content. Variety Tula was the most responsive among hulless varieties (47.3 %). None of varieties with waxy endosperm was highly responsive. The highest yield of green plants was obtained in varieties Modern and Revansh (71 and 49 plants per 100 anthers respectively). In the rest varieties above mentioned, green plant yields ranged from 6.4 to 21.4 plants per 100 anthers. All highly responsive varieties gave good results in crosses. At least one of the parents needs to be highly responsive because of dominant (more or less) inheritance of this trait.

Highly responsive to androgenesis *in vitro* genotypes suitable for use in the special breeding programs (high protein content, resistance to smut diseases etc.) were selected among varieties with different valuable agronomic traits. A spring barley collection of genotypes related to their diversity for androgenesis in vitro abilities was created.

Keywords: *spring barley, Hordeum vulgare L., anther culture in vitro, doubled haploid, response to androgenesis in vitro.*

UDC: **637.146**

BIOTECHNOLOGICAL POTENTIAL OF LACTIC ACID BACTERIA PRESERVED IN NATIONAL COLLECTION OF NONPATHOGENIC MICROORGANISMS

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Microbial collections are biologically valuable resources of different microorganisms for research and practical application. The National Collection of Nonpathogenic Microorganisms (NCNM) is a Republican research, information and coordination Institution that deals with the authentic preservation of valuable non-pathogenic microorganisms and their research and practical applications. NCNM includes representatives of *Lactococcus*, *Streptococcus*, *Lactobacillus* lactic acid bacteria isolated from naturally fermented homemade dairy products. These bacteria are used as starter cultures, obtained fermented products have better taste, flavor, texture, also contained beneficial microorganisms in abundance, extending shelf-life and enhancing the safety.

The aim of this study was to review of lactic acid bacteria from NCNM and their potential for industrial applications.

Strains were isolated from sample of different dairy products of spontaneous fermentation and are destined for the production of sour cream, fresh cheese, yoghurt, soy milk, brined cheese. *Lactococcus lactis ssp. lactis* are destinated for application as active acidifier for starter cultures. *Lactococcus lactis ssp. lactis bv. diacetylactis* contribute to flavor and aroma due to the production of diacetyl (specific to Camembert, Cheddar, Emmental cheeses). *Streptococcus thermophilus* is lactic-acid probiotic combined with the *Lactobacillus bulgaricus* for yogurt obtaining, flavour and texture, produce exopolysaccharides. *Lactococcus lactis ssp. cremoris* strains used to prevent active acid formation in manufacture of cream, sour milk, fresh cheese.

The viability of freeze-drying lactic acid bacteria periodically are investigated using classical microbiological, biochemical, physico-chemical methods. Technological features of strains are compared with the initial ones according to the strain passport. Lactic acid bacteria strains deposited in NCNM have biotechnological potential due to acidification and coagulation capacity and can be used for manufacturing fermented foods.

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Keywords: *collection, biotechnology, lactic acid bacteria*.

UDC: **582.32:574.52(478+479.22)**

FIRST STEPS IN EVALUATING THE ROLE OF WIND-BLOWN DUST IN MOSS BIOMONITORING

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An important task of environmental protection is to monitor the composition of atmospheric precipitation, since potentially toxic elements are quite stable and can adversely affect human health. Low cost and applicability of the moss biomonitoring method for studying the deposition of trace elements over large areas is an adequate alternative to traditional monitoring methods, but there is a need to evaluate the role of wind-blown dust and/or soil pollution in areas dominated by mineral soils. This problem is common for both countries, the Republic of Moldova and Georgia.

In order to investigate the influence of the local geochemistry on the spatial integration of trace elements in biomonitors, as well as to determine the effectiveness of the biomonitoring method in the assessment of the quality of atmospheric air in areas with different physical and geographical conditions, moss samples were collected in the agricultural and mountainous regions of Georgia. *Hypnum cupressiforme* was chosen as the biomonitor species for this study, as it was already used in the 2020 moss survey conducted in the Republic of Moldova.

All samples were cleaned from extraneous impurities, and only green part of the moss was used for analysis. Concentrations of 15 elements, including As, Al, Ba, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, S, Sr, V, and Zn were determined by the inductively coupled plasma atomic emission spectroscopy (ICP-AES), and the Hg concentration was determined using direct mercury analyzer (DMA-80 Milestone).

To reveal any associations of chemical elements and characterize the sources of elements detected in the samples, multivariate statistics was applied. The results were compared with the 2020 moss survey conducted in the Republic of Moldova.

The obtained results might be useful for biomonitoring studies in areas with different physical and geographical conditions.

Keywords: *moss biomonitoring, Air pollution, Trace elements, ICP-AES, DMA-80.*

UDC: **599.742.1:619:616.9-022.39(478)**

TRANSMISSIBLE PARASITIC ZOONOSES OF THE SPECIES *Vulpes vulpes* (Linnaeus, 1758)

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The canids pollute the environment with parasitic forms, therefore they represent a major danger to human health and to the environment. The evaluation of the population of *Vulpes vulpes* (Linnaeus, 1758) in the Republic of Moldova according to the number of populated burrows in the spring period indicates an increased density of foxes of about 7-8 times. The purpose of this paper is revealing the role of foxes in the transmission of parasitic species in the zoonotic and epizootic chain in natural and anthropogenic ecosystems of the Republic of Moldova.

Parasitological investigations were performed according to the methods of *Popova, Baermann, Fuileborn, Darling* and successive washing in the laboratory of Parasitology and Helminthology of the Institute of Zoology of SUM.

In taxonomic aspect the parasite species identified in fox belong to 5 classes, 10 families, 11 genera and 12 species, while the infestation level was of 100%. The nosological characteristic of helminthoses includes 4 categories: Sporozoosis (isosporosis – 14.3%), Trematodosis (alariosis – 51.0%), Cestodosis (mezocestoidosis – 21.7%, teniosis – 27.0%), Nematodosis (syphaciosis – 20.0%, strongyloidiasis – 15.0%, toxocarosis – 59.0%, toxascariosis – 65,5%, anquilostomosis – 8.7%, trichurosis – 30.5%, capillariosis – 35.0%). The epidemiological features includes 3 categories of parasitic species. The category of parasitos is with zoonotic impact (parasitozoonosis) includes 10 species (*A. alata, M. lineatus, Taeniaspp., S. obvelata, S. ratti, T. canis, T. leonina, A. caninum*), with mixt impact (zoonotic+episootic) 3 species (*H. taeniaformis larvae, M. lineatus larvae, C. hepatica*), and in the category of invasions particular to rodents are 7 species (*P. omphaloides, C. cricetorum, S. lobata, R. straminea, H. polygirus, M. muris, T. muris*).

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Keywords: *Vulpes vulpes, zoonoses, helminthoses.*

UDC: **577.152.311**

METHOD FOR FUNGAL LIPASES PRODUCTION IN LAB-SCALE FERMENTER

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Fungal lipases are preferred for the application in different industries due to the fact that they are mainly extracellular enzymes, which could be easily extracted from culture filtrate, their activity and stability in a wide range of pH and temperature. Actually, reactions catalyzed by lipases represented approximately 20% of the performed biotransformations. One of the major concerns of the current researches consists in the development of new technologies to intensify the synthesis of enzymes and their transfer from the submerged fermentations in shake flask level to the production scale. It is known the role of coordination compounds of transition metals as stimulators of the synthesis of biological active substances in microorganisms.

The object of the present investigation was the fungal strain *Rhizopus arrhizus* CNMN FD 03 - producer of exocellular lipases. Based on the previously obtained results, the compound $[Ca(L)_3][Co(SCN)_4]$, where L_3 – represents the dimethyl ester of 2,6-acid pyridinedicarboxylic, was used as a potential stimulator of the lipolytic activity. Lipases production under submerged fermentation condition was carried out during 2 days in 500 mL Erlenmeyer flasks by taking 100 mL of optimized nutritive medium including the metalocomplex in a concentration of 5.0-20.0 mg/l. It was found that the optimal concentration ensuring the maximum increase (78.4% compared to the control without stimulator) of the lipolytic activity and the shortening of the technological cycle with 24 h is 10 mg/l.

Fermenter studies were carried out in BIOSTATR A plus Sartorius fermenter. The fermentation medium was the same with shake flask culture. Two series of experiments were set up, with the setting of the main technological parameters (aeration, agitation) as follow: volume of nutrient medium - 2 L, stirring - 100 and 180 rpm, volume of forced aeration - 2 L /L medium / min. In the first experimental variant, the enzyme activity was 15458 U/mL on the 1st day of cultivation and 35875 U/mL on the 2nd day, being by 30.3% higher than the maximum of control revealed in 2nd day. The enzymatic activity (65625.0 u/mL) at 1^{st} day was by 117.2% higher compared to the upper level of the control when the stirring speed was increased to 180 rpm. So, the superiority of accumulation of lipases compared to classical cultivation (without stimulator) is preserved even under pilot station conditions.

Acknowledgments: this study was supported by the research project 20.80009.5007.28 with funding from ANCD. The coordinating compounds were synthesized and offered for investigations, according to the project's objectives, by the partner team from the Institute of Chemistry, MSU, coordinated by dr. hab. Bulhac Ion (project manager).

Keywords: *fungi, lipases, coordination compounds, production scale.*

UDC: **582.263:544.142.3:546.431**

THE INFLUENCE OF THE COORDINATING COMPOUND WITH BARIUM ON THE PRODUCTIVITY OF THE MICROALGAE CHLORELLA VULGARIS BEIJER

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Summary: The article presents the results of research aimed at evaluating the productivity of the microalgae *Chlorella vulgaris* Beijer., grown on modified nutrient media and supplemented with a coordination compound containing barium. It was found that increased concentrations of this compound have an inhibitory action on the *Chlorella* strain. A stimulatory effect was registered when the concentrations of 50 mg/L, 10 mg/L, 5 mg/L and 1 mg/L of the tested coordination compound were administered, where the biomass obtained was higher by 6,8%, 24,54%, 13,06% and 0,90%in relation to the witness.

The inoculum was obtained from the *Chlorella vulgaris* culture in the middle of the exponential growth phase and separated from the borscht nutrient medium by filtration. The amount of inoculum was 0.625 g/L Fresh biomass Erlenmeyer balloons inoculated with chlorophyte *Chlorella* were placed on special stelae at an artificial illumination of about 4000 lx and temperature of 24oC.

After 8 days of action of the coordinating compound chlorella vulgaris strain was subjected to the study. Statistical processing of the obtained data was carried out using the computer program "STATISTICA 7", the standard error of the average was also determined. The productivity of the microalgae strain was determined according to the methodology in force .

***Acknowledgments*:** the study was carried out within the framework of the scientific research project "elaboration of new multifunctional materials and efficient technologies for agriculture, medicine, technology and educational system based on metal complexes "s" and "d" with polydentate ligands", included in the "state program" (2020-2023), priority V: economic competitiveness and innovative technologies, cipher 20.80009.5007.28, with the financial support provided by ANCD.

Keywords: *Chlorella vulgaris, Ba(II), biomass, biostimulator, cultivation*

UDC: **631.847:633.34**

THE RIZOLIC BIOLOGICAL PREPARATION AS MEANS OF INCREASING QUANTITY AND QUALITY OF SOYBEAN YIELDS

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The last decades of the 20th century were largely focused onlooking for optimal ways of stimulating the world economic development.To achieve that several new concepts were adopted. Among others, the concept of sustainable development was emphasized because of the increasingly precarious state of the environment andrapid population growth. According to the Report of the World Commission on Environment and Development "Our Common Future", there are five spheres that will attract a lot of attention within the nearest 30 years: water and sanitation,energy, health, agriculture, and biodiversity.

Within the spheres of agriculture and soil biodiversity, one of theways to ensure sustainable development and to maintain soil productivity would be via substituting the chemical preparations with the biological ones. This implies isolation, selection, and introduction into soil of microorganisms that can increase soil fertility and, through that, the productivity and quality of crops. A good example here is the use of symbiotic microorganisms (rhizobia) for stimulating such leguminous plants as soybean, which are grown for obtaining plant proteins as well as for solving problems in the fields of energetics and environmental protection.

The symbiosis of the leguminous plants with rhizobia serves asa source of the biologically fixed nitrogenin soil, that is much more effective than the mineral nitrogen fertilizers. The biologically fixed nitrogen is safer for the human health and the environment, being at the same time relatively cheaper.

The purpose of this work was to test under field conditions the efficiency of the Rizolic biopreparation, containing the strain *Rhizobium japonicum* RD2, forthree new varieties of soybean plants –Aura, Indra, and Enigma. According to the obtained results, the seed bacterization by Rizolic had mostly positive impactson the tested soybean varieties. The highest soybean yield was observed forthe bacterized Enigma and Indra varieties (1430 and 1370 kg/ha respectively). The highest stimulation of the soybean yield was in the Indra case (+210 kg/ha as compared to the control without bacterization). The highest protein content was in the cases with thebacterized Indra and Aura varieties(39,3% and 39,5%respectively). Aura was the only variety of soybean plants thathad a mixed reaction to the bacterization with *Rhizobium japonicum* RD2 – the protein content was 2,3% higher and the bean yield was 120 kg/ha lower (reaching the total amount of 1120 kg/ha) than the ones in the control without bacterization.

Our conclusion was that the Rizolic biopreparation can be successfully used for stimulating the productivity and the quality of soybean yields. The best results can be obtained for the Indra variety.

Keywords: *Rhizobium japonicum, rizolic biological preparation, soybean yields.*

UDC: **636.92.082.453.5**

THE USE OF ARTIFICIAL INSEMINATION IN INDUSTRIAL RABBIT BREEDING

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Meat rabbit breeding is one of the promising branches of animal husbandry, which breeds the most early-ripening animals, produces meat and other products using low costs of feed, labor and funds. Rabbits have great reproductive and productive potential. They are distinguished by high precocity, fertility, intensity of growth of young animals and, with a short pregnancy.

One of the methods to improve the reproductive qualities of rabbits is artificial insemination. Until now, the method of artificial insemination has not yet found wide application in the practice of rabbit breeding. At present, due to the intensive development of rabbit breeding and the construction of large rabbit breeding enterprises, the introduction of the method of artificial insemination of rabbits is a priority, and its technique requires further improvement. The introduction of the method of artificial insemination in rabbit breeding is economically beneficial. If, for example, the number of males in the farm during natural mating is 10-15% of the main breeding stock, then with artificial insemination they can be reduced to 1% or less. Consequently, the cost of maintaining producers is significantly reduced and the breeding stock is increased by 10-15% due to the use of male cells. In the industrial system for the production of rabbit meat, the breeding stock of the rabbit farm is artificially inseminated. With such an intensive rhythm of herd reproduction from one rabbit, up to 40-60 weaned rabbits can be obtained annually and up to 120 kg of rabbit meat can be produced.

Artificial insemination opens up wide opportunities for breeding work, allows you to quickly and efficiently carry out breeding work to improve economically useful traits, including the use of interbreeding, which plays an important role in improving reproductive qualities. The introduction of this method is economically beneficial by increasing the polygamous ratio of males and females, synchronizing the mating period and reducing the time spent on covering. At the same time, it becomes possible to conduct an international exchange of sperm of rabbits of different highly productive breeds.

Thus, artificial insemination is a progressive and highly productive method of rabbit reproduction, which allows, with the industrial technology of rabbit meat production, to fully realize the reproductive and productive potential of both male producers and the breeding stock of the rabbit farm.

Keywords: *rabbit, reproduction, artificial insemination.*

UDC: **632.4:632.93:634.11**

EFFICACY OF TRICHODERMIN SC AND RIZOPLAN AGAINST *PODOSPHAERA LEUCOTRICHA*

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Powdery mildews rank among the most important diseases of agricultural and ornamental plants. Powdery mildew of apples is becoming increasingly problematic as many apple varieties preferred by consumers are susceptible to it. As resistance to many chemical fungicides becomes more common, integrated management with good resistance management is critical.

The purpose of this study – evaluation of the biological efficacy of the microbial agents Pseudomonas fluorescens AP-33 (manufactured as Rizoplan) and Trichoderma lignorum M-10 (manufactured as Trichodermin SC) in control of the apple powdery mildew (Podosphaera leucotricha (Ellis & Everh.) E.S.Salmon).

The experiments were mounted on the experimental lot of the Institute of Genetics, Physiology and Plant Protection (Moldova State University), on the apple trees, Reinette Simirenko variety, in 8 variants, 3 repetitions, with 3 trees per repetition.

According to the obtained results, the highest attack frequency 27.7% and intensity of the disease 14.5% were in the Control variant (untreated control) and the lowest frequency 4.0% and intensity of disease development 1.4% were in the Standard variant (Jeck Pot EC, 0,4 l/ha). Whereas in the variants where biological preparations were used, the frequency was between 6.0% and 13.0%, and the intensity of the development of the disease between 2.5% and 6.3%. The attack frequency reached 9.0 - 10.3% with a disease intensity of 4.1 - 4.3% when mixture of the biological plant protection products Rizoplan and Trichodermin SC was used. The biological efficacy of biological products Rizoplan and Trichodermin SC after foliar application in the control of the powdery mildew was as follows: Rizoplan 2.0 l/ha – 56.5%; Rizoplan 3.0 l/ha - 64.1%; Trichodermin SC 2.0 l/ha - 81.4%; Trichodermin SC 3.0 l/ha - 82.7% and for mixtures Rizoplan + Trichodermin SC 2.0 l/ha - 70.3%; Rizoplan + Trichodermin SC 3.0 l/ha -71.7%.

The best result in control of the Podosphaera leucotricha on apples was obtained for biological preparation Trichodermin SC 3.0 l/ha. The biological efficiency was 82.7%, which was at the level of the Standard variant.

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Keywords: *Rizoplan, Trichodermin-SC, powdery mildew, apple variety Reinette Simirenko.*

UDC: **636.5.087.7**

THE ACTION OF FOOD SUPPLEMENTS ON THE INTESTINAL MICROBIOTA IN BIRDS

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Currently, studies have been carried out to verify the factors affecting the development and composition of the intestinal microflora of birds, as well as its relationship with the host organism. Research has estimated in the intestinal microflora a diversity of hundreds of varieties of microorganisms, where facultative aerobic bacteria prevail. Therefore, several studies have used modern techniques at the molecular level to analyze the intestinal microflora of birds, to identify the main constituents of this microflora, to establish its functionality and to monitor the dynamics of the intestinal microflora of birds. For example, the temporal changes occurring in the gut microflora of chickens with the effects of formic acid, propionic acid and chain fatty acids added to the diet and under the influence of heat stress were compared.

Also, the composition of the intestinal microflora and the immune system of birds can be modulated by special feeding, mainly by the use of supplements and food additives. They confer general health benefits in the growth performance of birds, while modulating the gut microflora. Dietary supplements are used in bird nutrition and provide benefits such as competitive exclusion, gut maturation and integrity, immune system regulation, inflammation prevention, metabolism improvement and gut microflora modulation. Other food ingredients that promote microflora modulation are responsible for selectively altering the composition and metabolism of the gut microflora. Another dietary supplement widely used in microbial modulation is phytogenic additives derived from plants. Their use in food rations improves food quality and safety, as well as contributing to health status, acting as immunomodulators, antioxidants, digestive stimulants and substances that can increase the performance and quality of animal products. Moreover, the compounds of plant origin trigger the increase of mucus secretion in the intestine, which prevents the possibility of bacterial and fungal adhesion to the epithelium in the intestine of birds, as well as improves the physiological state and modulation of the intestinal microflora.

Therefore, modulation of the intestinal microflora of birds through dietary supplements promotes beneficial intestinal health of birds, which interacts with the intestinal mucosa and other components to ensure the proper functionality of the body's vital systems, maintaining the health, well-being and performance of the birds.

Keywords: *poultry, food supplement, intestinal microbiota.*

UDC: **582.232.7**

CULTIVATION OF CYANOBACTERIA *NOSTOC PUNCTIFORME* (KÜT.). LIST. ON DIFFERENT NUTRITIVE MEDIUMS

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Currently, the cultivation and exploitation of cyanobacteria is a priority direction in biotechnology and algology. Thus, the development of an efficient cianobacteria cultivation technology is necessary for the mass production of biomass that can be used in various spheres of human activity. The selection of nutrient media for the cultivation of cianobacteria represents a basic technological stage and is practically present in all cultivation technologies. Nutrients media, on the one hand, are intended to provide the algae with nutrients necessary for the growth and maintenance of the culture and, on the other hand, they directly influence the accumulation of biologically active substances in the cianobacteria biomass.

This paper presents the quantitative aspects of the cultivation of the cyanobacteria *Nostoc punctiforme* (Küt.). Elenk. on different nutrient mediums with the aim of highlighting the optimal nutrient environment for cultivating and maintaining the culture.

The experiments were carried out in laboratory conditions, the cyanobacteria was cultivated, according to the periodic method, on nutrient media Drew, BG-11 and Z-8, at a temperature of 22-25 ◦C and a light intensity of 4000 lx, for a period of 15 days. Cyanobacteria was inoculated in the amount of 0.4 g/l, the inoculum being obtained from the culture in the exponential growth state. The obtained results were processed mathematically, determining the arithmetic mean and the standard error.

The pH of the culture when growing on the experimented media differs according to the cultivation medium, in all the tested variants the tendency to alkalinize the nutrient media was attested. The highest pH values were recorded when growing on Z-8 nutritive medium, and the lowest on Drew medium.

The obtained results show that the highest productivity of the *N. punctiforme* is attested on the 12th day of cultivation on the nutritive medium Z-8 (1,60±0.08 g/l), and the lowest on the cultivation on Drew medium (0,82±0.04 g/l). When cultivating *N. punctiforme* on nutritive medium BG-11, the biomass reached the maximum value of 1,50±0.06 g/l on the 12th day of cultivation. It should be noted that the exponential growth phase of the culture was attested in the period of 3-12 days when growing on nutritive medium BG-11 and Z-8, and when growing on Drew medium it extended up to the 15th day. Although the cultivation cianobacteria on nutritive media BG-11 and Z-8 ensures a large amount of biomass, the culture grown on these media is more sensitive and can become infected with some algae, when reaching the stationary or regression phase, and when cultivated on the Drew nutritive medium this risk is considerably reduced.

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Keywords: *cyanobacteria, nutritive media, cultivation.*

UDC: **631.871:582.232.7:633.854.78**

THE PREMISES FOR USING THE BIOMASS OF THE CYANOBACTERIA *NOSTOC GELATINOSUM* (SCHOUSB) ELENK. AS A BIOFERTILIZER

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The application of cyanobacterial biofertilizers in the practice of cultivating agricultural crops is effective and necessary because their administration shows positive benefits both on the soil and on the cultivated plants. The species *Nostoc gelatinosum* (Schousb) Elenk. also belongs to the group of nitrogen-fixing cyanobacteria which lives intensively on various types of soil, is resistant to various environmental conditions, their biomass contains multiple biologically active substances and presents premises for use as biofertilizer.

Thus, in order to highlight the premises of using the biomass of the cyanobacteria *N. gelatinosum* as a biofertilizer, experiments were carried out in the open field for the cultivation of sunflower and corn. The researches were carried out, in our country, in the commune of Măleieşti, dist. Orhei within the enterprise SRL "Vindex Agro". In the research, the fresh biomass of the *N. gelatinosum* species was used in a dose of 12 kg/ha, and the lots, with the same area for the same crops, where no cyanobacterial biofertilizer was administered, served as a control. The experiments were mounted on an area of 30 m^2 each lot, the variants being exposed in three repetitions. The cyanobacterial biomass was administered by sprinkling drinking water on the soil surface during the period when the sunflower seedlings had 13 leaves, and the corn seedlings had 5. During the experiments, the total nitrogen content and soil pH were monitored, the growth process of the seedlings and the harvest obtained.

In the variants with administration of cyanobacterial biomass, the soil pH changed in the slightly alkaline direction (in the variants with biomass administration it was between 7,42-7,62, and in the control ones 6,85-7,53) and the content total nitrogen in the soil, at the end of the experiments, increased by approx. 0,01-0,02%. In the variants with administration of cyanobacterial biomass, the quantitative oscillation of soil nitrogen characterized by an increase in content followed by its reduction, after which this process was repeated, was attested.

Administration of *N. gelatinosum* biomass had a positive impact on the process of plant height growth during the entire monitored period. Thus, in the lots with biofertilizer administration, the sunflower plants were taller by approx. 2-5 cm, and the corn ones by 1-4 cm compared to those in the control variants. The application of the cyanobacterial biofertilizer also stimulated the productivity of the crops, in the variants with the administration of the biofertilizer, the sunflower yield increased by 30-35 kg/ha, and the corn cobs by 100-400 kg/ha.

Thus, we find that the application of *N. gelatinosum* cyanobacterium biomass as a biofertilizer to the cultivation of sunflower and corn contributes to improving the condition of the soil, increasing the yields obtained and creates practical premises for the use of cyanobacterial biomass as a biofertilizer.

***Acknowledgments*:** this study was carried out within the project for young researchers coordinated by S. Dobrojan and financed by ANCD.

Keywords: *biofertilizer, cyanobacteria, sunflower, corn.*

UDC: **582.572.4:58.085(478)**

MOBILIZATION OF THE SPECIES *GALANTHUS PLICATUS* BIEB. THROUGH *IN VITRO* CULTURE

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Galanthus plicatus Bieb. (*Plicated snowdrop*) is a critically endangered species, from the family Amaryllidaceae. In the Republic of Moldova it is protected by law, being included in the Red Book, 3rd edition. It shows increased interest as it has decorative and medicinal properties, thus destroying populations in natural habitats. *In vitro* culture is a modern technique used for practical purposes to complement and accelerate existing plant propagation methods.

The aim of this work is to mobilize plant material for the multiplication of *Galanthus plicatus* species through *in vitro* culture.

The research was carried out in the Laboratory of Embryology and Biotechnology within the „Alexandru Ciubotaru" National Botanical Garden (Institute), USM. Bulbs of about 0,5-1,0 cm in diameter were used as plant material for the research. Four types of sterilizing reagents (sodium hypochlorite, calcium hypochlorite, ethyl alcohol and mercuric chloride) were tested to sterilize the bulbs. The aseptic plant material was inoculated on three variants of nutrient medium supplemented with cytokinin 6 – benzylaminopurine (BAP), in different concentrations (1,0 mg/l; 2,0 mg/l; 3,0 mg/l). After that, the inocula were placed in dark controlled conditions with a temperature of 26 ^{0}C and an atmospheric humidity of about 85 %. Three weeks after inoculation, weak oxidation of the bulbs was observed without affecting their condition.

Of the reagents tested, the best results were found in the version with mercury chloride, the seedling viability rate of 60 %. When using the other sterilizing reagents, a high percentage of contamination was established in most of the inocula. From the medium variants tested for the microcloning of explants, the medium supplemented with cytokinin BAP in a concentration of 3,0 mg/l stood out, obtaining 3-4 microclones/explant.

The nutrient environment that causes the initiation of regenerative microclones in *Galanthus plicatus* was determined: MS 100% supplemented with cytokinin BAP in a concentration of 3,0 mg/l.

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Keywords: *Galanthus plicatus, critically endangered, mobilization, culture in vitro.*

UDC: **579.842.14:616.34-008.314**

SALMONELLA AND SHIGELLA PATHOGENIC ENTEROBACTERIA CAUSING ACUTE DIARRHEA DISEASE

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Diarrheal diseases are one of the main causes of death worldwide. The genera *Salmonella* and *Shigella* continue to be the major cause of acute diarrhea in many countries. The aim of this study was to identify pathogens from the Enterobacteriaceae family, in MTA Buiucani Public Health Medical Institution, Chisinau.

The research was carried out in the microbiological laboratory during 2011-2022. 12496 clinical samples (faecal masses) were investigated. Isolation of the pure culture was carried out on the differential and selective culture media. The identification of microorganisms was carried out by biochemical tests and by the serological method of agglutination.

From the total number of clinical samples investigated, 129 cases (1.03%) were found, in which the etiological agent was represented by pathogenic microorganisms from 2 genera of the Enterobacteriaceae family: *Salmonella* (*S*. Enteritidis, *S*. Typhymurium) and *Shigella* (*S. sonnei*, *S. flexneri*). Representatives of these two genera were isolated annually, the highest share had the genus *Salmonella* with 90.7%, and the genus *Shigella* – 9.3%. Analyzing the structure of the pathogenic strains identified, we found that in most cases the serovars *S*. Enteritidis (53.49%) and *S*. Typhimurium (37.21%) were isolated. The most frequently isolated *Shigella* serogroups were *S. flexneri* and *S. sonnei* – 4.65% each. The analysis of pathogenic strains distribution depending on the frequency of isolation, showed that the dominant serovars of the *Salmonella enterica* species were *S.* Enteritidis (83.33%) and *S*. Typhimurium (75%), and the species of gen. *Shigella* varied between 16.67% (*S. flexneri*) and 33.33% (*S. sonnei*). The highest circulation of pathogens *Shigella* spp. and *Salmonella* spp. was revealed in 2014 (2.01%), 2015 (1.78%) and 2011 (1.67%). In 2013 and 2017, the share of positive strains was practically similar, constituting about 1%, and in 2012, 2016, 2018 - 2022 - it varied from 0.12% to 0.89%.

The major causes of acute diarrheal disease during the study period were pathogenic microorganisms from the Enterobacteriaceae family, representatives of the genera *Salmonella* and *Shigella*. Permanent surveillance and implementation of infection prevention strategies are necessary to mitigate acute bacterial diarrhea.

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Keywords: *acute diarrheal diseases, pathogens, Enterobacteriaceae, Salmonella, Shigella.*

UDC: **579.873.1**

ASPECTS OF *SACCHAROPOLYSPORA SPINOSA* CULTIVATION AND SPINOSAD SEPARATION

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For a successful agriculture, it is necessary to have at hand efficient methods of plant protection that allow obtaining high productivity without loss of quality. The greatest perspective at present a method based on the microorganism or their metabolites, which are friendly to the environment. The race with the most promise are tele actinomycetes that produce or wide range of metabolites that have not yet been widely exploited by our society. Currently, our research is focused on cultivating *Saccharapolyspora spinosa* to isolate from the culture liquid the metabolite called spinosad. Nutrient medium compositions containing: malt extract, soy flour, yeast extract were tested for cultivation, which previously showed very good growth of *S. spinosa* biomass. Large mycelial conglomerates were noted on microscopic examination.

For the cultivation of *S. spinosa*, the method of deep cultivation on a liquid medium was used, the cultivation was carried out for 96 h, at a temperature of 30 ^{o}C. The liquid mother culture was used for inoculation, being used immediately after obtaining (the storage period of the mother culture was not studied.) For the spinosad separation, fresh culture liquid was used that was not kept for more than 24 h after the completion of cultivation. The separation was carried out through a series of repetitive centrifugations, initially to get rid of the components of the nutrient medium that were not used by the actinomycetes and later with the use of ethyl alcohol as a solvent, which is available, cheap and sufficiently safe for humans. Upon obtaining a yellow liquid, an attempt was made to crystallize spinosad by placing the liquid at temperatures of 35-40 ^{o}C under vacuum.

Following the cultivation trials, it was proven that ethyl alcohol is not suitable for carrying out the separation of spinosad. In our opinion, there is a need to carry out further research with other organic solvents that will allow a better dissolution of spinosad. It is also necessary to carry out additional studies of the presence of spinosad in the culture medium to be firmly convinced that its synthesis by S. spinosa takes place.

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Keywords: *Saccharopolyspora spinosa, separation, spinosad, cultivation.*

UDC: **582.282.23 + 663.1**

BAKER'S YEAST – APPLICATIONS, CHALLENGES, PROGRESS, AND PROSPECT TECHNOLOGIES

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Baker's yeast comprises a huge diversity of strains of unicellular fungi belonging to *Saccharomyces cerevisiae* species. Over their long global history of use, these microorganisms (such as brewer's yeast or wine yeast) have become one of the most frequently used either for the production of biologically active compounds, as they are an important source of proteins, antioxidants, vitamins and other essential components, or for conventional fermentation.

The first aspect addressed in various studies regarding baker's yeast relates to the role it plays in the production process of bakery products. *Saccharomyces cerevisiae* (baker's yeast) is superior fermentation yeast and the oldest known starter culture. Great interest was shown in the performance of productive capacities of baker's yeast strains: increasing of biomass production, improving their ability to convert sugars with the formation of CO_2 and ethyl alcohol, dough loosening etc. By addressing key aspects such as: selection of nutrient media with adaptive characteristics similar to habitats from which they were isolated, optimal cultivation and storage conditions, reactivating of dry forms, formation of resistance to various processing conditions, etc., commercial yeast strains with wide applications in the bakery industry have been generated. Since the introduction of genetic engineering, genetic and phenotypic variability of industrial and wild strains was identified as a way to improve their properties. The assessment of aromatic, antimold and nutritional qualities to better meet the industry needs has resulted in a wide range of specific baker's yeast ingredients for niche markets. In recent years, there has been a steady interest in the medical aspect of biologically active compounds with antioxidant, antimicrobial, and immunostimulating properties, specially developed on the basis of baker's yeast. Retrospective of principles and processes using baker's yeast, as well as recent advances in their application, reveal the impact of these technologies on industry and health. Therefore, baker's yeast still remains a valuable object of research and modern technologies. The trend of the last few years is the use of wild yeast in production processes instead of industrial one. This requires the identification and exploitation of new strains that can be used both in industrial and domestic production. The quality of yeast, which is a source of valuable micronutrients, can be improved by implementing technologies for directed synthesis of some biomass components (vitamins, minerals, amino acids, etc.). They can also ensure the stability of technological properties of bread yeasts and their quality.

Keywords: *Saccharomyces cerevisiae (baker's yeast), wild and industrial strains, productive capacities, processes, applications, prospect technologies.*

UDC: **606:004.356.2:547.913:675.043.84**

3D PRINTING WITH ESSENTIAL OIL IN HYDROPHILIC SUPPORT GEL

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In recent years, much attention has been paid to the characterization and creation of new bioinks, as it is believed that this is one of the main reasons for the slowdown in the development of the 3D bioprinting field. Therefore, the purpose of this study is to evaluate the possibility of using essential oils as bioinks of plant origin.

To create scaffolds, a Coolness 3D printer (IPC&C, Ukraine) was used, and an infusion pump was used as a dosing system for bioink. The 3D print models were created using FreeCAD software. All STL-files were prepared for printing using the free Cura slicing software, with layer thicknesses of 450 μm to generate G-code for 3D printer. The printing process was controlled using the open source Pronterface software package. The essential oil of Oríganum vulgare, obtained by extraction with liquefied gases, was used as bioink. Printing was carried out in a hydrophilic support gel consisting of 1.2% Carbopol 940 and 0.04% bromothymol blue. To increase the viscosity of Carbopol 940, a 10 M NaOH solution was used. The shape fidelity and characterization of filaments of the 3D scaffolds were evaluated according to the protocol described by Schwab et al. (2020).

Three-dimensional constructions were obtained printed with the essential oil of Oríganum vulgáre in the hydrophilic gel. In all the cases studied, the obtained filaments were heterogeneous. During the study, it was found that an extruder with a hole diameter of 0.583 ± 0.05 mm is most suitable for printing with essential oil. When printing structures with an extruder with this hole, a decrease in an uneven index of printing along all the axes under study is observed. Thus, the uneven index of printing along the Z axis was 123.8%, while an increase in the diameter of the extruder hole by 2.4 times leads to a proportional increase in the unevenness parameter. Reducing the extruder diameter below 0.583 results in uneven extrusion of the bioink. We have shown that the optimal bioink extrusion speed is 100 mm/s, while the printing unevenness along the X, Y, Z axes is 94.66%, 96.47%, and 123.48, respectively. For all printed structures, the value of the pore printability coefficient lies in the range from 0.92 to 1.00, which in turn indicates a good geometry of the printed pores.

The conducted research indicates the possibility of using Oríganum vulgare essential oil as a bioink for 3D printing in a hydrophilic support gel.

Keywords: *3D printing, Carbopol, Essential oil, Oríganum vulgáre.*

UDC: **620.3:546.56:633.822**

INFLUENCE OF THE TECHNIQUE OF COPPER NANOPARTICLES ADMINISTRATION ON *MENTHA SPICATA*

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Various stages of production, use and disposal of nanomaterials leads to their release into the environment with wastewater and emissions into atmosphere. Therefore, all components of ecosystems, including human health, can be affected. Spearmint (*Mentha spicata*), which is valuable raw plant materials, was chosen as the object of research. The main goal of this work was investigation of the effect of the treatment technique and the concentration of copper nanoparticle (CuNPs) solutions on the their accumulation and transfer in spearmint segments.

Two groups of spearmint plants were exposed to copper nanoparticles in a concentration range of 1-100 mg/L during a 28-day experiment. Foliar spraying was applied for the first group of plants. The second group was irrigated with solutions of CuNPs with the same concentrations. Copper content in plant segments and soil samples was determined by the ICP-OES method. Transmission electron microscopy was used to determine the size and shape of the nanoparticles.

Mint plants have demonstrated the ability to translocate of copper nanoparticles (15-70 nm) from the aerial parts to roots in the foliar spraying exposure. Copper influx into the roots was maximum at the lowest concentration of CuNPs solutions (1 mg/L). At the roots exposure copper mainly accumulated in soils (exceeded the control 22–130 times) and spearmint roots. Accumulation was negligible in leaves and stems when CuNPs solutions in the range 1-50 mg/L was used for irrigation. The copper content in the leaves was maximum when CuNPs 100 mg/L was used, while the copper content in the stems remained practically unchanged.

The results of this study indicate the availability of 15-70 nm in diameter copper nanoparticles for plants, both in the case of foliage spraying and at watering exposure. Differences in the accumulation of copper in roots, stems, and spearmint leaves were revealed depending on the concentration of the CuNPs in solutions and the exposure technique.

Keywords: *copper nanoparticles, uptake, spearmint.*

UDC: **[581.4 + 581.8]:582.949.2(478)**

THE HISTO – ANATOMY OF THE COMMON SKULLCAP FROM THE REPUBLIC OF MOLDOVA

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This research aims to describe the histo-anatomy, seed morphology, and possible uses of the medicinal plant *Scutellaria galericulata* L.

The roots and the aerial parts of *Scutellaria galericulata* L., in the flowering-fruiting phase, were collected from the Codrii Natural Reserve, from Lozova, Republic of Moldova. The cross-sections were performed manually with the help of a hand microtome and a botanic razor. The sections through vegetative organs were highlighted by double coloration (ruthenium red and iodine green), and the observation was performed on a Euromex bScope microscope. The pictures of the sections were made with the Image Focus 4 program. The seeds (bought from an online shop) were analyzed using to Olympus stereo microscope zoom SZX7 and the Vega Tescan II SBH microscope after metallization. For the identification of the possible uses of *Scutellaria galericulata* we performed the screening of literature.

The rhizome was characterized by the presence of numerous air cavities and disorganized pith. The transverse sections through the stem at different levels did not show significant anatomical differences. The leaf blade presented a dorsiventral structure and secretory trichomes located mainly at the level of the lower epidermis. The micromorphology of seeds showed the presence of characteristic papilliform formations, arranged regularly, which confers a unique architecture with taxonomic value. According to the literature, the species *Scutellaria galericulata* due to its chemical composition can present different properties for example insect antifeedants, antibacterial, and antioxidant.

Our observations relating to the histo-anatomy, and seed morphology of *Scutellaria galericulata* correspond with the observations of other researchers. After the screening of the literature, we concluded that *Scutellaria galericulata* can present potential uses in traditional medicine and agriculture.

Keywords: *Scutellaria galericulata, histo-anatomy, seed morphology.*

UDC: **591.2:597.2/.5**

MEANS OF INCREASING THE EFFECTIVENESS OF THE TREATMENT OF ECTOPARASITIC DISEASES IN FISH

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Currently, the parasites *Ichthyophthirius multifiliis* (indigenous) and *Neoichthyophthirius schlotfeldii* (imported from Southeast Asia) are found in fish farming systems. In order to make the methods of parasite eradication more efficient, within the framework of the research we set an objective of developing and testing preparations based on super-solvents, in order to increase the speed of penetration and their permeability through the integument of aquatic organisms and the membrane of parasitic cysts of species *Ichthyophthirius multifiliis* and *Neoichthyophthirius schlotfeldii*. We took as a basis the preparation of an aqueous solution of methylene blue and basic green (oxalate), with the addition of different concentrations of dimethylsulfoxide DMSO $(CH_3)_2SO$.

We have determined that the most effective veterinary antiparasitic treatment in the aforementioned ichthyophthiriosis is based on the application of the FMC preparation (3.7 g malachite green + 3.7 g methylene blue + 1 liter formaldehyde 32%). 3 variants of FMC + DMSO were prepared: 1. 1 liter of FMC + 0.1 liter of DMSO. 2. 1 liter of FMC + 0.15 liters of DMSO. 3. 1 liter of FMC + 0.2 liters of DMSO. All results were visually assessed every 24 hours. The following results were attested: 1. FMC + 0.1 DMSO (on the 6th day, a slight decrease in the number of resting cysts and reproductive cysts, a decrease in the secondary damage caused by saprolegniosis; on the 11th day - single cysts on the body and fins, no fungal lesions are noted; on the 14th day, the integument is clean, partial restoration of the epithelium begins. 2. FMC + 0.15 DMSO (on the 4th day the number of cysts decreased by 50-60%, no secondary fungal infection was attested; on the 7th day – attestation of simple cysts in the region of gill opercles and pectoral fins; on the 9th day the integument was completely cleared. 3. FMC + 0.2 l of DMSO (on the 2nd day the epithelium was 90-95% cleared of cysts, on the 3rd day the hydrobionts were completely freed from the cysts, the epithelium is restored.

According to the results obtained, we can recommend to fish breeding organizations to combat tropical species of *Ichthyophthirius* by applying a preparation consisting of 1 l of FMC and 0.2 l of dimethylsulfoxide.

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Keywords: *parasite eradication, ichthyophthiriosis, super-solvents.*

UDC: **579.852.11:[634 + 633.49]:551.583**

STUDY OF THE COMPLEX ACTION OF BIO-PREPARATIONS IN REDUCING THE AGRICULTURAL CROPS VULNERABILITY TO CLIMATE CHANGE

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Environmental pollution caused by use of pesticides, has led to considerable changes in people's attitudes towards the use of pesticides in agriculture. Under such circumstances biological control to be the most appropriate alternative to chemicals. (Kumar 2012 ; Senthil-Nathan 2015).

Products of microbial origin in combination with para-aminobenzoic acid (PABA) derivatives can be the basis for organic farming and plant resistance to unfavorable environmental factors inducing, as well as for the crop yield increasing. The aim of the work the results of the study of efficiency of fruit-cultures and potato plantations treatment with aqueous suspensions of entomopathogenic bacteria *Bacillus thuringiensis* subsp. *kurstaki* and *Bacillus thuringiensis* var. *thuringiensis* with addition of para-aminobenzoic acid derivatives solutions in concentrations 10^{-2}, 10^{-4}, 10^{-6} mol/l. An increase in the average weight of fruits and tubers and a reduction in disease and insect damage were observed in all variants of the experiment compared to the control. The studied derivatives exhibited higher biological activity at the lower concentration than PABA. The best trial was treatment with a mixture of *Bacillus thuringiensis* subsp. *kurstaki* with the addition of an aqueous solution of PABA at concentrations of 10^{-4} and 10^{-6} mol/l. 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.

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Keywords: *entomophotogenic bacteria, Bacilus, biological preparations, agriculture*.

UDC: **633.88:615.281.984.1/.2**

ANTIMICROBIAL ACTIVITY OF SOME MEDICINAL PLANTS WITH ANTICANCER PROPERTIES AGAINST *E. COLI*

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Data from the specialized literature confirm that plants and their natural products represent promising sources of antibacterial agents and that their exploration represents a productive trajectory. One of the future challenges for many phytochemicals is to find efficient routes and forms of administration, capable of delivering the active substance, the antimicrobial compound at the target site. The association between gut microbiota and some types of cancer is evident. Among the potential pro-carcinogenic effects of bacterial species: *Helicobacter pylori*, *Enterococcus faecalis*, *Clostridium septicum*, *Fusobacterium* spp. and *Escherichia coli* are genotoxicity, inflammation, oxidation, modulation of antioxidant defense, etc. Certain natural compounds of plant origin, such as essential oils, alkaloids, lectins, polypeptides, flavones, flavonols, coumarins, terpenoids and tannins, have become potential therapeutic tools. Polyphenols of vegetable origin have various biological effects, including antioxidant, anticarcinogenic, anti-inflammatory and antimicrobial activities. In the regulation of side effects during anticancer therapy, complementary and integrative approaches are becoming more current.

To highlight the antimicrobial properties of some plants with anticancer properties against agents of the *E. coli* genus 5 indigenous medicinal plants were used: *Chelidonium majus*, *Viscum album*, *Artemisia absinthium*, *Xanthium spinosum* and *Acorus calamus*, prepared in 4 forms: decoction, infusion, alcoholic tincture and cold maceration. Evaluation of their antimicrobial activity was performed using the well diffusion method. The diameter of the zones of cell growth inhibition around the wells depends on the degree of sensitivity of the reference culture to antibiotics: zone diameter up to 10 mm is considered low sensitivity; 11-15 mm – medium sensitivity; 15-25 mm – sensitive; greater than 25 mm – increased sensitivity. *Chelidonium majus* demonstrated the most pronounced antibacterial activity in the case of the decoction form – sensitive area according to the gradation of M. Birgher and tincture – medium sensitivity. *Viscum album* in the form of infusion and maceration showed medium sensitivity, while the forms of decoction and tincture – low sensitivity. *Artemisia absinthium* proved to be more effective in the form of tincture and infusion (sensitive area), also having the highest inhibition zone values compared to the other herbs. *E. coli* culture sensitivity in the infusion and maceration of *Xanthium spinosum* were higher, compared to the form of decoction and tincture, which both demonstrated an average sensitivity, and *Acorus calamus* in the forms of decoction, infusion and maceration – on the border between low and medium sensitivity.

Thus, the forms of preparation of tested medicinal plants were identified, which demonstrated *in vitro* a significant antimicrobial potential against *E. coli*, due to phytoconstituents with antibacterial action, among which the most active are polyphenols and terpenes, a fact that will allow their use in the process of further development of phytooncoprotectors.

Keywords: *antimicrobial activity, medicinal plants, phytooncoprotectors, natural compotents.*

UDC: **582.232.7**

CYANOBACTERIA- THE VALUABLE SOURCES OF BIOACTIVE COMPOUNDS WITH ANTIOXIDANT PROPERTIES

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Cyanobacteria are producers of a wide range of bioactive substances including substances with an antioxidant effect, having a high potential for biotechnological applications. Such natural bioactive substances can find applications in the pharmaceutical, cosmetic, medicine, food industry, as an alternative to synthetic chemical compounds.

Oxidative stress is the cause of many diseases, including neurodegenerative diseases, cancer, cardiovascular diseases, atherosclerosis, obstructive pulmonary diseases, etc. In order to overcome all the unwanted effects following the installation of oxidative stress, the application of natural products (cyanobacteria) is welcome due to the presence in their composition of biologically active compounds with antioxidant properties, including phycobiliproteins, phenolic compounds, pigments, sulfated polysaccharides, etc. which are certainly preferable to synthetic analogues.

The results obtained by some researchers highlighted the fact that cyanobacteria from the genera *Nostoc, Anabaena, Oscilatoria,. Lyngbya, Phormidium, Dolichospermum, Leptolyngbya, Planktothrix Aphanizomenon, Arthrospira* etc. can be used as sources of bioactive substances with an antioxidant effect: phycobiliproteins, pigments (carotenoids, chlorophylls, xanthophylls), sulfated polysaccharides, polar lipids, phenolic compounds (including quinic acid and catechin), flavonoids, antioxidant enzymes (SOD, catalase, peroxidase) et al., many of which may have cytotoxic, antiviral, anticancer, antimitotic, antimicrobial, specific enzyme inhibitory, and immunosuppressive activities.

Keywords: *Cyanobacteria, oxidative stress, antioxidant effect, bioactive substances*.

UDC: **633.111.1:58.085**

HAPLOPRODUCTIVE ABILITY OF WINTER BREAD WHEAT GENOTYPES WITH THE GPC-B1 GENE

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The purpose of the research is to evaluate the haploproduction capacity of the breeding material of bread wheat and to create high-protein lines by androgenesis *in vitro*. One of the urgent tasks of biotechnology today is the homozygization of genetically unstable breeding material with specific marker traits, which is the result of the destruction of wheat with introgressive lines. The research material was 13 genotypes provided by the wheat breeding department of the SGI-NCNS: varieties Kuyalnyk, Tradition, introgressive lines 9300, 9525 and 3238 (the latter obtained as a result of distant crossings of cultivated wheat with *Aegilops tauschii* (line 3238;) and *Triticum dicoccoidles* (line 9225; 9300) with subsequent selection and saturation crossings) and 8 hybrids of the first generation between these genotypes

Microspores of all genotypes formed calluses in anther culture in vitro were showed. The intensity of the last process was low (from 0.47 to 3.0%). The regenerative capacity of the new formations did not exceed 0.34% of the planted anthers. Green regenerates in anther culture of ten genotypes have been received. A total of 24 green regenerants were obtained by in vitro androgenesis, from which, after the stages of adaptation to soil conditions, vernalization and growth, seeds of seven dihaploid lines were obtained. Two lines each in the anther culture of the hybrid F1 Tradition / line 9300 and the Kuyalnik variety and one of the combinations of crosses F1 Line 9300 / Line 3238, F1 Line 9300 / Tradition and line 9525.

As a result of the study, it was shown that the effectiveness of the anther culture method for obtaining high-protein linear material of soft winter wheat depends on the donor material. In our research, we did not use diploidizers, that is, we obtained all 7 fertile plants - this is the result of spontaneous diploidization. The value of spontaneous diploidization ranged from 0 to 100% depending on the genotype, with an average of 29.17%, which correlates with similar results of another researches.

Thus, the low haploproduction potential in in vitro anther culture of genotypes carrying in the genome foreign genetic material with the GPC-B1 gene from Ae. tauschii and T. dicoccoidles have been showed. However, 30% of the obtained regenerative plants are dihaploid lines that are the result of spontaneous diploidization.

Keywords: *winter bread wheat, androgenesis in vitro, dihaploid, GPC-B1 gene.*

Session C

MOLECULAR BIOLOGY AND BIOMEDICINE

UDC: **616-056.25**

STUDY OF THE ACIDOPOIETIC FUNCTION OF THE STOMACH IN THE NORMOSTHENIC TYPE OF CONSTITUTION

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The objective of the research is to identify the particularities of the acidopoietic stomach function in persons with a normometabolic status. The experiment was performed on laboratory animals (white Wistar rats). The acidopoietic activity is determined by means of probes with two olives and the acidogastrometer AGM-10-01. The atropine test made it possible to distinguish basal acidogenesis (continuous) humoral and reflective nature. In the first case, acidogenesis is mainly caused by histamine and the like. An acidogenesis like that is not blocked by atropine. But if acidogenesis is brought about by reflexive and conditioned reflexive influences, then acidogenesis is blocked by atropine.

The research conducted provided the following findings: the acidity of the gastric juice in the region of the glands with gastric secretion in people with normometabolic status of the body during the observation period (50 min) varied within the limits of the pH value of 1.3±0.17 – 1.6±0.26. The positive atropine test resulted in a decrease in the acidity of the stomach content from a pH of 1.35±0.14 at baseline to a pH of 2.5±0.09 and 2.3±0.15 at 20 and 30 minutes of observation. This indicates the activity of the parasympathetic division of the region of the autonomic (vegetative) nervous system in the neurohumoral complex of acidogenesis in individuals with a normometabolic status of the body. Indications of pH-metry in the body of the stomach in rats without the atropine test (1.3±0.17-1.6±0.26 pH), obtained against the background of the normal functional state of the stomach, should be classified as sanogenic limits of acidogenesis for people with normometabolic status of the body. The prevalence of the reflector bond in the neurohumoral complex of mechanisms in people with normometabolic status allows us to label it as a neurohumoral type of secretion. The dynamics of the pH change in the pyloroantral area of the stomach in patients with normometabolic status indicate a high neutralization potential of the antrum. The excess of pH greater than 5.0 in the antrum and the difference in pH of 3.8–4.4 between the acidogenic and antral zones allow us to state that the neurohumoral type of secretion possesses compensated acidogenesis.

Thus, the experimental data made it possible to identify of the functional features of stomach acidogenesis in persons with a normometabolic state of the body. The positive test with atropine in the differentiation of basal acidogenesis demonstrates the presence of the reflector bond in the neurohumoral mechanism of acidogenesis in the normometabolic status of the organism.

***Keywords*:** *acidopoietic function, stomach, normometabolic, constitution, atropine, pH.*

UDC: **616.379-008.64**

THE IMPACT OF TYPE 2 DIABETES ON THE QUALITY OF LIFE OF THE PATIENT IN THE REPUBLIC OF MOLDOVA

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Diabetes is a chronic, metabolic disease characterized by elevated blood glucose levels, which over time leads to serious damage to the heart, blood vessels of the eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or does not produce enough insulin. In the last thre decades, the prevalence of type 2 diabetes has increased dramatically in countries of all income levels.

The main aim of the work is to evaluate the metabolic disorders and quality of life indices of the patient with type 2 diabetes. The study was carried out within the Public Health and Medical Institution, Asociația Territorial Botanica Medical Association. The total study group consisted of 50 patients with type 2 diabetes. 34 women (68%) and 16 men (32%) participated in the study. Patients' risk factors were evaluated: overweight, smoking, alcohol, lifestyle (sedentary or active). The complications of diabetes in patients were evaluated: diabetic retinopathy, diabetic nephropathy, macroangiopathy. According to the results obtained, the onset age of type 2 diabetes is between 50-59 years, the age category is represented by 60-69 years. Also, the 40-49 age group represents a high level, with a percentage of 18 %, being significant in the context of diabetes rejuvenation. The age of type 2 diabetes is between 5-10 years. Controlled diet and physical exercise can reduce the risk of type 2 diabetes.

Diabetes mellitus and arterial hypertension appear as a pathological association with maximum risk of cardiovascular and renal complications. Hypertension and type 2 diabetes coexist much more frequently than would be predicted from the calculation of individual prevalences. The relative risk to develop diabetes was 2.43 times higher in the group of hypertensive patients. Chronic degenerative complications correlate with the duration of the disease. It has been found that more than 40% of new cases of chronic renal insufficiency identified annually are due to diabetes, in particular, type 2 diabetes - 60-70% of patients have moderate or severe forms of neuropathy, 21% of patients have retinopathy.

Treatment of type 2 diabetes includes taking oral antibiotics and adjusting your diet. Drug treatment stimulates the secretion of insulin, a hormone that controls blood sugar levels. At the same time, patients diagnosed with such a condition will periodically check their blood sugar through outpatient testing, give up alcohol, quitting smoking and adopt a special diet, in which the consumption of carbohydrates will be carefully programmed.

Complications of type 2 diabetes have a fairly high yield, even if there is only one complication, thus diabetic encephalopathy, it has a efficiency of 42%, which is 21 cases in the study group. It is necessary for the patient to realize that diabetes is a special lifestyle and everything coming is already a consequence of diabetes.

***Acknowledgments*:** determination of Bioactivity and Antimyeloma Properties of Various Cyanobacteria (22.80013.5107.2TR).

Keywords: *diabetes, epidemic, glycemia, hypertension.*

UDC: **616-001.8:613.8**

PREVENTING THE DETRIMENTAL EFFECTS OF INTERMITTENT ASPHYXIA DURING REM SLEEP BY IMPROVING ADAPTABILITY

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The purpose consists of determination of the shifts in the activity level of the noradrenergic and serotonergic central neurotransmitter systems during periodic asphyxia during sleep, as well as in the state of sleep on the background of preliminary adaptation to hypoxia.

Male rats (180-220g) cortical, hippocampal, electrooculo- and electromyographic electrodes were implanted; during REM sleep, asphyxia was performed (by tightening the cuff around the neck) until awakening; repeatedly, daily for 15 days. This was an attempt to experimentally model obstructive sleep apnea. Adaptation to hypoxia was performed in a hypobaric chamber (daily for 40 days, at an "altitude of 2500 m" with an exposure of 5 hours starting from the 15th day). The concentration of norepinephrine (NE), 5-hydroxytryptamine (5-HT), and 5-hydroxyindole-3-acetic acid (5-HIAA) was determined in the tissue of the periaqueductal region of the midbrain and dorsal part of the medulla oblongata of decapitated animals using HPLC with electrochemical detection. Statistical analysis was performed using the ANOVA method.

After the first day of sleep, interrupted by episodes of asphyxia in the medulla oblongata, a significant increase in the concentration of 5-HT was found compared with the control (534±27.2 vs. 439±23.4 pg/mg ww, $P<0.05$). After 15 days of asphyxia, an increase in the concentration of 5-HIAA was detected in the midbrain and NE in the medulla oblongata (494±19.1 vs. 407±17.6; 573±23.5 vs. 463±21.4 pg/mg, respectively). In adapted animals, after 15 days of asphyxia, the concentration of 5-HT increases and 5-HIAA decreases in the medulla oblongata compared with the group of non-adapted animals. The latent period of awakening is significantly lengthened.

It can be assumed that adaptation to prior intermittent hypoxia contributes to maintaining a sufficient level of serotonin in the respiratory motor center by reducing its degradation, as well as increasing tolerance to hypoxia and/or hypercapnia, and adaptability.

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Keywords: *intermittent asphyxia, REM sleep, hypobaric hypoxia.*

UDC: **577.112.387:616-008.9:616.36**

PARTICULARITĂȚILE METABOLISMULUI TRIPTOFANEI LA PACIENȚI CU HEPATOPATII CRONICE VIRALE

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Hepatopatiile cronice virale prezintă una dintre cele mai importante probleme ale medicinei contemporane. Este cunoscut faptul că bolile hepatice cronice provoacă diverse tulburări metabolice, inclusiv și metabolismului proteic, afectând procesul de formare adecvată și compoziția aminoacizilor în organismal uman.

Scopul studiului a fost evaluarea nivelurilor aminoacidului triptofan în serul sanguin la pacienții cu hepatopatii cronice virale.

Pentru realizarea scopului s-au determinat nivelurile triptofanei în serul sanguin la 12 pacienți cu hepatopatiile cronice de etiologie HBV și la 11 persoane aparent sănătoase. Cantitatea triptofanei a fost facută prin utilizarea cromatografiei lichidiană. Studiul a fost efectuat în cadrul Proiectului 20.80009.8007.37 „Bolile cronice hepatice și pancreatice: aspecte nutriționale și chirurgicale”.

Ca urmare a studiului efectuat, s-a constatat că nivelul triptofanei la pacienții cu hepatopatiile cronice de etiologie HBV a fost semnificativ scăzut ($p<0,01$) în comparație cu persoanele aparent sănătoase, prezentând la persoanele cu infecția HBV 1,88±0,18 mcM/ dL versus 3,40±0,49 mcM/ dL la indivizi aparent sănătoase. Luând în vedere faptul că triptofanul este una din aminoacizii esențiali pentru sinteza proteinelor, având o serie de alte funcții metabolice importante așa ca sinteza serotoninei în creier, analiza nivelului triptofanului devine un factor important implicat în starea de spirit, comportament și cogniție.

La pacienții cu hepatopatie virală cronică de etiologie HBV se observă tulburări metabolice cu niveluri scăzute de triptofan. Cu toate acestea, este necesar să se continue studiul pe un eșanționul mai mare cu o evaluare conținutului de alți aminoacizi la pacienții cu hepatopatiile cronice de etiologie HBV.

Cuvinte-cheie: *hepatopatii cronice virale, triptofan, tulburări metabolice*.

UDC: **616-036.21:616.89-008.1**

PSYCHOGENIC DISORDERS DURING THE COVID-19 PANDEMIC

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The harmful effects of the pandemic were manifested not only at the somato-vegetative level, but also at the mental level, and not only in patients with coronavirus, but also in people in quarantine, which determined our study to identify the features of the psychogenic disorders.

The study of the phenomenology of the psychogenic disorders was carried out through a clinical interview, including the collection of analyses and the psychoindicators developed by Furdui T.I., Ciochina V.Ch. et al. (2018), reflecting sano-, dissano- and psychopathogenic reactions and processes: integrative-cognitive state, behavior, emotions, communications, personality-semantic activity and indicators reflecting levels of mental health. Both those infected with the coronavirus and those in quarantine most often showed the following signs of psychogenic disorders: irritability, outburst of anger, anxiety, fear, panic agitation, phobias, stressogenic disorders, depressive anxiety, difficulty concentrating, confusion, obsessive thoughts, sleep disturbance, chronic fatigue, low mood, hypochondria.

Psychogenic symptoms (anxiety, fear, panic, phobia, sleep disturbance, etc.) appear in the period from 2 to 6 days after infection. Dissanogenic mental and somato-vegetative reactions that form the symptoms of the disease, after their assessment by the patient as dangerous to their health, cause a sharp deterioration in their general state of health.

The primary manifestations of the disease, in the form of fever, cough, discomfort, anxiety, as well as phagocytosis, are protective phylogenetically determined reactions, and truly pathological symptoms (shortness of breath, acute respiratory syndrome, atony, ideational inhibition, muscle pain, multiple organ failure syndrome) appear with further invasion and development of the pathological process that depends on immunoreactivity, expression of ACE2 receptors and cell membranes.

After recovery, patients need to restore and stabilize the functions of the immune and respiratory systems, mental and general health.

***Acknowledgments*:** this study was supported by the research project *"The particularities of the change in the functions of the cardiorespiratory system and the post-covid mental status"*, funded by *Ministry of Education and Research*.

Keywords: *COVID-19 pandemic, psychogenic disorders, irritability, anxiety, confusion.*

UDC: **577.21:612.748.5**

MOLECULAR ANALYSIS OF MUTATIONS AND THEIR RELATION IN THE GENES ASSOCIATED WITH SMA

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Spinal Muscular Atrophy (SMA) is an autosomal recessive neuromuscular disease caused by the loss of the survival motor neuron (SMN1) gene in over 95% of cases. However, mutations in genes associated with the SMA chromosomal region can influence disease progression. Aim: To analyze the status of the NAIP and GTF2H2 genes in correlation with SMA.

The study included 120 patients suspected for SMA of which 55 with confirmed with SMA and 65 without causative deletions, and 130 healthy, unrelated individuals. The molecular genetics methods used were multiplex PCR, PCR-RFLP and MLPA.

From 120 patients, 57 were confirmed with SMA. In this group were identified in 9 patients (15%) with a homozygous deletion of exon 5 of the NAIP gene, 4 patients (7%) had a heterozygous status, and 2 (4%) had duplications. In the rest of the patients (63), in which deletions of SMN1 exon 7 were not identified, homozygous deletion of exon 5 of the NAIP gene was established in one patient (3%), 3 patients (5%) had duplications of exon 5 of the NAIP gene, and one patient had 5 copies of the NAIP gene. In the 130 healthy controls, one patient (1%) was identified with a deletion of exon 5 of the NAIP gene. None of the patients with combined deletions of SMN1 and NAIP had deletions in GTF2H2.

The frequency of deletions in the NAIP gene was found to be higher in the SMA patient group compared to the control group. Thus, a significant relationship was identified, the P value being <0.00001. The significance threshold was set at $p<0.05$. Our investigation is the first to examine the relationship between SMN locus genes and SMA in the Moldavian population. The genetic patterning of genes associated with SMA is an important aspect in the study of molecular pathophysiology and assessment of disease prognosis, especially in the approach to gene therapies.

Acknowledgements: this work was funded by Minister of Health of R.Moldova and research project „Medicina Genomică și Metabolomică în serviciul profilaxiei maladiilor genetice pentru generații sănătoase în Republica Moldova" [SCREENGEN, Cipher: 20.800009.8007.22, Contract 22-PS, 03.01.2022].

Keywords*: SMA, NAIP, GTF2H2, SMN1, deletions, frequency, molecular-genetics, correlation.*

UDC: **577.2:635.652**

MOLECULAR ANALYSIS OF THE TOXIGENIC FUSARIUM SPECIES IN COMMON BEAN

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Soil-borne fungi of the genus *Fusarium* are among the most harmful due to their ability to produce secondary metabolites - mycotoxins, that make agricultural products dangerous for consumption. The objective of this study was to reveal the presence of mycotoxin-producing sequences of the *Fusarium* spp. genomes in infected beans using *nested*-PCR assay.

Dry beans of eight *Phaseolus vulgaris* L. genotypes from the gene bank collection of IGPPP were used in the study (MDC00202, MDC00204, MDC00209, MDC00223, harvest 2015 and 2020). Total DNA was extracted from 0,5 g of seeds 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.

Initially DNA samples were tested with the primers designed on the basis of the beta-tubulin gene sequences, which are specific for genus *Fusarium.* Analysis revealed only one fusarium-bearing sample - MDC 00202, collected in 2020. Further, this sample have been selected for subsequent tests using species-specific primers for identification of *F. oxysporum, F. nivale, F. proliferatum, F. verticillioides, F. avenaceum, F. culmorum, F. equiseti, F. sporotrichioides, F. graminearum.* As a result of *nested*-PCR were detected *F. sporotrichioides* and *F. culmorum.* These species belong to the group of potential producers of such mycotoxins as Deoxynivalenol (DON), T2-toxin, Zearalenone (ZEN), Fumonisin B1. Subsequently analysis was performed using specific primers for the detection of genes involved in the synthesis of these mycotoxins in the tested sample. For this, a set of primers was used for identification of polyketide synthase (PKS13) genes that are involved in the Zearalenon synthesis, trichothecene biosynthetic gene cluster - DON/T2 synthesis and FUM gene cluster - Fumonisina B1 synthesis. The presence of *Fusarium* spp. genomic sequences involved in DON/T2 mycotoxin synthesis was revealed.

***Acknowledgments*:** this study was supported by the research 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", funded by the National Agency for Research and Development.

Keywords: *Phaseolus vulgaris* L., *Fusarium spp., nested-PCR.*

UDC: **576.316:616-071**

DEVELOPMENT OF NEW QF-PCR BASED DiGEORGE TYPE I SYNDROME DIAGNOSTICS METHOD WITH HIGH PROGNOSTIC VALUE

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DiGeorge Syndrome type I (DiGSI), also known as velo-cardio-facial syndrome or 22q11.2 deletion syndrome is affecting genes involved in formation of 3rd and 4th brachial arches and causes different malformations like cardiac abnormalities, hypo- or aplasia of thymus, palate abnormalities, hypoparathyroidism, autism etc. In Most frequently it is caused by *de novo* deletion, in rare cases it is inherited from one of the parents. Anyway, it heavily affects persons quality of life and should be diagnosed as soon as possible. One of the obstacles in DiGSI diagnostics is deletion polymorphism – deletion can be quite of different length and involve different genes, changing patients personal prognosis in dependence of genes involved.

Previously, we proposed a method, based on gene copy number quantification based on TaqMan qPCR quantification of genes of interest. However, this proposition has its limitations, which includes limited scalability (modern qPCR machines support only up to 6 channels of fluorescence per well, one target per fluorescence channel) and dependence on different qPCR machines resolution by Ct and sensitivity. Now we propose highly-multiplexed method for DiGSI testing based on QF-PCR using FAM channel for internal controls, VIC/HEX channel for regions of interest and LIZ channel for size marker. QF-PCR method advantage is possibility of use of multiple targets on single fluorescence channel by its size and spatial separation. This method is highly-sensitive, fast and highly-accurate mode of DiGSI diagnostics with possibility of making prognosis of disease severity and features. It also includes optimized protocol and run parameters for capillary electrophoresis machines. Unlike our previous method, this one can scan region of interest for multiple genes deletions without need for further precization and verification.

Keywords: *DiGeorge syndrome, VCFS, QF-PCR.*

UDC: **579.873.7:599.323.4:612.821.2(478)**

SPATIAL LEARNING AND MEMORY OF MALE AND FEMALE WHITE RATS UNDER THE INFLUENCE OF BIOMASS OF STREPTOMYCETES ISOLATED FROM THE SOILS OF THE REPUBLIC OF MOLDOVA

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The aim of this work is a comparative study of the effect of long-term consumption of biomass of *Streptomyces massasporeus* CNMN-Ac-36 and *Streptomyces fradiae* CNMN-Ac-11 strains isolated from the soils of the central part of Moldova on the spatial learning and memory in white rats of both sexes.

The studies were performed on Wistar rats of both sexes. Animals of the experimental subgroups 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. Rats kept on a standard diet served as controls. To study the process of spatial learning and memory, an eight-arm radial 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 long-term consumption of the biomass of local strains of streptomycetes - *Streptomyces massasporeus* CNMN-36 and, to a greater extent, *Streptomyces fradiae* CNMN-Ac-11, leads to a significant decrease in such indicators as the total number of errors, total the time during which the rat explored the 8-arm radial maze, especially after 3-4 training sessions, the number of errors in working and long-term memory, while the number of correct choices increased significantly. In the control and experimental groups, no significant differences were found between males and females when learning in the maze for most of the studied indicators, however, further analysis showed a significant influence of the sex factor on the percentage of correct visits in training sessions 1 and 5, which may be a reflection of the processes of emotionally induced learning and memory, differentiated by gender.

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, eight-arm radial maze, streptomycetes, biomass.*

UDC: **612.332.72:599.323:159.944.4**

FEATURES OF MONOSACCHARIDE ABSORPTION IN THE SMALL INTESTINE OF WHITE RATS WITH DIFFERENT LEVELS OF CONSTITUTIONAL STRESS REACTIVITY

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The aim of this work is a comparative study of the absorption of glucose and fructose in the small intestine of white rats with high and medium levels of constitutional stress reactivity.

The rats were divided into two groups depending on the level of constitutional stress reactivity: 1 - high stress reactivity; 2 – the average level of stress reactivity. Constitutional stress reactivity was assessed using a set of behavioral tests and analysis of histopathological differences in the tissues of the stomach, thymus, and adrenal glands in some of the animals of each group after immobilization stress. To study the absorption of monosaccharides, the method of perfusion of an isolated loop of the small intestine in vivo was used.

It was found that in rats with an average level of stress reactivity, the rate of glucose absorption at its initial concentrations in the cavity of an isolated loop of the small intestine of 25 and 50 mM was higher by 24–26% ($P < 0.05$) compared to animals with high stress reactivity. The absorption rate of fructose (25 and 50 mM) is higher in rats with an average level of stress reactivity compared to animals with high stress reactivity by 32-38% ($P < 0.05$). It was found that the main role in the adaptive rearrangement of glucose absorption to the level of constitutional stress reactivity is played by the transport system mediated by the SGLT1 transporter. A study of the kinetics of glucose absorption in the small intestine under the influence of an inhibitor of its active transport mediated by the SGLT1 transporter, phloridzin (2 mM), showed that in animals with an average level of constitutional stress reactivity, compared with animals with a high level of it, there is a significant increase in such an important constant of active glucose absorption as the maximum transport rate (J_{max}), a significant decrease in the rate constant of unsaturable absorption (K_d), while the Michaelis constant (K_t) does not change significantly. Therefore, in animals with an average level of constitutional stress reactivity, a higher coefficient of efficiency of the active glucose transport system through the apical membrane of the intestinal cell (J_{max}/K_t) is observed compared to animals with a high level of stress reactivity (more than 1.5 times).

Thus, the results obtained demonstrate the existence of a relationship between the genetically determined stress reactivity of the body and the transport function of the small intestine.

Keywords: *small intestine, glucose absorption, fructose absorption, the system of active glucose transport, constitutional stress reactivity.*

UDC: **612.39:57.034**

OPTIMIZATION OF ACTIVITY LEVEL AND EATING BEHAVIOR TO PREVENT CIRCADIAN RHYTHM DESYNCHRONOSIS IMPACT

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Optimizing our daily habits to balance the interactions between environmental factors, activity, and homeostatic factors in the internal environment results in improved quality and quantity of sleep, quality of wakefulness, metabolism, and overall health.

The goal is to test an experimental model of circadian rhythm desynchronosis caused by eating behavior and environmental conditions.

The experiment used laboratory animals (rats) (n = 20) raised in a vivarium. Motor activity was recorded using an actigraph (ActiGraph wGT3X-BT). Motivated eating behavior was stimulated by the use of hedonic food during the rest period after daily food deprivation, and physical activity was forcibly induced in a rotating cage during the rest period and during the active period. Statistical analysis was performed using Student's t-test.

The results indicate that after a period of wakefulness in conditions of physiological rest under natural light and with normal eating behavior with the use of a standard diet, the examined laboratory animals show increased motor activity in the dark within 800 units for every 2 hours. Whereas during daylight hours and at a standard meal, activity is 350 units during a meal and 150 units after a meal. During the use of hedonic food, motor activity was about 500-600 units, and at night 700-800 units. Violent desynchronosis at night caused significantly higher motor activity up to 1400 ($P<0.01$), and during daylight hours motor activity was significantly higher ($P<0.01$) compared to physiological rest.

We assume that environmental influence (violent desynchronosis) and food behavioral influence (hedonic diet) cause synergistic activation of the central oscillator in the suprachiasmatic nucleus and the orexinergic activating system of the lateral region of the hypothalamus. Thus, the activation of the interaction and synergistic effect of both central oscillators during the rest period contributes to the destruction of the natural circadian rhythm, excessive activity during the active period, as well as an imbalance in eating behavior and homeostatic metabolic rhythmic processes.

Keywords: *circadian rhythm, suprachiasmatic nucleus, orexinergic activating system.*

UDC:**612.332.7:612.396**

MEMBRANE HYDROLYSIS OF SUCROSE AND ABSORPTION OF FORMED MONOSACCHARIDES IN THE SMALL INTESTINE UNDER CONDITIONS OF DIETS WITH DIFFERENT CONTENT OF CARBOHYDRATES IN EARLY POSTNATAL ONTOGENESIS

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The aim of this work is to study the membrane hydrolysis of sucrose and the absorption of glucose and fructose formed in the small intestine of rats under the influence of diets with different carbohydrate content in early postnatal ontogenesis.

The studies were performed on male Wistar rats. After weaning, the rat pups of the experimental groups were kept for 6 weeks on diets with a high (78.2% of energy intake) or low (27.9% of energy intake) content of carbohydrates, or on a carbohydrate-free diet, then a part of the animals of each of the experimental groups were kept on a standard diet for 3 days, 2 or 6 weeks. Animals kept after weaning on a standard diet served as controls. The method of perfusion of an isolated loop of the small intestine *in situ* was used to study the digestive and transport processes.

It was found that a high carbohydrate diet leads to an increase in the hydrolysis of sucrose and the absorption of the resulting glucose and fructose (by 1.2–1.6 times) depending on the initial concentration of sucrose (12.5; 25 and 37.5 mM). Under the conditions of a low-carbohydrate diet, the studied parameters do not change at low concentrations of sucrose (12.5 and 25 mM), and at higher concentrations they decrease by 1.2-1.4 times. As a result of a carbohydrate-free diet, there is a sharp decrease in sucrose hydrolysis and glucose absorption (by 3 or more times) and fructose absorption is practically leveled. The transfer of animals from a low-carbohydrate diet to a standard diet leads to normalization of monosaccharide absorption after 3 days, and membrane hydrolysis of sucrose after 2 weeks. The transfer of animals from a high-carbohydrate diet to a standard diet leads only to a partial normalization of the intensity of hydrolysis and transport processes even after 6 weeks. The transfer of animals from a carbohydrate-free diet to a standard diet causes a gradual increase in membrane hydrolysis of sucrose and absorption of monosaccharides, however, even after 6 weeks, the absorption rate remains 1.5 times lower (glucose) and 3.5 times (fructose) than in the control.

Thus, long-term high-carbohydrate and carbohydrate-free diets in early postnatal ontogenesis, in contrast to a low-carbohydrate diet, contribute to the development of disorders in the membrane hydrolysis of sucrose and absorption of glucose and fructose formed in the small intestine.

Keywords: *small intestine, sucrose hydrolysis, glucose absorption, fructose absorption, sucrase activity, carbohydrates, early postnatal ontogenesis.*

UDC: **633.15:58.032.3:[576.314+576.343]:577.115**

MEMBRANE LIPIDS AND H^+-ATPASE PROMOTE *ZEA MAYS* L. TOLERANCE TO DROUGHT

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Purpose of the study was to determine biological effects of moderate water deficit on plasmalemma lipid composition in roots of two *Z. mays* varieties: drought-resistant "Dostatok" and non-resistant "Pereyaslavska" and also evaluate whether these changes could affect H^+-ATPase activities and adaptation of plants to water deficit, respectively.

Material and methods: plants grew in containers with sand substrate for 21-22 days of 80% moisture from plants (control) and 30% (experiment). The microsomal fractions enriched by plasmalemma were obtained from maize roots by two-phase aqueous polymer technique. Lipids were extracted from plasmalemma and their composition was analyzed by reversed-phase high performance liquid chromatography using Agilent 1100 HPLC-system. H^+-ATPase hydrolytic activity was determined by the number of released inorganic phosphorus in nmol PO_4^{-3}/mg protein / min.

Water deficit causes increase of estimated sterol proportion in fractions of plasmalemma: in 32.6% of total lipids for "Dostatok" and in 27.5% of total lipids for "Pereyaslavska" variety. In our experiments, water deficit led to decrease of total amount of glycolipids in both varieties. This phenomenon occurred due to inhibition of cell signaling function. The major phospholipids were: phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylinositol (PI) and phosphatidylglycerol (PG). Following water deficit, we observed a reduction of these phospholipids. Dehydration caused a sharp decrease of major phospholipids, especially PC and PE. In general, "Dostatok" appeared to be more adaptive to water deficit. Modulation of phospholipid environment of the plasma membrane regulates activity of H^+-ATPase. Activation of H^+-ATPase depends on degree of un\saturation of fatty acyl chains and their length. Data obtained show that hydrolytic activity of H^+-ATPase in plasma membrane of maize roots under conditions of adequate water supply was lower than under conditions of water deficit, in particular, in 2 times for variety "Dostatok" (225.67 52.8 nmol PO_4^{-3}/mg protein / min / / 59.59 449.0±59.59 nmol PO_4^{-3}/mg protein / min) and in 1.3 times for variety "Pereyaslavska" (117.93 ±27.05 / / 156.88 ±64.65 nmol PO_4^{-3}/mg protein / min.).

Conclusions: changes in the lipid composition and plasma membrane H^+-ATPase activity are important elements in determination of plant adaptive responses. Expression of above elements depends on stress factor intensity; they promote membrane stabilization during plant cell adaptation to environmental fluctuations.

Keywords**:** *drought, plasmalemma, lipid composition, H^+-ATPase activity.*

UDC: **577.2:577.34**

MODIFICATION OF BIOMOLECULES UNDER THE ACTION OF RADIATION

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The research focuses on the study of the cooperative effects of the radiation induced modification of biomolecules.

The purpose of this paper is the description of the cooperation mechanisms and the resistance of biomolecules (DNA/RNA, proteins) at different intensities, frequencies, and durations of the applied radiation pulses. The description of optical phenomena is achieved through classical and quantum models of thermodynamics and mathematical approximation methods. A fundamental aspect of the research is the highlighting of new physical mechanisms based on the phenomena of cooperation between molecules under the action of radiation.

The applicative aspect of the research is based on the selective excitation of biomolecules as well as on the dimerization of nucleotides (T=T). These reactions offer new opportunities for the selective inactivation of some organic compounds / pathogens. The destruction of the cell biopolymers makes it impossible to complete the cycles necessary to infect humans. Thus, we conclude, knowing the cellular reactions and new aspects of cooperation between bio molecules under the action of radiation, we can build equipment that will have the desired effect on the cells.

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

Keywords: *radiation, cooperative effects, biomolecules, quantum transitions.*

UDC: **613.29:616.34-002**

FUNCTIONAL FOOD COMPONENTS, DYSBIOSIS IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE

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Inflammatory bowel diseases (IBD) are characterized by a chronic inflammatory process that affects the intestinal barrier structure. Recent evidence suggests that some food components can influence the integrity of the intestinal barrier and thus its permeability. IBD is characterized by a chronic inflammatory process of the gastrointestinal tract and is marked by a disruption of the intestinal barrier with symptoms which vary from constipation, flatulence, diarrhea, reflux.In this study we wanted to see what influence certain groups of functional foods have on the intestinal flora.

Laboratory Amplification of the 16S rRNA gene region using PCR with universal primers Sequence the amplified products using a high-throughput platform such as the Illumina MiSeq Analysis of sequence data using bioinformatics tools such as QIIME or Mothur,Store samples at -80°C until DNA extraction with Extract DNA from faces samples using a commercial kit or a standard protocol, Patient collection of stool samples using sterile containers and gloves.Comparison of microbial diversity and composition between different participants in the study and identifying potential associations between the gut microbiome before and after dietary intervention with functional foods, listed in the results below.

For a period of 8-9 months, the dietary intervention was observed by reducing dairy products, red meat and introducing functional foods, such as listed in tabel 1 with the reduction of gastrointestinal symptoms.

In conclusion, our results showed in the tabel 1, that the benefit in including and excluding, in short-term, specific food components, have potentially beneficial for IBD patients is important to improve inflamatory markers. But it is still uncertain if IBD individuals could benefit in time for reaccurence from this type of nutritional therapeutic intervention The intake/restriction of those nutrients/food did affect, in a significant way, the gut bacteria and the gastrointestinal symptomatology.

Table 1. Comparison of microbial composition before and after dietary intervention with functional foods

DYSBOSIS , CFU/g faces before	FLORA pH-faces INDEX before	DIETARY THERAPY/Time of intervention	DYSBIOSIS CFU/g faces after	FLOA pH-faces INDEX after
PACIENT R.I				
E.coli 2x10^9 Proteus 2x10^8 Klebsiella 1x10^9 Bifidobacterium 1 x 10^8 Lactobacillus 1 x 10^5 Enterococcus 1 x 10^4 Candida albicans 4x10^6 Bloating,flatulance, constipation symptoms, halen, refflux gastroesophageal	Flora index 12 pH 7.5	8 months, black cumin oil, turmeric tea, garlic extract 500mg, oregano oil carvacrol 80%, l.glutamine 1-2gr, zero dairy, normal fats, low sugar intake, no red meat, fiber intake 25gr	E.coli 1 x 10^9 Proteus 1 x 10^4 Klebsiella 1 x 10^4 Bifidobacterium 4x10^9 Lactobacillus 1 x 10^5 Enterococcus 1 x 10^5 Candida albicans 5x10^5 Improved bowel movment, reduced bloating and flatulance and reflux	Flora index 10 pH 7.00
PACIENT F.E				
E.coli 2x10^9 Klebsiella 2x10^9 Bifidobacterium 1 x 10^8 Lactobacillus 1 x 10^5 Enterococcus 1 x 10^4 Bloating,flatulance, constipation symptoms, halen, refflux gastroesophageal	Flora index 10 pH 8.00	9 months black cumin oil, turmeric tea, garlic extract 500mg, oregano oil carvacrol 80%, l.glutamine 1-2gr, zero dairy, normal fats, low sugar intake, no red meat, fiber intake 25gr	E.coli 2x10^9 Bifidobacterium 1 x 10^8 Lactobacillus 4 x 10^6 Enterococcus 1 x 10^4 Improved bowel movment, reduced bloating and reflux	Flora index 7 pH 7.5

Keywords*: inflammatory bowel disease; dysbiosis; functional foods, dietary therapy, food restriction.*

UDC: **616-056.7-07**

MOLECULAR DIAGNOSTIC STRATEGIES IN PATIENTS SUSPECTED FOR MITOCHONDRIAL DNA DISORDERS

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Mitochondrial DNA (mtDNA) disorders encompass a broad group of inherited neuromuscular disorders caused by a biochemical defect of the respiratory chain and oxidative phosphorylation system, with a minimum prevalence of around 1:5,000 live births. The clinical diagnosis of individuals with mitochondrial disease poses a major challenge due to the clinical heterogeneity and therefore, proper genetic diagnosis of mtDNA disorders is important for prognosis and to provide counselling.

The purpose of the study is to present the current strategies for the genetic diagnosis of mtDNA disorders used by the Laboratory of Human Molecular Genetics of The Mother and Child Institute.

The present study was carried out on 43 patients with the characteristic phenotype of mitochondrial diseases. The strategy for the molecular-genetic diagnosis of mitochondrial disorders caused by mtDNA mutations involved performing HRM (High Resolution Melting) analysis in order to test patients for the most common pathogenic point mutations, followed by partial sequencing of the mitochondrial genome by the Sanger technique.

After testing 43 patients by the HRM technique, 3 patients with pathogenic mutations associated with mitochondrial pathologies were identified (7%). The Sanger sequencing technique was performed in 23 patients, and as a result, pathogenic or potentially pathogenic mutations associated with mitochondrial pathology were identified in 9 patients (39%).

The molecular-genetic techniques available in the Republic of Moldova can effectively be used for the diagnosis of mitochondrial diseases caused by mtDNA mutations. The current strategies for the genetic diagnosis of mtDNA disorders used by the research team within the Human Molecular Genetics Laboratory of the Institute of Mother and Child, allow establishing in a short period of time, but also cost effectively, the presence or absence of pathogenic variants at the level of mtDNA. In the group of 43 investigated patients, it was possible to identify pathogenic and potentially pathogenic variants associated with the patients' phenotype in 28%.

***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, Contract 22-PS, 03.01.2022].

Keywords: *mitochondrial DNA; mitochondrial disease; HRM technique; Sanger sequencing.*

UDC: **577.112.386:577.122.3**

THE ROLE OF COFACTORS IN HOMOCYSTEINE METABOLISM: A REVIEW OF CURRENT KNOWLEDGE

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Homocysteine, a sulfur-containing amino acid derived from methionine metabolism, has emerged as a significant biomarker in the study of various pathological conditions. Dysregulation of homocysteine metabolism has been linked to cardiovascular diseases, neurological disorders, and developmental abnormalities. This review aims to provide an overview of the current understanding of the role of cofactors in homocysteine metabolism, highlighting the mechanisms by which they modulate enzyme activity, and their implications in health and disease.

A comprehensive search of scientific literature was performed to identify relevant studies investigating the role of cofactors in homocysteine metabolism. Studies encompassing both in vitro experiments and clinical observations were included. The selected studies were critically evaluated to elucidate the molecular mechanisms by which cofactors influence key enzymes involved in homocysteine metabolism.

In vitro studies have consistently demonstrated the essentiality of cofactors, such as folate, vitamin B12, and vitamin B6, in the proper functioning of enzymes that regulate homocysteine metabolism. Folate, in the form of 5-methyltetrahydrofolate, acts as a methyl donor for the remethylation of homocysteine to methionine via methionine synthase. Vitamin B12 serves as a cofactor for methionine synthase and methionine synthase reductase, facilitating the conversion of homocysteine to methionine. Vitamin B6, as pyridoxal phosphate, is involved in the transsulfuration pathway, converting homocysteine to cysteine through the action of cystathionine beta-synthase. Dysregulation or deficiencies in these cofactors disrupt the enzymatic activity of these key enzymes, leading to impaired homocysteine metabolism and elevated homocysteine levels.

The reviewed literature underscores the critical role of cofactors in homocysteine metabolism. Adequate levels of folate, vitamin B12, and vitamin B6 are essential for the proper functioning of enzymes involved in homocysteine clearance pathways. Deficiencies in these cofactors have been consistently associated with elevated homocysteine levels, which have been implicated in the pathogenesis of numerous diseases. Consequently, maintaining optimal levels of these cofactors through dietary intake or supplementation holds promise as a potential therapeutic strategy for preventing or managing homocysteine-related disorders. However, further research is needed to elucidate the optimal dosage, duration, and potential interactions with other factors to maximize the benefits of cofactor supplementation.

Keywords: *homocysteine, folate, vitamin B12, vitamin B6.*

UDC: **575.86:599.363(478)**

SEQUENCING AND PHYLOGENETIC ANALYSIS OF MICROTUS ARVALIS CYTB GENE

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Microtus arvalis is a rodent species that inhabits different areas of Europe and Asia and includes several evolutionary lineages: Western (United Kingdom, France, Spain), Italian (Italy), Central (Germany, Netherlands, Denmark, Switzerland), Eastern (Hungary, Slovakia, Poland, Ukraine, Finland) and a distinct lineage (Ukraine, Georgia, Armenia, Turkey) coinciding with the distribution of the subspecies *Microtus arvalis obscurus*. In our research we aimed to determine the evolutionary lineage specific to *M. arvalis* specimens from the Republic of Moldova. We propose to sequence and perform phylogenetic analysis of the cytochrome *b* (CYTB) gene from field voles sampled in Moldova. The cytochrome *b* gene is often used to identify species and determine phylogenetic relationships between organisms because it possesses limited variability within the species and high variability outside of it.

In the Republic of Moldova the genus *Microtus* is represented by 2 species: *M. arvalis* and *M. rossiaemeridionalis*. Since these two are cryptic species (cannot be differentiated morphologically) and their habitat area overlaps, it was not possible to differentiate them at the time of sampling. Thus, for sequencing were collected 13 samples of the genus *Microtus*, collection sites being located in Chisinau, Horesti, Malcoci and Piatra Alba. The identification of the 13 specimens was achieved using Sanger sequencing technology resulting in 8 sequences for *M. rossiaemeridionalis* and 5 for *M. arvalis*. The 5 sequences of interest with a size of 1106 bp were compared with other 26 CYTB sequences (obtained from GenBank) that represent the species *M. arvalis* and are associated with all the evolutionary lineages mentioned above. The phylogenetic analysis of 31 sequences was performed in the R programming environment with the application of the NJ (Neighbor Joining) method.

The obtained phylogenetic tree revealed 5 clusters associated with the described lineages. It was established that the studied specimens from Moldova belonged to the Eastern evolutionary lineage in *M. arvalis*. All molecular barcodes of specimens from Moldova have been registered on the BOLD Systems global platform.

***Acknowledgments*:** this study was supported by the research project no. 20.80009.7007.02 Evolutionary changes of economically important terrestrial fauna, of rare and protected species in the conditions of anthropogenic and climatic changes, funded by the Ministry of Education and Research.

Keywords: *sequencing, phylogenetic analysis, cytochrome b, Microtus arvalis.*

UDC: **575.224.2:616.24-006.6(478)**

SOME TP53 AND EGFR DRIVER MUTATIONS IN NSCLC PATIENTS FROM THE REPUBLIC OF MOLDOVA

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Lung cancer is the leading cause of cancer death worldwide, non-small cell lung cancer (NSCLC) being the main type. NSCLC also has two main histological subtypes - lung adenocarcinoma (LUAD) and lung squamous cell carcinoma (LUSC). In the Republic of Moldova, in 2022, 424 people were diagnosed with lung cancer, of which 327 were men and 97 were women. Out of 320 histologically classified cases, 226 (70.63%) were NSCLC.

In all types and subtypes TP53 mutations occur with a high frequency while EGFR driver mutations are important for establishing the treatment strategy.

In this study, we aimed to detect some TP53 and EGFR driver mutations in NSCLC histological subtypes at patients from the Republic of Moldova.

In the study, were included 67 people with NSCLC: 39 cases (39/67, 58.21%) of LUSC, 25 cases (25/67, 37.31%) of LUAD and one case each of pleomorphic carcinoma (LUPC), adenosquamous carcinoma (LUAS) and lung adenocarcinoma with large cell neuroendocrine carcinoma (LUAD with LUNE).

Fresh tumor tissue and FFPE (Formalin-fixed, paraffin-embedded) samples were tested by the castPCR method for driver mutations c.524G>A, c.818G>A and c.817C>T in the TP53 gene and driver mutations ex19Dels, c.2572_2573CT>AG and c.2369C >T in the EGFR gene.

From the total number of samples tested 13 had non-functional DNA for TP53 mutations and 19 for EGFR mutations. There were detected 14 positive samples for TP53 mutations: 4 cases with c.524G>A (3 LUSC, 1 LUAD), 9 cases with c.818G>A (LUSC) and one case with c.817C>T (LUSC). Regarding the tested EGFR mutations, there were identified 5 positive cases, of which 3 cases with ex19Dels mutations (LUAD) and 2 cases with the c.2572_2573CT>AG mutation (LUAD).

In the analyzed samples, the TP53 tested mutations occur mainly in LUSC while EGFR tested mutations occur exclusively in LUAD.

***Acknowledgments*:** this study was supported by the research project 20.80009.8007.02 Comparative study of genomic, immunological and functional features of squamous cell carcinomas in five anatomical locations, funded by National Agency for Research and Development

Keywords: *lung cancer, driver mutations, TP53, EGFR.*

Session D

ENVIRONMENT PROTECTION AND NATURAL RESOURCES MANAGEMENT

UDC: **581.54:634.5**

RESEARCH AND DEVELOPMENT OF A UNIFORM PHENOLOGY SCALE FOR PECAN TREE VARIETIES

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Pecan trees are notorious for alternate bearing. Some varieties are prone to bigger yields one year and smaller crops the next, while others tend to produce good crops every year. A pecan tree has both male flowers (pendant catkins), and female flowers (erect spikes), on the same tree. Type I (protandrous) pecans have male flowers that release their pollen before their female flowers are receptive to pollen shed. Type II (protogynous) pecans release their pollen after their female flowers were receptive. There is also variation in flowering time among varieties within each type. Both types must be present to get pollination and subsequent nut development, and the bloom periods must overlap. Experience has shown that three or more pecan varieties planted together provide the best pollination, and therefore the biggest nut crops. Plants respond to environmental changes by shifting the timing of life-cycle events. Phenology is the simplest process to track the ecological changes of species in response to climate change. In fact, a species, phenology scale includes understanding the influence of seasonal and year-toyear variation in climate on the species' life-cycle events and activities. Understanding the phenology is essential to provid a standard format for recording plant responses to climate change, plan for how these changes affect activities such as resource management and production practices, and help in decision-making and adaptation in response to variables, changing climates and environments. There are two major approaches to monitoring and recording phenology: phenophase status and phenological event monitoring.

Field observations of individual plants using the two approaches yield different types and amounts of phenology data. Phenophase is an observable stage in the plant's annual life cycle that can be defined by a start and endpoint, and generally has a duration of a few days or weeks. The phenophases are used as a standard unit of observation, and maintain uniformity and simplicity within phenophase definitions to facilitate comparisons across taxa. A phenological event is a point in the annual life cycle of a plant, generally marking the start or endpoint of a phenophase, and can be recorded as a calendar date. In this approach, the observer watches for a defined phenological event during the plant's life cycle. The observation of the life cycle event using the phenological event approach results in one data record compared to the multiple data records for the same event observed with the phenophase status monitoring approach. Application of decimal codes for pecan growth stages, including timing and external morphology, provides a useful guide for pecan growers. It can help growers manage different practices such as pruning, thinning, and applying pesticides in their orchards. As phenology scale can be used to define the start and end of the growing season, it can also be used in global climate change research, considering the great diffusion of pecan growing areas around the world.

Keywords: *pecan trees, phenology scale, observation, variation, phenophase.*

UDC: **556.535(478)**

RESTORATION OF THE NATURAL REGIME OF SMALL RIVERS (BY THE EXAMPLE OF THE REPUBLIC OF MOLDOVA)

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The restoration of small rivers on the example of the hydrological network of Moldova is analyzed. Methodically, the studies included a general analysis of the channel forms characteristic of small rivers in Moldova, an analysis of the hydraulic regime and experimental studies of the fields of average velocities and turbulence of small rivers. We have found that the restoration of small rivers should include the following methods: 1) Calculation of the stability of cross sections for regulatory purposes. This method takes into account the data on the capacity of the channel (Qo), the slope of the river bottom (Id), the roughness coefficient (n) when the channel is completely filled, the Grishanin parameter (M), the limiting angle of the stable slope of soils in water (B), the characteristics of solid runoff; 2) Calculation of the planned form of the meandering riverbed. For this method, four approaches have been applied to restore the channels: the first approach is based on restoring the planned form before human intervention. The implementation of the second approach is based on the dependence of the morphometric characteristics on empirical dependencies connecting the morphometric characteristics of the meanders with the hydraulic and hydrological parameters of the flow. The third approach involves the formation of a meandering channel, without first giving it a meandering shape. The fourth, systematic approach, is based on the analysis of meanders and geomorphological assessment of the disturbed territory; 3) Designing the route of the restored channel. This procedure, by using the main sinus function, was necessary to estimate the midline of the valley floor (from the map). When calculating the ordinates for this dependence, the values of (λ) and (Ym) are used. The survey analysis carried out gives grounds to draw a conclusion about the beginning of the creation of scientific foundations for the restoration of the main parameters of the channel and the hydrological regime of straightened small rivers in Moldova. These should include environmental and other requirements, analytical and empirical methods for calculating stable cross-sections for channel regulation, calculation of the planned form of a meandering river channel, and designing the route of the restored channel.

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***Keywords*:** small rivers, restoration, methodology.

UDC: **579.8:636.084:502.3(624)**

UNVEILING THE MENACE: FUNGAL CONTAMINATION IN ANIMAL FEED IN SUDAN AND ITS IMPACT ON ENVIRONMENT PROTECTION AND NATURAL RESOURCES MANAGEMENT - A COMPREHENSIVE REVIEW

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This comprehensive review examines the assessment of fungal contamination in animal feed in Sudan and explores its far-reaching implications for environment protection and natural resources management. Fungal contamination poses a critical challenge in maintaining the quality and safety of animal feed, thereby impacting both the livestock industry and the environment.

Sudan's diverse agricultural practices and significant livestock sector make it vulnerable to fungal contamination in animal feed. Factors such as inadequate storage facilities, suboptimal quality control measures, and limited awareness among feed producers and farmers contribute to the prevalence of fungal contamination. This creates an environment conducive to fungal growth and mycotoxin production, posing health risks to both animals and humans. Improper disposal of contaminated feed further leads to environmental pollution, impacting soil quality, water resources, and ecosystem health. It is crucial to implement effective measures to address these challenges and mitigate the risks associated with fungal contamination. Addressing the issue of fungal contamination necessitates comprehensive strategies throughout the feed production and supply chain. Key interventions include enhancing storage facilities, implementing rigorous monitoring and testing protocols for fungal contamination, promoting the adoption of good agricultural practices, and raising awareness among stakeholders about the critical importance of feed quality for environment protection and sustainable natural resources management.

The ramifications of fungal contamination in animal feed are significant for Sudan's livestock sector, as they directly impact animal health, the integrity of the environment, and the sustainable management of natural resources. This review underscores the urgency of collaborative efforts and comprehensive measures to combat fungal contamination, considering Sudan's specific circumstances and the implications for environment protection and natural resources management. By understanding and addressing these challenges, Sudan can pave the way for safeguarding animal welfare, preserving the environment, and ensuring the sustainable use of its valuable natural resources.

Keywords: *fungal contamination, animal feed, Sudan, environment protection.*

UDC: **582.28:502.3**

ISOLATION AND PRESERVATION OF YEAST STRAINS FROM WATER

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Yeasts are single-celled fungi that can be isolated from numerous environments, including soil, water, and other habitats. Due to their unicellular growth type and saprophytic nature, they colonize and exploit especially liquid substrates or habitats with high moisture content. A research was carried out to isolation of different types of microorganisms (such as: bacteria, actinobacteria, cyanobacteria and microalgae, filamentous fungi and yeasts) from water of the "La Izvor" park lakes. The aim of the research was isolation a pure culture of microorganisms, identification of strains with biotechnological potential and their preservation by different methods.

For study were isolated four new yeast strains on malt agar medium used as a nutrient medium for the cultivation and growth at temperature of $+28^0$C, for 48-72 hours. Preservation was carried out by the lyophilization method in skimmed milk with 7% sucrose served as a protective medium. After resuspending the culture in the protective medium and distributing 1 mL each in ampoules, the samples were freeze-dried at t^0 - 80^0C, then lyophilized in the Free Zone Plus system, after that sealed and stored at $+4^0$C.

The determination of the yeast cultures viability was carried out by the method proposed by Donev 2002 according to the principle of serial dilutions into a sterile Petri dishes, to measure colony-forming units and performing statistical calculations using the MS Excel 2010 program.

As a result of this study, from water of lakes of the "La Izvor" park were isolated in pure culture five strains of yeasts, one of them being pathogenic (g. *Candida*) was excluded. According to the first tests of morphological and cultural characteristics, three out of four strains belong to g. *Saccharomyces* and one to g. *Schizosaccharomyces*. It is known that yeast strains have ability to synthesize important substances widely used in agriculture. After identification by molecular biological methods will be folowed biochemical properties determination of selected strains for replenishing the National Collection of Non-pathogenic Microorganisms.

As a result of the lyophilization preservation of selected strains, we found that their viability after lyophilization varies between 89-94% for three strains belong to g. *Saccharomyces* and 11-16% lower for representative strains of *Schizosaccharomyces*, or up to 22% compared to the viability before lyophilization. Within the National Collection of Non-Pathogenic Microorganisms there are strains that have significant osmotic and thermal shocks at the process of preservation by lyophilization. Also, it has been demonstrated that after several years of storage the viability is maintained or decreases insignificantly, but a high viability after lyophilization cannot be guaranteed to long-term preservation.

Keywords: *yeast, lyophilization, preservation, water.*

UDC: **556.55(478):551.58**

CLIMATE CONDITIONS OF THE CUBOLTA RIVER BASIN

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This study addresses aspects related to the assessment of climatic elements, which play an important role in the spatial distribution of land use, in the structure, functionality and dynamics of the landscapes. This problem being necessary and current in the context in which the Cubolta river basin needs special protection due to intensive agricultural exploitation (about 90% of the total area). In order to assess the climatic conditions in the Cubolta river basin, quantitative and qualitative parameters were analyzed represented by: average annual temperature and annual rainfall, which were taken from two meteorological stations (Briceni, Soroca and Bălți) for a period of 40 years (1980 - 2020). Thus, it was established that for the analyzed period, the general trend of average annual temperatures is one of increase, by about $0,4^0$C. If in the period 1981-2010, temp. The annual average in the basin was $+9.2^0$C, then already in 1991-2020, it constituted $+9.6^0$C. In the winter period, these variations were from -1.8^0C to -1.5^0C, and in the summer period the temperature increased by 1.0^0C, from $+20.0^0$C to $+21.0^0$C. Precipitation, in the same time interval, decreased by 10 mm. If during the period the amount of average precipitation in 1981-2010 was 590 mm, then in 1991-2020 – only 580 mm. Between 2015 and 2022, the average annual rainfall generally fell below 550 mm. Analyzing the correlation between the dynamics of temperature and that of the amount of precipitation, the trend of aridification within the limits of the basin is very clearly highlighted, which will also influence the structure of the landscapes categories.

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Keywords: *Cubolta river basin, climat.*

UDC: **58.14:551.5**

THE USE OF GIS IN THE CALCULATION OF VEGETATION CONDITION INDICES

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The NDVI process creates a single-band dataset that mainly represents vegetation density and vigor. The differential reflection in the red and infrared (IR) bands enables you to monitor density and relative vigor of vegetation growth using the spectral reflectivity of solar radiation. Healthy vegetation commonly exhibits higher reflection in the near-infrared wavelength range than in the red wavelength range. When leaves are water stressed, diseased, or dead, they become more yellow and reflect significantly less in the near-infrared range. Infrared wavelengths are absorbed by clouds, water, and snow, and reflected similarly as the red band by rock and bare soil. The negative values represent clouds, water, and snow, and values near zero represent rock and bare soil.

An NDVI is often used worldwide to monitor drought, monitor, and predict agricultural production, assist in predicting hazardous fire zones, and map desert encroachment. The NDVI is preferred for global vegetation monitoring because it helps compensate for changing illumination conditions, surface slope, aspect, and other extraneous factors.

The default equation for NDVI is as follows:

NDVI = ((IR - R)/(IR + R))

IR = pixel values from the infrared band

R = pixel values from the red band

This scientific index outputs values between -1.0 and 1.0, which represents vegetation density and vigor. Negative values are mainly generated from clouds, water, and snow, and values near zero are mainly generated from rock and bare soil. Very low values (0.1 and below) of NDVI correspond to barren areas of rock, sand, or snow. Moderate values (0.2 to 0.3) represent shrub and grassland, while high values (0.6 to 0.8) indicate temperate and tropical rainforests.

ArcGIS Pro software and Sentinel-2 satellite images were used to calculate NDVI. Several protected areas with representative forest vegetation were selected as case studies.

Acknowledgments: this study was supported by the research project of the Institute of Ecology and Geography, (Internal Research Program 2020-2023) „Spatio-temporal modeling of environmental abiotic factors for estimating the ecological stability of landscapes" Code: 20.80009.7007.08.

Keywords: *NDVI, ArcGIS Pro, Sentinel-2, state of the forest vegetation, land use, aridity.*

UDC: **635.9:502.1(478-22)**

INVASIVE SPECIES OF WOODY PLANTS IN THE „ORHEIUL VECHI" PROTECTED AREA

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The EU Biodiversity Strategy for 2030 sets out a comprehensive framework of commitments and actions to tackle the main causes of biodiversity loss. Despite the growing concerns regarding the problem of phytoinvasions, the understanding of the mechanisms that determine the distribution and abundance of invasive plant species, on a local or regional scale, is still limited. Thus, researches regarding the rapid identification of invasive and potentially invasive species, their monitoring, highlighting the adaptive particularities of invasive species, become extremely necessary, understanding the ecophysiological responses of invasive species and their adaptation mechanisms being essential to predict the spread, especially in changing environmental and climatic conditions.

The present study is focused on the inventory and analysis of the distribution of the invasive species *Ailanthus altissima* (Mill.) Swingle in the „Orheiul Vechi" protected area. Observations on invasive and potentially invasive plant species in the reserve were carried out during the years 2021-2023. The method of linear transects was used to assess the distribution of the species *A. altissima*, by direct observation (visual marking). Observations in the field were carried out during the summer-autumn and winter, when the phenotyping of the species is easy to achieve.

In order to identify the distribution corridors of this species in the „Orheiul Vechi" protected area, the abundance and distribution of *A. altissima* populations in the given area was analyzed. The five-interval DAFOR scale was used to determine the frequency of *A. altissima* in the dendroflora of Butuceni and Morovaia villages and on the section between these villages. The GPS application was used for the exact location of the populations.

It has been established that the number of trees with the highest height and thickness of the stem, but also the number of mature individuals with seeds is attested in the village of Morovaia and in the segment between these two villages. According to the DAFOR scale, the species was cataloged as *dominant, abundant* and *frequent* in the village of Morovaia, while in the village of Butuceni it fell more often into the category of *rare* and *occasional* spread, which indicates that the species' spread corridor has the Morovaia-Butuceni vector.

Taking into account the imminent danger of invasive species, their early detection, early eradication and systematic monitoring are the most economically effective actions to avoid the further spread of the species in question, while understanding the mechanisms that allow a rapid population growth of exotic species is an important step in the process of controlling existing invasions and preventing future invasions.

Keywords: *invasive species, Ailanthus altissima, protected area.*

UDC: **504.4.054:577.164.1**

NEW APPROACHES IN ESTIMATING PROCESSES OF RADICAL SELF-PURIFICATION OF WATERS

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From all the processes of chemical self-purification of natural waters, radical processes have the greatest impact on the restoration of the initial natural chemical composition. The study of water self-purification processes is a complex task, which involves the study of both the chemical composition and the processes that determine this composition. Research in this field can allow the estimation of the maximum "load" with various pollutants of aquatic objects. The ecological state of waters can be evaluated with kinetic parameters: inhibition capacity, stationary concentration of hydrogen peroxide, redox state. However, these parameters do not suggest full information about the persistence of pollutants in the environment.

The aim of the work is to estimate the impact on the processes of radical self-purification of waters by determining the antioxidant activity of some potential pollutants. Thus, two reducing compounds were selected, which are found in the water composition - cysteine (Cys) and ascorbic acid (AA).

The antioxidant activity of the reducers was established by the DPPH method, calculating the EC_{100} parameter (the effective concentration of the substrate that consumes 100% oxidant (with reference to free radicals)), or the inverse of the antiradical power (ARP). EC_{100} values were obtained for ascorbic acid (0.74) and for cysteine (2.36), indicating a more pronounced antioxidant activity of AA (ARP=1.35) than Cys (ARP=0.42).

In order to be able to interpret the obtained results, with reference to the impact of these reducers on the radical self-purification processes, they were analyzed in relation to the kinetic parameters of the induced photolysis of the studied compounds. According to them, ascorbic acid undergoes induced photolysis with a higher intensity ($k=(2,45\pm0,09)\cdot10^{-4}s^{-1}$) than cysteine, for which $k=(1,77\pm0,10)\cdot10^{-4}s^{-1}$. In other words, cysteine is more persistent in the environment and its oxidation requires a larger amount of free radicals.

The EC_{100} values indicate a 3.2-fold lower antioxidant activity of cysteine compared to ascorbic acid, which can also be interpreted as cysteine being a reductant that requires higher amounts of oxidative equivalents to be oxidized.

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Keywords: *natural waters, pollutant, self-purification processes, redox state.*

UDC: **633.85:632.115.3(478)**

THE IMPACT OF HEAT WAVES ON SUNFLOWER YIELD IN THE REPUBLIC OF MOLDOVA

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Heat waves fall under the category of weather-climatic risks that increasingly affect socio-economic activity, often having serious consequences on agriculture and the state of the environment. In the climate observations of the Republic of Moldova, heat waves are highlighted by tropical days (maximum daily temperature ≥30°C), hot days (maximum daily temperature ≥33°C), respectively tropical nights (minimum daily temperature ≥20°C).

The study carried out consisted in establishing the impact of the heat waves of the last two decades on the size and quality of the sunflower yield in the Republic of Moldova.

Instrumental measurement data, collected from the archives of state institutions in the respective field, were used as primary materials for the study. The mentioned data were systematized, processed, interpreted graphically and cartographically, with the use of statistical programs - Statgraphics, Instat Plus and QGis, in accordance with the proposed objectives.

In the Republic of Moldova, during the last 23 years, absolute maximum temperatures have recorded high values and increased frequency: between 30.0 and 32.9°C – 684 cases; between 33°C and 34.9°C - 270 cases; between 35°C and 39.9°C – 185 cases; temperatures ≥ 40.0°C – 8 cases. In all these years, temperatures ≥ 33.0°C were recorded. But these warm-ups can have a different effect. In the last two decades, an expansion of temperatures ≥ 30°C and ≥ 35°C is increasingly observed, being a possible consequence of global warming.

The most intensive and prolonged heat waves during the study period were recorded in the warm season of 2007, 2012, 2015, 2020 and 2022, when the sunflower yield was significantly reduced. For example, performing a comparative analysis of the average yield per 1 ha of sunflowers in 2020 with the corresponding yield in 2019 and with that of the previous 10 years (2010-2019), allowed establishing the impact of the intensive and long heat waves in 2020 on the average sunflower crop in administrative-territorial profile, being compromised by about 50% of its size compared to that of 2019.

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Keywords: *heat waves, frequency and duration of heat waves, impact of heat waves, sunflower fruit.*

UDC: **633.85:632.112(478)"2022"**

THE IMPACT OF THE CATASTROPHIC DROUGHT IN THE SUMMER OF 2022 ON THE SUNFLOWER YIELD IN MOLDOVA

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The drought in the Republic of Moldova represents the specific feature of the regional climate, being conditioned by the very uneven spatial-temporal distribution of atmospheric precipitation against the background of high air temperature values. Droughts on the territory of the Republic of Moldova are the result of frequent advection of air masses with different characteristics, their subsequent transformation under the influence the underlying surface, during their stationing which leads to the formation of the deficit of humidity and rising temperatures.

The purpose of this work was to determine the impact of the drought in the summer of 2022 on the development and fruit formation of the sunflower crop in the Republic of Moldova.

The investigations carried out are based on the initial data collected from the archives of specialized state institutions. The factual data collected were systematized, processed, interpreted graphically and cartographically, with the help of statistical programs - Statgraphics, Instat Plus and QGis in accordance with the proposed objectives.

The summer of 2022 in the Republic of Moldova was hot and basically with a large deficit of precipitation. The average air temperature for this season in the territory was +21.1...+23.7ºC, being 2.0-3.2ºC higher than the norm. Abnormally warm weather was in the third decade of August, when the average decadal air temperature exceeded the norm by 5-6ºC. The amount of precipitation for the May-July period was basically 30-90 mm (15-45% of the norm), which on a large part of the territory was reported for the first time in the entire period of observations.

Due to the severe aridity, which was maintained during the summer season on a large part of the country's territory, extremely unfavorable conditions were created for the formation of sunflower fruit, as well as for the absolute majority of agricultural crops. Carrying out the comparative analysis of the average yield per 1 ha of sunflowers in 2022 with the respective yield in 2021 and with that of the previous 10 years (2012-2021), allowed establishing the impact of the strong and very strong drought in 2022 on the average yield of sunflowers in administrative-territorial profile. Thus, the drought in the summer of 2022 compromised about 42% of the sunflower fruit, constituting only 14.4 ch/ha compared to 24.6 ch/ha in 2021.

***Acknowledgments*:** this study was supported by the research project 20.80009.5107.01, funded by NARD.

Keywords: *heat waves, frequency and duration of heat waves, impact of heat waves, sunflower fruit.*

UDC: **551.583.1(478)"1961/2020"**

COMPARATIVE ANALYSIS OF THE PERIODS 1961 – 1990 AND 1991 – 2020 REGARDING THE IMPACT OF CLIMATE CHANGE ON THE DATE OF THE DANGEROUSE FROSTS ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA

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Despite the increasingly advanced development of technology and its importance for human life and activity, our dependence on the climate is undeniable, especially in the current period due to climate change. Thus, climatic phenomena with a risk aspect become more and more dangerous for everything alive and especially for humans, due to the random character of their manifestation. Among them are the frosts, which are quite dangerous when they occur outside the typical season. Frosts are observed in late spring, when agricultural crops are in an active phase of development, and in early autumn, when the fruit has not been harvested yet, causing frostbite or even the death of some crops/plants annually on the territory of the Republic of Moldova.

Along with the changes that take place at the regional climatic level, there are also changes regarding the date of their manifestation, therefore for the present study we analyzed some of the parameters that are characteristic for dangerous frosts: the extreme dates of the manifestation of the first and last frost and the duration of the frost-free period specific to them. We should mention the fact that the frost-free period is an indicator that's directly proportional to the duration of the period of active vegetation of agricultural crops in which they manage to pass through all the phenological phases of development.

Data was collected from the archives of the State Hydrometeorological Service from 14 meteorological stations. The resulting database obtained was statistically processed using Microsoft Excel and Statgraphics software, and the spatialization was carried out in ArcGIS 10.2. Two time periods of 30 years each (climate periods), which include the years 1961-1990 and 1991-2020, were subjected to the spatio-temporal analysis.

The results obtained from the data analysis show us some obvious changes regarding the extreme date of the last frosts for the period 1991 - 2020, which know an advance towards the warm period of the year by about 10 days compared to the period 1961 - 1990, which tells us about the shrinking of the growing season. Also, the date of occurrence of early frost knows some changes. It manifests itself about 6 - 13 days earlier, which represents an advance towards the warm period, thus reducing the vegetation period. As a result, there is also a change in the frost-free period, which shows a decrease for Baltata and Tiraspol m.s. respectively by about 10 and 3 days recorded in the period 1991 - 2020 compared to the period 1961 - 1990.

The information is of interest to farmers for the correct placement of thermophilic plants, as well as for establishing areas favorable to them. Another aspect regarding the need for this study is the establishment of the optimal sowing/planting period of different agricultural crops in order to optimize the process of their active growth.

***Acknowledgments*:** the studies were carried out within the project: „Modelarea spațio-temporală a factorilor abiotici de mediu pentru estimarea stabilității ecologice a peisajelor" cu cifrul 20.80009.7007.08.

Keywords: *climate change, dangerouse frosts, Republic of Moldova.*

UDC: **502.1:582.5/.9(478)**

PROTECTED PLANT SPECIES ON THE TERRITORY OF THE "FETEȘTI" LANDSCAPE RESERVE

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The "Fetești" landscape reserve (Edineț district) stands out for its diversity of habitats, which also determined the floristic richness. Taking into account the intensity of anthropic pressure (clear cuttings to promote natural regeneration, excessive grazing, etc.) and the negative influence of natural factors in recent decades (especially drought), a study was required to specify the composition of rare plant species in this territory.

The data presented in this work are the result of the study of rare plant species, which have national, regional and international protection status. The study was carried out by the itinerary method. Specialized literature was used to determine the systematic affiliation of the identified species and the protection status of rare species.

As a result of the conducted research, the presence of 42 rare plant species was found, belonging to 36 genera from 19 families. The data analysis showed that the most species-rich families were *Liliaceae* with 16% of the total number of rare species and *Ranunculaceae* with 13%.

The Red Book of the Republic of Moldova (ed. III) includes 15 species of rare plants, attributed to different categories of rarity: critically endangered (CR) - *Herniaria glabra L., Melittis sarmatica Klokov*; endangered (EN) - *Cotoneaster melanocarpus Fisch. ex Blytt, Crambe tatarica Sebeok, Dictamnus gymnostylis Stev., Lunaria rediviva L.*; vulnerable (VU) - *Dryopteris filix-mas (L.) Schott, Epipactis purpurata Smith, Fritillaria montana Hoppe, Galanthus nivalis L., Hepatica nobilis Mill., Poa versicolor Bess., Polypodium vulgare L., Schivereckia podolica (Bess.) Andrz. ex DC, Trifolium pannonicum Jacq.*

The category of rare species (R) includes 27 species, most of which are under state protection, being included in the LRM. Some fairly common species in natural habitats (Corydalis cava, Convollaria majalis, Primula veris, etc.) are included in the list because their populations are in continuous decline under the influence of anthropogenic factors.

Some of the researched species are part of the LRR, for example: Epipactis heleborine, as well as LRU, for example: Staphilea pinnata, Tulipa bibersteiniana etc. One species - Lilium martagon - is included in the Red List of Europe (LRE).

The analysis of the data from the specialized literature allows us to establish that for the species Dictamnus gymnostylis (gymnostylus ash), the landscape reserve "Fetești" serves as a new habitat on the territory of the Republic of Moldova.

Keywords: *conservation, rare species, flora, nature reserves*.

UDC: **582.31:661.7**

TOTAL POLYPHENOLIC CONTENT IN THE DIFFERENT ORGANS OF SPECIES *CASSIA OCCIDENTALIS* L.

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The genus Cassia contains about 60 species, including C. occidentalis. This species has recently become the object of research on its polyphenolic content with therapeutic properties such as anti-inflammatory, antioxidant, antibacterial and antifungal. The species native to the Americas was introduced into the Collection of Medicinal and Aromatic plants of the Institute of Genetics, Physiology and Plant Protection of the Republic of Moldova.

Determination of total polyphenolic content in different vegetal products collected from the *C.occidentalis* species, grown in climate conditions of the Republic of Moldova.

The dry extracts of *Herba, Folia, Flores, Fructus et semina* were obtained in ethyl alcohol of 70% using rotary evaporator. The total polyphenol content of each extract was determined spectrophotometrically as galliic acid equivalent by Folin Ciocalteu's method. The sample extract dilution was oxidized with Folin Ciocalteu reagent and the reaction was neutralized with sodium carbonate of 4.0 and 7.5% concentrations. The absorbance of the resulting blue color was measured at 765 nm after 30 min.

The yield of dry extract was different in vegetal products: *Herba* – 30.14; *Folia* – 25.90; *Flores* – 37.7 and in *Fructus and semina* – 16.46. Data from spectrophotometric measurements show that total polyphenolic values for all extracts analyzed are higher in the 7.5% sodium carbonate variant. The highest values (mg/g) recorded in both variants were reported for *Herba* – 28.99 in sodium carbonate of 7.5% and 2.88 in that of 4.0%, followed by *Flores* (respectively) – 28.60 and 2.02, *Folia* – 22.13 and 1.42 and the lowest in *Fructus et semina* – 9.90 and 0.67.

The use of 7.5% sodium carbonate is much more efficient than 4.0% for the determination of total polyphenols in all *C. occidentalis* plant products. All the plant products analyzed are characterized by their polyphenol content and are of interest for the cultivation and valorization of this species for pharmaceutical purposes.

This study was carried out with the support of the project "Diminishing the consequences of climate change by creating, implementing varieties of medicinal and aromatic plants with high productivity, resistant to drought, wintering, disease, ensuring sustainable development of agriculture, guarantees high quality products, predestined for the industry perfumery, cosmetics, pharmaceuticals, food ", code 20.80009.5107.07

Keywords: *C. occidentalis, polyphenols, dry extracts, spectrophotometry*.

UDC: **599.4:591.1(478)**

DIVERSITY OF CHIROPTERA COMMUNITIES IN GOIANUL NOU MINES (NEW RESEARCH SITE)

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The abandoned mines of Goianul Nou are located in the central area of the Republic of Moldova (47°07'18 N", 28°55'16" E) near the mines of Cricova. It represents an underground shelter for chiroptera during the active period, as well as during the hibernation period. It is an area little influenced by human activity, remote from localities, being surrounded by forest strips with thickets, the mines were investigated for the first time, previously it was not mentioned in the literature. Classical methods of identification and collection of individuals were used in the research: net, camera, gloves, ultrasound detector and caliper.

In April 2016, 4 bat species were identified in the Goianul Nou mines: *M. daubentonii* 36.36%, *M. bechsteinii* 36.36%, *Rh. hipposideros* 18.18% and *M. mystacinus* 9.10%. A small population was recorded with a relatively low diversity for this period, because the spring was with high temperatures, a phenomenon that increased the awakening of bats from hibernation and the commuting between roosts in the surrounding canyons.

In 2020, the research took place in mid-September. The temperature outside was 25°C, clear sky, inside the temperature was 18°C humidity 65%. 35 bats from 6 species were identified: *E. serotinus* 40%, *M. daubentonii* 37%, *M. becshtenii* 8%, *M. dasycneme* and *P. auritus* with 6% each and M. *myotys* 3%. All the bats were found solitary near the entrance to the mine, except for a few individuals, located deeper at about 70-80 m.

In 2021 the fights took place in March, 26 individuals from 5 bat species were identified: *M. daubentonii* 38.46%, *M. myotis* 30.77%, *M. blythii* 7.69%, *M. becshtenii* 19 .23%, *P. austriacus* 3.85%. We note a relatively high diversity with a small numerical herd due to spring migrations to maternity shelters.

The most numerous were individuals of the species *E. serotinus* in 2020, which in 2016 and 2021 were not identified. Greater diversity is observed in autumn in September when hibernation preparation takes place compared to spring when bats disperse to other roosts. The species *M. myotys* was identified, which has not been identified on the territory of the republic since the last century, a strictly endangered species. Six out of seven identified species are included in the Red Book of Moldova

***Acknowledgments*:** this study was supported by the research project (20.80009.7007.02. "Schimbări evolutive ale faunei terestre economic importante, ale speciilor rare şi protejate în condiţiile modificărilor antropice şi climatice"), funded by *State University of Moldova, Institute of Zoology*.

Keywords: *mines, chiroptera, species, hibernation.*

UDC: **556.55:332.3(478)**

THE INFLUENCE OF THE MORPHOMETRIC CHARACTERISTICS OF THE RELIEF WITHIN THE CUBOLTA RIVER BASIN ON LAND USE

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The morphometric characteristics of the relief decisively determine the way of the land use. For example, flat relief, with low altitudes (specific for the Cubolteі Plain) favors predominantly agricultural use of the territory, while the high lands, with steep slopes, are unsuitable for these land categories, but become favorable for forested lands (in the geomorphological and climatic conditions of the Republic of Moldova).

Thanks to the use of GIS (Geographic Information Systems) techniques, it was possible to map the morphometric parameters (altitude, slope, exposure, etc.) of the researched basin and their graphic representation through maps. Topographic maps at a scale of 1:25,000 served as the cartographic base. ArcGIS 10.5 software was used for the morphological and morphographic analysis of the studied region. Thus, based on the interpolation of the level curves obtained, the hypsometric map, that of the slopes and the exposure, was created. Thus, it was determined that the elevation of the Cubolta Basin varies between 85 m and 280 m, with an average elevation of 221 m. The average slope of the basin is below 5°, and the dominant exposures are the southwest and northeast, respectively.

The determined morphometric conditions, once again demonstrate their favorability for arable land, especially for intensively mechanized crops (cereal and technical).

Keywords: *morphometric characteristics, relief, cubolta river basin.*

UDC: **632.116.1(478)"2000/2021"**

THE IMPACT AND DAMAGE CAUSED BY TORRENTIAL RAINS IN THE PERIOD 2000-2021 ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA

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Hydrometeorological phenomena were and are decisive factors for the well-being and security of people's lives and for the daily activity of human communities, so studying their impact is important, vital and current.

In this paper, we aimed to evaluate the impact and damage caused by torrential rains in the Republic of Moldova in the period 2000-2021, on the economy, the environment and the population, and the description of adaptation and mitigation measures in relation to them

The research methodology included the conceptual-theoretical principles of estimating the negative impact of torrential rains in the Republic of Moldova in the period 2000-2021, through the analysis of the series of statistical data and the reports of the General Inspectorate for Emergency Situations, with the use of the Geographical Information System to elaborate thematic maps exposed in this article.

Assessment of the negative impact and damage caused by torrential rains in the Republic of Moldova in the period 2000-2021 on the environment, the national economy and the population of the Republic of Moldova; developed geographical materials (maps, diagrams) that reflect the spatio-temporal impact of the studied risks on the environment, the national economy and the population of the Republic of Moldova; measures to mitigate and adapt to these risks.

At the same time, the obtained results are recommended for the development and implementation of policies regarding the civil protection of the population, in the agricultural, energy, transport, tourism sectors and in the teaching of specialized courses in higher education (geography, pedology, ecology, agronomy, etc..)

Torrential rains in the Republic of Moldova were and remain a source of risk for the population, economy and environment, causing essential damage to the economy, and sometimes human sacrifices, so it is necessary to have sufficient knowledge about their spatial-temporal distribution , about the frequency and intensity of their manifestation, and about possible damages induced by them. The assessment of the damage caused by the torrential rains shows that the policies to mitigate the consequences of these phenomena are based on the principle of crisis interventions with reactive measures and not on the principle of risk management with proactive measures.

Keywords: *torrential rains, floods, property damage, protective measures.*

UDC: **633.85:632.934**

AMORPHOUS SILICON DIOXIDE IN SOYBEAN PLANT HEALTH

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The purpose of the research is to determine the leaf surface and seed productivity of two soybean varieties under the action of amorphous silicon dioxide and nitrogen-fixing bacteria Bradyrhizobium japonicum in order to elucidate the action of the exogenous factors studied on the health of soybean plants.

The planned activities were studied in vegetation experience. Soybean plants of two varieties served as study objects: Amelina and Aura. Three treatments with amorphous silicon dioxide (nano) were carried out in the period from 27 to 82 DAP (days after planting). Five variants were studied: 1. treatment of plants with distilled water, control; 2. treatment with chemical standard, Flint fungicide; 3. treatment with amorphous silicon dioxide; 4. nitrogen-fixing bacterial suspension of Bradyrhizobium japonicum was introduced into the soil; 5. Treatment of the plants with amorphous silicon dioxide and introducing the nitrogen-fixing bacterial suspension of Bradyrhizobium japonicum into the soil.

The values of the treated plants leaf surface were less than in the control variant. The lowest values were in plants treated foliar with amorphous silicon dioxide and in the complex variant with Bradyrhizobium japonicum. SPLA (seed productivity, g seeds per unit leaf area, dm2) characterizes the assimilation efficiency of leaf area and can serve as an indicator of soybean plant health. In the variant with Aura plants from seeds treated with Bradyrhizobium japonicum, SPLA was higher than in the control. In the version with plants from seeds treated with Bradyrhizobium japonicum with plant foliar treatment by amorphous silicon dioxide, SPLA was maximal, 1.00 ±0.06 g /dm2.

In conclusion, it was shown that the foliar treatment by amorphous silicon reduces the leaf surface; for the Aura variety, upon the complex use of amorphous silicon with rhizobacteria, the SPLA values show synergistic relationships for plant health.

Acknowledgments: this study was supported by the research project 20.80009.7007.16 “Synergism between natural factors and ecologically harmless microbiological means of regulating the density of populations of pests for the protection of agricultural crops in conventional and organic agriculture”, funded by the National Agency for Research and Development.

Keywords: *amorphous silicon dioxide, soybean, Bradyrhizobium japonicum, plant health*.

UDC: **504.4.054:577.164.1(478)"2022"**

MONITORING OF THE THIOLS IN GHIDIGHICI AND DANCENI LAKES DURING 2022

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The Ghidighici and Danceni reservoirs are the largest reservoirs in the central part of the Republic of Moldova. These reservoirs are used in agriculture, for fishing, and are also a recreation area. Natural aquatic ecosystems are characterized by a dynamic balance between oxidizing and reducing agents, which is characterized by the redox state parameter of the aquatic environment and can be determined directly by determining the concentration of hydrogen peroxide, or indirectly by monitoring the content of substances of a reducing nature, for example, thiols. Thus, the purpose of this work was to monitor the concentration of thiols in the waters of lakes Ghidighici and Danceni during 2022.

Monitoring of the content of thiol substances in lakes was carried out using the adapted Ellman spectrophotometric method. Water sampling was carried out seasonally.

During the monitoring period, the average annual concentrations of thiols in the waters of the Ghidighici and Danceni lakes were 1,48·10-6M and 1,25·10-6M, respectively. Since thiols enter the water as a result of the vital activity of hydrobionts, their maximum concentration should be observed in summer, when the temperature of water systems is optimal for the development of hydrobionts. In the lake Ghidigici the maximum concentration of thiols (1,82·10-6 M) is observed in spring, which is evidence of a reduced self-purifying ability of waters. In the lake Danceni there is a sharp increase in the concentration of thiols in autumn (1,52·10-6M). This may be due to a sharp drop in the water level in the lake, and also indicate that the processes of water self-purification are of low intensity.

Thus, based on the obtained data on the content of thiols, we can conclude that the waters of the studied lakes have a low ability to self-purification, that they consume oxidative equivalents and, accordingly, that their redox state is disturbed.

Acknowledgments: this study was supported by the research projectnr. 20.80009.5007.27, Physico-Chemical Mechanisms of the Redox Processes with Electron Transfer in Vital, Technological and Environmental Systems, funded by Institute of Chemistry of the Moldova State University.

Keywords: *natural waters, thiols, redox state, chemical self-purification.*

UDC: **579.8:628.4.043**

STUDY OF MICROORGANISMS WITH A CAPACITY TO BIODEGRADE NON-RECYCLABLE PLASTIC WASTE

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Microbial communities resistant to differe unfavorable conditions can present many unig characteristics. Among a series of properties of soil microorganisms in different climatic zones, with different capacities to decompose plastic is mentioned more and more. It vas found thatwhen the plastic decomposes, dissolved organic carbon is released stimulating the activity of heterotrophic microbes.

Adaptation to new sources of organic carbon can create new characteristics of microorganisms, especiaiiy that produce active enzymes. Enzymes adapted to unfavorable conditions of microorganisms can offer numerous opportunities for biotechnological exploration and the creation of new ones for the degradation of non-recyclable plastic waste.

Trus, the potential of microorganisms from different conditions can be used in openoir waste deposits. Among the promin microbial agents used for degradation belonging to the following speciens *Pseudomonas, Agrobacterium, Streptomices, Corynebacterium, Arthrobacter, Micrococcus si Rhodococcus, Subtercola, Adreia, Leifsonia, Cryobacterium si Flavobacterium.*

The, study of the planned research is based on the elaboration of new ecological processes based on microorganisms far the biodegration of non-recyclable plastic waste.

Vegetational laboratory experiments are launched with the use of phytoremediator microorganisms in plastic polluting environmental conditions.

The abundance of microorganisms in ecosystems up to hundreds of millions of bacterial cells in one gram of sediment. Many assume that any surface in the polluting environments is colonized with macro and microorganisms. Bacterial colonization the plastic material begins almost immediately. In these stages, the microbial assemblies could catalyze the metabolic reactions that lead to the adsorption and fragmentation of the associated microplastic compounds. Basedon the study carried out, we can conclude that soil with a high microbial biodiversity can have a high biodegradation capacity of non-recyclable.

Acknowledgments: the studies are obtained within the Research Project 20.6009.7007.03. :"Microbiological potential in the degradation of non-recyclable plastic waste" , financed by the ANCD

Keywords: *polluting, biodegration, microorganisms, phytoremediator.*

UDC: **632.934:582.288:633.11**

THE PROTECTIVE ACTIVITY OF THE TANNINS FROM BLACK TEA AGAINST *FUSARIUM SPP.*

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Fusariosis are very widespread in common winter wheat, of which rot of the root, the base of the stem and the grains meet with the highest frequency. Vegetable compounds with antifungal activity are important factors in the integrated protection system and, at the same time, ecologically harmless.

Establishing of the protective capacity of the oxidized tannin extract, isolated from commercial black tea against the Fusarium avenaceum and F. oxysporum fungi, that are very widespread in common winter wheat under the conditions of the Republic of Moldova.

The commercial black tea extract (RISTON®, Ceylon black leaf tea, Sri Lanka) was obtained by static method of mechanical agitation (maceration and draining, carried out in three stages of 24 hours each) with subsequent concentration by distillation and drying at a temperature of 45oC to a constant mass.

The evaluation of the antioxidant activity of the tea extract was carried out with the application of the ABTS (2,2 azinobis 3-ethylbenzothiazoline-6-sulfonic acid) and DPPH (2,2 diphenyl-1-picryl hydrazyl) tests. To determine the total content (Ctotal) of acid functional groups (carboxylic and phenolic), the Boehm method, partially modified, was used.

Wheat grains (2 genotypes – Moldova 16, L Selania/Accent) were treated for 4 hours with an aqueous solution of oxidized black tea, dried in the open air for 24 hours and then kept in F. avenaceum, F. oxysporum culture filtrates for 18 hours.

It was shown that when applying concentrations of 0,0025 and 0,005% tannin extracts, stimulation of germination, radicle and stem growth of common wheat occurred, which led to an increase in vigor index by 5,4-47,8% and dried mass per plant by 5,0-35% in relation to culture filtrates, respectively.

The obtained data demonstrate the identification of a new protector of common wheat, ecologically pure – black tea tannin extract against the causative agents of root rot.

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Keywords: *wheat, Fusarium spp., black tea, tannins.*

UDC: **504.06:574:334**

IMPLEMENTATION OF THE ECOLOGIZATION ACTIONS OF THE ENTERPRISES

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The greening of enterprises is based on an integrated system of actions aimed at minimizing the negative impact on the environment, maximizing the efficiency of resource use, using renewable resources, increasing productivity, efficient waste management, etc. Through greening, practically all industries and agriculture continuously improve their resource productivity and environmental performance.

The successful implementation of greening actions within an enterprise is a complex process that must be carried out through certain specific steps. In our view, the most effective procedure for the implementation of the greening actions of enterprises is achieved by going through, successively, five basic stages, namely: *Stage no. 1* - determination of the current ecological situation of the enterprise; *Stage no. 2* - planning the necessary measures to be undertaken for the greening of the enterprise; *Stage no. 3* - implementation of the planned measures; *Stage no. 4* - quantitative and qualitative monitoring of the effects of the implementation of the planned measures and *Stage no. 5* - review and improvement of greening actions. Stages 1 of the greening of enterprises can be achieved more effectively by performing the environmental audit, however, in the situation where there are not enough financial resources, they must be performed by experienced specialists. The second stage is particularly important for ensuring the greening of enterprises, the course of which will highlight the aspects that need to be implemented/improved, the technique or technology selected, the implementation period, the benefits obtained, the costs and return on investment. At the third stage, it involves the actual execution of the measures proposed at the previous stage, which need to be carried out with prudence and vigilance. Stage no. 4 can be carried out by the company's staff, with experience in the field, or by teams of qualified specialists, we recommend carrying out daily monitoring. The review and improvement of the greening actions is not in all cases a mandatory stage of the greening, it may appear as necessary, and in the situation where the enterprise has reached the "*peak*" of the greening, the review is not mandatory. Stage 5 can most frequently appear when some recommendations resulting from stage 4 have been proposed, or if there have been changes in the ecological legislation, if the company wants to improve (by applying new techniques, methods, etc.), as well as in other cases. After carrying out the review, the other stages can be repeated consecutively if necessary.

In conclusion, we mention that the greening of enterprises will allow the identification of environmental problems, their solution, the efficiency of the use of resources and the increase of the competitiveness of enterprises.

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Keywords: *implementation, stages of greening, enterprises.*

UDC: **502.58:632.111.8:633.85(478)**

INFLUENCE OF TEMPERATURES IN THE WARM PERIOD OF THE YEAR ON THE SUNFLOWER HARVEST

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Temperature is one of the climatic elements that decisively influences the growth and yield of crops. The rate of many growth and development processes of crop plants is controlled by air temperature, at least when there is enough moisture. Global sunflower production, in turn, is affected by the increase in air temperature and the risks associated with this process.

The objectives of the research consist in identifying the temperature-harvest relationship, through the prism of the correlations between the air temperature in the growing season (April-September) and the sunflower fruit, as well as the degree of thermal resources of the sunflower on the territory of the Republic of Moldova.

In this regard, the data on the air temperature from April to September and its relationship with the average harvest, between 2005 and 2021, were analyzed. At the level of the entire growing season, the correlation coefficients vary between 0.4401 and -0.8308. Between 2005-2021, the relationship between temperature and average fruit per hectare in most of the years is reversed. The exceptions are only the years 2016 and 2021. The highest degree of correlation is attested in dry years: 2007 (-0.8308); 2020 (-0.7534); 2012 (-0.7235); 2009 (-0.7652).

The situation of the correlation coefficients between the fruit and the temperatures in the period June-July, is practically identical to those in the April September range. Thus, the years 2016 and 2021 stand out through positive values of the correlation coefficients, and in the dry years, previously listed, the most pronounced inverse correlations are signaled.

From the point of view of the average temperatures during the growing season, in territorial aspect, the districts in the north of the country register values lower than 18°C, a threshold considered optimal for the good development of the sunflower. On the other hand, the south-west of the country meets, from this point of view, the average values most favorable to the development of the sunflower crop, with temperatures of 18.5...19.1°C.

The paper tested the null hypothesis that there is no statistically significant correlation between temperature and the yield of the sunflower crop.

The temperature range ranged from 12.8°C to 21.1°C, and the harvest between 2.0 and 30.7 q/ha. The temperature recorded a 35% acceptance of the null hypothesis in which explained between 0.1% and 3.6% the variation in crop yield, in contrast to 65% rejection, where 17.9% - 69.0% of the variability of the crop yield was due to the temperature in the growing season. To a large extent, other factors hold several explanations for the variation in crop yield.

Acknowledgments: this study was funded by the project of the State Program 20.80009.5107.01 - Genetico-molecular and biotechnological studies of the sunflower in the context of sustainable management of agricultural ecosystems.

Keywords: *temperature, vegetation period, correlations, sunflower.*

UDC: **582.632.2:631.53.011.3**

GERMINATION KINETICS OF *Fagus sylvatica* SEEDS OF VARIOUS ORIGINS

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Successful artificial reforestation of European beech (*Fagus sylvatica* L.) directly depends on the quality of planting material. For better adaptation and survival of a new population in changing conditions, it is desirable that the planting material be genetically diverse. Therefore, the purpose of our work was to study the germination kinetics of *Fagus sylvatica* seeds and emergence of beech seedlings of various origins.

Seeds of *F.sylvatica* were collected in October 2022 on the territory of the Mlyňany Arboretum of the Slovak Academy of Sciences, Zvolen, Slovak Republic – *Fagus sylvatica* L. (FsSR), *F. sylvatica* 'Rohani' (FsR), *F. sylvatica* 'Aurea' (FsA), *F. sylvatica* 'Atropurpurea' (FsAt), *F. sylvatica* 'Pendula' (FsP); and in the park of Schönburn Palace, Vienna, Austria – *Fagus sylvatica* L. (FsAu).

The highest germination energy was characterized by FsSR seeds – mean time germination (MGT) for them was 62.6 days. FsAu seeds were also characterized by fairly high germination energy, MGT was 74.9 days. The lowest capacity of germination was noted for FsP seeds – 130 days. The rest tested beech seeds germinated within 103-107 days. The overall germination of seeds was distributed as follows: FsP (83.33%) > FsA (60.0%) > FsSR (58.81%) > FsAu (56.12%) > FsR (53.18%) > FsAt (37.93%).

Germinated seeds were sown under solarium conditions. Emergence of seedlings was from 60 to 100%. The highest emergence of seedlings in solarium conditions was showed by the seeds of FsP (100%), FsR (85.83%), FsA (83.33%) and FsAu (81.33%). Seeds FsSR (65.56%) and FsAt (60.00%) were characterized by lower emergence of seedlings. Thus, not all seeds with high MGT indices showed the highest emergence of seedlings in solarium conditions. The seeds FsA and FsSR originated from the Slovak Republic had the highest and most stable germination rate and emergence of seedlings.

***Acknowledgments*:** this study was supported by the research project within the State Program no. 20.80009.7007.07 "Determining the parameters that characterize the resistance of plants with the different level of organization to the action of extreme temperatures in order to reduce the effects of climate change" funded by the National Agency for Research and Development of the Republic of Moldova (www.ancd.gov.md).

Keywords: *Fagus sylvatica, seed germination, seedling emergence*.

UDC: **504.453.05:574(478:282.247.314)**

COMPARATIVE CHARACTERISTICS OF BIOGENIC POLLUTION OF THE LOWER NISTR RIVER ECOSYSTEMS

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It has been established that in all sections of the rivers under study, cases of pollution with biogenic substances have been identified, which differ both in their concentrations and in the cases of their detection. In each river section, the intra-annual dynamics of the degree of biogenic pollution was revealed, followed by the determination of the dominant pollutant for each river ecosystem.

The most environmentally unfavorable periods of time associated with this pollution have been established. The most unfavorable river section was revealed, which was the Byk, which has the highest degree of pollution and degrading state.

It is shown that when assessing the quality of river water from an ecological point of view, inflows according to the same indicators had different quality classes. However, class V was determined in all river ecosystems, which indicates the fact of an increased anthropogenic load, associated primarily with the inflow of both recent and permanent pollution into the rivers.

Keywords: *nutrients, ammonium, nitrites, nitrates, water quality, pollution*

UDC: **631.445.4:631.46:579.64(478)**

METAGENOMIC CHARACTERIZATION OF THE BIODIVERSITY A ANTHROPICALLY CHERNOZEM

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The purpose of our research was to evaluate the efficiency of soil resources and microbial biodiversity through the use of elements of organic farming. Methods unrelated to the cultivation of microorganisms were used to assess biodiversity. This allowed assessment of the entire diversity of microbial communities, including non-cultivable microorganisms.

The object of the study was the microbial communities of a typical chernozem of two land use systems: in the forest belt and on the arable land of the Biotron long-term hospital. Soil samples were studied in a layer of 0-20 cm in the spring of 2022. Agrochemical analyzes were carried out according to classical methods. The metagenomic analysis of soil microbiomes was carried out using the technology of high throughput sequencing of the 16S rRNA gene. The work was carried out using the equipment of the Central Collective Use Center "Genomic Technologies, Proteomics and Cell Biology" FGBNU VNIISM, St. Petersburg, Russia.

It was established that the studied land use systems determined the formation of the following structure of the prokaryotic community: about 268-270 genera, 172-177 families, 27-30 classes and about 16-19 types. Pearson's correlation analysis revealed the priority of soil structure in the formation of microbial diversity in comparison with other studied factors (16), assigning a secondary or statistically insignificant role to the content of soil biophilic elements through low values of the Pearson coefficient or through their statistical insignificance. In accordance with this, the nutritional requirements of the studied prokaryotes do not fit into the known algorithm for cultured prokaryotes; therefore, no statistically significant correlations were found between the diversity of microorganisms and the content of certain nutrients in the soil.

Therefore, agricultural practices must be carried out not only in accordance with the needs of plants, but also in accordance with the needs of the soil. This could be an alternative with the potential to improve soil resources and microbial diversity.

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Keywords*: typical chernozem, succession, land use system, metagenome, 16S rRNA gene, pyrosequencing, abundance, biodiversity microbiome.*

UDC: **502.1:597.8(478)**

THE EFFECTIVE OF AMPHIBIANS POPULATIONS IN THE ORHEI NATIONAL PARK

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On the territory of Orhei National Park, 11 species of amphibians (84.6%) of the 13 species found in the republic were recorded. Thus, of the 11 species of amphibians found in the given area, 8 species (72.7%) in forest habitats, 10 species (90.9%) in aquatic habitats, 2 species (18, 2%), and in localities, only one species (9.1%) were recorded.

For the purpose of evaluating the actual numbers of amphibian populations and monitoring their degree of conservation at the national and international level it was classical research methods were used. Following field investigations, we established that the herpetofauna present in the Orhei National Park includes rare species, which benefit from special conservation status at European level, such as: the frog (Hyla arborea), the brown field frog (*Pelobates fuscus*); these being listed in the Annexes of various International Conventions on the conservation of the wild world (Bern; Bonn, Washington, etc.).

According to the habitat distribution, these therapods prefer forest spaces with clearings, rarists with rich grass cover used for feeding, resting and as places to hide. Some of the species, such as the frog (*Hyla arborea*), green frogs (*Pelophylax ridibundus, P. esculentus, P. lessonae*), green toad (*Bufo viridis*), are also widely distributed in the ecotone areas: forest- meadow, forest-plain etc. Here they benefit from milder climatic conditions, but also from much richer trophic resources due to the interference process of the two types of invertebrate fauna - forest and open spaces (meadow and/or plain). Another group of amphibians - that of brown frogs (*Rana temporaria, Rana dalmatina*) are typical forest species, inhabiting the habitats of oak, hornbeam and ash forests; these concentrating in greater numbers along the streams, through the sectors with an increased degree of humidity.

Among the amphibian species that can be characterized as background species of the Orhei National Park, we mention: the frog (*Hyla arborea*), the red-bellied frog (*Bombina bombina*), the toad (*Rana dalmatina*), the frog -brown-toed (*Bufo bufo*), crested newt (*Triturus cristatus*).

Acknowledgments: this research work was carried out with the support of framework of the state projects „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" no. 20.80009.7007.02 and „Helminthic fauna of amphibians (*Amphibia*), their importance as vectors in the formation and maintenance of parasitic zoonoses" no. 23.00208.7007.05/PDI

Keywords: *amphibians, Orhei National Park.*

UDC: **591.9:597.8(478)**

FAUNA OF TREMATODES OF AMPHIBIANS (RANIDAE BUFONIDAE FAMILIES) IN THE REPUBLIC OF MOLDOVA. 1. FAMILY *PLAGIORCHIIDAE*

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The paper presents data on trematodes infestation in amphibians from Ranidae and Bufonidae families (Amphibia: Ecaudata) in natural and anthropized ecosystems in the Republic of Moldova. The helminthological researches of amphibians were carried out according to the specific research methodology (Skrjabin, 1928; Рыжиков и др., 1980; Судариков и др., 2002; Сергеев, и др., 2001).

As result the infestation of Ranidae family species (*Pelophylax ridibundus, Pelophylax lessonae, Pelophylax esculentus, Rana dalmatina, Rana temporaria*) and of Bufonidae family species (*Bufo bufo, Bufo viridis*) with trematodes from family Plagiorchiidae the presence of 7 trematode species was established: *Astiotrema monticelli* Stossich, 1900; *Haplometra cylindracea* Zeder, 1800; *Opisthioglyphe ranae* Frohlich, 1792; *Paralepoderma brumpti* Buttner, 1951; *Plagiorchis elegans* Rudolphi, 1802; *Haematoloechus variegatus* Rudolphi, 1819 and *Metaleptophallus gracillimus* Luhe, 1990.

Although, the trematode species detected in amphibians taxonomically belong to the same family, each of them has a different organic specificity, thus 4 species were detected in the small intestine (*A. monticelli*; *H. cylindracea*; *O. ranae*; *P. elegans*) one species each in the lungs (*H. variegatus*), in the stomach wall (*P. brumpti*) and in the body cavity (*M. gracillimus*).

For each of these species of helminths determined in amphibians, the main parasitological indices were calculated, on the basis of which the importance of the helminthological study of amphibians was found, reflecting and supplementing the previous researches with new data.

Therefore, the helminthological results obtained have faunal importance, bioindicators, participate in solving problems with reference to zoogeographical and speciation division, as well as veterinary medicine, because amphibians are the main vectors of pathogens dangerous to biological diversity, thus causing considerable economic and social damage.

According to our research, we found that biologically, amphibians not only participate in the regulation of biological diversity in an ecosystem, but also directly participate in combating various parasitic zoonoses. *Haplometra cylindraceea* species is antagonistic to the trematode species *Fasciola hepatica* with a major impact on domestic and wild animals.

***Acknowledgments*:** this research work was carried out with the support of framework of the state projects „*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*" no. 20.80009.7007.02 and „Helminthic fauna of amphibians (*Amphibia*), their importance as vectors in the formation and maintenance of parasitic zoonoses" no. 23.00208.7007.05/PDI

Keywords: *amphibians, trematodes, family Plagiorchiidae, Moldova.*

UDC: **615.012/014:542.943`7**

OXIDATION/MINERALIZATION OF DRUGS IN MIXED SYSTEMS BY APPLYING HETEROGENEOUS PHOTOCATALYTIC PROCESSES

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Pollution of aquatic resources and soil with emergent compounds (drugs) can have serious consequences for aquatic biota. Pharmaceuticals affect and sometimes make it impossible to treat wastewater by conventional methods. This is due to the fact that these pollutants are toxic to the biocenosis, they slow down the growth of microorganisms in activated sludge, thus inhibiting the purification process.

The main purpose of the research to determine the optimal conditions in the process of oxidation/mineralization of emerging pollutants (EP) from mixed model systems by using advanced oxidation processes (AOPs). As drugs, the oxidation/mineralization of amoxicillin, cephalexin and diclofenac was studied. The decrease of drug concentration in the mixed model systems *EP/TiO_2/UV, EP/TiO_2/H_2O_2/UV* was studied by photocatalytic degradation. The degradation of Ep from aqueous solutions under the action of AOPs on UV irradiation (λ = 254 and 365 nm) was evaluated by studying the kinetics of the photocatalytic process, controlling the concentration of pharmaceuticals by various physicochemical parameters. Important factors influencing the degradation/mineralization performance were evaluated: oxidant concentration (0.5, 1.0, and 1.5 mM), photocatalyst concentration (0.025, 0.05, and 0.01 g/L), substrates concentration and reaction time.

As a result of the experimental research, it was found that the oxidation/mineralization process depends on the titanium dioxide concentration. Therefore, the oxidation/mineralization of 30 mg/L pharmaceuticals has been 89.3% at the optimal concentration of photocatalyst 0.05 g/L and 1.0 mM oxidant concentration by UV-A irradiation.

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Keywords: *advanced oxidation processes (AOPs), heterogenous process, titanium dioxide, pharmaceutical wastewater treatment, amoxicillin, aefalexin, diclofenac.*

UDC: **550.4:556.32:552.1(478)**

THE ROLE OF WATER – ROCK SYSTEM IN THE FORMATION OF GROUNDWATER GEOCHEMISTRY IN MOLDOVA.

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At present, a high scientific interest is directed to the doctrine of the geological evolution of the interaction between groundwater and rocks. This is explained by the fact that the water-rock system is all-encompassing and its geological evolution leads to the formation of numerous geochemical types of natural waters and various secondary mineral formations, including weathering crusts, hydrothermally altered rocks, various mineral deposits, etc.

The work purpose is to identify trends in the processes of interaction between groundwater and rocks in the framework of modeling the processes of secondary mineral formation for drinking groundwater. The aquifers of interstratal waters of the Lower Sarmatian, Middle Sarmatian and Upper Cretaceous deposits, which are widely and intensively used for centralized water supply of settlements and economic objects of the country, were chosen as representative objects for this research.

The methodology of studying geochemical processes in the water-rock system is based on the methods of equilibrium thermodynamics of hydrogeochemical processes and the analysis of elementary reactions, the initial products of which are the main rock-forming minerals and water, the final products are secondary minerals, as well as ions and neutral molecules that have passed into the liquid phase. Calculations of ionic equilibria were carried out using the HydroGeo software package developed by M. Bukaty. To determine the degree of groundwater saturation with various minerals, we used the methodology of constructing mineral stability fields developed by R. Garrels and C. Christ.

Having analyzed the equilibrium - non-equilibrium state of the system, it can be argued that the primary aluminosilicates (anorthite, analcime, K-feldspar, pyrophyllite, etc.) are not in equilibrium with the groundwater aquifers of Moldova and they are dissolved in these conditions with the formation of secondary minerals (gibbsite, kaolinite, montmorillonite, illite, calcite, etc.). Thus, a significant part of the chemical elements entering the solution due to the incongruent primary minerals dissolution is bound by secondary products, while the other part (mobile elements) is concentrated in the solution.

Studies of this direction should be continued due to the wide distribution of soda groundwater and the formation of unique secondary mineral formations.

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Keywords: *water-rock system, groundwater aquifers, geochemistry formation.*

UDC: **595.753(478)**

FIRST RECORD OF THE LEAFHOPPER *MEGOPHTHALMUS SCANICUS* (FALLEN, 1806) (HEMIPTERA: AUCHENORRHYNCHA: CICADELLIDAE) IN THE REPUBLIC OF MOLDOVA

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Cicada Megophthalmus scanicus (Fallen, 1806) is a new species for the fauna of the Republic of Moldova and belongs to the largest family Cicadellidae, subfamily Megophthalminae. The leafhopper subfamily Megophthalminae comprises more than 650 described species placed in 53 genera. The species from this subfamily occur in habitats ranging from tropical rainforest to cold desert where they feed on both woody and herbaceous host plants. Some species can be found in extreme conditions like coastal dunes, deserts and alpine meadows. On the European continent, according to the Fauna Europaea (FE), two genera of subfamily Megophthalminae are common: Megophthalmus (M. scabripennis, M. scanicus) and Parapulopa (P. lineata).

The material was obtained by mowing of entomologycal net on vegetation at the edge of the forest near the Măcărești village, Ungheni district. Cicada specimens in the amount of 2 ♂ and 5 larvae were found in the material collected on 09.06.2022. This is the only point on the territory of the Republic of Moldova where the cicada was detected so far.

Description. Small cicada, dimensions of male: 2.5-3 mm and female 3.3-4.4 mm. The base colour of male is approximately blackish brown, the colour of female is lighter, surface of elytra cells of female approximately smooth. The head is short, there are dark spots on the face, there are 3 dark spots on the head, elytra have darker veins (fig. 1).

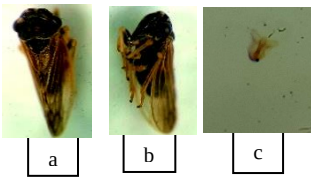

Fig.1. Specie *M. scanicus* a. – dorsal view, b. – lateral view, c. aedeagus. Photo: Grozdeva S.

The species Megophthalmus scanicus (Fallen, 1806) is a hortobiont, found on grassy vegetation of dry meadows, and can also inhabit forest communities. In Western Europe, it can also occur in mesophytic meadows, in outskirts of swamps, in various types of pine forests. It develops one generation per year, overwinters in the egg stage.

The cicada is widespread in most European countries including the neighbour countries of Moldova – Romania and Ukraine; it is also common for the North Africa, Asia (Syria, Azerbaijan, Georgia), Russia (north and middle of European part). Distribution area: pan-European region.

Acknowledgments: the work was implemented with the financial support of the project Nr. 20.80009.7007.02. "Evolutionary changes of economically important terrestrial fauna, of rare and protected species under anthropogenic and climatic changes".

Keywords: *fauna, leafhopper, new species.*

UDC: **631.46:631.445.4:631.86**

CORE MICROBIOTA IN CARBONATE CHERNOZEM

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The purpose of this study is to evaluate, using next generation sequencing (NGS), the effect of long-term use of organic and mineral fertilizers on the core microbiota in Carbonate chernozem.

The research was carried out in the long-term field experiment (from 1950) on the Chetrosu (Ketrosy) Experimental Station situated in the Central Zone of Moldova. The following experimental plots were studied: 1 - control without fertilizers (CON), 2 – with organic fertilizers - manure (ORG), 3 – with mineral fertilizers (NPK). The soil layer of 0-20 cm was analyzed. The metagenomic analysis of soil was done using equipment of the Core Centrum 'Genomic Technologies, Proteomics and Cell Biology' in ARRIAM. Sequencing of 16S rRNA genes was carried out using the MiSeq genetic analyzer from Illumina (USA), taxonomic identification - using the RDP SILVA database (https://www.arbsilva.de/).

In total, 18 prokaryotic phyla (16 bacterial and 2 archaeal) were identified, unclassified and others were not included; 15 phyla of them constitute the core microbiota in the studied variants: Chloroflexi, Acidobacteriota, Proteobacteria, Planctomycetota, Nitrososphaerota (Thaumarchaeota), Halobacterota / Euryarchaeota, Fibrobacterota, Myxococcota, Verrucomicrobiota, Gemmatimonadota, Bacteroidota, Nitrospirota, Actinobacteriota. Only 65 out of 122 identified genera constitute the core microbiome of the studied variants, unclassified and uncultured genera were not included too. The phyla Nitrososphaerota (Thaumarchaeota), Firmicutes and Actinobacteriota were with the highest number of OTUs (Operational taxonomic units). The taxonomic composition at phylum level was dominated by bacterial phyla Actinobacteriota (11.8% in variant CON to 14.3% in variant NPK), Proteobacteria (9.3% in CON to 12.1% in ORG), Firmicutes (5.6% in ORG to 8.1% in CON) and archaeal phylum Nitrososphaerota (Thaumarchaeota) (9.3% in NPK to 12.2 % in ORG). At the genus level the most dominant genera were Bacillus (Firmicutes), Microlunatus (Actinobacteriota) and Rubrobacter (Actinobacteriota). The long-term use of fertilizer increased microbial diversity (Shannon's, Margalef's, Pielou's, Menhinick's and inverse Simpson's indexes).

Acknowledgments: this study was supported by the research project 20.80009.5107.08 Efficient use of soil resources and microbial diversity through the use of elements of biological (organic) farming, funded by National Agency for Research and Development (NARD).

Keywords: *soil metagenomic analysis, 16S ribosomal RNA gene, prokaryotes, mineral fertilizers, organic fertilizers, microbial diversity, long-term field experiment.*

UDC: **502.3:556.535(478)**

ALLUVIUM RUNOFF IN THE INTERNAL RIVERS OF THE REPUBLIC OF MOLDOVA

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The Republic of Moldova has few large rivers, but it has a dense network of small rivers and streams, permanent or temporary, the number of which is more than 3100. Most of the internal rivers form their alluvium discharge on the territory of the country.

Among the analyzed internal rivers are: Vilia, Draghiste, Ciuhur, Caldărușa, Raut, Căinari, Bălțata.

In the small rivers, the annual characteristics of the alluvium discharge established from the data of the measurements carried out in the network of the State Hydrometeorological Service, vary in a very wide range.

On average, during spring high waters and summer, in the north approximately the same amount of alluvium is observed – 40% of the annual, in the south – 15–20% for spring high waters and 40% in summer . When heavy rains fall, the share of summer alluvium is very high. For example, in the summer of 1990, for the Taraclia valley it made up 97%.

Vilia River. The river basin is located in the northern part of the Northern Moldavian Plateau. The Vilia River has a length of 50 km, the total area of the catchment basin is 301 km^2. The basin is located in the forest-steppe area. Forests are found predominantly on the left bank, on gray forest soils. The river regime is studied at the hydrometric station in Bălăsinești village. The multiannual average water flow is 0.57 m^3/s. The average annual water turbidity value is 370 g/m^3. The average flow of alluvium during the observation period is 0.30 kg/s, maximum-2.3kg/s, minimum-0.028kg/s. The average multi-year runoff of alluvium is 9.7 thousand tons.

Draghiste River. The river basin is located on the Northern Moldavian Plateau, in the Toltre sector. The Draghiste River has a length of 70.7 km, the total area of the catchment basin is 282 $km^{2.}$

The river regime is studied at the hydrometric station in the Trinca village. The multiannual average water flow is 0.46 m^3/s. The average annual water turbidity value is 110 g/m3. The average flow of alluvium during the observation period is 0.03 kg/s, maximum–0.22 kg/s, minimum–0.001 kg/s (in 2016). The average multi-year runoff of alluvium is 1.02 thousand tons.

Caldărușa River. The river basin is located on the Middle Prut Plain. The Căldărușa River has a length of 40 km, the area of the reception basin is 319 km^2. The basin is characterized by old eras, made of sedimentary rocks. The soils are forest ash and chernozem. The river regime is studied at the hydrometric station in the Cajba village. The multiannual average water flow is 0.15 m^3/s. The average annual water turbidity value varies from 114 to 850 g/m^3.

The average flow of alluvium during the observation period is 20 kg/s, maximum-340 kg/s (in 1969), minimum-0.58 kg/s. The average multi-year runoff of alluvium is 0.65 thousand tons.

Ciuhur River. The river basin is located on the Northern Moldavian Plateau. The Ciuhur River has a length of 75 km, the area of the reception basin - 742 km^2. The basin is made up of sedimentary rocks, the rocky calcareous toltres-chains are well expressed.

The river regime is studied at the hydrometric station in the village of Bârladeni. The flow of the river is very regularized. A large storage lake – Cupcini, over 100 small water reservoirs and about 25 ponds is built in the basin. The multiannual average water flow is 0.28 m^3/s. The average annual water turbidity value is 100 g/m3. The average flow of alluvium during the observation period is 0.03 kg/s, maximum-0.13 kg/s, minimum-0.002 kg/s. The average multi-year runoff of alluvium is 0.83 thousand tons.

Răut River. The river basin is located on the Dniester Plateau and the Central Moldavian Plateau. Răut River has a length of 286 km, the area of the catchment basin – 7760 km^2. At the base of the basin are sandy rocks, sands, chalk, marl from the Cretaceous period, covered with a layer of calcareous and clayey rocks of Tortonian origin. The soils are chernozemous, and on the higher sectors - forest ash. For the most part, the basin is exploited under arable land.

The share of the wooded area is 7.4%, deciduous, oak and hornbeam forests predominate.

Hydrometric measurements (water level, liquid flow, solid flow, water temperature, etc.) on the Răut river are carried out at 2 hydrological stations, ph Balti and ph Jeloboc. For the analysis of alluvium runoff, the Jeloboc ph is more representative, because it is closer to the mouth of the river. The multiannual average water flow is 11 m^3/s. The average annual water turbidity value is 990 g/m^3. The average flow of alluvium at this post during the observation period is 7.2 kg/s, maximum-130 kg/s, minimum-0.045 kg/s. The average multi-year runoff of alluvium is 227 thousand tons.

The Căinari River has a length of 95 km, the area of the catchment area is 835 km^2, being heavily dismembered by ravines. At the base of the basin are limestones, marls and sands, covered with sandy clays and clays on which chernozems have formed.

The surface of the basin is predominantly cultivated (arable land), deciduous forests are found (oak, ash, maple, etc.). The river regime is studied at the hydrometric station in the village of Sevirova. The multiannual average water flow is 1.35 m^3/s.

The average annual water turbidity value is 400 g/m^3. The average flow of alluvium during the observation period is 0.4 kg/s, maximum–1.6 kg/s, minimum–0.054 kg/s. The average multi-year runoff of alluvium is 11.7 thousand tons.

The Bălțata River has a length of 27.5 km, the area of the catchment basin is 166 km^2. The multiannual average water flow is 0.05 m3/s. The average annual water turbidity value is 337 g/m^3.

The average flow of alluvium during the observation period is 17 kg/s, maximum-53 kg/s, minimum-1.2 kg/s. The average multi-year runoff of alluvium is 531 thousand tons.

An indicator that allows us to best compare the transport of alluvium is the annual runoff module, expressed in t/km^2/year.

This parameter shows us that Vilia r. Bălăsinești has the highest annual runoff module (37.3 t/km^2) together with Răut r. Jeloboc (32.1 t/km^2). The Draghiste River and the Ciuhur River have the lowest module of annual alluvium discharge, 4.55 t/km2 and 5.76 t/km2 respectively.

Keywords: *river, water flow, alluvium runoff, runoff module.*

UDC: **502.3:556.535(478)**

EVALUATING THE CONDITION OF STEPPE ECOSYSTEMS IN THE REPUBLIC OF MOLDOVA

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The steppes played a significant role in the evolution of human civilization. These ecosystems provided humanity with various benefits, such as food and living places, and represented a natural migration corridor for people, material, and spiritual goods. However, with the increase of anthropogenic impact through hunting, overgrazing, and land plowing, the steppe biome has been considerably modified, mainly into agroecosystems.

Within the natural ecosystems of the temperate zone, the steppes are the most affected by human activity. For example, in the Republic of Moldova, the natural steppe is almost destroyed, now covering only 1.9% of the total area of the natural ecosystems (Decision of the Government of the Republic of Moldova no. 112 of 27.04.2001). Moreover, steppes are the least protected ecosystems. The total area of the steppe territories properly protected by the state does not exceed 300 hectares, and even these continue to shrink. Legal and economic provisions do not stimulate the restoration of steppe landscapes, contrarily assigning them to managed ecosystems favors their extensive destruction. As consequence many species typical for steppe ecosystems have disappeared or considerably reduced their numbers.

However, steppe ecosystems still host a high concentration of biodiversity, including endemic species, and therefore protective actions are needed. The first step for this purpose is evaluating their condition. In this context, a study of the diversity and ecology of beetles in the steppe ecosystems of the Republic of Moldova and their role in evaluating habitat quality was initiated.

The representatives of the Coleoptera order are used as bioindicators for evaluating the steppe habitats. Beetle communities are characterized using ecological diversity indices: α, β, and γ. The most significant species as biological indicators of the quality of steppe habitats will be highlighted, and evaluation criteria based on metric indices will be elaborated. As a result, conservation measures of valuable steppe areas and strategies for the rational use of natural resources will be developed.

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Keywords: *Coleoptera, diversity, steppe, ecosystem, Republic of Moldova*.

UDC: **632.11: 631.445.4**

PEDOFUNCTIONAL EFFECTS WITH NEGATIVE IMPACT ON THE HEALTH OF ARABLE CHERNOZEM SOILS INDUCED BY AGROGENESIS AND CLIMATE CHANGE

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The combined action of agrogenesis and climate change led to the establishment of an evolutionary phase within the genetic-evolutionary chain factors←pedogenetic regimes←pedogenetic processes←soil (soil health) in which the soils do not correspond to the current climatic conditions. The specified phenomenon does not fit into the basic principles of the theory of pedogenesis and is caused by the particularities of the soil in its capacity as a complex bioroutine system constituted on the pedological scale of time manifested in its stability in relations with environmental factors. The changes induced in its structural-functional organization by the agrogenetic degradative processes led to the reduction of the adaptability of arable chernozems to the newly created climatic conditions, especially to more severe climate phenomena, especially to drought. According to the landscape-genetic concept of the genesis and evolution of chernozioms, drought and periodic water deficit are features "memorized in the genetic code of chernozioms".

Degradative processes induced by agrogenesis have led to the disruption of pedofunctional balances between the components of the bioroutine system established during the last 4-6 thousand years and the reduction of the capacity to adapt to the conditions of the current climate framework. In this sense, we mention that the disturbance of the ecological balances between the components of the bioroutine system is inherent in agrogenesis and implies the unidirectional degradation of the soil in its biotope quality and soil fertility. Climate changes act interspersed with agrogenesis and lead to the intensification of degradation processes. The main cause of the reduction in the ability of arable chernozioms to adapt to climate conditions with a higher degree of continentality is the degradation of three basic functions of chernozioms: a) production; b) environmental-formative and c) reproductive.

The specified functions are basic attributes of soil health. Through this prism of ideas, soil health is an integrative index of all soil functions, the destination of which is to ensure an optimal external and internal environment for the functionality of the soil ecosystem and the continuous reproduction of the pedogenetic process responsible for the reproduction of soil health factors. The disturbance of the quantitative and qualitative balances between them leads to the disturbance of the functionality of the bioroutine system, its stability and health.

The degradation of the production function is determined by the change in the direction and intensity of the humus formation and accumulation process responsible for the elementary functions: hydrophysical, nutritional, physiological, biologically stimulating, metabolic. The degradation of the environmental-forming function is caused by the reduction of the biogenic modeling capacity of the abiotic substrate and is manifested in the disruption of the functionality of the pedofunctional system [bioenergetic system↔aggregate system] responsible for the functionality of the biotic component. The degradation of these functions reduces the self-reproduction capacity of the bioroutine system and its health.

Keywords: *arable chernozems, pedogenetic regimes, pedofunctional regimes, pedogenetic processes, soil health.*

UDC: **544.52:577.164.1:504.4**

INFLUENCE OF COPPER(II) IONS ON THE PHOTOLYSIS OF FOLIC ACID IN AQUATIC SYSTEMS

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Folic acid is a form of water-soluble vitamin B9, which is important in amino acid and nucleotide metabolism, growth, and health of most aquatic animals and is known to occur in living organisms, but little is known about their distribution and potential role in aquatic systems. The purpose of the present study was to evaluate the influence of Cu(II) ions on the indirect photolysis of folic acid (FA) in aquatic systems.

In order to evaluate the influence of Cu(II) ions on photochemical transformations of FA in aquatic systems, was modeled the following system FA-H2O2-Cu(II)-buffer solution-hυ, under aerobic conditions, bringing the model closer to natural conditions. As irradiation sources, the DRT-400 lamp and Solar Simulator (SS), Oriel Model 9119X, were used. FA concentration was determined using the UV-Vis spectroscopy method, by measuring the absorbance of the solution at 281 nm.

Research results show that Cu(II) ions reduce the phototransformation rates of FA. This is explained by the fact that FA generates more stable complexes when it interacts with copper ions. The photolysis rates of the system irradiated under DRT-400 lamp (it emits radiation in the 220-600 nm range), increase with the concentration of all the components in the system and are of the order of 10-10-10-9 M·s-1. However, when compared to previous research, the rates are 2-3 times lower in systems without Cu(II) ions, confirming the stated idea. The phototransformation rates of FA decrease as the initial concentration of Cu(II) ions in the system increases, according to the results of SS irradiation (which generates radiation similar to sun radiation reaching the soil surface). This proves that Cu(II) ions are more strongly bonded in more stable complexes under conditions that are similar to those found in the environment. The rates of systems exposed to SS radiation are an order of magnitude lower than those exposed to the DRT-400 lamp (10-11-10-10 M·s-1).

The obtained results show that Cu(II) ions play a beneficial effect in aquatic ecosystems by slowing down the rapid transformation of FA, which plays an essential role in the metabolism, development, and health of most aquatic organisms. When exposed to the DRT-400 lamp's radiation while containing Cu(II) ions, FA has a half-life of 2 hours, 14 minutes, and 29 seconds. Additionally, the half-life of FA after exposure to SS is 16 hours, 35 minutes, 2 seconds, or about 8 times higher.

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Keywords: *folic acid, indirect photolysis, aquatic systems, kinetic parameters.*

UDC: **577:582.231:661.183.2**

STUDY OF THE ADSORPTION OF *CANDIDA ALBICANS* FUNGUS ON ENTEROSORBENTS OBTAINED FROM APRIKOT HUSKS

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Purpose: Establishing of the adsorption processes particularities of *Candida albicans* fungus on activated carbon obtained from aprikot husks.

The activated carbons used have a specific BET area of about 1500 m^2/g and a total sorption volume of the pores being in the range of 0,95-1,08 cm^3/g. The experimental results of the kinetics of the adsorption processes were registered at 15, 30, 45…150 min of the contact. In order to carry out the research of the fungus adsorption on the mentioned activated carbons, solution of this fungus with an optical density of 0,52 was prepared. This density was recorded at the КФК-2-УХЛ photo colorimeter 4,2. At the beginning of the experiment 5, 10, 15… .50 ml of the prepared fungal solutions were placed in 10 flasks, to which 45, 40, 35,… 5 ml of distilled water were added to dilute the initial prepared solutions. Subsequently, it was established the calibration curve. The prepared solutions were then contacted with pre-weighed activated carbon samples, approximately 100 mg each. After 90-150 min of contact, the optical densities were measured at a wavelength of 315 nm, and then subsequently calculated the equilibrium concentrations and the adsorption values.

The kinetics of the adsorption of the studied fungus showed that the value of the maximum adsorption is established within 2,5 hours. At the 90-150 min contact times the adsorption values were in the range of 0,9-1,12 $McF*10^8/g$.

Because the diameter of the studied fungus is between 2000-4000 nm, we can conclude that the adsorption of the fungus will take place in the macropores of carbonic adsorbent.

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Keywords: *activated carbons, fungus, adsorption, macropores*.

UDC: **569:551.782.13(478)**

UPPER SARMATIAN FAUNA FROM POCŞEŞTI, REPUBLIC OF MOLDOVA

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The location of Late Sarmatian vertebrate fossils near Pocsesti village, Orhei district, was discovered in 1975. Here, above the Bessarabian marine sediments, there is a stratum of sandy-clay formations belonging to the "Balta Formation", represented by alluvial and lacustrine deposits, widely spread to the south of Chisinau. According to paleomagnetic data, the osseous rocks have normal magnetization and belong to the 9th chron of magnetic polarity, which corresponds to the first half of the Late Sarmatian (Early Charsonian, 9.8 million years; MN 10).

Terrestrial vertebrate remains were found in sandy and lumpy clays, forming a lens-shaped assemblage that varies in thickness from 0.3 to 0.7 m. The sorting of bone material is weak, indicating its rapid burial.

Based on the study of faunistic composition Prof. Lungu A.N. singles out the fossil fauna of this locality into an independent complex - Poksheshtsky, characterizing the fauna of the Late Sarmatian.

The composition of the Poksesti faunal complex: Amphibia: *Hyla* sp., *Bombina* sp.; Reptilia: *Protestudo* sp.; Aves: *Strutio* sp.; Mammalia: Lagomorpha - *Proochotona* cf. *calfina* Lungu, 1981; *Alilepus* sp.; Rodentia - *Neocricetodon* (Kowalskia) sp., *Collimys* sp.; Carnivora - *Parataxidea* sp., *Proictherium* aff. *tauricum* (Borissiak, 1915), *Dinocrocuta* (*Percrocuta*) *gigantea* (Schlosser, 1903), *Metailurus* cf. *parvulus*., *Machairodus* sp. (cf. *M. giganteus)* (Wagner, 1854); Cetacea: Physeteroidea indet.; Proboscidea – *Tetralophodon longirostris* Kaup, 1832; Perissodactyla - *Hippotherium* aff. *verae* Gabunia, 1979; *H. giganteum* (Gromova, 1952); *Chilotherium* (*Acerorhinus*) cf. *zernovi* Borissiak, 1915; *Ch.* (*Ch.*) aff. *sarmaticum* Korotkevich, 1958; Artiodactyla *Achtiaria* aff. *moldavica* Godina, 1979; *Gazella* (*Miogazella*) *schlosseri* Pavlow, 1913; *Gazella* aff. *deperdita* Gaudry, 1848; *Tragoportax leskevitski* (Borissiak, 1915), *Tragoportax* sp.; Cetacea: Delphinidae gen. et sp. indet.; Physeteroidea indet. (*Scaldicetus caretti*?); Sirenia: conf. *Metaxytherium*.

New data on the fossil fauna from Poksesti and data on geology and taphonomy, suggest the presence of a semi-marine or marine sedimentation environment, corresponding to the near-adjacent zone of a large river system with spits and rifts.

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Keywords: *miocene, Mammals, Republic of Moldova.*

UDC: **569:551.782.13(478)**

PHILONTHUS SALINUS KIESENWETTER, 1844 (COLEOPTERA, STAPHYLINIDAE, STAPHYLININAE), FAUNISTIC COMPONENT: RETROSPECTIVE AND UPDATE

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The faunistic study of the staphylinid group (Coleoptera, Staphylinidae) involves multiannual researches based on field collections, exploring of a new different types of habitats and microhabitats. Tracing of the influence of certain forest and agricultural plants in atracting of staphylinids species for population and adaptation, checking of preferable substrates for growth and consumption of nutritional content.

Philonthus salinus Kiesenwetter, 1844, figure 1, is a coprobiont, predatory staphylinid from subfamily Staphylininae Latreille, 1802. About the study of this species on the Republic of Moldova territory are represented in publication the materials by autochthonous entomologists: Ostaficiuc V, Neculiseanu Z., Bacal S., etc. More concerned about the staphylinidofaunistical domain was Ostaficiuc V., group being one of 2 (click-beetles – Elateridae and rove beetles – Staphylinidea) included in the research during the practiced professional period. In this context, Ostaficiuc V. approached several aspects dedicated to the group of Staphylinids.

Previous records: 1. One of the relevant results obtained over time were the phenological sheets developed and published for species from 6 genera including genus *Philonthus* Stephens, 1829 and the respective species. Thus, he presented an entire biological cycle for each developmental stage of the staphylinid *Philonthus salinus* Kiesenwetter, 1844. He has recorded data relating to: hibernation stage and place; the emergence of the adult after hibernation; flying of population in mass; the beginning of sexual maturation of hibernating females; mass development of sexually mature females; the beginning of mating of individuals and their mass coupling; the beginning of the lay and mass deposition; the decline of adults; embryonic development and incubation period; începutul eclozării larvelor și dezvoltării în masă; establishing the number of larval ages and duration for each; the beginning of process of pupation and their transformation into mass; the emergence of new generation adults and their mass flight.

2.In 1980, a direction of investigation for this staphylinid was the detailed investigation of bioecological peculiarities in laboratory conditions by organizing of an artificial insectarium with controlled environmental conditions and prepared nutritional menu.

3. Records about the distribution mode of staphylinids were made in the conditions of our country, classifying them into groups with uniform and non-uniform expansion potential.

4. He emphasized the specific species in a certain habitat, on a certain crop and/or substrate.

5. He classified the dominant species according to certain statistical indices with a certain value for certain researched areas.

6. Serial collections were recorded in the faunal register: Ghidighici, Strășeni district, 12.07.1968, 1♂; Chișinău city, 20.05.1971, 1♂; Palanca, Ștefan-Vodă district, 16.07.1974, 3 ♀♀; Giurgiulești, Cahul district, 09.07.1987, 7♀♀, at artificial light. He researched 550 points on the territory of the country in the years: 93 sites in 1968, 58 - in 1969, 8 - 1970, 119 - 1971, 38 - 1972, 32 - 1973 100 - 1974, 82 - 1975, one by 10 points in each year: 1976 and 1977, from which he extracted staphylinic material in general and specimens of the species *Philonthus salinus* Kiesenwetter, 1844.

Figure 1. *Philonthus salinus* Kiesenwetter, 1844, the staphylinid from subfam.Staphylininae Latreille, 1802 (data base: Mihailov Irina)

Recent records: **1.**In 2010, the author was contributed to the completion of the database with new gathering for this species and tracking the expansion on new biotopes. From the research carried out in the Landscape Reserve "Saharna", have been identified with a high abundance more than 10 staphylinid species. In this year, 27 specimens of *Philonthus salinus* Kiesenwetter, 1844 were extracted from the collected samples.

2. In 2011, the author was completed the chapter with records gathered from the white and ultraviolet light collections and evaluate the seasonal dynamics in the northern area: the surroundings of Brinzeni (the didactic-experimental station). The flight period for *Philonthus salinus* Kiesenwetter, 1844 was set in July, with a frequency of 1-2 copies per day. It showed better receptivity to white light.

3. In 2012, she studies the belonging of the species in agrobiocenoses: maintained and unmaintained apple orchards. The research points were: Brînzeni, Zabriceni from Edineț district; Codru, experimental plantation, Chisinau; Demonstration orchard Stăuceni, Petricani, Durlești; Unmaintained orchard Budești, Grătiesti, Ghidighici, etc.

4. Gradually the author reconfirms the presence of the species in different types of substrates: in 2013 on grassland, in animal droppings and vegetable remains (Molovata Veche, Molovata Nouă, Dubăsari district).

5. In (2021-2022) was elucidated faunal diversity in the forest ecosystem : Saharna, Rezina district; Reserve Codrii, Strășeni; Reserve Padurea Domnească, Glodeni district; Reserve Plaiul Fagului, Ungheni district, Reserve Prutul de Jos, Cahul district.

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Keywords: *Philonthus salinus Kiesenwetter, 1844, Republic of Moldova, previous records, recent records.*

UDC: **595.76:551.782.13(478)**

OCYPUS FULVIPENNIS ERICHSON, 1840 (COLEOPTERA, STAPHYLINIDAE) IN THE REPUBLIC OF MOLDOVA AS A POLYBIONT VITAL FORM SPECIES.

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From the research of the faunal diversity of stafilinids from the Republic of Moldova, there were selected species for which sequences from the ecological field were exposed, specifying some classification based on certain criteria. In this context, the aspects of trophic categories (based on the type of nutrition), ecological preferences (type and variety of the populated biotope) and the influence of abiotic factors during the development processes were considered.

Classification of stafilinid communities into bioecological groups by vital form and habitat preferences is interdependent by adaptation and popularization of various substrates and microhabitats. Stafilinid species adapted to an open way of life with free location: on the soil, on substrates, on plants, in the grassy floor, are treated as representatives of the group of epibiont species.

As a specific general characteristic of this group there are pedobionts,the individuals with slim, elongated, slender body, proportionally developed and adapted for running legs. The groups which species have a semi-hidden way of life: underground, on the surface and in the substrate, are referred to cavernous species, as an example the saprobiont, coprobiont and mycetobiont stafilinids could be given. By the cryptobiont classification, the species adapted to a hidden way of life (underground and in the bark of trees, caves, etc.) are nidicols and xylobionts,. Stafilinids with a symbiotic way of life are the symphyl species. They interact with social insects (ants), populate anthills, are a part of the group of myrmecobionts.

Ocypus fulvipennis Erichson, 1840, Figure 1, is a predatory/necrophagous stapylinid from the subfamily Staphylococcininae Latreille, 1802, registered for the fauna of our country, treated as a species with polybiont ecological status and with important place for the environment. It participates in the natural ecosystem as a regulating species in the biological control of some harmful insects in cultivated crops. By the size of the adult that is accentuated, of 12 mm, it ranks in the group of large stafilinids. It can be observed both in the natural ecosystem and in agrobiocenoses.

Figure 1. *Ocypus fulvipennis* Erichson, 1840, staphylinid from subfam.Staphylininae Latreille, 1802
(database: Mihailov Irina)

Observed for several years in the field, analyzed according to the specialized literature and in laboratory conditions, this species was included in the fundamental and applied research in the period 2021-2022. The material extracted from samples collected from various biotopes showed a wide trajectory of expansion of this species on the territory of our country. According to the recorded points, it appeared in different types of forests in the central regions (Horăști, Cocieri, Strășeni) and North (Brînzeni, Zăbriceni), under litter, in soil traps, under trees knocked down by the wind, on decaying stumps, in layers gathered by grass, on decomposed animal matter. These records indicate that according to the structure of the vital form Ocypus fulvipennis Erichson, 1840, is a component of the group of polybiont species, with a wider ecological spectrum, thus treated as pedobiont, nidicole and saprobiont species.

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Keywords: *Ocypus fulvicornis Erichson, 1840, polybiont species, Republic of Moldova.*

UDC: **542.943:615.276**

FENTON OXIDATION OF SODIUM DICLOFENAC

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Since such a large number of pharmaceutical compounds are consumed every year, significant unused overtime drugs, including human and veterinary medical compounds, are released into environment continuously. A large part, in the form of original drugs or metabolites, is discarded to waste disposal site or into municipal sewer (human body only metabolizes a small percentage of drug). Much of these medicines escape from being eliminated in wastewater treatment plants, because they are soluble or slightly soluble, and they are resistant to degradation through biological or conventional chemical processes. Considering that conventional wastewater treatment processes display sometime poor removal efficiency for pharmaceuticals, the aim of this paper is to increase degradation/ mineralization efficiency of sodium diclofenac using chemical advanced oxidation processes. To achieve the goal, the catalytic oxidation of the model systems was carried out with the Fenton reagent ($DFC/H_2O_2/Fe^{2+}$) for 60 min at room temperature. The analysed systems contain sodium diclofenac with an initial concentration of 50 mg/L. The degradation kinetics of sodium diclofenac from aqueous solutions was estimated by the variation of DCF concentration (C_t), determining the reaction rates ($\Delta c/\Delta t$, $molL^{-1}s^{-1}$, rate constants (k_t, s^{-1}) and the half-life ($\tau_{1/2}$, s). The oxidation/mineralization was monitored by the variation of residual compounds (COD_t).

Based on the obtained results, it can be observed that upon the oxidation of 50 mg/L DFC from aqueous solution with Fenton's reagent, the highest degradation/mineralization performance was obtained: a rate constant (k) of $2.7 \cdot 10^{-3}$ s^{-1}, a reaction rate ($\Delta c/\Delta t$) of $2.1 \cdot 10^{-7}$ $molL^{-1}s^{-1}$, and a half-life ($\tau_{1/2}$) of 256 s, compared to Photo-Fenton and Sono-Fenton oxidation. These results are due to the fact that in the presence of Fe^{2+} ions, aqua ferric ions are formed in large quantities, which at pH 2.5 have a strong catalytic activity. Therefore, interacting with hydrogen peroxide it forms OH radicals, which leads to an almost complete conversion in the first 3 min of reaction and oxidizes the pollutant to less toxic organic compounds. Thus, the degradation and the oxidation/mineralization are, on average, 80%. It may be concluding that the effect of each independent variable depends on the value of the other due to the existence of simultaneous interactions. Thus, any of the variables could positively or negatively affect both the degradation and mineralization rate of sodium diclofenac. It was concluded that catalytic process can be a potential method for removal sodium diclofenac in optimal conditions.

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Keywords: *fenton reagent, wastewater treatment, diclofenac, anti-inflammatory drugs.*

UDC: **579.2:577:678.7**

ISOLATION OF MICROBIAL CONSORTIA FOR THEIR POTENTIAL APPLICATION IN LDPE BIODEGRADATION

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Low-density polyethylene (LDPE) is one of the major causes of persistent environmental pollution due to its resistance to degradation. Polyethylene can be degraded by different methods: chemical, thermal, biological, and photodegradation. The use of microorganisms in environmental decontamination is the most ecological and safest way. The purpose of the research was the isolation and characterization of consortia of microorganisms with potential in LDPE biodegradation.

In order to isolate microbial consortia from the soil, with potential in the bioconversion of non-recyclable plastic, research was initiated using soil samples polluted with plastic and other contaminants, collected from the landfill near the village of Slobozia-Dușca. Incubation experiments were carried out under laboratory conditions, in pots with soil with the addition of LDPE strips. Two experimental variants of incubation were planned: 1) oxic conditions, and 2) anoxic conditions. The experiment duration was 180 days. To isolate the microbial consortia, which populated the polyethylene surface, the strips were transferred to flasks with MSM 2 liquid mineral medium and cultivated under continuous stirring conditions at 28°C for 30 days. The obtained consortia were cultivated for 270 days under similar conditions, in the presence of LDPE. Subsequently, the consortia were characterized by inoculation on solid media and under the optical microscope. The degree of LDPE degradation was determined by optical microscopy of the films and by Fourier-transform infrared spectroscopy (FTIR).

The obtained results showed that in experimental variant 1 (oxic conditions) the microbial consortium was composed of 3 strains of micromycetes and 1 strain of bacteria. In variant 2 (anoxic conditions) the consortium was composed of 1 strain of micromycetes, 1 strain of yeasts and 2 strains of bacteria. Microscopic study of LDPE films revealed both immobilization of microorganism cells and damage to the polyethylene surface. The analysis of the LDPE films by the FTIR method showed that the microorganisms, which populated the surface of the LDPE samples, cause physical changes, observed on the absorption spectra of the films, such as the appearance and disappearance of some absorption bands, or their splitting.

The obtained data allow us to conclude that the obtained microbial consortia have potential in the biodegradation of non-recyclable plastic.

***Acknowledgments*:** this study was supported by the research State Program Project 20.80009.7007.03 “Microbial tools for degradation of non-recyclable plastics waste”, funded by NARD of the Republic of Moldova.

Keywords: *microbial consortia, LDPE, biodegradation.*

UDC: **556.3.072:627.17**

PECULATITIES OF GROUNDWATER POTENTIAL IN THE SOUTH-WESTERN PART OF THE BLACK SEA ARTEZIAN BASIN

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Knowledge of the potential of groundwater makes it possible to reasonably use and plan the use of aquifer resources for the needs of society and its economic development. Within the southwestern part of the Black Sea artesian basin (on the example of the territory of the Republic of Moldova), drinking (or fresh), technical, mineral, geothermal and industrial groundwater are developed. Drinking (and technical) groundwater is the most common. Officially, there are 248 groundwater deposits. Geologically, they are confined within the hydrogeological zone of active water exchange and by age belong to various complexes of sedimentary rocks of the Neogene and Cretaceous-Silurian, as well as Vendian and Archean metamorphic rocks. Mineral waters form 58 deposits, which are located within the entire study area. These deposits are of the same age as drinking groundwater. Mineral waters are different in gas and chemical composition.

Currently, not all deposits are exploited. Geothermal waters are distributed only in the central-western and southern parts of the territory. The deposits of these waters are not officially registered and the geothermal waters are dated by age to the rocks of the Neogene and, down the section, to various age categories of rocks. The temperature and chemical composition of geothermal waters are variable both in plan and within the section. Geothermal water are not exploited. Industrial underground waters (from which valuable chemical elements can be extracted) are common in different parts of the study area and differ in geological age. Currently, 5 deposits are officially registered, which contain high concentrations of iodine, bromine, boron, lithium, rubidium, cesium, strontium and potassium. In addition to these deposits, helium deposits are known. The deposits are not exploited yet. The State Monitoring Hydrogeological Network primarily monitors the level of drinking groundwater. Within each field of drinking groundwater, monitoring of the chemical and bacteriological composition is carried out by the owners of production wells. There is no unified database of groundwater quality.

Groundwater potential is formed under the influence of the sum of natural factors. It is necessary to distinguish separately the potential of drinking (and technical) groundwater, the potential of mineral waters, the potential of geothermal waters and the potential of industrial waters.

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Keywords: *groundwater, potential, water use.*

UDC: **598.235.2:556.55(478)**

CURRENT STATUS OF THE PELECANIFORMES SPECIES IN THE RAMSAR AREA "THE LAKES OF LOWER PRUT"

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Following the research of the avifauna of the "Lower Prut Lakes" Ramsar site territory, carried out in the period 2018-2023, 13 species belonging to the Pelecaniformes order were identified. The classification of birds was carried out according to Avibase - Bird World Database and BirdLife International. Out of the total number, 8 species: *Pelecanus onocrotalus, Pelecanus crispus, Botaurus stellaris, Ardeola ralloides, Ardea alba, Ardea purpurea, Plegadis falcinellus, Platalea leucorodia*, have the status of rare species, protected at national and international level.

In phenological aspect, the pelecaniformes registered in the Lower Prut sector have the status of summer guests, some solitary specimens were also observed during winter *(Botaurus stellaris, Ardea alba, Ardea cinerea,* rarely *Platalea leucorodia).*

Among the 9 species of Ardeidae, the rarest one was *Bubulcus ibis*, recorded only two times (May, December 2021).

The pelecans *Pelecanus crispus* and *Pelecanus onocrotalus* visit the area in search of food during the warm season of the year. Small groups or solitary specimens appear for a few days in winter as well. During the summer *Pelecanus onocrotalus* is the most numerous, with 200-2500 individuals. These birds fly between different bodies of water in search of fish to feed on. They can be frequently seen on Beleu and Manta lakes until September.

Except for the *Bubulcus ibis* species, the herons are attracted to available nesting sites in the area. However, due to changes in the ecosystems and the influence of environmental factors, especially the persistent drought in recent years, the reproduction of these birds sometimes fails.

The species from fam. Threskiornithidae *Plegadis falcinellus* and *Platalea leucorodia* are summer guests, but also passage species. The number of nesting pairs is very low, and they were noted in the colonies from the swamp sectors of Manta and Beleu lakes. The other sectors are visited for foraging.

Starting in July, hundreds of specimens can be seen at the water's edge forming groups and preparing for migration.

Acknowledgments: this study was supported by the research project no. 20.80009.7007.02 *Evolutionary changes of economically important terrestrial fauna, of rare and protected species in the conditions of anthropogenic and climatic changes*, funded by the Ministry of Education and Research. Doctoral project: Aavifauna of the Ramsar wetland "Lower Prut Lakes".

Keywords: *Pelecaniformes species, Lower Prut Lakes Ramsar site*.

UDC: **502.131.1:581.5(478-21)**

FORECAST OF SUSTAINABILITY OF BĂLȚI CITY EMERGING FROM THE AMOUNT OF PHYTOMASS

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The sustainable development of an urban ecosystem is ensured by maintaining the ecological balance that provides for the rational use of natural resources and the protection of the quality of environmental components. Fresh phytomass is an indicator that provides information about the state and capacity of the ecosystem. The minimum amount of phytomass can serve as a predictor of an ecosystem at risk of degradation. It depends on several conditions,but also by the anthropic factor.

In order to assess the productive potential of herbaceous plants within the Bălți urban ecosystem (BUE), during the years 2020-2022 studies were carried out in 9 resorts, in 8 of them phytocenological cutting were carried out using the quadrat method. Productivity was calculated in g/m^2.

As a result of the evaluation of the primary productivity of the grassy layer, it was established that the lower activity of the anthropic factor increasesthe higher fresh phytomass.The best situation was recorded in the sites: *Răut r., confluence with Copăceanca r.*;*Flămânda - the tributary of Răut r.;Vânătorilor &Pescarilor lake.*At the opposite side, the most disadvantaged turned out to be the *canoeing channel* resort, where it was not possible to carry out phytocenological cutting, as the vegetation was practically absent and dry. Resortthe*bank* of the*Răut r.*, near *Locomotivelorstr.*, is at risk of degradation, as a minimal amount of phytomass was recorded.Likewise, the following vulnerable areas were also identified: *the Comsomol lake*; *Răut r. after confluence withwastewater treatment plant*, as well as *Răut r.*, nearbythe *bus station*.

The productivity of the vegetal carpet within the BUE is disturbed by the following threats: grazing, tillage of the soil, ruderal and invasive species, soil salinization, lack of precipitation, etc.

In order to ensure the sustainable development of the plant component and increase productivity in vulnerable areas within the BUE, it is proposed to plant native trees and shrubs, which prevent soil erosion, have the ability to maintain water and soil temperature, thus ensuring protection for herbaceous species, but also contributing to the extension of the vegetation period.

***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 the Ministry of Finance**.**

Keywords: *Bălți urban ecosystem, productivity, phytomass, vulnerable areas.*

UDC: **556.531:628.358(478:282)**

THE IMPACT OF THE EFFLUENT FROM THE WASTEWATER TREATMENT PLANT BĂLȚI ON QUALITY RĂUT RIVER

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Organic, nutrient and hazardous surface water pollution is mainly caused by direct or indirect discharges of insufficiently treated wastewater from sewage treatment plants.

Thus, the present study highlights the degree of pollution of the Răut River, downstream from the upstream by the wastewater treatment plant from Bălți city (WTP Bălți), from the physic-chemical point of view of surface water quality.

In the Republic of Moldova, the quality of wastewater discharged into natural receivers is regulated by Government Decision no. 950 of 25.11.2013, regarding the requirements for the collection, treatment and evacuation of waste water in the sewage system and / or in natural water bodies for cities and rural towns.

Therefore, in the first quarter of 2023, water samples were taken from the Răut river, upstream and downstream of the wastewater discharge from WTP Bălți. The determination of the physic-chemical quality parameters of the surface water in the water samples was carried out in the accredited laboratory "Laboratorul Investigații de Mediu" S.R.L., by me personally.

According to the results of laboratory tests, a high degree of pollution with organic substances was found: COD (upstream 67.7 mg/l; downstream 103.5); BOD_5 (upstream 16.9 mg/l; downstream 25.9); N/NH_4^+ (upstream 1.63 mg/l; downstream 18.1 mg/l); P_{tot} (upstream 0.55 mg/l; downstream 1.70 mg/l). There is an obvious pressure on the quality of the Răut river, downstream of the wastewater discharge from WTP Bălți, due to the reduced effectiveness of the biological step, the bacteria and microorganisms (activated sludge) in the aeration basins are not able to degrade the organic substances. Thus, insufficiently purified water is discharged directly into the Răut river. Due to the small flow of the river, the process of self-purification of surface water stagnates.

In conclusion, wastewater treatment is of colossal importance for the protection and maintenance of the environment in the best conditions. The image of the polluted Republic of Moldova should become a thing of the past, so legal regulations and European standards must be respected, active participation in the treatment and cleaning of wastewater in order to achieve a sustainable management of aquatic resources.

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Keywords: *effluent, natural receptor, organic substances, degree of pollution.*

UDC: **574.5:502.1(478:282)**

THE DIVERSITY OF THE PLANKTONIC ALGOFLORA IN THE WATER OF THE RĂUT RIVER BASIN WITHIN THE LIMITS OF THE BĂLȚI AND FLOREȘTI

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The algoflora of water bodies play an important role in maintaining the ecological balance in water ecosystems, they are the primary producers of organic matter, which present the nutritional basis of the trophic chains in these ecosystems, and the assimilation of compounds from the water environment ensures the process of self-purification of water bodies. Due to the bioindicator capacity of many algae species, algoflora represents an important component in the bioecological monitoring system of water bodies.

The planktonic algoflora in the water of the Răut River in the sectors located within the limits of the Bălți and Florești urban ecosystems was studied based on the planktonic samples taken in 10 stations established along the river, its tributaries, lakes on the territory of the Bălți urboecosystem and 2 stations established along the course of the river upstream and downstream of the waste water treatment station in the Florești urban ecosystem during the year 2019-2022. Temperature, transparency, pH and chemical analysis of the water were measured in the studied sites.

The planktonic algae flora in the studied stations is represented by 141 species and 4 varieties of algae, from the phyla: Cyanophyta – 14 species, Chlorophyta – 47 species, Chrysophyta – 13 species, Bacillariophyta 46 species and 4 var., Pyrrophyta – 2 species, Euglenophyta -19 species and 1 var. The two major groups according to diversity, Chlorophyta and Bacillariophyta form the dominant complexes in most of the investigated stations, but in the sites where the river water has a high degree of eutrophication, for example, the Răut river upstream and downstream of the wastewater treatment stations in the Bălți and Florești city, in the water of the river upstream and downstream of the place of confluence with the Copăceanca tributary, the dominant complexes are formed by representatives of the phyla Euglenophyta and Cyanophyta.

Fluctuations in the taxonomic structure of the planktonic algal flora, which manifest both seasonally and during the period of our investigations, are explained by the instability of environmental factors, the anthropogenic impact, which is quite pronounced throughout the water area of the Răut River, but especially the course of the river located within the urboecosystems and the adjacent sectors.

***Acknowledgments*:** this study was supported by the research project (*nr. 20.80009.7007.11, Bulimaga Constantin*), funded by (*The Ministry of Finance*).

Keywords: *algal flora, taxonomic structure, bodies of water.*

UDC: **598.2:591.524**

ADAPTIVE FEATURES OF THE ETHOLOGY OF SOME WETLAND BIRDS TO LIFE IN SETTLEMENTS

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The research was carried out on the reservoirs of Transnistria, confined to settlements in 2020-2023. At this moment, the adaptation and differences in the behavior of the conditionally synanthropic avifauna of reservoirs with wetland birds living outside the settlements were determined. The adaptive behavior of 4 bird species of the target group was analyzed, these species are found in all reservoirs of the studied territory.

Anas platyrhynchos is the most plastic species, adapting to anthropogenic changes in natural habitat conditions and undergoing synanthropization. Micropopulations of these ducks within the settlements, let a person close enough and take fertilizing. However, birds that are not part of the grouping confined to the reservoir of the settlement do not let a person close.

Cygnus olor – is rare in nesting, but during migrations, bird flocks in some areas reach 200 individuals. To a greater extent, the behavior of swans was influenced by the ban on hunting and feeding birds, especially in winter. Swans do not have a clear division into "residential" and "wild" groups. Birds that are located on the reservoirs of settlements are cautious when a person appears, but they let humans get much closer than other goose-like species.

Fulica atra is a common species in all reservoirs of the research zone. In recent decades, this species has increasingly appeared in the reservoirs of settlements. In nature, *Fulica atra* are very cautious and secretive birds, but there is a decrease in fear of humans, this is especially noticeable at the Kuchurgan reservoir, therefore, in the area of the Pervomaisk-Kuchurgan bridge, birds let humans very close and take food. In general, the change in the behavior of these birds is poorly expressed in the reservoirs of the studied zone.

Acrocephalus arundinaceus is a numerous species in the research area. This species has recently settled quite widely in natural habitats within the boundaries of settlements. This species does not experience much anxiety near a person, and even uses artificial materials when building a nest. The nest found on the city stream "Kolkotovy" was constructed of dry stems, leaves, fluff, rags, paper and placed on reed stems at a height of about 1 m from the water surface. Thus, birds have adapted to the neighborhood with people and even enjoy some of the advantages of such a neighborhood.

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Keywords: *birds, urban reservoirs, adaptation, swan, duck, urbanization*.

UDC: **582.912.4:502.1(478)**

THE *MONOTROPA* L. (*ERICACEAE*) IN THE FLORA OF "DOBRUȘA" LANDSCAPE RESERVE

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The number of plant species is declining at an increasingly alarming rate in recent years, mainly due to human activities such: as change of land use, pollution and climate change.

The problem of the conservation of biodiversity, presents two distinct aspects: the identification of rare species threatened with extinction and the development of the necessary measures to save them; the application of these measures within endangered biocenotic systems.

The floristic research, carried out in the period of 2009-2022 within the "Dobrușa" landscape reserve, led to the identification of two new species of the flora of this protected area, from the genus *Monotropa* L. as: *Monotropa hypophegea* Wallr. and *M. hypopitys* L..

The *Monotropa* genus are classified in family of Ericaceae. According to data from literature, the number of species in this genus varies between three and eight.

In the flora of the Republic of Moldova are registered two species of *Monotropa* genus: *M. hypopitys* L. and *M. hypophegea* Wallr., both species are rare in our country and included in the Red Book of the Republic of Moldova with the rarity category – Critically Endangered (CR) species.

On the territory of the "Dobrușa" landscape reserve it was identified a population of *M. hypopitys* L., on plot 55H (47°47'36.63"N, 28°40'52.27"E), the population is characterized by 15 specimens, it lives under the canopy of an old stand which predominates the hornbeam mixed with ash, pedunculate oak and linden. Also were recorded two populations of *M. hypophegea* Wallr., one in the plot 41A (47°48'25.16"N, 28°39'28.40"E) and another in the plot 69S (47°47'12.44"N, 28°41'10.88"E), they live under the canopy of stand of pedunculate oak grove mixed with hornbeam and ash.

Given the fact that this growth point is identified for the first time on the territory of the Republic of Moldova, the respective population needs to be constantly protected and monitored in order to highlight their evolution.

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Keywords: *"Dobrușa" landscape reserve, Monotropa L., rare plants.*

UDC: **628.315:546.39:542.943**

ANAMMOX AS A METHOD FOR REMOVING NITROGEN COMPOUNDS FROM WASTEWATER

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An important aspect of the treatment of industrial, municipal and domestic wastewater is their removal of organic and inorganic nitrogen compounds. The cycle of nitrogen compounds consists of five metabolic reactions (nitritation, nitration, denitrification, dissimilation oxidation of nitrate and anaerobic oxidation of ammonia); three anabolic reactions (ammonia uptake, nitrate assimilation oxidation and nitrogen fixation) and ammonification (Kallistova, A., et al. (2016). Mikrobiologiia, 85(2), 126-144).

All reactions, with the exception of anammox reactions, have been known for a long time. ANAMMOX or anaerobic ammonium oxidation was noticed in the bioreactor of the wastewater treatment by the Delft University of Technology (Holland) (Van Loosdrecht, M.C.M.; Jetten, M.S.M. (1998). Patent WO9807664).

The application of the anammox process lies in the removal of ammonium in wastewater treatment and consists of two separate processes. The first step is partial nitrification (nitritation) of half of the ammonium to nitrite by ammonia oxidizing bacteria: $2NH_4^+ + 3O_2 \rightarrow 2NO_2^- + 4H^+ + 2H_2O$. The resulting ammonium and nitrite are converted in the anammox process to dinitrogen gas and ~15% nitrate by anammox bacteria: $NH_4^+ + NO_2^- \rightarrow N_2 + 2H_2O$. Both processes can take place in in the same reactor where two guilds of bacteria form compact granules (Kartal, B., et al. (2010). Science, 328(5979), 702-703).

Special reactors are needed to obtain granular biomass or biofilm from colonies of the anammox organisms. Possible reactors are sequencing batch reactors (SBR), moving bed reactors or gas-lift-loop reactors. Anammox is applied for ammonium removal in wastewater treatment in many countries of the world (Cao, S., et al. (2021). Critical Reviews in Environmental Science and Technology, 51(19), 2260-2293). The first full scale reactor intended for the application of anammox bacteria was built in the Netherlands in 2002 (Van der Star W. R. L., et al. (2007). Water research, 41(18), 4149-4163).

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Keywords: *anammox, wastewater, ammonium, nitrogen removal.*

UDC: **504:574**

A DECADE OF BIBLIOMETRIC ANALYSIS OF BIODIVERSITY

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Starting from the premise that bibliometric analysis is a rigorous method of exploitation and analysis of large volumes of scientific data, in this article, we want to highlight how many papers have been published about biodiversity over the period of 2012-2022.

Thus, for the mentioned sample, we took into account some of the most prestigious journals in the field, identifying a number of 238 published articles. Because it is underdeveloped and new in many fields, bibliometric analysis must bring to light the emerging areas, but also the evolutionary nuances in a certain field. However, in our article we will present an overview of the field-specific methodology, we will highlight its different techniques, so we can provide reliable guidance for those who want to rigorously perform bibliometric analysis.

Consequently, we defined when and how to apply bibliometric analysis in addition to the other methodologies, such as meta-analysis and systematic literature reviews. As a result, we aim this paper to serve as a helpful source of information for learning about the methods and strategies accessible for performing studies employing bibliometric analysis.

Keywords: *biodiversity, bibliometric analysis, environment.*

UDC: **599.322/.324:574(478)**

EVOLUTION OF SMALL MAMMAL COMMUNITIES AT THE DEPRESSION PHASE IN AGROCENOSES IN THE REPUBLIC OF MOLDOVA IN 2022

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Elucidating the evolution of small mammal populations and communities in agrolandscape is of great importance for determining the adaptation of species to the conditions existing in various ecosystems. The research aimed to analyse the evolution of small mammal community structure, diversity and population parameters in model species in different ecosystems. The research included forest ecosystems and agrocenoses at the "Horăşti", "Rezeni", "Plaiul Fagului" stations in the central part of the Republic. Relative density was determined for numerical evaluation. Species, sex, age, morphological indices, physiological and reproductive status were recorded. It was determined that the desertification process in the summer of the year preceding the depression phase had a negative influence on the species of small herbivorous mammals. In spring, a decrease in relative density was recorded, especially in forest ecosystems. Communities with a relative density of 10-14% were reported in the ecotone with the blackthorn subarboretum and 3-4% in the forest ecotone with agricultural stations. In grassland fields the relative density is 8-12% in June. In forest ecosystems the dominant species is *A.flavicollis* (45%), and in agro-forests *A.sylvaticus* (62%). 12 species of rodents and 5 species of insectivores were recorded in autumn. The highest diversity was found in ecosystems near water bodies (H'=2.27), followed by forest ecosystems (1.82), forage crops (1.57) and grassland crops (1.1). There was a deep numerical depression in microtine populations in spring, with densities in forage crops being 1-2 individuals per hectare. Following the autumn rains and the intense growth of forage crops the density increased to 5-10 colonies/ha. In recent years, the dominance of the woodland species *A.flavicollis* and *C.glareolus*, but also of the species *Mus spicilegus* has decreased because of desertification. The negative trend is conditioned by the climate factor, which influences the development of herbaceous plants – the food source of these species. At the same time, the number of myophagous predators has increased significantly.

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Keywords: *evolution, communities, dominance, frequency, diversity.*

UDC: **631.423:631.816:663.262**

THE BIO-ECOLOGICAL SOIL FETILIZATION WITH WINERY AND ETHANOL PRODUCTION INDUSTRY WASTES

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In today's world, the environment ecological state in most natural and anthropogenic ecosystems is deplorable. The production of alcoholic beverages discarded chaotically wastes represent a major danger both for human life and for air, soil, flora, etc. There is not any enterprise in the Republic of Moldova for either the direct disposal or the reprocessing of these wastes. However, in these wastes contain a significant amount of biophilic elements necessary for the nutrition of crop plants and soil fertility, and last but not least, a high amount of organic matter. An estimated 100 thousand of the waste is accumulated in the country annually. It is in them 28 thousand tons of organic matter, 211 tons of nitrogen, 95 tons of phosphorus and 257 tons of potassium are contained.

The several hitherto unexplored wastes in the Republic of Moldova which originate from the alcoholic beverage production units' output (wine yeasts, vinasa from wineries and cereal marc from ethanol production enterprises) were tested in two field experiences on the Technological-Experimental Station "Codru" located in the municipality of Chisinau in 2011-2022 years. The use of these fertilizers resulted in a significant increase in organic matter content by 0.17-0.43%. A significant increase of nitric nitrogen by 1.48-6.30 mg/kg, changeable phosphorus and potassium respectively by 0.31-0.72 mg/100 g and 7.5-20.1 mg/100 g was found. The improvement of the agrophysical indices of the soil was observed. The application of wine yeasts ensures a significant increase in grape production (Sauvignon) on average over 12 years to 1.6-3.0 t/ha. The increase in yield when incorporating vinasa was on average 1.2-1.9 t/ha. The cereal marc applied to the soil resulted in average of crop production increases in 1300-1800 kg/ha cereal units over 11 years compared to the unfertilized control. The investigated wines are characterized by good organoleptic qualities and according to their typicality they correspond to the normative acts in force. At fertilization with cereal marc was recorded considerably increases the harvested mass of protein and fat. In comparison to the control plants, the mass of protein collected in 11 years increased by 120-987 kg/ha.

The bio-ecological fertilizers applied, therefore, have financial benefits and at the same time the level of environmental pollution decreases substantially.

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Keywords: wastes, *alcohol, beverages, soil fertility, crop productivity, environment*.

UDC: **502.3:338.48:574(478)**

SOME ASPECTS OF THE DEVELOPMENT OF ENVIRONMENTALLY FRIENDLY TOURISM IN THE CENTER DEVELOPMENT REGION OF THE REPUBLIC OF MOLDOVA

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In the last decades in the Republic of Moldova (RM), the trend of tourism development is manifested, through its return to nature and authentic cultural values. Thus, research dedicated to the practice of ecotourism or environmentally friendly tourism is becoming more and more current. The Center Development Region (CDR) of the RM was taken into the study.

The CDR has considerable ecotourism potential, represented, first of all, by the geomorphological aspect of the territory – an unusual diversity of natural landscapes and unique natural monuments, of European and world value. The other categories of protected natural areas in this region are also of interest, which facilitates the practice of ecotourism. According to the annexes to the Law on the fund of state protected natural areas no. 1538-XIII of 25.02.1998, with subsequent amendments, as well as based on data from specialized literature, we estimated the number of protected natural areas that are of interest for the practice of ecotourism in the CDR. Thus, the CDR territory has 401 protected natural areas by the state: 1 national park (Orhei), 3 scientific reserves, 28 geological and paleontological monuments, 14 hydrological monuments, 4 botanical monuments, with representative sectors of forest vegetation, 276 centuries-old trees, 26 forest nature reserves, 3 medicinal plant nature reserves, 20 landscape reserves, 1 resource reserve, 14 multifunctional management areas, 8 landscape architecture monuments, 1 dendrological garden, 1 botanical garden and 1 zoo. In the CDR, the richest in state protected natural areas in terms of number, but not in terms of surface, is the Chisinau municipality: 92 protected natural areas (87 centuries-old trees, 1 dendrological garden, 1 botanical garden, 1 zoo, 2 monuments of landscape architecture). On the second place according to the number of protected natural areas is the Călărași district: 87 protected natural areas, and on the last place is the Ialoveni district with 5 protected areas.

Thus, the presence of a large number of representative state protected natural areas on the territory of the CDR of the RM creates favourable premises for the development of environmentally friendly tourism.

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Keywords: *ecotourism, natural state protected areas, Center Development Region of the Republic of Moldova*.

UDC: **502.3:338.48:574(478)**

CRIULENI DISTRICT AS AN ECOTOURISM DESTINATION

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The development of modern ecotourism in the Republic of Moldova is at the beginning and has great perspectives due to the fact that the country has rich and varied resources of natural and human origin. We selected the Criuleni district for research, because it is in the vicinity of the country's capital, so tourists who come for business visits or other purposes to Chisinau, as well as all those who love this type of tourism, can practice ecotourism in this district.

The Criuleni district has a relatively rich ecotourism potential, consisting of 14 natural objectives and complexes taken under the protection by the state: 1 national park (Orhei), 3 geological and paleontological nature monuments, 1 hydrological nature monument, 2 botanical nature monuments, with representative sectors of forest vegetation, 2 natural forest reserves, 2 monuments of landscape architecture and 3 centuries-old trees. For the valorization of the protected natural areas in the Criuleni district, we have developed an ecotourism route (itinerary), which includes visiting some more relevant protected natural areas. The ecotourism itinerary includes the following points to visit: 1. "Orhei" National Park (a sector within the limits of the Mașcăuți commune); 2. Bălăbăneşti village park (monument of landscape architecture) – moving from Chişinău to Bălăbăneşti village, tourists will be offered to admire the secular Canadian poplar on the side of the Chişinău-Orhei highway, on the left side, near Măgdăceşti village; 3. The springs with mineral waters from the Oniţcani village (hydrological nature monument); 4. The Goian outcrop (monument of geological and paleontological type – the first impression of the Goian landscape is the similarity with the Orheiul Vechi landscape, but in miniature: the same aspect of nature, the same calcareous rocks, the same winding gorge, only smaller size and area; 5. The park in Micleşti village (monument of landscape architecture). For ecotourists interested in soil sciences and geology, it is possible to additionally include, between the first and third tourist objective, the visit of site no. 6: Fossil soils on the right terraces of the Dniester river near the Mălăiesti village (geological and paleontological natural monument). And for speleology lovers, but at the same time, who have additional specialized training in the field, after visiting the mineral water springs from the Oniţcani village – visiting objective no. 7: The Cave of Surprises.

Thus, the Criuleni district has a valuable ecotourism potential, which can provide income both necessary for the protection of natural areas and for the economic development of the communities, on whose territory it is located, based on the concept of sustainable development.

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Keywords: *ecotourism, state protected natural areas, Criuleni district.*

UDC: **631.147:631.31:631.445.4**

ELEMENTS OF THE EVOLUTION OF AGROECOLOGICAL POTENTIAL OF ARABLE CHERNOZEM SOILS UNDER CLIMATE CHANGE CONDITIONS

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In the current stage of anthropo-natural chernozemous pedogenesis, the direction and intensity of the typogenetic processes responsible for the agroecological environment are determined by the intercalated action of agrogenesis and climate changes involving an agro-climatic trend.

Our research has shown that dehumidification, caused by the action of the specified factors, leads to the degradation of hydrophysical properties. Depending on the degree of their vulnerability to degradation in our research, the hydrophysical indices were divided into two groups: a) with a very low degree of vulnerability - the coefficient of hydroscopicity (CH) and the coefficient of wilting (CO) determined by factors with high stability over time (granulometric composition; mineralogical composition of the fine clay fraction); b) with a high degree of vulnerability - moisture breaking the capillary continuity (URC) and field capacity for water (CC) determined by the structural-aggregate composition, aggregate stability, volume and composition of the pore space. The degradation of the structural-aggregate composition and the reduction of the aggregate stability, as a result of dehumification, leads to the reduction of the total volume of the porous space and the volume of the capillary pores and the increase of the volume of the textural pores occupied by inactive water. This leads to the reduction of the field capacity for water and the increase of the moisture values of capillary continuity interruption. As a result, despite the fact that the wilting coefficient remains relatively constant, the optimum range for useful water (DOAU =CC-URC) and the range of useful water (DAU=URC-CO) are reduced in the soils. The cumulative effects of the specified changes are the cause of the establishment in the soils of a unidirectional trend of aridification of the active pedogenetic layer ($A_{ph1}+A_{ph2}+A_mB_m$).

As a result, even in years with amounts of atmospheric precipitation corresponding to the multiannual norm, in the layer affected by aridification, there is a moisture deficit, practically, for the entire duration of the active vegetation period.

The specified effects are intensified by the significant increase in water consumption during evapotranspiration caused by the reduction of the relative humidity of the air and its hot temperatures, but also by the 2-5ºC increase in the soil temperature in the active pedogenetic layer. More vulnerable to the climatic-aridization process are soils with humus content <3.5%, content of agronomically valuable aggregates (10-0.25mm) below 60% and agronomically valuable "chernoziomic" aggregates (5-1 mm) below 40%. The aridification of the active pedogenetic layer is also caused by the change in the apparent density regime determined by the specifics of the atmospheric precipitation regime manifested in the increase in the frequency of short periods of time with abundant precipitation and long periods without precipitation but with hot temperatures.

Keywords: *agroecological potential, structural-aggregate composition, aggregate stability, agronomically valuable structure, apparent density, total and differential porosity.*

UDC: **631.867:663.1:663.05**

EFFECT OF BIOACTIVE ADDITIVES ON BIOMASS FERMENTATION FROM AGRO-INDUSTRIAL SECTOR

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Wastes from the agro-industrial sector, due to their toxic effects with regard to plants and living organisms, cannot be dumped in the soil. However, they can serve as renewable source of value-added products, following the specific digestive treatment. This research was focused on studies of vinasse fermentation processes in the presence of bioactive substances introduced directly into the digested biomass. The results obtained testify that the substances of natural origin used as additives, demonstrate the pronounced effects on alcoholic fermentation of vinasse under the mesophilic conditions. Thus, the study of the effects of bioactive substances with possible antioxidant properties on biomass from winemaking sector with identification of these processes mechanisms can be a perspective direction, suggesting the new ways of wastes valorisation.

Table 1

Comparative efficiency of different types of additives of bioactive substances in the vinasse fermentation process at concentration of 0,003 g/L biomass

Nr. crt.	Bioactive substance used as an additive to the fermented biomass, 3g/L	Total volume of CO_2 emitted gas, cm^3	Fermentation time, h
2.	Aescinum	251.01	55
3.	Tomatin	233.46	78
4.	Sclareol	232.50	55
7.	Betuline	250.00	80
8.	Menthol	200.00	70

The comparative assessment of different additives action in the studied processes have demonstrated that the dihydroxyfumaric acid caused the emission of 266 cm^3 CO_2 in 76 hours, aescinum – 251 cm^3 in 55 hours, tomatin – 233 cm^3 during 78 hours, sclareol – 232 cm^3 during 55 hours, vanillin – 229 cm^3 during 69 hours, whereas catechin – 180 cm^3 during 61 hours of fermentation, until the fermentation process was completed. The principle of stimulating and intensifying the biochemical fermentation process may be due to the oxidation - reducing properties of SBA.

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Keywords: *agro-industrial wastes, vinasse, fermentation, bioactive additives.*

UDC: **638.157:595.2:634.22(478)**

THE RESULTS OF THE RESEARCH ON INVASIVE NEMATODE COMPLEXES ASSOCIATED WITH HARMFUL ARTHROPODS IN PLUM ORCHARDS UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

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Plum cultivation in the Republic of Moldova is particularly important, due to the popularity of its fruits, which are used fresh and in processed products. The safety of obtaining plum production is largely affected by the parasitic impact of invasive nematode complexes associated with harmful insects, which largely compromise the fruit yield and tree health, being dependent on the degree of infestation, the abundance of pests and the diversity of species. This argument summarizes the purpose of the research, which provided suggestions in establishing the invasive impact and consequences of these pests to plum plantations, during the growing season, in fruit production associations.

Phytosanitary surveys were done in various areas on intensive plum orchards with various modern cultivars, by collecting soil samples and affected organs, which were later analysed in the laboratory. For entomological research, the insects were simultaneously captured manually from the trees, sampled in test tubes, and later fixed and taxonomically determined. From collected species, the harmful ones were separated by establishing the parasitic diagnosis and taxonomic diversity.

As a result of phytosanitary investigations and laboratory analyses, the presence of 15 species of invasive nematodes and viral vectors of the following genera were detected: *Pratylenchus, Paratylenchus, Rotylenchus, Ditylenchus, Criconemoides*, associated with vector species of pathogenic viruses of the genera: *Xiphinema sp., Longidorus sp., Trichodorus sp.* Besides, 12 species of invasive arthropods were detected: plum fruit moth (*Cydia funebrana*); midges (*Dasineura spp.*); species of wasps (*Hoplocampa minuta, Hoplocampa flava, Eurytoma schreineri*); mealy plum aphid (*Hyalopterus pruni*), green peach and plum aphid (*Myzus persicae*), red spider mite (*Tetranychus urticae),* gall (*Eriophyes pruni),* clover mite (*Bryobia praetiosa),* green leafhopper *(Cicadella viridis),* weevil *(Sciaphobus squalidus),* various species of moths etc. At the same time, the presence of 5 viral diseases with specific pathogenic effect was detected in plum orchards, with average intensity of 5-15%, detected practically in all investigated orchards, and the estimated invasive impact caused by arthropod species was characterised by a degree of attack from 8% to 30%, with prevalence on leaves and young shoots.

Acknowledgments: the research was carried out with the support of the institutional project - State program: 20.80009.7007.12 and 20.80009.5107.02., 2023.

Keywords: *invasive nematodes, plum crops, pest insect, biological control, abundance, diversity.*

UDC: **638.157:592/599:633.11(478)**

INVASIVE NEMATOFAUNA AND ITS PARASITIC EFFECTS ON AUTUMN WHEAT CROPS UNDER THE CLIMATIC CONDITIONS OF THE REPUBLIC OF MOLDOVA

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The main goal in exploring and expanding valuable agroecosystems includes various undisputed objectives, aiming at ensuring high productivity of caryopses in cereals such an important role in the agro-industrial and food sector of the Republic of Moldova. There are losses of agricultural production because of unstable and extremely important environmental conditions, for both wheat crops and parasites, that deserve special attention and research, particularly on the parameters of the populations of parasitic nematodes, which cause severe diseases, specific to cereal plants, in the early stages of vegetation. Under the unstable pedo-climatic conditions of the Republic of Moldova, by performing biological control of nematodes, within the Parasitology and Helminthology Laboratory, at the Institute of Zoology, MSU, it has been established that the helminthic agents of cereal species trigger annually specific phyto-helminthiases and severely affect plants in the first phenological stages. The phytosanitary monitoring carried out on the parasitic nematofauna has a major theoretical-applicative significance by adapting and applying the new control measures in detecting outbreaks in plantations established with the use of new technological systems, crop rotation, modern imported varieties and hybrids.

The results of the research on the diversity and structure of parasitic nematode complexes in autumn wheat agrocenoses reflect the results of the ecological, parasitic and phytosanitary impact depending on environmental conditions, crop rotation and zonal areas of the Republic of Moldova. As a result of the morpho-taxonomic analysis of biological samples of nematodes, it was found that in the wheat crop, during the spring seasons of 2021-2022, there was a higher frequency of nematodes, consisting of 18-22 species, and in the summer season – the indices were by 15-30% lower; the comparative analyses were done in different zones and in natural ecosystems, where the nematode complexes with various trophic specialization predominate, depending on environmental factors and soil structure. Thus, regarding the structure of the populations of parasitic nematodes in autumn wheat, a total number of 24 species was found, analyzing the distribution of abundance in the investigated areas where the most frequent invasive species belonged to the genera: *Pratylenchus, Ditylenchus, Paratylenchus, Tylenchys, Rotylechus, Helicotylenchus, Tylenchorhynchus, Criconemoide,*

***Acknowledgments*:** the research was carried out with the support of the institutional project - State program: 20.80009.7007.12 and *20.80009.5107.02.*, 2023.

Keywords: *invasive nematodes, autumn wheat crops, parasitic impact, biological control, abundance, diversity.*

UDC: **595.786(478)″18″**

CARADRINA ASPERSA RAMBUR, 1834 (LEPIDOPTERA, NOCTUIDAE) – A NEW SPECIES IN THE FAUNA OF THE REPUBLIC OF MOLDOVA

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About 428 species of Noctuidae were recorded in the Republic of Moldova, taxonomically beloging to 170 genres and 17 subfamilies (Țugulea, 2022). The Xyleninae subfamily records 142 species beloging to the *Caradrina* genus. The genus *Caradrina* also includes the following species reported on the territory of the Republic of Moldova: *C. morpheus* (Hufnagel, 1766), *C. kadenii* Freyer, 1836, *C. selini* Boisduval, 1840 and *C. clavipalpis* (Scopoli, 1763).

The research was conducted during the vegetation period of 2022 in the "Prutul de Jos" Natural Reserve (Cahul district). The "Prutul de Jos" Reserve is located in the Down Prut River's basin and includes Lake Beleu and its surroundings, a network of ponds that, as a whole, form a unique ecosystem, that is quite attractive for a large number of lepidopteran species. The entomological material were collected in different habitats of the "Prutul de Jos" Natural Reserve like the lake shore and its meadows, floodplain forest, forest edge etc.

As a result of investigation many rare and new specie from Lepidoptera order were indetified for the first time in the reserve. Among the identified species, three specimens of *Caradrina aspersa* were collected on 28.06.2022. So, the number of *Caradrina* species identified on the territory of the Republic of Moldova reached 5. The species was also reported in the center of the Republic of Moldova in the "Codrii" reserve (Strășeni district), near Căpriana village, by C. Furtună who collected two specimens on 02.07.2022.

Caradrina aspersa occurs from North Africa across South and parts of Central Europe to Asia Minor and the Near East. The species inhabits stony mountain slopes, limestone grasslands and other dry and warm habitats. The larvae are polyphagous in the grass and herb layer. The moths occur in one or two generations between June and September-October.

Acknowledgments: this study was supported by the research project 20.80009.7007.02. from State program of the Institute of Zoology. I thank C. Furtună for his active contribution to the collection of entomological material.

Keywords: *Caradrina, new species, Noctuidae, Prutul de Jos, Codrii, reserve*.

UDC: **597.2/.5:574.5(478)**

THE PHYTOPLANKTON IN FISH PONDS OF FALESTI DISTRICT

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There are presented the results of the hydrobiological investigations carried out in the fish ponds in the Fălești district, Republic of Moldova during the years 2021-2022. Phytoplankton samples were collected and microscopically analyzed from the Moldovanca, Morozeni, Calugar, Gârla, Făgădău, Soltoaia, Ilenuta, Cegara and Logofteni fish ponds. The taxonomic diversity and quantitative parameters of the algal groups in the phytoplankton composition were established. The diversity and structural parameters of the phytoplankton are the indicators, that allow appreciation of the trophic level and degree of the water pollution. Collection and processing of samples was carried out within the research of the Laboratory of Hydrobiology and Ecotoxicology of the Institute of Zoology, according to the unified methods of collection and processing of hydrobiological samples.

In phytoplankton compositions of the fish ponds were identified 40 species of planktonic algae which refer to 4 groups: *Cyanophyta (Cyanobacteria)*-5, *Bacillariophyta*-12, *Euglenophyta*-10, *Chlorophyta*-13. During the vegetation period, cyanophyta (cyanobacteria), green and euglenophyta algae dominated, and representatives of other groups of algae were presented in insignificant amounts. The richest diversity was attested in the fish ponds: Moldovanca, Calugăr, Gârla and Făgădău, with the share of species: *Synechocystis aquatilis* (Sauv)., *Oscillatoria planctonica* (Wolosz.), *Euglena polymorpha* Dang., *Chlorella vulgaris* Beij. During the investigations, three species *Merismopedia tenuissima* Lemm., *Synechocystis aquatilis* Sauv., *Aphanizomenon flos-aquae* Ralfs., which by their development in large quantities cause the "blooming" of the water, were attested. The number of phytoplankton species was in limits 4.26-232.3 mln. cell/l, with high values in Fagădau, caused by the intensive growth of the species *Synechocystis aquatilis.* According to the values of phytoplankton biomass, which varied within the limits of 4.41-109.7 g/m^3, the investigated fish ponds were attributed to the category of "polytrophic" trophicity, periodically "hypertrophic", with higher values at Făgădău and Logofteni.

Out of the total number of algal species - 28 species are indicators of water saprobity. The saprobity index of the fish ponds varied between 1.86-2.29, which refers to the β-mesosaprobic zone and water quality class II (good), with the exception of the Făgădau and Șoltoaia ponds, which recorded saprobity index values of 3.12 and 3.24, respectively, which refer to the α-mesosaprobe zone and belong to the limits of water quality class III (moderately polluted).

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Keywords: *phytoplankton, cantitative parameters, troficity, saprobic index.*

UDC: **504.064.3:574:504.3.054**

ASSESSMENT OF AIR POLLUTION IN THE VICINITY OF OIL REFINERY PLANT USING MOSS BAGS TECHNIQUE

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Active biomonitoring technique using the species Sphagnum girgensohnii was used to examine heavy metals and trace element atmospheric deposition around the oil refinery plant "Slavneft'" in Yaroslavl. Moss was collected in pristine area in Tver region, Russia.

Three moss-bags were exposed for 2-month periods (June –August 2022) at eight representative sites. The concentrations of 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.

Significant accumulation of some elements in the exposed moss bags compared to the control was observed. Content of V and Ni, tracers of oil-refinery industry, increased up to 8 times, depends on wind direction. Moss bags biomonitoring proved to be a cheap and efficient tool to assess heavy metal pollution in urban area.

Keywords: *biomonitoring, moss bags, oil refinery plant.*

UDC: **628.315:504.064.3:574(478)**

EXPLORING INNOVATIVE TECHNOLOGICAL SCHEMES FOR OPTIMIZING NITROGEN SEPARATION IN THE WASTEWATER TREATMENT PROCESS AT MEDIUM-SCALE STATIONS

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Currently, in the Republic of Moldova, due to the high content of biogenic element compounds (namely, nitrogen and phosphorus) in domestic and small-scale industrial wastewater discharged into wastewater treatment plants, necessary measures for the protection of the aquatic environment are required, as these compounds significantly contribute to the eutrophication process of rivers and lakes.

To investigate the possibility of intensifying and optimizing wastewater treatment processes in medium-scale plants, tests were conducted based on the newly constructed biological wastewater treatment plant (WWTP) in Causeni, which started operation in 2021.

In order to optimize the treatment process, three technological schemes of operation for the Causeni WWTP were modeled. Laboratory investigations of concentration parameters such as COD_{Cr}, NO_2^-, NO_3^-, and NH_4^+ were carried out to estimate the processes occurring in each compartment of the WWTP complex and the migration effects of different nitrogen forms. The dynamics of nitrogen form changes throughout the treatment process were also analyzed.

The first tested technological scheme involved aeration treatment in four consecutive aeration tanks. The second variant included pre-denitrification in the treatment cycle. For both schemes, organic compound removal and nitrification processes occurred completely, while denitrification took only place in the secondary clarifier. This is deemed unacceptable as it causes process instability with uncontrolled discharge of excess floating sludge.

In the third technological scheme, which included pre-denitrification and post-denitrification in the treatment cycle, known as BARDENPHO, an efficiency of 85% in total nitrogen removal was achieved, in accordance with the legal requirements of Government Decision 950. Additionally, the obtained composition complied with the discharge standards into the aquatic environment, with NH_4^+ at 0.90 mg/dm^3 and NO_2^- at 0.37 mg/dm^3.

In conclusion, it was demonstrated that aerobic treatment does not significantly enhance the removal effect of biogenic elements. However, the inclusion of anoxic-oxic-anoxic-oxic zones in the sequential biological treatment scheme, along with the use of amplifying selectors, substantially enhances this effect within the same technological volumes, reducing the air consumption for oxidation by utilizing oxygen from nitrate and nitrite compounds

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Keywords: *air consumption, denitrification, medium-scale WWTP, Nitrogen separation, sludge.*

UDC: **582.866:338.45:665.3(498)**

CIRCULAR ECONOMIC RECOVERY OF ORGANIC CERTIFIED CULTURE OF SEA BUCKTHORN

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In Romania, sea buckthorn grows spontaneously or in culture. The aim of the study was the analysis of the biological behavior of some autochthonous varieties of sea buckthorn, in the climatic conditions of the farm located in Bacău County, in order to certify its ecological production. Methods: For the implementation of the ecological culture system, a series of laboratory analyzes were carried out in order to determine the quality of the fruits. The main technological processing flows implemented within the farm for processing white sea buckthorn were for fruit, organic juice, organic oil, and powder.

The evaluation of the finished products demonstrates their superior quality resulting from the application of new technologies used in processing (juice pressing extraction, vacuum drying at max 600C, and supercritical CO2 extraction of sea buckthorn oil).

The waste collected from the production process, because it still contains a large number of antioxidant compounds, can be further used in other production processes such as: obtaining premixes for animal feed, and bio-compost, thus being able to be included in another category of value, that of the by-product, applying the principles of the circular economy.

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Keywords: *organic sea buckthorn, circular recover.*

UDC: **582.232:591.5**

BIOSORPTION AND BIOACCUMULATION CAPACITY OF *ARTHROSPIRA PLATENSIS* TOWARD YTTRIUM IONS

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Yttrium is an element of critical importance for industry and technology. Cyanobacteria *Arthrospira platensis* was employed for Y(III) recovery from contaminated wastewater through biosorption and bioaccumulation processes. The effect of pH of a solution, contact time, temperature, and initial Y(III) concentration on the adsorption behaviour of *Arthrospira platensis* were studied. The maximum adsorption capacity of 719.8 mg/g was attained at a pH of 3, temperature of 20°C, and adsorption time of 3 min. The Langmuir and Freundlich isotherm models were suitable to describe the equilibrium of the biosorption, while kinetic of the process followed the pseudo-first-order model.

Thermodynamic parameters showed that the biosorption process was spontaneous and exothermic in nature. In bioaccumulation experiments, *Arthrospira platensis* was able to remove up to 70% of Y(III) from the solution.

Experiments performed using *Arthrospira platensis* showed that biological objects have a great potential to be applied for the recovery of rare earth elements from wastewater.

Keywords: *yttrium, Arthrospira platensis, biosorption, bioaccumulation, wastewater, rare-earth element.*

UDC: **582.232:628.16:546.662**

CYANOBACTERIA ARTHOSPIRA PLATENSIS AS AN EFFECTIVE TOOL FOR GADOLINIUM REMOVAL FROM WASTEWATER

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Gadolinium is applied in various industries, such as nuclear technologies, metallurgy, in luminescent material, superconductor production, etc. As result of this extensive usage, gadolinium in stable and radioactive forms is released in the environment, affecting the quality of water.

Due to the increasing application of gadolinium in technological processes, the biosorption and bioaccumulation of gadolinium by *Arthospira platensis* in batch experiments was examined. In biosorption experiments, the influence of pH, gadolinium concentration, time of contact and temperature on *Arthospira platensis* sorption capacity was investigated. The maximum biosorption capacity of 101 mg/g was attained at a pH of 3.0 and temperature of 20 °C.

A pseudo-first-order model was applicable to describe the kinetics of the biosorption and the Freundlich model to explain the equilibrium of the process. In the bioaccumulation experiments, gadolinium ions were almost completely accumulated from the cultivation medium and stimulated biomass growth. *Arthospira platensis* is of interest for the development of the technology of gadolinium-contaminated wastewater remediation.

Keywords: *gadolinium, Arthrospira platensis, biosorption, bioaccumulation, wastewater, rare-earth element.*

UDC **591.69:598.261(478)**

SPECIES OF EIMERIA IDENTIFIED IN GALINACEAE FROM THE REPUBLIC OF MOLDOVA

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Chicken production is positioned as an important source of meat in the whole world. Approximatively 60 billion chickens are produced annually in the whole world. Parasitic diseases, like coccidiosis, represents a constant challenge in raising domestic and wild animals, because of persistent challenges, antimicrobial resistance, economic losses, as well as negative impact over production indicators. Apicomplexan parasites of the genus *Eimeria* are considered to be a great risk for avian production, because it is the agent that causes avian coccidiosis (Blake D.P., Clark E.L. et al., 2015), causing failure in achieving daily weight gains and their mortality (Ramos D., 2019). At the same time, coccidiosis is recognized as the parasitosis with the greatest economic impact on poultry production, annual damage constituting 3 billion dollars in the world poultry industry (McDonald and Shirley, 2009).

The investigations regarding the determination of eimeria species in wild (pheasant, quail) and domestic (hen, turkey, guinea fowl) birds were carried out in the Laboratory of Parasitology and Helminthology, Institute of Zoology of the University of State of Moldova. Samples were collected from various areas of the Republic of Moldova during the years 2020-2022. Coproscopic examinations were carried out, using flotation methods with supersaturated sodium chloride solution (Darling method), through which Eimeria oocysts were identified. The material collected was examined using the Novex Holland B ob. 20-40 WF 10x DIN objective /20mm microscope.

As a result of the parasitological research carried out on wild birds (pheasants) in the 45 collected biological samples, an infestation with 4 species of eimeria was established: *Eimeria colchici, Eimeria duodenalis*, *Eimeria dispersa* and *Eimeria phasiani*. The species *Eimeria dispersa* is common to turkeys, quails and partridges. In the quails in the 32 collected biological samples, the infestation with the following species was established: *Eimeria bateri*, *Eimeria coturnicis*, *Eimeria dispersa* and *Eimeria usura*.

In domestic birds (hens) 6 species of *Eimeria* were recorded in the 122 collected biological samples: *Eimeria acervulina, Eimeria brunetti, Eimeria maxima, Eimeria mitis, Eimeria necatrix* and *Eimeria tenella*. The most pathogenic of these eimeria species are considered to be *Eimeria necatrix* and *E. tenella*, which cause high mortality. Infestation with the species *Eimeria numidae* was established in guinea pigs in 17 biological samples. In turkeys from the 54 biological samples investigated, 4 species of

eimeria were recorded: *Eimeria adenoeides*, Eimeria dispersa, *Eimeria meleagridis* and *Eimeria gallopavonis.*

Therefore, infection with an only species of *Eimeria* is rare in natural conditions, mixed infections being usual. Whereas combating coccidiosis is very hard to realise and very expensive, preventive measures are the only effective and economical ones. Biocontrol measures can minimize the spread of sporulated oocysts. Practicing strict biosecurity is essential for poultry farmers.

***Acknowledgments*:** the research was carried out with the support of the institutional project - state program: 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 F, 2020-2023.

***Keywords*:** *eimerian species, wild birds, domestic birds.*

Session E

CHEMISTRY AND CHEMICAL COMPOUNDS IN BIOLOGY, AGRICULTURE AND MEDICINE

UDC: **547-3:633.861**

UTILIZATION OF *SAFFRON* FLORAL RESIDUES AS A SOURCE OF HEALTH-ENHANCING BIOACTIVE COMPOUNDS

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Saffron (Crocus sativus L.) is a plant belonging to the Iridaceae family, with compound flowers of six purple tepals, three yellow stamens and a white pistil with the upper part represented by a bright red stigma divided into three threads. Stigmas are the main reason for where saffron is grown, and once removed and dried, they become the most expensive spices of the world. However, they represent only 7.4% (m/m) of the total weight of the flowers. 68 kg of saffron flowers are required to produce 1 kg of the spice, thus producing huge amounts of floral residues (tepals, stamens and pistils).

In the production of saffron spice, about 93 g of 100 g of saffron is residue floral. This large amount of waste must be recovered due to its deterioration fast. Generally, saffron floral residues are disposed of as waste, added to compost and therefore used as fertilizers or exploited through the extraction of natural textile dye.

In the research carried out, technological lines were developed in which saffron residues are used for products in the pharmaceutical industry, the cosmetic industry and in the food industry. All these steps for sustainability and a circular economy.

Keywords: *saffron, waste flower, industrial products, sustenability, circular economy*.

UDC: **546.73:542.9:57.02**

THEORETICAL STUDY OF BINDING ENERGY IN MULTI-COMPONENT COMPOUNDS INVOLVING HEXAAMMINE COBALT(III) CATION

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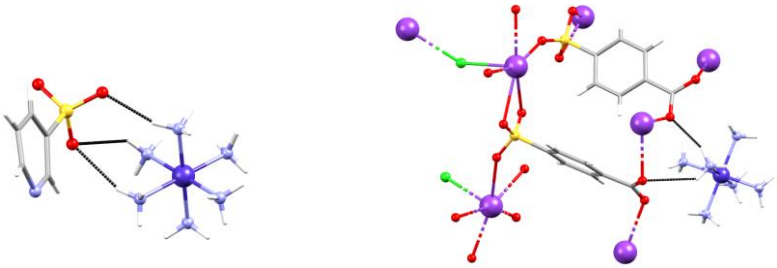
A fully coordinated complex of Co(III) ion surrounded by six ammonia ligands, $[Co(NH_3)_6]^{3+}$, has high stability, large number of N-H donor groups, high positive charge (+3), and exhibits antiviral and antibacterial activity. As part of our ongoing research concerning of development of novel multi-component solids with biological properties, three novel compounds containing the $[Co(NH_3)_6]^{3+}$ cation and N,O- and O-donor moieties have been synthesized and characterized. This series includes: $[Co(NH_3)_6](pys)_3 \cdot Hpys$ (**1**), $[Co(NH_3)_6](pys)_2Cl \cdot 2CH_3CN$ (**2**), and $\{K_2[Co(NH_3)_6]Cl \cdot (sb)_2\}_n$ (**3**) (where Hpys = pyridine sulfonic acid; H_2sb = 4-sulfobenzoic acid). To study the non-covalent bonding interactions of $[Co(NH_3)_6]^{3+}$ cations with mono- and dianions in these compounds, the energy decomposition analysis of the intermolecular interaction energy (E_{int}) has been performed for pairs of complex cation and anions, which are linked by hydrogen bonds (Fig. 1). It was found that the calculated binding energy is minimal for compound **1** (the absolute values of E_{int} decrease in the following order $E_3 > E_2 > E_1$). In selected pairs of **1-2** the electrostatic term dominates in calculated binding energy followed by induction interaction, whereas for **3** it is observed the inverse order. The minimum binding energy among the studied compounds indicates that in **1** both the cation and the anion could affect the biological activity.



$[Co(NH_3)_6]^{3+} \cdot (pys)^-$ $[Co(NH_3)_6]^{3+} \cdot (sbK)^-$

Figure 1. View of selected pairs for estimation of interaction energies in **1** and **3**.

***Acknowledgments*:** this study was supported by the research project ANCD 20.80009.5007.15 within the State Programs funded by the National Agency for Research and Development of the Republic of Moldova.

Keywords: cobalt, hydrogen bonds, energy decomposition, biological activity.

UDC: **542.94:546.171.8:547-318**

SYNTHESIS OF NEW SESQUITERPENIC DERIVATIVES WITH AZIDE AND □-LACTAM FUNCTIONAL GROUPS

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Albicanol is a sesquiterpenic alcohol with a bicyclic carbon skeleton found along with its derivatives in numerous natural sources, including terrestrial and marine organisms. In particular, albicanyl acetate was isolated from skin extracts of some species of sea slugs and exhibits potent piscicidal effects, such fish antifeedant activity. On the other hand, nitrogen-containing sesquiterpenoids are quite rare and in the perspective of SAR studies, we planned to synthesize nitrogen-containing derivatives based on readily available albicanyl acetate.

We report in the current communication a new azide-functionalized compound synthesized through radical carboazidation of the sesquiterpenic substrate. Its following transformation included catalytic hydrogenation, accompanied by a spontaneous lactamization to a □-lactam product.

The structure of both compounds was demonstrated by spectral analysis. Their following biological activity testing will reveal their interaction with the biomolecular targets in the living cells and potential applications.

Acknowledgments: this study was supported by the research project PLANTERAS, code 20.80009.8007.03., funded by the National Agency for Research and Development (ANCD) of the Republic of Moldova.

Keywords: *drimane, radical chemistry, carboazidation, azide, □-lactam.*

UDC: **546.56:548:632.23**

BIOLOGICAL ACTIVITY OF POLYNUCLEAR Cu(II) ISOBUTYRATES AGAINST TUMOR GROWTH IN GRAPEVINE

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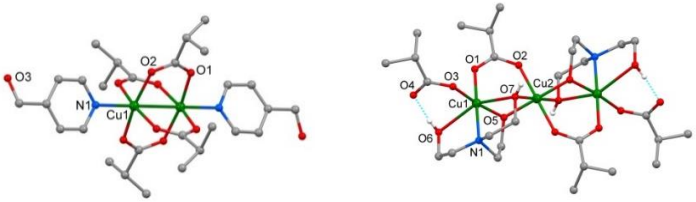
An increasing interest in Cu(II) complexes based on carboxylic acids in the field of agricultural chemistry is associated with their availability, low cost, less toxicity, easily biodegradability and high fungicidal activity. Three Cu(II) coordination compounds with isobutyric acid $[Cu_2(is)_4(dmso)_2]$ (**1**), $[Cu_2(is)_4(4\text{-pyca})_2]$ (**2**), $[Cu_3(is)_4(H_2tea)_2]$ (**3**) have been synthesized by the interaction of copper(II) isobutyrate with 4-pyridinecarboxaldehyde (pyca) and triethanolamine (H_3tea). Single-crystal X-ray diffraction analysis shows that compounds **1** and **2** are binuclear coordination compounds, and compound **3** is a trinuclear linear cluster (Figure 1). In the structure of **3** the O–H···O = 2.637 Å hydrogen bonds stabilise the mutual arrangement of the terminal (is^- and H_2tea^-) ligands. The prepared compounds were further tested in vitro against *Rhizobium* (Agrobacterium) *vitis*, an oncogenic bacterium that causes tumor formation in plants. The results of these tests will be discussed.



(a) (b)

Figure 1. Molecular structures of **2** (a) and **3** (b), hydrogen atoms on carbon atoms omitted for sake of clarity.

***Acknowledgments*:** this study was supported by the research project 20.80009.5007.15 „Implementation of principles of crystal engineering and X-ray crystallography for the design and creation of organic/inorganic hybrid materials with advanced physical and biologically active functional properties", funded by the National Agency for Research and Development of the Republic of Moldova.

Keywords: *copper, carboxylates, X-ray diffraction, biological properties.*

UDC: **544.142.3:547.497**

MOLECULAR DOCKING OF NEW THIOSEMICARBAZONES IN THE BASE 2-OXO-6-PHENYLHEXA-3,5-DIENOIC ACID

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The major biological potential that thiosemicarbazones possess is due to the target centers in their structure, showing antimicrobial, antitumor and antioxidative activities.

Using PASS online, target proteins with which the synthesized thiosemicarbazone (***HL***) can interact were predicted. From the string obtained, Serine/threonine-protein kinase was chosen because it had the highest score (0.65). Optimization of the geometry of the thiosemicarbazone (***HL***) was done with "Avogadro". Molecular docking was performed with "AutoDock Vina" and visualized with CB-Dock2 (Figure).

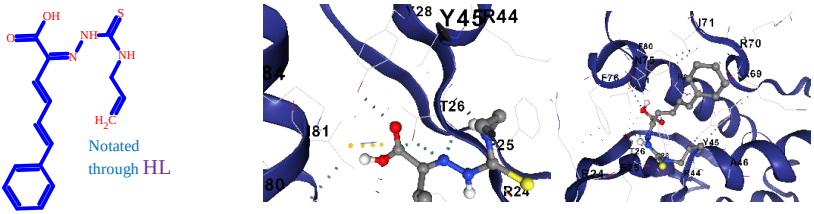

Figure. The structural formula of thiosemicarbazone **HL** and molecular docking

The substance has a strong hydrogen bond with threonine. It is known that blocking threonine in the active site of the protein leads to its inactivation. This means that the synthesized substance has the potential to inactivate the Serine/threonine-protein kinase Sgk3, which is responsible for cell growth and proliferation.

***Acknowledgments*:** this study was supported by the research project 20.80009.5007.10; ,, New, innovative products with remarkable performance in medicine (biofarmaceutics). Elucidation of the molecular and cellular mechanisms of the action of these new products and argumentation of their use for the enhancement of the treatment of pathologies", funded by the NARD.

Keywords: *thiosemicarbazones, molecular docking, 2-oxo-6-phenylhexa-3,5-dienoic acid.*

UDC: **547.853:574**

ENVIRONMENTAL SAFETY OF CATALYTIC CONDITIONS IN THE SYNTHESIS OF DIHYDROPYRIMIDINE PRODUCTS

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The range of applications for 3,4-dihydropyrimidine-2-thiones has been expanded through the synthesis of a bioactive derivative of 3,4-dihydropyrimidine-2 (1H) thione known as Monastrol , which has shown a completely new mechanism of anti-cancer action, it is a cell-permeable small molecule inhibitor , inhibiting the activity of a cancer.

Materials. Thiourea, urea, acetoacetic ether; Biginelli cyclization method.

Monastrol is the result of a three-component one-pot synthesis based on the reaction of acetoacetic ether, thiourea and 3-hydroxybenzaldehyde in the presence of various catalysts. In the synthesis of monastrol, the goal is to select reagents and test various catalysts that are environmentally friendly, least toxic and financially attractive, in order to maximize the yield of the product, shorten the reaction time, selectivity and minimize excess reagents, the formation of by-products, high temperatures, environmental pollution. environment, waste and costs.

Catalysis plays a fundamental role in the Biginelli synthesis, especially in the development of strategies to approach eco - friendly catalytic conditions for further use in the renewable chemical industry. Such catalytic conditions were provided by ionic liquids that do not lose their activity in at least five repeated syntheses and ensure the preservation of the environment.

The authors are grateful to the Agency for Research and Development (ACD) of the Republic of Moldova for funding provided under the state project 20.80009.5007.17

Keywords. *monastrol, ionic liquids, eutectic solvents.*

UDC: **547:581.19**

SYNTHESIS AND CHARACTERIZATION OF THE (1S,3R,4S,6R)-3,4-AZA-3,7,7-TRIMETHYLBICYCLO-[4.1.0]-HEPTANE

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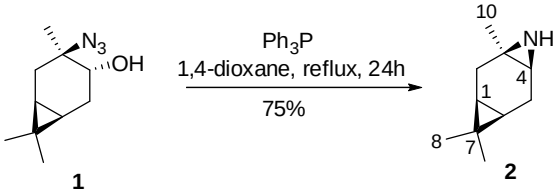
In an attempt to develop new antibacterial agents targeted at human dihydrofolate reductase (DHFR) and tymidylate synthase (TS) (*two specific enzymes involved in the biosynthesis of the nucleic acids*), we designed and synthesized aziredine derivatives. In this context for the synthesis of aziridine with potential biological activity, it appears desirable to combine the aziredine ring with 3,7,7-trimethylbicyclo[4.1.0]heptane moiety e.g. compound **2** starting from (1R,3R,4R,6S)-4-azido-4,7,7-trimethylbicyclo[4.1.0]heptan-3-ol **1.** The synthetic route to the target compound formation is depicted in Figure. Cyclization of **1** with Ph_3P in refluxing 1,4-dioxane under nitrogen atmosphere afforded the desired aziredine compound **2** in good yield. The aziridine **2** showed in its IR data absorption bands for NH and methyl, respectively. The C(4')-H and NH protons appeared at σ 2.01 and 2.3 ppm, respectively, in its ^{1}H NMR data.



Synthesis of (1S,3R,4S,6R)-3,4-aza-3,7,7-trimethylbicyclo-[4.1.0]-heptane

A mixture of azidoheptanol **1**, Ph_3P in 1,4-dioxane was heated gently at 100^{o}C 24 hours. After cooling, it was poured onto ice-water mixture, extracted by EtOAc. The organic layer was washed with water, dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude product was purified by column chromatography (chloroform) and afforded the target compound **2** with 75%.

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 2.30 (ddd, J = 18.0, 10.6, 8.0 Hz, 1H, H-N), 2.01 (ddd, J = 15.2, 7.3, 1.2 Hz, 1H), 1.94 (dd, J = 7.7 , 4.5 Hz, 1H), 1.32 (s, 3H, H-C9), 1.30 – 1.12 (m, 1H), 0.99 (s, 3H, H-C10), 1.08 – 0.88 (m, 1H), 0.84 (s , 3H, H-C8), 0.88 – 0.56 (m, 4H H-C2 and H-C5). ^{13}C NMR (101 MHz, $CDCl_3$) δ 38.17(C10), 35.86(C3), 29.81(C1), 28.70(C6), 27.20(C4), 26.61(C2), 21.89(C5), 21.05(C7), 19.99 (C8), 14.85(C9).

***Acknowledgments*:** the authors are grateful for the funding of this research under the Moldovan State Program (2020–2023), Project Nr. 20.80009.5007.17 "Hybrid materials functionalized with carboxyl groups based on plant metabolites with activity against human and agricultural pathogens".

Keywords: *cyclization, (1R,3R,4R,6S)-4-azido-4,7,7-trimethylbicyclo[4.1.0]heptan-3-ol, triphenylphosphine.*

UDC: **547-318**

PREPARETION, ANALYSIS AND CHARACTERIZATION OF (1R,3R,5S,7S)-4,4,7-TRIMETHYL-8-AZATRICYCLO[5.2.0.0^{3,5}]NONAN-9-ONE

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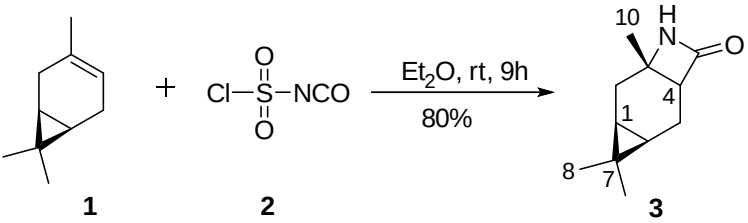
It is well known that β-lactam are agents that interrupt bacterial formation *via* covalent binding to essential penicillin-binding proteins. The identification of the novel lactams, which not only improve the quality of therapy, but also reduce side effects on patients are still a major concern for medicinal chemists.

In our work, the β-lactam **3** was synthesized by cycloaddition chlorosulfonyl isocyanate **2** to natural (+)-3-carene **1.**



1 **2** **3**

Synthesis of the β-lactam

To a solution of the compound **1** in Et_2O was added the chlorosulfonyl isocyanate **2** at 0^{o}C under nitrogen atmosphere. The reaction mixture was stired at r.t. for 9h. After this time solution of Na_2SO_3 in water was added dropwise to the reaction mixture and solution was stirred for 30 min. Solution of KOH 20% was added to the reaction mixture and extracted the organic phase with Et_2O. Organic layer was washed with water, dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude product was recrystallized from hexane and afforded the target compound **3**.

The reaction was verified TLC by ethyl acetate: petroleum ether 1:4 system. The final compound was analyzed with NMR:

Keywords: *lactams, (1r,3r,5s,7s)-4,4,7-trimethyl-8-azatricyclo[5.2.0.03,5]nonan-9-one.*

UDC: **547.631.1:548**

SYNTHESIS AND CRYSTAL STRUCTURE OF A NEW Co(II) METAL-ORGANIC COMPOUND WITH THE BENT DITOPIC 4,4'-DIAMINODIPHENYLMETHANE LIGAND

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Analysis of the Cambridge Structural Database and our previous studies have shown that the aromatic ligand 4,4'-diaminodiphenylmethane (dadpm) with a weaker donor ability than pyridyl-type ligands could coordinate to transition metal ions through an NH_2 group, acting as a terminal ligand or through two NH_2 groups, acting as a bridging ligand and forming various coordination compounds and supramolecular ensembles. The new coordination compound $[Co(dadpm)_2(H_2O)_2(NO_3)_2]$ was obtained by the reaction of cobalt(II) nitrate hexahydrate salt with the ditopic dadpm ligand in a MeCN/EtOH solvent mixture. The given mononuclear neutral complex crystallizes in the triclinic space group *P*-1: a=5.8352(5), b=9.4794(7), c=13.4138(9) Å; α=105.648(6), β=98.057(6)°, γ=105.819(7)°, V = 668.88(9) Å^3. The Co(II) cation resides on an inversion center and adopts a slightly distorted octahedral geometry, with the set of N_2O_4 donor atoms resulting from pairs of dadpm and aqua ligands, and nitrate anions, all coordinating to the metal in monodentate mode and occupying the *trans*-positions.

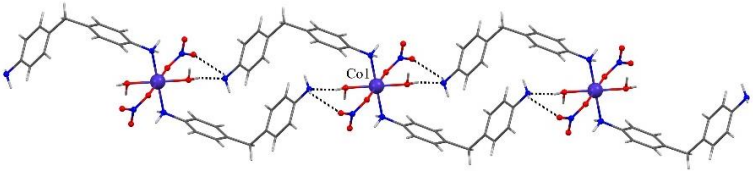

Figure 1. Fragment of crystal packing with the representation of supramolecular chain

The crystal packing revealed that uncoordinated NH_2 groups of the dadpm ligands form hydrogen bonds with the coordinating water molecules and nitrate-anions of adjacent complexes, generating supramolecular chains (Fig. 1).

***Acknowledgments*:** this research was funded by the projects of **ANCD 20.80009.5007.15** "Implementation of crystal engineering approach and X-ray crystallography for design and creation of hybrid organic/inorganic materials with advanced physical and biologically active functions" and **ANCD 20.80009.5007.28** "Elaboration of new multifunctional materials and efficient technologies for agriculture, medicine, techniques and educational system based on the "s" and "d" metals complexes with polydentate ligands."

Keywords: *4,4'-diaminodiphenylmethane (dadpm), coordination compound, X-ray study.*

UDC: **661.873:578.828**

MULTI-COMPONENT COBALT(III) COMPOUNDS WITH ANTIVIRAL PROPERTIES

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The resistance of microorganisms to existing drugs necessitates a constant search for new compounds with antibacterial and antiviral properties. Hexaammine cobalt(III) chloride $[Co(NH_3)_6]Cl_3$ showed remarkable antiviral properties against Sindbis virus, adenovirus, human immunodeficiency virus (HIV) and Zaire Ebola strain. Four multi-component compounds containing $[Co(NH_3)_6]^{3+}$ cations and different N-, O-, and N,O-donor ligands with the formula $[Co(NH_3)_6]Cl_3 \cdot 2(phen) \cdot 3H_2O$ (**1**) (Figure), $[Co(NH_3)_6]Cl_2(Hpht) \cdot 3H_2O$ (**2**), $[Co(NH_3)_6]Cl(Hpht)_2 \cdot 3H_2O$ (**3**), and $[Co(NH_3)_6][Co(pdc)_2(H_2O)_4]Cl \cdot 3H_2O$ (**4**) (phen = 1,10-phenanthroline; H_2pht = *o*-phthalic acid; H_2pdc = 3,5-pyridinedicarboxylic acid) were synthesized and tested for their potential to inhibit the replication of HIV-1 (strain III_B) and HIV-2 (strain ROD) in acutely infected MT-4 cells with parallel determination of their toxicity. Compound **1** exhibited the best activity among all tested with IC_{50} of 0.46 mg/mL.

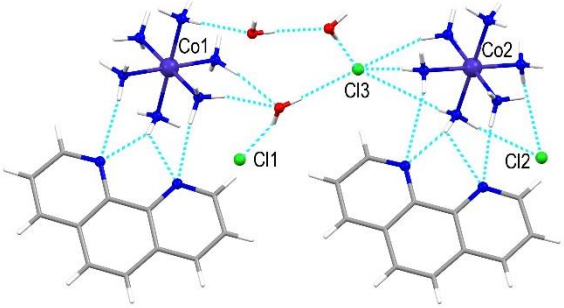

Figure. View of formula unit of $[Co(NH_3)_6]Cl_3 \cdot 2(phen) \cdot 3H_2O$.

***Acknowledgment*:** this study was supported by the research project 20.80009.5007.15 „Implementation of principles of crystal engineering and X-ray crystallography for the design and creation of organic/inorganic hybrid materials with advanced physical and biologically active functional properties" funded by the National Agency for Research and Development of the Republic of Moldova.

Keywords: *cobalt, biological activity, human immunodeficiency virus.*

UDC: **542.943:547.497**

COMPUTATIONAL STUDY OF OXIDIZED TFIIIA ZINC FINGERS INTERACTING WITH 5S RNA

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Zinc finger (ZF) proteins interact with nucleic acids and proteins which plays an important role in DNA transcription and repair, biochemical recognition, and protein regulation. The release of Zn^{2+} through oxidation of cysteine thiolates is associated with inhibition of viral replication, disruption of cancer gene expression, and DNA repair preventing tumor growth.

Molecular dynamics (MD) simulations were carried out to examine the effect of cysteine oxidation on the ZF456 fragment of transcription factor III A (TFIIIA) and its complex with 5S RNA at the atomistic level. In the absence of 5S RNA, the reduced ZF456 peptide undergoes conformational changes in the secondary structure due to the reorientation of the intact ZF domains. Upon oxidation, the individual ZF domains unfold to various degrees, yielding a globular ZF456 peptide with ZF4 and ZF6 losing their ββα-folds. ZF5, on the other hand, participates in nonspecific interactions through its α-helix that conditionally unravels early in the simulation.

In the presence of RNA, oxidation of the ZF456 peptide disrupts the key hydrogen bonding interactions between ZF5/ZF6 and 5S RNA. However, interactions with ZF4 are dependent on the protonation state of His119. Therefore, disulfide formation and Zn^{2+} loss diminish the ability of the oxidized ZF456 peptides to recognize RNA. This loss of key protein – RNA interactions and the conformational flexibility of the oxidized peptide demonstrate the structural importance of Zn^{2+} to the ZF secondary structure and ZF recognition mechanisms.

Keywords: *zinc finger proteins, molecular dynamics, Zn2+ release*.

UDC: **547.497.1:541.49**

COMPUTATIONAL APPROACHES IN DESIGN OF SOME N-(METHYLPHENYL)HYDRAZINECARBOTHIOAMIDES

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"Lipinski's rule of five" was formulated on the basis of the evaluation of an impressive number of biologically active chemical compounds. Nowadays, this rule is widely used to evaluate the pharmacological potential of chemical compounds, in order to discover new therapeutic agents. "Lipinski's rule of five" is also called Ab initio, as it is theoretical basis allows to calculate a series of physical parameters by computer simulation. The use of computer modeling to evaluate the physical properties of chemical compounds offers new insights into the assembly of new efficient therapeutic compounds and therefore allows saving time and resources.

Hydrazinecarbothioamide derivatives represent novel pharmacophores. The presence of S(sulfur) and N(nitrogen) atoms in their molecular structures gives them an enormous potential for assembling an impressive range of new compounds with promising biological properties.

Evaluation of the potential biological properties of a series of N-(methylphenyl)hydrazinecarbothioamides was performed by means of the computational program Molinspiration. Parameters such as: partition coefficient (logP) also called lipophilicity index, molecular mass, number of hydrogen bond donor and acceptor atoms (LH) and polar surface area (SP) were calculated.

	Physical parameters			
	Mr	**logP**	**SP**	**LH**
Theoretical pharmacokinetics	>480	-0.4-5.6	>140Å	>10 şi 5
Chemical compounds				
Hydrazinecarbothioamide	91	-1.53	64	3, 5
N-(methylphenyl)-hydrazincarbotioamide	181	0.33	50	3, 4
N-(methylphenyl)-2-(pyridin-2-ilmethyliden)hydrazincarbotioamide	270	2.55	49.3	4, 2
N-(methylphenyl)-2-(1-pyridin-2-iletiliden)hidrazincarbothioamide	284	2.46	49.3	4, 2
N-(methylphenyl)-(2-hidroxi-benziliden)hidrazincarbothioamide	285	3.66	56.65	4, 3
N-(methylphenyl)-2-(2-hidroxi-3-metoxibenziliden)hydrazincarbothioamide	315	3.26	65.88	5, 3

All evaluated compounds have parameters that fall within the "Lipinski's rule of five ", therefore it is recommended to be tested for *in vitro* biological activity.

Keywords: *Lipinski's rule of five, N-(methylphenyl)hydrazinecarbothioamide derivatives, computational program Molinspiration, pharmacophores.*

UDC: **544.142.3:546.56:547-304.6**

NOVEL MIXED-LIGAND CU(II) COORDINATION COMPOUNDS WITH 4-ALLYLTHIOSEMICARBAZONE

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The thiosemicarbazones and their transition metal complexes are relevant for study due to their diverse biological activity. Such compounds have a lot of diverse applications: anticancer, antibacterial, antiviral, antifungal, anti-HIV. Mixed-ligand complexes play an important role in biological systems because the combination of different ligands can result in substances with higher and more promising biological activities.

For this purpose, the 4-allylthiosemicarbazone *N*-(4-methoxyphenyl)-2-oxopropanamide HL (Fig. 1) was synthesized by the interaction between 4-allylthiosemicarbazide and *N*-(4-methoxyphenyl)-2-oxopropanamide in ethanol in molar ratio 1:1.

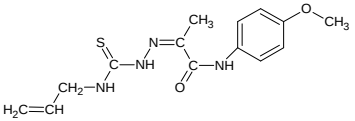

Figure 1. The structure of HL

The obtained HL was studied by NMR and FTIR spectroscopy. The mixed-ligand complexes were obtained by two step mechanism. At the first step the copper(II) coordination compound $Cu(L)NO_3$ was obtained by reaction between HL and $Cu(NO_3)_2 \cdot 3H_2O$ in ethanol with heating in molar ratio 1:1. At the second step the corresponding *N*-heteroaromatic base (1,10-phenantroline, 2,2'-bipyridyl, 3,4-lutidine, 3-picoline, 4-picoline, pyridine, imidazole) was added to the ethanolic solution of $Cu(L)NO_3$. The composition of these compounds was determined using elemental analysis for copper: $Cu(A)(L)NO_3$ (A = 1,10-Phen, 2,2'-Bpy, 3,4-Lut, 3-Pic, 4-Pic, Py, Im).

A standard $ABTS^{\bullet+}$ method has been used to determine the antioxidant properties of synthesized compounds. The values of IC_{50} are in the range 61.32-99.31 μM. The most active one is complex with 3-picoline into the inner sphere.

***Acknowledgments*:** this study was supported by the research project 20.80009.5007.10 "Produse noi, inovative cu performanțe remarcabile în medicina (biofarmaceutica). Elucidarea mecanismelor moleculare și celulare ale acțiunii acestor produse noi și argumentarea folosirii lor la eficientizarea tratamentului unor patologii", funded by ANCD.

Keywords: *thiosemicarbazone; copper(II) complexes; N-heteroaromatic bases; antioxidant activity.*

UDC: **577:632.952:633.11**

THE INHIBITORY ACTIVITY OF THE VINYL-TRIAZOLIC COMPOUND FOR *FUSARIUM* SPP.

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Root rot in plants, including straw cereal crops, is one of the most widespread and severe diseases with quite diverse manifestations. For example, in wheat, root rot is manifested by the rotting of caryopsis, primary and secondary roots, coleoptile, twining node, etc. The fungi *Fusarium avenaceum* and *F. oxysporum* are pathogens of root rot frequently encountered in wheat and in ear diseases in grass crops. Since Fusarium species, like many other micromycetes, easily adapt to the chemical preparations used in plant protection measures, the research on the identification of new compounds with antifungal activity is particularly actual.

Establishing the activity of the vinyl-triazole derivative: 4-(2-(2,4-dichlorophenyl)-2-oxoethyl)-1-((2-(2,4-dichlorophenyl)-4-propyl-1,3-dioxolane) chloride -2-yl)methyl)-1H-1,2,4-triazol-4-iu against phytopathogens *F. avenaceum* and *F. oxysporum.*

The vinyl-triazole derivative was 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 3-5 days for the fast-growing fungus – *F. avenaceum* and 6-7 – for the medium-growing fungus – *F. oxysporum*.

According to the obtained data, the vinyl-triazole derivative in the concentration range 0,01....0,005% strongly inhibited the fungi *F. avenaceum* and *F. oxysporum*, the diameter of their colonies constituting 16,3 – 25,0% and 28,6-28, 4% of the control, respectively.

The high activity of the mentioned vinyl-triazole compound in relatively low concentrations reveals the high opportunities for its use in the wheat plant protection system against the root rot pathogens.

This study was supported by the research projects 20.80009.5007.17 "Hybridized functionalized materials with carboxyl groups based on plant metabolites with action against human and agricultural pathogens" and 20.80009.7007.04 "Biotechnologies and genetic processes for evaluation, conservation and valorization of agrobiodiversity" funded by the National Agency for Research and Development of the Republic of Moldova.

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

UDC: **635.655:577.112**

SYNTHESIS OF N-(4,6-DIMETHYLPYRIMIDIN-2-YL)HYDRAZINECARBOTHIOAMIDE

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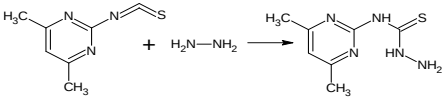
Thiosemicarbazides are chemical compounds with the general formula $R^1R^2NC(S)NHNH_2$ and are commonly used as ligands for transition metals. Many thiosemicarbazides are known where the hydrogens R^1 and R^2 are both substituted or only one with different radicals. The interest of science in thiosemicarbazides is that they have a vast potential for the synthesis of bioactive substances with pharmaceutical potential and are therefore widely used in the field of medicinal chemistry. They also have a wide range of diverse biological activities, such as antimicrobial, antiviral, anticancer, anti-inflammatory, antitubercular, as well as topoisomerase IV and urease inhibitors. Because thiosemicarbazides can form an imine bond (-N=CH-) with carbonyl compounds, they are very often used in organic synthesis, especially to obtain thiosemicarbazones, which in turn possess a wide spectrum of medicinal properties, and are studied for their activities antibacterial, antiviral and antifungal. A very wide range of thiosemicarbazones have been clinically tested for a variety of diseases, such as tuberculosis, viral infections, malaria and cancer. Also, the complexes of thiosemicarbazones with metals show a wide range of biological activities.

Heterocyclic pyrimidine compounds have a wide occurrence in nature as substituted derivatives, and it is known that in nucleic acids, there are three nitrogenous bases derived from pyrimidine, called pyrimidine bases: cytosine, thymine, and uracil. The pyrimidine structure, both aromatic and hydrogenated, is part of many biologically active substances and drugs, for example, barbiturates, which have hypnotic, anticonvulsant effects, and some synthetic herbicides of the sulfonylurea class. The pyrimidine core is also found as part of some vitamins, especially B1 (thiamine). To obtain N-(4,6-dimethylpyrimidin-2-yl)hydrazinecarbothioamide, it was proposed to use already known synthetic routes, starting from 4,6-dimethylpyrimidin-2-amine as starting substance. It is generally known that the synthesis of thiosemicarbazides can be carried out in several ways by the reaction of hydrazides with isothiocyanates in various organic solvents. The general method involves the preparation of thiosemicarbazides by nucleophilic addition of amine or carbohydrazides to isothiocyanates. We proposed that the isothiocyanate be synthesized from this amine first using one of the three available methods, using carbon sulfide (CS_2), thiophosgene ($CSCl_2$) or disulfide tetramethylthiouram (DTMT) as intermediates.



The optimization of these methods will allow us to find the most efficient way, allowing us to obtain a sufficiently pure product, with good yield to be able to be tested for biological efficiency in the future, to be subjected to condensation with a series of carbonyl components, to obtain new thiosemicarbazones that will be complexed with different metals.

Keywords: *thiosemicarbazides, biological activity, pyrimidine*.

UDC: **635.655:577.112**

CONTENT OF TRYPSIN INHIBITORS IN SOYBEAN GENOTYPES

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The purpose of our research was to evaluate the trypsin inhibitors content in five soybean genotypes obtained at IGPhPP. TI determination was performed according to the standard method, based on the ability of legume flour extracts to inhibit trypsin activity against the chromogenic substrate N-benzoyl-DL-arginine p-nitroanilide (BAPA), which was performed at MSU.

As a result of the evaluation of the five soybean genotypes: Genap 54, L.2, $Z3M_{10}200$, Onika and $Z1M_{9}250$, where Genap 54 and L.2 which belong to the medium vegetation group, recorded a trypsin inhibitors content ranging from 12.31 mg/g, respectively 12.85 mg/g. These values indicate a moderate content of trypsin inhibitors. On the other hand, the genotypes $Z3M_{10}200$, Onika and $Z1M_{9}250$ belong to the semi-early vegetation group and recorded a higher content of trypsin inhibitors. More precisely, the values reported for these varieties were 14.06 mg/g, 15.06 mg/g, and 15.60 mg/g, respectively.

These results are important from the perspective of using soybeans in food and the food industry. Although trypsin inhibitors can have an anti-nutritional effect by interfering with digestion activity, the moderate concentrations of inhibitors in Genap 54 and L.2 genotypes indicate that these varieties can be consumed properly and in reasonable amounts as part of a soy food.

However, genotypes $Z3M_{10}200$, Onika, and $Z1M_{9}250$, which exhibited higher trypsin inhibitor contents, may require greater attention in terms of processing and consumption. By employing appropriate processing techniques such as soaking, boiling, or fermentation, the trypsin inhibitor content can be reduced, resulting in soy products that are more easily digestible and have increased nutritional value.

In conclusion, our study has shown that the analyzed soybean genotypes exhibited variable trypsin inhibitor contents, and this information can be valuable in the development of processing strategies and techniques.

Acknowledgments: the research was carried out within the project of the State Program 20.80009.7007.04 *"Biotechnologies and Genetic Methods for the Detection, Conservation, and Utilization of Agrobiodiversity*," funded by the *National Research and Development Agency*.

Keywords: *trypsin inhibitors, soybean genotypes, digestion, soy food*.

UDC: **57.083.32:634.58**

OPTIMIZED METHOD FOR SEPARATION OF ARA H1 ALLERGEN FROM ROASTED PEANUTS

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The present study aimed to optimize a methodology for separating the major allergen Ara h1 from roasted peanuts, based on the precipitation technique with ammonium sulfate by serial fractionation at different salt concentrations, in view of biomedical applications (Figure 1).

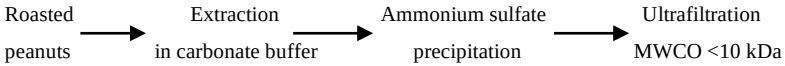

Figure 1. Scheme of lab biotechnology for Ara h1 separation from roasted peanuts

The procedure consisted of several steps. Defatted peanut powder was extracted in carbonate buffer, pH 9.6, for 24 h. Then, the total protein extract was serially precipitated with ammonium sulfate at 0-70%, 70-80% and 80-90% saturation. After dialysis against distilled water, the final fraction was subjected to centrifugal ultrafiltration using filtration units having membranes with a molecular weight cut-off (MWCO) at 10 kDa, which allowed the harvesting of a concentrated retentate and the removal of proteins with a molecular weight smaller than 10 kDa. The protein concentration of the ammonium sulfate fractions and the retentate was determined using the bicinchoninic acid (BCA) method.

The results confirmed the increase of the protein content in the retentate. The identification of the major peanut allergen Ara h1 was performed by electrophoretic migration of the retentate in a tricine-SDS-polyacrylamide gel in gradient of concentration, under reducing conditions. Determination of the molecular weight of the main bands indicated the presence of an intense band at 64.14 kDa, corresponding to the Ara h1 allergen.

In conclusion, all these results demonstrated that a serial precipitation methodology with ammonium sulfate up to 90% saturation, followed by dialysis and centrifugal ultrafiltration through units with MWCO of 10 kDa could separate a fraction enriched in Ara h1 allergen from the total protein extract of roasted peanuts. This procedure is useful in further biomedical applications for peanut allergy diagnostic and treatment.

Acknowledgment: this study was supported by the Ministry of Research, Innovation and Digitization, Program 1 – Development of the National R&D System, Subprogram 1.2 – Institutional Performance – Projects for Excellence Financing in RDI, contract no. 2PFE/2021 and Program Nucleu, contract no. 23020101/2023.

Keywords: *peanuts, Ara h1, allergen, precipitation, electrophoresis*.

UDC: **543.645.6:635.055:576.3**

EFFECT OF ANTIMICROBIAL PEPTIDES ON CELL ADHESION

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Antimicrobial peptides (AMPs) are small molecules with a positive charge or a combination of positive and negative charges. They are attracted to the negatively charged bacterial membrane, which contains teicholic acid and lipopolysaccharide. Positively charged AMP has a strong electrostatic interaction with negatively charged phospholipids on the outer leaflet of the bacterial membrane.

AMPs are able to integrate into the cell membrane to form ion channels or adsorb parallel to the lipid layer forming a "carpet". This disrupts the membrane's integrity and electrolyte gradient, leading to impaired cell adhesion and potentially cell death.

In this study, the cyclic decapeptide gramicidin S (GrS) was used to investigate these effects. Experimental data obtained through light scattering and fluorescent microscopy confirms that GrS readily interacts with the negatively charged phospholipids of plasma membranes, disrupting the bilayer's integrity and causing leakage of monovalent cations such as Na+ and K+. This disruption alters the transmembrane potential and affects platelet aggregation, granule release, and blood clot inactivation.

Similar anti-adhesive effects of GrS on bacterial cells were observed in a study [2], where different concentrations of GrS (10 nM, 20 nM, 30 nM, and 40 nM) inhibited proliferation and biofilm formation in bacterial cell cultures.

Adhesion and aggregation share some common molecular mechanisms involving nonspecific AMP lipids interactions that occur in cancer progression and malignancy proliferation. We assume that the ability of GrS to affect aggregation and adhesion may have potential antitumor effect. It was shown recently that some AMPs can act as anticancer peptides. Specific recognition of tumor cells is facilitated by the presence of negatively charged phospholipids on their surface. In particular, anionic phospholipids such as phosphatidylserine and phosphatidylethanolamine move from the inner leaflet to the outer face, resulting in an additional negative charge of the membrane and an increase in the transmembrane potential. Overexpression of other negatively charged biomolecules, such as O-glycosylated mucins, sialylated gangliosides, forms an increased transmembrane potential, which leads to increased AMP-membrane interaction of cancer cells. The ability of GrS to influence the adhesion of cancer cells as a prevention of metastasis of cancer cells is being studied on cell cultures. The impact of GrS on cancer cell adhesion is being investigated as a potential preventive measure against metastasis, and the apoptotic effect of GrS at different concentrations is assessed using fluorescently labeled lipids and cell survival assessment.

Keywords: *antimicrobial peptides, bacterial cells, cell adhesion, cyclic decapeptide gramicidin.*

UDC: **544.142.2:546.72:547.35:548.3**

A NEW OCTANUCLEAR PROPELLER-LIKE AMINOALCOHOL-SUPPORTED IRON(III) PIVALATE CLUSTER

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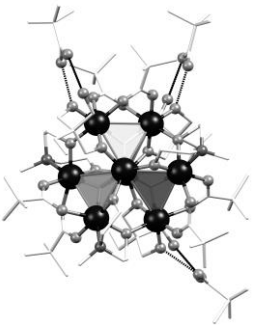
Iron coordination compounds play a vital role in biological systems and most commonly known and studied are the heme proteins and enzymes. The Fe-containing clusters are also involved in catalysis, drug design, and materials science. A new octanuclear iron(III) cluster $[Fe_8O_3(piv)_6(mdea)_3(thmpH)_3]\cdot 3Hpiv$ (**1**) (Hpiv = pivalic acid) has been prepared by the reaction of a hexanuclear $[Fe_6(OH)_2(piv)_{12}]$ cluster with tris(hydroxymethyl)propane ($thmpH_3$) and methyldiethanolamine ($mdeaH_2$) ligands in toluene/acetonitrile mixture. Single-crystal X-ray diffraction analysis revealed that compound **1** crystalizes in the monoclinic $P2_1/c$ space group with unit cell parameters a = 14.6313(5), b = 37.5950(15), c = 23.2333(9) Å, β = 95.521(3)º. The $\{Fe_8\}$ core of **1** consists of two central axial Fe(III) ions that are bridged by three μ_4-O with six peripheral Fe(III) ions to form the three blades of the propeller (Figure).



These six peripheral Fe(III) ions are noncoplanar and reside in the vertexes of flatten trigonal antiprism. The central pair of iron atoms represents the axis of the propeller with the Fe···Fe distance of 2.784(1) Å, while the shortest distances between axial and peripheral iron atoms are in the range 3.009(1)- 3.084(1) Å. Six pivalates, three $mdea^{2-}$ and three $thmpH^{2-}$ completed the coordination spheres of Fe atoms. Axial and peripheral iron atoms display O_6 and NO_5 distorted octahedral surrounding, respectively. Each of three outer sphere pivalic acid molecules form two hydrogen bonds with $thmpH^{2-}$ ligands.

***Acknowledgements*:** this study was supported by the research project ANCD 20.80009.5007.15 within the State Programs of the National Agency for Research and Development of R. Moldova.

Keywords: *iron cluster, polyalcohols, X-ray crystallography.*

UDC: **547.913.6:582.949.27:665.5**

THE CHEMICAL COMPOSITION OF BY-PRODUCT RESULTING FROM THE PRODUCTION OF SCLAREOL

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Clary Sage (*Salvia sclarea* L.) is an eminent species of the Lamiaceae family that includes more than 1000 taxa. This species is widely used in medicine, pharmacology, phytotherapy and perfumery. Also, volatile oil and sclareol, two important commercial products, are produced industrially from inflorescences.

Sclareol is the natural labdanic diterpenoid that is mainly used for the chemical synthesis of effective ambergris substitutes for the cosmetic and perfume industries. The demand for this product on the market is constantly increasing due to its wide range of uses in the production of flavoring and seasoning agents, preservatives, flavors for ennobling tobacco products or for toothpaste.

The main world producers of sclareol are the companies Avoca, Frachem Technologies, Bontoux, Amyris, etc. The first producer has a share of about 55% of global production, and North America is the largest market, with a share of almost 70%.

In the Republic of Moldova, the only producer of sclareol is the Moldavian-French company "MOLSALVIA SRL". Sclareol is extracted from the concrete obtained from the waste left after the distillation of the volatile oil of sage. Annually, the plant produces 63,600 kg of concrete, from which 2,700 kg of sclareol is obtained. After extracting the sclareol, 2 waste products result: No. 1 with a low content of sclareol (<5%) 22600 kg/year and No. 2 with a higher content of sclareol (~20%) 12700 kg/year. Unfortunately, currently none of these products are used.

The aim of this study was to determine the chemical composition of waste No. 2 in order of its practical use. Initially, the waste was subjected to chromatographic fractionation on silica gel, by elution with equal volumes of solvents from apolar to polar and 8 fractions were obtaining. The GC-MS analysis of fractions 1-8 was performed on an Agilent 7890B system, equipped with a VF-WAXms 30m x 250µm x 0.25µm column in 30 minutes. Apart from sclareol (~28%), several dozens of constituents from different classes of compounds were identified. Of these can be mentioned: *higher alkanes* (decane, undecane, dodecane, nonacosane), *oxygenated derivatives* (cetylic alcohol, 2(*E*)-decenal, 2(*Z*)-decenal; myristic, capric and stearic acids; ethyl caprate, methyl linoleate, methyil oleate, ethyl oleate, ethyl linoleate), *oxygenated monoterpenes* (linalool, camfor, bornyl acetate), *diterpenes* (sclareol fitol) and *triterpenes* (scualene).

On the basis of the obtained data, procedures for the enrichment of waste No. 2 for the repeated extraction of sclareol or its utilization in the perfumery or cosmetic industries can be developed.

***Acknowledgments*:** this research was financially supported by the National Agency for Research and Development, Republic of Moldova, via the project PLANTERAS 20.80009.8007.03.

Keywords: *Salvia sclarea L., concrete, sclareol, by-product.*

UDC: **544.142.3:547-304.6**

SYNTHESIS OF NEW ETHYL 2-({2-[PHENYL(PYRIDIN-2-YL)METHYLIDENE]HYDRAZINECARBOTHIOYL}AMINO)-BENZOATE

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Microorganisms have the possibility to develop resistance to different drugs and therefore the synthesis of new drugs with antimicrobial properties is necessary. In this paper, the synthesis of a new organic compound from the class of thiosemicarbazones is presented.

Synthesis of new ethyl 2-({2-[phenyl(pyridin-2-yl)methylidene]-hydrazinecarbothioyl}amino)benzoate **(3)**, and determination of structure.

Compound **(3)** was obtained through the two step (fig. 1): ethyl 2-aminobenzoate **(1)** was reacted with thiophosgene in the presence of sodium hydrogencarbonate, obtaining the ethyl 2-isothiocyanatobenzoate **(2)** with 80% yield, which was then subjected to an addition reaction with 2-[hydrazinylidene(phenyl)methyl]pyridine with the formation of compound **(3)** with 90% yield. The reactions were monitoring by using thin layer chromatography.

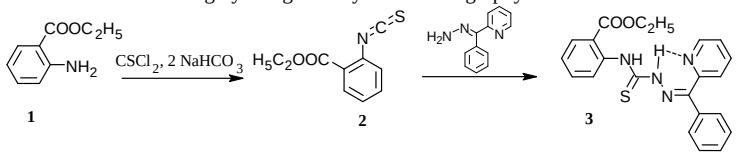

Figure 1. Synthesis of compound **(3)**.

The structure of compound **(3)** was confirmed by elemental analysis, ^{1}H-NMR, ^{13}C-NMR, FT-IR spectroscopy. Upon recrystallization from alcoholic solution of compound 3, single crystals were obtained, which were investigated by single-crystal X-ray diffraction (fig. 2).

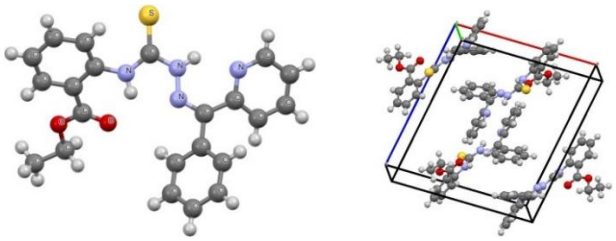

Figure 2. Crystalline structure and packing of compound **(3)**

In the ^{1}H, ^{13}C NMR spectra, two tautomeric forms are present: 95% thione, 5% thiol. In the solid state, it crystallizes in the monoclinic system (common from the pharmaceutical point of view) with the C=S bond length of 1.667 Å, according to the study of the specialized literature, the interatomic distance corresponding to the double bond.

Keywords: *synthesis, thiosemicarbazone, molecular structure.*

UDC:**541.572.5:546.73**

SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF TETRANUCLEAR {Co(III)$_2$Y(III)$_2$} ISOBUTYRATE CLUSTER WITH N-BUTYLDIETHANOLAMINE

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Cobalt, as an essential element for human beings, exists almost exclusively as Co(II) or Co(III) in biological systems. These two predominant oxidation states allow its coordination complexes to exhibit different redox and magnetic properties and make them suitable for applications in biology and medicine. As a part of our ongoing research in elaborating biologically active cobalt-containing complexes a new heterometallic $[Co_2Y_2(OH)_2(ib)_4(bdea)_2(NO_3)_2]\cdot 2MeCN$ (**1**) cluster has been synthesized by the reaction of Co(II) isobutyrate (Hiz = isobutyric acid) and $Y(NO_3)_3\cdot 6H_2O$ with N-butyldiethanolamine (H_2bdea) in MeCN.

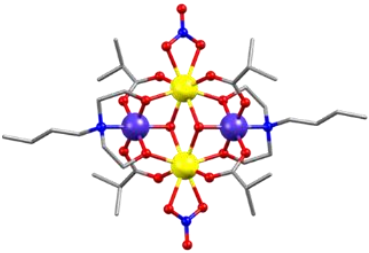

Figure 1. Structure of $[Co_2Y_2(OH)_2(ib)_4(bdea)_2(NO_3)_2]$ cluster in **1**.

Single-crystal X-ray structural analysis reveals that **1** is a tetranuclear compound (Figure 1) and crystallizes with two acetonitrile molecules in the $P2_1/n$ space group of the monoclinic system with a = 14.727(3), b = 9.243(2), c = 19.002(4) Å, β = 99.06(3), V = 2554.3(9) Å^3. Cluster **1** has a rhombic planar tetranuclear central core best described as a „butterfly" motif with the Y(III) ions ocupied the „body" positions and the Co(III) ions at the „wing" sites. The core is stabilized by two OH^- groups, each of them bridges two Y(III) and one Co(III) ions. In this tetranuclear heterometallic cluster, peripheral ligation of four metal centers is provided by four isobutyrate groups and two additional doubly deprotonated bdea^{2-} co-ligands. The Co–O and Co–N bond distances fall into range of 1.881(2)–1.964(2) and 1.967(2)–1.999(2) Å, and the Y–O bond distances are 2.248(2)–2.467(2) Å.

***Acknowledgments*:** this study was supported by the research project ANCD 20.80009.5007.15 within the State Program funded by the National Agency for Research and Development of the Republic of Moldova.

Keywords: *coordination compounds, synthesis, X-ray, aminopolyalcohol ligand.*

UDC: **544.182.342:546.56:547.82**

SYNTHESIS AND CRYSTAL STRUCTURE OF Cu(II) 1D COORDINATION POLYMERS WITH A CARBOHYDRAZONE LIGAND AND BIS(PYRIDYL) LINKERS

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In this abstract we present the use of a carbohydrazone based ligand and bis(pyridyl) compounds, containing pyridine groups linked to the two ends of a spacer, to build 1D coordination polymers. By the interaction of 1,5-*bis*(2-hydroxybenzaldehyde)carbohydrazone (H_4L) with copper nitrate in the presence of 4,4'-bipyridine (bpy) and 1,2-*bis*(4-pyridyl)ethane (bpe) in dimethylformamide (DMF) the compounds $\{[Cu_2(HL)(bpy)(H_2O)(NO_3)]\cdot DMF\}_n$ (**1**) (Figure 1, right) and $\{[Cu_2(HL)(bpe)(H_2O)(NO_3)]\cdot DMF\}_n$ (**2**) were synthesized. In the obtained compounds, the ditopic ligand coordinates hexadentately in the trideprotonated form HL^{3-} through the ONN and ONO donor atom sets, which are formed as a result of its tautomerization. The generated binuclear monocations $[Cu_2(HL)(bpy)(H_2O)(NO_3)]^+$ are linked *via* bpy bridges (in **1**) (Figure 1, left) and bpe (in **2**), forming 1D dimensional polymers. It should be mentioned, that copper ions from both compartments ONN and ONO are involved in polymerization. In compound **1**, the Cu1 atom (coordinated by the ONN set) in the axial position has a monodentately coordinated nitrate anion, while to the Cu2 atom (coordinated by the ONO set) a water molecule is coordinated. In compound **2** the water molecule and the ion nitrate are interchanged. As a result, the coordination number of all copper ions is 5, and the coordination polyhedra are square pyramids. In compound **1**, the Cu1–Cu2 distance within the binuclear unit is 4.812 Å, and those connected *via* bpy, that are Cu1-Cu1' and Cu2-Cu2', are 11.108 Å and 11.086 Å,. In compound **2**, these values are 4.770 Å, 13.136 Å (Cu1-Cu1') and 13.357 Å(Cu2-Cu2'), respectively. An extended network of hydrogen bonds involving hydrazine nitrogen atoms, nitrate anions and DMF molecules join the components of the crystal in **1** and **2**.

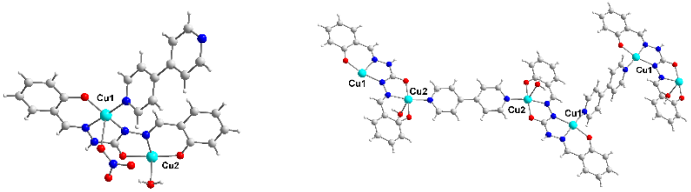

Figure 1. Structure of the monocation $[Cu_2(HL)(bpy)(H_2O)(NO_3)]^+$ (left) and the polymeric chain (right) of compound **1** (coordinated nitrate ion is omitted for clarity)

Keywords: *single crystal X-ray diffraction, Cu(II), carbohydrazone, salicylaldehyde, pyridyl.*

UDC: **547.98:634.8:542.943-92`78**

ANTIOXIDANT ACTIVITY OF ENOXIL DETERMINED *VIA* INTERACTION WITH VARIOUS FREE RADICALS

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The autochthonous compound ENOXIL, represents grape seeds tannins with good antioxidant activity, obtained after slow oxidation processes. ENOXIL is, also, known as an efficient and non-toxic medicine against skin and wound infectious agents due to several action mechanisms that it can stimulate: capture of iron ions from the substrate, and depriving microorganisms of compounds necessary for their physiological activity; binding to microbial proteins and formation of complexes; capturing of free radicals; absorption of oxygen radicals; inhibition of low density lipoproteins oxidation.

In this study, we investigated the antioxidant activity of ENOXIL by using different free radicals, to betted understand and describe the utility of this compound and its mechanisms of action. DPPH radical and ABTS cation radical can be neutralized via electron or H atom transfer, therefore, these methods have been used to determine the total antioxidant activity of the substrate. The prooxidant activity was tested through Fenton reaction. This method revealed the capacity of ENOXIL to scavenge the aggressive OH radicals. The Folin-Ciocalteu reagent was used due to its selective interaction with phenolic compounds; and the DMACA reagent was utilized due to its reactivity to flavonols.

Acknowledgments: this work has been performed under the Moldovan National Research Project Nr. 20.80009.5007.27 “Physical-Chemical Mechanisms of the Redox Processes with Electron Transfer in Vital, Technological and Environmental Systems” funded by National Agency for Research and Development of Republic of Moldova.

Keywords: *ENOXIL, antioxidant, free radicals, tannins.*

GENETIC AND BIOCHEMICAL ANALYSIS OF GROUPS OF MUSSELS FROM THE BLACK SEA

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An important role in the ecology of the Black Sea is played by filter molluscs – mussels. To find out population status of mussels in the Black Sea, it is very important to establish affiliation to certain species and study the genetic structure of the population. First of all study such parameters as the level of heterozygosity and polymorphism of population.

Aim. To investigate the genetic polymorphism among groups of mussels in the North-Western region of the Black Sea by using molecular markers, microsatellite (MS) and biochemical markers.

Material and methods. The material for molecular-genetic analysis was mussels from 6 locations of the North-Western region of the Black Sea: Odesa Bay (location A with coordinates N: 46°26'28" / E: 30°46'20"; location E – N: 46°22'35" / E: 30°45'7"), the 411th Battery Memorial (location B – N: 46°22'2" / E: 30°43'45"), Zmiiniy Island (location C – N: 45°15'18" / E: 30°12'15"), Sukhyi Estuary (location D – N: 46°20'22" / E: 30°39'38") and Tylihul Estuary (location F – N: 46°40'46" / E: 30°9'26"). As an external group, mussels from the Baltic Sea (location G – N: 54°10'55" / E: 12°5'18") and the North Sea (location H – N: 51°8'23" / E: 2°39'58") were used. Genomic DNA of individual mussels was stadied by PCR using molecular markers: *Me 15-16* (Inoue et al., 1995); *Mch 5*, *Mch 8* (Ouagajjou et al., 2011); *MT 203*, *MT 282* (Gardeström et al., 2008). The amplification fragments were fractionated by electrophoresis in 7% polyacrylamide gels (PAGE) and stained with $AgNO_3$ (Promega, 1999). The size of the amplification fragments was defined using the software GelAnalyzer (http://www.gelanalyzer.com) according to the marker *pUC 19 / Msp I*.

For biochemical analysis, aggregated material from the organs (hepatopancreas, ktenidia, mantle, leg and adductor muscle) of 6-10 individuals of mussels from location A was performed using 13 protein markers (enzymes): superoxide dismutase (EC 1.15.1.1), ferroxidase (EC 1.16.3.1), glutathione peroxidase (EC 1.11.1.9), peroxidase (EC 1.11.1.7), peroxyredoxins (EC 1.11.1.15), catalase (EC 1.11.1.6), glutathione reductase (EC 1.6.4.2), NADH oxidase (EC 1.6.3.3), NADPH oxidase (EC 1.6.99.6), carbonic anhydrase (EC 4.2.1.1), amino oxidase (EC 1.4.3.6), nonspecific esterases (EC 3.1.1-), glutathione S-transferase (EC 2.5.1.18). Enzyme analysis was performed by PAGE (6.5-10%) electrophoresis (Toptikov et al., 2017). The enzymes in various organs of mussels were detected using the methods of Manchenko (2003), Meijer & Bloem (1966), Lloyd (1967) and Toptikov et al. (2022). Detection of multiple molecular forms (MMFs) of enzymes after separation in PAGE was performed according to the method (Toptikov et al., 2002). The software AnaIS (anaispro@ua.fm) was used to analyze electrophoregrams.

Results. According to the results of molecular genetic analysis using the diagnostic marker *Me 15-16* in the studied locations (A, B, C, D, E, F) of the North-Western region of the Black Sea, it was established that only individuals of the *Mytilus galloprovincialis* Lamarck, 1819 species are present (*n*=171), which are characterized by a 126 bp amplification fragment. In samples from the Baltic Sea using PCR-identification with the *Me 15-16* marker were detected *Mytilus edulis* Linnaeus, 1758 (*n*=26), *Mytilus trossulus* Gould, 1850 (*n*=1), as well as their

hybrids (*n*=11), which were characterized by amplicons of 168 bp and 180 bp (Chubyk et al., 2022a). Among the mussels from the North Sea were found *M. edulis* (*n*=18), *M. galloprovincialis* (*n*=1) and their hybrid (*n*=1) (Chubyk et al., 2022b).

Using MS-markers (*Mch 5*, *Mch 8*, *MT 203*, *MT 282*), the genetic structure was analyzed for mussel groups from locations A, B and C of the North-Western region of the Black Sea, as well as for mussels from the Baltic and North Seas. A total of 59 alleles were identified in all studied samples of mussels (*n*=118), which differed in the frequency of MS-loci. Data on observed and expected heterozygosity, as well as fixation indices, indicated a shortage of heterozygotes in the studied mussel groups. According to the F_{ST} coefficient, weak and medium genetic differentiation was established between the locations of the Black Sea, and medium genetic differentiation was established between the locations of the Black, Baltic and North Seas.

According to the biochemical analysis, it was established that all the studied enzymes are polymorphic, each organ differs in the level of enzyme activity and a set of multiple forms. The largest number of multiple forms of enzymes was detected using peroxidase activity (up to 11 forms), NADPH-oxidase activity (up to 8 forms) and esterase activi ty (up to 8 forms). The smallest number of multiple forms of enzymes (up to two forms) were characterized by: glutathione peroxidase and glutathione S-transferase activities. The coordinated functioning of protective enzymes in various mussel organs was demonstrated (Toptikov et al., 2022). However, none of the enzymes can be recommended for studies of differences between mussels from different geographic locations or for differentiation of subpopulations.

***Conclusions*.** The studied groups of mussels from 6 locations in the North-Western region of the Black Sea were identified as the species *M. galloprovincialis*. In the group of mussels from the Baltic Sea were found *M. edulis*, *M. trossulus* and their hybrids; from the North Sea – *M. edulis*, *M. galloprovincialis* and their hybrid. According to the data of microsatellite analysis, it was found that the groups of mussels of the Black Sea were the most similar to each other and differed from the groups of the Baltic and North Seas. The studied enzymes (as protein markers) cannot be recommended for the differentiation of the studied mussel groups due to the scarcity of the spectra, namely the variation of the spectra characteristic of different organs and quantitative differences in the activity of enzyme forms.

***Acknowledgments*:** Presented results were obtained within the framework of the project «Ecological and genetic aspects of adaptation and genetic polymorphism of living systems» (2021-2025) that was conducted on the Chair of Molecular biology, Biochemistry and Genetics of Odesa I.I. Mechnikov National University with the state registration number 0121U109169 at Ukrainian Institute of Scientific and Technical Expertise and Information.

***Keywords*:** mussels, polymorphism, biodiversity, molecular and biochemical markers, microsatellite loci.

UDC: **633.88:631.547.15**

GERMINATION OF SEEDS OF MEDICINAL PLANTS OF DIFFERENT GROUPS OF RIPENESS

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In the last centuries, the species requested by medicinal plants are introduced into culture. The aim of the research is to study seed germination under monoculture conditions. The collection of medicinal and aromatic plants includes 93 botanical taxa of plants grown in monoculture. The collection was divided into 3 groups according to the ripeness of the seeds: early ripe - the seeds ripen in June, the first decade of July; mid-season - seed ripening occurs in july-august and late-ripening plants in which seeds ripen in september-october. The growing season of plants usually begins in march and ends in october.

Representatives of the group of early ripening plants include two species of *Rumex* (*acetosella* and *teanshanicum* L.), *Salvia officinalis* L., and *Thymus vulgaris* L. Seed ripening begins at the end of June and continues until the first decade of July. In dry years, the average seed germination is 68%. However, in *Rumex* it reaches 85–90%. We note that the germination of seeds in *Rumex* also decreases by 10%. However, in *Salvia officinalis*, seed germination was quite low and in moderate drought conditions is 49%. The ripening of seeds in species of medium ripeness begins in august, and it coincides with the onset of the dry period. The seed germination averages 47% in years with moderate drought. Low germination, up to 20%, was recorded in *Tanacetum vulgare* L. In dry years, seed germination in this group decreased to 37%. *Tanacetum* is especially affected by drought. In such years, plant leaves are shed, inflorescences are small, seed germination is 2–4%. The group of late plants includes *Origanum vulgare* L., *Satureja montana* L., *Datura stramonium* L., and *Foeniculum vulgare* L. Seed ripening time occurs in october-november. We note that the seeds of plants of this group have the highest germination rate and it reaches 60% with moderate drought and 42% with severe drought.

Conclusion. Seed germination of medicinal plants of three groups of maturity was studied. We note that seed germination is sharply reduced under the influence of summer drought, especially in plants of the middle ripeness group, in which the period of seed growth and development coincides with the period of severe drought.

Research was carried out within the project of the State Program **20.80009.5107.07** "*Reducing the consequences of climate change by creating, implementing varieties of medicinal and aromatic plants drought, frost, winter, disease resistant, which ensures sustainable development of agriculture and guarantees high quality raw material predestined to the perfumery, cosmetics, pharmaceuticals and food industry", financed by NARD.*

***Keywords**: medicinal, aromatic plants, germination, seeds.*

UDC: **633.812(478)**

PROSPECTIVE VARIETIES OF LAVENDER CREATED AT IGFPP

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Lavender is an aromatic and medicinal species most often used in agriculture and the industry of many countries, including the Republic of Moldova. The main goal proposed by the researchers from the AMP Laboratory is to improve the species and create new clone varieties, which ensure a high production of raw material with a high essential oil content.

The biological material used was represented by 4 approved lavender varieties, in the Republic of Moldova *Vis Magic* 10; *Moldoveanca* 4; *Alba* 7; *Aroma* unica and five hybrids: Fr.5S-8-24**;** Cr.13S-6-7**;** Cr.13S-6-35**;** VM-18V**;** Fr.8-5-15V. Experience was located on an area of 1300 m.p. The varieties - clones were planted with the soil surface of 1.4 m x 0.6 m in four repetitions. Phenological evaluations by scoring developmental phases. The essential oil content by hydrodistillation in Ginsberg apparatus and recalculated to the dry matter. The research carried out on lavender in CCC started in 2013. The results obtained led to the creation of two new varieties of lavender, which are characterized by remarkable quantitative and qualitative characters: *Svetlana* and *Favoare*.

Svetlana clone variety - late maturity group, vegetation period - 71 days. The corolla of the flower is dark purple, the calyx is dark purple. Plant height 71.5cm, diameter - on average 93.3 cm. The number of flower stalks per plant – 854 units. Floral spike 9.5cm long. The number of vertices in the inflorescence – 7.9 units. MMB - 0.7 g. Average production of inflorescences: – 7.7 t/ha. Essential oil content at standard humidity (60%) -2.323%, dry matter 5.721%. Average production of essential oil: 179.2 kg/ha. The yield of the very high variety of 23.4 kg/t. *Favoare* clone variety - early group, vegetation period 60 days. Plant height 68.0 cm, diameter 91.3 cm. Forms 835 flower stalks per plant. Forna leaves linear. Calyx green-violet, corolla light purple. The flowers are grouped in 6-7 pseudo whorls. MMB - 0.6g. The average production of inflorescences: – 7.4 t/ha. Essential oil content, at standard humidity (60%) - 2.077%, at dry matter - 5.157%. Average production of essential oil: 155.2 kg/ha. Essential oil yield of 20.7 kg/t. We can conclude that the varieties *Svetlana* and *Favoare* are part of different groups of maturity, high production of raw material, high content of essential oil. They are resistant to frost, winter and drought.

Acknowledgments: The research was carried out within the project of the State Program 20.80009.5107.07 "Diminishing the consequences of climate change by creating and implementing varieties of medicinal and aromatic plants with high productivity, resistant to drought, wintering, diseases, which ensures sustainable development of agriculture, guarantees high quality products, predestined for the perfumery, cosmetics, pharmaceuticals, food industry" funded by the National Agency for Research and Developmenta.

Keywords*: Lavender, aromatic plant, clone variety, essential oil, productivity.*

UDC: **635.743: 581.135.51**

PERFORMING HYBRIDS F_6-F_7 *SALVIA SCLAREA* L. WITH HIGH ESSENTIAL OIL CONTENT

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The breeding research carried out on *Salvia sclarea* L., aims to create and improve germplasm sources, new genotypes, more productive, more resistant to environmental conditions. The purpose of our research consists in the evaluation and selection of *Salvia sclarea* L. hybrids, with high essential oil content. The biological material used is represented by 29 hybrids of different complexity: simple, trilinear, double, in stages and complex F_6–F_7 of *Salvia sclarea*, in the first and second year of vegetation (2021–2022). Phenological evaluations, biometric research, visual evaluations were carried out, morphological character indices were studied: plant height, inflorescence length, number of first and second degree ramifications of the inflorescence. The essential oil content was determined by hidrodistillation in *Ginsberg* apparatus. The statistical interpretation of the obtained experimental data was carried out according to the methods in force.

The evaluated hybrids are characterized by an average height between 86.9–122.0 cm. Well-developed plants with the highest height recorded a trilinear hybrid [(S-1122 60 S_{10} x (M-69 10S_4 x L-15)F_9)]F_6 and the complex hybrid [(M-44S4 x L-15)F_1 x L-15)F_7 x (K-36 x 0-41)F_2 x 0-19)B_5)]F_6 (122.0 cm). The length of the inflorescence is quite large 46.4–67.1 cm and constitutes 48.3–55.4% of the plant's height. With the most vigorous panic the trilinear hybrid [(S-1122 60 S_{10} x (M-69 10S_4 x L-15)F_9)]F_6 – 67.1 cm was highlighted. Plant inflorescences had a total of 27.0–59.2 branches, including 11.6–20.0 first-degree and 14.8–42.4 second-degree branches. The highest number of first-degree branches (20.0) was found in the stepwise hybrid combination [(K-36 x 0-41)F_2 x 0-19)F_1 x 0-22)B_4 x L-15)F_6 x Cr. p.99 S_{11})]F_6. The double hybrid [(V-24-86 809 S_3 x 0-33 S_6)F_7 X (S-1122 528S3 x S.s.Tien-Shan/south)B_5)]F_6 – with 42.4 ramifications.

The essential oil content of the evaluated genotypes varied from 0.624 to 2.227% (s.u.). The hybrids that stood out with high and very high content of essential oil, of 1,410–2,227% (dry matter) were selected. The step hybrids [(M-44S_4 x L-15)F_1 x L-15)F_7 x (S.s.Turkmen/N)S_7)F_6 white (2.120% (dry matter)), [(M-44S_4 x L-15)F_1 x L-15)F_7 x (K-36 x 0-41)F_2 x 0-19)B_5)]F_6 (2.141% (dry matter)) and the trilinear hybrid [(S-1122 60 S_{10} x (M-69 429-82 S_3 x 0-40S_5)F_7)]F_6 (2.227% (s.u.))

Research was carried out within the project of the State Program **20.80009.5107.07**"Reducing the consequences of climate change by creating, implementing varieties of medicinal and aromatic plants drought, frost, winter, disease resistant, which ensures sustainable development of agriculture and guarantees high quality raw material predestined to the perfumery, cosmetics, pharmaceuticals and food industry", financed by the NARD".

***Keywords**: Salvia sclarea* L., *hybrid, the quantitative characters, essential oil.*

The Conference was attended by 399 participants from 19 universities and 41 institutes and research centers, representing 11 countries, including: Republic of Moldova (302), Ukraine (43), Romania (26), Serbia (7), Russian Federation (6), China (5), Czech Republic (3), USA (3), Slovak Republic (2), Switzerland (1), France (1).

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