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Botanical Garden (Institut) of ASM

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Cuprins

1. Plant conservation

SUSTAINABLE USE, DEVELOPMENT, CONSERVATION AND MANAGEMENT OF FOREST GENETIC RESOURCES

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Keywords*: ecosystem, silviculture, afforestation, conservation, seed sources*.

The conservation of biodiversity is among the most important responsibilities of the international scientific community in the frame of the environmental protection. Under this respect, rare and scattered species, and species whose distribution area was severely fragmented and reduced, are particularly threatened.

The conservation of forest genetic resources is a multi-dimension process. It needs global and regional coordination through guidelines and networking. Because most species ignore administrative boundaries, each nation has to take care of its own resources, probably in coordination with neighbouring countries. Conservation is a multi-step process. In situ and ex situ, dynamic and static conservations are complementary parts of this puzzle. Conservation is a considerable undertaking, which needs the scientific background, commitment and partnership of all actors in the forestry sector, public and private funding and space, and time for periodic evaluation.

Maintaining the biological diversity of an ecosystem depends upon sustaining the genetic diversity of the species comprising that ecosystem. Dominant trees are major determinants of the characteristics of other flora and fauna of forest ecosystems and, if their genetic diversity is compromised or lost, those effects are felt throughout the entire system. To ensure sustainable management of forests, the genetic resources of forest trees must be conserved and developed, whether they exist as trees in planted forest, natural forest or protected conservation stands, or as seeds or tissue cultures in storage.

The choice of seed sources is one of the main factors affecting the establishment and productivity of plantations of forest trees. In the present practice of silviculture, provenance research provides a sound basis for the selection of seed sources. Anyone concerned with afforestation and reforestation should develop a program of provenance research to assist in the selection of seed sources. Such valuable work has been done in the past. Extensions of this and new research are vitally needed on an international scale because without it future investments in afforestation and reforestation will not return their maximum revenue. Provenance research should be given highest priority at the outset of any program of forest tree improvement.

From a scientific point of view, research activities related to conservation result in an extraordinary, sometimes unexpected, source of knowledge with applications outside its strict limits. Conservation is not an independent and self-sufficient activity. In forest trees, it is closely related to management. It should not be perceived by lay persons and professionals as an obstruction of resources, like in a museum. It should be considered part of the daily activities of professionals and specialists.

Genetic conservation of forest trees represents maintenance of the evolutionary created adaptation potential of a species, and therefore, its forest community, and the entire ecosystem. For the purpose of the conservation of the forest tree species, protection is needed of the existing genetic variability, its adaptability to processes of evolution and breeding.

Research should be supplemented by data encompassing forest inventory, legislation, practical utilization, coordination on both national and pan-European levels, as well as promotion of public awareness on the importance of the conservation of the endangered species pertaining to the forest ecosystems. Climate changes and new habitat conditions will pose additional challenges to forest reproductive material and forest management; in turn, this will influence their economic and social benefits, as well as biological diversity of forest ecosystems.

BIBLIOGRAPHY:

1. Muller-Starck G., Baradat, Ph., Bergmann, F., – *Genetic variation within european tree species*. Kluwer Academic Publisher, Frankurt am Main, 1992, pp. 23 – 47.

2. Nanson, A. – *Genetique et amelioration des arbres forestieres. Les presses agronomique de Gembloux*, Lyon, 2004, pp. 420-510.

3. Godeanu S., Davidescu D., Bavaru A., – *Sursele și evoluția biodiversității. Biodiversitate și ocrotirea naturi*i, Editura Academiei Române, București, 2007, pp. 38–75.

FOREST REPRODUCTIVE MATERIAL AND CONSERVATION OF FOREST GENETIC RESOURCES IN THE REPUBLIC OF MOLDOVA

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Keywords*: Conservation, diversity, forest, oak, environment.*

Conservation of genetic diversity of forest tree species represents the foundation for sustainable forest management and preservation of natural structure of forest stands in the Republic of Moldova. Diversity of geographical regions in the Republic of Moldova has generated various ecological conditions and thus diverse forest communities which are directly affected by habitat degradation, various anthropogenic effects like pollution of air and water, excessive use of certain more valuable species of forest trees, for example oaks, and by the increasing impact of global climatic changes.

Study of the particularities of descendent growth, quality of trunks, as well as their resistance to pests, diseases, and abiotic stress in geographical and environmental cultures, is one of the most actual problems in the forest seed zoning based on population genetics. The interaction of inherited characteristics and environmental conditions determine the resistance and productivity of descendents from various environmental and geographical origins. Differences in productivity due these factors might achieve II-III growth classes. In researches carried out by some scientists, it has been shown that the properties of climatic types and ecotypes are inherited and expressed in the second and even in 3-rd generation. Moreover, in geographical cultures that influence descendants' growth, the strategies of forest restoration and breeding ultimately depend on the relationships between the inherited properties and environmental factors. Despite the fact that the seed zoning based on the population-genetic basis is an important methodological approach for maintaining the productivity and sustainability of plantations, the intensification of global warming tendency in recent years, may exceed the adaptive capacity of woody plants in population. Manifestation during long time of temperatures above the average by only 1-2°C will cause the necessity to increase the adaptive capacity of individuals in plantations, which in turn can lead to regressive succession process and modification of distribution of oak species. Therefore, at present it is very important to identify individuals, families and oak descendents from different ecological zones that are the most resistant to elevated temperatures.

The aim of our research is to study the comparative plant state depending on the genetic characteristics of the pedunculate oak (*Quercus robur* L.) descendents at the same age, different ecological origin, and growing in the Scientific Reservation "Plaiul Fagului". Plantations growing from local seeds usually have a higher stress resistance and productivity. However, sometimes the ecotypes from other zones have advantages over the local for a number of economically important qualities. Growth and state of plants depends not only on the geographic origin of the seeds, but also on environmental, phenological and individual variability within specific climatic region. The revealing of how in a long time interval the growth and adaptations of descendents of different ecological origins are expressed provides opportunities to evaluate the effectiveness of using the seeds from distant areas during the afforestation works. Conservation of genetic diversity of various forest tree species is conducted through programmes employing *in situ* and *ex situ* methods. Conservation of native species by the *in situ* method is based upon a status quo concept of protection of natural conditions in local habitats with optimal allelic gene frequency having been attained, ensuring survival and reproduction in a given environment. Furthermore, this means that the local populations and certain species of forest trees show best resistance and adaptability to stressful environmental conditions, as well as to pests and diseases. Studies conducted on conservation of genetic diversity include necessary knowledge of the minimum viable population which is necessary for the population's relatively safe survival in terms of genetic, demographic, environmental and other factors.

BIBLIOGRAPHY:

1. Geburek Th., Müller F., – *How can silvicultural management contribute to genetic conservation.* // In: Th. Geburek & J.Turok eds. Conservation and Management of Forest Genetic Resources in Europe. Arbora Publishers. Zvolen, 2004, pp. 640-659.

2. Vidaković, M., Kajba, D., Bogdan, S., Podnar, V., – *Estimation of Genetic Gain in a Progeny Trial of Pedunculate Oak (Quercus robur L.).* Glasnik za šumske pokuse, Croatia, 2000, pp 375-381.

3. Hosius B., Leinemann L., Konnert M., Bergmann F., – *Genetic aspects of forestry in the Central Europe.* // Eur. J. Forest Res., Zvolen, 2006, Vol. 125, pp. 407-417.

THE INFLUENCE OF SOIL MOISTURE REGIME ON OAKS FROM CENTRAL CODRII

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Keywords: *oaks, humidity, soil, protosoil, albic.*

The moisture regime puts in value the soil richness in nutrients, making this wealth into actual fertility. One of the essential factors of moisture regime is the extent to which the soil performs the main function of supplying oaks with accessible water and nutrients, which allows good circulation of the air.

The soils of Central Plateau of Moldova served as objective of the research. The research was conducted in the areas of samples 12G; 12F and 12A. They were dug and pedogenetical profile was analyzed (0-150 cm). According to the traditional geopedological methodology it was highlighted and characterized the genetic horizon morphology, samples were collected in order to determine the percentage of humidity, pH and CaCO3. Soil typology corresponds to classification (1999; 2004).

From these areas, soil samples were collected once in ten days to determine humidity at depth: 0-5 cm; 5-10 cm; 15-20 cm; 45-50 cm 95-100 cm. The temperature was recorded at depth of 0-5 cm and 95-100 cm.

In clay protosoil under sessile oak-beech forest (12G) during the vegetation period in 2014, the percentage of humidity in early May was 23.74% in layer 0-5cm and 17.51% at depth 95-100 cm. A higher humidity degree was recorded at the end of May – 35.61% in layer 0-5cm and 19.36% at depth of 95-100 cm. The average temperature this month (May) was 15.3 ° C and 81.4 mm of precipitation fell.

It's very small percentage of humidity in this type of soil in August. It serves as evidence that the end of the growing season exhausted all useful soil water reserves and substantially enhanced evapotranspiration process. Another cause is the lack of rainfall. The percentage of humidity is 6.89% in the layer of 0-5 cm, and at depth of 95-100 cm – 13.34%. The average temperature this month (August) was 21.1 ° C and 17.9 mm of precipitation fell.

The temperature in clay protosoil under sessile oak-beech forest was: May – 11.0° C (0-5 cm) and 12.0° C (95-100 cm). In August – 22.0° C (0-5 cm) and 22.8° C (95-100 cm).

In gray clay molic soil under hill mixed oak forest (12F), during that period, the following indices of humidity were registered: in May – 36.47% in layer 0-5 cm and 27.63% – at depth of 95-100 cm. A lower level of humidity was recorded in August: 30.23% in layer 0-5 cm and 15.41% at 95-100 cm depth. Humidity in the soil is kept well due to the developed canopy of trees that reduces the intensity of evaporation.

The temperature of molic gray silty clay soil under the hill oak forest plainly was: May - 11.0 ° C (0-5 cm) and 11.0 ° C (95-100 cm). In August – 23.0 ° C (0-5 cm) and 21.2 ° C (95-100 cm).

In the sandy-silty albic gray soil under hill mixed forest with sessile oak and oak (12A), during the vegetation period, the humidity was recorded: in May – 35.33% in layer 0-5 cm and 20.35% at depth of 95-100 cm. A lower level of humidity was recorded in this type of soil in August: 17.81% in layer 0-5 cm and 15.89% respectively at 95-100 cm depth.

The temperature of albic gray sandy clayey soil under the hill mixed forest with holm oak was: May – 12.0 ° C (0-5 cm) and 8.0 ° C (95-100 cm). In August – 18.6 ° C (0-5 cm) and 18.2 ° C (95-100 cm).

The research shows that the moisture content, during the vegetation period, of clay protosoil under sessile oak-beech forest is lower than molic gray silty clay soil under hill mixed forest with holm oak due to the well developed canopy of trees that reduces the intensity of evaporation. Biochemical processes, in particular anaerobic or aerobic decomposition of organic matter is entirely influenced by the character of the soil moisture regime that highlights the richness of soil in nutrients, making this wealth into actual fertility.

Determination of soil moisture on the whole profile has allowed highlighting the distribution and movement of water in soil depending on granulometric composition. One of the essential factors of moisture regime is the extent to which the soil performs throughout the whole period the main function of supplying oaks with accessible water and nutrients, while allowing good air circulation.

SCREENING OF ACCESSIONS OF MAIZE COLLECTION BY HEAT AND DROUGHT RESISTANCE

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Key words**:** *resistance, female inflorescences, male inflorescences, protandry.*

Availability of large plant collections of genebanks for use is determined to a great extent by the level of knowledge accumulated about stored biomaterial. For this purpose, collections by traits are created as a result of long-term studies of genotypes by complex of parameters at all ontogenesis stages. Extreme conditions of year 2012, i.e. abnormal heat and prolonged drought, allowed performing evaluation of maize lines by their resistance to these abiotic factors. Special attention was paid to the development of plants in generative phase. This period is the most important for yielding of grain. High temperature and low humidity of the air reduce viability of pollen and also negatively affect pollination and grain content in maize cobs. Humidity deficit in generative phase of plants influences the production of underdeveloped flowers and asynchronous flowering [1]. The delay in flowering of female and male inflorescences or protandry in maize is not long under favorable conditions. Under the influence of abiotic stress this delay can become significantly longer in some genotypes. As a result of this, part of female flowers is not pollinated and maize cob remains imperfect [2].

Studied material included 8 high-lysine maize lines (Chișinău H.O *o2* 434, Ch. - 433 Ch.- 219-2, Ch. - 245, Ch.- 424, Ch. - 253, Ch. -221, Ch.-235-2) from collection of the Center for Plant Genetic Resources of Moldova. For selection of lines for resistance, the main parameters of generative phase were considered: protandry duration, pollen production ability of panicles, number and length of maize stigma.
As a result of phenological observations, genotypic differences were revealed with regard to duration of period from seedlings to flowering of male inflorescences. Beginning of flowering of panicles was recorded upon the appearance of more than 20% anthers in half of recorded plants. Trait variability was noted within 50 days (lines: Ch.- 219 -2 Ch- 424) to 58 days (Ch.- 253, Ch.- 221). Flowering of female inflorescences began when not less than 10-20 stigmas appeared from the cornhusk. Duration of the period from seedlings to flowering varied within 52 days (lines Ch.-424) to 62 days (Ch.-253). Line Ch.-221 was noted for full absence of stigmas and reduced maize cobs. So, under the influence of stress, the asynchrony of flowering increased in all 8 lines of maize. At that, protandry of line Ch- 424 was 3 days (minimum value) and the longest delay was recorded for lines Ch. - 253 (5 days) and Ch.- 221 (full absence of stigmas).

Number of stigmas and their length were recorded on the first, third and fifth day after their appearance from the cornhusk. Further, the average values were found from these three measurements. Line Ch-434 had the most intensive flowering of maize cob (54 stigmas with the average length of 6.8 cm.), a few short stigmas were observed in line Ch-253 (8 stigmas with the average length of 2.3 cm.) and line Ch-221 had no stigmas at all. Other lines were characterized by the intermediate values of parameters.
For evaluation of lines by pollen production ability, a 6-point scale was used considering weight of pollen from one collection for pollination. Comparative analysis of obtained data allowed revealing significant genotypic differences; lines were divided into two groups. The first group included 3 lines with high level of parameter (5-6 points): Ch- 224, Ch- 219, and Ch- 433. In second group of lines plants developed reduced panicles that resulted in significant decrease of the amount of pollen (1-2 points).

Thus, as a result of evaluation of 8 high-lysine maize lines by resistance to high temperatures and humidity deficit, some parameters of generative phase of plants were studied. Genotypic differences were revealed with respect to response to stress (prolonged protandry, decreased pollen production ability, reduced development of male and female inflorescences). After collation of the results by productivity, the line Chișinău H.O *o2*- 424 was selected as the resistance donor.

BIBLIOGRAPHY

1. Vianello I., Sobrado M.A.*Respuestas contrastantes del maiz in ante la sequia en el periodo vegetativo o reproductivo*., Turrialba. 1991, 41, 3, 403-411.
2. Былич Е. Н. *Воздействие абиотических факторов среды на проявление протандрии кукурузы*. К 110-летию академика ВАСХНИЛ и Россельхозакадемии М.С. Дунина «Культурные растения для устойчивого сельского хозяйства в XXI веке (иммунитет, селекция и интродукция)», Москва, 2011, Том. IV (II), стр. 167-169.

THE EVOLUTION OF THE CONCEPT OF FOREST GENETIC RESOURCES IN REPUBLIC OF MOLDOVA

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Keywords: *Forest Genetic Resources, silviculture, basic materials.*

In the current context, it is more and more emphasized the problem of conservation of the biodiversity and of the forest ecosystems. The intensive and irrational exploitation of the forests caused the extinction of many species of plants, including shrubs and trees and simultaneously reduced the genetic potential of the existent species. For this reason, the concentration of the efforts on the conservation of the forest genetic resources is vitally important for the national forest patrimony. The conservation of FGR involves, not at least, the creation of a national catalogue of basic materials, which could effectively supply with forest reproductive material, superior in terms of quality (physiological and hereditary) and quantity, when it comes to afforestation works, with all their forms of application.

During the last century, in the Republic of Moldova, numerous studies have been conducted regarding the forest genetic fund. However, in the last ten years, the identification and the conservation of the forest genetic resources was less approached in the literature and in practice. Refocusing the attention on this subject represents a primary task for the modern silviculture in order to conduct a sustainable management of the forest resources. In this regard, currently within the Forest Research and Management Institute, there are several ongoing projects and initiatives for the conservation of forest genetic resources, including participation in the fifth phase of the EUFORGEN program.

BIBLIOGRAPHY

1. Blada I., Alexandrov A., Postolache G. Inventories for in situ conservation of broadleaved forest genetic resources in Southeastern Europe. Science and Technology for Plant Genetic Resources in the 21-st Century : proceedings of the Intern. Conf. – Kuala Lumpur (Malaysia), 2000. – P. 11-22
2. Enescu V.,Cherecheș D., Bîndiu C., Conservarea biodiversității și a resurselor genetice forestiere. Ed. SC. AGRIȘ – Redacția revistelor agricole, București 1997.
3. Instrucțiuni tehnice privind menagementul durabil al Resurselor Genetice Forestiere. O.M. Nr. 945/01.03.2012
4. OECD Scheme for the certification of forest reoroductive material moving in international trade. Paris, 2013
5. Postolache D. State of Forest and Tree Genetic Resources in the Republic of Moldova. Forest Genetic Resources, FGR/64E. Forest Resources Development Service, Forest Resources Division. FAO,Roma (Italy) 2004
6. Postolache G.,Chirtoacă V.,Talmaci L., Dandara S. Problemele actuale de conservare şi folosire raţională a resurselor genetice forestiere în Republica Moldova. Congresul II al Societăţii de Botanică din RM. 12-13 noiembrie 1998
7. Teleuţă A., Postolache G., Munteanu A. Conservarea biodiversităţii forestiere – obiectiv de bază a gestionării durabile a sectorului forestier Dezvoltarea durabilă a sectorului forestier – noi obiective şi priorităţi. Materialele simp. intern., 17-19 noiem. 2011. – Ch., 2011. – P. 88-89.
8. Тышкевич Г. Л, Охрана и восстановление буковых лесов. Кишинёв, 1984.
9. Гейдеман Т. С. О флоре сосудистых растений известняковых гряд Молдавии // Флористические и геоботанические исследования в Молдавии. Кишинёв 1980, с. 28-36.

HIGHLY THREATENED SPECIES FROM THE FLORA OF THE REPUBLIC OF MOLDOVA PROPOSED FOR STATE PROTECTION

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Key words: *rare species, categories of endangerment, Red Book, flora, R. Moldova*

Anthropogenic factors over the last 10-15 years have exerted negative influences on natural plant kingdom, causing an increasing degradation of forest, steppe, aquatic biotopes, etc. – fact which has caused significant changes related to the number of plants and population viability, habitat loss or expansion. The Law on the Red Book of the Republic of Moldova (25.01.2006, no. 432-IV) provides a series of articles on protection and restoration of objects of the Red Book (R. B.), updating the R. B., organizing state monitoring of R. B. objects, editing and publishing the R. B. (every 10 years), etc.

While preparing the Red Book of Republic of Moldova (RBM), 3rd edition, for publication, during 2012-2013, field and laboratory researches on the current status of rare species of wild flora, assessment of habitat quality, number of plants in populations and limiting factors acting on native flora were conducted. As a result of the conducted research, highly threatened species were highlighted and a list of species proposed for the RBM, 3rd ed., was made. The evaluation of rare species and their categorisation was done according to the criteria adopted by the International Union for the Conservation of Nature (2001, 2003).

The selection of species proposed for the respective edition was based on the following criteria: *taxonomic* – from taxonomic point of view, safe taxa were selected; the dubious and unclear ones were left for further study; *specific spreading area* – species with restricted and disjunctive specific spreading areas, endangered species; *boundary of the specific spreading area* – species that are near or at the boundary of the specific spreading area, situation characteristic of most species; species that are found in few localities and geographical areas; species mentioned in international conventions etc.

Further, we present the list of highly threatened species, included in RBM, 3rd ed., proposed by the authors for state protection:

Critically Endangered (CR) – *Carex rhizina* Blytt ex Lindb. (Cyperaceae), *Centaurea salonitana* Vis. (Asteraceae), *Hieracium laevigatum* Willd. (Asteraceae), *Laserpitium latifolium* L. (Apiaceae), *Ortilia secunda* (L.) House (Pyrolaceae), *Pulsatilla patens* (L.) Mill., *Ranunculus lingua* L., (Ranunculaceae); *Scorzonera austriaca* Willd. (Asteraceae), *Serratula bulgarica* Acht. & Stoj. (Asteraceae), *Thymus calcareus* Klokov et Des.-Schost. (Lamiaceae), *Vincetoxicum fuscatum* (Hornem.) Reichenb. fil. (*V. intermedium* Taliev) (Asclepiadaceae), *Monotropa hypophegea* Wallr. (Monotropaceae); (3, 4, 5)

Endangered (EN) – *Aconitum lasiostomum* Rchb. et Besser (Ranunculaceae), *Astragalus pastellianus* Pollini (Fabaceae), *Carex paniculata* L. (Cyperaceae), *Linum linearifolium* Javorka (Linaceae); *Rosa pygmaea* Bieb. (Rosaceae), *Rosa frutetorum* Bess. (Rosaceae); *Serratula lycopifolia* (Vill.) A. Kerner (Asteraceae); (3, 4, 5)

Vulnerabile (VU) – *Aconithum eulophum* Rchb. (Ranunculaceae), *Seseli peucedanifolium* Besser (Apiaceae), *Scorzonera mollis* Bieb. (Asteraceae), *Serratula coronata* L. (Asteraceae), *Alyssum gmelinii* Jord. (Brassicaceae); (3, 4, 5)

The legal and institutional framework on biodiversity conservation in the Republic of Moldova requires modifications in accordance with the current exigencies, and the legislation must be respected.

BIBLIOGRAPHY

1. IUCN. *IUCN Red List Categories and Criteria*: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland: 2001.
2. IUCN. *Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, 2003. UK. ii + 26 pp.
3. NEGRU, A., ŞABANOVA G, CANTEMIR V. şi al. *Plantele rare din flora spontană a R. Moldova*. Ch.: USM, 2002, 198 p.
4. PÂNZARU P., NEGRU A., IZVERSCHI T. *Taxoni rari din flora Republicii Moldova*. Chişinău. 2000, 148 p.
5. PÎNZARU P., SÎRBU T. *Flora vasculară din Republica Moldova (lista speciilor şi ecologia*). Chişinău:„Garmont-Studio”, 2014, 234 p.

THE ROLE OF BOTANICAL GARDENS IN *EX SITU* AND *IN SITU* CONSERVATION

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Key words: *in situ conservation, ex situ conservation, rare species, conventions.*

Nowadays, when biodiversity is rapidly decreasing because of the anthropogenic impact, information exchange and international cooperation are the key elements of a joint effort that people need to make in order to reduce biodiversity loss.

In a series of international documents (Convention on Biological Diversity, Agenda 21, etc.) and of the European Union (Habitats Directive, Action Plan for Botanic Gardens, etc.), the objectives and the major responsibility, concerning this problem, of the Botanical Gardens from all over the world are stipulated.

Currently, on Earth, there are over 1800 Botanical Gardens and stands in 150 countries. Their activities concerning collection, protection, conservation and research oriented towards 80 000 plant species contribute significantly to the implementation of the requirements of the Convention on Biological Diversity. The contribution of Botanical Gardens to the implementation of the Global Biodiversity Strategy, as evidenced by the articles of the Convention on Biological Diversity, relates to a range of priority directions of global importance: Articles 6,7,8,9,10,11,12,13,15,17,18.

Art. 9 – "Ex-situ" conservation: herbarium collections, seed banks, collections of endangered and rare plants, repopulation programs, researches on reproductive biology and propagation, researches on genetic variability and ecomorphology;

Art. 17 - Exchange of information: exchange of information in electronic form, between Botanical Gardens, open access to results of scientific research, unification of the taxonomic system;

In these conditions, it is recognized the fact that the main method of biodiversity conservation is "*in-situ*" and an additional, but absolutely necessary and quite effective one is "*ex-situ*" conservation. At present, one third of the spontaneous flora of Earth is found in the living plant collections of Botanical Gardens. This strategic reserve can always be used for "in-situ" conservation.

"*In-situ*" conservation aims at perpetuation of organisms in ecosystems and in their natural habitats, where all processes take place naturally and organisms reproduce freely or at the rate imposed by the system where they integrate.

The specialists from Botanical Gardens need to get involved in activities concerning "in situ" conservation by:

- Supporting programs on ecological restoration and management of protected areas;
- Developing strategies and programs for the conservation of plant diversity in areas undergoing intense anthropogenic activity;
- Developing and implementing educational programs in this field etc.

Ex situ conservation is a complex of means by which certain endangered taxa are protected and studied by various specialized institutions. Botanical Gardens have more possibilities in this regard, we consider as priorities the following directions:

- Propagation by modern and classic means of taxa with high risk of endangerment and extinction;
- Development of collections of rare and relic plants (in the last 4 years, in the Botanical Garden of ASM, rare species of wild flora, such as: *Salvinia natans* L., *Trapa natans* L., *Asplenium trichomanes* L., *Polypodium vulgare* L., *Centaurea thirkei Sch. Bip.*, *Sempervivum ruthenicum* Schnittsp. et C.B. Lehm., *Allium montanum* F.W. Schmidt, *Nectaroscordum bulgaricum* Janca, *Aconitum anthora* L., *Delphinium fissum* Waldst. et Kit.etc., have been conserved);
- Development of the Database of rare plant species and of those included in the Red Book of Moldova;
- Development and spreading of materials with the purpose of informing and popularizing the need to protect plant heritage.

BIBLIOGRAPHY

1. *Convention on Biological Diversity, Rio* de Janeiro, 1992
2. IUCN. *IUCN Red List Categories and Criteria*: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland: 2001.
3. NEGRU, A. *Determinator de plante din flora Republicii Moldova.* Ch.: Universul, 2007, 391 p.

ROLE OF GENE BANKS IN CONSERVATION OF PLANT GERMPLASM

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Key words: *genetic resources, gene bank, conservation, germplasm*

The most important purpose of plant gene banks is to provide plant selection breeders with required collection material for creation of more productive and more resistant cultivars and hybrids. It is necessary to help ecologists to preserve critically endangered populations until they are re-introduced into their former natural habitats [1]. Germplasm in gene banks is conversed to the state of suspended vegetal functions in order to have suitable combinations of alleles and rare alleles of species in future. Actually, plant germplasm is a collection of parts of plants for vegetative propagation: seeds or pollen for conservation of genetic structure of population, and propagules for conservation of specific gene combinations of individual samples. Conservation of plant genetic diversity is necessary for creation of landscapes by introduction of species adapted to changing environmental conditions [2]. Plant genetic resources play a very significant role in assurance of sustainable agricultural development, sustainable food production and environmental protection. Therefore, there is an urgent need for conservation of plant genetic material.

Morphophysiological, biochemical, biometrical and other parameters, specified in passports of collection samples, allow revealing and effectively using many sources of germplasm for plant selection to create new cultivars and hybrids of plants possessing the required and valuable agronomic traits (resistance, quality, early ripeness, yielding capacity and etc.).

It is obvious that the majority of genetic resources are grown in the farmers' fields, especially in developing countries, and that it is necessary to join efforts for their conservation.

Plant genetic resources that are stored in gene banks should be available for use in research and selection work in the field of agriculture and forest management. They include the following components:

1) Currently existing cultivated varieties (cultivars and hybrids);
2) Old cultivars that have been grown in the past but are neglected nowadays;
3) Local varieties called landraces that are grown today or have been grown in the past;
4) Crop wild relatives [3].

There is a set of important circumstances proving the necessity of conservation of germplasm in gene banks. The most significant of them are as follows:

- 60 to 100 thousands of plant species of different economic use are threatened with extinction and must be protected;
- About three-quarters of biodiversity have been lost during the last century;
- For the last 50 years many highly productive and/or best (by some other parameters) varieties, especially highly tolerant to pests and diseases, continuously supersede cultivars and landraces preferred in the past;
- Neglected varieties may possess genes that can be useful for future agriculture;
- Crop wild relatives may possess genes useful for improvement of crops;
- Centers of origin of species where crops appeared and centers of cultivation of crop varieties are the treasury of genetic diversity of crops, the majority of which have already been lost and the rest is in need of conservation;
- Current economy forces farmers to abandon crops and today many of them grow one or two crops with a very high efficiency, but due to genetic uniformity these crops can become vulnerable to changes in habitats as well as to pests and diseases.

Thus it is obvious from the evidence that conservation of seed material under strictly controlled environmental conditions is a critically important task of the gene banks that maintain viability of seeds during their long-term storage along with inhibition of irreversible aging processes.

REFERENCES

1. International Symposium on ART for the Conservation and Genetic Management of Wildlife. Walters C. *Ex situ Conservation of Plant Genetic Resources.* Doorly Zoo, Omaha, NE, 2002, p.193-195.
2. *Ex situ* Plant conservation: Supporting Species Survival in the Wild. Walters, C. *Principles for Preserving Germplasm in Genebanks.* Island Press, Covela, CA, 2004, p.113-138.
3. *Conservation of Plant Genetic Resources.* C. Kameswara Rao. FBAE, 11, 2008.

UNDERSOWN CROPS - SOLUTION FOR CONSERVATION AGRICULTURE

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Keywords: *conserve sowing, under sowing, mixed, crop*

Conservation of water, soil and energy is of utmost importance, various approaches have been tested in a practical environment, and from our evidence, under sowing of crops might play an important role. There are two practical approaches that were once neglected, namely under sowing cultivation where various species are simultaneously grown with or between plantings of a main crop. These have been researched in multiyear field studies.

Under sowing is the practice of seeding one or more crops at the same time as the main crop, where only the main crop is harvested. Under sowing of crops might play an important role. For example, under sowing of spring barley with alfalfa helps to: Fix nitrogen through the symbiotic rhizobium of legumes. Possibly a little nitrogen will be available for the main crop but more will be available for following crop; Increase ground cover and root penetration to combat soil erosion and increase traffic ability; Produce humus to enhance soil fertility and soil structure.

Our trials were carried out at the Institute for Plant Protection and Ecological Agriculture in 2008-2010 (Chisinau, Moldova) with focus on the research field. In addition to trials on small plots of land, there were also large-scale field trials on commercial farms. From the outset, importance was placed on practical implementation by introducing so-called “on-farm research” methods. Important results – statistics attest a guaranteed decrease of weeds and an increase in harvest in our trials by under sowing legumes into summer cereals.

Yields were significantly higher with under sown crops. Results from scientific trials were: Spring barley alone 1713 kg/ha (100%); Spring barley+ Alfalfa 2173 kg/ha (460 kg=+27%); Spring barley+ Alfalfa+ White clover 2174 kg/ha (+461 kg=+27%); Spring barley +White clover 2077 kg/ha (364=+21%). Spring barley grown with Alfalfa produced significantly higher yields than a pure crop. Alfalfa has a deep rooting crop which can sustain dry matter production at times of low rainfall. Under sowing significantly reduces the numbers of weeds. On average, weed dry matter is 34-49 % less in the under sown crop. This may be attributed to the drastic decrease in weed competition; the subsequent crop also profited from the nitrogen fixed by the legume. Number of weeds/weight (g). Spring barley alone 38.0/2.5 (100%); Spring barley+ Alfalfa 16.2/1.2 43%/48%); Spring barley +White clover 17.4/1.4 (46%/56%); Spring barley +Alfalfa+ White clover 12.8/1.6(34%/64%). White clover and Alfalfa have proven to be suitable for under sowing in our trials, where under sowing of these legumes significantly reduced weediness.

Conclusions

1. Conserving farming systems are vital for the future, and practices such as good crop rotation, selection of resistant varieties and seed quality are indispensable.
2. The above results show that under sowing crops can be valuable component of conservation farming.
3. Under sowing significantly reduces the numbers of weeds. On average, weed dry matter was at the 34-49 % less in the under sown crop.

BIBLIOGRAPHY

*1***.** Hans Ramsier and Valentin Crismaru“*Resource-conserving agriculture: under-sowing and mixed crops as stepping stones towards a solution”*. Soil as World Heritage, David Dent Editor, ISBN 978-94-007-6186-5, Sprindger Dordrecht Heidelberg New York Londond,p.354-360

“MARSHLAND” EXPOSITION FOR RARE AND ENDANGERED SPICIES OF CARNIVOROUS PLANT COLLECTION OF O.V. FOMIN BOTANICAL GARDEN

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Key words: *carnivorous plants, collection, introduction, methodological approach.*

Carnivory is a unique adaptation that has appeared under natural conditions of the environment which is very limited in nutrients, where plants are grown and thanks to transformation of leaves, stems, petioles – vegetative, aboveground, for some species, underwater and underground organs, they attract and catch insects, crustaceans, small birds and mice and then digest and metabolize received essential nutrients [8].

Most of carnivorous plants are rare and endangered species [1]. It is systematically combined group, which connected not a general origin but also a peculiarity of the places of growing, where such mineral elements as nitrogen, phosphorus, potassium, magnesium and sodium are difficult to access. Deficiency of these elements, that substratum of wet forests, marshes, ponds and sandy talus lacks, and the problem that they can’t get these elements because they don’t have roots or even root hairs made plants to compensate this gap by a special way of eating. Most carnivorous plants are distributed in countries with tropical climate in wet places in marshes, in ponds and in forests of tropical Asia, Australia and Madagascar Island. The endemics of Atlantic coast of North America and South East of the USA, marshy areas of Alabama, Georgia, Louisiana, Mississippi, Texas and Florida are also among them. Some species are growing on the coast of the Gulf of Mexico, on the west of the Apalacha River, and there are some species that have little population near Okefenoke lake [5; 8; 9]. The collection of carnivorous plants of O. V. Fomin Botanical garden includes 9 genera: *Cephalotus* Labill., *Darlingtonia* Torr., *Dionea* Ellis, *Drosera* L., *Heliamphora* Benth., *Nepenthes* L., *Pinguicula* L., *Sarracenia* L., *Utricularia* L., 32 species, 6 varieties, 19 hybrids and 6 cultivars, according to the inventory from 2014 [3]. On the basis of creation of this group, collection of rare and endangered carnivorous plants, in protected soil conditions, the five principles of exposition organization have been established by methodological approach.

Carnivorous plants which are distributed in Ukraine belong to 4 genera. Their cultivation in Botanical gardens of the CIS began in the 30^{s}. In Ukraine, for the first time, carnivorous plants were grown in the open air in O. V. Fomin Botanical garden in 1938 [4; 7]. Then, the renovation of the collection was noted in 1984. According to the inventory of that year, the collection counted 30 species that were represented by 5 genera. The collection had 24 species in 1989 [2]. Later on, almost all collection was lost because of non-availability of a curator and appropriate conditions of maintenance. Twenty new artificial compartments (of about 15 sq. m.) were created and “marshland” exposition for the carnivorous plant collection in protected conditions in water and coastal-water plant greenhouse of O. V. Fomin Botanical garden was launched in 2012-2013 [3]. For modelling the collection, it has been set the aim of creating the exposition that displays the most completely natural peculiarities and biodiversity of the carnivorous plants considering their ecological amplitude and environmental compliance. Five basic principles of growing this group of plants in protected conditions have been determined working out methodological approaches: 1 – modeling ecotypes according to moisture of soils; 2 – environmental compliance considering ecological amplitude of the place of growing of carnivorous plants; 3 – environment-protecting, which provides implementation of rare, endangered, endemic and relict species in introduction; 4 – aesthetic, which provides creation, in protected soil, of such expositions which match people’s aesthetic demands; 5 – landscape approach, which demands use of existing facility for creating compositions of carnivorous plants in protected soil.

For today, “Marshland” exposition for rare and endangered species of carnivorous plant collection in protected soil conditions consists of 5 families, 9 genera, 32 species, 6 varieties, 19 hybrids and 6 cultivars; it is only one in Ukraine. The methodological approach has allowed maintaining apart from them the representatives of more than 17 another families, from appropriate areas of their growing (North America, Australia, Madagascar and North-Eastern regions of South Africa).

BIBLIOGRAPHY

1. *Комахоїдні рослини України* / Під ред. В. В. Протопопової / Т. Л. Андрієнко. – К. Альтерпрес, 2010. – 80 с.
2. *Ботанічний сад ім. акад. О. В. Фоміна 1839–1989*. – К.: Вид-во при КДУ “Вища школа”. 1989. – С. 162–164.
3. *Колекція комахоїдних рослин в Ботанічному саду ім. акад. О. В. Фоміна* / М. Я. Дідух, А. Я. Дідух, Т. П. Мазур // Природничий альманах. Біологічні науки, вип. 19. II 77 Збір. наук. праць. – Херсон: “Тімекс”, 2013. – С. 83–93.
4. *Київський Ботанічний сад ім. акад. О. В. Фоміна* / М. В. Дубовик. – К.: Мистецтво, 1938. – С 43–52.
5. *Жизнь растений* / А. Марилаун фон Кернер. – С.Пб: Книгоиздательское Товарищество “Просвещение”, 1899, Т. 1. – С. 115–154.
6. *Коллекция насекомоядных растений в Ботаническом саду им. акад. А. В. Фомина Киевского университета* / Е. В. Монастырецкая // Охрана, изучение и обогащение растительного мира. – К.: Изд-во при КГУ “Вища школа”, 1984. – Вып. 11. – С. 54–57.
7. *Комахоїдні рослини* / М. Г. Холодний. – К.: Видав-во Академії наук УРСР, 1938. – 108 с.
8. *Insektivores* / W. Goebel // Pflanzenbiologische Schilderungen. – II-ter Teil. – Marburg.: N.C. Elwert'sche Verlagsbuchhandlung, 1891. – S. 51–174.
9. *Die fleischiressenden Pflanzen*. Aus Natur- und Geisteswelt, 344, Leipzig / A. Wagner. – 1911. – 128 p.

IN SITU CONSERVATION OF PLANT AGRICULTURAL BIODIVERSITY – THE IMPORTANT FACTOR TO PRESERVE AND USE THE AUTOCHTHONOUS VEGETAL GENE POOL

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Keywords: *agrobiodiversity, in situ conservation, on farm conservation, inventorying, evaluation*

Global problems that people face in the XXI century dictate the necessity of finding optimal and sustainable solutions of arising conflicts and challenges. Food shortages and irrational distribution as well as detrimental consequences of climate change on the Earth significantly modified the attitude towards diversity of living organisms of the biosphere, especially with respect to that part of it, which is used or can be used for food production or other human activities.

Agricultural biodiversity is the result of interaction between genetic resources, environment, management systems and practices accumulated by diverse nations in the sphere of plant cultivation and livestock growing. It includes diversity and variability of animals, plants and microorganisms that are necessary for maintenance of key functions of agroecosystems (including their structure and processes occurring therein), and also support of food production and food security (FAO, 1999). Local knowledge and cultural characteristics of population are considered as the integral part of agrobiodiversity because human activity in agriculture facilitates conservation of different components of agrobiodiversity.

In situ conservation of plant agrobiodiversity involves "maintenance of intra-population and inter-population diversity of some species used in agriculture directly or as the source of genes, in habitats where this diversity has appeared and continues to grow" (Brown, 1999). It includes:

a) Agroecosystems that comprise directly used useful species (for example, food crops, forage plants and agroforestry species) and their wild and weed relatives growing in the surrounding areas – Heywood, Dulloo, 2000;
b) Conservation of landraces or local crop varieties cultivated in the farmers' fields and backyards (*on farm* conservation) - Jarvis et.al, 2000; Maxted et.al, 2002.

Laboratory of Plant Genetic Resources conducts complex investigations on study and conservation of agrobiodiversity components. Inventorying of populations of 5 pilot species of fruit crop wild relatives – wild apple, wild cherry, wild pear, cornelian cherry and hazel – has been performed in forest ecosystems of all soil-climatic zones of the Republic of Moldova. Different degree of their functional status was identified in associations with various forest cultures and under the influence of environmental stresses, gene sources of valuable traits were found in *Pyrus pyraster* (L.) Burgsd.) and *Prunus avium* L. In the meantime, hybrid forms between wild and crop genotypes were revealed reducing the efficacy of conservation of local gene pool of crop wild relatives.

Furthermore, positioning and collection of local forms of crops were performed on individual farms in all ecological zones of the republic. Collected material is described in *ex situ* collections and deposited in gene bank for mid-term storage at +2°C.

For successful protection and effective use of plant genetic resources for food and agriculture it is necessary to create National System of Plant Agrobiodiversity Conservation based on mobilization of subject-matter experts of the country within the framework of developed relevant National Program.

BIBLIOGRAPHY

1. FAO. *Agricultural Biodiversity, Multifunctional Character of Agriculture and Land Conference, Background Paper 1.* Maastricht, Netherlands. September 1999. 42 p.
2. Brown A.H.D. *The genetic structure of crop landraces and the challenge to conserve them in situ on farms. In: Brush, S.B. (ed.), Genes in the Field: Conserving plant diversity on farms*. Lewis Publishers, Boca Raton, FL, USA, 1999, p. 29–48.
3. Heywood V.H., Dulloo M.E. *In situ conservation of wild plant species: a critical global review of best practices*. IPGRI Technical Bulletin 11. IPGRI, Rome, Italy, 2005, 174 p.
4. Jarvis, D.I., Myer L., Klemick H., Guarino L., et al. *A Training Guide for In Situ Conservation On-farm. Version 1*. IPGRI, Rome, Italy, 2000, 161 p.
5. Maxted, N., Guarino, L., Myer, L., Chiwona, E.A. *Towards a methodology for on-farm conservation of plant genetic resources*. Genetic Resources and Crop Evolution, 2002, vol. 49, nr.1, p.31–46.

ALLIUM FUSCUM AND *ALLIUM PODOLICUM* (*ALLIACEAE* JUSS.) IN THE FLORA OF REPUBLIC OF MOLDOVA

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Keywords: *flora of Republic of Moldova, Allium fuscum, Allium podolicum*

Following our taxonomic studies in the garlic flora of the Republic of Moldova [1], and within the framework of the project of the *Allium* treatment for the Flora of Bessarabia (vol. VI, in prep.), we compared the material with the plants deposited in the existing herbaria and samples collected from the natural habitats during 2011-2014. Along with the rare and threatened *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib., a new species of garlic for the flora of Republic of Moldova – *Allium fuscum* Waldst. et Kit. was registered in the central (Zloti village, district Cimislia, Landscape reservation "Carbuna" – N 46° 42' 02", E 28° 54' 41") and southern parts of the country (Vadul lui Isac village, district Cahul, Flamanda natural forest reservation – N 45° 44' 46", E 28° 15' 53").

The collected material of plant species is deposited in the Herbarium of the Botanical Garden (Institute) of the Academy of Sciences of Moldova. The designation of Habitat types was made according to NATURA 2000 on the basis of scientific criteria defined in Annex III of the Directive [2].

The estimation of the threat status of the species for the territory of R. Moldova is made according to the IUCN Red List Categories and Criteria (2001, 2003) [3, 4].

Like most species of section *Codonoprasum* Koch (genus *Allium* L.) with main distribution in southern and eastern Europe, these two species grow in arid habitats, but each of them having their own preferences. *Allium podolicum* grows on arid limestone gravelly slopes in the northern parts of the country, in a habitat – Sub-pannonic steppic grasslands (6240), in fact it is known from two localities in Rashcani district. *Allium fuscum* was collected from the azonal white-oak dominated woods with a submediterranean flora – Eastern white oak woods (91AA).

Allium fuscum Waldst. et Kit. – Critically Endangered species **CR B2ab (ii,iii).** In Republic of Moldova, it grows in the southern half of the country near commune Vadul lui Isac (Valul lui Traian wall), Cahul district and Zloti, Cimishlia district. Species grows on cernoziomic arid slopes, forest glades with steppic grassland vegetation, in groups of 10-20 specimens. The population is represented by specimens of different ages; the density is 5 to 10 plants per one square meter.

Allium podolicum (Aschers. et Graebn.) Błocki ex Racib. – Critically Endangered species **CR B2ab (ii,iii,iv).** In Republic of Moldova, it can be met in the northern part of the country near communes of Varatic and Horodiste (Rashcani district). Species grows on calcareous arid slopes with petrofilous vegetation, solitarily or in groups of 3-10 specimens, rarely it forms clusters. The population is stable, represented by specimens of different ages; the density amounts up to 10 plants per one square meter [1].

On the basis of estimated conservation status according to IUCN Red List Categories and Criteria [3, 4], we propose *A. fuscum* [CR B2ab(ii,iii)] and *A. podolicum* [CR B2ab(ii,iii,iv)] to be included in the next edition of Red Book of the Republic of Moldova and in the List of vascular plants protected by national law. Both species are met in the Priority habitat types: 6240 (Sub-pannonic steppic grasslands) and 91AA (Eastern white oak woods) which are in danger of disappearance and whose natural range mainly falls within the territory of the European Union [2].

BIBLIOGRAPHY

1. Ghendov V. Rare species of *Allium* L. (*Alliaceae*) in the flora of Republic of Moldova /Botaničeskie čtenija. Išim. Izd. IGPI im. P.P. Eršova, 2012, cc. 6-7.
2. Interpretation Manual of European Union Habitats – EUR 27. European Commission DG Environment. Nature and biodiversity. July 2007, 142 pp.
3. IUCN. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2001.
4. IUCN. Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2003.

IN SITU AND *EX SITU* STUDY OF *NEPETA PANNONICA* IN REPUBLIC OF MOLDOVA

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Keywords: *Lamiaceae, Nepeta pannonica, natural habitat*

The genus *Nepeta* L. (*Lamiaceae* family) includes over 250 predominantly herbaceous species widespread in Eurasia, North Africa, North and Central America and the Canary Islands [4, 5]. In spontaneous flora of the Republic of Moldova, *Nepeta* L. genus is represented by three species (*Nepeta cataria* L., *N. pannonica* L. and N. *parviflora* Bieb.) [3].

Present study refers to *N. pannonica* L. (syn. *Nepeta nuda* L.) species distributed from Mediterranean, central and Eastern Europe and extends to central Russia, Caucasus, south-west and Middle Asia, Siberia, Mongolia and China [1, 5]. This research was initiated in the spring of 2013. Fieldwork was carried out in the central and southern parts of the republic in order to identify the sites of the species occurrence. The field studies were preceded by an extensive literature survey regarding this medicinally important species. An ample revision of voucher specimens from the Herbarium of the Botanical Garden (I) of ASM was performed.

The designation of Habitat types was made according to NATURA 2000 **(**Interpretation Manual of EU Habitats, 2007, Directive 92/43/EEC) [2]. The vegetal material (parts of plants) for creating *ex situ* experimental plots were collected in April 2013 (third decade) from Scientific reservation "Codru", near Lozova village, Straseni district and in the second decade of May near Zloti village.

The natural habitat of *N. pannonica* (Eastern white oak woods with *Quercus pubescens* – 91AA) is represented by phytocenosis edified by Sub-Mediterranean species. Tree layer is composed exclusively of downy oak (*Quercus pubescens*) or oak (*Quercus robur*) and rare specimens of *Tilia tomentosa, Acer campestre, Pyrus pyraster, Sorbus domestica, Carpinus orientalis.* It has low coverage (20-50%) and 8-10 m height. Shrub stratum, always vigorously developed, is composed almost exclusively of *Cotinus coggygria,* covering up to 70%, but locally with high patches of *Prunus spinosa* and *Crataegus monogyna*. Herbaceous and under shrub layer variable developed, depending on the coverage of shrub layer is composed from xerophytes species (*Lithospermum purpurocoeruleum, Asparagus verticillatus, A. tenuifolius, Carex michelii* etc.).

The ecological studies reveal that the most numerous group is hemichriptophytes with 77 species that represent 49% of registered taxa; the distribution of the species according to humidity preferences shows domination of xeromesophytes (with 86 species or 55,8%) and xerophytes (29 species or 18,8%), representing the arid nature of Ponto-Sarmatic Forest vegetation; with respect to the temperature, it was noted an absolute presence of the mesotherm species (38,96% – 60 species) and from a phytogeografic point of view high percentage of submediterranean floristic elements (Mediterranean – 25,97% with 40 species), Pontic – 18,83% (29 sp.) and Balcanic – 3,25%) is characteristic to thermophilous, sub-Mediterranean *Quercus pubescens* woods of the west Pontic regions including central and southern parts of the republic.

The primary results on cultivation of *N. pannonica* show that this species can be cultivated and established successfully in artificial conditions outside its natural habitat with acceptable bio-morphological parameters.

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BIBLIOGRAPHY

5. Gladkova V. N. *Nepeta* L. In Flora partis europaeae URSS, in An. A. Fedorov (eds.), Ed. Nauka, Leningrad, 1978, t. 3, p. 144-149.
6. Interpretation Manual of European Union Habitats – EUR 27. European Commission DG Environment. Nature and biodiversity. July 2007, 142 pp.
7. Negru A. Determinator de plante din flora Republicii Moldova. Chişinău: Edit. Universul, 2007, 391 pp.
8. Pojarkova A.I. *Nepeta* L. In Flora U.R.S.S., in B.K. Shishkin and S.V. Yuzepchuk (eds.), Ed. Akad. Nauk SSSR, Moscva-Leningrad, 1954, t. 20, p. 286-437.
9. Turner C. *Nepeta* L. In Tutin T. G. et al. (Eds.) *Flora Europaea.* Cambridge: Cambridge University Press, vol. 3, p. 158-160.

PECULIARITES OF STANDS REGENERATION IN THE ECOLOGICAL RECONSTRUCTION PROCESS IN THE "CODRII" RESERVE

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Key words: *ecological reconstruction, natural regeneration, inappropriate stands, "Codrii" Reserve.*

The „Codrii" Reserve was created in 1971 in order to conserve the most representative areas with the pedunculate oak, sessile oak and beech forest of Central European type. The territory covered by forest constitutes 5040.7 ha.

Up to founding the reserve, the forest stands were managed intensively in regime of thicket with the regeneration of shoots. This mode of management focused only on getting timber and inevitably led to the substitution of the oak forest with mixing species (ash, lime, cherry, hornbeam, maple). As a result, there are 26.1% (131 6 ha) fundamental natural forest stands, 1.6% (79.3 ha) degraded forest stands, 64.3% (3242.6 ha) derived forest stands and partially derived and 8% (402.8 ha) artificial forest stands.

Of the total area represented by forest, only 547.1 ha (11%) are permanent forest stands (generative) with a high eco-protective capacity, but 89% are classified as inappropriate forest stands, in which the ecological reconstruction works are to be conducted. As a result of researches in the field and according to Management plan of reserve (2010), were highlighted 244 subplots with structural inappropriate stands that require ecological reconstruction. The stands regeneration with the main species that existed before being degraded or structurally damaged is at the base of carrying out of the ecological restoration.

In 2012, on seven subplots, were delimited sample surfaces (54M; 2A; 3B; 14K; 12G; 35B and 35J) in inappropriate stands. The delimitation of sample surfaces aims at studying the unfolding of ecological reconstruction process by applying appropriate treatments and the regeneration peculiarities.

In each sample surface, the inventory of forest vegetation was performed, the current composition of stand, the soil type, the station and forest type were established, to determine the correspondence with data from forest planning and were applied the appropriate treatments for each sample surface separately.

It was analyzed the unfolding of ecological reconstruction on two sample surfaces: 54M - partially derived stand and 35J - totally derived stand.

The partially derived stand (54M) has undergone the treatment of progressive cutting after that resorted to treatment of combined cutting (progressive and successive). The regeneration occurred naturally with soil mobilization. In the area where the acorns have not penetrated into the soil by mobilization, it was intervened with sowing the acorns.

In the totally derived stands (35J), it was applied the successive cutting treatment in two stages and sown the pedunculate oak acorns in rows with distance of 3 m.

In both sample surfaces, it was carried out the cutting of offshoots and suckers to prevent overwhelming of the seedlings.

According to technical standards developed by the Agency "Moldsilva", the result of the natural regenerations is considered very good when we have per 1ha 13000 seedlings of sessile oak or 10500 of pedunculate oak, whereas in our case in p. 54M we have 230000 seedlings of sessile oak, 20000 – pedunculate oak, 90000 – hornbeam, maple and linden with 10,000 each, but in p. 35J were registered 22440 seedlings of pedunculate oak, which we consider very good results for ecological restoration.

CONDITIONS OF VEGETATION IN THE ISC STRASENI

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Keywords: forestry sector, resorts, forest types, soil type.

The study of vegetation conditions leads us to a better knowledge of the potential offered by the resort and as a consequence the choice of species in regeneration process works.

The territory of forestry enterprise is located in the forest-hunting region of Strășeni, also known as the central part of Codri forest stands where the majority are fundamental natural and partially derived.

Creditworthiness is reflected through the resorts stand productivity climate warming continues to draw us to choose species with particular attention in the case of forestry culture.

As human society focuses more on economic development, material welfare in the rush to lose sight of the fact that there is no development without natural resources.

The potential of the productivity offered by the station will increase the volume of wood and will increase the quality of the wood.

The trees reflects the potential offered by the Strășeni district station. The study on the ground has also achieved the identification of flora of herbaceous stratum that is paramount in determining creditworthiness, contributing to the establishment of the future stand compositions, the potential could provide the resort at their realisation.

The total area which has been attributed to the types of resort, forest and soil constitutes 12595,2 ha, which represents more than 95%.

Mollisols-class soils predominate with 12467,6 hectares (99%) followed by neevoluate there are also hydromorphic soils and soils. The largest share is open land with 9355,1 hectares (74%), and grey soils with 3112,5 hectares (25%)

The types of resorts of the Straseni enterprise are grouped in a single fitoclimatic floor:

-FD2-hilly Oak floor with Gandhi and mixes hill and lower limit of beech-12595,2 ha (100%);

The forest types identified 55% (6913,4 ha) are superior productivity in Wawa. The largest share in the territory have the types of forest productivity (55%), Middle 45%, and those of lower productivity (5%).

70% (8788,3 ha) of the area occupied with woods are found naturally together with the basic fundamentals in terms of composition and productivity of which 12% is subproductive. The volume corresponds to the I and II class production.

BIBLIOGRAPHY

1. Studiul general ÎSC Strășeni, Institutul de Amenajări Silvice, Chișinău, 2011(cap. IV).
2. Grati V., Grati S. "Studiul arboretelor din cadrul rezervației "Căpriana", UASM, 2013;
3. Galupa D., Grati V., Contextul de politici forestiere internationale cu participarea R. Moldova, rev. Silvicultură și Cinegetică nr. 33, Brașov 2014.
4. V. Grati, E. Prosii The analysis of the implementation of forest planning in R. Moldova, Universitatea Transilvania, Brașov, România, 2014

NOTES ON SOME THREATENED SPECIES OF *ASTERACEAE* IN THE FLORA OF THE REPUBLIC OF MOLDOVA

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Key words: *Asteraceae, threatened species, conservation*

The problem of biodiversity conservation and rational use of natural resources has become a priority concern of humankind. The intensification of the negative impact on biosphere leads to changes in floral composition of natural habitats and to biodiversity loss. Currently, the conservation of plant diversity of a territory is based on monographic studies of separate taxonomic groups.

As a result of field investigations, examination of herbaria and study of scientific literature regarding the subfamily *Cichorioideae* Kitam. (family *Asteraceae* Dumort.) in the wild flora of the Republic of Moldova, a list of rare species, which includes 30 taxa, was made and their category of endangerment was determined. The present research was carried out on 10 rare species of *Cichorioideae,* which as a result of the assessment and categorization according to the criteria of the International Union for the Conservation of Nature (2001, 2003) [2,3] were classified as threatened species and were assigned to the following categories: Critically endangered [CR] Endangered [EN] and Vulnerable [VU].

1. ***Crepis capillaris*** (L.) Wallr. - **EN** [B2ab(iii,iv,v); C2a(i); D]. It is a xeromesophilous species, which grows in meadows, scrubs and steppe slopes from the central and southern parts of the investigated region. The identified populations are poor, represented by few specimens.
2. ***Hieracium laevigatum*** Willd. - **CR** [B2ab(iii,v); D]. Mesophilous species, which grows in meadows and at the edge of the forests, it has been found in only one place in the zone of forests from our country. This taxon has been proposed for inclusion in the Red Book of the Republic of Moldova, 3rd edition.
3. ***H. vagum*** Jord. - **VU** [B2ab(iii,v); D2]. Mesophilous species, characteristic of ecosystems with oak and ash trees, it was found in two localities in the center of the region. This species is endangered by the presence of towns, villages and transport networks near the areas where it grows, and also by deforestation.
4. ***Pilosella caespitosa*** (Dumort.) P.D.Sell et C.West. - **VU** [B2ab(iii,iv,v); C2a(i)]. Mesophilous species, which grows at the edge of forests, in glades and scrubs. In the local flora, there are known seven locations where it can be found. Populations are threatened by deforestation and unregulated tourism.
5. ***Scorzonera austriaca*** Willd. – **CR** [B2b(iii,iv); C2b]. This species is protected by law in the Republic of Moldova [4], proposed for inclusion in the Red Book of the Republic of Moldova, 3rd edition, included in the Red Book of Ukraine [5].
6. ***Scorzonera mollis*** Bieb. - **VU** [B2ab(iii,iv,v); C2a(i)]. It is protected by law in the Republic of Moldova [4], proposed for inclusion in the Red Book of the Republic of Moldova, 3rd edition, included in the Red Book of Vascular Plants of Romania [1]. It is a species with highly fragmented habitat, threatened by the reduction of the steppe areas and their use for agricultural purposes.
7. ***Scorzonera purpurea*** L. - **VU** [A4ac; B2b(iii,iv,v)]. Taxon is protected by law in the Republic of Moldova [4]. It is a xeromesophilous species, threatened by the drastic reduction of the areas where it grows; it is in satisfactory condition only in inaccessible, impassable or protected areas.
8. ***Scorzonera stricta*** Hornem. - **EN** [B2ab(iii,iv)]. It is protected by law in the Republic of Moldova [4]. It is found only in the southern part of the country. It forms small populations, with a small number of individuals.
9. ***Scorzonera taurica*** Bieb. **– EN** [B2ab(iii,iv); C2a(i)]. It is a xeromesophilous species, characteristic of steppe sectors. The reduction of the specific habitats leads to the decrease of the viability of populations, and sometimes – to their disappearance.
10. ***Trommsdorfia maculata*** (L.) Bernh. - **VU** [A4ace; B2ab(iii,iv,v); C2a(i)]. It is a mesophilous species. In the last decade the number of areas where the species grows has declined considerably.

BIBLIOGRAPHY

1. Cartea Roşie a plantelor vasculare din România / Dihoru Gh., Negrean G. Bucureşti: Ed. Acad. Române, 2009. 630 p.
2. IUCN. *Guidelines for application of UICN Red List Criteria at Regional Levels*: Version 3.0.UICN Species Survival Commission. IUCN, Gland, Switzerland: 2003.
3. IUCN. *UICN Red List Categories and Criteria*: Version 3.1. UICN Species Survival Commission. IUCN, Gland, Switzerland: 2001.
4. Legislaţia ecologică a Republicii Moldova (1996-1998). Chişinău, 1999. 233 p.

Червона книга України. Рослинниі світ / під ред. Дідуха Я. П. Київ: Глобалконсалтинг, 2009. 900с.

SPECIES OF *SERRATULA* L. (*ASTERACEAE* DUMORT.) FOR THE RED BOOK OF THE REPUBLIC OF MOLDOVA

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Key words: *Serratula L., rare plants, conservation*

Serratula L. genus includes about 70 species distributed in temperate zones of Eurasia and North America [9]. The wild flora of the Republic of Moldova comprises five species of this genus: *Serratula bulgarica* Acht. et Stojan., *S. lycopifolia* (Vill.) A. Kerner, *S. coronata* L., *S. tinctoria* L. and *S. radiata* (Waldst. et Kit.) Bieb. [7], the first three of which are rare species included in the List of Species Protected by the State [6].

Being endangered taxa, which need special conservation measures, *Serratula bulgarica*, *S. lycopifolia* and *S. coronata* are proposed for inclusion in the Red Book of the Republic of Moldova, 3rd edition.

The degree of endangerment of these species was evaluated according to the latest criteria developed by the International Union for the Conservation of Nature [4,5], assigning the following categories: Critically Endangered [**CR]**, Endangered [**EN]**, Vulnerable [**VU]**.

The research on populations and habitats of endangered species allowed us to reveal the limiting factors and recommend protection measures for the taxa under study:

Serratula bulgarica Acht. et Stojan. (=*S. caput-najae* Zahar.)

Critically Endangered [CR B2ab(ii,iii);C2a(i,ii); D]. In flora of the Republic of Moldova it is found in only one location, near Batar village, Cimişlia district. The taxon is found at the northeastern boundary of the specific spreading area. Limitative factors: reduction and modification of the forestry sectors in which the plant grows, mowing and grazing of meadows, small number of individuals, limited specific spreading area. Conservation measures: habitat protection, monitoring of population status, cultivation in *ex-situ* conditions. This species is included in the Red Book of Vascular Plants of Romania [2] and in the Red Data Book of the Republic of Bulgaria [8].

***Serratula lycopifolia* (Vill.) A. Kerner** (=*S. heterophylla* auct. non (L.) Desf.)

Endangered [EN B2ab(iii,iv,v); D]. In local flora, it grows only around Gordinesti village (Edinet), on the steppe rocky slopes of the Landscape reserve "La Castel". There are several stable populations, with 20-30 individuals each. Limitative factors: degradation of steppe slopes, reduction of the area of specific habitats, overgrazing. Conservation measures: protection of the only place where the taxon grows, monitoring of the population status, compliance with the protection regime of the Landscape reserve "La Castel". This species is listed as priority species on Annex II of the Habitats Directive [3]. Also it is listed in the UICN Red List of Threatened Species [1].

***Serratula coronata* L.** (=*S. wolffii* Andrae)

Endangered [EN B2ab(iii,iv,v); C2a(i)]. In the region's flora, it is found near Codreni village (Landscape Reserve "Carbuna") and Lipoveni village (Cimislia district), Lozova village, Straseni district, (Scientific Reserve "Codru") and Caracusenii Vechi village (Briceni district). Limitative factors: deforestation, inappropriate management of forests, tourism and recreational activities, populations with limited number of plants. Conservation measures: restriction of human activities in the sectors where the species grows, compliance with the reserve's protection regime, highlighting the new areas where the species grows and their protection.

BIBLIOGRAPHY

1. Bilz, M. 2013. *Klasea lycopifolia*. *The IUCN Red List of Threatened Species*. Version 2015.2. www.iucnredlist.org.
2. *Cartea Roşie a plantelor vasculare din România* / Dihoru Gh., Negrean G. Bucureşti: Ed. Acad. Române, 2009. 630 p.
3. *Convention on the Conservation of European Wildlife and Natural Habitats*. Bern, Switzerland. 1979. Available at htpp: conventions.coe.int/Treaty/EN/Treaties/Html/104.htm.
4. IUCN. *Guidelines for application of UICN Red List Criteria at Regional Levels*: Version 3.0.UICN Species Survival Commission. IUCN, Gland, Switzerland: 2003.
5. IUCN. *UICN Red List Categories and Criteria*: Version 3.1. UICN Species Survival Commission. IUCN, Gland, Switzerland: 2001.
6. *Legislaţia ecologică a Republicii Moldova* (1996-1998). Chişinău: Societatea Ecologică „BIOTICA", 1999. 233 p.
7. Negru A. *Determinator de plante din flora Republicii Moldova*. Chisinau: Universul, 2007. 391 p.
8. *Red Data Book of the Republic of Bulgaria. Plants and Fungi* / Tzonev Rossen. Sofia, 2011.

Мордак Е. Род *Serratula* L. *Флора европеиской части СССР.* Санкт-Петербург, изд. Наука, 1994. Т. 7. 317 с.

THE EXTENT OF DAMAGE CAUSED BY WHITE MISTLETOE (*VISCUM ALBUM* L.) TO THE FAMILY *SALICACEAE* MIRBEL. IN BILA TSERKVA

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Key words: *Salix, Populus, Viscum album*, damages evaluation, evaluation index.

White mistletoe as a semi parasite plant with a wide selective ability parasitizes many autochthonous species of willow and poplar. The problem seems topical since the mistletoe invasion is rather extended and is almost extreme and Ukraine may face an ecological disaster. If all the trees in the state are not cleared from this hemiparasite in two or three years, the invasion will go on a new circle and in 10-15 years it will practically be too late to control mistletoe.

That's why we used a rating estimation by V.P. Shlapak and others (Shlapak, Muzyka, Sobchenko, Marno, Tysiachnyi, 2010) which estimates the damages of woody plants affected by white mistletoe after two 7-rating estimation and index of complex estimation of damaged plants with mistletoe (CEDM). Researches were conducted in Bila Tserkva town (Tabl. 1).

Damage degree of *Salicaceae* representatives with *Viscum album* in Bila Tserkva Table 1.

№	Genus name	Damage of different parts, score			Index of complex damage estimation with mistletoe, score
		Crown damage	Trunk damage	Skeletal branches damage	
1.	*Populus alba* L.	6	2	4	12
2.	*Populus balsamifera* L.	5	-	3	8
3.	*Populus italica* (Du Roi Moench.)	3	-	-	3
4.	*Populus nigra* L.	5	3	4	12
5.	*Populus tremula* L.	4	2	3	9
6.	*Salix alba* L.	5	2	4	11
7.	*Salix alba* L. 'Viteline Pendula'	4	1	3	8
8.	*Salix caprea* L.	1	-	1	2
9.	*Salix fragilis* L.	1	-	1	2
10.	*Salix pentandra* L.	1	-	1	2
11.	*Salix matsudana* Koidz.	1	-	1	2

Thus, damage degree of *Salicaceae* representatives with white mistletoe isn't the same. High level of damage has *Populus alba* L., *Populus nigra* L., *Populus balsamifera* L., *Salix alba* L., *Salix alba* L. 'Viteline Pendula'. Low damage level of crown is characteristic of *Populus italica* (Du Roi Moench.), *Salix caprea* L., *Salix fragilis* L., *Salix pentandra* L., *Salix matsudana* Koidz. As usual, crown suffers the most damage (16-25 "bushes") on one tree and the trunks of affected trees suffer the least damage. We noted very intense damage of 11-12 scores at roadside plantings with *Populus alba* L., *Populus nigra* L., *Salix alba* L. The varieties with middle and low level of lesion caused by *Viscum album* are promising for use in landscaping and planting settlements in Ukraine.

Nowadays *Viscum album* is one the most dangerous factors which influence viability, longevity and ornamentality of *Salicaceae* representatives at green planting in Bila Tserkva town. There is a great number of trees affected by mistletoe whose fruits promote its propagation and birds that eat its fruits promote its expansion. It's necessary to cut trees systematically for avoiding its fruiting in order to destroy mistletoe. Strongly affected trees must be chopped off. To solve this problem, we need to embrace municipal and state course of controlling actions with white mistletoe. Besides it must be authority to allocate funds for carrying out these actions. Promising species for landscaping and gardening of settlements in Ukraine: *Populus italica* (Du Roi Moench.), *Salix caprea* L., *Salix fragilis* L, *Salix pentandra* L., *Salix matsudana* Koidz.

REFERENCES

1. *Shlapak V.P., Muzyka H.I., Sobchenko V.F., Marno L.I., Tysiachnyi O.P. Definition peculiarities of damage degree of arboreal plantings with Viscum album L. in historical part of National dendrological park "Sophiivka" of Ukrainian National Academy of Sciences* // Scientific announcer of NLTU of Ukraine. – 2010. – Edition 20.7. – P. 8-14.

ORIGIN OF THE AUTHENTIC HYBRIDS OF *VITIS VINIFERA* L. X *VITIS ROTUNDIFOLIA* MICHX.

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Key words: *grapevine, genus, Euvitis, Muscadinia, hybrids.*

The genus *Vitis* contains two subgenera: *Euvitis* Planch. (bunchgrapes) and *Muscadinia* Planch (muscadine grapes). Muscadinia grape is genetically and morphologically distinct from species within the genus *Vitis*. There is disagreement as to whether the differences between *Muscadinia* and *Vitis* warrant generic status or whether it is better to consider these taxa as subgenera. The most obvious genetic difference between these two taxa is the number of somatic chromosomes: *Muscadinia* Small. species has 2n=40, and *Vitis* L. species has 2n=38. *Muscadinia* species differs from *Vitis* species in its seeds, bark, tendril and cluster morphology and possesses high resistance to *Uncinula necator* (Schw.) Burr., *Meloidogyne Goeldi*, *Xiphinema index* Thorne and Allen, *Xylella fastidiosa* Wells and *Daktulosphaira vitifoliae* Fitch. et al. The introgression of resistance to disease and pest from *Vitis rotundifolia* Michx. into *Vitis vinifera* L. was confounded by the differences in chromosome numbers. The *V. rotundifolia* cultivars exhibited 88 unique alleles that were not present in a database of more than 600 *V. vinifera* cultivars (S.Riaz, A.C.Tenscher, B.P.Smith, D.A.Ng, and M.A.Walker, 2008).

A long standing goal of both *Euvitis* and *Muscadinia* breeding programs has been development of hybrids between these two subgenera, combining fruit quality from *V. vinifera* with resistance and environmental adaptation of muscadines. However, efforts to breed muscadine grapes commenced in the early 1900s and have generated a large number of cultivars and a limited number of hybrids *V. vinifera*. The works on synthesis of grapevine genome were initiated by A.Wylie, 1868; 1871, Detjen, 1919; Olmo, 1986 (F1). R.Dunstan, in 1962-1964, has initiated works by creating hybrids DRX (2n=39) (F2). In our researches, on the basis of hybrid DRX- 55, a new species of crop *V. vinifera* L. type, similar to that cultivated on proper roots, before *Viteus vitifolii* Shimmer (Fitch) (1868) appearing and being distiguished by hibridogenous origin and high degree resistance to phylloxera, has been synthesized.

The authentic synthesis of genome by backcrossing DRX-55 x *Aramon* x *V. riparia*, including by backcrossing with parental species, the hybrids *Seyve Villari*, polyploid forms and varieties of *V. vinifera* L. has been initiated (F3). According to our investigations, we can emphasize that the process of genome synthesis was performed in ex situ conditions due to the interaction of internal and external factors with the following backrossing (DRX M3-232-S.V.12-309, DRX M3-90x S.V. 20-366) (F4). The next stage, on the basis of hybrids F4 with several backrossing DRX M4-510 x *Moldova*, DRX M4-520 x *GM*-325-58, DRX M4-520 x *Crystal*, 80 hybrids has been created (F5). In our study, the authentic hybrids of species *V. vinifera* L. (2n=38) and *V. rotundifolia* Michx. (2n=40) served as biological material (F5). In the generation F5, the synthetic species *V. vinifolia Top., V. rotundifera Dad. and V. crucestiana Top.* were considered the exponents of authentic new genome of grapevine. These species grow on proper roots, blossoming and fertilizing normally, because they possess a genome equal to 2n=38 and high degree resistance to *Viteus vitifolii* Shimmer (Fitch) - phylloxera (Topala et al.2012). The vinifera grapes broke bud and bloomed about a month earlier than the muscadine grapes, while the hybrids were in between the parents.

These hybrids can be used as bridges to carry viticulturally important genes from *V. vinifera* to *V. rotundifolia* and vice versa, to transfer resistant genes from *V. rotundifolia* to *V. vinifera* grape. In fact, it was established that with the aid of distant hybridisation method, forms which superpose in a single genotype the quantity and quality of harvest of the species *V.vinifera* L. with high resistance of *V.rotundifolia*. Michx. can be created.

BIBLIOGRAPHY

1. Dunstan R. *Hybridization of Euvitis x V. rotundifolia: Backrosses to Muscadinia.* American Soc. Hort. Sci. 1964, vol. 84, p. 238-242.

Topala St., Dadu K., Ivasishin Daniela. *Analiz sovremennih rabot po rassifrovche ghenoma Vitis vinifera L.* Vinogradarstvo i vinodelie, 2012, 1, s. 30-37.

RARE SPECIES OF THE GENUS *ASTRAGALUS* L. *(FABACEAE)* IN DNIESTER-PRUT RIVER REGION

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Keywords: *flora of Republic of Moldova, rare species, Astragalus*

Genus *Astragalus* L. – ancient, heterogeneous, variable in morphology and ecological characteristics, holding the central position in system of family *Fabaceae* Lindl. *Astragalus* species play a significant role in vegetation cover and is an important component in structure of the grassland cover of the region. *Astragalus* L. comprises over 2200 species, distributed worldwide, with exception of Australia [6]. In the local flora it embodies 20 species. Among them, there were identified 11 rare species.

The estimation of the threat status of the species for the territory under study is made according to the IUCN Red List Categories and Criteria (2001, 2003) [3, 4].

Astragalus contortuplicatus L. Regionally extinct species – **RE**. Protected by law in Romania [1]. In the region was known only in the Danube estuary in meadows, wetlands, sandy and salty grounds.

A. corniculatus Bieb. Endangered species – **EN (A4ce; B2ab(i,ii,iii,iv); D2)**. Protected by law in Romania [1]. Species is rarely met in central and southern parts of the region in steppes.

A. dasyanthus Pall. Near Threatened species – **NT**. This species is protected by law in the Republic of Moldova [5], Romania [1] and Ukraine [7]. The area of distribution is South-Eastern Europe. It occurs in steppe slopes and limestone grounds in all parts of the local flora excluding extreme south. In the region, it is located on the northern limit of its natural area of distribution.

A. dolichophyllus Pall. Regionally extinct species – **RE**. It is protected by law in Romania [1]. In the region, the species was known in the past only in the southern districts in steppes.

A. exscapus L. Vulnerable species – **VU (A4ce; B2ab(i,iii,iv,v); D2)**. Protected by law in the Ukraine [7]. The species is distributed in Dniester basin and in southern parts of the region on steppe and limestone slopes. In the region, it is located on the northern limit of its natural area of distribution.

A. monspessulanus L. Data Deficient species – **DD**. It is protected by law in Romania [1]. In the region, it is met only in the north on limestone slopes.

A. pallescens Bieb. Data Deficient species – **DD**. Protected by law in the Republic of Moldova [5]. Endemic of the southern parts of Eastern Europe. The species is met only in the south of the region, where grows in steppes on loess soil.

A. pastellianus Pollini. Endangered species – **EN (A4ce; B2ab(i,ii,iii,iv); D2)**. Protected by law in the Republic of Moldova [2]. The species is rarely met throughout the region in steppes.

A. ponticus Pall. Vulnerable species – **VU (A4acde; B2ab(i,ii,iii,iv); D2)**. Protected by law in Ukraine [7]. It is met through the region in arid oak forests, on steppe and limestone slopes. In the region, it is located on the northern limit of its natural area.

A. pubiflorus DC. Critically Endangered species – **CR (A4ace; B2ab(ii,iii,iv)**. This species is protected by law in the Republic of Moldova [2, 5] and Romania [1]. The species is found only on steppe slopes in the center and south. In the region, it is located on the southern limit of its natural area.

A. subuliformis DC. Data Deficient species – **DD**. It is protected by law in the Republic of Moldova [5] and Romania [1]. In the region, it is met only in the south on steppe slopes.

A. varius S.G. Gmel. Critically Endangered species – **CR (A4ace; B2ab(ii,iii,iv)**. Protected by law in Romania [1]. It is rarely met in central and southern parts of the region on steppe slopes and sandy terrain along the Black Sea.

BIBLIOGRAPHY

1. Cartea Roşie a plantelor vasculare din România /Dihoru Gh., Negrean G. Bucureşti: Editura Academiei Române, 2009. 630 p.
2. Cartea Roşie a Republicii Moldova. Chişinău: Ştiinţa. Ed. III. 2015.
3. Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2003.
4. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2001.
5. Legislaţia ecologică a Republicii Moldova (1996-1998). Chişinău: Societatea Ecologică „BIOTICA", 1999, 233 p.
6. Васильева Л.И. Астрагал – *Astragalus* L. /Флора Европейской части СССР. Л.: Наука, 1987. Т. 6. С. 47-76.

Червона книга України. Рослинниі світ /під ред. Дідуха Я.П. Київ: Глобалконсалтинг, 2009. 900 с.

ARTEMISIA LERCHIANA WEB. EX STEHM. IN THE FLORA OF REPUBLIC OF MOLDOVA

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Keywords: *flora of Republic of Moldova, Artemisia lerchiana, Asteraceae*

The genus *Artemisia* L. in the flora of Republic of Moldova comprises 9 species [4]. The section *Seriphidium* (Bess.) Peterm. up to recent time was represented by *Artemisia santonica* L. – a halophytic species belonging to *A. maritima* group – a highly polymorphic and widespread group in Europe and temperate Asia [5].

The recent floristic and chorological studies of the genus *Artemisia* undertaken in the southern parts of Republic of Moldova enabled us to identify a new species of *Artemisia* from this section for the local flora – *A. lerchiana* Web. ex Stechm. It is a densely grey- to white-tomentose, strongly aromatic perennial with an ascending to vertical, much branched, very stout and woody stock and numerous short non-flowering shoots; flowering stems 20-40 cm, woody below. Lower cauline leaves withering at anthesis, 3- to 4-pinnatisect, petiolate or subsessile, leaf lobes 2-6 x 0,2-0,4(-0,5) mm, linear, subacute to acute; upper leaves sessile, uppermost with pinnatisect lobes basally, seldom entire. Capitula patent to nodding, oblong to ellipsoid, subsessile to sessile, erect, in a narrow paniculate inflorescence with erecto-patent branches 0.5-6.0 cm. Involucre 4-5 mm; involucral bracts oblong to narrowly linear, slightly patent, the outer tomentose, the inner often much longer than the outer, pubescent at least in the upper half, elliptical, with a linear to slightly spathulate midrib region and a glabrous, scarious margin narrowing towards the base [5].

It is a quite rare species, found only in the southern part of the country, between Valeni (N 45° 36' 35", E 28° 10' 11") and Giurgiulesti (N 45° 29' 30", E 28° 10' 45") villages, district Cahul, with a population surface totaling about 50 hectares. The collected material of plant species is deposited in the Herbarium of the Botanical Garden (Institute) of the Academy of Sciences of Moldova. The species grows in Ponto-Sarmatic steppes – a type of xerophytic steppic grasslands, mostly on loessy slopes with southern, south-western and western exposition, dominated by tussock-grasses, chamaephytes and perennials [1].

These xerotherme communities are developed on southern and western exposed slopes with alkaline soils on rocky substrate and on clay-sandy sedimentation layers enriched with gravels. They are partially of natural, partially of anthropogenic origin with grasses such as *Kochia prostrata* (L.) Schrad., *Agropyron pectinatum* (Bieb.) Beauv., *Koeleria cristata* (L.) Pers., *Artemisia austriaca* Jacq., *Bothriochloa ischaemum* (L.) Keng, *Stipa capillata* L., etc.

The relative inaccessibility of these sites (slopes) provide some protection to the habitat, although the threat status of the species can be assessed as vulnerable [**VU**: B1ab(iii,v)] [2, 3].

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BIBLIOGRAPHY

10. Interpretation Manual of European Union Habitats – EUR 27. European Commission DG Environment. Nature and biodiversity. July 2007, 142 pp.
11. IUCN. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2001.
12. IUCN. Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland, 2003.
13. Negru A. Determinator de plante din flora Republicii Moldova. Chişinău: Edit. Universul, 2007, 391 pp.
14. Tutin T.G., Persson K. et Gutermann. *Artemisia* L. In Tutin T. G. et al. (Eds.) *Flora Europaea.* Cambridge: Cambridge University Press, vol. 4, p. 178-186.

SYNANTHROPE PLANTS FROM "CODRII" RESERVE

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Key words: *synanthrope flora, "Codrii" Reserve, taxonomy, bioecology, geoelement.*

The synanthrope flora in the "Codrii" Reserve territory is spread in the anthropic biotopes. Some plant species penetrate in meadows, clearings and especially in those places where the litter is destroyed. In forest communities where the ecological reconstructions are performed, the synanthrope species dominate, in other places substitute some native species, predominating in vegetal cover.

The synanthrope flora of reserve includes 97 species of vascular plants, belonging to 26 families and 76 genera. Taxonomical composition of the synanthrope flora is dominated by representatives of families: *Asteraceae* (26 species), *Brassicaceae* (13 species) and *Poaceae* (12 species), which constitute 53.7%. The genera with more species are: *Carduus*, *Cirsium*, *Sonchus* and *Setaria* (with 3 species each).

The plant species highlighted on the territory of the reserve are grouped into 4 categories of vital forms. The most species belong to the group of terrophytes representing 84.9%. Other groups participate unessential in the formation of bioform spectrum (hemicryptophytes – 9.7%, geophytes – 3.2% and chamaephytes – 2.2%).

Analyzing their requirements to moisture factor, we see that the most numerous are xeromesophytes (50%) and mesophytes (34.9%). The xerophytes (6.5%), mesohygrophytes and euriphytes (with 4.3% each) have low percentages.

According to the requirements for the air temperature, predominant are the mesothermal plants – 59.3%, which constitute more than half of the specific composition of the synanthrope flora. The moderate thermophilic species totaled 25.3%, but the amphitolerant species comprise only 15.4%.

Taking into account the preferences to the soil reaction, in the synanthrope flora, the eurionic species predominate with 48.3%, followed by the light acid-neutrophil species – 37.4%. A significant share has the acid-neutrophil species, which records 11%. The neutro-basiphil species constitute 2.2%, but the acidophil – 1.1%.

The analysis of geoelements revealed the predominance of Eurasian species (50%) and the Cosmopolitan species (15.9%). The Adventitious elements recorded 9.6%, the European – 7.4%, the Pontic – 6.4% and the Central European – 5.3%. The Mediterranean (3.2%), Sarmatian and Circumpolar geoelements (1.1% each) have insignificant shares.

BIBLIOGRAPHY

1. Ciocârlan V. *Flora ilustrată a României*. Bucureşti: Ceres, 2009. 1141 p.
2. Jardan N. *Flora Rezervației "Codrii" (plante vasculare).* Teză de dr. în șt. biologice. Chișinău, 2015. 186 p.
3. Mârza M., Negru A., Mamai I. *Flora sinantropă necultivată a Republicii Moldova*. Studia Universitatis Moldaviae. Revista Științifică a Universității de Stat din Moldova, 2013, nr.6 (66), p. 154-168.
4. Negru A. *Determinator de plante din flora Republicii Moldova*. Chișinău, 2007. 391 p.
5. Pînzaru P., Sîrbu T. *Flora vasculară din Republica Moldova*. Chișinău, 2014. 240 p.
6. Popescu A., Sanda V. *Conspectul florei cormofitelor spontane din România*. Editura Universităţii din Bucureşti, 1998. 336p.
7. Гейдеман Т. *Определитель высших растений Молдавской ССР*. Кишинёв, 1986. 638 с.

NATURAL AREA "PAJIŞTEA GURA-OITUZ"

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Keywords: *Protected natural area, pratoformants, calcified habitat.*

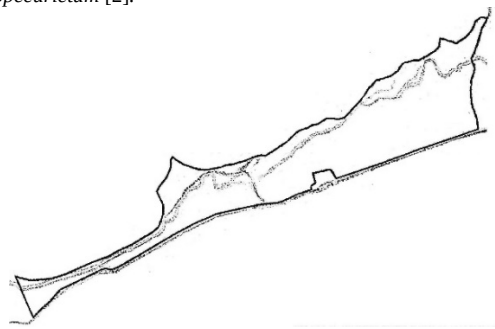
Natural area „Pajiştea Gura Oituz" (P.G.O.) consists of 15 ha protected by State according to the Law of Natural Area Fund and 22.41 ha, after 2014 reevaluation, is placed on meadow of Solonet river Soloneţ, affluent of Răut River. It is subordinate to the Cotiujenii-mici mayoralty (village Gura-Oituz), Sângerei district. P.G.O. has the following coordinates: longitude of 28.363406, 28.358201, 28.345448, 28.345719 latitude of 47.705769, 47.702504, 47.697913, 47.700652. Protected area is contained in Ecological Legislation of the Republic of Moldova, Decision nr. 1538-XIII dd 25.02.1998 in chapter "Areas with multifunctional management" [1].

The actual protected area represents a primary meadow, intensively grazed, with predominance of field grass (*Agrostis gigantea* and *A. stolonifera*). It has been attested the presence of 33 species of vascular plants, out of which, the most rare are pratoformants – *Poa pratensis Alopecurus pratensis, Beckmannia eruciformis* [2].

P.G.O. contains the following species: *Agrostis stolonifera, Agrostis gigantea, Poa pratensis, Alopecurus pratensis, Beckmannia eruciformis, Festuca gigantea, Carex otrubae, Carex distans, Ranunculus acer, Taraxacum officinale, Elytrigia repens, Lolium perenne, Plantago media, Potentilla repens, Rumex sanguineum, Medicago falcata,* and also swampy habitat species: *Bolboschoemus maritimus, Scirpus tabernaemontani, Carex riparia, Tipha latifolia, Tipha angustifolia, Butumus umbelatus, Scirpus lacustris, Phragmites australis, Potentilla anserina,* as well as salty resorts species: *Puccinellia distans, Juncus gerardii, Lotus corniculatus, Leontodon autumnalis* and some weedy resorts species: *Xanthium strumarium, Achillea neilreichii, Cichorium intybus, Leontodon autumnalis, Plantago lanceolata, Cardaria draba, Senecio vernalis, Capsella bursa-pastoris, Lepidium ruderale, Arctium lappa.*

Threatened species are pratoformants – *Agrostis stolonifera, Poa pratensis, Alopecurus pratensis, Beckmannia eruciformis,* which are physically and ecologically damaged under grazing conditions and are stimulated by intensifying process of habitat xerophytization.

Associative character is expressed by grass communities of ass. *Agrostetum stoloniferae* Ujvaroşi 1941; and *Poetum pratensis* Răvăruţ, Cazak, Turenschi, 1956 with associations of *Beckmanietum* and *Alopecurietum* [2].



Natural protected area „Gura-Oituz"

It is threatened by establishment of Danubian-Pontic habitat and species with Nordic area *Agrostis stolonifera, Poa pratense, Festuca pratensis, Alopecurus pratensis*.

Causes of habitat degradation are expressed through unlimited and spontaneous grazing.

BIBLIOGRAPHY:

1. Legislaţia ecologică a R.Moldova. 1999.
2. Lazu Şt. Pajiştile de luncă din Republica Moldova. Chişinău, Tipografia Academiei de Ştiinţe. 2014. 452 p.

CONSERVATION OF THE SEED POOL OF PLANT GENETIC RESOURCES IN AZERBAIJAN

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Key words: *genebank, conservation, seeds, database*

Azerbaijan is located in the South Caucasus, which is considered as one of the centers of biodiversity in the world. The rich diversity of plant species that grow on the territory of the republic is represented by 4500 species, which is about 64% of the flora of the Caucasus and 11% of the flora of our planet. 209 species of plants of Azerbaijan, representing 32 families and 98 genera, are endemic, of which 547 species are currently threatened with extinction [1]. Features of addressing the issue of conservation and restoration of Azerbaijan plant genetic resources (PGR) have been noted in the National Program for the Biodiversity Conservation (2006), The Low on Azerbaijan PGR (2011), which defined the strategy of conservation, development, and rational use of all the genetic diversity of plant resources at the national level and their integration into the world system of natural resources preservation [2].

In order to save the existing unique and valuable diversity of Azerbaijan genetic resources the National Genebank of a medium-term conservation, as well as a zonal network of field genebanks and gene pool gardens, has been in operation at the Genetic Resources Institute since 2004, where collectible samples are constantly kept in an active state and their morphological and physiological, biochemical, immunological, and cytogenetic parameters of life are assessed (3). For the creation of plant genetic resources database we used MS Visual FoxPro computer programming package (4).

The use of biotechnological methods using DNA markers allows determining the degree of genetic diversity of collectible samples, as well as optimizing the composition and number of samples.

At the present, the medium-term storage chamber of the Genetic Resources Institute with a controlled temperature of +5–7°C contains more than 7083 seed samples belonging to 63 families, 244 genera, 437 plant species and 257 subspecies. From them 3740 cereals, 959 legumes, 344 fodders, 655 vegetables, 932 technical crops, 69 fruits and 375 are medicinal plants. It is planning to transfer the samples from medium-term conservation to long-term conservation in a near future. Over set periods of storage, the seed material is subjected to restoration and regeneration. Information accumulated in all of the stages of collection, conservation and restoration is documented and placed into a central database CDB, which contains information on 11962 samples belonging to 113 families, 443 genera, 869 plant species and 304 subspecies. From them 4368 cereals, 1208 legumes, 737 fodders, 865 vegetables, 1580 technical crops, 2414 fruits and 786 medicinal plants. At the CDB 4508 scientific-breeding materials, 2365 landraces, 3025 research materials, 2056 wild relatives, 8 others has been classificated. From them 3134 scientific-breeding materials, 631 landraces, 2397 research materials, 915 wild relatives and 6 other plants are at the medium term conservation.

In 2011–2015 years seeds from the national collection in the amount of 1722 samples were sent by the National Genebank of Azerbaijan to the “Svalbard Global Seed Vault” and also to other international genebanks for duplication of samples.

BIBLIOGRAPHY

1. Aliyev D.A., Akparov Z.İ. *Plant Genetic Pesources of Azerbaijan*. News of ANAS, 2002, 1/6, pp.3-14
2. *Low, decree, decisions, rules and regulations on crop plant genetic resources protection and effective use.* Teknur Baku, 2014, p.168 .
3. *A Training Module for the International Course on Plant Genetic Resources and Genebank Management*, Suwon, Republic of Korea, 2009.
4. Mammadov A.T., Konopka J., Akparov Z.I. *The Central Database of Azerbaijan Plant Genetic Resources*, Elm, Baku, 2006, p.255.

MYCORRHIZAL MACROMYCETES IN THE REPUBLIC OF MOLDOVA

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Key words: *macromycetes, ecology, symbiotrophic, mycorrhizal.*

The presence of mycorrhizal macromycetes confers many different advantages to plants; among them, those related to nutrition, development and protection against pathogens are emphasized most often. Mycorrhizas function as true radicular absorptive organs. This is due to the mycelial network on a large area of contact with the plant cells and the secretion of fungal metabolites, which increase the solubility of mineral ions bound into the soil and also increase their mobility [4].

According to P.V. Lobanov [5], the necessity of symbiotrophic associations of different species of trees and shrubs is not the same. In this connection, tree and shrub species fall into three categories according to the attitude towards ectotrophic mycorrhiza: 1. Highly mycorrhizal; 2. Weakly mycorrhizal; 3. Non-mycorrhizal.

In the forests of the Republic of Moldova, highly mycorrhizal tree species are: oak, hornbeam, beech, poplar and lime. Weakly mycorrhizal species: maple, willow, trees and shrubs of the Rosaceae family. Non-mycorrhizal species: ash, dogwood, elm, acacia.

We haven't done any special research in order to determine woody symbionts of the mycorrhizal fungi, but according to literature data [1, 3, 5] and to the field observations that were carried out by us, we have highlighted the specific composition of symbiotrophic fungi from the forest stand, which mostly belong to the genera: *Amanita, Boletus, Cantharellus, Choiromyces, Chroogomphus, Clitopilus, Cortinarius, Gomphidius, Gyroporus, Entoloma, Hebeloma, Hydnum, Hygrophorus, Lactarius, Leccinellum, Leccinum, Naucoria, Paxillus, Russula, Suillus, Tricholoma, Tuber*.

The spectrum of the mycorrhizal macromycetes from the investigated phytocenoses shows that the taxa associated with oak are the most numerous (183), followed by the taxa that form mycorrhizas with beech (138), poplar (63), hornbeam (48), lime (6) and various other species (16).

The necessity of fungi to form symbiotic associations is not the same, as well as the necessity of trees. There are species of fungi that form symbiotic associations with both deciduous and coniferous trees. Such species, in the investigated area, are: *Amanita pantherina, A. vaginata, Lactarius vellereus, Russula delica, R. foetens, R. nigricans*.

Another category of mycorrhizal fungi has symbiotic relationships only with certain species of deciduous or coniferous trees, or even with only one species [2]. In the forest phytocenoses of Moldova, such species as: *Amanita solitaria, Boletus aereus, B. edulis, Lactarius quietus, Hygrophorus mesotephrus, Russula sororia, R. verescens* are quite frequently associated with oak; *Lactarius blennius, L. subdulcis, R. fellea, R. Romellii* – with beech, *Leccinum griseum* – with hornbeam; *Lactarius pubescens* – with birch, *Leccinum duriusculum, L. Albostipitatum* – with poplar.

Taking into consideration the ability of fungi to form mycorrhizas with certain species of trees and shrubs and the need of woody species to have symbiotic associations, the presence or absence of mycorrhizal fungi in certain forest phytocenoses can be explained.

BIBLIOGRAPHY

1. Bon M. Champignons de France et d´Europe occidentale. Paris: Arthaud, 1988. 368 p.;

2. Manic Ş. Contributions to taxonomic diversity research of macromycobiota of Republic of Moldova. *In: Journal of Botani,Chişinău,* 2014, vol.YI, nr.2 (9), p. 52-62.;

3. Moser M. Guida alla determination dei funghi. Polyporales, Boletales, Agaricales, Russulales). *Trento:* Saturnia, 1993. 565 p.

4. **Бункина И. А.** Микотрофность главнейших древесных и кустарниковых пород Приморского края. *В кн.: Тр.Д.В. фил. СО АН СССР, сер. бот., 5,* 1962, с. 79-126.**;**

5. Лобанов Н. В. Микотрофность древесных растений. *М.,*1971, 2-е изд. 216 с.

ROOT AND BASAL ROTS OF GENUS ROSA L. ORNAMENTAL SHRUBS

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Key words: *Rosa L., root and basal rot, phytopathogenic complex, pathogen, species, genus*.

The results of mycological analysis of genus *Rosa L*. ornamental shrubs infected with root and basal rots reveal that phytopathogenic complex of green cuttings' basal part is represented by 15 species of *Micromycetes* from 11 genera, 7 families, 8 levels, 4 parts of 2 kingdoms. Fungi kingdom is represented by 12 species of 9 families and *Chromista* – by 3 species of 2 genera.

Phytopathogenic complex of root and basal rots is represented by saprophytic and parasitic organisms. Saprotrofitic types of Micromycetes were distinguished from the infected *Rosa×hybrida* and *Rosa canina* cuttings: *Aspergillus* spp., *Trichothecium* roseum, *Gliocladium* spp., *Mucor* spp., and epiphytes *Alternaria* spp. The allocation frequency was regular, except for species of the genus *Alternaria*. In some cases necrosis was detected on rooted green cuttings which contained potentially pathogenic species of Micromycetes: *Botrytis cinerea, Fusarium spp., Pythium spp., Rhizoctonia sola*ni, but the frequency of detection was low, and they were allocated irregularly. In the phytopathogenic complex of necrosis in the basal part of green cuttings *Rosa × hybrida* and *Rosa canina*, compared to other soil Micromycetes, *Fusarium, Verticillium, Phytophthora* species dominated. From the data presented, we should also note that the fungi *F. oxysporum, F. solani, V. albo-atrum, V. dahliae, Ph. cactorum* are the main participants of infection that causes rotting process in green cuttings of genus *Rosa* ornamental shrubs during their rooting in greenhouses.

Mycological analysis of young (1-2 years) genus Rosa ornamental shrubs in the open ground, affected by root and basal rots showed that the species composition of pathogenic complex does not differ from the one set in the greenhouse for green cuttings' rooting. The dominant place in allocation frequency is possessed by family *Fusarium*, the species of which were met twice as often as the *Verticillium* kind of pathogens and 3 times more often than the *Phytophthora* kind. As a result of mycological analysis of genus *Rosa* L. ornamental shrubs' infected root we have found that the dominant position in a phytopathogen complex belongs to *F. oxysporum*, its frequency allocation is 3 times higher than *F. solani.* In most cases, these two pathogens complement each other. The genus *Verticillium* in the pathological process is represented by species of *V. albo-atrum, V. dahliae*, the dominant place on the frequency selection is taken by *V. dahliae*. The genus *Phytophthor*a is represented by *Ph. Cactorum* kind.

Diagnostic features of fusariose, verticilliose and phytophtoroise root and basal rot of genus Rosa ornamental shrubs are defined.

BIBLIOGRAPHY

1. Increases in root and shoot growth of Rosa multiflora cuttings taken from stock plants fertilized with lime /Pemberton H.B., Haby V.A., Roberson W.E., Davis J.V. // Acta hortic. The Hague. 1986. – T. 189. – P.123–126.
2. Талалуева Л.В. Опыт борьбы с загниванием черенков роз при укоренении /Л.В.Талалуева, И.Н. Маяцкий // Тезисы докладов 13 Рабочего совещания руководителей служб защиты растений ботанических садов СССР. – Рига, 1989. – С.112–113.
3. Талалуева Л.В. Особенности размножения сортовых роз зелеными черенками / Л.В.Талалуева, И.Н. Маяцкий // Интродукция растений и озеленение. Ботан. исслед. 1990.– Т.8. – С.111–130.
4. First report of dry rot caused by Fusarium oxysporumon rose (Rosa spp.) in Brazil./ Barguil, B.M., Viana, F.M.P., Anjos, R.M., and Cardoso, J.E.// Pl. Dis. 2009. 93: 766 p.
5. Horst, R.K. Compendium of rose diseases./ R.K. Horst // APS Press, St. Paul. – Minnesota, 1983 – 50 p.
6. Sampson, P.J., An Annotated List of Plant Diseases in Tasmania./ P.J. Sampson, J. Walker // Department of Agriculture Tasmania, 1982. 121 p.
7. Mendes, M.A.S., da Silva, V.L., Dianese, J.C. Fungos em Plants no Brasil. Embrapa-SPI/Embrapa-Cenargen. – Brasilia, 1998. 555 p.
8. Kobayashi, T. Index of fungi inhabiting woody plants in Japan. / T.Kobayashi// Host, Distribution and Literature. Zenkoku-Noson-Kyoiku Kyokai Publishing Co., Ltd., 2007. 1227 p.
9. Goud, J.-K.C. Morphology of Verticillium dahliae and V. tricorpus on semi-selective media used for the detection of V. dahliae in soil./ J.-K.C. Goud, A. Termorshiuzen, W. Gams, // Mycol. Res. 2003.107: P.822-830.
10. Gadgil, P.D. Fungi on trees and shrubs in New Zealand. / P.D.Gadgil, // Fungi of New Zealand Vol. 4. Fungal Diversity Press. – Hong Kong, 2005. 437 p.
11. Crous, P.W., Phytopathogenic Fungi from South Africa. / P.W.Crous, A.J.L. Phillips, A.P. Baxter // University of Stellenbosch, Department of Plant Pathology Press, 2000. 358 p.
12. Erwin, D.C. Phytophthora Diseases Worldwide./ D.C. Erwin, O.K. Ribeiro // APS Press, St. Paul, Minnesota, 1996. 562 p.
13. Флетчер Дж. Т. Борьба с болезнями растений в теплицах / Дж. Т. Флетчер // Пер. с англ. С. О. Эбель; Под ред. и с предисл. П. М. Голышина /– М.: Агропромиздат, 1987. – 399 с.
14. Черемисов Н.А. Грибы и грибные болезни деревьев и кустарников / Н.А. Черемисов, С.Ф. Негруцкий, И.И. Лешковцева. – М.: Лесн. пром-сть, 1970. – 392 с.

THE PHYTONEMATODES AT THE TREES FROM THE BOTANICAL GARDEN OF THE NATIONAL MUSEUM OF ETHNOGRAPHY AND NATURAL HISTORY

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Keywords: *nematodes, trophic groups, trees.*

The Botanical Garden of the National Museum of Ethnography and Natural History, Chisinau, represents forest microexhibitions of vegetation of the Prut-Dniester region, which includes species of century trees, truly natural monuments of national importance. It was declared a protected natural area, monument of landscape architecture in 1998. Over more than 100 years, the Botanical Garden is regularly exposed to various changes in the outcome of the restoration and completion of plant collections, without that they be tested for the presence of phytoparasitic root nematodes. Among the phytoparasitic root nematodes are distinguished the species of the *Tylenchida* and *Dorylaimida* orders, most of which parasitize the roots of trees, causing different phytohelminthiasises. In recent years, there has been a partial drying of remarkable trees from the Botanical Garden, especially the *Ulmus carpinifolia, Ulmus glabra*. The cause may be the root diseases caused by phytohelminthiasises provoked to the roots by ecto- and endoparasitic nematodes, especially since most of them are vectors of harmful microflora. The taxonomic analysis of soil samples collected from the rhizosphere of trees like oak, elm, lime, ash, beech, walnut, maple, poplar etc., horizon 0-30 cm, demonstrated the presence of 80 species of parasitic and free nematodes from soil, which are included in 51 genera, 24 families, 7 orders, 2 classes: *Secerenentea* class (3 orders) - 1. *Tylenchida*, fam.: *Anguinidae*, *Criconematidae*, *Ecphyadoridae*, *Hoplolaimidae*, *Paratylenchidae*, *Pratylenchidae*, *Telotylenchidae*, *Tylenchidae*; 2. *Aphelenchida*, fam.: *Aphelenchidae*, *Aphelenchoididae*, *Seinuridae*; 3. *Rhabditida*, fam.: *Cephalobidae*, *Diplogasteroididae*, *Neodiplogasteridae*, *Panagrolaimidae*, *Rhabditidae*; *Adenophorea* class (4 orders) - 1. *Dorylaimida*, fam.: *Aporcelaimidae*, *Discolaimidae*, *Dorylaimidae*, *Longidoridae*, *Nordiidae*, *Qudsianematidae*, *Xiphinematidae*; 2. *Enoplida*, fam.: *Alaimidae*; 3. *Mononchida*, fam.: *Mononchidae*, *Mylonchulidae*; 4. *Plectida*, fam. *Plectidae*. The nematodes which were found are in all 5 trophic groups according by Yeates et al. (1993) (Table):

Table

Percentage of distribution of phytonematodes from the Botanical Garden by trophic groups

No.	Group (subgroup)	The total of species	% from the total
1	Plant feeding : 1b; 1c; 1d; 1e	25	31,25
2	Hyphal feeding	5	6,25
3	Bacterial feeding	34	42,50
4	Omnivorous	9	11,25
5	Animal predation: 5a; 5b	7	8,75

By the diversity of species, there are different species of nematodes, from trophic groups (1): Plant feeders: migratory endoparasites (1b); semiendoparasites (1c); ectoparasites (1d); epidermal cell and root hair feeders (1e), which together account for 31.25% of the total (80 species), and the Bacterial feeding nematodes – 42.5%. The presence of Bacterial feeding nematodes shows an accumulation of a considerable quantity of plant residues, which are subject to the slow mineralization by these nematodes. For the investigated trees, the species of nematodes from the Plant feeding group are dangerous. In the research process, it was observed that more sensitive to the harmful root nematodes are the trees *Ulmus carpinifolia, Ulmus glabra*, at which were discovered sources of 30-40%, dominant species being *Hoplolaimoidea*. Both species *Criconematoidea* and *Hoplolaimoidea* cause necrosis on the roots of trees, and depending on the density of individuals, their drying. Pretty dangerous for trees, especially for the elm, ash, maple, are root ectoparasitic species (1d) of the genera *Xiphinema* and *Longidorus* that in parallel can be not only dangerous parasites, but also vectors of viral infections, including *Arabis mosaic nepovirus* (ArMV). The Hyphal feeding species, fam. *Aphelenchidae, Aphelenchoididae*, and root/fungal feeding species of the family *Tylenchidae* are dangerous in the case of nutrition with mycorrhizal fungus hyphae associated with the tree roots.

CONTRIBUTION TO RESEARCH OF SPONTANEOUS FLORA OF THE REPUBLIC OF MOLDOVA

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Keywords: *Flora of the Republic of Moldova, Taeniatherum caput-medusae, Poaceae.*

Botanical researches in pastures from the Cahul and Cantemir districts carried out in 2013-2014 have led to the discovery of a genus and new species for the spontaneous flora of the Republic of Moldova, belonging to family *Poaceae* – genus *Taeniatherum* Nevski, species *T. caput-medusae* (L.) Nevski (syn.: *Elymus caput-medusae* L., *Hordeum asperum* (Simonkai) Degen, *H. crinitum* (Schreber) Desf., *Taeniatherum asperum* (Simonkai) Nevski, *T. crinitum* (Schreber) Nevski). The species is annual, therophytic, pontic mediterranian, it is characteristic for dry, ruderalised pastures and rocky places, it occurs in the neighboring countries – Romania and Ukraine [1, 2, 3, 4].

Within the research area, it has been identified in cliffy slopes or plateaus in five localities: Larga Noua, Doina, Andrusul de Jos (the Cahul district), Capaclia, Cisla (the Cantemir district). The species occurs sporadically or it forms small phytocoenosis with coverage of 50-100%. In floristic composition of phytocoenosis dominated by this species occurs also: *Medicago minima, Poa angustifolia, Galium humifusum, Botriochloa ischaemum, Bromus arvensis, Lapulla squarrosa, Erodium cicutarium, Lepidium campestre, Plantago lanceolata*.

Validity of the species discovery was confirmed by the specialists from the Botanical Garden (I) of the Academy of Sciencies of Moldova and the Moldova State University. The species can be consulted in the herbarium of the Botanical Garden (I) of the Academy of Sciencies of Moldova.

BIBLIOGRAPHY

1. Ciocirlan V. *Flora ilustrata a Romaniei*. Editura Ceres, Bucuresti, 2000, p. 1044.
2. Sanda V., Biță-Nicolae C., Barabas N. *Flora cormofitelor spontane si cultivate din Romania*. Editura ”Ion Borcea”, Bacau, 2003, p. 273.
3. Tutin T. *Flora Europaea*. Cambridge University Press, Vol. 5, 1980, p. 205-206.

Доброчаева Д.Н., Котов М.И. и др. Определитель высших растений Украины. Киев, Наукова думка, 1987, с 432-440.

THE CENOTAXONOMIC CONSPECT OF VEGETAL ASSOCIATIONS OF PROTECTED NATURAL AREA "LUNCĂ CU FIRUȚĂ"

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Keywords: *protected area, meadow, vegetation, cenotaxonomic conspect.*

The protected area "*Luncă cu firuță*" is located in the territory of the commune Bursuceni, Singerei district, on an area of 12 ha in a meadow of the affluent of the river Ciulucul Mic. It is a protected area of national interest which corresponds with the category of area with multifunctional management. It was declared a protected area by the Law on Fund of Natural Areas protected by the State (1998).

The study presents vegetable associations described in the protected area "*Luncă cu firuță*" during the 2010 year. Study of vegetation was realized, using method of phytosociological relevées, collected in the July-August, from the plot areas of 50-100 m^2.

Based on conducted research were identified 7 associations of plants included in the following cenotaxonomic system:

I. PHRAGMITI - MAGNOCARICETEA Klika in Klika et Novác 1941
PHRAGMITETALIA Koch 1926
Phragmition communis Koch 1926
1. As. ***Phragmitetum vulgaris*** Soó 1927
MAGNOCARICETALIA ELATAE Pignatti 1953
Magnocaricion elatae Koch 1926
Subal. ***Caricenion gracilis*** (Neuhäus 1959) Oberd. et al. 1967
2. As. ***Caricetum otrubae*** Burescu 1999; Dihoru (1969) 1970
II. MOLINIO - ARRHENATHERETEA R. Tx. 1937
MOLINIETALIA CAERULEAE Koch 1926
Agrostion stoloniferae Soo (1933) 1971
3. As. ***Alopecuretosum arundinaceae*** (Tirenschi 1966) Chifu 1995
POTENTILLO – POLYGONETALIA R. Tx. 1947
Potentillion anserinae R. Tx. 1947
4. As. ***Rorippo austriacae – Agropyretum repentis*** (Timar 1947) R. Tx. 1950
III. FESTUCO - BROMETEA Br.-Bl. et R. Tx. in Br.-Bl. 1949
FESTUCETALIA VALESIACAE Br.-Bl. et R. Tx. ex Br.-Bl. 1949
Festucion valesiacae Klika 1931
Subal. ***Jurineo arachnoideae – Euphorbinenion nicaeensis*** Dobrescu et Kovács 1971 corr. Sârbu, Coldea et Chifu 1993
5. As. ***Artemisio austriacae – Poëtum bulbosae*** I. Pop 1970
IV. PUCCINELLIO - SALICORNIETEA Țopa 1939
PUCCINELLIETALIA Soó 1940
Puccinellion peisonis [Wendelbg. 1943] 500 – 1957
6. As. ***Puccinellietum distantis*** Soó 1937; Knapp 1948
Juncion gerardii Wendelbg. 1943
7. As. ***Juncetum gerardii*** (Warming 1906) Nordhagen 1923; Wenzl 1934

BIBLIOGRAPHY

4. Burescu P. *Flora și vegetația zonelor umede din nord-vestul României.* Ed. Academiei Române, București, 2003, 474 p.
5. Chifu T., Mânzu C., Zamfirescu O. *Flora și vegetația Moldovei (România).* Ed. Universității "A.I.Cuza" Iași, 2006, 367 p.
6. Legea privind fondul ariilor naturale protejate de stat (1998).
7. Sanda V., Ollerer K., Burescu P. *Fitocenozele din România*. Ed. Ars Docendi – Universitatea din București, 2008, 570 p.
8. Sanda V., Vicol I., Ștefănuț S. *Biodiversitatea ceno-structurală a învelișului vegetal din România*. Ed. Ars Docendi – Universitatea din București, 2008, 569 p.

CONSIDERATIONS ABOUT FLORA OF DOWNY OAK FORESTS (*QUERCUS PUBESCENS*) FROM THE LANDSCAPE RESERVATION "PĂDUREA HÂNCEŞTI"

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Keywords: *flora, species of rare plants, landscape reservation, plant protection*

The landscape's reservation area is 4499 ha according to the Law of State Protected Natural Areas. According to the forest management plan from 2011, the area of the landscape's reservation in "Padurea Hâncesti" is 4573.1 ha. It is located in Mereşeni and Logăneşti forest district, the State Forest Enterprise Hânceşti.

In 2015 (march-august), we studied the flora of downy oak forests from the reservation to emphasize the floristic composition and to elaborate measures to optimize the biodiversity conservation. The researches were done in the parcels with downy oaks *(Quercus pubescens)* using the itinerary method. The known species were registered in the journal, and the unknown species were collected in a herbarium according to A. Skvortov (1977). To determine the plants from the herbarium, we have also used the plant determination of T. Geideman (1986), V. Ciocarlan(1988-1990), A. Negru (2007) and the works like: " Flora R.P. României" (1952- 1976), Al. Beldie (1977- 1979),etc.

The downy oak forests (*Quercus robur)* from the landscape reservation "Pădurea Hâncesti" extend on a 260.8 ha area. The biggest areas of downy oak stands are in the Mereseni forest district (224.3 ha). The general area of fundamental natural stands of downy oak *(Quercus pubescens)* is 258 ha.

The general area of the partially derived downy oak stands (*Quercus pubescens*) from the reservation is 1.4 ha (Logăneşti forest district). There were planted downy oak stands (*Quercus pubescens*) in Mereşeni forest district on a 0.9 ha area, but in Logăneşti forest district – 0.5 ha. (parcel 47 W)

There are present pure downy oak stands. There were distinguished some mixed stands of sessile oak (*Quercua petraea*), linden *(Tilia tomentosa),* ash *(Fraxinus excelsior),* cherry *(Cerasus avium),* maple *(Acer platanoides),* etc.

In the shrubs' layer, the cornelian cherry *(Cornus mas),* smoke tree *(Cotinus coggygria)* prevail more often. Less present but frequent there are the hawthorn *(Crataegus monogyna), (Euonymus verrucosa),* etc. The herbaceous coating is richer on meadows and it changes during the growing season.

In the result of the research on downy oak forests from the reservation, there were distinguished more than 90 species of vascular plants including 15 trees, 14 shrubs and more than 84 herbaceous plant species. In the greater majority of the studied stands there prevails the downy oak *(Quercus pubescens*). At the start of the stands prevails the smoke tree *(Cotinus coggyygria)* and in some cases the cornelian cherry *(Cornus mas).*

Under the crowning of the stands the herbage percentage is 4-15 %. On glades, the herbage covering percentage is 90-100 %. There is not observed the domination of any plant species on the herbaceous coating on glades. More frequent on glades there are the herbaceous plant species like nodding sage (*Salvia nutans),* wild strawberries *(Fragaria vesca),* the british yellowhead *(Inula britannica),* tall skullcap (*Scutellaria altissima),* lesser periwinkle (*Vinca minor),* wood avens *(Geum urbanum),* lesser meadow-rue *(Thalictrum minus),* etc. In the downy oak forest of the landscape reservation "Pădurea Hânceşti" there were distinguished 9 rare plant species: prunus tenella (*Amygdalus nana),* pheasant's eye *(Adonis vernalis), Adonis volgensis,* garden asparagus (*Asparagus officinalis), Asparagus tenuifolius, Belevalia sarmatica*, prairie crocus *(Pulsatila montana),* feather grass (*Stipa lessingiana),* tassel hyacinth *(Leopoldia comosa).*

BIBLIOGRAPHY

1. Ciocârlan V Flora ilustrată a României. Bucureşti. 2000. Editura "Ceres". 1139 p.
2. Negru A. Determinator de plante din flora Republicii Moldova.Chişinău,2007. 391 p.

Гейдеман Т. Определитель высших растений Молдавской ССР.Кишинев1966"Штиинца".

TWO IMPORTANT HABITATS IN THE NATURE OF THE REPUBLIC OF MOLDOVA

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Key words: *Habitat, characteristic, distribution, Moldova.*

Since CORINE Programme, the term **habitat** has become common in Europe, in the strict sense, it means living place, i.e., the abiotic environment where an organism lives or a distinct biocenosis. The habitats from the Republic of Moldova are poorly studied, we aren't fully aware of the entire network of habitats in our country and we don't have their characteristics. The phytosociological investigations of grassy vegetation in rocky areas from the Dniester-Prut interfluve revealed two important habitats of high conservation value for Europe's nature, they are part of *Inland cliffs and exposed rocks* subclass (62), *Inland rocks, screes and sands* class (6), according to the PALAEARCTIC HABITATS classification system where the habitats of Romania are described. Floristic nomenclature. The average annual temperature and annual precipitation.

1. Habitat RM(R) 6223. Ponto-Sarmatic communities, in fissures of limestone cliffs, of the association *Sempervivo ruthenici-Schiverckion podolicae,* Pînzaru et A. Ruschuk 2009.

This habitat, R6233, described on the basis of the association *Asplenio-Schivereckietm* Mititelu et al. 1971, is corrected and completed in this paper.

Plant associations: *Sempervivo ruthenici-Schivereckietum* (Mititelu et al. 1971) Pînzaru et A. Ruschuk 2009, *Sedo acri-Saxifragetum tridactylitis* Pînzaru 2015, *Sedo acri-Allietum luisitanici* Pînzaru(2006) 2015, *Asplenio ruta-murariae-Allietum flavescentis* Pînzaru *ass. nov, prov.*

Distribution: Romania (Prut Valley), Republic of Moldova (Dniester and Prut river basins), Ukraine (Dniester river basin), Russia (Southern European part).

Area: some hectares.

Sites: Altitude 50-250 m. Climate: T = 8-10°C, R = 500-700 mm. Relief: petrified limestone cliffs, diverse exposure, inclination of (2-5) 15-60°. Rocks: shell-limestone, coral-reef limestone. Soils: orthents.

Structure. It is a pioneer, xerophile, calciphile habitat, includes reef rocks from the hilly zone. Mono- or double-layered phytocoenoses with a coverage rate of 30-50 (-70) %.

Floristic composition: Dominant species: **Schiverckia podolica, *Sempervivum ruthenicum, *Saxifraga tridactylitis, *Allium luisitanicum, Allium flavescens*. Other important species: **Aurinia saxatilis, *Asplenium ruta-muraria, Arabidopsis arenosa, Sedum acre, Allium paniculatum, Gypsophyla collina*. Phytocoenoses include also a large number of species of the *Festucion valesiacae* association, but with few specimens.

Conservation value: high, includes species protected by the state, marked with an asterisk.

2. Habitat RM6224. Western Ponto-Sarmatic communities, on friable, dusty Sarmatian limestone, of the association *Genisto tetragonae-Seselion peucedanifolii* Pânzaru 1997.

Plant associations: *Genisto tetragonae-Seselietum peucedanifolii* Pânzaru 1997, *Thymo moldavici-Helianthemetum cani* Pânzaru 1997, *Sileno supinae-Pimpinellietum tragii* Pânzaru 1997, *Astragalo pseudoglauci-Peucedanietum ruthenici* Pânzaru et A. Ruschuk in A. Ruschuk et al. 2005, *Thymo sibthropii-Seselietum hippomarathri* Pînzaru et Coldea 2006.

Distribution. Middle and upper basin of the Dniester River (Republic of Moldova, Ukraine).

Area: some hundreds of hectares.

Sites: Altitude 50-250 m. Climate: T = 8-10°C, R = 500-700 mm. Relief: steep slopes, diverse exposure, inclination, usually, of 15-50°. Rocks: crumbly limestone of Middle and Lower Sarmatian. Soils: absent or a thin layer of rendzina which contains a significant amount of limestone gravel.

Structure. It is a pioneer, xerophile, calciphile habitat, includes some exposed Sarmatian limestone from the hilly zone. Double-layered grass cover, coverage rate of 40-70(80-90) %.

Floristic composition. Dominant species: **Genista tetragona, *Seseli peucedanifoliu, Thymus moldavicus, *Koeleria moldavica, *Silene spergulifolia, *Linum tauricum, *Pimpinella tragium, *Astragalus vesicarius s.l., *Helianthemum canum, *Peucedanum ruthenicum, *Scutellaria supina, *Alyssum gmelinii, * Paronychia cephalotes, Thymus sibthriopii, Seseli hippomorathrum.* Other important species: **Ephedra distachya, *Convolvulus lineatus,* Helianthemum nummularia, Haplophyllum suaveolens, Linum tenuifolium, *Teucrium montanum s.l, Gypsophila collina.*

Conservation value: high, includes species protected by the state.

CURRENT PRESERVATION ISSUES AND CONCERNS OF SECULAR TREES IN THE REPUBLIC OF MOLDOVA

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Keywords: *secular trees, long-lived trees, ornamental trees, rare tree species*

Secular trees are solitary trees or small groups of isolated trees, remarkable by their ages, sizes, beauty, rareness, or for that have witnessed historic events. A number of 433 new secular trees, from 158 different sites are protected by state (Law on State Protected Natural Areas Fund (nr.1538/ 25.02.1998). A national survey of secular trees has been realized during the period of 2010-2012 in the framework of UNDP-GEF Project "Improving Coverage and Management Effectiveness of the Protected Area System in Moldova" and as a result 433 secular trees from 158 different sites have been assessed.

A new concept on how to describe secular trees from state protected areas has been developed, which include next descriptors: height (m), the circumference of the stem (the stem perimeter (cm), stem diameter (cm, measured at a height of 1.3 m), age (years), the diameter of the crown (m), crown height (m), the number of primary branches the number of dry branches, health, natural and anthropogenic impacts, recommendations for improvement of the condition of the tree.

Secular trees were grouped in two major categories: native species, including (*Quercus robur, Quercus petraea, Fagus sylvatica, Fraxinus excelsior, Acer campestre, Pyrus pyraster, Populus alba, Sorbus aucuparia,Sorbus torminalis,Tilia cordata,Ulmus carpinifolua*) and non-native species, including (*Abies nordmaniana, Aesculus hipocastanum, Celtis occidentalis, Corylus columa, Gleditsia triacanthos, Quercus castaneifolia, Libocedrus decurrens, Maclura pomifera Picea abies, Picea canadensis, Picea pungens, Pinus strobus, Pinus nigra, Platanus occidentalis, Sophora gaponica*).

Secular trees may be classified according to their values into four groups: long-lived trees, remarkable trees, ornamental trees and rare tree species. Most of secular trees belong to the first group of long-lived trees with estimated age older than 100 years. Next trees are most representative and may have also an European value: pedunculate oak (*Quercus robur*) from Cobâlea vilage, pedunculate oak from Schinoasa (Chișinău), pedunculate oak near to Bolduresti, Leova, pedunculate oak close to Pârâta village (Dubăsari), pedunculate oak near to Gură Bâcului, pedunculate oak from Pârâta vilage, pedunculate oak close to Micăuți village, pedunculate oak from reserve „Călărășeuca", pedunculate oak from Galoci forest, pedunculate oak nearby Zahorna village, Lipcani, pedunculate oak from Curchi Monastery, pedunculate oak close to Zahorna village, pedunculate oak nearby Morenii Noi village, pedunculate oak close to Giurgiulești, pedunculate oak from Petrușeni forest, pedunculate oak from reserve „Livada Turcească", common ash (*Fraxinus excelsior*) from Vărzăreștii Noi village and American sycamore *(Platanus occidentalis)* nearby Păulești village.

Secular trees may be grouped according to their health conditions into next five groups: healthy secular trees, secular trees with partially damaged crown, secular trees with substantially affected crown, secular trees with broken trunk (hollows, scars etc.) and fallen or dead secular trees.

Based on made inventory, 135 secular trees were attributed to healthy trees and 167 secular trees belong to the group of trees with partially damaged crown. Consequently, 302 secular trees were validated and submitted to be included into the *List of state protected secular trees.*

Additionally the present inventory revealed that 71 secular trees, previously included in the former *List of state protected secular trees*, are missing as being dead, fallen or damaged by fire. Moreover 56 secular trees have been substantially damaged and were proposed to be excluded from the *List of state protected secular trees.* The carried out inventory of secular trees revealed, that during the last 40 years, 71 secular trees disappeared and 56 have been considerably damaged.

33 new remarkable secular trees have been identified in 27 different sites the last years. Newly discovered secular trees have been proposed to be included into the *List of state protected secular trees*. Our laboratory continues to carry out exploration activities for remarkable secular trees in the Republic of Moldova.

THE ROLE OF TAXONOMY IN PLANT GENETIC RESOURCES DOCUMENTATION

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Keywords: taxonomy, plant genetic resources, documentation, database

Taxonomy is an important input to the documentation of plant genetic resources collections. It is the basis for various genebank management activities such as the identification, search of the accessions and structuring of the collection. For identification purposes, taxonomic inputs such as genus, species, and intraspecific name (including authorities) are generally included in the documentation systems of genebanks (M.van Veller et al., 2008).

The quantity of data associated with taxonomic information is vast and in recent years, to enhance the efficiency of data handling, computer database technology is increasingly being used to organize these data. Data sources for species – related information are usually organized in the form of species checklists for various purposes or databases with the scientific name as primary entry point. For the conservation of PGR correctly determined species are an indispensable prerequisite and key to relevant information from other sources. As Thormann et al. (1999) point out, "using the correct taxonomic name is essential to obtain appropriate information on a species". There are a number of Internet sources with species-related information. The "Species 2000" checklist of "all known species of plants", the Mansfeld's World Database of Agricultural and Horticultural Crops, and Kew Bibliographic Databases (KBD) covering cultivated plant species worldwide. Other sources for cultivated plants information are the taxonomic database of the USDA Genetic Resources Information Network (GRIN), GBIF (Global Biodiversity Information Facility). Such sources need to be used to verify the correct scientific name, synonyms, vernacular names and species authors. For correctly documenting species, authors and taxonomic literature references, standards have been published for authors (Brummitt and Powell, 1992), journal abbreviations (Lawrence et al., 1968; Bridson and Smith, 1991) and books (Stafley and Cowan).

In order to effectively use the information on the germplasm collections at the national level, ReGen – that represents the information system on plant genetic resources in the Republic of Moldova was established. For elaboration of ReGen system was used programming language Visual Fox Pro 9.0. The system was set up for operation system Microsoft Windows 2000 and XP. ReGen is a relational information system. Databases consist of many tables connected by special fields.

In ReGen system, the taxonomic data is the first level at which users can input, search the information on accessions, and it determines the protocols used in the management of collections.

ReGen is an easily accessible database with reliable information on species names and their hierarchical classification. The database is reviewed periodically to ensure high quality with valid classifications, revisions, and additions of newly described species. The ReGen includes documented taxonomic information of plant genetic resources at the national level. For each scientific name, this database includes the authority, taxonomic rank, associated synonyms and vernacular names where available.

The information stored in database is structured by the botanical description such as family, genus and species. In first of all, is input the family, after that genus, and finally the species. If it is necessary, the photo of current species can/not be displayed.

For such a large collection taxonomy is essential for identification and documentation the wide range of diversity in the assortment. Taxonomy of cultivated plants is an important tool to describe the variability of plant genetic resources.

Bibliography:

Lohwasser Ulrike, Dittbrenner Anke, budahn Holger, Marthe Frank, Börner Andreas. Taxonomy of plant genetic resources – use of morphological, molecular and phytochemical data in order to verify existing classifications. Agriculturae Conspectus Scientificus, Vol. 75 (2010) No. 4 (175-178).

L. J. G. Van Der Maesen. Gene banks and plant taxonomy. In: The Plant Diversity of Malesia. Kluwer Academic Publishers, 1990 p. 341-349

Watson J., Eyzaguiree P.B. Home garden and in situ conservation of plant genetic resources in farming system. Proceeding of the Second International Home Gardens Workshop, 2001.

ANTIFUNGAL ACTIVITY OF SOME STRAINS OF MICROORGANISMS AFTER 3 AND 6 YEARS OF LYOPHILIZATION

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Antifungal activity is a relatively common characteristic among bacteria, conferring an ecological advantage in environments which support the growth of a mixed bacterial and fungal flora. This activity has been detected by using a variety of *in vitro* methods and although the chemical basis for this activity has been elucidated in many cases, in some it has not, even though antifungal activity has been demonstrated. This activity has significance in four areas: development of therapeutic antifungal drugs, development of plant protection agents and suppression of fungal colonization: proliferation within the human body resulting in modification of the pattern of certain human clinical infections and reduction in the efficiency of isolation of fungal pathogens from clinical specimens.

Fluorescent pseudomonads representing the group of PGPR can promote growth and suppress plant pathogens by multiple mechanisms. Their applicability as bio-controlling agents has drawn wide attention because of production of secondary metabolites such as siderophores, antibiotics, volatile compounds, HCN, enzymes and phytohormones. *Pseudomonas fluorescens* is considered as a biological bio-controlling agent against various plant related diseases including root diseases. The use of bacterial remedies in the fight with pests and various mycoses encountered at agricultural plants represents a major interest. Some of the most popular remedies with entomo- and phytopathogenic activity are obtained from bacteria of the genus *Bacillus* and *Pseudomonas.*

In this regard, the strains of microorganisms that are used in biotechnology are representing a commercial value and the problem of maintaining as longer as possible of their biosynthetic proprieties and of those that are economic valuable are permanently in the attention of scientists. The conservation of microorganisms and of their properties requires the use of efficient methods of preservation and a continuous monitoring of the effectiveness of these methods.

A special interest aroused the maintenance of the antifungal activity of bacterial strains of *Pseudomonas aurantiaca* CNMN-PsB-08, *Pseudomonas aureofaciens* CNMN-PsB-07 and *Bacillus cereus var. fluorescens* CNMN-BB-07 that are stored in the NCNM (National Collection of Nonpathogenic Microorganism) of the Institute of Microbiology and Biotechnology of the ASM, after a long period of time as a result of the lyophilization. As pathogenic cultures, the following fungal strains were used: *Fusarium oxysporum*, *Fusarium solani*, *Alternaria alternata*, *Botrytis cinerea* and *Aspergillus niger*.

The results of investigations undertaken on determining the antifungal activity of the strains of *Ps. aurantiaca* CNMN-PsB-08, *Ps. aureofaciens* CNMN-PsB-07 and *B. cereus var. fluorescens* CNMN-BB-07 over the strains of fungal pathogens after their freeze-drying storage in the protective environment of Na succinate + 12% sucrose during the 3 and 6 years, proved that together with the extension of the storage period increases also the antifungal activity. Thus, the collected data are demonstrating that after 6 years of conservation of strains of *Ps. aurantiaca* CNMN-PsB-08 and *B. cereus var. fluorescens* CNMN-BB-07 the antifungal activity on micromycetes *F. oxysporum* and *F. solani* is increasing so, that the diameter of the inhibition zone is increasing by 5.0 – 4.7 mm and 6.3 – 7.7 mm, respectively, from the preservation period of 3 years.

The antifungal activity of all isolates has increased together with the increase of the storage period of 3 to 6 years towards the micromycetes *A. alternata* and *B. cinerea* which also are active pathogens of the crop plants. In this case, we can observe that the diameter of the inhibition zone of the strain *Ps. aurantiaca* CNMN-PsB-08 towards the *A. alternata* and *B. cinerea* is growing by 8.6 and 5.3 mm, respectively. Unlike this, the strains of *Ps. aureofaciens* CNMN-PsB-07 and *B. cereus var. fluorescens* CNMN-BB-07 are possessing antifungal activity also over the *A. niger* culture, thus the diameter of the inhibition zone is increasing from 12.3 to 19.0 mm and from 14.3 to 15.0 mm, respectively.

The most significant increase of the antifungal activity was determined at the strain *Ps. aureofaciens* CNMN-PsB-07 over the micromicetes *B. cinerea*, where the inhibition zone was increasing together with the storage period from 3 to 6 years with 2.03 times.

The use of these bacterial species in biological control would allow increasing the plant resistance to pathogens. Thus, the achievement of some efficient conservation methods that would allow the maintenance or the increase of antifungal properties can be finalized with the development of some technological equipment for the attainment of the active biological remedies, efficient in the agricultural usage as an alternative to chemical fungicides.

PHENOTYPIC VARIABILITY OF ENGLISH OAK (*QUERCUS ROBUR L.)* IN THE DONBASS REGION

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The range of occurrence of English oak (*Quercus robur L.*) occupies almost all of Western and most of Eastern Europe (except for northern regions), extending to the east to the Ural Mountains [1]. Resumption of oak under the forest canopy, in other words, the ability to generate self-seeding and trustworthy undergrowth, allowing to provide a generational change, deteriorating in the direction from the western regions to the eastern area; the intensity of renewal can vary dramatically in different species composition and completeness of the forest types in the same area [2, 6].

Quercus robur L. is indigenous, and one of the main forest-forming species in Ukraine, which has a high adaptive capacity, which contributes to long-range transport of pollen to 50-80 km [5]. Oak generates high-quality sustainable plantations in the steppe zone, but according to the literature and the experience of steppe afforestation has no perspective on natural regeneration by seeds in artificial plantations and ravine forests [3].

Populations of *Quercus robur L.* in the steppe zone are of interest for the study of general biological positions, as they are formed during the long evolution in dry conditions (annual rainfall of 350-450 mm), and now extreme effects of climatic factors increasing due to global change climate, this contributes to high arable agricultural land (90%), as well as the presence of environmental contaminants [4].

The purpose of this study was to investigate the phenotypic variability, population differentiation resumption of English oak in the steppe zone of Ukraine on the example of the Donbass region.

Morphological characteristics of leaves, which are characterized by high genotypic conditionality and are often used in population studies, were used as phenotypic traits to assess variability and population structure of the resumption of oak. We analyzed 11 morphological characters (including 3 relative characteristics) in three hierarchical levels of sampling within each tree (endogenous variability) within each trial population (individual or intrapopulation volatility) and between populations (ecological-geographic or interpopulation variability). In total, 12 populations of *Quercus robur L.*, growing in the Donbass, in villages Yarovaya, Bokovoe, Novodonetskoe, Elizavetovka, Nikolskoe, Olginka, Maloyanisol, Starodubovka, reserves – Zaplava-1, Azov dacha, Velikoanadolskiy forest and the Regional Landscape Park - "Kleban-byk", were analyzed.

Maximum length of the leaves is fixed in populations of the forest reserve Zaplava-1 – 137.59 mm and the smallest – in the village Novodonetskoe – 116.56 mm. The maximum length of petioles revealed in populations of the forest reserve Zaplava-1 - 7,41mm, the minimum in the village Olginka – 5.47 mm. The widest leaf blades were marked in the forest Velikoanadolskiy and the village Yarovaya – 87.56 mm and 87.61 mm respectively, the narrowest – in the population situated in the village Bokovoe – 63.62 mm. Maximum width of the leaf was found in the population of the reserve "Azov Dacha" – 52.15 mm, the smallest – in the village Novodonetskoe – 33.43 mm. The number of blades of the highest value is characteristic of the population, situated in the village Elizavetovka – 11.03 pcs., The smallest populations "Azov Dacha" and Bokovoe – 9.67 pc. and 9.71 pc. respectively. Maximum angle of veining in the population of the village was recorded in Starodubovka – 46,27 °, the smallest – in the population Novodonetskoe – 43,3 °. The highest dissected leaf stands – Starodubovka village population – 0.527, the lowest – reserve Zaplava 1 – 0.357.

The results of field studies have allowed a clear distinction between the populations of oak and informatively describe the morphological characteristics of this type of plant. The following characteristics are the most variable: the length of petiole, the width of leaf blades, the width of the leaves and the length of the line from the bottom to the widest place of the leaf. Preservation of the gene pool of species in the region shall be adapted to the type of population differentiation and the choice of the populations with the highest level of phenotypic variability, such as Yarovaya, Zaplava-1 and Velikoanadolskiy forest.

BIBLIOGRAPHY

1. *Yakovlev A.S., Yakovlev I.A.*, Oakwood Middle Volga. - Yoshkar-Ola: Mari State Technical University, 1999. - 352 p.
2. *Semerikov L.F.*, Population structure of woody plants (for example, species of oak by the European part of the USSR and the Caucasus). - M .: Nauka, 1986 - 140 p.
3. *Mamaev S.A.*, Forms of intraspecific variation of woody plants (for example, family Pinaceae). - M .: Nauka, 1973. 284 p.
4. *Kelly P. M., Munro M. A. R., Hughes M. K., Goodness C. M.* 1989. Climate and signature years in west European oaks // Nature. 340 (6228): 57 60.
5. *Petit R.J., Csaikl U.M., Bordacs S.* Chloroplast DNA variation in European white oaks / R.J.Petit, U.M. Csaikl, S. Bordács.// Forest Ecology and Management. – 2002. – 156, №1–3. – P. 5–26.
6. *Menitsky, J.L.*, Review of the genus Quercus L. in Eurasia / *Y.L., Menitsky.* L: Nauka, 1982. 60 p.

A NEW VARIETY OF BASIL VEGETABLE (EUGENOL) IN THE CONDITIONS OF CENTRAL REGION OF RUSSIAN FEDERATION

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Key words: *basil vegetable, eugenol, anthocyanin color, fragrance of lilacs, harvest, weight of 1000 seeds.*

Introduction. Basil eugenol - *Ocimum gratissimum L*. belongs to the family Lamiaceae, native to tropical Africa. The generic name is derived from its ancient Greek name - ocimon. It is widely distributed in the south of the continent, and some adjacent islands, where it forms the natural perennial shrub thickets [1]. It is known as the East Indian basil, woody basil, clove basil [1]. It is widely grown in Moldova, Ukraine, it is also a favorite spice in the Caucasus and Central Asia.

Ocimum gratissimum is an important essential oil and spicy culture. It's young green leaves contain ascorbic acid, carotene, rutin, tannins. Also leaves contain 0,5-0,8 % of essential oil on wet weight, the inflorescences contain 0,4-0,9 % of essential oil on wet weight, and up to 5 % of essential oil on the dry weight. The main component of the essential oil (90 %) is eugenol. Ocimum gratissimum is a good honey plant [1].

The aim of our research was the introduction, the comprehensive study and selection within the culture of basil eugenol in the conditions of the Moscow region. During 2009-2013 in the Center of the gene pool and bioresources in Russian Selection and Technological Institute of Horticulture and Nursery Sciences Academy (Mikhnevo, Stupin district, Moscow region) was performed phenological observations, surveys and selection of basil eugenol.

This cultivar was obtained by mass selection from a population of local varieties, has been introduced and cultivated in the private areas of the Yaroslavl region. The initial sample was obtained from world seed's collection of N.I. Vavilov Research Institute of Plant Industry. As a result was created vegetable (eugenol) basil cultivar named Zhemchuzhina Podmoskovja. Authors: Temirbekova S.K., Malakhova E.I., Kulikov I.M. et al.

Morphological and economically valuable Characteristics of the variety

The plant is erect, high (110-120 cm), medium density. The mass of the plant – 370 g. Stem has average anthocyanin pigmentation with small hairs. The number of flower shoots (in full bloom) more than three. The leaves are medium, elliptical, medium length and width, with an average of anthocyanin coloration, toothed medium depth, marked by powerful rosette of leaves. The flowers are purple in color, collected in spiciform inflorescences at the ends of shoots. Length of inflorescence – 10-12 cm. In conditions of Moscow region the plant blooms in July, flowering lasts for 1,5 months. Seeds ripen in late September. Seeds are small, oblong, smooth, dark brown. Weight of 1000 seeds 1,1-1,5 g. Seeds remain viable for 5-7 years. All aboveground biomass emits a strong, pleasant scent of lilacs. The cultivar has early maturation. Noted abundant accumulation of green biomass even in poor sod-podzolic soils. The cultivar is resistant to diseases and pests. Productivity of basil vegetable (eugenol) green biomass is 3,5-9,0 kg/m^2.

Soil for planting should be nutritious and light in texture. Sowing should be carried out at the beginning of May and in the open ground [1]. Seeds are buried to a depth of 0,5 cm at a distance of 2-3 cm from each other. Seeding rate – 0,5-0,6 g/m^2. Seedlings emerge in 10-12 days. In dry weather Ocimum gratissimum need watering.

Harvesting for food purposes spend 2-3 times per season, prior to or at the beginning of flowering, when the young shoots and leaves are fragrant and rich in ascorbic acid (15-25 mg/100 g), carotene - 7,0-10,0 mg/100 g, routine – 5,3 mg/100 g. When the stems have length near 10-12 cm they should be cut, tie in a bunch for transport or storage. During the period of mass flowering shoots become stiff. At the bottom left vase life of. After cutting leave 1-2 pairs of leaves and the plants fed and loosen the soil in rows.

Basil grows well in the ranks. If necessary, the shoots are dried for storage and future use. For permanent consumption shoots may be cut as needed throughout the summer. Green biomass dried in bunches at t ^{0}C not exceeding 35 ^{0}C. Green biomass often ground into powder for making spice.

Created cultivar Zhemchuzhina Podmoskovja is suitable for cultivation and seed production in the Central region, where most prevalent wet weather conditions during the growing season and seed maturation.

Seeds harvesting is carried out in late September when they are blackening and drying of more than half of the bracts. Seed yield in excessively humid 2013 amounted 8,0-15,0 g/m^2, in 2014 – 30-45 g/m^2. After drying, the seeds must be threshed, cleaned of debris and finally dried. Basil is a cross-pollinated plant. If there are several varieties must be complied spatial isolation or grow one variety.

The cultivar Zhemchuzhina Podmoskovja differs consistently high yield, resistance to abiotic and biotic stress factors and recommended for cultivation in the central region of the Russian Federation.

LITERATURE

1. *Temirbekova S.K., Malakhova E.I., Kulikov I.M. et al.* Basil Vegetable (eugenol) in the conditions of the Russian Federation Central Region // Vegetables of Russia, 2014. - № 3 (24). - P. 48-49.

FLORA AND VEGETATION OF SEMI-DESERT GRASSLAND AREA "CÎŞLIŢA-PRUT"

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Semi-desert grassland sector "Cîşliţa-Prut" (area of 42.8 ha) is located near the Prut riverbed and Prut village (d. Cahul). It is located on the sunny, west-facing slopes of complex meanders of the lower Prut River. The angle of inclination of the slope is 25-40 °, the inclination changes very quickly in places with steeps.

Field research was conducted during 2007-2015 growing season according to the phytocoenological method and route surveys. Floristic research was conducted during the growing season (March-September). Phytosociological surveys were conducted according to the classical methodology of the Zürich-Montpellier school (Braun-Blanquet, 1964).

Semi-desert steppes are formed at the transition from the desert steppe and are characterized by alteration of perennial herbaceous plant communities, xerophyte, with rich plant communities of semi-shrubs, xerophytic unfinished (Postolache 1994, 1995). A phase of semirest during the long summer is characteristic of semi-desert steppe plant communities (Keller, 1923). These and other features of the semi-desert grassland area "Cîşliţa-Prut" were recorded. In the sector "Cîşliţa-Prut", there were 237 species of vascular plants. The spectrum of the bioforms: the therophytes are clearly dominant 41.1%, followed by hemicryptophytes 40%, geophytes 9.2%, fanerophytes 6.7% and chamaephytes 3.3%. The analysis of the phytogeographic elements: Eurasian element 45.1% and pontic species 28.2%, followed by the European 7.6%, Central-European 5.9%, Mediterranean 3.7%, adventive and circumpolar with 2.5% each, cosmopolite 2.1%, Submediterranean 1.2%, Atlantic and Pannonian with 0.4% each. The analysis of the ecologic spectra: the xerophytes 65%, xeromesophytic species 33.3% and amphitolerant 1.6%. The economical plant importance. Analyses of plants from wild flora are represented by relevant categories of economical importance of plants. The most numerous are the medicinal 41.1%, melliferous and industrial 19.1%, fodder 9.3%, alimentary 6%, decorative 3.5% and toxic plants 1.9%. Rare plants. In the steppe "Cîşliţa-Prut", 30 species of vascular plants with varying degrees of rarity were identified. In accordance with the Law on Natural Areas Protected by the State (1998) and International Union for Conservation of Nature (IUCN, 1994), these species are grouped into the following categories of rarity; the plants included in the Red Book of Moldova (RBM, second edition, 2001) belong to 6 species. Plant communities of the "Cîşliţa-Prut" were assigned to nine associations.

In the semi-desert grassland sector "Cîşliţa-Prut", were found 30 species of rare plants, including 6 species of rare plants (*Astragalus dasyanthus*, *Colchium triphyllum*, *Convolvulus lineatus*, *Ephedra distachya*, *Gypsophila glomerata*, *Ornithogalum amphibolum*) that are included in the Red Book of Moldova. Given the presence of rich gene pool (237 species of vascular plants), of which 30 rare plant species, plant communities assigned to the nine associations, it was proposed to establish the semi-desert grassland steppe "Cîşliţa-Prut" with surface 42.8 ha of meadow as protected area named "Cîşliţa-Prut".

BIBLIOGRAPHY

1. Borza A., Boscaiu N., 1965 – Introducere în studiul covorului vegetal, Edit. Acad. Române, Bucureşti.
2. Постолаке Г.Г. Растительность степей Республики Молдова. // Известия АН РМ. Серия биол. и хим. наук. 1993, № 4, с. 3-10.
3. Postolache Gh. Vegetaţia Republicii Moldova, Chişinău, Ştiinţa, 1995. 340 pag.

SPECIES OF *AGRIMONIA* L. (*ROSACEAE* JUSS.) FOR THE FLORA OF BESSARABIA

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Keywords: *Agrimonia, Bessarabia, synonymy, bioecology.*

The genus *Agrimonia* L. includes about 20 species which grow mainly in Eurasia, North and South America, Africa. Into many of these regions, species of this genus have been introduced as medicinal plants. On the territory of Bessarabia, three species have been found: *A. eupatoria* L., *A. procera* Wallr. and *A. pilosa* Ledeb. [2, 4], they grow mainly in glades and forest edges, meadows, orchards and on road edges.

As a result of the research on the genus *Agrimonia* L. (the study of the material collected in the field, the analysis of the exsiccata from the herbarium of the Botanical Garden (I) of ASM, the examination of literature data) [2-4], the bioecological and chorological peculiarities of taxa have been established, the synonymy and the key to species identification have been prepared.

Key to species identification

1a. Leaves with whitish underside. Stem with both short and long eglandular hairs. Mature hypanthium grooved for at least ¾ of its length..... **A. eupatoria**

1b. Leaves green on both sides. Stem with long eglandular hairs only. ……..... **2**

2a. Toothed leaflets with 6-14 teeth on each side, fine pubescent on the dorsal side. Petals golden yellow. Mature hypanthium grooved for half its length. Bristles distinctly deflexed..... **A. procera**

2b. Leaflets at the base with entire margin, cuneate and towards the tip with 4-5 teeth on each side. On the dorsal side hairy only on ribs. Petals pale yellow. Mature hypanthium grooved until the base. External bristles cone-shape directed upwards……..... **A. pilosa**

A. eupatoria L. 1753, Sp. Pl.: 448; Юзепчук 1941, Фл. СССР, 10: 413; Skalický, 1968, Fl. Europ. 2: 32; Гейдеман, 1986, Опред. высш. раст. МССР, изд. 3 : 280; Зиман, 1999, Опред. высш. раст. Укр., изд. 2 : 170; Камелин, 2001, Фл. восточ. Европы, 10: 469; Negru, 2007, Determ. pl. fl. R. Mold.: 132; Ciocârlan, 2009, Fl. Ilus. Rom.: 332. – *A. officinalis* Lam. 1783, Encycl. Méth. Bot. 1: 62.

Eurasian hemicriptophyte, mesophilic, mesothermal, slightly acid-neutrophil species. It grows on grassy slopes, in glades and forest edges, orchards, along the roads. Medicinal plant. Common throughout the country.

A. procera Wallr. 1840, Fl. Hercyn.: 203; Skalický, 1968, Fl. Europ. 2: 32; Гейдеман, 1986, Опред. высш. раст. МССР, изд. 3 : 280; Зиман, 1999, Опред. высш. раст. Укр., изд. 2 : 170; Камелин, 2001, Фл. вост. Европы, 10: 469; Negru, 2007, Determ. pl. fl. R. Mold.: 132; Ciocârlan, 2009, Fl. Ilus. Rom.: 332. – *A. robusta* Andrz. 1860, Enum. Pl. Podol. 1: 36. – *A. odorata* auct. fl. ross. non Mill. : Ledeb. 1844, Fl. Ross. 2: 31, p. p.; Юзепчук, 1941, Фл. СССР, 10: 411.

Eurasian hemicriptophyte, mesophilic, amphitolerant, slightly acid-neutrophil species. It can be found in shady forests, thickens, ruderalised places, river banks. It is found sporadically throughout the flora of the country.

A. pilosa Ledeb. 1823, Index Sem. Horti Dorpat. Suppl.: 1; Юзепчук 1941, Фл. СССР, 10: 418; Skalický, 1968, Fl. Europ. 2: 32; Гейдеман, 1986, Опред. высш. раст. МССР, изд. 3 : 280; Зиман, 1999, Опред. высш. раст. Укр., изд. 2 : 170; Камелин, 2001, Фл. восточ. Европы, 10: 468; Negru, 2007, Determ. pl. fl. R. Mold.: 132; Ciocârlan, 2009, Fl. Ilus. Rom.: 332.

Eurasian hemicriptophyte, mesophilic, mesothermal, slightly acid-neutrophil species. It grows solitary in glades and forest edges. It is a rare species, indicated for forest-steppe districts [4]. The area of distribution of this species includes Central Europe, Siberia, Far East, Caucasus, and Himalayas [3]. The species *A. pilosa* Ledeb. in the flora of Bessarabia needs further field research.

BIBLIOGRAPHY

1. Buia Al., Prodan I. *Flora Republicii Populare Române. Bucureşti: Ed. Academiei Republicii Populare Române,* 1956, vol. IV, p. 697-703.
2. Negru A. *Determinator de plante din flora Republicii Moldova. Chişinău*: Universul, 2007, 391 p.
3. Камелин Р. В. Род *Agrimonia* L. В: *Флора Восточной Европы*. Санкт-Петербург: Мир и Семья, 2001, с. 467-470.
4. Гейдеман Т.С. *Определитель высших растений МССР.* Изд. 3-е, Кишинев: Штиинца, 1986, 637 с.

Коровина О. *Методические указания к систематике растений.* Ленинград: изд. ВИР, 1986, 210 с.

ROSA INODORA FRIES – RARE SPECIES FOR THE FLORA OF THE REPUBLIC OF MOLDOVA

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Keywords: *Rosa, Republic of Moldova, taxonomy, morphology, bioecology*

Within the framework of the field research on the genus *Rosa* L., during the expedition in Leova district, Cneazevca v., a rare species of wild rose has been found: *Rosa inodora* Fries. This species was indicated for the flora of the Republic of Moldova, based only on literature [2,4], near Bahmut v., Calarasi d., this information is still unconfirmed by collecting. We specify that, in the herbarium of the Botanical Garden, there is no exsiccata of this species.

The determination of the taxonomic status was done in laboratory conditions according to the conventional comparative-morphological method [5]. The nomenclature, bioecological peculiarities and synonyms were established according to specialized floristic papers [1-3].

R. inodora Fries, 1814, Nov. Fl. Suec. 1: 9; Бузунова, 2001, Фл. восточ. Европы, 10: 354; Negru, 2007, Determ. pl. fl. Rep. Mold.: 126; – *R. elliptica* Tausch, 1819, Flora (Regensb.), 2, 30: 465; Хржан. 1958, Розы: 305; Klášterský, 1968, Fl. Europ. 2: 31; Гейдеман, 1986, Опред. высш. раст. МССР: 289; Ciocârlan, 2009, Fl. Ilus. Rom.: 338.

It is a 1.5-2 m tall, densely branched shrub, with branches covered with uniform, strong, curved thorns, often grouped or arranged in pairs at the base of the leaves. Its leaves are alternate, 8-9 cm long; the rachis is covered with many glands, rare hairs and small, uncinate thorns; the leaves are composed of 7 leaflets, which are elliptic to narrow elliptic, cuneate, with pointed or rounded tip, with entire margin at the base and double-toothed towards the tip, with glands on top of the teeth, on the upper surface hairy to glabrous, on the inferior one glandular mixed with simple hairs, mainly on ribs; stipellae on both sides glabrous or sparsely hairy, glandular-ciliated on margins. Flowers are solitary or grouped in inflorescences by 3-8, pale pink to white. Pedicels are 15-19 mm long, glabrous. Sepals are narrow, glandular-ciliated on margins, after flowering erect or horizontally patent. Hairy styles. Receptacle fructiferous ovoid, glabrous, dark red.

The population found near Cîzlear village represents a new point where this species grows and is composed of about 20 mature specimens, on an area of about 2 hectares, which grow solitary or in small groups, on a slope with North-Eastern exposition (N 46 38.206', E 028 32.126').

Rosa inodora Fries, a rare species for the flora of the Republic of Moldova, is quite widespread in Central and Eastern Europe and in the Mediterranean region, it grows on sunny slopes, rocky hills, in groves and forest edges.

This taxon is found at the eastern boundary of the specific spreading area, it is characterized by high vulnerability to environmental and anthropogenic factors, that's why it needs conservation measures such as including it in the List of Species Protected by the State, highlighting and taking the areas where it grows under protection, monitoring the population status.

BIBLIOGRAPHY

1. Buia Al., Prodan I. *Flora Republicii Populare Române. Bucureşti: Ed. Academiei Republicii Populare Române*, 1956, vol. IV, p. 802.
2. Negru A. *Determinator de plante din flora Republicii Moldova. Chişinău*: Universul, 2007, 391 p.
3. Бузунова И. Род *Rosa* L. В: *Флора Восточной Европы*. Санкт-Петербург: Мир и Семья, 2001, с. 329-361.
4. Гейдеман Т.С. *Определитель высших растений МССР. Кишинев: Штиинца*, 1986, 637 с.

Коровина О. *Методические указания к систематике растений.* Ленинград: изд. ВИР, 1986, 210 с.

SYNTHESIS OF THE NEW GRAPE GENOME AS A REMARKABLE ACHIEVEMENT IN THE CYTOGENETICS OF *VITIS VINIFERA* L.

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Key words: *backcross, vinifera, rotundifoloa, distant, hybrid, synthesis, genome*

The preliminary synthesis of the new grape genome was certainly initiated in the USA by A.P.Wylie (1868-'71), who was the first to obtain the F_1 hybrids from the cultivated species *Vitis vinifera* L. (2n=38, Euvitis subgene) and the American spontaneous species – *V.rotundifolia* Michx. (2n=40, Muscadinia subgene). Through the backcrossings of the F_1 hybrids (N.C.- 6-15; N.C.- 6-16) with the European and local varieties R.T.Dunstan (1962-'64) has created the F_2 hybrids – the so called DRXs: DRX -58-5; DRX-55; etc. in the USA too. Here is the end of the stage of the new grape genome's preliminary synthesis, which has resulted in creation of 2 generations (F_1,F_2) of distant hybrids, with a somatic number of chromosomes 2n=39, i.e. two complete haploid sets (n=19 and n=20) from the parent species – *V.vinifera* and *V.rotundifolia*, respectively.

The key problem caused by the high sterility of the distant hybrids, which hampered their involvement in the improvement process has been resolved by us by performing the intensive backcrossings under the *in-situ* conditions, with fresh pollen or with that conserved in liquid nitrogen. These were the backcrossings that started and urged *continuation* of the biochemical reactions of *a true synthesis of the new grape genome*. In 1982, based on the DRX-55 hybrid, a „plant mule" with 2n=39, under the *in-situ* conditions the first backcross was conducted with the hybrid Aramon x V.riparia. As a result, the first 32 indigenous hybrids were created in Moldova. 15 backcrossings of the DRX-55 hybrid with Seyve Villarii, initial species, polyploid forms and *V.vinifera* varieties were performed in 1984. Therefore, 412, and totally 444 distant indigenous hybrids were created, which made up conventionally F_3 or the BC_2 population. The synthesis itself of the *new grape genome* started and resulted in the partially fertile hybrids of F_3 under the *in-situ* conditions in the NIWW, and under the *ex-situ* conditions at the Botanical Garden (I.) of the SAM and in the NIWW as well. The appearance and presence of the normal pollen grains in the pollen sacs along with the sterile grains proved that namely here, at this moment, the final stage of the process itself of the *true synthesis of the new genome* started and took its course, which got realized under the *ex-situ* conditions under the interaction of the internal and external factors. In 1987 in the F_3 hybrids, which started yielding, the process of the new genome synthesis quickened, by conducting 2 backcrossings with hybrids of Seyve Villari: DRX-M_3-90 x S.V.20-366 and DRX-M_3-232 x S.V.-12-309. As a result, it was created a new population of the distant hybrids in the number of > 200, which has made up F_4 or the BC_3 progeny. From the backcrosses with F_4 as a mother plant (♀), while the various European varieties were father plants (♂), approx. 80 plants have been obtained, conventionally F_5 or the BC_4 progeny. The F_5 generation was planted in 2001 on the experimental land plot of the NIWW. In the third year, some of the hybrids blossomed and judging from the normal size and form of the pollen grains, similar to that of the standard hermaphrodite grape varieties, we assert that the meiosis flows without any disorders, and the fertility according to the size of the grapes of the F_5 distant hybrids was reestablished additionally.

Hence, it was the first time in the world that **the new grapevine genome synthesis** was performed successfully, that is the haploid set of **–n=19** was reconstituted from the chromosomes of the genome of *V.vinifera* –**n=19** and the chromosomes of the species of *V.rotundifolia*-**n=20**, the value of which is absolute resistance to disease and phylloxera. The synthesogenesis of the synthetic species and the elimination of the single chromosome, the scandalous 39th „troublemaker", from the karyotype (nucleus) in the cytoplasm, which is a cause of the pollen sterility and the zero fertility of the ovules in F_1, F_2 and partially in the hybrids of F_3 and F_4 took place under the effect of the backcrossings. Thus, the unique process of synthesis was performed in 5 main stages, which flowed consecutively and ended with the complete, irreversible and definitive *synthesis of the new grape genome.*

BIBLIOGRAPHY:

Topală Ș.Gh. *Cariologia, poliploidia și hibridarea distantă a viței de vie (sistematica și citogenetica viței de vie).* Ediția a 2-a revăzută și completată.- Chișinău.- 2013.-p.538.

BREEDING INVESTIGATION IN ORDER TO IMPROVE THE PRODUCTIVITY AND QUALITY OF PROTEIN OF MAIZE

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Keywords: *Hybrid, Lines, Maize opaque-2, Quality protein, Gene's recombination.*

It is known that the grain protein of ordinary maize has a low biological value due to deficiencies of balance of amino acid content. Therefore improving the limited content of amino acids like lysine, tryptophan, threonine and others is an important objective for maize breeding. The scientific works on improving the quality of maize protein began after the discovery of the biochemical effect of the recessive gene opaque-2 (o2), which transformed a horny endosperm in floury texture of the endosperm and changed the synthesis of protein fractions. In consequence of the redistribution of protein fractions' conditions, considerably reduces the zein content and increases the content of albumins, globulins and glutamines of fractions rich in lysine, tryptophan and other essential amino acids. The opaque-2 maize with high content of lysine guarantees the nutritive value of grain used in food of people and forage of animals.

In this paper, we presented the progress of our breeding research in order to improve quality of maize. As a result of our work during long time (1076-2014 years), numerous forms of inbred lines and hybrids of o2 maize were created. The initial material of working collection consists of more than 550 inbred lines with grain o2 and mo2, gene recombination as o2su2, o2wx1, lines higher in protein and higher in oil. Their matching has a high combining ability for productivity, resistance to diseases of plant, ear and grain, tolerance to drought and high temperature etc. More than 70 inbred lines with high quality of grain ware included in World Collection of Plant Genetic Resources of All-Russian Research Institute of Plant Genetic Resources N. I. Vavilov from Saint Petersburg city and Centre of Genetic Vegetable Sources of the Scientific Research Institutes of ISC of the Republic of Moldova too.
After application of the new lines in crossing, a lot of hybrids of opaque-2 maize were created and evaluated, including those with high content of protein, oil and modified grain.

Recently, two competitive o2 hybrids were regionalized: Chisinau 307 PL and Chisinau 401 L mo2. The Chisinau 307PL manifested a high content of protein (12.0-12.5%) and lysine (4.12-4.50%) in grain and yield – till 14.9 t/ha. The Chisinau 401 L mo2 has a modified structure of endosperm grain, protein content about 10.8% and 3.98-4.00% – of lysine, and kernel yield – till 15.9 t/ha. The lysine production of these hybrids is 34 kg/ha and 30 kg/ha, respectively. The nutritive value of grain of hybrid Chisinau 307 PL used as fodder for pigs, showed a higher nutritious capacity with 49.5% more in comparison with normal maize. The hybrids may be cultivated up to 50-55 thousands plants per ha in all agrarian farms of our country.

At the time, we can submit to the *State* Commission for Plant *Variety Testing*, two new hybrids with high productivity and quality of grain.

The hybrids of maize with high quality of grain represent important raw material for fodder, contribute to reducing the protein malnutrition of humans, the cost of feed supplement for monogastric animals and promote the improvement of economical efficiency of agricultural branches.

PROGRESS OF IMPROVING THE QUALITY OF STARCH IN WAXY-1 MAIZE

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Keywords: *Amylopectin starch, Botanical taxa, Hybrid, Lines, Maize wx1.*

The spontaneous mutation of maize endosperm offers a large genetic diversity which gives great possibilities to find important resources and new combinations of genes, in order to improve the quality of maize kernel. Among this wide variability, the waxy-1 (wx1) genes determine only the synthesis of amylopectin fraction from starch in grain. The amylopectin starch, in its turn, is used a lot for: dietetic food and food for children, macaroni, sugar products (glucose, fructose, maltose and glucose – fructose syrup), substitute of blood (oxiethyl starch or valicham), glue production and other branches of modern economy of high developed countries of the world.

The results of our long-term study consist in creation of the new initial material and hybrids of waxy-1 maize with yellow and white grain. This biological material was obtained by using methods as backcross, hybridization, standard with multiple self-pollination and successive selection of promising maize genotypes. Our working collection was represented by more than 175 inbred lines (level S6-S7) of waxy-1 special maize which were, for the first time, systematized in four botanical varieties. Out of them, two new botanical taxa were suggested by us under the names **alborubraceratiha**, which includes inbred lines with white grain and red rachis, and **luteorubraceratina**, which includes inbred lines with yellow grain and red rachis (table 1).

Table 1. The varieties of initial material of waxy-1 maize (*Zea mays* L. subsp. Ceratina)

No.	Variety	Color		Quantity of Inbred lines	%
		grain	rachis		
1.	Var. alboceratina (Kulesh. et	white	white	28	17.1
2.	Kozhuch.)	yellow	white	26	14.9
3.	Var. luteoceratina (Kulesh. et	white	red	40	24.0
4.	Kozhuch.)	yellow	red	81	44.0
	Var. alborubraceratina (Tsiganas)				
	Var. luteorubraceratina (Tsiganas)				
	Total	-	-	175	100

The majority of the inbred lines belong to the luteorubraceratina variety because the signs of yellow colour of grain and red colour of rachis are controlled by dominant genes of maize plant. As a result of assessing the general combining ability, a lot of lines of wx1 maize, the most valuable ones, were selected. These lines show minimal depressions and basically are homozygous according to plant, ear and grain characteristics. According to biochemical properties, these lines have high starch content, from 70.1% to 73.2%, which consist only of amylopectin, a polymer with branched molecule and superior physical and chemical properties in comparison with amylose from starch. The newly developed lines contribute to increase the genetic diversity of waxy-1 maize, to synthesize competitive hybrids with valuable technological and food features and can be used as initial material for improvement of productivity of waxy-1 maize. Some of these inbred lines came in component of numerous hybrids.

At present, five of our single-cross wx1 hybrids were regionalized in the Republic of Moldova, such as: Chisinau 297 wx1;Y, Chisinau 333 wx1;Y, Chisinau 403 wx1;Y, Stalker (regionalized in Ukraine, was created in collaboration with Ukrainian breeders) wall with yellow grain and Chisinau 297 wx1;y with white grain. Now, there is at State Plant Testing of RM a new single-cross wx1 hybrid with white grain named Chisinau 335 wx1;y.

The wx1 hybrids represent the main source of amylopectin starch as raw material for industry. Also, the inbred lines and hybrids of waxy-1 maize may be used in diverse scientific research programs on breeding and genetics in order to improve the quality of maize grain in our country and abroad.

THE INFLUENCE OF SEED AGE ON GERMINATION ENERGY AND GERMINATION PERCENTAGE OF *GALEGA ORIENTALIS* LAM.

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Keywords: *Galega orientalis Lam, seeds, germination, energy, percentage*

Perennial legumes play an important role in fodder production in our country and their spreading is largely influenced by longevity and viability of seeds. In the process of evolution, some plants, for example – some legumes, have obtained some morphological characteristics, concerning the seed structure, that have led to the formation of a hard coat which maintains seed viability under adverse conditions and with age. This type of seeds is also specific to *Galega orientalis* Lam. – fodder, melliferous and promising energy plant species.

1, 2, 3, 4, 20 and 23 year-old seeds of *Galega orientalis* Lam., which had been harvested from the collection of fodder plants of the Botanical Garden (Institute) of the ASM, were used as material for research. In order to determine the germination energy and the germination percentage, the method for determining the germination of the seeds of agricultural crops was used: „Семена сельскохозяйственных культур. Методы определения всхожести, ГОСТ 12038-84" [1].

In order to determine the germination energy and the germination percentage, according to the above mentioned method, there were taken 6 samples of 50 seeds each (in 2 repetitions) from different years of harvesting – 1 (2014), 2 (2013), 3 (2012), 20 (1995) and 23 (1992) year-old seeds. The seeds were placed in Petri dishes on filter paper and placed in a thermostat for 14 days under conditions of constant temperature of 20 ºC and lack of light.

On the third day, according to the method, the germination energy was determined; it turned out to be higher in seeds that had been harvested in 1992 and 2013 – about 8%. Seeds harvested in 1995 and 2012 had germination energy of 4%. The lowest germination energy index was in one year-old seeds, harvested in 2014; in this case the percentage was practically zero.

In order to determine the germination percentage, seeds were counted on the 14th day according to the method. It was observed that seeds harvested 1 year ago (2014) have the lowest germination percentage – about 4%, being followed by the germination percentage of seeds harvested 23 years ago (1992) – 32%. The seeds harvested 3 years ago (2012) – 58% and those harvested 20 years ago (1995) – about 58% are at approximately the same level of germination percentage. The highest germination percentage was found in seeds harvested in 2013 – about 76%. It should be noted that about 4% of seeds from each sample got mouldy during the test, being omitted, and the rest of the seeds that didn't germinate were classified as hard seeds. According to the method, hard seeds of forage legumes are also considered capable of germination.

Since the seeds of *Galega orientalis* Lam. have a very hard coat, in order to increase their germination percentage and germination energy, mechanical, chemical or thermic scarification is necessary [2]. Mechanical scarification, after which it was observed that germination energy reached up to 94% and the germination percentage reached up to 98%, regardless of the year of harvesting, is the most frequently used and the safest for health.

In conclusion, it should be mentioned that the seeds of *Galega orientalis* Lam., due to their properties and their hard coat, can retain their viability, under appropriate conditions, even over 23 years.Germination energy and germination percentage are higher in seeds that were harvested several years ago than in recently harvested ones (which haven't been scarified). This is possible due to the fact that some of the cells from the layers of the hard coat that protects the seed are destroyed in the course of time, increasing permeability.

Bibliography

1. Министерство сельского хозяйства СССР - *Семена сельскохозяйственных культур. Методы определения всхожести*, Утверждён: 19.12.1984 Госстандарт СССР (USSR Gosstandart 4710), Издан: Стандартинформ (2011 г.).

Андрей Евгеньевич - *Скарификация семян как прием адаптивной технологии возделывания колятника восточного (Galega orientalis Lam.)*, Сборники статей / Стратегия и тактика экономически целесообразной адаптивной интенсификации земледелия Том 1, 2013

COPPER DISTRIBUTION IN DIFFERENT FRACTIONS EXTRACTED FROM SPIRULINA BIOMASS

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The difference of the structure of the cell membrane and the cell wall to different groups of microorganisms, algae, bacteria, fungi and cyanobacteria leads to a significant difference concerning the mechanisms of metal binding to the cellular components. Thus, most of microelements, as a result of entering the cyanobacterial cells, form bonds with the molecules of organic compounds as proteins, lipids, polysaccharides, amino acids etc. If the microelements are in excess they are stored in specific configurations being stored in inactive and non toxic form for the cell.

The absorption capacity of heavy metals by cyanobacteria is mainly due to the protein-COO- groups and the secondary functional chains of amino acids such as histidine, cysteine, aspartic acid and glutamic acid. The histidine and carboxylic group effectively bind Cu(II) because of its bidentate structure. The copper, in high quantities being toxic and penetrating into the cell, forms complexes with proteins as the free ion can cause the oxidative stress and leads to the lipids oxidation and macromolecules degeneration.

The obtained results concerning the copper accumulation in the biomass of Spirulina showed interest to study with what organic components of the biomass the intracellular accumulated copper was bound. The fractionation method of the biomass of Spirulina was based on the solubility of the cellular constituents in different solvents combining some of the known and described methods.

Thus, as a result of Spirulina biomass fractionation cultivated in the presence of the compounds [Cu(L^9-2H)] and [Cu(L^{11}-H)Br] in a concentration of 2.00 and 6.00 mg/L respectively, compounds that lead to the maximum accumulation of copper in Spirulina biomass (10.63 and 11.14 mg%), it proved that the total amount of copper accumulated in the biomass, the most important weight of copper is due to the fraction of carbohydrates and peptides with amino acids (Figure 1).

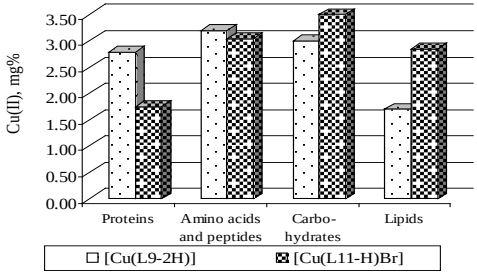

Fig. 1. Distribution of copper in fractions extracted from Spirulina biomass cultivated in the presence of 2.00 mg/L – [Cu(L^9-2H)] and 6.00 mg/L – [Cu(L^{11}-H)Br]

As a result of the fractionation of Spirulina biomass cultivated in the presence of the compound [Cu(L^9-2H)] it was known that from the total amount of copper accumulated in the biomass, the highest content of copper was bound with the fraction of peptides and amino acids – 30.10% (3.20 mg%) and the carbohydrates fraction – 28.22% (3.00 mg%). The copper incorporated into protein molecules represents 26.25% of the total copper and the most decreased content was detected in the lipid fraction and constitutes about 15.99% of the total copper in the biomass.

The researches carried out in the cultivation of Spirulina in the presence of coordination compound [Cu(L^{11}-H)Br] have shown that the accumulated copper content is 11.14 mg% from ADB. The maximum weight of copper is due to the carbohydrates and peptides fraction with amino acids constituting 31.42% (3.5 mg%) and 27.29% (3.04 mg%), respectively, from the total copper, followed by the lipid fraction – 25.58% (2.85 mg%). In the case of Spirulina cultivation in the presence of the coordination compound of copper [Cu(L^{11}-H)Br], the protein molecules from Spirulina biomass bind a smaller amount of copper compared to the compound [Cu(L^9-2H)] and constitute 15.71% (1.75 mg%) of the total copper accumulated in the biomass.

PERSPECTIVES OF INTRODUCTION GYMNOSPERMS IN MOLDOVA

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Key words: *Pinophyta, mobilization, families, genera, species.*

Currently, the division gymnosperms (*Pinophyta*) is subdivided into 7 orders, 12 families, 83 genera and about 1100 species [2, 3, 4], including more than 300 species of cycads (*Cycadidae*), 1 species of Ginkgo (*Ginkgoidae*), about 100 species of gnetophytes (*Gnetidae*) and more than 680 species of conifers (*Pinidae*).

As a result of the researches on identification of the taxonomic composition of gymnosperms in the Republic of Moldova, 161 species and about 650 cultivars, belonging to 28 genera and 6 families, were found [1]. The genera represented by the greatest number of taxa are: *Picea* (24 species, 125 cultivars); *Thuja* (3, 82); *Juniperus* (22, 105); *Pinus* (38, 92); *Chamaecyparis* (5, 82); *Abies* (25, 37); *Larix* (11, 16).

The results of years of experience in introducing gymnosperms in the conditions of our region point to great opportunities to enrich the range of new species and cultivars. A significant increase in the number of species is real due to the richest genera, such as: *Pinus*, *Abies*, *Picea*, *Juniperus*, *Ephedra*. In this connection, 164 species belonging to 29 genera and 6 families are recommended for the primary testing.

Family ***Ephedraceae*** (***Ephedra*** *antisyphilitica, E. americana, E. aspera, E. aurantiaca, E. botschantzevii, E. californica, E. cutleri, E. dahurica, E. fasciculate, E. funerea, E. glauca, E. lomatolepis, E. monosperma, E. nevadensis, E. pedunculata, E. procera, E. przewalskii, E. pseudodistachya, E. sinica, E. strobilacea, E. torreyana, E. trifurca, E. viridis, E. vvedenskyi*).

Family ***Pinaceae*** (***Abies*** *beshanzuensis, A. bornmuelleriana, A. bracteata, A. chengii, A. chensiensis, A. delavayi, A. densa, A. durangensis, A. farbi, A. fargesii, A. firma, A. grandis, A. kawakami, A. magnifica, A. mariesii, A. nebrodensis, A. squamata, A. vajarii,* ***Cathaya*** *argyrophylla,* ***Cedrus*** *brevifolia,* ***Keteleeria*** *davidiana, K. evelyniana, K. fortunei,* ***Larix*** *griffithii, L. lyallii, L. potaninii,* ***Nothotsuga*** *longibracteata,* ***Picea*** *aurantiaca, P. brachytyla, P. chihuahuana, P. crassifolia, P. farreri, P. koyamae, P. likiangensis, P. linzhiensis, P. martinezii, P. maximowiczii, P. meyeri, P. morrisonicola, P. retroflexa, P. spinulosa, P. wilsonii,* ***Pinus*** *albicaulis, P. arizonica, P. attenuata, P. ayacahuite, P. balforiana, P. cembroides, P. clausa, P. coulteri, P. culminicola, P. densata, P. douglasiana, P. echinata, P. edulus, P. engelmannii, P. gerardiana, P. hartwegii, P. henryi, P. lambertiana, P. massoniana, P. monophylla, P. monticola, P. muricata, P. palustris, P. penthaphylla, P. pinceana, P. pungens, P. quadrifolia, P. radiata, P. rigida, P. sabineana, P. serotina, P. tabuliformis, P. virginiana, P. yunnanensis,* ***Pseudotsuga*** *japonica, P. macrocarpa, P. sinensis,* ***Tsuga*** *caroliniana, T. chinensis, T. heterophylla, T. sieboldii*).

Family ***Araucariaceae*** (***Araucaria*** *araucana, A. cunninghamii*).

Family ***Podocarpaceae*** (***Podocarpus*** *acutifolius, P. chingianus, P. cunninghamii, P. fasciculus, P. humbertii, P. lawrencei, P. macrophyllus, P. nivalis, P. nubigenus,* ***Prumnopitys*** *andina, P. axigua,* ***Saxegothaea*** *conspicua*).

Family ***Cupressaceae*** (***Austrocedrus*** *chilensis,* ***Chamaecyparis*** *formosensis,* ***Fitzroya*** *patagonica,* ***Libocedrus*** *plumosa,* ***Cupressus*** *bakeri, C. chengiana, C. gigantea, C. macrocarpa, C. funebris,* ***Juniperus*** *cedrus, J. coahuilensis, J. convallium, J. formosana, J. indica, J. komarovii, J. monosperma, J. monticola, J. oblonga, J. occidentalis, J. osteosperma, J. pachyphlaea, J. pingii, J. przewalskii, J. recurva, J. saltuaria, J. standleyi, J. tibetica,* ***Pilgerodendron*** *uviferum,* ***Sequoia*** *sempervirens,* ***Taiwania*** *cryptomeriodes,* ***Thuja*** *koraiensis, Th. sutchuenensis*).

Family ***Taxaceae*** (***Taxus*** *brevifolia, T. contorta, T. mairei, T. wallichiana,* ***Cephalotaxus*** *hainanensis, C. lanceolata, C. latifolia, C. sinensis,* ***Pseudotaxus*** *chienii,* ***Torreya*** *californica, T. fargesii*)

The enrichment of the collection is also possible on the basis of a huge diversity of ornamental cultivars, varieties and forms.

BIBLIOGRAPHY

1. Bucatsel, V. *Analysis and prognosis of results introduction gymnosperms from the world flora in the conditions of Republic Moldova*. Journal of Botany, 2014, vol. VI, nr 2(9), p. 137-145.
2. Christenhusz, M.J.M., J.L. Reveal, A. Farjon et al. *A new classification and linear sequence of extant gymnosperms*. Phytotaxa, Magnolia Press, 2011, p. 57–70.
3. Encyclopedia of Conifers: Comprehensive Guide to Cultivars and Species by Aris G. Auders and Derek P. Spicer, 2012, Hardcover, 2 vol., 1507 p.
4. Farjon, A. *Handbook of the World's Conifers*. Leiden, Boston: Phytotaxa. Magnolia Press, 2011.

SOME BIOLOGAL AND PHYTOCHEMICAL ASPECTS OF *MONARDA FISTULOSA* L. SPECIES FROM CENTER OF MEDICINAL PLANT CULTIVATION OF USMF "NICOLAE TESTEMITANU"

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Keywords: *Monarda fistulosa, biometry, microscopy, flavonoids, tannins*

Monarda fistulosa L., the common name – wild bergamot is known in spontaneous flora of North America (from Quebec to the Northwest territories and British Columbia, South to Georgia, Texas, Arizona, Idaho, and Washington) and today is cultivated in American, European and Asian countries as ornamental, aromatic, culinary and medicinal plant. The wild bergamot vegetable drug is characterized by especially volatile oils content, flavonoids and tannins with multiple therapeutic effects [1, 2]. That is why *M.fistulosa* was introduced in collection of plants of Center of Medicinal Plant Cultivation of USMF "Nicolae Testemitanu" in 2009 and it has been grown as three chemotypes – violet (with the highest content of corvacrol), purple (with thymol) and white (mixed – corvacrol and thymol) [1].

In the wild bergamot plantation, were made phenological observations, biometric measurements to plants and collecting of vegetable products (*Monardae folia, M. flores and M. herba*) for microscopic and phytochemical analyses. The importance of this study is to determine which of the three chemotypes (white, violet and purple) is most suitable to be cultivated in the pedoclimatic conditions of the Republic of Moldova and to elucidate the best vegetable product of *M.fistulosa* L. as a source of phenolic compounds, also to establish the microscopic indices to identify the vegetable products.

Wild bergamot vegetable products (leaves, flowers, aerial parts) were used for microscopic analyses, qualitative study of flavonoids and tannins by specific colour or sedimentation reactions and thin layer cromatography, dosing of flavonoids – spectrophotometrically and tannins – titrimetrically.

The highest biometric values (plant height, number or branches, number of flower clusters, leaf size) were referred for violet, then purple and white chemotypes of wild bergamot. Microscopic indices for all vegetable products are: 2 types of secretory hairs, one – short stipe and 8-cellular gland with brownish content and other – 2-3 cells stipe and unicellular gland; dens uni- and multicellular protective trichomes, especially on lower surface of the leaves and bracts. The highest frequency of secretory hairs with 8-cellular gland was mentioned on leaves, bracts and petals.

Qualitative analysis of flavonoids shows the presence of flavonoid constituents with varying degrees of intensity: in leaves – chalcones and aurons (+++), hydroxyflavone (+); in aerial parts – chalcones and aurons (+), hydroxyflavone (++) and anthocyanins (++); but in flowers, only – hydroxyflavone (+++) and anthocyanins (+++).

In flowers, it was found the highest content of flavonoids – 2.87 %, followed by aerial parts – 2.79% and in the leaves – the lowest content (2.73%). Screening of colour and sedimentation reactions in the all extracts denotes only the presence of condensed tannins with different intensity in all analyzed specimens. Dosage of tannins by titrimetric method showed that the leaves have higher content of tannins – 17.2%, than the flowers – 12.4% and the lowest is in the aerial parts – 9.0% of *M.fistulosa* plant.

Flavonoids and tannins content of vegetable drugs of *M. fistulosa* grown in pedoclimatic conditions of the Republic of Moldova varies: aerial parts with the highest content of both (flavonoids and tannins), while flowers containing a maximum of flavonoids and minimum of tannins, and leaves – contrary. The importance of this study is that species *Monarda fistulosa* L. is suitable to be cultivated in the pedoclimatic conditions of the Republic of Moldova as a new medicinal plant for our region with rich specter of active principles.

BIBLIOGRAPHY:

1. Mazza, G., F.A. Kiehn, and H.H. Marshall. *Monarda: A source of geraniol, linalool, thymol and carvacrol-rich essential oils.* In: J. Janick and J.E. Simon (eds.), New crops. Wiley, New York. 1993. p. 628-631.
2. Joy R. Borchardt, Donald L. Wyse, Craig C. Sheaffer et al. *Antimicrobial activity of native and naturalized plants of Minnesota and Wisconsin.* Journal of Medicinal Plants Research Vol. 2(5), 2008, p. 098-110.

BIOLOGICAL ASPECTS OF THE INTRODUCTION OF *CARDIOSPERMUM HALICACABUM* L. IN THE BOTANICAL GARDEN OF THE ASM

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Key words: *Cardiospermum, medicinal, seeds, seedling, flower*

Cardiospermum halicacabum L. is a species of *Sapindaceae* family, it is woody at the base, evergreen, climbing, annual or biennial plant native to India, Africa and South America. A sample of seeds, which we obtained from the Institute of MAP- BATEM Antalya, in the climate conditions of Moldova, is an herbaceous, annual climbing plant, having medicinal, culinary and decorative properties.

This type of *Cardiospermum* contains many biologically active substances. Among them – triterpene saponins, quebrachitol, halic acid, tannins, pentacyclic terpenes (glutinon, β- amirenon, β-amyrin), sterols (β-sitotsterol, campesterol, stigmasterol), flavonoids, fatty oil (33%), which include arachidonic, 11 eicosenoic, linolenic, linoleic, oleic and other acids. Phytosterols that are contained in the plant have a similar chemical structure to cholesterol, are able to penetrate the cell membrane. In addition, phytosterols can effectively inhibit inflammation and relieve itching skin diseases (1).

The aboveground part of the plant, collected during flowering, the dried leaves and seeds fatty oil are used for medicinal purposes. The drug is prescribed for chronic dermatoses, including atopic dermatitis, cumulative-toxic contact eczema, atopic eczema. In studies, the drugs obtained from this plant are compared with cortisone. In numerous clinical studies conducted in various countries, the drugs obtained from this plant have been proven effective and safe, primarily in the form of an ointment for topical treatment of various forms of eczema (2). *Cardiospermum* extracts included in cosmetic products are an effective protection from the negative effects of the environment: sun, wind, cold, dust. It has a pronounced anti-allergic effect (3). The stems and leaves are edible and are used as green vegetables.

Cardiospermum halicacabum plants were propagated by seeds sown directly into the ground at their intended places and 60-day seedlings pricked out later into individual pots with fertile soil. The method of propagation by cuttings of green shoots that rooted for 20-25 days has also been applied successfully.

Seedlings were transplanted after the danger of frost had passed. In the second half of May, the plants were transplanted into nutrient soil in a sunny and protected from the wind place. This species is undemanding to soil, but lighter soil with pH 6.1-8.5 is preferable. In this period, *Cardiospermum* plants were attached to the supports. They were watered abundantly and often.

After 35-40 days, the liana-like *Cardiospermum* plants had thin, branching, green shoots, 5-6 grooved, glabrous or slightly hairy. The leaves are opposite, triangular in outline, 15-20 cm long, pinnatifid, of 7-9 oblong-oval, deeply toothed, bright green leaves, slightly pubescent on veins, petioles are 3-4 cm long.

The flowers are small, 0.5 cm in diameter, greenish-white, consisting of 4 reverse-ovate petals and 4 ciliated sepals. There are 8 stamens in the male flowers, in the female flowers – without anthers. The pistil – with three-lobed stigma. The ovary – angular, with three nests, in each nest – one ovule. Inflorescence – panicle of flowers with a pair of several antennae on pedicel 4-8 cm long.

Decorative light-green, later – brownish hairy seed pods are pubescent, ellipsoid, triangular bubbles with shiny, black, spherical, 1.0-1.4 cm long seeds with a spot like a white heart, they ripen in September. In each box there are three achenes.

Thus, in the climatic conditions of Moldova, for *Cardiospermum halicacabum* L., the methods of reproduction, in which the plants pass all the ontogenetic cycles, forming many viable seeds, were identified.

BIBLIOGRAPHY

1. *Chandra, T., and Sadique, J.: Anti-inflammatory effect of the medicinal plant Cardiospermum halicacabum L. In vitro Study. Arogya* – J. Health Science. 1984; X: 57-56.
2. *Gopalakrishnan, C. Dhananjayan, D. and Kameswaran, L.: Stidies on the pharmacological actions of Cardiospermum halicacabum.* Ind. J Physioloy. Pharmacoloy 1976; 20: 203-208.
3. *Sadique, J. Chandra, T. Thenmozhi, V. and Elango, V.:Biochemical modes of action of Cassia occidentalis and Cardiospermum halicacabum in inflammation.* J. Ethnopharmacol. 1987;19: 201-212.

Watt, J. M., and Dreyer-Drandwijk, M.G.: The medicinal and poisonous plants of Southern and Eastern Africa. E. & S. Livingstone Ltd., Edinburg, London 1962, P. 930

STUDIES CONCERNING MEDICINAL *LAMIACEAE* SPECIES IN THE BOTANICAL GARDEN (I) OF ASM

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Key words*: Lamiaceae, Ajuga, Teucrium, Satureja, Origanum, Nepeta*

Lamiaceae family comprises a large number of genera and species with economic value due to their use as medicinal, ornamental and aromatic plants. Recent studies [1, 2] showed that the medicinal plants belonging to the *Lamiaceae* family, in particular to the subfamily *Lamioideae* are very important for the antimicrobial, antifungal, antibacterial and antioxidant activities.

This paper refers to the biomorphological peculiarities and preliminary phytochemical results of the species of the genera: *Ajuga* L., *Satureja* L., *Teucrium* L, *Origanum* L. and *Nepeta* L. cultivated in the collection of medicinal and aromatic plants in the Botanical Garden (I) of ASM.

Spontaneous *Ajuga* L. species (*Ajuga reptans* L. and *A. genevensis* L.) with significant medicinal value are included in the collection of medicinal plants. The monitoring of the plants during vegetative period relates positive results and demonstrated a good adaptation in culture conditions, requiring very little maintenance. Phytochemical study conducted on *A. reptans* and *A. genevensis* samples highlighted the presence of total polyphenols, phenolic acids, essential oil and flavonoids. Methanol extracts of both *A. genevensis* and *A. reptans* demonstrated antioxidant activity; the extracts of *A. reptans* demonstrated higher radical scavenging capacity.

Six species of the genus *Satureja* L. (*Satureja montana* L., *S. kitaibelii* Wierzb., *S. parnassica* Heldr. et. Sart ex. Boiss., *S. thymbra* L., *S. subspicata* Bartl. ex. Vis., and *S. calamintha* (L.) Scheele) were included in the research agenda. The investigation results showed that the species *S. montana*, *S. kitaibelii* and *S. parnassica* are aromatic and medicinal plants with promising therapeutic effect which grow and develop successfully in the climatic conditions of Republic of Moldova. Results regarding the content and chemical composition of essential oils, argue also, for important therapeutic value of these plants. High content of carvacrol registered in *S. montana* and *S. parnassica* attribute to the plants antimicrobial, antimycotic and antifungal qualities, representing an important source of raw material for the pharmaceutical industry.

Species belonging to the genus *Teucrium* L. (*Teucrium chamaedrys* L., *T. montanum* L. and *T. polium* L.) contain a wide variety of bioactive substances that make them very important from pharmacological point of view. Recent studies suggest that some *Teucrium* L. species are found to be rich natural sources of new anticancer compounds. Their plant extracts and isolated compound possess strong anticancer activity. Three *Teucrium* species (*T. chamaedrys, T. polium* and *T. montanum*) are cultivated on the experimental fields in the Botanical Garden of ASM in order to observe their reproductive behavior and accumulate experience on their agro-technical peculiarities. The fenologic observations and morphologic measurements demonstrate an intensive vegetative growth with abundant flowering for *T. chamaedrys* and *T. polium* species.

The ample biological and phytochemical studies of *Origanum* L. (*Origanum vulgare* L., *O. onites* L., *O. hirtum* Link, *O. kopetdaghense* Boriss., *O. prismaticum* L. and *O. creticum* L .) grown in herb collection were undertaken. Investigated species are important sources of essential oils, containing increased amounts of thymol and carvacrol, requested these days in the medication and food industry.

In the collection of medicinal plants, *Nepeta* L. genus is represented by six species (*Nepeta cataria* L., *N. cataria* L. var. *citriodora*, *N. transcaucasica* Grossh., *N. camphorata, N. pannonica* L. and N. *parviflora* Bieb.). The results of the experiments on cultivation of *Nepeta* L. species show that these plants can be cultivated and established successfully in *ex situ* conditions with acceptable bio-morphological parameters. Phytochemical study revealed the presence of phenolic acids, total polyphenols and flavonoids in *N. cataria*, *N. transcaucasica, N. pannonica* and *N. parviflora* vegetal material.

BIBLIOGRAPHY

1. Matkowsi, A., Piotrowska A.: *Antioxidant and free radical scavenging activities of some medicinal plants from Lamiaceae.* Fitoterapia, vol. 77, 2006, p. 346-353.
Richardson, P.: *The chemistry of Labiatae: an introduction and overview.* In: Harley R.M., Reynolds T. (eds.), Advances in *Labiatae* Science, Royal Botanic Gardens, Kew, 1992, p. 291-297.

BIOLOGICAL STUDIES OF *ARTEMISIA ANNUA* L. AND *A. ABSINTHIUM* L. (*ASTERACEAE*) IN NATURAL POPULATIONS IN REPUBLIC OF MOLDOVA

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Key words: *Artemisia annua, A. absinthium, ecology, bio-productivity, Republic of Moldova*

The aim of the study is focused on bio-ecological peculiarities, bio-productivity assessment, habitat evaluation and abundance estimation of natural populations of two *Artemisia* L. species (*Artemisia annua* L. and *A. absinthium* L.) in order to identify and capitalize their economic potential at local level.

The bio-morphological and ontogenetic peculiarities of studied species were conducted; phenological phases were recorded on a weekly basis [2]. For the bio-productive assessment, in terms of biomass, the standard methodology was used, following parameters were assessed: the number of individuals on surface unit, height of the individuals, number of shoots, inflorescence length. For these samples the fresh weight, dry weight and drying ratio were determined. The designation of Habitat types was made according to the Interpretation Manual of EU Habitats, 2007, Directive 92/43/EEC on the basis of scientific criteria defined in Annex III of the Directive [1]. In order to determine the abundance of the species in studied locations, the DAFOR scale was used. The taxonomic nomenclature followed by the recent taxonomical literature. Voucher specimens are lodged in the Herbarium of Botanical Garden (Institute) of ASM. Fieldwork was carried out throughout the country; 16 growing sites (*A. annua* and *A. absinthium* – 8 sites each) were identified and investigated.

For *Artemisia absinthium*, one type of steppic grassland (Ponto-Sarmatic steppes) and three types of forested habitats (Euro-Siberian woods with *Quercus* spp, Dacian oak and hornbeam forests and Eastern white oak woods) have been identified and characterized. *Artemisia annua* is tending to populate some anthropogenic habitats, sometimes forms pure vegetal associations or is a part of floristic component of other phytocoenoses.

As a result of biometric measurement the height of the *A. annua* plants ranges between 62 cm and 171 cm. In the central part of the country (Trebujeni population) the plants have 56-182 cm height and the plants from Cosauti population (north of the country) reached up 120-160 cm. The average of the fresh/dry weight per plant in case of *A. annua* was 66.3g/25.7 g (38.8 g d.w./100g f.w.). The average of stem/leaf ratio per plant in terms of dry biomass is 47.3% /49.6% (approximately 1:1).

The average of the fresh/dry weight per plant in case of *A. absinthium* is 485g/202.5g (41.7g d.w./100g f.w.). The average of inflorescence/stem/leaf ratio per plant, in terms of dry biomass, is 42.9% /32.9%/19.6% (approximately 4:3:2). The height of the plants ranges between 112 cm and 190 cm (Bugeac population, southern part of the country); inflorescence length varies from 26 to 70 cm (the same population). It was also noted the various number of the stems (5-21units) per plant.

There was no significant difference in the starting and duration of phenological phases of *A. absinthium* and *A. annua* plants from the studied areas situated in central and northern part of the country. In the south, the beginning of the blooming stage was noted 5-7 days earlier.

The abundance for both *A. absinthium* and *A. annua* species was determined as dominant and abundant in one location each and frequent in other six locations. This recorded abundance index indicates the possibility for these species to be harvested in the wild without any damage to the species subpopulations.

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BIBLIOGRAPHY

1. *Interpretation Manual of European Union Habitats – EUR 27*, European Commission DG Environment. Nature and biodiversity, 2007, 142 p.
2. Sparks T. H., Menzel A., Stenseth N.C. *European Cooperation in Plant Phenology*. Climate Research, 2009, vol. 39, 12 p.

INTRODUCTION AND MICROPROPAGATION OF CULTIVARS OF THE GENUS *LYCIUM*

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Keywords: *Lycium barbarum, introduction, in vitro propagation, MS medium, adaptation.*

In recent years, in the Republic of Moldova, the market demand for new assortments of crops has increased, contributing directly to the implementation of the Food and Health Programme of the country. The creation of industrial plantations with new species of fruit-bearing shrubs is a novelty for the Republic of Moldova and plays an important role in the implementation of the programme. Berries or "small fruits" are characterized by high content of vitamins, minerals and antioxidants. They contain a class of compounds called "the 21st century vitamins", vitamins which include flavanols, anthocyanins, dimers and trimers thereof, called "catechins" and polymers with high molecular weight, tannins. Large-scale cultivation of fruit-bearing shrubs and especially of new, less frequently cultivated species contribute to the introduction of new species into culture and provides a source of healthy food with a wide range of fruits. *Lycium barbarum*, also known as Chinese wolfberry or Himalayan goji is native to China, but was also introduced into Europe [Tămaș M., Ilioara Oniga 2009; Fernandez F. F. 2008].

Researches on the regeneration of some new cultivars of *Lycium barbarum* by vitro cultures are conducted, within the framework of the institutional project, by the team of Embryology and Biotechnology Laboratory. This shrub became popular lately due to the taste of its fruits, their therapeutic properties and rich content of biologically active substances; this fact explains the interest of people in high quality planting material of this crop.

The use of modern biotechnology in agriculture ensures the production of planting material of high biological value that meets important criteria: genetic uniformity, quality of planting material and price, and it is also a method of obtaining pathogen-free planting material. This project aims at the development and optimization of *in vitro* propagation technologies for new species of fruit-bearing and ornamental shrubs, one of which is *Lycium barbarum L.* New results of the research on micropropagation and obtaining healthy planting material are expected by applying and consolidating scientific results obtained, in this field, by the scientific community from Europe and from Moldova, in particular. The problem addressed in this project has two aspects of novelty and originality: first – the new species which are studied in order to be cultivated later and second – the studies on micropropagation of these species.

The cultivar with high productivity, of *L. barbarum* L. was propagated *in vitro* through apical meristem. The sterilization method, the terms of sampling and the size of explants were tested. The MS 100% culture media supplemented with different concentrations of cytokinins (BAP, KIN), which cause the development of adventitious shoots, were established and tested. After 4 weeks since inoculation, the inoculated material was inventoried, from six types of media, the agar medium supplemented with 0.5 BAP stood out. The inocula from this medium provoked callus formation, from which, multiple adventitious shoots developed, about 14.1 per explant. The obtained micro-plantlets were transplanted for rhizogenesis to the agar medium ½ MS without hormones; during 2 weeks, the root system developed and, during 10 days, the plants matured and grew 6-10 cm tall with 2-3 internodes for *in vitro* microfragmentation and the basal part, with roots – for *ex vitro*.

At the moment, the plants are tested for adaptation and acclimatization to *ex vitro* conditions.

BIBLIOGRAPHY:

1. Tămaș M., Ilioara Oniga. 2009 Plante medicinale de perspectivă pentru introducere în cultură. P.125
2. Fernandez F. F. 2008. Minor crops: An alternative for the UK fruit industry. Nuffield Farming Scholarships Trust (autoreferat) P.35

MICROPROPAGATION PROTOCOL OF PAULOWNIA THROUGH *IN VITRO* CULTURE TECHNIQUE

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Key words: *Paulownia tomentosa, Paulownia elongata, micropropagation, tissue culture.*

Paulownia is a genus that belongs to the *Paulowniaceae* family (previously to the family *Scrophulariaceae*) and includes 6-17 species of plants. They are native to China and have been naturalized in other parts of the world such as USA and Europe. The genus is receiving increasing attention as an extremely fast growing, short-rotation woody crop plant, with large leaves arranged in opposite pairs on the stem. The trees are used for re-forestation, roadside planting and as ornamental trees. They grow well in a wide variety of soil types, notably poor ones, and yields a multiple-purpose wood, has potential medicinal use and because of its wide-spreading root system can be used for phytoremediation of contaminated soils. The *Paulownia* tree adapts easily to a wide range of climatic conditions, such as, temperature and a range of soils. It grows well in abundance of sunshine and rainfall, usually on sandy and clay soils. A high demand for planting material in domestic and international markets for afforestation and bioenergy has determined the development of efficient micropropagation protocols for rapid mass propagation of *Paulownia*. Due to their rapid growth and value in the timber market, many *Paulownia* species are cultivated in several temperate zones worldwide. Therefore, the application of biotechnological approaches for *in vitro* regeneration and micropropagation techniques of *Paulownia* have been encouraging, particularly for supply of planting material for forestry. The use of *in vitro* propagation techniques provides healthy, homogeneous planting stock for a forestation and woody biomass production of *Paulownia* [2].

The aim of this study was to develop an effective *in vitro* regeneration protocol for micropropagation of two *Paulownia* genotypes (using Murashige and Skoogand), study the consecutive micropropagation behaviour, multiplication, risogenesis, in order to improve plantlets production quantitatively and qualitatively.

The research was conducted in the Embryology and Biotechnology Laboratory, within the framework of the Botanical Garden (Institute) of the ASM. As biological material were used two *Paulownia* species (*P. elongata and P. tomentosa*). Explants were collected from tissues of mature plants. The shoot tips and nodal segments were cut and collected in a beaker containing water to avoid desiccation and then brought to the laboratory. The shoot tips (15-20 mm length) were sterilized, were washed thoroughly under running tap water for 15 minutes, then with liquid detergent with few drops of Tween-20 (polyoxyethylene sorbiton monolaurate) and finally rinsed several times in distilled water then with a solution 0,001% $KMnO_4$ for 15 minutes. After repeated washing with distilled water, the explants were finally treated with 0.1% diacid for 10 minutes and with 5% H_2O_2 for 5 minutes in the laminar air flow cabinet and washed for three times with autoclaved double-distilled water. After disinfection, the axillary buds were excised and inoculated, one by one, into each test tube [1].

Initial explants were cultivated on basal medium MS 100% and supplemented with meta-topolin (0.5 mg/l). For induction of roots, well-developed single plants were put on MS 50%. The subculture period was 45 days in growth chambers with permanent temperature +25 C^o white fluorescent light with 3000 Lux intensity and 16/8 h photoperiod [3].

Based on our results, the following conclusions can be drawn: the studied *Paulownia* genotypes were successfully propagated *in vitro* and significant multiplication was achieved. Application of the propagation medium with MS and addition of meta-topolina resulted in high proliferation and induced development of uniform plants as a prerequisite for effective rooting and high quality material production. Successful in vitro rooting was achieved when plants were cultivated on MS 50%. High average efficiency of adaptation (96%) was obtained.

BIBLIOGRAPHY:

1. Atiqur R., Farhana R., *In vitro regeneration of Paulownia tomentosa Steud. plants through the induction of adventitious shoots in explants derived from selected mature trees, by studying the effect of different plant growth regulators.*In: American-Eurasian Journal of Sustainable Agriculture, 7(4): 2013. 259-268,
2. Joshee, N. *Paulownia: A multipurpose tree for rapid lignocellulosic biomass production*. In: C. Kole, C. P. Joshi and D. Shonnard, Eds., Handbook of Bioenergy Crop Plants, Taylor & Francis, Boca Raton, USA. 2012, 671-686
3. Murashige T. & Skoog F. *A revised medium for rapid growth and bioassays with tobacco tissue culture.* Physiol. Plant, 15: 1962. 473-497.

SEED GERMINATION OF *POLYGONUM SACHALINENSE* F. SCHMIDT

UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

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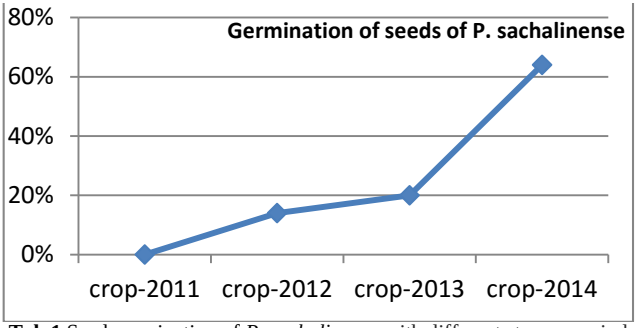
Keywords*: seeds, Polygonum sachalinense, germination.*

Polygonum sachalinense F. Schmidt ex Maxim, syn. *Fallopia sachalinense* Ronse Decr., *Reynoutria sachalinense* Nakai (*Polygonaceae*) is an herbaceous, perennial plant widely distributed in northern Japan and has spread to North American and European countries, species with intensive growth which provides animals with qualitative fodder. This plant is strongly rhizomatous [2.3]. Under the conditions of the Republic of Moldova, it can grow up to 4-5 m tall.

Seed means the beginning of a new life, the environmental conditions for each species, the seed must pass from latent to active life and give rise to a vigorous plants. [1] Depending on the position of the cotyledons, *Polygonum sachalinense* belongs to the category of plants with the germination epigenous, cotyledons are removed from the soil surface as a result of germination. Overcoming rest semen or reaching maturity physiological seed has a special importance for attending and completing the process of germination. Determining the potential of the germinating *Polygonum sachalinense* species, will allow future use, in agriculture, of seeds with high energy, in such a way not to feel loss at harvest.

Under the conditions of the Republic of Moldova, *Polygonum sachalinense* forms viable seeds, but their viability depends on the storage period, as the seeds are kept longer, the more decreases viability. The table reflects the values of germination of the seeds of *P.sachalinense*, with prolonged storage.



Tab.1 Seed germination of *P. sachalinense* with different storage period

At the harvest of 2014, we obtained effective values in seed germination, as compared with samples analysed in previous years 2011-2013. With increasing storage, seeds become inefficient, in 2-3 years are lost 60-80% germination.

Fig. 1 Seed germinations

BIBLIOGRAPHY

1. Popescu I. Fiziologia plantelor, Universitatea din București, facultatea de biologie, p.309, 1981.
2. Țiței V.,Teleuța A., Cosman S., Fodder value of silage of the giant knotweed plants under the conditions of the Republic of Moldova.Simpozionul științific conservarea diversității plantelor in situ și ex situ. Volum de rezumate, Iași 2011, p. 125-126.
3. Yuji Kawai et al. Antimicrobial activity of extracts from giant knotweed *Polygonum sachalinense* against animal pathogenic bacteria, Bull.Fish.Sci.Hokkaido Univ, 55(3), 139-144, 2004.

THE QUANTITATIVE ANATOMY OF THE EPIDERMIS OF GRAPEVINE LEAVES (*VITIS* L.)

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Key words: *Vitis, grapevine, leaf blade, epidermis, stomata.*

For the purpose of highlighting the adaptive characters that cause the drought resistance of grapevine, which can be used in research works on selection and introduction of species of the genus *Vitis* L., the biometric values of 10 anatomical characters of the epidermis of leaf blade at 15 species of the genus *Vitis* L. and at 15 local grapevine cultivars have been determined.

The epidermis of the grapevine leaf (*Vitis* L.) is a primary protective tissue, composed of a single layer of cells with different shape, structure and functions. This tissue covers the mesophyll and forms on the ventral side of the leaf the adaxial epidermis and on the dorsal side – the abaxial epidermis.

The adaxial epidermis is made up of a single layer of polygonal, compactly arranged cells. The adaxial epidermis of grapevine leaves (*Vitis* L.) doesn't contain stomata. The adaxial side of leaves of many species and cultivars of grapevine lacks or has very few trichomes. There are a lot of trichomes on the abaxial side of the leaf blade.

The abaxial epidermis has 2 main components: basic epidermal cells, of polygonal shape, and stomata. Stoma is a pair of stomatal cells (guard cells) with a pore (aperture) between them. A stoma is surrounded by usual epidermal cells (neighbouring cells) or modified cells (subsidiary cells). The species and cultivars of grapevine have stomata only on the abaxial side of the leaf blade. The stoma with the subsidiary cells or the neighbouring cells forms the *stomatal apparatus (complex).*

The actinocytic type of stomatal apparatus (complex) is characteristic of the abaxial epidermis of the leaf blade of species and cultivars of the genus *Vitis* L.

The main function of the epidermis of the leaf blade is to protect the grapevine plant from the excess water and nutrient loss, mechanical damage and from damage caused by fungi, bacteria, viruses and other pathogens.

The stomatal density of the abaxial epidermis, at the studied species, is specific and varied, in 2006, from 168.43 stomata/mm^2, at the species *Vitis californica Benth.,* to 244.71 stomata/mm^2, at *Vitis candicans* Engelm. At local grapevine cultivars, the stomatal density is specific and varies from 121.16 stomata/mm^2, at the cultivar "Negru de Căuşeni", to 177.83 stomata/mm^2, at the cultivar "Coarna albă". The stomatal index (SI) of species varies from 4.55, at *Vitis solonis, to 9.23, at Vitis aestivalis. The SI of the studied cultivars varies from 4.90, at the cultivar* "Negru de Căuseni", to 7.47, *at the cultivar "Feteasca neagră". The stomata length at species and cultivars varies from 23.15* µm, at *Vitis wilsonae* Veitch., to 30.55 µm, at the cultivar Gordin.

The mean stomatal area of species varies from 230.67 µm^2, at *Vitis candicans* Engelm., to 386.49 µm^2, at *Vitis aestivalis Michx.* The mean stomatal area of cultivars is somewhat larger and varies from 314.71 µm^2, at the cultivar "Negru de Acherman", to 406.09 µm^2, *at the cultivar "Feteasca neagră".*

The mean area of stomata and of basic cells of the abaxial *epidermis is theoretically calculated by the method proposed by the author.*

The study of stomata of grapevine is relevant and necessary for viticulture, because the grapevine genotypes whose stomatal density is lower are better adapted to the concrete conditions of life, and the genotypes whose stomatal density varies significantly, the next year after a droughty year, adapt easier to other conditions of life. The species Vitis monticola, Vitis rupestris, Vitis solonis and the cultivars Copciac, Rară neagră, Feteasca neagră are more adaptable to new conditions of life. The stomatal density of the species Vitis sylvestris Gmel., Vitis californica Benth. and – of the cultivars Coarna neagră, *Plavae, Feteasca neagră varied less in 2006-2010, so, they adapted better to concrete conditions of life.*

The correlation coefficient between stomatal density and SI is of 0.677. It has been established a positive correlation between SI and the number of cells of the abaxial epidermis on 0.25 mm^2 of leaf area (r=0.6908). The *correlation* coefficient between the mean area of cells of abaxial and adaxial epidermis of 12 grapevine cultivars is r=0.6884.

BIBLIOGRAPHY

1. Codreanu V. *Anatomia comparata a viţei de vie (Vitis L.)*. Chişinău, 2006, Combinatul poligrafic;
2. Codreanu V. Anatomia epidermei frunzei la unele specii de viţă de vie *(Vitis L.).* – Studia Universitas. Ştiinţe ale Naturii, 2007, nr. 7, anul 1, p. 106-113;
3. Кодреану В. Количественная анатомия листовой пластинки винограда *(Vitis L.).* – Modern Phytomorphology 4: 199-207, 2013.

SOME ASPECTS OF THE DEVELOPMENT OF THE *MONARDA* SPECIES IN THE REBUBLIC OF MOLDOVA

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Keywords*: aromatic plants, introduction, volatile oil, propagation*

The demand for aromatic plants is increasing from year to year, due to their wide application in various industries (cosmetics, perfumes, food, pharmaceutical products). Along with such common aromatic crops such as lavender, dill, parsley, celery, fennel, anise, there are many non-traditional crops, which contain oil, but are used less frequently and researches on their introduction, content, economic value haven't been done.

Monarda is an aromatic, medicinal and ornamental plant with two or three storeys of flowers and it is also an excellent honey plant. *Monarda* is native to North America, where the plant grows in meadows and forest clearings. The name "Monarda" was given to the genus in honour of the botanist and physician Nicholas Monardes, who wrote a book about New World plants.

The experiments were carried out in open field, in balanced conditions, on a general agro-technical background, without using fertilizers and herbicides. The seeds were sown on plots with an area of 10-20 m^2, in March, all at the same time, but, in greenhouses, they were sown in early February. The vegetative method, by dividing mature bushes, was also experimented with. Phenological observations were performed on 25 plants, every 3 days.

The biological material used in the experimental field setting is represented by three species of the genus *Monarda* L.*: M. didyma* L., *M. fistulosa* L. and *M. citriodora* Cerv.

In the seasonal study, the observations on highlighting the phases of plant development were performed by standard methods.

Monarda species is a strong plant that can survive in almost any conditions. It grows best in full sun, but can tolerate some light shade. If the soil is well drained, it does not necessarily need to be very rich in nutrients. If grown in gardens, Monarda attracts bees, which contribute to the pollination of this plant and of those around. The flowering period can be extended and the abundance of flowers can be increased if the withered flowers are removed.

Monarda citriodora Cerv. ex. Lag is an annual species, which grows 25-90 cm tall, with well-developed, branched tap root system. Stems are branched, tetraedged, pubescent. The leaves are opposite, petiolate, lanceolate or oblong-lanceolate, pubescent, with serrated edges, with a strong lemon scent. The flowers are pink-purple, are grouped in 2-7 capituliform, terminal whorls (verticillasters). The fruits are ovoid, glossy nut-like.

Monarda didyma L. is a perennial species with flowering period from July to October. The stem is about 100-130 cm tall. The leaves are opposite, ovate-lanceolate, petiolate, 8-10 cm long. The flowers are irregular, bilabiate, red, arranged in 1-3 capituliform, terminal whorls. On each stem, there are 6-8 inflorescences, with a diameter of 4-10 cm. This species is quite undemanding to growing conditions, being drought and frost tolerant.

Monarda fistulosa L. is a perennial, shrub-like species, which grows 35-120 cm tall. The stem is simple, erect, hairy, reddish at the top. The leaves are strongly flavoured, are large, ovate-lanceolate, petiolate, toothed, 3-10 cm long. The flowers are of lilac-purple colour, grouped in terminal whorls; the calyx is tubular.

The plants from the variant established by seedling in the experimental year 2014 have determined the highest values of morphological characters examined in comparison with the variants obtained by direct sowing in the experimental field. The *M. fistulosa* L. plants from the variants established by seedling had the highest values regarding their height measured in the full flowering phenophase.

BIBLIOGRAPHY

Бейдеман И.Н. Методика изучения фенологии растений и растительных сообществ. – Новосибирск: Наука, 1974, – 154 с.

Воронина Е. П., Горбунов Ю. Н., Горбунова Е. О. Новые ароматические растения для Черноземья. – М.: Наука, 2001. – 173 с.

THE LOCAL POPULATION - GENETIC BASIS FOR THE SELECTION OF WALNUT VARIETIES

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In the study on variability of common walnut, we applied, for the first time in Moldova, the principle of population. As a result, the limits and the level of variability of characters were determined. It was also assessed the agrobiological and selection potential of the local population.

The proportion (part) of genotypic variability (η^2) in the general phenotypic variability, which gives the opportunity to assess the effectiveness of artificial selection, was determined on the basis of the analysis of variance. For such characters as the mass of the nut, the thickness of the shell, the proportion (η^2) is quite high – 60-80%, while for the mass and output of kernel, it is much lower – 24-37%. The probability of frequency, in the population, of forms with valuable characters was also determined. Thus, the output of kernel of 60% occurs with the probability of 1 : 120; the high resistance to marsonia (of 6 points) – 1 : 212; high and stable yield – 1 : 300; forms with high indices at a group of 7 agro-biological characters (with "quality index" 10) – 1 : 576.

In the comparative study of variability of walnut in the primary genocentre (South Kyrgyzstan and Tajikistan) and Moldova, we have found that the composition of walnut forms in Moldova is almost the same as in the primary genocentre and the amplitude of variability of characters is greater than in the primary genocentre, which demonstrates the existence of a focus of the secondary genocentre in Moldova. This focus represents the genetic basis for the selection of new varieties of walnut.

The population study of the local gene pool of walnut resulted in the selection of 10 valuable varieties, two of which – ′Codrene′ and ′Lunguiețe′ are homologated and six varieties are registered and submitted to State Commission for Variety Testing.

All of the 6 varieties are distinguished by high and regular yields. The production is rather uniform (coefficient of variation CV – 8-13), the trees are resistant to frost and to marsonia. Walnuts have an attractive appearance; the kernel is full, light coloured.

Indices of agro-biological characters

	Nut mass, g	Kernel mass, g	Output of kernel, %	Shell thickness, mm	Yield, kg/tree	CV	Resistance to frost, points	Resistance to marsonia, points	Quality index
De Vălcineț	11,3±0,63	6,0	53,1±0,49	1,1	30	12,90	4,5	4,5	10,3
Surpriz	11,5±0,64	6,3	54,5±0,56	1,0	27	12,35	4,5	5,0	10,3
Dolna	9,9±0,71	5,2	52,5±0,87	1,2	35	11,50	4,5	5,0	10,0
Nistrene	10,7±0,66	5,5	51,2±0,66	1,3	32	11,80	4,5	5,0	10,0
Micleușene	12,6±0,33	6,2	49,1±0,94	1,1	30	8,34	4,5	5,0	9,7
Chișinăuiene	11,9±0,42	6,0	50,4±0,54	1,0	32	10,11	4,5	5,0	9,7

TYPES OF CALLUS MASS OF *WITHANIA SOMNIFERA* (L.) DUNAL

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Keywords: *callus, meristem, leaf blade, medium*

Withania somnifera belongs to the family *Solanaceae*, it is a perennial plant, but in the conditions of the Republic of Moldova behaves as an annual plant. Due to its characteristics, *Withania somnifera* is of particular interest for medicine, this fact favours its introduction and cultivation by different methods and technologies, especially by *in vitro* culture.

The micropropagation of *Withania somnifera* has proven to be a great method of large scale production of virus-free plants. This method can also be used in order to obtain raw material for the industrial extraction of biologically active substances. Multiplication rate in culture *in vitro* is much higher in a shorter period of time for obtaining plants.

The *in vitro* experiments performed on *Withania somnifera* aimed at obtaining callus mass in order to produce further meristemoids that give rise to plants. There were tested different types of explants, used as biological material, inoculated on MS medium supplemented with growth regulators. As a result of the carried out research, we have found out that BAP (1 mg/l) with IAA (0.4mg/l) are the most effective growth regulators for initiating organogenic processes.

The initiation of organogenic processes at callus level can be demonstrated by histological analysis of callus mass. The media that were selected for callus culture have regenerative capacity, as demonstrated by the appearance of leaf primordia. The vigorous development of morphogenetic centres depends on certain factors: the duration of callus cultivation, certain growth regulators, sampling period, the stage of plant development, as well as external factors such as temperature, light etc.

The morphogenetic centres of *Withania somnifera* are composed of compact, small, closely located cells. Like the cells of callus tissue, these cells contain chloroplasts.

The callus mass, derived from fragments of leaf lamina, contains morphogenetic centres (up to 8 meristemoids) in its margins, the callus cells are large, parenchymal ones, while the meristemoids are composed of small, compactly arranged cells.

The cells contain chloroplasts. Most morphogenetic centres are found in the callus that was derived from the tip or the base of the leaf. Callus is compact, of whitish-green to intense green colour (in the places where morphogenetic centres are found).

The callus mass derived from fragments of shoots is of whitish-green colour, which becomes greenish-brown after 50 days. Callus is porous and contains few morphogenetic centres (up to 3 meristemoids), which are subsequently inhibited. The morphogenetic centres are distinguished at the tip of the callus and at the point where the callus interacts with the shoot. Callus cells are large, parenchymal, with large vacuoles and intercellular spaces. They contain a small number of chloroplasts. The cell membrane is thickened.

The callus mass derived from apical meristem is formed at the base of the shoot. It isn't compact, is porous and is of whitish green colour, with the shoot growth, callus mass is inhibited. The callus is non-morphogenetic, the cells are parenchymal, with small intercellular spaces. The cells have thickened membrane and are arranged irregularly.

As a result of the research, it has been found that the morphogenetic callus derives from leaf blade, on MS medium supplemented with BAP + IAA growth regulators. For a complete development of the plantlet, the derived bud is inoculated on culture medium, freshly prepared for development. It has been found that the morphogenetic centres are located on callus surface and, on margins, they are protected by parenchymal cells of the callus that have thicker walls.

BIBLIOGRAPHY

Чиоркина Н, Кутковски А «*Withania somnifera (L.) Dunal* - аспекты интродукции и культивирование „*in vitro*" и „*ex situ*"»//Интродукция и селекция ароматических и лекарственных растений. Тезисы международной научно-практической конференции Ялта, 08-12 июня 2009 стр. 208-209.

Cutcovschi-Muştuc Alina. Iniţierea şi dezvoltarea organogenezei din masa calusară la *Withania somnifera* (L.) Dunal. Revista botanică. Vol.IV, Nr.1(5). Chişinău 2012, p.68-73.

Cutcovschi Alina. Influenţa hormonilor BAP şi 2,4 D asupra dezvoltării calosugenezei la *Withania somnifera*. Congresul al IX-lea Naţional cu participare internaţională al Geneticienilor şi Amelioratorilor, 21-22 octombrie 2010, Chişinău, p.177.

BIOTECHNOLOGICAL APPROACHES FOR THE PROPAGATION ON SEVERAL *NEPETOIDEAE* SPECIES FROM ROMANIA AND REPUBLIC OF MOLDOVA WITH PHYTOTHERAPEUTIC VALUE AND/OR RARE AND THREATENED

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Keywords: Nepetoideae, Agastache rugosa, Nepeta parviflora, plant micropropagation

The *Nepetoideae* is the largest subfamily in *Lamiaceae* family, and comprise the majority of medicinal, aromatic and culinary species. The main sources of plant antioxidants belong to *Nepetoideae* (they contain rosmarinic acid and also have a high content in volatile terpenes).
Our studies aimed at the achievement of *in vitro* tissue culture multiplication of species from wild populations and experimental cultures as an integrated part what envisages the identification, characterization, conservation and sustainable capitalization of some varieties of *Nepetoideae* species with an optimum content in biologically active compounds, from Romania and R. of Moldova. For the *in vitro* multiplication protocols, *Nepeta parviflora* Bieb, and *Agastache rugosa* Kuntze species were envisaged.
A. rugosa, alochthonous species, now also cultivated in Europe, due to its therapeutic importance, was recently studied for it bioactive compounds (mainly essential oil and rosmarinic acid), biological activity (anti-apoptotic, antioxidant, antifungal, antiviral), respectively for the capitalization through biotechnology of its biosynthetic potential [1,2].
For the *Nepeta* species, the micropropagation is also studied as a conservation method, multiplication and reintroduction of rare species, aspect which is of interest in programs for amelioration of local genetic resources in the wild flora. *In vitro m*ultiplication studies were developed for endemic threatened species – with medicinal value, for their reintroduction in natural habitats [3,4]. *N. parviflora*, is included in *the Red List of higher plants from Romania* as vulnerable (VU) and for R. Moldova is considered species threatened with extinction in the local flora (regional assessment for the Red Book of Republic of Moldova, 3rd edition is **Vulnerable [VU]**) known from several extant locations.
The plant material (seeds and floriferous stems) used for the initiation of tissue cultures and phytochemical assessments was collected (Mai – June 2011-2013) from experimental cultures of Romania for *A. rugosa* and from wild populations in R. of Moldova for *N. parviflora* species. Phytochemical profile for the polyphenolic compounds and essential oil were performed by means of TLC, HPLC, GSM and Spectrophotometry. The initiation of calusogenesis, the multiplication of stem buds, the plant regeneration and rhysogenesis induction were achieved on different MS variants, supplemented with BAP (benzylaminopurine) and NAA (naphthaleneacetic acid), in different ratios and concentrations, depending on the stages of the *in vitro* culture. The acclimatization of the *in vitro* regenerated plants was achieved in hydroponic system, the plants being afterwards transferred in soil.
The results on the multiplication through tissue cultures may be used on the establishment of the protocols for the *in situ* and *ex situ* multiplication for species with phytotherapeutic potential and economic importance (*A. rugosa*). For *N. parviflora* species the *in vitro* multiplication generates material for propagation which may be used in conservation studies through establishing *ex situ* collections and experimental variants (for morpho-physiological and phytochemical studies) and also for reintroduction strategies, in accordance with the principles of *Plant introduction and sustainable use of plant resources*.

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REFERENCES

[1]Lee, C., Kim, H., Kho, Y. - *Agastinol and Agastenol, Novel Lignans from Agastache rugosa and Their Evaluation in an Apoptosis Inhibition Assay*, J. Nat. Prod., 2002, 65: 414-6.
[2]Zielinska, S., Piatczak, E., Kalemba, D., Matkowski, A. - *Influence of plant growth regulators on volatiles produced by in vitro grown shoots of Agastache rugosa (Fischer & C.A.Meyer) O. Kuntze*, Plant Cell Tiss Organ Cult, 2011, 107:161–7.
[3]Misic D. M., Ghalawenji N. A., Grubisic D. V., Konjevic R. M. - *Micropropagation and reintroduction of Nepeta rtanjensis, an endemic and critically endangered perennial of Serbia*. Phyton, 2005, 45, 1-20.
[4]Najafi F., Kouchaki A.R., Rezvani M. P., Rastgou M. - *Evaluation of seed germination characteristics in Nepeta binaludensis, a highly endangered medicinal plant of Iran.* Iranian Journal of Field Crops Research, 2006, 3, 385- 392.

THE ONTOGENETIC CHARACTERISTICS OF *OCIMUM BASILICUM* L. UNDER CONDITIONS OF REPUBLIC OF MOLDOVA

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***Keywords**: basil, ontogenesis, latent, pre-generative, generative, post-generative.*

The angiosperms' ontogenesis is the consecutive order of morphological states that succeed and changes from seed germination to complete destruction of the plant, and if vegetative propagation – all offspring resulting by vegetative way. The study of ontogenetic peculiarities of basil (*O. basilicum* L.) presents theoretical and practical importance for observing the growth tempos and development of plants under culture conditions, morphological description of the regularities in the formation process of the individual, assessment of the vital condition at different stages of cultivation in Republic of Moldova.

The research of ontogenetic peculiarities of basil was carried out using the scheme proposed by Rabotnov T. (1950) and improved by Uranov A. (1975) (Florea V., 2006, Жукова Л., 1983) and methodological guidelines used to study medicinal plants ontogenesis (Воронцова Л. и др. 1976, Майсурадзе Н. и др., 1984). Ontogenesis of *O. basilicum* L. was studied on the example of *purpurescens* and *difforme* varieties, grown from seed by local reproduction during two growing seasons (2013-2014) on the experimental field of the Laboratory of Medicinal, Aromatic and Fodder plants and on protected land.

O. basilicum L. passes through all periods (*latent, pre-generative, generative, post-generative*) and life stages (*seed, seedling, juvenile, immature, virginal, early generative, middle generative, late generative, sub-senile, senile, end of ontogeny*) of complete ontogenesis to the natural death. The vegetative propagation is missing (Глухов А., Кустова О., 2009).

Pre-generative period. In the closet for germination the seeds of *O. basilicum* germinate at the 3^{rd}-4^{th} day and in greenhouse conditions at the 6^{th}-8^{th} day. *O. basilicum* var. *purpurescens* anthocyanin pigmentation appears initially on cotyledons and then on hypocotyls. At the 14^{th}-16^{th} day, the first pair of leaves unfolds and plants move to *juvenile age*. The leaves are petiole formed, ovate to *purpurescens* and wide ovate and convex in var. *difforme*. The difference between the time of development stages of varieties O. *basilicum* L. is 1-3 days. Seedlings and juvenile individuals of *O. basilicum* L. varieties grow identically. The difference is in the anthocyanin pigmentation of cotyledons and hypocotyl from var. *purpurescens* and bulging leaf lamina and larger organs of var. *difforme*, which allows setting the belonging of varieties at a *juvenile age stage*. *O. basilicum* L. cotyledons work for a long time (up to 2 months). After the emergence of 3-4 pairs of leaves, starts the ramification of the main sprout, accordingly plant passes to an *immature age stage*. *Virginal age stage*, determined by forming characteristic structures for the mature plant without generative organs is very short at *O. basilicum* L. (5-10 days) due perhaps to annual life cycle of the species.

Generative period. The *young generative plants* of *O. basilicum* L. together with the developing of generative organs takes place the enhancing of the green mass (late June-July). Plants have multiple one-three side sprouts due to the increasing of the number of generative sprouts. On the side sprouts are developed inflorescences with sympodial ramification. The *generative plants* reach maturity in August. By the mass flowering time of the main sprout is lignifying and reaches 6-10 cm in diameter. The inflorescences are composed cymes. The *stage of late generative age.* Seed maturing begins in mid-August. The plants are fructifying concurrently with the end of flowering.

Post-generative period. In the second half of September the plants go through senile and sub-senile stages dying in mass in early October when the weather is suddenly cooling down.

O. basilicum L. is a simple individual, which is not morphologically disintegrating, the ontogenetic cycle is of monocentric biomorphs. The terms of creation and the degree of development of morphological structures depend on the way they grow. The growth from seedling ensure seed ripening to O. *basilicum* L., but the stages of pre-generative life take too long because of unfavorable conditions in the greenhouse where the seedlings are grown. This makes the whole ontogenetic cycle, so it is acclimated in Moldova's pedoclimate conditions.

BIBLIOGRAPHY:

Florea V., *Cultura plantelor medicinale*. Chişinău, 2006, p. 6.

Воронцова Л., Гатцук Л., Егорова В. и др. *Ценопопуляции растений (Основные понятия и структура).* Москва, «Наука», 1976. стр. 13-25.

Глухов А., Кустова О., *Интродукция и перспективы использования видов рода базилик (Ocimum) на юго-востоке Украины.* Изд. Вебер. Донецк. 2009, стр. 69-83.

Жукова Л. А., *Онтогенез и циклы воспроизведения растений. Журнал общей биологии.* XLIV, № 3, 1983, стр. 361-373.

Майсурадзе Н., Киселев В., Черкасов О. и др. *Методика исследований при интродукции лекарственных растений. Лекарственное растениеводство*. Москва, 1984, вып. 3, стр. 17-21.

PLANTS IN PROTECTION OF AGRICULTURAL CROPS AGAINST PESTS AND DISEASES

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Keywords: *Plant Extracts, Plant Protection, Pests, Diseases*

The biologically active substances of the plants nowadays are quite widely used in practice of agricultural crop protection against pests and diseases in many countries. There were tested more than 3000 species of plants and founded quite a large quantity of effective species, defined and identified the active components. However, notwithstanding so wide testing of plant extracts, there was received comparatively small quantity of commercial preparations. The most famous applied plant preparations are the following: NeemAzal, NeemAzal-S, Nimazali-TC, Margosan-O®, Azatin-EC®, Neem-EC®, RH-9999 and Neemix®, received on the basis of azadirachtin, extracted from plant *Azadirachta indica* A. Juss. (Meliaceae), preparation Quassia-MD – on the basis of quassia, extracted from plant *Quassia amara* L. (Simaroubaceae), "Biostat" (Krasnodar, ARRIBPP RAAS) on the basis of terpenes of biogenic origin (from essential oil of coriander) and their synthetic analogues, as well as preparations "Silk", "Novosil", "Larixin" and "Raststim" (Moscow, FRC, ICG SB RAS) created on the basis of biologically active substances, extracted from needles of Siberian fir. The last preparations refer to plant growth stimulants; they increase the immunity and adaptability of the plants to unfavorable conditions of environment [2, 3, 4, 5, 8].

Over the years, we have studied the insecticide, acaricide, deterrent, antifeedant, ovicidal and repellent properties of plant extracts against the wide spectrum of phytophages – insects and mites [1, 6, 7]. There were extracted the effective plants from Alliaceae, Apiaceae, Asteraceae, Liliacea, Cupressaceae, Simarubaceae and other families. It was established that the plant extracts contain a complex of biologically active compounds, the concentration of which may significantly vary depending on conditions of plant growth, harvest time, storage conditions of raw material and methods of extract obtaining. Practically, the whole complex of compounds ensures a high effectiveness of plant extracts. The division of extracts on fractions demonstrated that the different substances can meet the different properties and, at the same time, the overall effectiveness of extract, as a rule, increases the activity of certain fractions. Also it is well known that the insects are complicated to produce the resistance to a complex of compounds. So, the division of extracts on fractions and obtaining of synthetic analogues may be disadvantageous, at the same time, the toxicological expertise of overall extract is a difficult and expensive process.

For these reasons, many researches, including us, arrived at conclusion on reasonability of obtaining the plant extracts by means of available and inexpensive methods for their use as an alternative to chemical pesticides in integrated plant protection. At the same time, not polluting the environment and having the elective action on insects, the plant extracts thus promote accumulation of useful entomofauna and restoration of agrobiocenosis balance. At that, many plant extracts can exterminate a pathogenic flora and increase the plant resistance to diseases.

BIBLIOGRAPHY

1. Elisovetskaya, Dina; Nastas Tudor. *Biological activity of the extract of Veratrum lobelianum BERNH. against harmful species of insects and mites and it impact on entomophages*. Oltenia. Studii şi comunicări. Ştiinţele naturii, Publisher: Muzeul Oltenia Craiova, Craiova, România, 2013, 29(1), 185-192.
2. Gusmão D.S. et al. *Derris* (*Lonchocarpus*) *urucu* (*Leguminosae*) *extract modifies the peritrophic matrix structure of Aedes aegypti* (Diptera: *Culicidae*). Memórias do Instituto Oswaldo Cruz. 2002, 97(2), 371-375.
3. Isman M.B. *Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world.* Annual Review of Entomology. 2006, 51, 45-66.
4. Patent Number US4698222. United States Patent. Grinda et al. *Extraction of insecticides from plants* / Inventors: Grinda Francoise (Vallauris, FR), Gueyne Jean (Paris, FR). Assignee: Saphyr SARL, France. Publication Date: 10/06/1987. Appl. Number: 06/576385.
5. Stark J.D. *Comparison of the impact of a neem seed-kernel extract formulation, Margosan-O and chlorpyrifos on non-target invertebrates inhabiting turf grass*. Pest Management Science. 1999, 36(3), 293-299.
6. Елисовецкая Д., Настас Т., Брадовская Н. Инсектицидная, антифидантная и репеллентная активность растительных экстрактов против *Galleria mellonella* L. Материалы общества зоологов Азербайджана, «*Proceedings of the Azerbaijan society of Zoologists*». Baki: "Elm", 2013, 5(1), с.140-146.
7. Елисовецкая Д.С. Инсектицидная и антифидантная активность растительного экстракта из *Coronilla varia* L. и его фракций относительно *Leptinotarsa decemlineata* Say. В: «Интегрированная защита растений: стратегия и тактика». Материалы докладов межд. научно-практической конференции, ИЗР НАН Беларуси, Минск, 2011, с. 230-234.
8. Шпаар Д., Бурт У., Фрайер Б. *Возможности и проблемы применения и регистрации биологических средств защиты растений в Германии*. Инф. Бюлл. ВПРС МОББ, СПб, 2007, 38, 263-266.

ANTHECOLOGICAL RELATIONS OF INTRODUCED ORCHIDS AT THE M.M. GRYSHKO NATIONAL BOTANICAL GARDEN NAS OF UKRAINE

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Keywords: Orchidaceae, introduction, anthecology, pollination, insects

Study of orchids introduction have been conducted at the M.M. Gryshko National Botanical Garden since 1970 [1, 4]. Species of *Orchidaceae* Juss. family are presented at the plot "Rare Plants of Ukrainian Flora" of the botanical garden. We studied *ex situ* decepteive *Anacamptis morio* (L.) R. M. Bateman, Pridgeon & M. W. Chase, *Dactylorhiza majalis* (Rchb.) P. F. Hunt & Summerh., *Orchis purpurea* Huds. and rewarding *Epipactis palustris* (L.) Crantz. *Anacamptis morio, Dactylorhiza majalis* blossom and fruit in conditions of Kyiv every year. *D. majalis* forms a self-seeding. Plants of *Epipactis palustris, Dactylorhiza majalis* have formed an introduction populations. Significant impact on insects visiting the orchids are flowering of other plants nearby. We found that under cultivation pollinators significantly more often visit other plants than deceptive orchids. During *A. morio* and *D. majalis* flowering at the plot blossom *Lamium purpureum* L. and *Glehoma hederacea* L. Color and shape of *Lamium purpureum* and *Glehoma hederacea* flowers are similar to orchids and they attract many pollinators. Also at this time blooms *Iris sibirica* L. *Iris sibirica* flowers attract most insects including wasps and bumblebees. *Geranium phaeum* L. also blossom at this time and attract mainly bees. Many insects focused on *Spiraea media* Schmidt. At the end of *A. morio*,*D. majalis* and *Orchis purpurea* flowering also plants of *Silene vulgaris* (Moench) Garcke blossom. It is also very attractive to different insects. During flowering of *E. palustris* most pollinators focused on *Delphinium sergii* Wissjul. and *Silene hypanica* Klokov. For studied orchids others plants species are concurrents but also they are helpers in implementing the strategy of deception. However insects visited flowers of other plants much more than the flowers of orchids.

In general, the studied species found consortial relationships with ants, aphids, various types of beetles, wasps, bugs and bees of following families: *Formicidae* Latreille, 1802 (*Lasius* Fabricius, 1804), *Bombyliidae* Latreille, 1802 (*Bombylius* Linnaeus, 1758), *Cantharididae* Imhoff, 1856 (*Cantharis* Linnaeus), *Pieridae* Duponchel, 1835 (*Anthocharis* Boisduval, Rambur, Duméril & Graslin, 1833), *Aphididae* Latreille, 1802, *Cetoniinae* Leach, 1815 (*Cetonia* Fabricius, 1775), *Noctuidae* Latreille, 1809 (*Orthosia* Ochsenheimer, 1816, *Lacanobia* Billberg, 1820), *Pentatomidae* Leach, 1815 (*Palomena* Mulsant & Rey, 1866), *Scarabaeidae* Latreille, 1802 (*Tropinota* Mulsant, 1842; *Valgus* Scriba, 1790), *Coccinellidae* Latreille, 1807 (*Harmonia* Mulsant, 1850), *Apidae* (*Apis* Linnaeus, 1758; *Anthophora* Latreille, 1803; *Bombus* Latreille, 1802), *Halictidae* Thomson, 1869 (*Lasioglossum* Curtis, 1833), *Andrenidae* Latreille, 1802 (*Andrena* Fabricius, 1775) [2, 3].

For all orchid species in introduction conditions are characteristic consortial relationships with ants and aphids. Ants (*Formicidae*) feed nectar and pollen of orchids. In the pollination of studied species ants mostly does not participate. Although during the study was recorded transfer of *Epipactis palustris* pollinia by ants. Ants often diluted aphids (*Aphidoidea*). Ants and aphids noted on *E. helleborine, E. palustris, A. morio, Ophrys oestrifera* M.Bieb., *Gymnadenia conopsea* (L.) R.Br., *Platanthera bifolia* (L.) RICH., *Cypripedium salceolus* L., *Listera ovata* (L.) R. Br., *Orchis punctulata* Steven ex Lindl. According to our observations presence of aphids on orchids inflorescences do not significant damage fruit set.

So in a culture rare plants form close relations with consortial insects, including pollinators as well as phytophages.

BIBLIOGRAPHY

1. Gaponenko M.B., Sobko V.G., Gnatiuk A.M. Rare species at the collection plot "Rare Plants of Ukrainian Flora" of M.M.Gryshko National Botanic Garden of NAS of Ukraine. Problems of Experimental Botany and Biotechnology. – Kyiv: Fitosotsiotsentr, 2012. – P.72–83. *(ukr.).*
2. Gusev V.I., Yermolayenko V.M. Svyschuk V.V. Shmyhovskyy K.A. *Atlas of insects of Ukraine*. – K. : Radianska Shkola. – 1962. – 307 p. *(ukr.).*
3. *Keys to the insects of the European part of the USSR in five volumes* (edited by Corresponding Member of the USSR Academy of Sciences G.S.Medvedeva). – V.3. – Leningrad: Nauka, 1978. – 584 p. *(rus.).*
4. Sobko V.G. *Ukrainian Orchids*. - K.: Naukova Dumka, 1989. – 191 p. *(ukr.).*

STUDY OF THE WILD, SPONTANEOUS HEMP FORMS AND LOCAL POPULATIONS REGARDING THE CONTENT OF THC AND THEIR USE IN THE BREEDING PROCESS OF THE MONOECIOUS HEMP

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Keywords: *monoecious hemp, chromatographic method, THC content*

INTRODUCTION

Reducing of the cannabinoid content, and maintaining the monoecious character in the new creations, under the conditions of existing in the research area of the dioecious hemp forms, spontaneous, local populations or derived from former cultivated varieties with dominant characters on the monoecious and THC content has proven very difficult. The pronounced allogamy of hemp, high pollen viability and spread resistance by air currents led us to become involved in a study regarding the spreading of these forms (Ceapoiu, 1976).

The 2009 collecting expedition in the Subcarpathian area and northern area of Moldova resulted in the collection of seven resources considered populations, of which only one can be characterized as such and useful to the improvement process, the rest being sourced from the varieties recently found in crop.

MATERIAL AND METHOD

The identification of the distribution areas and the collection of new genetic resources from the spontaneous and cultivated flora was carried out by organizing two scientific expeditions in 1991 and 1992, and for the cultivated forms which have become spontaneous and local populations, in 1996 and 2009. The seed collection was made on a large number of plants in mixture, for the coverage of maximum potential variability of the area, and also on individual plants analyzed for highlighting the genetic and phenotypic characters in the experimental field.

The cannabinoid content was determined orientatively through the colorimetric method, which consists of a color scaler, with grades from 1 to 10, corresponding to the 0.00 – 1.0% THC content. The maximum grade was awarded to the maximum color intensity with shades of purple. The method has been approved and the improvement process regarding the reduced cannabinoid content gave satisfactions, by obtaining Dacia Secuieni and Secuieni Jubileu varieties, with an unidentifiable content through the quantitative chromatographic method.

RESULTS AND DISCUSSIONS

The expeditions of identifying the spontaneous hemp forms had as purpose to establish their spread in Romania, the taxonomic classification and their influence on the cultivated forms. The pronounced alogamy and the dominant dioecious character caused the formation of genotypes with adaptability to environmental stress conditions, the soil drought and atmospheric heat, which were consolidated as wild and primitive populations that occupy vast areas in some parts of the country.

The *spontanea* sp. *ramosa* var. has specific characters for the area between the Danube and 44º50'latitude, and as eastern longitude between 22º30' and 28º30'. The *intermedia* var. is specific for some areas from central and northern Dobrogea, the northern part of Baragan and the central and eastern area of Moldova, until at 46º10' latitude.

The spontaneous *ramosa* and *intermedia* varieties have a THC content noted with 9 and 10, content that decreases from south to north, and at local populations, the content is variable, noted with 5 and 6, the inclusion in the improvement process requiring a reduction of THC content below 0.2%. Reducing the cannabinoid content in the improvement process was done by direct hybridization, the dioecious form with high content – maternal genitor and the monoecious lines or varieties with low content as paternal genitor. Through backcrossing B1, B2 and individual selection, the content was reduced below 0.01% or even unidentifiable through the chromatographic methods at the new creations of ARDS Secuieni, the cultivars Dacia Secuieni for fiber and Secuieni Jubileu for seed production.

REFERENCES

ARNOUX M., CASTIAUX J., MATHIEU G. – *Sur l'amélioration de la productivité en fibres chez le chanvre* (*Cannabis sativa* L.). Annales l'amélioration des plantes 19 (4), 1969, p. 405 – 418;
CEAPOIU N. – *Hemp – monographic study*. Ed. R.P.R. Academy Bucuresti, 1958, p. 416 – 468;
CEAPOIU N. – *Genetics and evolution of biological populations*. Ed. Academy Bucuresti, 1976.
CRISTEA M. – *The evaluation and use of plant genetic resources*. Ed. Academy Bucuresti, 1988.
GĂUCĂ C., BEREA N. – *Collection and characterization of some forms of wild hemp and local populations. 35 years of research – development at ARDS Secuieni*, Secuieni, 1997, p. 71 – 76.

ASPECTS OF THE INTRODUCTION OF PLANTS OF THE FAMILY *AGAVACEAE* IN THE GREENHOUSES OF THE BG (I) OF THE ASM

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Keywords: *introduction, Agave, collection, seed productivity*

Family *Agavaceae* Endl. belongs to class *Liliopsida* and includes 10 genera and about 450 species, widespread in tropical and subtropical arid regions of North and Central America, in the northern part of South America, on the islands of the Caribbean Basin and also in the western part of Asia.

The collection of plants from *Agavaceae* family, created within the BG in the course of about 40 years, served as material for the research. Phenological observations on flowering and formation of fruits with seeds were carried out according to «Методика фенологических наблюдений в ботанических садах СССР-1975-Москва, «Наука», 75 стр. (Methods of phenological observations in the botanical gardens of the USSR). The seed productivity of *Agave* L. species was determined according to «Методические указания по семеноведению интродуцентов», 1980- Москва, «Наука» (Methodical guidelines for the study of seeds of introduced species). The evaluation of the collection was carried out according to H. Jacobsen, 1970.

The collection of plants from *Agavaceae* family within the BG (I) of the ASM was created in the early 70s of the 20th century. A lot of species were brought as seedlings, suckers or seeds from various Botanical Gardens of Russia, Ukraine, Romania etc. The collection of plants from *Agavaceae* family, of the BG (I) of the ASM, includes 52 taxa belonging to 6 genera: *Agave* – 40 taxa, *Iucca* – 6, *Fourcraea* – 3, *Dasylirion* – 1, *Hesperaloe* – 1 and *Beschorneria* – 1. Within the genus *Agave*, 8 (20%) species reached the generative phase, 5 (12%) of which formed fruits with viable seeds; at *Agave* sp., on the flower stem, after flowering, in the place where usually appear flowers, young plantlets appeared, which served to restore the species, at *Iucca* – two taxa bloomed, but did not form fruits with seeds; at *Beschorneria* – after flowering, on the flower stem also developed young plantlets. At *Agave* species, the inflorescence development until the opening of the first flower lasts from 30 days at *A. ferdinandi-regis* to 90 days at *A. albicans*. The length of flowering stage ranges from 31 days at *A. victoriae-reginae* to 61 days at *A. ferdinandi-regis.*

The seeds of Agave species are found in dry dehiscent capsule fruits, with three locules. The size of the fruits varies from 2.5 cm long and 1.3 cm wide at *A. ferdinandi-regis* to 1.6 cm and 0.7 cm, respectively, at *A. victoriae-reginae*. The potential productivity of seeds of *Agave* species ranges from 267 seeds in one fruit at *A. ferdinandi-regis*, to 22 seeds at *A. schotii*, the real productivity is much lower in comparison with the potential one: 44 (16,3%) at *A. ferdinandi-regis*, and 2 at *A. schotii.*

All species and varieties of plants of fam. *Agavaceae* from our collections propagate vegetatively (by suckers) while the plants that form seeds propagate by seeds too, but the plantlets obtained from seeds grow very slowly.

The optimal period for vegetative propagation is spring-summer. The optimal substrate for plants of fam. *Agavaceae* is the mixture consisting of: fallow soil: peat: garden soil: sand, in a ratio of 2:1:0.5:0.5. Young plants are placed in bright places without direct sunlight, in the warm seasons they must be abundantly watered. In winter, the amount of water is reduced.

Plants of the fam. *Agavaceae*, being very decorative and having a high adaptive potential, can be widely used indoor for ornamental purposes, as solitary plants or in different compositions, as well as outdoors in the warm seasons.

Bibliography

1. H.Jacobsen *Das Sukkulenten lexicon*. VEB Gustav Fischer Verlag Jena 1970, p.35-58,100,151,239.
2. *Методика фенологических наблюдений в ботанических садах СССР*-1975-Москва, «Наука».
3. *Методические указания по семеноведению интродуцентов*, 1980- Москва,

THE LIFE STATE OF *QUERCUS ROBUR* L. IN THE CONDITIONS OF NORTHERN KAZAKHSTAN

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Key words: *Quercus robur L.; Nothern Kazakhstan; dendrological park; rare species; life state.*

Quercus robur L. (pedunculate oak) is a rare and relict species of Kazakhstan included in the Red Book. The tree reaches heights up to 40 m. *Q. robur* L. is photophilous, wind-resistant, drought-resistant plant. Q. robur L. naturally propagates from acorns, rarely vegetatively.

Naturally grows in Europe, Crimea, Caucasus, and the Balkans. Grows in the zone of mixed forests, river valleys, in the steppe zone in the ravines and gullies. It is cultivated as an ornamental and landscaping plant.

Q. robur L. is cultivated in many Botanical gardens in Kazakhstan. It is found in the plantings of the cities of Southern Kazakhstan (including Almaty), as well as some localities of Shymkent region. Naturally grows in Ural region, in the floodplain of the rivers Ural and Ilek [1,2].

In connection with a shrinking area under oak forests in Kazakhstan, especially relevant is the question of the preservation and restoration of *Q. robur* L. Plant introduction in Botanical institutions or conservation of biodiversity *ex situ* is part of modern techniques necessary to enhance the conservation of natural resources of plant origin.

The introduced plants of *Quercus robur* L. (age 50-62 years), planted in the Dendrological Park of Kazakh Research Institute of Forestry and Agroforestry (Northern Kazakhstan) in oak quarter in 1961-1963, served as object of the study. The Dendrological Park is located on three naturally formed terraces on the shore of Lake Shchuchie in the north-eastern part of Shchuchinsk. The land is flat with a slight slope. The soil of the Dendrological Park is alluvial, to the west, rocky areas are met.

The plants were brought from Kondratovskiy nursery as 5 and 2 year-old seedlings. The type of planting is free (landscape biological groups).

In the studied plantation, it was laid a test area of 0.065 hectares on which records and measurements of necessary taxation and biometric indicators of all trees were made. The description of the categories of the life state of trees was performed [3].

During the studies, it was identified that studied plantation refers to the VI growth class, the average height was 11.7±0.3 m, and the average trunk diameter was 20.7±1.02 cm and average crown diameter – 4.6±0.3 m. On the category of the life state of trees, the planting refers to the weakened one (78.1%). This is due primarily to the mismatch of the growing conditions and the influence of sharply continental climate. Pests on the trunk and the crown of trees were not found. During the inspection of the tree from top to bottom on the stems of some plants were found frost cracks. In the crown, it was noticed the presence of dead skeletal branches. In addition, the studied plantation crowded by self-seeding, growing in the Dendrological Park of introducents – *Acer negundo* L., *Acer platanoides* L., *Malus baccata* (L.) Borkh., shrubs – *Rhamnus cathartica* L., *Lonicera tatarica* L. and *Lonicera canadensis* Bartr. ex Marsh.

Despite the tough growing conditions, *Quercus robur* L. passes complete cycle of phenological development, fruiting and forms a self-seeding. This species can be grown in Northern Kazakhstan with proper care in landscaping plantings and solitary plantings.

REFERENCES:

1. *Rubanik V.G., Zheronkina T.A. Introduction of trees and shrubs of Europe in Kazakhstan [in Russian]* – Alma-Ata: «Science» Kazakh SSR, 1980. – 192 p.

2. Red Data Book of Kazakhstan. The 2nd edition revised and supplemented. Volume 2: Plants (joint authorship). – Astana, LTD « Арт Print XXI», 2014. – P. 89.

3. *Alekseev V.A. Diagnosis of the Life State of Trees and Tree Stands [in Russian]*, Lesovedenie, 1989, no. 4, pp. 51–57

EUONYMUS WARTY (*EUONYMUS VERRUCOSA* SCOP.) IN COLLECTIBLE PLANTATIONS OF NORTHERN KAZAKHSTAN

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Keywords: *Euonymus verrucosus Scop.; Northern Kazakhstan; rare species; phenological growth.*

Many plants of the Kazakhstan flora belong to rare and endangered species, and are of special value.

In Kazakhstan, rare and endangered plants were identified at the end of last century.

A collection of rare and endangered plant species of the native flora in the Dendrological park and the Arboretum of the Kazakh Research Institute of Forestry and Agroforestry (Northern Kazakhstan) began to form in the 60s of the last century. The first plants were involved in the implementation of the biogeocenotic studies of natural systems in Northern Kazakhstan.

Euonymus warty (*Euonymus verrucosa* Scop.) belongs to the family *Celastraceae* Lindl. and is included in the list of rare and endangered species of plants and the Red Book of Kazakhstan.

The species is distributed in the mountains of Southern, Central and Southeastern Europe, in the European part of Russia. It also grows in Turkey, Iran, China, Japan and Korea.

E. verrucosa is most often found in broad-leaved forests (especially oak) and mixed coniferous-broad leaved forests. Prefers fertile, lime-rich soils. Shade-tolerant mesophyte.

In Kazakhstan, the species grows in the conditions of introduction in Karaganda and Almaty. Under natural conditions, the species occurs in West Kazakhstan region in the flood plain of the Ural River, occasionally forming undergrowth in oak plantings [1].

In the Dendrological park of the Kazakh Research Institute of Forestry and Agroforestry in different years for the study were recruited seeds of 24 samples from the Botanical gardens and experimental stations: Moscow, St. Petersburg, Nizhny Novgorod, Penza, Omsk, Lvov, Sochi, Ekaterinburg, Far East, Barnaul, Lipetsk and one sample of 2-year-old seedlings from Lipetsk in 1966. Sprouting was obtained from 6 samples, but later preserved plants from 5 samples. Plants were planted in the biological groups in the Dendrological park of the Kazakh Research Institute of Forestry and Agroforestry. Currently, in the dendrological Park, 7 instances of different origin grow, 4 of them are in good condition, bloom and fruit every year (2 of them under the canopy of other species, and 2 – open space). Three plants are constantly mowed down or are felled when care work is performed and grow again, but they don't bloom.

E. verrucosa is resistant to frost, doesn't freeze in the spring and is drought-resistant. Very decorative coloring of leaves and fruits in autumn.

Average dates of phenological growth are as follows: start of growth (the swelling of the buds) was observed on April 21, opening of buds (start) – April 24, foliation – May 6, end of shoot growth – June 12-19. Flowering lasts for 15 days (June 1-14). Seeds ripen in early September (September 5). The first coloring of leaves observed on September 12, coloring lasts more than a week (until September 30). A leaf fall lasts from October 4 until frosts (the end of leaf fall unnatural). *E. verrucosa* under the canopy of plants has a height of 4 m (age 49 years), on free territory in the age of 42 – 3.3 m. During different years, it has been observed damage caused by allied moth (*Yponomeuta cogwatellus* Hb.).

Thus, *E. verrucosa* grows well in conditions of Northern Kazakhstan and is used in protective afforestation, in the underbrush, but mainly because of its decorative effect is used in landscaping.

REFERENCE:

1. Red Data Book of Kazakhstan. The 2nd edition revised and supplemented. Volume 2: Plants (joint authorship). – Astana, LTD « Арт Print XXI», 2014. – P. 197.

BIOLOGICAL ASPECTS OF VARIETIES OF BLACKBERRY CHESTER AND THORNLESS EVERGREEN

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Key words: *Rosaceae, Rubus, variety, vegetation, resistance*

Growing more widely the shrubs of the less cultivated species, addressed in this paper, is motivated in particular, by the importance of their fruit, due to its high content of vitamins, minerals, antioxidants and resistance of this species to low temperature, diseases and pests and their ability to exploit the worthiness of lands. [1]

Cultivars *Chester* and *Thornless evergreen* belong to the genus *Rubus*. *Rubus* is one of the most diverse genera in the plant kingdom with approximately 740 species (Gu et al., 1993). Blackberries are a native crop in North America and Europe (Crandall, 1995). Interest in blackberry phenolics has increased owing to their roles as antioxidants and the possible beneficial implications in human health, such as in the treatment and prevention of cancer, cardiovascular disease and other pathologies (Jennings et al., 1990). The cultivar *Chester* belongs to the genus *Rubus fruticosus*, but the cultivar *Evergeen* - to *Rubus laciniatus*, multiplied *in vitro* in the Laboratory of Biotechnology and Embryology of the Botanical Garden (Institute) of the ASM. [2]

These varieties are semi-shrub creepers, forming canes of up to 6-8 meters long. Fruit bud differentiation occurs in the first year of life. Lateral buds form a series of anticipated shoots that can reach a length of 2-3 m. Because of the less developed mechanical tissue, these plants cannot support themselves and need to be trained on trellis. Taxa differ in biological characteristics of the plant: repent shoots – *Thornless evergreen*, semi-erect – *Chester*; the cultivar *Evergreen* is characterized by greater vigor and *Chester* is semi-vigorous. Vegetation period lasts 180 days. Rest period: 6 months (October-March).

Chester cultivar with a semi-erect habit needs for self-support 2-3 string trellis placed at least 70 cm above the ground, the variety *Thornless evergreen* requires 3-4 trellises, fences are also recommended, green decorative arches can be formed. *Thornless evergreen* cultivar has an ornamental decorative appearance keeping leaf ornament throughout the year. In soil, these cultivars form a vigorous rhizome that further increases in that form annually, but, at the same, time cause the plant to have a good resistance to drought and frost.

Bud awakening occurs in March and flowering of both varieties occurs in the 3rd decade of May until the first decade of July. The plant may produce more shoots, but, for a better harvest, around 4-6 fruit shoots per plant remain, others are removed. Primary shoots grow about 6-8 meters long and their tips can be cut off, in the 2nd year, they develop second-order shoots bearing a large terminal corymb inflorescence. For *Thornless evergreen* variety were determined on average 70 sprout flowers on bush, but for *Thornless evergreen* variety – 60 each floral sprig, by 50 flowers on each floral sprig for *Thornless evergreen* and 25-30 flowers for *Chester*, 80% of which reach maturation (produce fruit) for *Thornless evergreen*, but for *Chester* cultivar – 85-90%. It is noted the contrast of the number of drupes in fruits of these 2 varieties, 80-90 drupes in the fruits of *Chester* variety and 70 drupes in the fruits of *Thornless evergreen*. The existing varieties are diploid and self-fertile culture. Fruits are polidrupes (aggregate *fruits*), consisting of several closely united drupelets and floral receptacle which is part of the fruit. A fruit of *Chester* cultivar weighs 5 g and a fruit of *Thornless evergreen* variety – 4.5-5 g. The color of fruits is bright purplish-black. Sweetish taste is characteristic of *Evergreen* cultivar and sweetish sour – of *Chester*. Fruit ripening occurs in the second decade of July, the first decade of September. Fruit harvesting is done with floral receptacle. The productive potential: 10-20 t / ha. Duration of economic exploitation of plantations – 15-20 years.

The described cultivars are grown in the collection of the Botanical Garden (I) of the ASM. In a periodic research that lasted four years, any diseases of leaves, shoots and fruits have not been detected, as the plants were not damaged by pests, fact which confirms that multiplication by modern biotechnological methods serves as a safe platform to obtain a healthy biological material.

BIBLIOGRAPHY

1. Slađana M. Stajčić*, Aleksandra N. Tepić, Sonja M. Djilas, Zdravko M. Šumić,Jasna M. Čanadanović-Brunet, Gordana S. Ćetković, Jelena J. Vulićand Vesna T.Tumbas,*CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF BERRY FRUITS* **,**University of Novi Sad, Faculty of Technology, Sad, Serbia.page 93-105;

2. Coirchină,N. and Lozinschii M *THE PARTICULARITIES OF MICROCLONING BLACKBERRY CULTIVAR "CHESTER"*,. România 12th International Symposium "Prospects for the 3th Millenium Agriculture, 2012.

THE CHARACTERISTICS OF THE THORNLESS EVERGREEN CULTIVAR MULTIPLICATION THROUGH MICRO-CLONING

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Key words: *Thornless, in vitro, medium, culture, multiplication*

Blackberries are native to Asia, Europe, North America and South America. Blackberries have been used in Europe for over 2000 years in pharmaceutical and food industries. Blackberries, often called "berries", are a diverse group of species and hybrids of the *Rubus* genus. They are members of the *Rosaceae* family, subfamily *Rosoideae*. *Rubus lacinatus* with its *Thornless evergreen* representative is a European cultivar from North America; its branches can reach up to 6 m in length. With leaves pinnately veined, with white flowers with shades of pink, having shiny round black fruit weighted 4.5 g, it has a particular flavor. This shrub can be grown for ornamental purposes having a decorative appearance due to its vigorous evergreen leaves.

In vitro tissue culture is considered to be the most effective method for multiplication of blackberries [1]. In result, we have a material with a strong resistance to diseases, ability of quick multiplication, a healthy material with the same genetic lines. Before placing it into the *in vitro* culture, an important step was to do the sterilization of the plant material taken from the donor plant which is an essential contribution to the initial stage of the *in vitro* culture. The best period of time for all types of explants while treating them with diacid is 7 minutes. The inoculation of different types of meristems led to the start of the morphogenesis and organogenesis processes. The medium created for inoculation was MS 100 % modified. The period between passing is approximately one month, when the plant material increases considerably (10 times) in this time limit.

The following medium has a positive influence on the *Thornless evergreen* cultivar. It was noted that on medium with naphthaleneacetic acid (NAA) 0.1 mg / l supplement, a broader development of the vegetative material is observed after 12 to 15 days. At this time, the shoot length is 5 cm. In comparison with other varieties of shrubs, the *Thornless evergreen* cultivar has a better observed rootedness. Rootedness was stimulated by filling the nutrient medium with indolle-3-byric acid (IBA) and NAA, the formation of roots was visible after 10-12 days of cultivation. On medium with IBA are developing roots and is observed a white callus, but on mediums with NAA is developing radicular system and the plant in full. To optimize the mediums through micropropagation of this cultivar we used medium MS 50 % with 30 g commercial sugar, liquid with NAA in concentration of 0.1, 0.2 mg/ l, on this medium shoot grows 12 cm in 30 days and takes roots in 14 days. The cytokinins 6-benzyl aminoppurine (BAP) used in different concentrations 0.1, 0.3, 0.5, 0.7 had an important role in the initiation of morphogenesis.

The most effective multiplication medium for the *Thornless evergreen* is the MS 100% supplemented with BAP (0.5 mg / l). In that medium, for a period of over 50-55 days, a quantity of 19 to 20 adventitious shoots with a length of 7 cm was obtained.

During the *ex vitro* acclimatization process, the substrate in which we plant is taken in great consideration. For the *ex vitro* transfer, the multiplied plantlets were taken from culture tubes, their base has been washed with hot water in order to remove the culture medium and the base roots were slightly cut to better stimulate the rooting process. The plantlets, which previously passed through a weak pink solution of KMnO4, are transferred into a solid substrate. The most appropriate and optimal substrate for plant growth and development was composed only of commercial peat with a pH of 5.8-6.5. Plants with substrate are planted in palettes composed of cells provided with holes. These cells are filled with a mixture of substrate in advance. The plant material is planted in the palettes for the *ex vitro* process, the palettes are enwrapped in transparent sheets to maintain humidity. For all cultivars it is very important the substrate to be as drained as possible, otherwise the percentage of plant survival is minimal. This culture has a growth rate of acclimatization 89-90% in winter months, but 95-99% – in summer months.

As a result of the investigations it has been established that the tissue culture for the *Thornless evergreen* cultivar was successfully used, being improved with time, this allowing to obtain perfectly healthy plants and high efficiency of seedlings. Nowadays, this method has turned into a modern technique for rapid multiplication of different species and cultivars including the one described above.

BIBLIOGRAPHY

1.Alexandru FIRA1), Doina CLAPA1), Catita PLOPA2)1 *IN VITRO MULTIPLICATION OF BLACKBERRY CULTIVAR THORNLESS EVERGREEN* Bulletin 5394 UASVM Horticulture, 66(1)/2009Print ISSN 1843-5254; Electronic ISSN 1843-
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INFLUENCE OF NODULE BACTERIA (RHIZOBIUM MELILOTI) UPON THE PRODUCTIVITY OF ALFALFA PLANTS

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Key words: *alfalfa, bacteria of nodules, green mass, harvest.*

Alfalfa is one of the main crops ensuring the creation of fodder base and increasing the share of vegetable protein. It also accumulates biological nitrogen in the soil, contributes to the accumulation of humus in the soil, prevents the soil erosion, contributes to soil structure, restores its formation and improves the ecological situation in agriculture.

If American specialists argue that alfalfa is the green gold of the Great Plains, then our specialists said that "it is the green gold of Moldavian cernozems" [1, 2].

With all the good qualities that this culture have, in the last few decades for various reasons it has not been given attention, which led to its loss of productivity.

In order to stabilize and increase plant productivity, an important role is played by the development of new intensive technologies of alfalfa cultivation using microbial fertilizers, growth stimulators, varieties with increased protein yield, also being used in optimal doses mineral and organic fertilizers. Given, however, the fact that fertilizers are quite expensive, it is necessary to seek another remedy for plant nutrition. This remedy can be obtained from the rhizosphere and rhizoplane of alfalfa plants (3, 4, 5).

Based on the above mentioned, our collective undertake field trips in various pedo-climatic areas of the country where alfalfa plants were collected and there were isolated, in laboratory conditions, 20 strains of bacteria *Rhizobium meliloti* – symbiotroph nitrogen fixing in alfalfa. After the purification procedure, they were studied in laboratory conditions, finally being selected the following strains of *Rhizobium meliloti*: 2/13, 3A, RS-B2, RP2, 29/30, 833 etc. Thus, the parameters of capacity of biomass storage and of virulence in nominated bacteria were studied. It was established that bacterization of alfalfa seeds stimulates the accumulation of green mass, it increased by 30.7% compared to the control and of dry mass – by 36.6%. The number of nodules formed on the roots of the plants has increased from 7.3 to 29.4%.

In field conditions, on small plots, in 2014, there were investigated four strains of bacteria *Rhizobium meliloti* 19K, RS-B_2, RP_2, RDm_1 with the aim of assessing their effect on the productivity of alfalfa variety Tuna. Plant harvesting occurred in bud-flowering phases. After the analysis of data obtained, it was found that green mass increased by 5.0 to 32.5% compared to the control. In this regard, the bacterium *Rhizobium meliloti* RS-B_2 was highlighted.

As a result of investigations, the following conclusions were made:

- Soil and plant samples contained multiple strains of *Rhizobium meliloti* nodule bacteria;
- In laboratory experimental conditions were highlighted the following strains of Rhizobium meliloti: 3A, 2/13, 29/30, RP_2, RS-B_2 with increased activity in alfalfa biomass accumulation and under field conditions, *Rhizobium meliloti* strain RS-B_2 was more pronounced.

BIBLIOGRAPHY

1. M. Lupascu. *Lucerna*. Chisinau, „Ed. Stiinta", 2004. – p. 10.
2. Lupascu M. *Agricultura Moldovei și ameliorarea ei ecologica*. Chisinau, „Ed. Stiinta", 1996.
3. Varga P.,Gumaniuc L. *Obiective si realizari in ameliorarea lucernei*.An.Inst.Cerc.Cereale, Plante Tehn.,,Fundulea,, 1977,42,75-80.
4. Blaxterk et al.*The effect of nitrogenous fertilizer on the nutritive value of artificielly dried grass*. J.agr.Sc., 1971,V.76, nr.2,p.307-319.
5. Mecletian W. *Alfalfa: effects of seeding rates and Rhizobium inoculations.* Calif.Agr.,1975,V.29,nr.2,p.13.

BOTANICAL GARDEN (INSTITUTE) – AN INEXHAUSTIBLE SOURCE OF NEW PLANT VARIETIES (ASPECTS ON THEIR PATENTABILITY)

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Keywords: *species, variety, plant variety patent, protection, intellectual property*

In the Republic of Moldova are found over 5500 species of plants, most of which are held, in its collection, by Botanical Garden (Institute). These species are not only maintained in collections, but are also subjected to the permanent improvement process.

As a result of improvement are obtained new plant varieties with a significant economic, social, aesthetic value, etc. New obtained varieties make up the intellectual property of the authors of variety and of the institution. In turn, these varieties, being a property, shall be legally protected and used. This problem can be solved by the acquisition of exclusive rights on varieties. They are regulated by Law no. 39-XVI of 29 February 2008 on the Protection of Plant Varieties (hereinafter - the Law) and other official documents in the field.

To have such rights is necessary to obtain a plant variety patent (hereinafter - PVP). PVP is a title of protection that certifies the priority of the variety, the authorship of the breeder and the exclusive right of the patent owner to use the variety. The patent provides legal protection for the new plant variety in the Republic of Moldova. Only the patent guarantees to the plant variety a safe legal protection and gives the possibility of a fair regulation of the personal and economic relations arising during the creation or use of this variety.

During the term of validity of the patent, there appear two categories of rights:

- moral rights of the author of the variety;
- exclusive economic rights of the variety patent owner

The exclusive rights allow right holders to exploit the variety, to dispose of the patent and variety, to prohibit third parties to perform the following acts with respect to the material of the variety or harvested material of the protected variety:

a) production or reproduction (for the purpose of multiplication);
b) conditioning for the purpose of propagation;
c) offering for sale;
d) selling or other marketing;
e) exporting;
f) importing;
g) stocking for any of the purposes mentioned in items a) to f).

Legal protection by plant variety patent may be granted to varieties belonging to all genera and species of plants. But according to the Law, a variety shall be patentable only where it is: - distinct; - uniform (homogeneous); - stable; - new. The variety shall also be designated by a denomination that meets the legal requirements.

In 2013, 15 new varieties of plants selected by the GB co-workers were submitted for patenting (I) (*Sida hermaphrodita* Rusby (ENERGO); *Heliathus tuberosus* L. (SOLAR); *Phacelia tanacetifolia* Benth. (MELIFERA); *Polygonum sachalinense* F. Schmidt (GIGANT); *Silphium perfoliatum* L . (VITAL); *Lavandula angustifolia* Mill (LAVINIE DE GRĂDINĂ); *Ocimum basilicum* L. (OPAL-MINI, CREȚIȘOR); *Physalis ixocarpa* Jack. ex. Nees. (AGAT-GB); *Polymnia sonchifolia* Poepp. et Endl. (SAVOARE); *Foeniculum vulgare* Mill. (PEREN – 1); *Sorbus* L. (CATRIN); *Aronia melanocarpa* (Michx) Elliot (ALECSANDRINA); *Hippophae rhamnoides* L. (REGINA, ELISA), iar in 2014 – 6 (*Chrysanthemum indicum* L. (ZEFIR, FACLIA); *Hemerocalis x hybrida* hort. (MELANCOLIE, ZEMFIRA); *Paeonia lactiflora* Pall. (TRAIAN, RUXANDA).

All varieties of the species submitted were subjected to the tests of patentability conditions, in accordance with the Law. It may be mentioned that these varieties fully correspond to the criteria of novelty, distinctness, uniformity and stability. And some of them are now protected by plant variety patent in the Republic of Moldova. These varieties were evaluated with gold and silver medals at several salons and exhibitions of inventions and technology transfer in the country and abroad.

BIBLIOGRAPHY:

1. *Law no. 39-XVI of 29 February 2008 on the Protection of Plant Varieties.* Chisinau, 2015, p. 152.
2. *http://bsapm.moldnet.md/Text/Pagina%20web%20Raport/Roman/Capitolul2total.html*

SCREENING AND IMPLEMENTATION OF AN ENERGY INTENDED CROP – JERUSALEM ARTICHOKE (*HELIANTHUS TUBEROSUS* L.)

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Key-words: *jerusalem artichoke, bioenergy, biogas, bioethanol, production.*

Agricultural crops, actually cultivated in Moldova, present strong shortages in terms of using thoroughly and efficiently natural, technological and social factors and fail to satisfy all the requirements of the country. Testing out and implementing new crops offer new possibilities of improving the agribusiness.

Currently Moldova is importing over 90% of energy resources, though it could cover at least 50% of energy needs from renewable bioenergy sources, produced in agriculture. In order to generate bioenergy resources, it is necessary to perform a selection and promotion of special crops, highly efficient in intercepting and exploiting 5-6% of photosynthetically active radiation, whilst the current crops are barely using 1-2% of photosynthetically active radiation. There are many energy intended crops that may be cultivated in Moldova. Amid these crops, the most attractive and efficient is the Jerusalem artichoke, that assimilates 2-3 times more energy than any other crop cultivated in Moldova. In the last decade, this crop is intensively studied and implemented in many countries.

In Moldova, Jerusalem artichoke was introduced more than 200 years ago, cultivated on small individual parcels, processed for nutriment and cattle feed. As an energy crop, the Jerusalem artichoke never presented an object of studies.

Based on the exceptional productivity and adaptability of this crop, its versatile use and economic efficiency, the cultivation of the Jerusalem artichoke on a large scale will benefit the agriculture, especially the renewable bioenergy production sector. The implementation is futile without the promotion of highly efficient varieties and production of seeding material.

In last 7 years (2009-2015), we have realised a modest breeding and selection program of most important samples (genotypes) from local populations along with samples from cultivation areas. 58 samples were studied, selected and tested – 28, tested in field trials – the best 8 samples. The program resulted in the selection and homologation of 2 varieties, displaying high productivity, adaptability, stability and homogeneity. In the period of 2011-2014, the average production of tubers was 67.4 metric tons/hectare (MT/ha), plus 54.71 MT/ha of green mass.

At the yield of 100 MT/ha of biomass, 1 ha of Jerusalem artichoke can assure the production of 10 metric tons (MT) of bioethanol, 20000 m^3 of biogas, 20-22 MT of nutritive units, 7.8-10 MT of fructose.

The energetic efficiency of Jerusalem artichoke outrivals by far the production of other crops and is defined by the improved use of photosynthetically active radiation – up to 5-6%, compared with 1-2% for corn, sugar beet and other crops.

The Jerusalem artichoke, aside its high productivity, holds many other advantages: can be cultivated on salinized soil, can be cultivated herbicide free, tubers may survive cold temperatures down to -20^0C (in soil), can be used as soilage, in human nutriment, for pharmaceutical purposes and as a fructose source.

The introduction of Jerusalem artichoke as a crop will bring multiple benefits in agriculture, especially in the production and usage of biomass as a source of energy.

STUDY OF MATERNAL FORMS OF *LAVANDULA ANGUSTIFOLIA* MILL ON CONTENT AND QUALITY OF ESSENTIAL OIL

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Keywords: *Lavandula, maternal forms, quantitative signs.*

The value of *L. angustifolia* is the content of essential oil. A refined aroma of essential oil allows using it in perfumery, but chemical components of lavender's oil contribute to using this in medicine. In order to successfully increase the lavender plantations and raw materials in the country and to get the possibility to enter the world marketing, we must ensure that the lavender in the country again becomes a highly profitable crop. To do this, we must obtain new high-yielding varieties and hybrids with high quality and content of essential oil.

The purpose of this research was studying maternal forms of *Lavandula angustifolia* Mill for content and quality of essential oil.

The biological materials for this research were three maternal forms involved in polycross. These are two forms of Ukrainian variety Krymchanka (Cr.-13, Cr.-26) and one French variety (Fr.-5). Evaluation on the content of essential oil was done by the method of Ginsberg. Essential oil was obtained from fresh inflorescences by hydro distillation on devices Ginsberg based on the dry weight. Qualitative and quantitative composition of the essential oil components was determined by gas chromatographic analysis of the essential oil in combination with mass spectrometry (GC-MS) [1, 2].

According to the content of essential oil, maternal forms have significant differences. After four years of research, the high content of essential oil showed the maternal form Fr.-5 - 3.528 % on dry weight. Maternal form Cr.26 on average, in four years, is 2.808% on dry weight and 2.776% at Cr.13. In this period of research, component composition of the essential oil of these maternal forms was studied. The number of identified chemical components in the oil, the same as the content of essential oil in maternal forms has differences. The greatest total number of chemical compounds has been found and identified (35) in the mother form Cr.26. The lowest number, of 23 components, was identified at the parent form Cr.13. In the essential oil of French form – Fr.5, 27 chemical components were detected and identified. According to the International Organization for Standardization of essential oil (ISO), in these maternal forms, the average percentage of the basic components complies with the following components: camphor - from 0.248% to 0.753% for the standard from 0.5% to 2.0%; lavandula – acetate – from 0.980% to 4.511% for the standard from 3.0 % to 6.0%; octanone-3 – from 0.080 % to 0.399 % at 1.0% – 2.0% in the standard; a-terpinene – from 0.128 % to 0.310% in the standard of 0% to 2.0%; linalyl acetate ─ from 27,290% to 33,533% at the standard 25.0 % -45.0% >. For such main components as the linalool, terpinene-4-ol, the average readings in the studied maternal forms exceeds the standard: linalool – from 34.196% to 45.500% at the standard 25.0% – 38.0%; 4-terpeniol – from 8.449% to 12.580 percentage at standard 2.0%-6.0%. Such chemical components as 1.8 - cineole, limonene and trans-β-ocimene were identified only at one parent form Cr.26.

Based on this information, we can conclude that the investigated maternal forms have a significant difference in content of essential oil and the quality of oil. The observed percentage of the main components meets the international standards.

BIBLIOGRAPHY:

1. *Goncearіuc M., Maşcovţeva S., Butnaraş V., Balmuş Z.* The biodiversity of *Lavandula angustifolia Mill.* F_1 hybrids./*Oltenia J. For Studies in Natural Sciences.*2011.27(1).Craiova. România. p.7-12.

2. *Mashcovteva Svetlana, Goncearіuc Maria*. The Expression of Heterosis in the Perspective F_1 Policross Hybrids of the *Lavandula angustifolia* Mill. Proceeding of the Seventh Conference on Medicinal Aromatic Plants of the Southeast European Countries (Proceedings of the 7th CAPSEEC). / Institute for Medicinal Plant Research "Dr. Pančičic." Belgrad and AMAPSEEC. 2011. p.374-380.

MANIFESTATION OF SOME BIOLOGICAL TRAITS OF *CUPHEA* GENUS

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Keywords: *pollen, oblate, sincolporate, morphology, striated exine*

Cuphea genus (fam. Lythraceae) includes 250 – 260 species growing in Central and South Africa. Economic value of these plants is very diverse but of special interest is the ability of plants to synthesize and store oil (16 to 42%) in seeds containing capric, caprylic, lauric and myristic acids used in production of laundry powders, plasticizers, and also in perfumery, medicine and other sectors[1]. Successful introduction of valuable species in culture assumes detailed study of plant biology as well as display of productivity and resistance potential under new conditions. In connection therewith, the purpose of our investigations was to study manifestation of some biological parameters of representatives of *Cuphea* genus in specific conditions of their introduction in Central Zone of Moldova. The objects of our studies were accessions of three species: *C. lanceolata* (1), *C. viscosissima* (2); *C. lutea* (3). We studied and described some morphological parameters.

Thus, plants of all genotypes were characterized as herbaceous, annual plants with tap root system and upright stem. They have simple, opposite, and entire-kind leaves. Flowers are small, single, zygomorphic, located interaxillary. Corolla has six unequal petals, they are uniformly violet-cherry-colored in plants of the 1st and 2nd species. Plants of the 3rd species have flowers with two violet petals and four white petals with red central vein. Androecinum has eleven stamens located in two rings. Gynoecium is syncarpous. Stem, leaves and sepals have sticky hairy surface. Fruit represents a seed case where small oblate brown seeds develop.

Results of phenological observations showed that genotypes of all three species are characterized by rather long flowering period (from the second decade of June to the first frosts). Representatives of the first 2 species begin to flower 8-10 days earlier than genotypes of the 3rd species. Fruit formation was noted to begin in the first decade of July and fructification lasted till October.

To determine reproductive potential of plants, the analysis of pollen must be conducted because the changes in basic characteristics of pollen influence fertility and reproductive biology of plants [2]. We performed morphological description of pollen grains using scanning electron microscopy method. For characteristics of species, the following parameters were used: diameter, shape, surface and aperture of pollen grain.

***Cuphea lanceolata* Ait.** Pollen grains have oblate shape, 20.65 to 23.04 µm in diameter. Aperture contains three pores, pore diameter varies within 4.5 to 6.0 µm. Pollen grains are sincolporate and have no apocolpium. The structure is wrinkled in mesocolpium.

Cuphea viscosissima Jacq. Pollen grains are sincolporate, with three prominent pores and streaks located on the opposite poles. The shape of pollen grains is oblate, 21.0 to 22.86 µm in diameter. Pore diameter varies within 4.0 to 6.0 µm. Mesocolpium surface is smooth except for the area around the pore where it has wrinkled sculpture.

***Cuphea lutea* Rose.** The shape of pollen grains is oblate, 24.57 to 26.09 µm in diameter. Pore diameter varies within 7.62 to 8.0 µm. Mesocolpium surface is smooth except for the area around the pore where it has wrinkled sculpture.

Thus for the first time, three species of *Cuphea* genus have been introduced in Moldova. Morphobiological parameters of plants were studied. Pollen grains of *Cuphea lanceolata*, *Cuphea lutea* and *Cuphea viscosissima* species are sincolporate, oblate and 20.65 to 26.09 µm in diameter, *C. lutea* has the largest of them and *C. lanceolata* – the smallest. The study of surface by scanning electron microscopy method showed that sculpture of a single pollen grain is non-uniform, and differences between species include location and intensity of sculpture elements. Analysis of morphometric traits showed that studied species differ in diameter of pores and aperture.

BIBLIOGRAPHY

1. Webb D. M., Knapp S. J. – *Genetic parameters for oil yeld in a populations of Cuphea lanceolata. In: Crop science*, 1991, vol.31, nr.3, P.621-626.
2. Батыгина, Т.Б., Васильева, В.Е. – *Размножение растений.* Изд-во Санкт-петерб. Ун-та, СПб, 1999, 102с.

NEW VARIETIES OF PEONIES BRED IN BOTANICAL GARDEN-INSTITUTE, UFA SCIENTIFIC CENTER

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Keywords: *paeonia, new variety, selection, introduction.*

Peonies - exceptionally beautiful ornamental plants known since ancient times. Thanks to their rich decorative qualities, they are widely and variously used in landscaping gardens, parks, boulevards, factory areas and residential areas. Abroad, for a long time, people are engaged in breeding peonies. Of all European countries, France was the first to cultivate peonies. Later, peonies were grown in England, Holland, USA. In Russia, the breeding work with peonies is carried out in the Botanical Garden of Moscow State University, Main Botanical Garden of Tsitsin RAS, the Institute of Horticulture for Siberia of Lisavenko et al. It should nevertheless be noted that there are very few domestic varieties of peony, and almost none is cultivated on a large scale. All of this suggests that, despite the difficulties of breeding work with peonies (duration of their growth and reproduction - 12-15 years old), this work is extremely interesting and necessary for ornamental horticulture regions of Russia.

In the Botanical Garden of the city of Ufa, breeding research to develop new varieties of peony has been performed for more than 60 years. The initiator of this trend was the candidate of agricultural sciences Kravchenko O.A. The purpose was the creation of domestic varieties better adapted to local conditions, with large double flowers of the original form and color [1]. With the use of open pollination and artificial hybridization, it was created a large fund of hybrids (more than 800 seedlings). In 1999, the peony breeding work has been continued by Tukhvatullina L.A., Mironova L.N., and since 2003, by Reut A.A. As a result, the fund of hybrid seedlings has been expanded for 1500 samples. Of them, are currently highlighted about fifty hybrids, the most interesting from decorative point of view with large and medium-sized flowers of rose-like, crown-like, spherical, anemone-like and Japanese forms, red, pink, cream and white color, and intermediary colors. Seventeen candidates for varieties were submitted to state testing. In 2008, they were included in the State register of breeding achievements permitted for utilization. They received certificates of authorship and patents [2, 3]. The following are characteristics of some hybrid varieties of peony bred in the Botanical Garden-Institute, Ufa Scientific center.

Aurora. Bred in the late 90s of the 20th century (authors: Mironova, Tukhvatullina, Reut; copyright certificate number 49818) by hybridization of *Amabilis Superbissima* varieties and species *Paeonia wittmanniana* Hart. Shrub up to 60 cm, semi-spreading, average foliage. Stems slender, without anthocyanin coloration. Leaves are medium length, green, shiny, three trifoliate, the lower side without pubescence. Hemispherical doubled flowers, up to 15 cm in diameter, light pink. Pistils normally developed in an amount of 5 or more pieces. Stigmas pink. Stamens ring, yellow stamen thread. Fragrance middle. Peduncle durable. Number of flowers per spike – up to 4, on the bush – up to 25. Late, blooms in late June 9-10 days. Decorativeness 94 points [4].

Sasha. Bred in the late 90s of the 20th century (authors: Mironova, Tukhvatullina, Reut, copyright certificate number 49808) by open pollination varieties *Yubiley Revoljucji.* Shrub up to 85 cm, semi-spreading, average foliage. Stems slender, weak anthocyanin coloration. Leaves are medium length, dark green, shiny, three trifoliate, the lower side without pubescence. Doubled flowers, globosely shaped, up to 15 cm in diameter, pale pink. Pistils and stamens absent. Aroma average, pleasant. Peduncle medium strength. Number of flowers per spike up to 2, on the bush – up to 20. Late, blooms in late June 9-10 days. Decorativeness 95 points.

Tornado. Bred in the late 60s of the 20th century (authors: Kravchenko, Mironova, Reut, copyright certificate number 47860) by the free pollination of varieties *Mons Martin Cahuzak.* Shrub up to 80 cm, compact, weakly foliate. Stems slender, with anthocyanin coloration. Leaves are medium length, dark green, shiny, three trifoliate, the lower side without pubescence. Semi-double flowers with a diameter of 13 cm, crimson. Pistils deformed, in an amount of 3-4 pieces. Crimson stigmas. Stamens random, yellow stamen thread. Fragrance middle. Peduncle durable. Number of flowers per spike – up to 2, on the bush – up to 25. Late, blooms in late June 11-12 days. Decorativeness 91 points.

Chak-chak. Bred in the late 60s of the 20th century (authors: Kravchenko, Mironova, Reut, copyright certificate number 47880) by hybridization of varieties *A. Superbissima* and *Avalanche*. Shrub up to 80 cm, compact, average foliage. Stems medium thickness, without anthocyanin coloration. Leaves are medium length, green, shiny, three trifoliate, the lower side without pubescence. Japanese flowers with a diameter of 16 cm, pale pink. Pistils normally developed, in an amount of 5 or more pieces. Stigmas pink. Stamens absent. Pleasant aroma low. Peduncle durable. Number of flowers per spike: up to 2, on the bush: up to 20. Middle, blooms in late June. Decorativeness 91 points.

BIBLIOGRAPHY:

1. Миронова Л.Н., Воронцова А.А., Шипаева Г.В. *Итоги интродукции и селекции декоративных травянистых растений в Республике Башкортостан.* М.: Наука, 2006. Ч. 1. 211 с.
2. Миронова Л.Н., Реут А.А. *Пионы башкирской селекции* // Цветоводство. 2012, №3. С. 2-5.
3. Реут А.А., Миронова Л.Н. *Новые сорта пиона гибридного для средней полосы России* // Известия Уфимского научного центра РАН. 2012а, №3. С. 35-41.
4. Реут А.А., Миронова Л.Н. *Пионы. Биология и размножение*. Saarbrucken, Germany: LAP LAMBERT Academic Publishing, 20126. 200 с.

THE INDUCTION OF THE MICROCLONAL AND MICROPROPAGATION PROCESSES IN *IN VITRO* CULTURE OF BLACKBERRY X RASPBERRY HYBRID *TAYBERRY*

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Key words: *Cytokinin, 6-Benzylaminopurine (BAP), Micropropagation, MS medium, adventiv shoot.*

Tayberry is a hybrid obtained by the crossing of the blackberry - *Rubus fruticosus* and the raspberry - *Rubus idaeus*. The original plant was selected from a family of seedlings resulting from a cross made in 1969 at the Scottish Horticultural Research Institute, Dundee, UK, between the octoploid blackberry Aurora and a tetraploid raspberry 626/67. This variety resembles the Loganberry in some respects, but is superior to it with respect to fruit size, yield, fruit color, mode of presentation of fruit. *In vitro* culture of *Tayberry* is cost effective for obtaining vitroplantlets free of viruses in a short period of time. In this paper we have presented some aspects concerning the *in vitro* propagation and the evaluation of different concentrations of growth regulators BAP and NAA.

The culture media were prepared using the stock solution of macro-, microelements and vitamins, subsequently being autoclaved at 100 ° C for 5 min. For the *in vitro* micropropagation, it was used Murashige Skoog medium [3] supplemented with growth regulator BAP. The sucrose in the culture medium may be replaced with sugar 30 g/l.

As study material of the cultivar *Tayberry* in *in vitro* culture served cauline meristem (apical meristem). The explants were inoculated immediately after shaping and disinfection, as it degrades rapidly oxidizing. First, it is prepared a small number of explants. The speed of degradation and loss of viability depend on the nature of explants, on their size and the conditions in which they are kept (on the glass, filter paper moistened with distilled water or are submerged in water).

The inoculums came from open ground after being sterilized according to the methods described by Cachiţa-Cosma [1] and modified in the laboratory.

After the investigation on the multiplication of variety *Tayberry* on these mediums, it was observed that efficient result was obtained on MS medium with the addition of BAP for a period of 55-60 days. It was found that on the medium supplemented with BAP (0.3 mg / l) the number of adventitious shoots is about 14, but with the increase of amount of BAP in the culture medium increases the number of adventitious shoots. In the culture medium supplemented with BAP at a concentration of 0.7 mg / l their number reaches 26 shoots. With the increasing of number of adventitious shoots decreases their length. For *Tayberry*, it was established an optimal culture medium for rootedness, with the composition – MS 50% supplemented with 0.1mg / l NAA. On this substrate it has been observed a growth of the plantlet axis of about 8.0-10.0 cm, over a period of 30 days, and the basal part of the plant having a branched root system, composed of 5-6 white, branched rootlets. The plant being of an increased vigor, having a high potential of growth, afterwards being micropropagated on the culture media, and the basal part of the shoot is passed to *ex vitro*. Simultaneously was tested MS 50% medium without growth regulators. It was established that on this culture media rootedness process is slower (60-65 days), and the development of the aerial part is harder. The plant does not grow more than 2-3 cm in length.

So we conclude that: *Tayberry* cultivar showed a positive assertion in multiplying by vitro cultures.

Optimal culture medium for the development of plantlets for microcloning (larger number of shoots, more vigorous, that are long enough) is MS supplemented with BAP (0.5 mg / l).

Basic culture medium for the rootedness process is MS 50% supplemented with NAA (0.1 mg / l).

BIBLIOGRAPHY

1. Cachiţă, C.D., Deliu C., Rákosy-Tican E., Ardelean A., 2004, *Tratat de biotehnologie vegetală*, Ed. “Dacia”, Cluj-Napoca, vol 1, 433p.
2. http://www.google.com/patents/USPP4424
3. Murashige, T. and F. Skoog. *A revised medium for rapid growth and bioassays with tobacco tissue cultures*. Physiol. Plant., 15: 1962, p. 473-497.

SOME PARTICULARITIES OF VEGETATIVE REGENERATION OF CROP FIELD PASSIFLORA IN MOLDOVA'S CONDITIONS

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Keywords: *Passiflora incarnata, rhizomes, regeneration, perennity*

Passiflora (*Passiflora incarnata* L.) from Central America, in natural habitat, is an herbaceous perennial creeper liana longer than 9 m [1, 2, 3]. Under the conditions of abundance of humidity, passiflora develops rhizomes of 1-2 m and 3-15 mm in diameter [2, 3]. Rhizomes are placed superficially (5-10cm) that makes possible their harvesting as planting material. The method of breeding by rhizomes is practiced in subtropical areas of the Caucaz (Georgia) [2, 3].

Prior researches showed that in different years, due climatic conditions of Moldova, passiflora as alien species introduced into crop field, regenerates from different depths, from 8-10 cm and over 20 cm, the rhizome harvest being reduced. In order to argue some cultivation methods, we aimed to study the mode of placement of rhizomes and their regeneration in spring, on soils with various degree of loosening.

Materials and methods: on passiflora plantation of black earth soil, initiated by seedling in 2013 and 2014, were used following methods: without soil loosening; with watering 80-100m^3/ha after harvesting of raw materials; with deep loosening with disk (10-12 cm) and cultivator KRN-4,2 early spring; spring soil loosening. All variants were harrowed in spring, in March, were fertilized with $N4_{45}$ (ammonia soda) and processed with herbicide Glufosat 6 l/ha. The depths of regeneration were determined by digging up to 40 cm near the plants and their manual removal from soil.

Researches showed that the growth conditions, especially in the second half of a year, influence a lot the mass and depth of forming Passiflora plant rhizomes in the soil. On not irrigated soil, in conditions of insufficiency of humidity, rhizomes are developed at 15-25 cm, in winter being under the frozen layer of soil. On irrigated, moist soil, passiflora developed rhizomes at depth of 5-6 cm to 30 cm. Active, external buds with regenerative capacities spread through entire length of rhizomes, including those from the depth of 30 cm, like perennial herbaceous species with basal shoots. During the irrigation, first of all, regenerated plants from the rhizome sprouts placed on 10-15 cm layer (Fig. A). Rhizomes from frozen soil layer during the winter usually perish. Passiflora regenerate evenly on spring loose soil or protected in winter by coating of plant waste. On compact soil, the most buds begin to sprout, but fail to cross the 1-10 cm soil layer or they arise much later after watering or rainfall (Fig. B). On loose and wet soil, Passiflora regenerated even from a depth of more than 20 cm (Fig. C).

Figure A

Figure B

Figure C

Passiflora plants 40 days after the beginning of regeneration

Fig. A…. non compacted soil: regeneration from the depth of: ***1***…9 cm – early; ***2***….from 9 to 12 cm; ***3***…from 14-16 cm – 10 days later.

Fig. B… irrigated soil: ***1***…compact soil; ***2***… loosed at 10-12 cm.

Fig. C… loosed soil at 10-12 cm: ***1***…regeneration from 14-15 cm, early; ***2***….regeneration from 20-25 cm, late.

Preliminary conclusions: 1. Rhizomes of Passiflora cultivated in Moldova form reproductive buds along their whole length and thus can generate from different depths, even below the frozen soil layer in winter. This makes possible a stabile perennial of this crop field species in conditions of Central and South zones of the country.

2. The depth of rhizome regeneration is largely determined by the density and degree of compactness of the soil. On the soil with density close to the norm (1,1-1,3 g/cm^3) earlier regenerate sprouts from rhizome segments up to 10 cm, followed by those of 10-20 cm layer.

3. On the loosed soil, Passiflora may regenerate from the depth over 20 cm.

4. On the compact soil with density more than 1.4 g/cm^3, Passiflora may regenerate well only if the soil is loosed in spring, with cultivator, at the depth of 12-15 cm and is wet enough.

BIBLIOGRAPHY

1. *Musteaţă G. Pasiflora (Passiflora incarnata L.) în cultura de câmp în Republica Moldova.* Chişinău: S.n.,2014.100 p.

2. *Рабинович И.М., Баджелидзе Л.С. Пассифлора инкарнатная в условиях полевой культуры.* Лекарственные растения. Т. 3. Возделывание. Москва: ВИЛАР, 1968. С. 110-117

3. *Рабинович И.М. Пассифлора инкарнатная.* Лекарственные растения СССР /Под ред. А.А. Хотина и др. Москва: Колос, 1967. С. 184-187

4. *Musteaţă G., Roşca Nina, Baranova Natalia. Floarea pasiunii (Passiflora incarnata l.) – plantă medicinală de perspectivă pentru cultivare în Moldova.* Conservarea diversităţii plantelor: Materialele Simpozionului ştiinţific internaţional. Chişinău, 2010. P.386-393

BIOLOGY OF REPRODUCTION OF THE SPECIES *AMELANCHIER ALNIFOLIA* (NUTT.) NUTT

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Keywords: *Amelanchier alnifolia, fruit, generative and vegetative propagation.*

With the transition to market economy, specific strategy for the development of the national economy of the Republic of Moldova in recent years, the problem concerning the diversification of the assortment of crops appeared, envisaging the introduction and cultivation of new plant species of wild flora, thus directly contributing to the solution of some problems related to the provision of healthy food. The pedoclimatic conditions of the Republic of Moldova favour greatly the introduction and cultivation of non-traditional fruit trees and shrubs that, being undemanding with regard to environmental conditions, can be introduced without major efforts in different sectors of national economy.

Amelanchier alnifolia is an ornamental, melliferous and, at the same time, a fruit shrub with globoid, berry-like, delicious fruits that contain a lot of vitamins, are about 10-13 mm in diameter, of black-blue colour, covered with waxy bloom. Fruits contain 1-6 seeds. This shrub is valuable due to its fruits, which contain many biologically active substances: carbohydrates – up to 20%, provitamin A, vitamin C, P, group B, organic acids, a large amount of malic acid, derivatives of carboxylic and phenolcarboxylic acids, flavonoids, tannins, substances containing microelements (Cu, Pb, Co), catechins, anthocyanins, carotenoids. The polysaccharides contained in saskatoon fruits, after hydrolysis, give rise to monosaccharides such as galactose, glucose, arabinose, xylose, rhamnose, etc., which are very necessary for the metabolism of human body. Leaves contain phenolcarboxylic acids and halogenated derivatives of these organic acids, catechins and other active chemical compounds. Fresh fruits serve as raw material for the food industry, for making jams, juices, compotes. Canned fruits are used for prophylactic purposes in cases of hypo- and avitaminosis, asthenia and different diseases of the digestive tract and regulation of plastic metabolism in case of anomalies.

The purpose of this paper is to study the bioecological peculiarities of this species and to obtain high quality planting material. *Amelanchier alnifolia*, a shrub native to North America, grows and develops well under the conditions of the Republic of Moldova. It has erect, relatively thick stems with brown or gray bark. The young branches are tomentous, later – glabrous, reddish brown and the buds are purple. The leaves are broad-oval to nearly circular, rounded to slightly indented at apex, rounded to heart-shaped at base, sharply and coarsely toothed mostly above the middle.

The flowers reach 20-30 mm in diameter, the sepals are lanceolate, acute, persistent, petals – oblanceolate with rostrum. They have 20 stamens, five styles united near their base. The flowers are white, grouped in upright short racemes that contain a dense cluster of 5-10 stalked flowers with tomentous, whitish receptacle. Flowering time: April-May. The stalks of superior flowers from the inflorescence are 2-5 mm long, the stalks of inferior ones – 10-12 mm long. Fruits reach maturity in June-July. The seeds are shiny, brown, 5 mm long and 2 mm wide, remain viable for two years.

Some of the harvested seeds were stratified cold and were sown in late autumn, in loose soil; other seeds were stratified in six months and were sown in early spring at a depth of 1.5-2 cm. The most successful methods of vegetative propagation were the marcottage, carried out in early spring, and separation of the bush, carried out in autumn. Rooting percentage was 85-90%. The percentage of rooting of cuttings ranged between 35-45%. Propagation by root cuttings was also practiced, but the obtained plantlets had poorly developed root system. The rooting of cuttings depends on many factors: the quality of cuttings and substrate, conditions for growth and development of mother plants and of stalks before cutting, compliance with the optimal techniques of cutting, density of plantlets in plant nursery.

The cultivation of this shrub, which is resistant to diseases and pests, has a positive impact on improving the diversity and quality of berry production in the republic and providing organic fruits, rich in vitamins. This shrub fructifies early at the age of 4-5 years. *Amelanchier alnifolia* can serve as a source of raw material for food, pharmaceutical, medicinal sectors, can essentially contribute to improving health and strengthening food security and can also be used as a decorative plant.

MORPHO-ANATOMICAL CHARACTERS OF GENERATIVE ORGANS OF INTERGENERIC HYBRIDS CYDONIA X MALUS

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Keywords: *intergeneric hybrids, generative organs, anatomy*.

The studied polyploid hybrids inherit the morpho-anatomical characters of generative organs differently, analogically to the features of leaf blade and petiole structure. The characters of apple flowers prevail in these hybrids, but their flowers are bigger. A distinguishing feature of the paternal triploid and diploid hybrids is the number of flowers in an inflorescence – from 1 to 4; solitary flowers predominate – 50-65%. The number of inflorescences with 2-3 flowers constitutes 31-47%, which allows us to conclude that these hybrid plants inherit this character from both genitors. The 75% of the flowers of diploids are solitary and only 25% are inflorescences with 2 flowers. In the tetraploids and paternal triploids, solitary flowers predominate (97-99 %) and inflorescences with 2 flowers are very rarely observed.

The triploid intergeneric hybrids quince x apple differ from other hybrid forms by the number of flowers in inflorescences and the flowering period, which coincides with the flowering of late varieties of apple. The quince varieties start flowering later and the pollen of apple varieties with late flowering period can be used to improve these hybrid forms. It has been established a directly proportional correlation between the polyploidy level and the size of the pollen grain. Pollen viability of tetraploids is higher (56-67%) than of triploids, which constitutes 3.1-10.2%. The studied tetraploids are distinguished from other hybrid forms by the high viability of the pollen, the larger size of pollen grains and cells from the zones and subzones of the pericarp. The pollen of diploids proved to be sterile in all variants. The paternal triploid hybrids inherit the characters of initial forms, mostly the characters of apple fruits (shape, taste and colour of the epicarp) but also specific features of quince (mostly solitary flowers – more than 50%, stable crops, presence of sclereids in fruit parenchyma). The studied distant hybrids differ in shape, size and intensity of fruit colour. The triploids' fruits don't contain seeds; few of them have 1-2 underdeveloped seeds, unlike tetraploid forms which contain 10-22 viable seeds in a fruit.

The pericarp of mature fruits of distant hybrids bears certain similarities in tissue zoning from outside to inside (epicarp, mezocarp differentiated into 4 subzones and endocarp) to the parental forms. The epicarp of a mature fruit is represented by single layered external epidermis covered by a relatively thick cuticle which constitutes 16.9-34.2 μm, of external-internal type, with the degree of spread from 1/3 up to 1/2 among epidermal cells. The epidermis is composed of polygonal parenchymal cells, tangentially elongated. The mezocarp is the middle tissue layer, the most voluminous part of the pericarp, made up of parenchymal cells. In the fruit mezocarp of the studied hybrids (similar to quince and apple), from outside to inside, there are 4 subzones which succeed one another easily without definite boundaries: the hypodermis, the external subzone of oval-rounded cells, the subzone of radial oval-elongated cells and the internal subzone of oval-rounded cells. The endocarp of the fruits of distant hybrids *Cydonia* x *Malus* is the internal histological zone, represented by the internal epidermis consisting of a layer of cells of 28-35 μm, well wrapped, elongated on the tangential axis and arranged in the form of parquet, with thickened cell walls. The studied progenies differ from each other and from other hybrid forms in the thickness of cuticle and parchment layer, the size of epidermal cells (tangential and radial) and parenchymal cells from the subzones of the mezocarp (hypodermis, the subzone of oval-rounded and oval-elongated cells), the density and arrangement of sclereids in mezocarp.

In the paternal triploids, the uneven thickness of the cell walls of epidermal cells, the absence of sclereids in the external subzone of oval-rounded cells and the shape of endocarp cells typical of apple dominate in the structure of pericarp and the size and shape of cells from other subzones of the mezocarp was inherited intermediary. The tetraploids from other hybrid forms by larger pericarp cells are distinguished.

Our research confirms the similarities (dominance of characters of generative organs of apple) in the morpho-anatomical and biochemical peculiarities of vegetative organs and seeds of paternal triploid distant hybrids.

The results of the morpho-anatomical research can be used to develop a program on fruit tree improvement and further testing of resistance of hybrids from *(*subfam. *Pomoideae)* fam. *Rosaceae*.

CULTIVATED DENDROFLORA OF THE REPUBLIC OF MOLDOVA

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The cultivated dondroflora represents a complex of trees, bushes and lianas of autochthonous and allochthonous origin, which accommodates at pedo-climatic conditions and are used in different proportions in practice. Apparition and establishing of the cultivated dendroflora is the result of multiannual process of introduction, which registered ascensions as well as descensions. The valorous period of plant introduction is registered in the second half of the last century when the Botanical Garden of the Academy of Science of Moldova was created. In that period the introduction process gets a scientific connotation and in the short period of time 2000 species, forms and varieties of trees, bushes and lianas were introduced and experimented. At present, a great genetic fund of woody plants is accumulated in green spaces and dendrological collection which counts about 808 species and 625 forms and varieties (total about 1500 taxa) and belong to 67 families and 199 genus. The Pinophyta division is represented by 7 families, 26 genus and about 375 species and varieties. Two families - Pinaceae and Cupresaceae are the most representative counting about 95% of the total taxa from this division. The majority of 70% of taxa are trees, but the bushes represent the rest of 30%. The lianas, as a vital form, are missing. Only 60 taxa (16%) from this reach genetic fund are used in practice (frequency "permanent" and "everywhere"). Magnoliophyta division is represented by 1125 taxa from 60 families and 173 genus, of which the most representative are ten families or 74% of the total taxa of this division: Aceraceae, Berberidaceae, Betulaceae, Caprifoliaceae, Fabaceae, Fagaceae, Hydrangeaceae, Oleaceae, Rosaceae, Salicaceae. The most common vital form are bushes, about 53% of the total number of taxa, trees 40% and lianas 7%. Only 315 taxa (28%) from this reach genetic fund are used in practice (frequency "permanent" and "everywhere"). Absence of seed production system and modern technology on reproduction and breeding, as well as deficiency in economic evaluation and marketing for each taxa are the reasons of an insufficient usage of genetic fund of introduced dendroflora.

GROWTH AND DEVELOPMENT OF THE VARIETY "ALECSANDRINA" OF *ARONIA MELANOCARPA* (MICHX.) ELLIOT IN THE REPUBLIC OF MOLDOVA

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Keywords: *Aronia melanocarpa΄Alecsandrina΄, productivity, vegetative and generative propagation.*

Enriching the assortment of cultivated plants is one of the strategic directions of the national economy. The introduction, research and cultivation of new species and varieties of precious plants contribute to solving the problems related to the Food Programme of the Republic of Moldova. Aronia surpasses 2-4 times the traditional fruit species in the amount of iodine in fruits. Aronia berries contain vitamins (P, C, A, B_1 ,B_2, P, E), carbohydrates, carboxylic acids, tannins and pectin. In the amount of vitamin P (from 1200 to 6100 mg%) in fruits, aronia surpasses main traditional fruit plant species [1,2,3]. Aronia fruits and juice help strengthening the walls of blood vessels and are indicated for people suffering from hypertension, but are contraindicated for people suffering from gastritis or duodenitis. Aronia berries are a valuable food and pharmaceutical source with therapeutic properties: vasoprotective, antiviral, hypotensive, antioxidant, anti-atherosclerotic, chemopreventive, anti-inflammatory, antimutagenic and antimicrobial [1, 3].

Aronia melanocarpa is a species native to eastern North America. It grows and develops well in the Botanical Garden (I) of the ASM. In our country, it is cultivated rarely, usually by amateurs [3, 4]. Aronia varieties are quite undemanding to soil. However, they grow better in light soils with sufficient moisture. They are resistant to drought, frost, pests, diseases and early spring frosts. The variety "Alecsandrina" grows and develops well in full sun and part shadow. It starts vegetating early, when the average temperature is of 4.5-7 °C.

The variety "Alecsandrina" is a 1-1.5 m tall shrub with glabrous stems. The leaves are 7-9 cm long, elliptic or ovate to oblong oblanceolate, acuminate or obtuse. On the upper side, the leaves are green and glossy, and on the lower side – lighter green, glabrous. Its vegetative stage starts in early spring (March-April), depending on the climate conditions of Moldova. The shoots begin to grow when buds open and end – in late July or early August. The flowers of this variety are white, 1.5 cm in diameter, grouped by 5-25 in glabrous, corymb inflorescences. It blooms in April-May.

The flowering stage lasts from 10 to 17 days, depending on climatic conditions at the time of flowering. Fruits are globoid, 0.8-1.5 cm in diameter, black or purple-black, shiny, covered with a light, bluish waxy bloom and have a specific sour-sweet taste. The mass 100 of fruits of the variety "Alecsandrina" was of 113 g. The number of fruits in a corymb ranged from 5 to 25, and in 1kg – 885. "Alecsandrina" variety differs essentially regarding the following characters: plant height, mass of 100 fresh fruits and fruit content in a kg. It is highly productive, fructifies regularly and early, beginning with the age of 2-3 years and has high degree of fruit development of 90-95%.

The studied variety propagates vegetatively (by lignified and semi-lignified cuttings) and generatively [4]. Seeds are sown in autumn or spring. It can be propagated by marcottage, root cuttings and division of the bush.

Aronia is a wonderful source of health, a gift from nature if we cultivate it.

The variety "Alecsandrina" may be used as highly productive fruit, honey plant, for amelioration of forests and green spaces, can be planted on lawns or in small groups in thickets, at the edge of forests.

BIBLIOGRAPHY

1. Calalb T. Structura şi compoziţia biochimică a fructelor de *Aronia melanocarpa* (Michx.) Elliot in vivo şi in vitro. Autoref. tezei de d. h. biol., Chişinău. 2010. 22 p.
2. Calalb T., Onica E..Content of some natural fruits compounds of chokeberrz and sea-buckthorn new forms.In: Journal of Botany .Chişinău 2014,Vol.VI, nr.2 (9), p. 5-9
3. Jakobek L., Seruga M., Medvidovic-Kosanovic M., et al. Antioxidant Activity and Polyphenols of Aronia in comparision to other berry apecies. In : Agriculture Conspects Scientificus, 2007, Vol.72, nr. 4, p.301-306.

Palancean A., Comanici I. Dendrologie (Asortimentul de arbori , arbuşti şi liane pentru împădurit şi spaţii verzi) Chişinău: „Tipogr. Centrală" 2009. 520 p.

GROWTH AND DEVELOPMENT PECULIARITIES OF THE SPECIES *EXOCHORDA RACEMOSA* IN THE REPUBLIC OF MOLDOVA

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Keywords*: Exochorda racemosa, fruit, generative propagation*

Conservation, mobilization and rational use of plant resources are and will be a strategic issue of humanity's relationship with nature. Landscape design with social, recreational and ecological role, important for improvement and maintenance of environmental balance, is the main beneficiary and motive factor of the production of ornamental woody plants. It is therefore necessary to study the peculiarities of growth and development, the advantageous methods of obtaining qualitative planting material of ornamental woody plants.

Exochorda Racemosa Rehd. is a shrub native to China, but grows and develops well under the conditions of R. Moldova. Its leaves are elliptical to oblong-ovate, acuminate or acute at the tip, narrow at the base, with entire or toothed margins, 3-6 cm long, with short petiole. The emergence of foliage and flowering occur in the same period, from late April to early May. The leaf color change occurs in August and September. The spherical fruit, of 8-10 mm in diameter, gradually matures from July to September.

This species grows rapidly in light soil, fructifies at age of 5 years. It is characterized by abundant flowering in spring and by dark green leaves. It grows alone, in groups or at the edge of woods. *Exochorda racemosa* Rehd. prefers sunny locations and is a xerophytic species, reaches 3-5 m tall. Its flowers reach 4 cm in diameter and are grouped by 6-10 in inflorescences. It blooms regularly and abundantly in April-May. The 8-10 mm long fruits mature in late August and September. The mass of 1000 dried fruits is of 150 g, seeds are 7-8 mm long.

The semi-lignified seedlings, treated with 0.01% solution of heteroauxin, were rooted after 30 days. The percentage of rooting of treated semi-lignified seedlings was 35-50% and – of untreated ones was 28-30%. The root system of treated seedlings developed better than the root system of untreated ones.

The best variant to obtain planting material is cold stratification of seeds for a period of 30-60 days, with further sowing in late autumn, in well loosened soil, at a depth of 2-2.5 cm. The percentage of seed germination was 70-80%, depending on the climate conditions in which the mother plants had developed fruits.

The percentage of seed germination depends on many objective and subjective factors. A key role is played by climatic conditions during flowering, fruit growth and maturation, seed quality, seed storage conditions, the substrate in which seeds were sown, compliance with the appropriate technology during vegetation (from sowing the seeds in the necessary substrate and up to transplanting seedlings in open ground). The duration of stratification may vary depending on the origin of the seeds, the time when they have been harvested, the storage conditions and the temperature and humidity regime.

The depth for sowing is determined by the size and shape of seeds, biological characteristics of the species, the soil texture, the moisture content of soil, the sowing time, the time when it is necessary that the seedlings emerge and the irrigation possibilities. A shallow depth for sowing seeds in spring hastens the emergence of seedlings, provided that the soil is permanently moist until the seedlings emerge at the soil surface.

EMBRYO AND ENDOSPERM DEVELOPMENT OF WALNUT (*J. regia L.*)

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Key words: *walnut, histochemistry, endospermogenesis, embryogenesis, dichogamy.*

Moldavian walnut varieties, obtained after multiannual investigations, are characterized by high adaptability to diverse local environmental (edaphic and microclimatic) unfavorable conditions. Registered varieties have higher level of resistance to temperature stresses and main diseases of walnut and low sensibility to blight. But the main trials are productivity and qualities of nuts. In comparative scientific researches, it is established good ecological plasticity of the main Moldavian varieties also in the neighbouring countries. On the basis of utilisation of cytoembryiological, including hystochemical methodology (1- 4), dynamics of contents and localization of enzymes, pollysaccharides, proteins and nucleic acids (ARN and ARN) during embryo and endospermogenesis were tested. Development of the walnut endosperm at the first stages is related by negative PAS and maximal intensity of protein reactions, a weak detection of ascorbic acid and enzymes. The most homogenous nuclear endosperm was established for the open pollination of all dichogamous genotypes. Transformation of endosperm nuclei in cellular structures occurs in all dichogamous types when are developed around one thousand of nuclei in open as well as within different kinds of hybridization. Synchronic divisions of the first large endosperm nuclei lead to coenocyte formation, which is either a whole even layer, or haustorial bands. Protoginous genotypes have a more accelerated rhythm of endosperm nuclei division compared to protandrous ones. Irrespective of dichogamy, formation of hypertrophycal nuclei, as well as their fusion and conglomeration are detected. In the absence of pollination and in same controlled experimental pollination, anomalous divisions or a full stop in endospermogenesis processes are established. A gradual decrease of the metabolism of endosperm nuclei is changed by increasing activity of enzymes and the appearance of the polysaccharide granules in the approach of cellular state. The transition of endosperm nuclei to cellular stage happens when the globular embryo reaches the maximal dimensions almost simultaneously in protoginous and protandrous genotypes. Initiation of cell membranes, first in separate seats, is brightly marked by some enzymes (especially succinate dehydrogenase and peroxidase) and disappearance of PAS reaction. Transformations of the endosperm of walnut are inseparably linked with certain stages of embryo development. An intensive resorption of cellular endosperm is observed in the period of the appearance of embryo bilateral segmentation. Protoginous genotypes have a more accelerated rhythm of endosperm nuclei division compared to protandrous ones. Irrespective of dichogamy, formation of hypertrophycal nuclei, as well as their fusion and conglomeration are detected. When pollination is absent, as well as in same experimental pollination, anomalous divisions or a full stop in endospermogenesis processes are established. It was established a gradual decrease of the metabolism of endosperm nuclei that is changed by increasing activity of enzymes and the appearance of the polysaccharide granules in the approach of cellular state. The transition of endosperm nuclei to cellular stage happens when the globular embryo reaches the maximal dimensions almost simultaneously in protoginous and protandrous genotypes. Initiation of cell membranes, first in separate seats, is brightly marked by succinate dehydrogenase and peroxidase and disappearance of PAS reaction. Our investigations show that development of the endosperm of walnut is inseparably linked with main stages of embryo development. The most intensive resorption of cellular endosperm is observed in the period of the appearance of embryo bilateral segmentation. Storage of starch, proteins and lipids in different parts of embryo occurred approximately in the same period (end of August) for different dichogamous types.

BIBLIOGRAPHY

1. Jensen W., 1965 - Botaniceskaia ghistohimia. Per. s angl. Moskva, Nauka. 377 s.
2. Kho J. O., Baer J. , 1968 -*Observing pollen tubes by means of fluorescence*. Euphytica. Vol. 17.-N2.- P. 298-302;

3. Pintea M. A., 2004 - *Nucul. Biologia reproductiva*. Chisinau. 364p.;

4. Rădulescu-Mitroiu N., 1976 - *Embriologie vegetală*, Bucureşti. 299 p.

STUDIES OF APRICOT POLLINATION COMPATIBILITY OF LOCAL AND INTRODUCED APRICOT (*Prunus armeniaca* L.) VARIETIES IN REPUBLIC OF MOLDOVA

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Key words: *apricot, varieties, pollination, progamic phase.*

There is studied progamic phase of the pollination of the local and introduced apricot (*Prunus armeniaca* L.) varieties using fluorescence microscopy [1, 2]. Fluorescence microscopy provides a relatively rapid and reliable method to determine self-(in)compatibility of apricot genotypes after *in vivo* experiences regarding pollination. The investigations also included its open pollination variant as control. As a rule, in self-compatible genotypes, developed on stigma pollen tubes reach the ovary in the majority of pistils, and also often rich the ovule. In self-incompatible varieties, growth of pollen tubes in the style is stopped along with formation of characteristic swellings. The research of the *in vivo* growth dynamics of the pollen tubes in experimental self-pollination showed that the highest level of efficiency was found in varieties: Auras, Bucuria, Detskii, Dionis, Krasnoshciokii, Kishiniovskii rannii, Kostiujenskii, Meteor, Melitopolskii pozdnii, Raduga, Saturn, Vimpel. The variety Nadejda and Vasile Cociu were self- and cross-pollinated with 3 autochthonous and 2 introduced varieties in order to investigate occurrence of incompatible pollen tubes in the style and their impact on fertilization success. Our results show that pollen tubes usually stop their growth in the third quarter of the style length. The highest percentage of them stopped the growth in the upper third of the style. As for the open pollination, percentages of incompatible pollen tubes in the upper part of the style by years were 12.0 - 14.0%, respectively. The occurrence of incompatible pollen tubes did not influence the fertilization success in studied interpollination variants. In those variants, pollen tubes reached the ovary in the majority (60-100%) of pistils. They also often (from 40 to 95%) reached the ovule. The average number of pollen tubes at the base of the style ranged from 2.8 to 15.1, and at the ovule ranged from 0.5 to 3.0. Varieties were considered self-incompatible if the pollen tubes stopped their growth in the style, usually with forming swollen tips. Other important signs of incompatibility include twisted pollen tube growth and bifurcation of a pollen tube. Self-incompatibility was found in 15 of the apricot varieties studied: Aurora, Burevestnik, Erevani, Goldrich, Gvardeyskyi, Harglow, Hargrand, Harostar, Nadejda, Orangered, Robada, Traian, Sun Glo, Veecot, 1B49. In these cultivars, pollen tubes rarely reached the base of the style, while no pollen tube was found in the ovules. The number of pollen tubes at the base of the style ranged from 0.0 to 1.0. The site of inhibition of pollen tube growth in apricot differs from that normally associated with gametophytic incompatibility (4). Usually, pollen tubes mainly stop their growth in the upper third of the style. However, in our study, in most cases of self incompatibility, we observed that pollen tubes stopped growing in the lower half of the style. The results obtained in this study lead to the conclusion that self-incompatibility is frequent among new important apricot varieties from many international breeding programs.

Self-incompatibility is an undesirable trait in fruit crop production, because self-incompatible varieties cannot be grown in single-variety plantations, and it is necessary to provide additional adequate pollinators. Apricot flowering takes place in early spring and usually proceeds under unfavorable weather conditions that limit bees' flight and optimal cross-pollination processes. Considering that self-incompatibility occurs frequently among newly created apricot varieties, care should be taken of variety partners' selection for new orchard establishing. Self-compatibility continues to be considered the most important objective in apricot breeding programs, because such varieties can ensure more successful pollination, higher and more regular fructification.

BIBLIOGRAPHY

1.Jensen W., 1965 - *Botaniceskaia ghistohimia*. Per. s angl. Moskva, Nauka. 377 s.
2. Kho J. O., Baer J. , **1968** -*Observing pollen tubes by means of fluorescence*. Euphytica. Vol. 17.-N2.-P. 298-302;

3. Pintea M. A., **2004.** *Cultivarea caisului.* Chisinau. 56 p.

4. **Hajilou J., Grigorian V., Mohammadi S.A., et all., 2006**. *Self- and cross-(in)compatibility between important apricot cultivars in northwest Iran*. J. Hortic. Sci. Biotech. 81, 513-517.

THE INFLUENCE OF TEMPERATURE ON GRAINS GERMINATION AT *SORGHUM BICOLOR* L.

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Keywords*: grains, germination, sorghum, temperature*

Sorghum bicolor L. has a great development because of its use in the alimentation especially in the semi-arid areas of the world where the climatic conditions give limited conditions for agriculture. Such situations predominate in Africa, Asia and Latin America, which are frequently drought-prone. India grows the largest acreage of sorghum in the world followed by Nigeria and Sudan, and produces the second largest tonnage after the US (FAO, 1995; ICRISAT, 2004; Nadia et al., 2009).

Sorghum can be an excellent source of starch, protein, sugar, fiber, being cheaper than corn, because the cost/ha are lower than the corn (Claver et al., 2010; Shinde, 2005; Singh and Sandhu, 2007).

Sorghum is a very demanding species to heat, it prefers at sowing minimum germination temperatures higher than 10ºC. For this reason, at the Agricultural Research – Development Station Secuieni, we have subjected to experiments a number of 16 samples of sorghum with 100 grains each under different temperatures in order to determine the effect of temperature on the germination of *Sorghum bicolor* L.

Following the results, it was observed that, in laboratory conditions, at temperatures ≤ with 10 ºC is obtained a very slow germination and with a huge percentage of grains which do not germinate. Thus, at a temperature of 7 °C, the number of days necessary for seed germination was of 21 days and the percentage of germinated seeds was only of 41.6 %. By increasing the temperature provided at germination until 10 °C, the number of days necessary for germination decreased to 18 days, and the percentage of germinated seeds was increased up to 67.5 %. Once we assured the germination temperatures higher than 14 °C and respectively 18 °C, it was observed an improvement of the seed germination capacity at *Sorghum bicolor* L. The sorghum grains have germinated in only 9 days and the percentage of germinated seeds was of 81.2 % when it was subjected to temperatures of 14 °C, but at the ensuring of a temperature of 18 °C, the sorghum grains have germinated in 6 days and the percentage of germinated seeds was of 93.5 %.

BIBLIOGRAPHY

1. Claver I.P., Zhang H., Li Q. Zhu, K. and Zhou H. (2010). Impact of the Soak and the Malt on the Physicochemical Properties of the Sorghum Starches. *International Journal of Molecular*, Sciences 11, pp. 3002-3015.

FAO. (1995). Sorghum and Millets in Human Nutrition. *FAO Food and Nutrition Series*; No. 27, ISBN 92-5-103381-1.

2. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (2004). *Sorghum, a crop of substance. (In En.) Patancheru 502 324, Andhra Pradesh*, India: International Crops Research Institute for the Semi-Arid Tropics, ISBN-92-9066-473-8

3. Nadia B., Naïma B., Boubekeur N., Claude D., Mohamed M., Barbara R. and Marianne S. (2009). Physicochemical and functional properties of starches from sorghum cultivated in the Sahara of Algeria. *Carbohydrate Polymers* 78, pp. 475-480.

4. Shinde V.V. (2005). Production kinetics and functional properties of carboxymethyl sorghum starch. *Natural Product Radiance*, 4(6), pp. 466-470.

5. Singh H., Singh Sodhi N. and Singh N. (2009). Structure and Functional Properties of Acid Thinned Sorghum Starch. *International Journal of Food Properties*, 12, pp. 713–725,

6. Singh N. and Sandhu K.S. (2007). Some properties of corn starches II: Physicochemical, gelatinization, retrogradation, pasting and gel textural properties. *Food Chemistry*, 101, pp. 1499-1507.

MICROORGANISMS WITH STIMULATORY CAPACITY IN CORN

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Key words: *microorganisms, corn, gross weight, dry weight, bacteria.*

The corn (*Zea mays* L.) in Moldova is considered one of the main cereal and forage crops. In the structure of grain crops, it occupies about 45% and the balance of grain is more than 50%.

The corn grains (depending on the variety, hybrid) contain 65-70% of carbohydrate, 8-12% of protein and 4-6% of fat. Corn is indispensable and serves as a basic component of combined fodder. The green mass of corn plant is widely used as a juicy fodder. The nutritive capacity of the cob in the phase of wax and milk-wax is virtually the same as in the period of grain ripening. With all the merits that can be attributed to corn, it must be mentioned that the level of corn harvest obtained in the Republic cannot be considered satisfactory, because it is influenced by many factors, including environmental, economic ones, use of expensive mineral fertilizers. Therefore, people look for other means to increase this crop harvest.

It is known that soil is a complex, dynamic system, accompanied by an enormous diversity of microorganisms (bacteria, fungi etc.) that may contribute to plant growth and development, while improving the quantity and quality of products obtained.

Because microorganisms possess capabilities, they have become objects of investigations in various fields, particularly in view of their use in agriculture [1, 2, 3, 4]. In this regard, there have been done many studies in order to highlight, select and study their stimulating effect both under laboratory and field conditions.

In laboratory conditions, more than 100 strains of bacteria have undergone research process. In the field were tested bacteria that in laboratory conditions were highlighted more pronounced by their action on the ability of seed germination, growth of seedlings, gross and dry mass accumulation. As a result of investigations, it was established that in laboratory conditions (Petri dish method) seed germination under the influence of bacteria increased in some cases by 8.0 to 21.7%, the gross mass of plantlets – with 13.5 to 82% and dry mass – by 12.6 to 64.9%. The stems: Sc1, SD8, SD9, Sc4, RD2, AS, CSp1, PC7, Tcc4, RPj1, P12Rp, RR8, etc. were more productive in this respect.

In vegetative experiences, in pots with non-sterile soil in climatic chamber conditions (daylight, temperature 20-24^{0}C, humidity 60-80%), it was established that most of the bacteria positively influenced the growth, development and biomass accumulation. Thus, the plant height increased by 6.4 to 22.5%, root length by 6.8-14%, gross mass of the plant – with 11.9 to 41.2% and dry mass with 20.9-63.8%. They highlighted in particular strains AS, PC7, Tcc4, RPj1, P12Rp, RR8, CSp1, Rp1, PC7, RR5, RD5, IUc$_1$.

Bacteria with the best stimulation indices were tested in field conditions. The investigations conducted over four years allowed selecting five strains of bacteria of the genus Pseudomonas (As, Tcc4, RPj1, RR8 and P12Rp), which increased the cob harvest by 12.8-33.5% compared to control and gross mass of the plant by 7.9-27%. These bacteria will be tested in field production.

BIBLIOGRAPHY

1 Кожемяков А.П., Белимов А.А. *Перспективы использования ассоциаций азотфиксирующих бактерий для инокуляции важнейших сельскохозяйственных культур*. //Тр. ВНИИСХМ 1992. Т. 61. - С. 7-18.

2. Минаева О.М., Бондаренко А.А. *Влияние бактерий Azotobacter chroococcum и Pseudomonas sp B-6798 на рост и развитие кукурузы //* Вопросы устойчивого бескризисного развития. Новосибирск: Изд-во ИДМИ, 2001. - С. 57-66.

3 Семынина Т.В. Биопрепараты и регуляторы роста растений для обработки семян зерновых культур // Защита и карантин растений. 2006. - № 2. - С. 24-25.

4. Сидоренко О.Д. Действие *ризосферных псевдомонад на урожайность сельскохозяйственных культур* // Агрохимия. 2001. - № 8. - С. 56-62.

INTRODUCTION OF PLANTS OF THE GENUS *ASTROPHYTUM* (FAM. *CACTACEAE*) IN THE GREENHOUSES OF THE BG (I) OF THE ASM

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Keywords: *introduction, Astrophytum, collection, fruit, seeds*

Fam. *Cactaceae* Juss is one of the largest groups of higher plants, which includes over 3000 species, and, in the greenhouses of the BG (I) of the ASM, it is the most represented one – 825 taxa, which constitute 30.26% of the gene pool of greenhouse plants. The genus *Astrophytum* Lem., within the collection of BG (I), is represented by 20 taxa: 5 species and 15 varieties. In the wild, this genus is represented by 6 species and 18 varieties. The plants of the genus *Astrophytum* can be easily hybridized during flowering, forming hundreds of hybrids. The plants of the genus *Astrophytum* are native to arid regions of Mexico.

The collection of plants of the genus *Astrophytum* (fam. Cactaceae) created within the BG in the course of about 40 years, served as material for the research. The phenological observations on flowering and formation of fruits with seeds was carried out according to «Методика фенологических наблюдений в ботанических садах СССР" (Methods of phenological observations in the botanical gardens of the USSR). The evaluation of the collection was carried out according to N. Backeberg, 1979.

The creation of the collection of plants from *Cactaceae* family, within BG (I) of the ASM, dates back to the early 70s of the 20th century. A lot of species and varieties of plants of the genus *Astrophytum* were brought as plantlets and seeds from different BG of Russia and Ukraine in the early 70s of the 20th century. The species of the *Astrophytum* genus are columnar (*A. myriostigma* Lem., *A.m. var. columnare*) and globular plants (*A.asterias* Lem., *A.ornatum v.mirbellii* (Lem.) OK., *A.capricorne* Br.& R., *A.myriostigma v. nudum* Backbg., *A.senile* Fric). At the beginning of plant growth and development, in all species and varieties, plants are globular, but, with age, many of them elongate and become columnar. 14 of the 20 taxa from the collection reach the generative phase under the conditions of BG greenhouses, 11 taxa develop fruits with viable seeds. From 3-4 to 6-7 fruits can be formed on a plant. The number of seeds in a fruit varies from 15 at *A.myriostigma v.tulense* Kays&Backbg. to 86 at *A. ornatum* hybr. and 97 at *A.m. columnare*.

The seeds of *Astrophytum* species are found in dry dehiscent capsule fruits, with one locule. Seeds are helmet-shaped, big, black and glossy. Seeds are put in sterilized sand in plastic trays and are placed in a medicine cabinet at the temperature of + 25-28 ^{o} C. The duration of germination of freshly gathered seeds of *Astrophytum* species is 4-6 days, the germination period of those stored over three years doubles or triples. The young seedlings obtained from one month old seeds are pricked out in substrate consisting of leaves: sand: neutral red peat: perlite in ratio of 2:2:1:1. Medium fraction ceramic is used for drainage. Plants are pricked out in ceramic pots of 0.5 l. As the seedlings grow, every 2 months, they are pricked out in new substrate till the age of 1 year. Mature plants are transplanted carefully, the clod isn't crumbled completely. After transplanting, the plants are watered a little in the first 2 months. Abundant watering begins after 2 months.

All species and varieties of plants of the genus *Astrophytum*, in our collections, reproduce only by seeds, because *Astrophytum* plants do not form young plantlets around the mother plant. The plants obtained from seeds reach the generative phase at the age of 6-7 years.

The optimal time for propagation by seeds is March-April. The optimal substrate for *Astrophytum* plants is the mixture consisting of: leaves: peat: sand in a ratio of 1:1:2. Young plants are placed in bright places without direct sunlight, in the warm seasons they are abundantly watered. In winter, the amount of water is reduced.

Plants of the genus *Astrophytum*, being very decorative and having a high adaptive potential can be widely used indoor for ornamental purposes, as solitary plants or in different compositions.

BIBLIOGRAPHY

1.Backeberg,N. 1979- Das Kakteenlexicon, Veb Gustav Fischer Verlag Jena, p. 66 – 67.
2.*Методика фенологических наблюдений в ботанических садах СССР*-1975-Москва, «Наука»,75 стр.
3.*Методические указания по семеноведению интродуцентов*, 1980- Москва,

SELECTING DECIDUOUS PLANTS FOR SPECIFIC CHARACTERISTICS OR PURPOSES

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Keywords: *trees, shrubs, design characteristics, cultural characteristics and maintenance, flower.*

Many readers require ready access to information on specific plants for specific purposes.

In compiling the following lists of the plants best suited to certain commonly desired characteristics or purposes, use these list as ready references to possible solutions for planting design problems. Look them up in the plant listings, read the text, peruse the photographs, and decide which plants will create the desired effects.

Deciduous trees, shrubs, including broadleaf evergreen shrubs and vines, categorize this information.

Plant Lists

TREES: Design Characteristics	SHRUBS: Design Characteristics
Flower Color and Fragrance	Showy Flowers, by Color
Fruit	Fragrant Flowers
Fall Color	Flowering Sequence
Bark	Fruit
Weeping Habit	Fall Color
Columnar or Fastigiate Habit	Evergreen, Semi-Evergreen, or Tardily Deciduous Foliage
Principal species of Commerce	Winter Stem Color and Texture
Underutilized Species and Cultivars	A Guide to Shrub Sizes
A guide to tree sizes	
	SHRUBS: Cultural Characteristics and Maintenance
TREES: Cultural Characteristics	Tolerance to Dry Soils
Tolerance to Compacted Soils, Drought, and Heat	Tolerance to Moist Soils
Street and Urban Planting	Salt Tolerance
Tolerance to Moist to Wet Soils	Shade Tolerance
Salt Tolerance	Hedges and Parterres
Shade Tolerance	Pruning Times
VINES: Design and Cultural Characteristics	
Flowers, Fruit, and Fall Color	
True Clinging Vines	
Shade Tolerance	

BIBLIOGRAPHY

1. Каталог растений. Деревья, кустарники, многолетники, рекомендованные Союзом Польских Питомников. Варшава. 2013. 389 с.
2. Е. М. Немова. Садовая классификация декоративных деревъев и кустарников. Проблемы современной дендрологии. Товарищество научных изданий КМК. Москва. 2009. 245 с.
3. Michael Dirr. Dirr’s Hardy Trees and Shrubs. An Illustrated Encyclopedia. Timber Press. Portland. Cambridge. 493.p
4. Lorenz von Ehren. Nurseries since 1865. Rinteln: HDR Gartenbild Heinz Hansmann. 2004. 1024 c.
5. Solitair nv.Brechtseweg 208. 2990. Loenhout. Belgie. M.A.N. vof. 2014. 175 p.

THE USEFUL VALUE OF DIFFERENT SEGMENTS IN HARVESTING AT *ORIGANUM VULGARE L.*

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Keywords: *Origanum vulgare harvest, raw material, volatile oil*

In the early 2000s, it has been proposed for implementation a number of new plants for Moldova. One of them was *Origanum vulgare* ssp, hirtum (Link) Ietswaart (1), which subsequently appeared promising and currently occupies more than 300 ha.

Origanum vulgare var. vulgare L. is a perennial herbaceous plant, which has various uses: in medicine, food industry (spice), as aromatic and as melliferous plant. It is particularly appreciated for the production of essential oil, which due to phenolic compounds (carvacrol and thymol) has antimicrobial, antifungal, antioxidant action [2, 3, 4]; it has natural Eurasian habitat, with many biotypes, genotypes and forms. *Origanum vulgare* ssp. vulgare is spread in Moldova, while *Origanum vulgare* ssp. hirtum in the wild flora of the country is not found. These subspecies have identical uses but differ greatly among themselves both morphologically and by the content and composition of volatile oil (2).

At Origanum vulgare ssp. vulgare technical conditions for pharmaceutical raw material are developed (5). At *Origanum vulgare* ssp. hirtum these conditions are lacking.

At the Institute of Genetics, Physiology and Plant Protection were made researches on which it could be possible to elaborate technical conditions for the reception of raw materials.

The researches were performed on *Origanum vulgare* ssp. vulgare, local population, and on ssp. hirtum – with generative descendants of fertile line no. 54 of German origin. The researches were conducted on plantations in the third year of vegetation. In flowering phase, plants were harvested and investigated morphologically and biochemically. In whole plants and in parts of segments 0-20 cm, 20-30 cm, 30-40 cm and below 40 cm from the top, it was determined the weight ratio of the flowers, leaves, stems and the volatile oil content in them.

The mass was determined by weighing and the content of essential oil - by hydrodistillation.

Ssp. vulgare plants in culture conditions, by flowering, are tall (76 cm), but only 20-25 cm from apical side is leafy and can be used as pharmaceutical raw material. Hirtum subspecies plants are smaller and reach 69-70 cm, have leafy stalks almost on their entire length, with bloom much more diffuse than at ssp. vulgaris. The mass of 25 shots at flowering is 179 g at ssp. hirtum and 112 g at ssp. vulgare. Both subspecies are volatile oil rich in flowers (inflorescence) followed by leaves. In stems, volatile oil is lower or is completely missing. But the volatile oil accumulation in the whole plant at flowering stage ssp. hirtum is 5-6 times higher compared to ssp. vulgaris and properly accounted 2.570% and 0.467% (absolutely dry mass).

At ssp. vulgaris, 94% of the inflorescence is located in segment 0-20 cm from the top, while at ssp. Hirtum, inflorescences persist as well in segments 20-30 cm and 30-40 cm. Volatile oil content (absolutely dry mass) on segments 0-20 cm, 20-30 cm, 30-40 cm and > 40 cm properly constituted 1.020; 0.251; 0.108 and 0.053% at ssp. vulgare and 2.880; 1.145; 0.926 and 0.377% at ssp. hirtum.

Given that the volatile oil content is higher on lower segments at ssp. plant hirtum, whole leafy plant has a useful production. This fact was confirmed in practice and production conditions.

In 2015, agricultural specialized enterprises in Căuşeni district, ssp. hirtum cultivated on area of 160 ha, the whole plants being harvested in full flowering phase with cutting at 8-10 cm above the ground have achieved high production of over 70.0 kg /ha of volatile oil, getting 12.8 kg of volatile oil per each tonne of fresh herbs.

So, at the ssp. Hirtum, aromatic raw material will consist not only of the plant segments with length of 20 cm (applies to ssp. vulgare) but of all leafy plant, harvested at full flowering by cutting at 8-10 cm above the ground.

BIBLIOGRAPHY

1. *http:/www.theplantlist.org/tpll.record/kew-1439*
2. *Goncearіuc Maria, Balmuş Zinaida, Bene Ana. Bârsan Victoria, Sandu Tatiana, Duca M.M. Biochemical diversity of the Origanum vulgare ssp. vulgare L. and Origanum vulgare ssp. hirtum (Link) Ietswaart genotypes from Moldova.* The Xth International Congress of Geneticists and Breeders: Abstract Book. 28 june-1july 2015. Chişinău, Republic of Moldova. P. 100
3. *Florea Vasile. Cultura plantelor medicinale*. Chişinău: Tipogr. Adriga-Vis. 312 p.
4. *Мустяцэ Г. И. Культиваря плантелор ароматисе.* Кишинэу: Картя Молдовеняскэ, 1980. П. 199-203
5. *Лекарственное растительное сырье.* Государственные стандарты Союза ССР. Издание официальное. Москва: Изд-во Стандартов, 1980. 296 с.

SEED FORMATION IN TORREYA GRANDIS INTRODUCTED TO THE SOUTHERN COAST OF CRIMEA

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Key words*: Torreya grandis, male cones, ovule, female gametophyte, seeds*

Plant introduction is an important part of Botanical Gardens` work. The highest stage of successful introduction is formation of viable seeds and further seedlings in the new growing conditions. At the same time, seed formation is a very complex process that includes a number of stages that are controlled not only genetically but also by the environmental factors. Thus the studies of plants' sexual reproduction in the new growth conditions, from one hand, let us decide a practical problem – obtaining of vital seeds and, from the other hand, give us more information about adaptive potential of plant species.

Torreya grandis Fortune ex Lindley (*Torreya*, Taxaceae) is an endemic species for eastern and south-eastern China that is also grown in Europe and North America as an ornamental tree. In Nikita Botanical Gardens (Southern coast of the Crimea), it is represented by one female tree for about 30 years old, 4 m tall with trunk diameter 0.14 m and four younger male trunks height 2.5-4 m that could be either rootstocks or seedlings. Female and two male trees are at the reproductive stage and annually produce reproductive structures (2001-2014 years). Couples of solitary ovules covered with two pairs of bracts appear in the axils of two decussate bracts on an extremely short shoot in the axils of a bit reduced foliage leaves at the shoot base. Development of ovule complexes starts in June (the first year) and a short shoot bearing a pair of bracts with ovule primordia in their axils develop. Next spring in early March (the second year) large apical buds bearing rudiment shoots of two types – vegetative and vegetative-generative are visible. Since this time ovule primordia grow and form nucellus and integument to the late April – May.

Male cones are initiated in the axils of leaves on the current year shoots in June as small meristem protuberances. Through the summer, these meristem protuberances develop the central axis with 25-30 alternate microsporophylls at the base of which archesporial cells initiating microsporangium development differentiate in late August – early September. Their transverse division resulted in parietal and sporogenous cells and initiation of microsporangium development. It`s known that male generative sphere is more sensitive to the changeable environmental conditions than female one, so analysis of the dependence between some phenological dates and environmental factors has been made. It was determined strong direct correlation between the phase of sporogenous tissue formation and sum of the average, maximum and minimum air temperatures during the period from June 1st, June 15th, July 1st to the date and less strong inverse correlation with the sum of the average day temperature, its mean, maximum and minimum for 10 days before the phase noticed. At this stage male cones come to winter and microspore mother cells could be found from late January to the end of February, compared with March in Zhuji county, China. The beginning of meiosis has strong direct correlation with minimum air temperature and the sum of the average day temperature for 10 days before the stage. It should be noticed there wasn`t any linear dependence between the environmental factors and pollination ("flowering"). In the conditions of the Southern coast of the Crimea, pollination may occur in late April – May that corresponds to the pollination in its native growth conditions (April). To the time of pollination ovule has small and intensively growing nucellus covered with over-topped integument formed the micropyle. In the basal part of nucellus megaspore mother cell differentiates. Further development of female gametophyte is stimulated by pollen grains and occurs only in successfully pollinated ovules next spring. Next spring in March (the third year) in successfully pollinated ovules megaspore mother cell meiosis occurs resulting in four megaspores. Among them only one – basal (chalazal) megaspore initiates further formation of nucleate and cell gametophyte and three other ones rapidly degenerate. At the same time pollen tube start its growth through the tissue of nucellus. Sequential nucleate and cell stages of female gametophyte development and archegonia initials differentiation occur up to June and, probably, their further development in summer is limited with high air temperatures (average day temperature is above +20ºC). It continues in September and fertilization occurs in late September - early October. In early spring next year, ovules with fertilized egg cells start their rapid growth and embryo development while nonpollinated ovules become yellow and drop down. Mostly only one ovule develops from the couple in the axil of the same foliage leaf. Seeds mature in late September – November. Their outer cover is flesh aril that becomes purple-brown and below there is hard woody seed coat. Seeds size (length x width) without flesh aril to the time they drop down the tree is (1.6) 1.8-2.3 x 1-1.5 (1.7) sm that is much smaller compared to its native area. Most of seed volume is endosperm and immature embryo takes the only 1/9 of the seed. Long time is needed for its growth and we haven`t observe any seedlings grow. Use of different methods for *Torreya* seeds germination in greenhouse conditions was not successful also.

THE CALLUSOGENESIS OF MATURE EMBRYOS TO RECIPROCAL HYBRIDS OF *TRITICUM AESTIVUM* L. AND THE MANIFESTATION REACTION TO *HELMINTHOSPORIUM AVENAE* CULTURE FILTRATE

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Keywords: *Triticum aestivum L., F_2 mutual hybrids, mature embryo, frequency of callose and of callus area, Helminthosporium avenae culture filtrate*

In vitro testing in response to selective biotic and abiotic factors is determined by the existence of positive relations between the sensitivity or tolerance of integral plants *in vivo* and of explants *in vitro* [1, 2, 3]. The tissue crop technique is considered a useful tool in screening of the combination ability of the genitors, choosing the best maternal form and of the hybrids within the cereal crop improvement programs [4]. Mature embryos present vitro crop with advanced morphogenetic capabilities, limitless and therefore, less expensive.

The following characters were investigated: the callus *frequency* (%) of mature embryos of common winter wheat and callus *area* (mm^2) at six F_2 hybrids derived from the reciprocal crossover of genotypes: BT 16-04, Odeschi 267 and line L 101 in 2013 and 2014 weather conditions. As a selective factor, it was used the culture filtrate (CF) *Helminthosporium avenae* (*Drechslera avenae* Eidam.) and further, in Murashige-Scoog (MS) crop environment in concentration of 30% capacity.

In vitro crop *witness* during 2014 the callus frequency of mature embryo presented advanced levels of those manifested by studied populations of 2013 harvest conditions. During parameter occurrence, the callus *frequency* index BT 16-04 showed positive maternal role in combination with L 101, whereas in combination with Odeschi 267 – paternal role during 2013 and 2014.

On the background with CF *H. avenae*, the *frequency* of callus character values was at the witness level or differentially decreased. Advanced resistance showed genitors in 2014 compared to 2013. The F_2 L 101 x BT 16-04 and F_2 Odeschi 267 x BT 16-04 hybrids presented in both years advanced *frequency* to reciprocal ones. The contribution to resistance character improvement was done by the paternal factor of BT 16-04 genitor.

The callus *area* character for genitors attested low genotypic specificity in vitro crop *witness* in 2013 but higher in 2014. The reciprocal hybrids were diversified only by paternal outcome BT 16-04 in combination with the L 101 genitor in 2013 conditions, while in the 2014 – in both possible combinations.

In reaction to CF *H. avenae*, supplemented in environment MS (30%), the callus *area* character showed only repression, its variability being within the range 84.1…93.7% and 80.9…98.1% of control in 2013 and 2014, respectively. Diversifying mutual hybrids, CF *H. avenae* reaction occurred as a result of the paternal effect of the BT 16-04 genitor in both possible combinations in 2013 conditions, while in 2014 – only in combination with L 101 line.

The callus *frequency* indices settled average positive correlations in environmental conditions of the years 2013, 2014 and more advanced – in witness version compared to CF *H. avenae* (*r=0.49* and *r=0.28*). The character callus *area* was most affected by conditions of the years, the correlations being low (*r=0.03* and *r=0.18*, respectively, and witness CF *H. avenae*). The callus *frequency* showed major correlation with callus *area* within FC *H. avenae* under weather conditions of both years, while in the *witness* version – only in 2014.

Environmental conditions in 2013-2014 had considerably influenced the interaction of alleles of genes which participate in the formation of *frequency* characteristics and callus *area* of reciprocal hybrids and in their reaction to the culture filtrate *Helminthosporium avenae*.

During both 2014 and 2013, F_2 L 101 x BT 16-04 produced increased callose *area* to reciprocal hybrid and the role of surface and resistance donor to fungal metabolites belonged to paternal genitor BT 16-04.

BIBLIOGRAPHY

1. Lupaşcu G., Fandeev E. *Genetica rezistenţei culturii triticale la fuzarioză. Cercetări in vitro.*– Chişinău: Tipografia A.Ş.M. – 2004. – 136 p.

2. Зобова Н.В. *Повышение устойчивости ячменя к стрессовым биотическим и абиотическим факторам в Сибири (генетико-биотехнологические аспекты)*: автореф. докт. с.- х. наук. – Красноярск, 2009. – 32 с.

3. Россеев В.М., Белан И.А., Россеева Л.П. *Тестирование in vitro яровой мягкой пшеницы на засухоустойчивость* / Вестник Алтайского Государственного Аграрного Университета. – 2011. – № 2(76) . – с. 32-34.

4. Abdel-Hady M.S.S. *Heterosis and Combining Ability Effects for Callus Growth of Wheat (Triticum durum, Desf.) In Vitro* / Journal of Applied Sciences Research. – 2006. – Vol. 2. – No 6. – pp. 360-363.

GENOTYPIC DIVERSITY OF GRAPEVINE GENE POOL

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Keywords: *grapevine, genetic resources, diversity, breeding.*

The progress of viticulture, one of the traditional and important economic branches of agro-industrial complex in the Republic of Moldova, is indispensably linked with the diversity of genetic resources – the basis for creating a competitive assortment with improved quality/productivity, seedlessness, diverse direction of use, including technological processing, advanced biological resistance to stressful factors [1, 4, 5]. Genotypic diversity of family *Vitaceae* Juss., as a whole and, in particular, of the genus *Vitis* L., including various species [6], gives us this possibility. Species *Vitis vinifera* L., the most widespread due to its practical use, includes, as classified by Negrul' [8], three ecological groups (proles) - *Proles occidentalis* Negr., *Proles orientalis* Negr. and *Proles pontica* Negr., diverse by geographic origin, morphological and agro-biological characteristics.

The accumulation and preservation of this wide diversity, its evaluation and use in the Republic of Moldova has a history of nearly two centuries and the greatest diversity is ascertained in so called "old" Ampelographic collection, founded in 1952, and in the current grapevine Gene pool, founded in 1982 [7, 9, 4]. The biological material was mobilized from about 60 viticulture centers from all over the world [9]. From literature sources, genetic sources with necessary traits were located: diverse direction of use, inclusive seedlessness , early ripening, increased resistance to disease and cold, as well as with possible combinations of these characteristics. Expeditions were conducted in India, Kopet-Dag mountains (Turkmenistan), USA. Over the past 30 years in the Institute's Gene pool were introduced more than 1100 genotypes, diverse by genotypic origin and characteristics [4, 5].

Along with *V.vinifera* L. species, which numerically is best represented (approx. 92% from all accessions) also are presented the samples belonging to other species of the genus *Vitis* L.: *V. aestivalis* Michx., *V. californica* Benth., *V. candicans* Engelm., *V. Lincecumii* Buckl., *V. sylvestris* Gmel. etc. The species *V. labrusca* L. is represented by more than 50 varieties, mostly with mixed use. In Gene pool is presented a wide range of direct producer hybrids and interspecific hybrids of third generation (Seibel and Seyve Villard) as well as about 80 rootstock genotypes.

A valuable genetic potential, partially known on phenotype level, represents the old autochthonous varieties. Some of them manifested by centuries high adaptability to local environmental conditions, most are characterized by increased levels of production [2]. Comparative anatomical studies of several species and varieties from the Gene pool have revealed some adaptive characters of resistance to phylloxera, frost and drought, including of some old autochthonous varieties [3].

Accumulated genetic resources with complex characteristics allow creation of varieties with diversity of quality/productivity, adaptability and resistance to unfavorable factors [5]. One of the requirements to the Gene pool is to ensure the presence of genetic material that not only meets current requirements, but future ones that may arise as a result of influence of anthropogenic and natural factors.

BIBLIOGRAPHY

1. Alleweldt G., - *Collection, conservation et mis en valeure des resources genetiques de la vigne.* In: Bull. d'O.I.V. 1983, vol.56, nr. 624, pp. 91-103.
2. Constantinescu Ghe., Negreanu E., Lăzărescu V. ş.a., - *Ampelografia Republicii Populare Române*. Editura Academiei RPR, Bucureşti, 1959-1971, Vol 1-8.
3. Codreanu V., - *Anatomia comparată a viţei de vie (Vitis L.).* Combinatul Poligrafic, Chişinău, 2006, 251 p.
4. Savin Gh., - *Fondul genetic al viţei de vie – precondiţie strategică a vitviniculturii sustenabile.* In: Akademos, 2014, nr. 1(32), pp. 74-82.
5. Savin Gh., - *Identification of ameliorative potential of grapevine genetic resources.* In: Journal of Academy of Sciences of Moldova, 2015, No. 2(326), pp. 125-130.
6. *Ампелография СССР*. Пищепромиздат, Москва, 1946, том. I, 494 с.
7. Иванова Е.Б., - *Каталог сортов винограда.* Штиинца, Кишинев, 1976, 311 с.
8. Негруль А.М., - *Происхождение и классификация культурного винограда.* В: Виноградарство и виноделье в СССР, 1946, № 43, с. 42-45.
9. Савин Г.А., - *Ампелографическая коллекция МолдНИИВиВ.* В: Научные достижения по виноградарству и виноделию МолдНИИВиВ. Сборник работ посвященных 70-летнему юбилею МНИИВиВ. Кишинев, 1980, с. 39-51.

PERSPECTIVES OF METHODS OF IN VITRO CULTURE IN THE CONSERVATION OF RARE SPECIES

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Keywords: *conservation, in vitro, rare species, biotechnology, plant biodiversity, in vitro conservation technologies.*

At present, one of the most pressing environmental challenges is the rapid reduction in the distribution and the complete disappearance of many plant species. In this regard, the need to develop methods for the preservation and maintenance of biological diversity in situ and ex situ is all the more urgent. In the last decade, in the world, there has been a tendency to use for the protection of plant resources, biotechnological methods, based on the cultivation of cells, tissues and organs of plants under controlled conditions in vitro. These techniques are part of an overall strategy for conservation of the gene pool of plants, and they also provide an opportunity for sustainable management of genetic resources [1].

Using an in vitro system in comparison with the traditional methods of maintaining collections of plants has many advantages: high rates of reproduction; miniaturization process, leading to savings of areas occupied by uterine and propagated plants; improvement of planting material from nematodes, fungi and bacteria that cause plant diseases; the possibility of long-term deposit of samples with less deposit. In the in vitro conditions, fail to propagate and instill those plants that are difficult to reproduce in the traditional way.

Micropropagation protocols developed for several thousand plants, including rare and endangered ones, are the basis for the successful introduction in culture, breeding and conservation in the bank of in vitro cultures of new models [2, 3]. For example, in the collection of the Royal Botanic Gardens (Kew, UK), in the bank, over 3 thousand taxa, most of which are rare and endangered species, are maintained in vitro. [4] The phenomenon of the rapid increase of the numbers of species of plants on the verge of extinction is also registered in the Republic of Moldova. Thus, if the first edition of the Red Book (1978) included 26 species of superior plants, endangered and critically endangered, the second edition of the Red Book (2001) comprised 126 species of plants on the verge of extinction; the present edition of the red book includes 208 species of plants. The number of endangered species is growing so you need to use modern and effective methods for their conservation. [5]. Using the method of tissue culture in the laboratory of Biotechnology and Embryology at the Botanical Garden (Institute) of the ASM, it has been created a collection of three rare species of spontaneous flora of the Republic of Moldova, of which *Bellevalia sarmatica* and *Fritillaria Montana*, which are included in the Red Book, and *Lilium martagon* – a species with rare and decorative appearance. Efficient technologies have been developed on micropropagation and long-term storage of these species in an in vitro culture, improved technology of adaptation of regenerated plants to growing conditions ex vitro. The results of the research are the basis for the creation of collections in vitro, conservation of plants and their rapid reproduction [6, 7].

BIBLIOGRAPHY:

1. Benson E.E. *Plant Conservation Biotechnology.* Taylor and Francis. 2002. 309 p.

2. Fay M.F. *Conservation of rare and endangered plants using in vitro methods.* In Vitro Cell Dev. Biol. 1992.V.28.p.4

3. George E.F., Hall M.A., De Klerk G.J. *Plant Propogation by Tissue Culture.* Heidelberg, 2008. V. 1. 358 p

4. Sarasan V. et al. *Conservation in vitro of threatened plants-Progress in the past decade* //In Vitro Cell Dev. Biol. Plant. 2006. V. 42. P. 206–214.

5. Cartea Roşie a Republicii Moldova / The Red Book of the Republic of Moldova: Min. Mediului al Rep. Moldova. – Ch.: Î.E.P. Ştiinţa, 2015, p.8.

6. Sedcenco M. *Impact of sucrose concentration on in vitro culturelong-term maintenance of rare species.*Revista Botanica, 2015. Vol. VII, Nr. 1(10), Chisinau, 2015б p.46

7. Седченко М., Чоркинэ Н. Г. *Сохранение редких и исчезающих растений методом культуры in vitro в Ботаническом саду (Институт) АНМ.* Materialele Simpozionului Științific Internațional. Rezervația Codrii – 40 de ani. Chișinău, Știința, 2011, p. 355-358.

THE CONDITION OF MICROORGANISMS CAUSING ROTTING OF GRAPE ROOT INFECTED BY PHYLLOXERA IN GAZAKH REGION

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Keywords: *Tabrizi, Fusarium, Gliocladium, Cylindrocarpon, Mucor*

Azerbaijan is one of the most ancient centers of grape cultivation. The presence here of plenty of local high-quality varieties is a result of long selection. The ancient monuments found out during archeological excavations and also numerous literary data testify to an antiquity of grapevine cultivation in Azerbaijan. Under the influence of spontaneous national selection during centuries, the set of grape varieties and forms which demanded studying, economic valuation, botanical description and classification has been created.

This distribution is almost conditional because there are also the pests in partially infected and a few infected regions (free zones). It is enough to mark the fact that phylloxera was found in just 9 hectares of grape plantations, but now about 50-60% of plantations are infected with phylloxera (1).

The samples of grape varieties (Kaberne, Tabrizi and Bayanshira) which have been infected with phylloxera have been taken from viticulture plantations of Gazakh region with the purpose of determination of species' composition of microorganisms which are the cause of rotting the roots of grapevines in Azerbaijan conditions.

The separation from roots of grape and reproduction of phytopathogen and saprotrophic root rotting microorganisms which cause rot of grapevines infected with phylloxera is carried out according to the method proposed by P.N.Nedov (2, 3) with the purpose of creating complex artificial infection background.

Root samples from infected by phylloxera grape varieties Kaberne, Tabrizi and Bayanshira collected from farms of Gazakh region were analyzed and species composition of microorganisms, which cause the second pathologic process – rotting, was determined.

The quantity of microorganisms separated from the roots of Kaberne grape varieties infected by phylloxera has been 100 %. From these, it has been identified that the funguses belonging to *Cylindrocarpon* species are 30%, but in the roots of this grape variety, it hasn't been discovered any fungus belonging to *Gliocladium* and *Fusarium* species. The bacteria that belong to phytopatogenic *Pseudomonas* species – 28.5%, the bacteria that belong to *Bacillus* species – 17.5% were identified. At the same time, it has been identified that here are funguses belonging to saprotrophic *Mucor* species – 10.5%, the funguses belonging to *Absidia* species – 9%, the funguses belonging to *Rhacodiella* species – 4.5%.

The quantity of microorganisms separated from the roots of Tabrizi grape varieties infected by phylloxera have been 100 %. From these, it has been identified that the funguses belonging to phytopatogenic *Gliocladium* species are 11.5%, the funguses belonging to *Fusarium* species are 25%. In the roots of this grape variety, it hasn't been discovered any fungus belonging to *Cylindrocarpon* species. There were identified bacteria belonging to phytopatogenic *Pseudomanas* species – 18 %, the bacteria belonging to *Bacillus* species – 35%. In the roots of this grape variety, it hasn't been discovered any fungus belonging to saprotrophic species.

The quantity of microorganisms separated from the roots of Bayanshira grape varieties damaged by phylloxera have been 100%. From these, it has been identified that funguses belonging to phytopatogenic *Gliocladium* species are 30.5%, funguses belonging to *Cylindrocarpon* species – 31%, the funguses belonging to *Fusarium* species – 13.5%. In the roots of this grape variety aren't discovered bacteria. As well as is identified that there are the funguses belonging to saprotrophic *Penicillium* species – 10%, the funguses belonging to *Absidia* species –7.5%, the fungi belonging to *Rhacodiella* species –7,5%.

BIBLIOGRAPHY

1. Shikhlinski H.M. *The phylloxera of grape and the microorganisms root rotting.* Baku, Chashioglu, 2001, 172 p.
2. *Nedov, P.N. Immunity of grape vine to phylloxera and root rots.* Kishinev, Shtiinsa, *1977*, 171 p.
3. *Nedov P.N.*, Guler A.P. *Normal and pathological anatomy of the roots in grape.* Kishinev, Shtiinsa, *1987*, 153 p.

CONTRIBUTIONS TO INTRODUCTION OF *SANTOLINA* L. SPECIES IN THE BOTANICAL GARDEN (I) OF ASM

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Key words: *Santolina L, ex-situ cultivation, propagation, use.*

The genus *Santolina* L. comprises species of dwarf shrubs, shrubs or evergreen, perennial, aromatic plants that belong to *Asteraceae* family. They are native to Southern Europe and Northern Africa. They are widespread especially in regions with temperate and subtropical climate. Various researchers have conflicting views on the taxonomic composition of this genus, attesting the existence of 5 to 70 species [1, 2]. According to current sources, the genus *Santolina* includes about 20 accepted species [3, 4]. They are small shrubs growing about 60 cm tall, with many-branched, erect or repent stems. The leaves are glabrous or pubescent, alternate, small, pinnate, finely divided, toothed or smooth, petiolate. The inflorescences are small, solitary, long-pedunculate flower-heads. The flowers are tubular, numerous, bisexual, with yellow, white or cream-white petals. The fruit – a wingless, naked achene with 3-5 edges. Flowering period – from June to September. The plants of the *Santolina* genus are cultivated since the late sixteenth century. Only 4-6 species are used for decorative purposes. [2, 3]. Some species are included in the European Red Lists, because they are endangered (*S. elegans* Boiss. ex DC., *S. oblongifolia* Boiss., *S. viscosa* Lag.)[4].

In the collection of perennial plants and in the experimental field of the Floriculture Laboratory of B**G** (I) of the ASM, there are three species of this genus: *S. chamaecyparissus* L., *S. virens* Mill. *S. insularis*. (Gennari ex Fiori) Arrigoni. The last one was received through international exchange of seeds in 2012**,** as the subspecies *S. chamaecyparissus ssp. insularis* (Genn. ex Fiori) Yeo. and is at the initial stage of testing in order to be cultivated. All species withstand the local soil and climate conditions, survive the winter in open ground and remain decorative during the rest period. Due to these characteristics, *Santolina* species are often used as ornamental plants indoors and outdoors. The initiation of the vegetative phase occurs at the end of March and in the first half of April. The budding phase of *S. chamaecyparissus* and *S. virens* takes place with a difference of 3-5 days from late May until early June. The flowering phases of these species nearly coincide. *S. insularis* blooms about 15 days later. The fruiting phase lasts about 40-60 days. The seeds obtained in the local soil and climate conditions have very low germination percentage. Therefore, vegetative propagation is the most effective method of producing seedlings. Cutting, layering and division are the best methods of propagation of *Santolina* plants in the conditions of our country. In autumn or spring, we can divide the bushes. Layering can also be accomplished. Cutting can be performed all year round. This process allows obtaining uniform planting material and a high coefficient of vegetative propagation. 5-7 cm tall, healthy, linear cuttings were taken from 3-4 year-old plants and were placed at a distance of 1 cm, between rows – 5 cm, on special shelves, in temperate greenhouse. The optimum temperature for rooting is 20-22^{o}C. The substrate for rooting consists of a mixture of sand and perlite, in equal proportions. The rooting period is in close connection with the characteristics of the species and the conditions for rooting. The roots appear in the 10th-14th days and develop faster in *S. chamaecyparissus.* Even without growth stimulants, the rooting of cuttings is 100%. The cuttings of *S. virens* need more time for rooting: it occurs in the 17th-20th days. The rooting percentage is 65% in summer and 85% – in autumn. In open ground, the cuttings are planted in April-May, or in September-October – depending on the rooting period. The autumn cuttings can be pricked out into the pots. In spring, we get well developed plants. The shrubs can be easily shaped by pruning, becoming more dense and beautiful. Being heliophile species that definitely prefer sunny places, *Santolina* plants require protection from draughts and excess moisture. They can also grow on poor calcareous substrate, but prefer well-structured, light soils. The studied species are resistant to adverse environmental conditions, diseases and pests. *Santolina* plants do not like abundant irrigation and water stagnation, so, good drainage is absolutely necessary.

Although *Santolina* species are quite common in our country, they are rarely used in floral decorations. We recommend them for green hedges, rock gardens, flowerbeds, for decorative walls and roofs, perennial meadow gardens. They are also suitable for cultivation in pots as indoor ornamental plants, due to the aromatic and insecticidal properties of the plants.

BIBLIOGRAPHY

1. Preda M. Dicţionar dendrofloricol. Editura ştiinţifică şi Enciclopedică. Bucureşti. 1989., p. 469
2. Şelaru E. *Cultura florilor de grădină*. Editura Ceres. Bucureşti. 2007, p. 710-712.
3. Tutin, Th. Gaskell et all. *Flora europaea*. Vol. IV. Cambridge University Press. Ed. 1976, reed. 2006. p. 145.
4. Белоусова Л.С., Денисова Л.В. *Редкие растения мира*. Москва, «Лесная промышленность». 1983, p. 20-21.
5. http://www.theplantlist.org (25 august 2015).

CATANANCHE CAERULEA L. – A NEW ORNAMENTAL SPECIES

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Key words: *introduction, Catananche caerulea, cultivation, propagation, use.*

The process of introduction of indigenous and, especially, of alien plants in culture, is a continuous, difficult one and doesn't always give positive results. In 2006, the Floriculture Laboratory of the BG (I) of the ASM received a lot of seeds for testing, offered by the State Commission for Variety Testing of Ministry of Agriculture of the Republic of Moldova. *Catananche caerulea* L. seeds were purchased from the Romanian company "Agrosel" by entrepreneurs from our country for commercial purposes. They were tested in order to determine quality indices and plant health. It was found that the germination power of the received seeds amounted to 15%. The percentage of germination was 65%. The seeds were clean, without any mixtures or plant debris. Any pathogens or pests weren't identified. The next year, seeds were sown in greenhouses (in February) in boxes. The obtained seedlings were transplanted into the experimental field of the laboratory in May. Most of them reached the generative phase in the same year. The current population consists of six mature, well branched plants, which vegetate, flourish and fructify, thus undergoing all phases, stages and periods of the ontogenetic cycle.

Catananche L. genus comprises only 5-6 recognized annual and perennial herbaceous species: *C. arenaria* Coss.&Durieu, *C. caerulea* L., *C. caespitosa* Desf., *C. lutea* L., *C. montana* Coss.&Durieu. The taxonomic rank of the studied species: family: *Asteraceae*, subfamily: *Cichorioideae*, genus: *Catananche*, species: ***Catananche caerulea*** *(syn. Cupidonia caerulea* (L.) BUB. [3]. The name of this genus is of Greek origin and means "flower of love". Common name: Cupid's dart. Some sources say that this plant contains substances with aphrodisiac effects and that it was used by the Greeks for this purpose [2].

C. caerulea is a perennial species, native to Southern and Southwestern Europe. Camephyte, xerophyte, calciphile. It grows on limestone slopes. It is grown as an ornamental plant in gardens since the sixteenth century [1, 3, 4]. Under the climate and soil conditions of our country, this plant grows 70-90 cm tall. The bushes are densely branched, semi-spreading. The whole plant is covered with numerous hairs; the stems and the underside of leaves are greyish. Radical leaves are arranged in dense rosettes. Leaves are narrow, unusually toothed (leaves look like tiny swords), 20-26 cm long. Cauline leaves are shorter (4-14 cm). The growing season starts in the middle or end of March. Budding occurs in May-June. It blooms from the middle of June to August-September. The flower heads are not too big, 2.5-3.5 cm, with about 25 flowers (around 2 cm) of blue-lavender colour. Flowers are bisexual, self-pollinating. Pistils have bifurcate, pubescent stigmas. Androceum is made up of five concrescent stamens, shorter than the pistil. The involucre comprises over 40 transparent, nacreous, scarious, decorative bracts. The bracts from the base (4-5 mm) are almost circular and those situated close to the petals (6-7 mm) are elongated, all acuminate, with well defined brown central rib. The centre of inflorescences is darker and creates an interesting colour contrast. A floral stem has 9-15 inflorescences. There are over 150 long pedunculate flower heads of different order on a bush. Seeds are viable. Fruits are brown, villous, 3-4 mm long achenes. The pappus consists of 6-7 scales. From all the flowers in a flower head, 10 to 17 seeds are formed.

This species prefers sunny, well drained slopes. It is undemanding towards substrate, but grows and develops better on calcareous and neutral soils. It can reproduce by seeds, which are planted directly into the soil in early summer. Plants will bloom next year. If seeds are sown in greenhouses during January-March, plants bloom in the same year. It is indicated to divide the bush in spring, when the threat of frost has passed, but we can also do it in autumn. A simple and effective method of obtaining a larger amount of plants is taking cuttings in summer or autumn. The planting distance is 35-50 cm. In autumn, after seed harvesting, the stems can be removed, leaving only the rosettes. Plants are irrigated and the soil is loosened in the usual way. In spring and summer, fertilizers are applied once a month. Plants are resistant to diseases, pests and adverse environmental conditions.

C. caerulea is a new ornamental species for our country. We recommend it for rustic gardens, rock gardens, floral decorations or flowerbeds. Also it can be promoted as a cut flower, can be used in bouquets of fresh and dried flowers.

BIBLIOGRAPHY

6. Preda M. Dicţionar dendrofloricol. Editura ştiinţifică şi Enciclopedică. Bucureşti. 1989., p. 110
7. Şelaru E. *Cultura florilor de grădină*. Editura Ceres. Bucureşti. 2007, p. 272-274.
8. Tutin, Th. Gaskell et all. *Flora Europaea*. Vol. IV. Cambridge University Press. Ed. 1976, reed. 2006. p. 305
9. http://www.theplantlist.org (august 2015).

ASSESSMENT OF VARIATION ON POTATO SOMACLONES USING BIOCHEMICAL ANALYSIS

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Key words: *storage proteins, peroxidase polymorphism, somaclone, in vitro culture, potato*

Somaclonal variations of regenerants obtained *in vitro* by callus cultures possess a spectrum of genetic and epigenetic modifications (PJ Larkin, WR Scowcroft., 1981; Kaeppler SM, HF Kaeppler, Y. Rhee, 2000). The amplitude of such deviations in various species of plants is determined by genetic, physiological, chemical and physical factors. Thus, different genotypes, nutrient media, explants types, conditions and terms of subculture could be a source of generating somaclonal variations. In addition, *in vitro* cultivation for long time can reduce the ability of plant regeneration (Wang QM, Wang L., 2012). Experimental mutagenesis (chemical, physical, biological techniques) in complex with *in vitro* culture is used for expanding the spectrum of induced variability in different plant species. Their identification is a requirement no mater of the ultimate intention – to increase or stabilize deviations of initial forms. Today researchers use a large spectrum of methods to assess somaclonal variations by morphological, physiological, biochemical, cytogenetic and molecular markers (RAPD, AFLP, RFLP, ISSR, SSR). Polymorphism of potato tuber protein is a basic tool used in study of variability in potato varieties (J. Barta, Courts V., J. Divis, 2003).

The aim of the present study is to evaluate somaclonal variation accompanied by virus infection in potato based on electrophoretic studies.

As biological material, were used potato regenerants (Ostara and Impala varieties) obtained *in vitro* by callus cultures from leaf fragments of virus infected (Potato virus M and Potato virus Y) and control plants (virus free). The electrophoretic analysis was performed for storage proteins and peroxidase in potato tubers from above mentioned variants. The extraction was carried out in solution of 0.01M Tris -glycine with addition of 0.5% sodium ascorbate. Electrophoresis was performed in 10 % polyacrylamide vertical gels after BJ Davis (1964). For protein polymorphism evaluation, the gels, after fixing in mix of trichloracetic acid - alcohol - distilled water (10:25:65), were stained in Coomassie blue R – 250. For peroxidase estimation, the gels were stained in R benzidine (0.2%) and hydrogen peroxide (10%).

It was established that some potato somaclones regenerated from explants of both experimental and control variants differed from original forms after the protein components and peroxidase isoforms. As a result of electrophoretic analysis of proteinograms in potato tubers of somaclones, an increased polymorphism for Ostara variety and less pronounced in the Impala variety was attested. Differences were found between the number of bands and their intensity and location.

So, from the total 23 protein bands attested in analyzed somaclones a greater diversity was established for components with a relatively lower (Rf 0.039 to 0.200) and increased electrophoretic mobility (Rf 0.428 to 0.830). Common for the most forms have been found the components with mobility between Rf 0.328 and 0.500. The study of peroxidase activity shows that the rate of common components for most forms was higher than for the proteins. A higher variability was recorded for Rf 0.133 to 0.168 and 0.415 to 0.435 components.

The results of electrophoretic analysis attest that the variability between somaclones and original forms is large and it is determined by genotype, presence of viruses in tissue of explants of donor plant. The biochemical deviation was confirmed by the variability of morphological characters.

BIBLIOGRAPHY

1. Barta J., Curn V., Divis J. *Study of biochemical variability of potato cultivars by soluble protein, isoesterase, and isoperoxidase electrophoretic patterns*. Plant Soil. Environ. 2003, (5), 49:230-236.
2. Davis B.J. *Disc electrophoresis to human serum protein*. Ann. N.-Y. Acad. Sci. 1964, 121:404-427.
3. Kaeppler SM, Kaeppler HF, Rhee Y. *Epigenetic aspects of somaclonal variation in plants*. Plant Mol Biol 2000, 43:179-188.
4. Larkin PJ, Scowcroft WR. *Somaclonal variation—a novel source of variability from cell cultures for plant improvement*. Theor Appl Genet 1981, 60:197–214.
5. Wang QM, Wang L. *An evolutionary view of plant tissue culture: somaclonal variation and selection*. Plant Cell Rep 2012, 31(9): 1535-1547.

ENTORNOPATHOGENIC VIRUSES DIVERSITY AND USE AS BIOINSECTICIDES

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Insects constitute the most diverse group of living things in the world. They can be found practically in every terrestrial and fresh-water habitat. Some have been associated with humans throughout their evolution and play an important role since the beginning of the agriculture, by becoming natural competitors for the food humans grow. Many insect species are called pests because they cause damage to humans, most frequently as competitors for the food that humans grow. Although many measures have been used for this purpose, an efficient technique was developed by the middle of the 20th century, which made obsolete and impractical any other kind of control: the use of chemical insecticides.

Consequences of the practically exclusive use of this technique soon were apparent. New control alternatives have been developed, especially those environment-friendly, such as biological control. Three main groups of organisms constitute the backbone of biological control: parasitoids, predators, and pathogens. The first two groups are mostly represented by other type of insects, while the third one is constituted by infectious microorganisms causing lethal or deleterious effects on susceptible individuals. These can be viruses, fungi, protozoa and nematodes, and are frequently used as "bioinsecticides", which are sprayed on pest populations. Nowadays, the market for bioinsecticides is about 2.5% of the total insecticide market and it is estimated that will rise to 4.2% by 2020. Although viruses constitute an important component of this type of agents, especially the baculoviruses. They constitute the most diverse group of entomopathogenic viruses which have been found practically exclusively on insect populations, mainly within the orders Lepidoptera, Hymenoptera and Coleoptera.

As pest control agents, baculoviruses do not leave harmful residues in the environment and resistance against the viruses is not observed in the field. Another advantage of these viruses is that they can persist in susceptible insect populations leading to a dynamic control of the pest. The baculovirus used in this project, is commercially available in many European countries as a bio-pesticide for the control of *Hypantria cunea, Agriotis segetum, Mamestra braseca*. The environmental and ecological impacts of baculovirus products are mirrored by characteristics of their pathogenesis and host range. In essence, every study that is required to assess their potential for environmental toxicity will be influenced by their limited host range and lack of infectivity to non-target animals. Baculoviruses have recently been included in the qualified presumption of safety (QPS) list authorized by the European Food Safety Authority (EFSA) (Leuschner et al., 2010) panel on Biological Hazards (BIOHAZ) (EFSA, 2009). Following a review of literature, EFSA concluded that baculoviruses are safe for animal and human consumption and are, therefore, acceptable for use in the control of insects that cause damage to plants (EFSA, 2010). Given that all published reviews unequivocally state that baculoviruses are safe and support their use as low-risk biological control agents for the control of insect pests, we propose that human and environmental toxicity.

Commercial production of baculoviruses for use as biological control agents of insect pests is carried out worldwide at different scales depending on the market. In 2014, there were more than 430 registered biopesticide active ingredients and 1320 active product registrations. Over 50 baculovirus products have been used worldwide as microbial insecticides. At Institute of Genetics, Physiology and Plant Protection of the Academy of Science of Moldova, the bioinsecticides are prepared in order to be used in the Republic of Moldova, mostly for the control of insect pests. In order to reduce the population of insect it is recommended utilization of the ecologically inoffensive preparations Virin-ABB-3, Virin-OS, Virin-HS-P, which is an efficient preparation for combating this pest in agricultural, ornamental and forest biocenosis.

CAPITALIZATION OF THE NATURAL POTENTIAL OF SEVERAL *ARTEMISIA* SPECIES IN THE FLORA OF REPUBLIC OF MOLDOVA

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Keywords: Artemisia annua, Artemisia absinthium, Artemisia lerchiana, Pytochemical screening

The genus *Artemisia* L. is represented by 9 species in the flora of the Republic of Moldova[1]. Phytochemical reports on *Artemisia* species deal mainly with terpenoids, flavonoids andcoumarins. Artemisia species have a vast range of bioactivities including antimalarial, cytotoxic, antihepatotoxic, antibacterial and antioxidant activities[2]. Also, they represent an important source for drug leads such as artemisinin, the well-known antimalarial agent isolated from *A. annua*. Studies on *Artemisia absinthium* species showed good antitumor activity of the extracts, extractive fractions and isolated compounds when tested on different human cancer cell lines[3].

Different *in vitro* methods of *Artemisia ssp.* culture are key to the production of these valuable compounds used as natural drugs. The tissue cultures for *A. annua* species, focused on the improvement of the artemisinin production[4]. Endangered, threatened and rare species, including *Artemisia* species, have successfully been grown and conserved by micro-propagation because of high coefficient of multiplication and small demands on number of initial plants and space[5].

Our study aims at the characterization of the phytochemical diversity of several *Artemisia* species through the chemical analyses of several classes of bioactive compounds. Our study focuses on three *Artemisia* species, namely *A. annua*, *A. Absinthium* and *A. lerchiana*.

Thus, the *Artemisia* samples harvested from different regions of Republic of Moldova will be subjected to a phytochemical screening for the assessment of biological active compounds content. The main classes of bioactive compounds envisaged are the sesquiterpen-lactones, phenolic compounds and volatile oil. In this respect, several analysis methods will be used: Thin Layer Chromatography, Spectrophotometry, High Performance Liquid Chromatography and Gas Chromatography for qualitative and quantitative assessments. Based on the phytochemical data, we will identify, isolate and propagate the high yielding accessions. The isolation and propagation of these accessions will be achieved by *in vitro* plant tissue culture, thus developing an *in vitro* and *ex situ* collection with applicability also in the conservation of the endangered *A. lerchiana* species.

The first analysis of the aerial part of *Artemisia* species showed a distinct TLC fingerprint. *A. absinthium* had a more complex spectrum for flavonoids. *A. lerchiana* had the highest content of total phenolic compounds and phenolic acids. *A. anuua* showed the highest content of flavonoids. The highest content of volatile oil was obtained for *A. annua* samples, followed by *A. absinthium* and *A. lerchiana*. The extracts richer in bioactive compounds will also be evaluated for antioxidant and antimicrobial activity.

By developing this study, important data will be obtained, regarding the diversity of medicinal and aromatic plants natural resources in Republic of Moldova, with applicability in breeding programs. This complex, interdisciplinary research on native medicinal *Artemisia* species will be performed for the first time in the Republic of Moldova.

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REFERENCES

[1]Negru A. - *Determinator de plante din flora Republicii Moldova*, Chisinau, 2007, p. 249-251.

[2]Yan L., Hu H., Zheng X., Zhu J., Liu L. -*Composition and antimicrobial activity of essential oil from the aerial part of Artemisia annua.*, J. Med. Plant. Res., 2011, 5(16): 3629-3633.

[3]Shafi G., Hasan T.N., Syed N.A., Al-Hazzani A.A., Alshatwi A.A., Jyothi A., Munshi A. (2012) *Artemisia absinthium* (AA): a novel potential complementary and alternative medicine for breast cancer, *Mol. Biol. Rep.*, DOI 10.1007/s11033-012-1569-0.

[4]Grech-Baran M., Pietrosiuk A. (2012), ***Artemisia* species *in vitro* cultures for production of biologically active secondary metabolites,** BioTechnologia, 93(4): 371-380.

[5]Pace L., Grandi S., Marotti M., Piccaglia R., Pacioni G., Spanò L. (2010), Terpenoid profiles of *in vitro* regenerated *A. petrosa* subsp. *eriantha* (Apennines' genepì), Ann. Appl. Biol., 157(2): 309-316.

BIOLOGICAL BASIS OF INTRODUCTION OF ANGIOSPERM WOODY PLANTS IN MOLDOVA

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1. For the first time in Moldova, on the basis of thorough investigations of biological particularities (ecophysiological, biochemical, biophysical, etc.) of many types of angiosperm woody plants, introduced in Moldova form different systematic groups (Aceraceae, Magnoliaceae, Platanaceae, Rosaceae, Fabaceae, Juglandaceae) and geographical origins: North America, East Asia, Central Asia, Caucasus, etc., *Biological basis of introduction of angiosperm woody plants in Moldova* have been established and developed.

Types of plants from the following families were subjected to investigations: Aceraceae – 6 types, Bignoniaceae – 3 types, Juglandaceae - 6 types, Fabaceae – 5 types, Magnoliaceae – 3 types, Platanaceae – 3 types, Rosaceae – 8 types, Schisandraceae – 1 type. Besides these types, for determination of certain parameters as: electrical resistance of plants, chlorophyll content in leaves and optical particularities of leaves, additionally, types of flitter-mouse (4), broussonetia, eucommia, etc. For the first time in Moldova, we have introduced, studied and recommended for green spaces: 3 types of Platanus, 2 types of Catalpa, Siberian apple, Bicolor lespedeza, 2 types of Magnolia and Liriodendron, 4 types of Bird Cherry, 4 types of nut, also Caspian gleditsia and Albizia lencorana. Plants with southern origin of the latest type (subtropical region), of short day, have been acclimatised to weather conditions of Moldova, where a day during summer is long. During many years, a new type of Albizia that entered into normal rhythm of development and growth in conditions of Moldova has been created, a type, resistant to drought and winter conditions.

2. Results of many years of investigations of biological particularities (hydrological regime, resistance to drought and winter conditions, dynamics of the content of chlorophyll pigments and of the content of proteins and organic phosphorus in leaves, also optical particularities of leaves and their electrical resistance, etc.) of many types of woody plants, introduced by us in Moldova, enabled us to open up a new direction of research – ecophysiological direction in investigation of plant introduction problems. Physiological particularities of angiosperm woody plants from different systematic groups and floral regions from Terra have been highlighted. Geographical role of seed reproduction for introduction was established. Plant forms have been highlighted inside type, which are distinguished by their physiological particularities and potential possibilities of adaptation to concrete conditions of existence. We have determined lawfulness of introduction of plant types from primary and secondary outbreaks.

3. Integrated approach of study of eco-physiological and biological particularities of introduced plants from different systematic groups and floral regions have enabled us to discover and explain ecological and physiological lawfulness of introduction of angiosperm woody plants in conditions of Moldova.

For the first time in science, types of hydrological regime and their evolution have been established and explained scientifically. Also, ecophysiological types of angiosperm woody plants have been determined by hydrological regime mobility, which reflects ecological types, degree and ways of adaptation of plants to drought conditions. It was established that the most adapted plants to Moldovan weather conditions are woody plants introduced from floral mountain region of North America and floral region of East Asia.

4. The research done during many years on types of angiosperm woody plants, introduced in Moldova by means of using methods of ecophysiology, biophysics, biochemistry, etc., have enabled us to highlight and riddle new direction in science about plant introduction, which differ from traditional ones. This direction called *Introductory vegetal eco-physiology*, has been opened up in PhD thesis (1981). Finally, on the basis of accumulated material and their analysis, for the first time we have managed to establish and develop *Biological basis of woody plants Agiosperm introduction in Moldova*.

INTRODUCTION AND USE OF NEW PERENNIAL FODDER LEGUMINOUS PLANTS

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Keywords: *fodder leguminous plants, nutritional value, productivity*

Continued population growth, reduction of agricultural lands require harnessing the productive potential of traditional crops by implementing new technologies and identifying, acclimatizing and introducing new species of plants that use more efficiently solar energy, soil and water, ensuring food for humans and animals and, on the other hand, serve as a source of raw material for various industries (food, textile, pharmaceutical, cosmetics etc.).

The development and modernization of our country's agriculture is related to the revitalization of the animal breeding sector along with the implementation of new genotypes of animals and diversification of fodder production, balanced in terms of quantity and quality throughout the year, suitable for the physiological requirements of animals, and qualitative products as required in the market. It is well known that the productivity of the grasslands from the Republic of Moldova is very low, constituting 300 - 500 kg/ha of hay, and the share of fodder leguminous plants is decreasing. The problem of forage with high protein content is still an actual one in livestock farming. Traditional legume crops, such as alfalfa and clover tend to exhaust with the lapse of time, and after 3-4 years their productivity gets considerably lower.

Collection of non-traditional fodder plants of the Botanical Garden (Institute) of ASM counts near 290 species and cultivars, including 71 leguminous plants. The fodder leguminous plants play an important role in increasing the quality of feed, due to a significant contribution in protein, vitamins and minerals, which raise the nutritional value of the feed and the livestock production. In order to redress the situation regarding the increase of the productivity and the quality of forage, it is necessary to extend the range of fodder leguminous species and to carry out reseeding works.

As a result of the research on mobilization of 25 species of the genus *Medicago* L., it has been established that species *Medicago agropyretorium* Vass., *Medicago polychroa* Grossh., *Medicago trautvetteri* Sumn., *Medicago tianschanica* Vass. and *Medicago varia* Mart. reach a productivity of 17.9-21.4 t/ha, at the first harvest, exceeding *Medicago sativa* L. with 8-27%, the nutritional value of the natural forage is of 0.20-0.25 nutritive units/kg and the digestible protein content – 170.0-211.6 g/nutritive unit. The species *Medicago agropyretorium, Medicago trautvetteri* and *Medicago tianschanica* are characterised by a higher degree of tolerance to abiotic factors and live longer.

The most promising species of the genus *Astragalus* L. is *Astragalus galegiformis* L., native to Caucasus Mountains has a productive potential, at the first mowing in the 3-5 years of vegetation, of 64.2-71.2 t/ha fresh mass balanced with digestible protein 127.0-145.8 g/nutritive unit, *Astragalus ponticus* Pall. is suitable for reseeding grasslands, *Astragalus sulcatus* L. – recovery of saline soils.

The promising perennial plant species of the genus *Lathyrus* L.: *Lathyrus latifolius* L., *Lathyrus pisiformis* L., *Lathyrus sylvestris* L. are characterised by a high content of dry matter (20.31-28.60%), nutritive unit balanced with digestible protein (166.68-259.00 g), high content of phosphorus but also – of nitrates; the genus *Coronilla L.,* crown vetch *Coronilla varia L.* allows obtaining 9.3 t/ha nutritive units and 1600 kg/ha digestible protein, and the genus *Onobrychis* Mill. : *Onobrychis tanaitica* Spr. and *Onobrychis inermis* Stev. – about 10 t/ha nutritive units and 1800 kg/ha digestible protein.

Galega orientalis Lam., native to Caucasus, is a promising species, the autochthonous cv. Speranța, in the 3rd-4th years of vegetation, has an accelerated growth and development rate. Its productivity reached 79.8 t/ha green mass, 15.1 t/ha nutritive units provided with 2176 kg/ha digestible protein. The green mass of *Galega orientalis* is used for preparation of hay, leaves remain on the stem, which helps ensure higher forage value. 100 kg of hay contain 71-74 nutritive units, 750-793 MJ/kg metabolizable energy for cattle and 9.16-12.2 kg digestible protein.

Valuable forms of these species can serve as starting material in crop improvement and implementation of new fodder leguminous plants for production of fodder and phytoremediation and use of polluted and eroded lands.

ASSORTMENT OF PLANTS FOR IMPROVING INDOOR AIR QUALITY IN MEDICAL INSTITUTIONS

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Keywords: *assortment, sanitation, medical institutions, phytoncide*

Plants in general and especially protected ground plants have a beneficial effect on human health, performing a number of functions. One of them is microclimate improvement as a result of the increase in air humidity, air ionization, increase in the amount of oxygen and decrease in the amount of CO2 in air, as well as the reduction to some extent of noise pollution, which positively influences the human psyche.

Another important function of indoor plants is to clear the air of dust, toxic chemicals and pathogenic microorganisms that can cause various diseases. Plants produce biologically active volatile substances – phytoncides, which have antimicrobial properties.

Greenhouse plant collections were used as material for research. Phytoncide activity was determined according to the methodology of A. M. Grodzinski (1973).

As a result of testing a large number of species, about 300, over several years, in order to determine their phytoncide content and using data from literature on growing indoor plants for decorative purposes and for improving air quality in medical institutions, we suggest an assortment of tropical, subtropical and succulent plants.

Species with high phytoncide activity: *Aglaonema commutatum* Schott., *Alocasia macrorhiza* Schott, *Aloe variegata* L., *A.arborescens* Mill.,*Anthurium andreanum* Lindl., *A.magnificum* Lindl.,*Aspidistra elatior* Bl., *Aucuba japonica* Thunb. *var.variegata*, *Begonia masoniana* Irmsch., *B. hereacleifolia* Cham.et Schl.,*B.manicata* Brogn., *B.maculata* Radii, *B. metallica* W.G.Smith, *Euonimus japonicus* Thunb., *Jasminum sambac* (L.) Ait., *J.polyanthum* L., *Kalanchoe blossfeldiana* V.Poelln., *K.daigremontana* Hamet et Perriet, *K.pinnatums* Kurz.,*K.marmorata* Baker, *K.tomentosa* Baker, *Coleus hybridus* Voss, *Laurus nobilis* L., *Monstera deliciosa* Lieb., *M.karwinskii* Scott., *Nephrolepis exaltata* (L.)Schott, *N.corfifolia*(L.)C.Presl, *Pelargonium grandiflorum* Willd., *P.odoratissimum* Ait., *P. Peltatum* Ait., *P.zonale* Ait.,*Peperomia clusiefolia* Hook.,*P.maculosa* Hook, *P. obtusifolia* Dietr.,*Hedera helix* L., *Rosmarinus officinalis* L., *Sanseviera grandis* Hook, *S.trifasciata* Prain, *Ficus benjamina* L., *F. elastica* Roxb.ex Horn, *Cisus antarctica* Vent., *Roicissus rhomboidea* Planch., *Dracaena draco* L., *D. deremensis* Engl., *D. marginata* Lam.,*Tetrastigma voinierianum* Pierre ex Gagnep, *Philodendron selloum* C.Koch., *Ph.erubescens* C.Koch et Augustin, *Ph.scandens* C.Koch et Sello, *Syngonium podophyllum* Schott, *Xanthosoma violaceum* Scott.,*Myrtus communis* L., *Plectranthus fruticosus* L, Herit., *P.coleoides var. Variegatus., Diefenbachia maculata* G.Don, *Acalipha wilkesiana* Muell., *Euphorbia tirucalli* L., *E. milli* Moulin,*Murraya paniculata* Jasq., *Justicia carnea* Lindl, *Ruellia amoena* Ness, *Sanchesis nobilis* Hook.f., *Hibiscus rosa-sinensis* L., *Agave americana* L., *Yucca elephantipes* Regel, *Sanchezia nobilis* Hook., *Clivia miniata* Regel , *Haemanthus albiflos* Jasq., *Scheflera actinophylla* Harms, *Gasteria fasciata* Haw., *Hawortia obtusa* Haw., *Asparagus sprengeri* Regel, *A.falcatus* Linn., *Crassula arborescens* Willd., *Ophiopogon jaburan* Lodd., *Psidium cattleianum* Sabine, *Pittosporum* tobira Dryand., *Abelia x grandiflora* Rehd..

The optimization of the indoor environment in medical institutions requires knowledge of the conditions and peculiarities of each room, so, actually, developing an ecological passport. It is also necessary to know the requirements and possibilities of each species used for this purpose.

REFERENCES

Гродзинский А.М. *Фитодизайн и фитонциды* – К., Наукова думка, 1973

COLLECTION OF ENERGY PLANTS SPECIES OF THE BOTANICAL GARDEN (INSTITUTE) OF THE ACADEMY OF SCIENCES OF MOLDOVA AND PROSPECTS OF USING THEM IN THE REPUBLIC OF MOLDOVA

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Keywords: *energy plants species, solid biofuel, biogas, bioethanol*

The sharp increase in fuel prices, the reserves of which are depleting, and the global warming, caused by the greenhouse gases emitted from burning fossil fuels, make the mankind search new, stable, environmentally friendly and advantageous energy sources. The complex problems of the development of renewable energy have become a global political dimension, which determines the orientation of research and innovation policy towards identifying new plant species by analyzing productivity, environmental impact, economic efficiency and ensuring that the food supply of population is not affected. For biomass production at industrial scale, the most efficient crops that are tolerant to harmful factors, use to a great extent the photosynthetically active solar energy during the vegetation period, accumulate a considerable amount of dry matter and demand optimal expenses for establishment and low expenses for maintenance, harvesting and processing should be selected and implemented. Mobilization, acclimatization and exploitation of plant resources for biofuel production are a new research direction within the Botanical Garden. As a result of researches on mobilization, the collection of energy plants species (crops) has been founded. It is enriching on the basis of species with multiple use from the collections and exhibitions of the Botanical Garden (I) ASM and due to international exchange of seeds. Currently, 68 taxa of 7 families are studied: family *Poaceae* Barnh. *(Agropyron desertorum* (Fisch. ex Link) Schult**,** *Agropyron sibiricum* **(**Willd.) P. Beauv, *Arundo donax* L., *Dactylis glomerata* L., *Eleusine coracana* Gaerth , *Festuca arundinacea* Schreb., *Miskanthus giganteus, Miskanthus sinensis* Andersson, *Setaria italica* P. Beauv, *Sorghum almum* Parodi, *Sorghum bicolor* (L.)Moench.); family *Asteraceae* Bercht. & J.Presl Dumort (*Cynara scolymus* L., *Helianthus tuberosus* L., *Helianthus tuberosus* L.x *H.annus* L., *Inula helenium* L., *Silphium perfoliatum* L., *Symphyotrichum novi-belgii* (L.) G.L.Nesom); family *Polygonaceae* Juss.(*Polygonum sachalinense* F. Schmidt, *Polygonum cuspidatum* Sieb. and Zucc,., the hybrid *Rumex tianschanicus* Losinsk. X *Rumex patientia* L.); family *Fabaceae* Lindl. (*Astragalus galegiformis* L., *Glycyrrhiza glabra* L., *Galega orientalis* Lam., *Medicago sativa* L., *Robinia pseudoacacia* L.); family *Malvaceae* Juss**.(** *Sida hermaphrodita* Rusby, *Malva crispa* L., *Malva verticillata* L.); family *Papaveraceae* Juss*.(Macleaya cordata* (Willd.) R.Br); family *Salicaceae* Mirb.*(Salix sp., Populus sp.).*

As a result of evaluation of agro biological peculiarities, determination of the biochemical composition, physical and mechanical properties of biomass, valuable species, adapted to the conditions of our country, have been identified: for production of solid biofuel (briquettes, pellets), potential of energy production of 240-500 GJ/ha (*Astragalus galegiformis, Miskanthus giganteus, Polygonum sachalinense,* the hybrid *Rumex tianschanicus* x *Rumex patientia, Sida hermaphrodita, Helianthus tuberosus, Silphium perfoliatum, Sorghum almum, Robinia pseudoacacia, Salix sp., Populus sp., Macleaya cordata, Inula helenium*); for production of biogas – of 6-16 thousand m^3/ha, equivalent to 3-8 thousand m^3 natural gas (*Silphium perfoliatum, Polygonum sachalinense, Helianthus tuberosus, Sida hermaphrodita, Festuca arundinacea, Glycyrrhiza glabra, Galega orientalis, Medicago sativa*); for production of bioethanol (*Helianthus tuberosus, Glycyrrhiza glabra, Inula helenium).*

The gene pool of energy plants species of the Botanical Garden (Institute) of the ASM was presented in the International Scientific Symposiums: "Conservation of plant diversity" Chisinau, Republic of Moldova (2012, 2014), "Prospects for the Third Millennium Agriculture" Cluj Napoca Romania (2013, 2014, 2015); the International Conferences: "Non-traditional, New and Forgotten Plant Species: Scientific and Practical Aspects of Cultivation" Kyiv, Ukraine(2013), "Agriculture for life, life for agriculture" Bucharest, Romania (2014,2015) "Trends in the European Agriculture Development" Timisoara, Romania (2015), International Scientific Congress "Life sciences, a challenge for the future " Iaşi, Romania (2014), at the International Exhibition Euroinvent Iaşi, Romania (2014, 2015), at the Exhibitions of IEC MOLDEXPO "Made in Moldova"(2013, 2014, 2015) and "BIOFORUM" (2014).

The maintenance and enrichment of collection of energy plants species of the Botanical Garden (Institute) of the ASM are necessary in order to ensure the energy security of the Republic of Moldova, the recovery of eroded and polluted soils. The gene pool of energy plants species is used in the researches on acclimatization and improvement and the obtained results – in production of high quality material for foundation of industrial plantations. The results of this research are also useful for students and economic agents working in the field of production and use of biofuel in various forms.

ANALYSIS OF THE PHENOLOGICAL SPECTRUM OF REPRESENTATIVES OF *HAWORTHIA DUVAL* IN THE GREENHOUSE COLLECTION OF BOTANICAL GARDEN OF REPUBLIC OF MOLDOVA

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Keywords: *Haworthia Duval, acclimatization, phenological observations*

Introduction of the indoor genus Haworthia Duval in the Republic of Moldova was started in the 1970s. According to Dvoryaninova, Sestak (1985), in the 70s, the famous collection consisted of eight species; it grew up to 16 species in mid 80s. Currently, the amount is 31 taxa. The collection enriched mainly due to the receipt of live material from various botanical gardens of the former USSR. Successful introduction of plants is generally believed to be evaluated in their ability to flower and fruit in a new environment. And, as fruiting is often linked to specific pollinators of plants, the main criterion is stable, in other words, regular at the same time observed bloom.

The objects of our study were species of the genus *Haworthia Duval* available in the greenhouse collections of the Botanical Garden of the Academy of Sciences of Moldova. In the greenhouse collections of *Haworthia,* there are, currently, 31 species samples and four hybrids. To assess the success of acclimatization, tests and phenological observations on collectible plants were carried out within five years. Phenological observation technique is used as follows: generative phase of plant development was observed every 10 days throughout the year: 1st, 10th, 20th of each month. We carried the following steps of generative development phases: the emergence of a visible bud, phase of inflorescence growth, colored bud, opening of the first flower, mass flowering and end of flowering.

The study yielded the following data: From the 31 studied species there are two not blooming species: *H. mirabilis* Haw, *H. retusa* (L) Haw. Not regularly, i.e. not every year flowering, was observed at 7 species: *H. herrei v.Poelln, H.lepida GG Smith, H. mucrocantha Haw., H nitidula v.Poelln, H.radula (Jacq.) Haw., H.regida (Lam.) Haw., H. ryderiana v. Poelln.* Regular and sustained flowering (in the same time frame) was observed at 14 species: *H.angustifolia Haw., H.angustifolia Haw. v. liliputana, H. aristata Haw., H. cassuta Bak., H caorctata (Salm.) Haw., H. cymbriformis (Haw.) Duv., H. glauca Bak., H. lemifolia Marl., H. margaritifera (L.) Haw., H. palida Haw., H. obtusa Haw., H. planifolia Haw., H. regida Haw. v.regida, H. tesselata (Salm) Haw.*

The studied *Haworthia* species showed the most stable and regular flowering (*H.angustifolia Haw., H.angustifolia Haw. v. liliputana, H. aristata Haw., H. cassuta Bak., H caorctata (Salm.) Haw., H. cymbriformis (Haw.) Duv., H. glauca Bak., H. lemifolia Marl., H. margaritifera (L.) Haw., H. palida Haw., H. obtusa Haw., H. planifolia Haw., H. regida Haw. v.regida, H. tesselata (Salm) Haw*.) can be considered the most adapted to the conditions maintained in the greenhouse collection of Botanical Garden, Academy of Sciences of the Republic of Moldova.

BIBLIOGRAPHY

1. Dvoryaninova KF, Sestak VI *" Tropical and subtropical plants in greenhouses Botaneskogo MSSR.Kratkie Garden of the results of the introduction."* - Chisinau " Shtiintsa " 1985 pp. 95-97 .

2. Jacobsen "*Das Succulenten lexicon*"-Jena "VEB Gustav Fischer Verlag" in 1970 . Seite 217-240

ADAPTATION OF CULTIVARS OF THE GENUS *RUBUS* TO *EX VITRO* CONDITIONS

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Key words: *genus Rubus, cultivars, ex vitro, acclimatization*

Along with the processes of plant development in aseptic conditions *in vitro*, the processes of development, adaptation and acclimatization of vitro cultures to *ex vitro* conditions play an important role in developing micropropagation technologies. The survival rate of plantlets that are moved from *in vitro* to *ex vitro*, in septic environment, depends on the skill with which accommodation of plantlets to the new conditions is achieved, especially protection from water stress, sunburn, extreme temperatures and air currents. Only after accommodation of plants to septic environment, they can be grown using agro-technical methods in open ground. [1, 2]

A major problem in the widespread application of micropropagation technology is necrosis which severely affects plantlets when they are transferred from *in vitro* conditions to *ex vitro* conditions. The vegetal material that is transferred from culture room to greenhouse conditions dehydrates easily, withers and dies because of changes in environmental conditions. In order to protect plantlets from such consequences, a series of measures is taken, namely: acclimatization is performed *gradually by decreasing air humidity and temperature, ventilation with controlled airflow, planting on optimal substrates for each cultivar. Plantlets are transferred in containers with small compartments of 25-30 ml, which have been previously filled with appropriate, moderately moist substrate and then are covered with transparent films, in order to maintain optimal humidity and temperature.*

Effective acclimatization takes place in three stages:

✓ Transfer of plantlets into containers and their maintenance under transparent films for 10-12 days at temperatures of 23-24 ºC, with regular ventilation 2-3 times a day and spraying with deionized water. Plants are kept under shade. As a result of testing the substrate, it has been found that the optimal one, for this stage, is peat with pH of 5.8-5.6. The explants that haven't formed roots are transferred to perlite and sand mixture in a ratio of 1:1 for *rhizogenesis*, over a period of 20-25 days.

✓ Transfer into bigger containers than the previous ones, of 125-155 ml, for a more efficient development of the root system, stems and leaves. At this stage, the plants have 2-3 leaflets, developed from the apex of the plant. Containers don't need to be covered any more, but the air humidity and the protection from direct sunrays during 21-25 days are still important. For this acclimatization stage, the optimal substrate is considered the substrate composed of peat and lawn soil in a ratio of 1:1.

✓ The plants that reach 8-10 cm high and have 6-8 leaflets are transferred to the substrate composed of lawn soil, peat, river sand and perlite in a ratio of 1:1:0.25:0.25. The substrate must be drained. Plants are transferred under a frame covered by thin fabric and are kept there for 21-25 days. In this period of time, the plants receive the necessary care: the substrate is moistened if necessary, mineral fertilizers are applied into the root zone once in 14 days, NPK – 7:10:12.

Analysing the results on adaptability of blackberry plants obtained during 3 years of research, we have found that during autumn-winter the vitality of blackberry cultivars *Cester, Loch Ness, Remontana, Smoothen, Tayberry* and *Evergreen* varies between 80-90 %. During spring-summer, the adaptability of the above mentioned cultivars constitutes 98-99%. [1, 3]

REFERENCES

1. Cachiță-Cosma Dorina, Ardelean Aurel, *Vitroculturile la cormofite, modele experimentale în cercetările de biologie*, Al VIII-lea Simpozion Național de Culturi de Țesuturi și Celule Vegetale, Ec. Bion, Sighișoara, 10 iunie, 2004, 138-151;
2. Cachiță-Cosma Dorina, *Metode in vitro la plantele de cultură*, Baze teoretice și practice, Ed. Ceres, București, 1987, 258;
3. Mariana Lozinschii, Nina Ciorchină, Particularităţile microclonării soiurilor de mur fără spini Cester şi Loch Ness, Revista botanică, Vol. V, Nr. 1 (6), Chișinău, 2013, 15-24.

VEGETATIVE PROPAGATION OF *HYACINTHUS ORIENTALIS* L.

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Keywords: *bulbous plants, bulbs, scales, vegetative reproduction*

Common Hyacinth (*Hyacinthus orientalis* L.) – the ancestor of all the garden hyacinths, belongs to the lily family (*Liliaceae*). Genus *Hyacinthus* L., has more than 30 species found primarily in North Africa and in the Mediterranean area. In the wild, hyacinths are spread in the Balkans, Minor Asia, Mesopotamia on dry open slopes at an altitude of 1500 m above sea level (Bykhovets, Goncharuk, 2004).

This is a perennial bulbous plant with linear-lanceolate, bright green, fleshy leaves, forming a rosette. The flowers are bell-shaped with six-partite corolla, simple or double – flowering collected in a straight cylindrical ear on the spike which grows to 20-35 cm tall. They have a strong flavor, and modern varieties differ in a wide palette of color (white, pink, purple, lilac, cream-yellow, blue, cyan, crimson, plain and with a border of various shades). The bulbs are spherical or broadly cone shaped with numerous juicy, stocking up, covering scales. The color of the coating scales of the bulbs depends on the color of the flower: Hyacinth with white flowers has it light grey, with pink flowers – lilac, the yellowish one has grayish-cream scale, the varieties with blue and purple flowers – purple. The roots are placed around the perimeter of the stems; do not have branches and root hairs. They are known since 1562. There are more than 300 varieties widespread all over the world. Hyacinths are used in group plantings, flower beds, for forcing. Hyacinths bloom early in Moldova in March-April, for 10-15 days. Hyacinths are propagated by seeds and vegetatively. In vegetative reproduction, it retains all the characteristics of the mother plant.

In the Botanical Chisinau Garden, *Hyacinthus orientalis* L. representatives are a part of the ornamental bulbous plant collection. The range is narrow and reproduction, until recently, was carried out by natural division of the bulbs. Such a method does not provide a large number of planting material, since the formation of the "kids" of hyacinths usually begins in the 5-6th year. This explains the poor distribution of hyacinth in flower forms in the Republic as well as among amateur gardeners. In this connection, in 2012 we began to study different ways of vegetative propagation of hyacinth. The aim of our research was to determine the most available and easy, in our conditions, method of increasing the number of taxa of that culture. The research work was made in the stock greenhouse of floriculture of Botanical Garden (Institute) of the ASM. Based on the methodology (Bykhovets, Goncharuk, 2004), we expanded hyacinths of two varieties *Amethyst* and *Blue Jasket* using various growth factors. Pre-treatment was carried out, soaking scales separated from the bulbs in aqueous solution of growth stimulants (8 variants). As a control, 0.4% fundazol solution and water were taken. Thus, treated scales were placed in special containers and at a predetermined temperature and humidity they were kept in diffused light for 6 weeks. During this time, at the base of the scales, formed one or more "children", which were subsequently separated and planted in the boxes filled with a special substrate for their rearing. Scales were placed again after 7 weeks bulbs were separated. Thus, over a period of weeks with 6 hyacinths bulbs we received more than 400 bulblets, which were planted in the open ground on the third year of cultivation.

Taking into account all the above, it can be concluded that the breeding of *Hyacinthus orientalis* L. with bulb scales, within the Botanical Garden (Institute) of the ASM, is successful. The best time for breeding hyacinth in Moldova in this way is September-October.

NEW PROCEDURES FOR OBTAINING SPIRULINA BIOMASS WITH HIGH CONTENT OF IRON AS AN EFFECTIVE COMPONENT PART

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Keywords: iron accumulation, Spirulina biomass, antianemic bio-preparations

The elaboration of procedures for obtaining iron-enriched Spirulina biomass could help solve one of the most acute problems, namely the one regarding iron deficiency, through effective involvement of organically bound iron in the metabolism of cellular biosynthesis, depending on the physiological and metabolic body's needs. Iron enters the composition of the hemoglobin – protein with an important role in the transport of oxygen, participates in oxidation-reduction reactions, while its absence in the human body leads to anaemia. The preparations currently used to treat anaemia (ferrogradumet, ferroplex etc.) are poorly effective because iron is in the form of simple salts, relatively toxic for the body, and their administration is accompanied by numerous side effects. In most of cases, the iron daily dose indicated for the treatment of iron deficiency anaemia exceeds the required daily norm, being determined by the fact that the iron from the composition of these preparations is badly assimilated, and the treatment turns out ineffective. For these reasons, the remedies used in the prophylaxis and treatment of these affections should be directed towards a greater efficiency, minimizing unwanted side effects and the possibility of installing hemochromatosis state. The most appropriate thing in this case would be the use of some organic complexes of iron, easily assimilable. The trinuclear coordination compounds of Fe(III) with amino acids, as well as the heterotrinuclear compounds of Fe(III), although they represent complexes containing molecules of organic compounds are obtained as a result of chemical synthesis and cannot be directly applied in the treatment of Iron Deficiency anaemia, as they can be toxic to the body. Therefore, it has been investigated the possibility of using them as chemical stimulators of the processes of growth and development of cyanobacterium *Spirulina platensis CNM-CB-02* and its ability to bind iron by forming links with intracellular organic compounds. The advantage of using iron-enriched Spirulina biomass in the treatment of anaemia is determined by the content of microelements and other bioactive components of its biomass: vitamins, phycobiliproteins, beta-carotene, acid gamma-linolenic, immunoactive amino acids, etc., increasing the effectiveness of treatment.

In the context of those exposed above, we aimed at elaborating new processes and technologies for producing Spirulina biomass with a high content of iron, which could serve as a source for obtaining new antianaemic preparations.

The research results on the accumulation of iron in Spirulina biomass, with the use as regulators of coordination compounds, have revealed the high capacity of Spirulina to accumulate iron. From all the tested compounds, there have been selected three compounds which have been shown to be the most effective: [Fe_3O-Gly], [Fe_3O-Ala] and [Fe_2MgO]. The application of a fairly broad range of compound concentrations (5 – 50 mg/L) allowed determining the gradient of the given process. As a result, iron accumulation in the biomass is directly proportional to the increase of the compound concentration. This rule is respected for all time limits of introducing the compounds.

The maximum content of iron with very slight oscillations between the obtained values is achieved in the biomass for the concentrations of the above-mentioned compounds of 50 mg/L, supplemented in rates at different stages of Spirulina growth (½ on the 1st day of cultivation and ½ on the 3rd day of cultivation), representing the maximum value 1020 mg % ([Fe_2MgO]), 1010 mg % ([Fe_3O-Ala]) and 1200 mg % ([Fe_3O-Gly]), compared to 180 mg % in the biomass cultivated without the addition of coordination compound.

The obtained biomass according to the elaborated procedures contains 1 – 1.2 % Fe from ADB, whose values are higher than the reference sample of about 5.62 to 6.74 times.

The obtained biomass may be used for the production of iron component nutraceutical products, as well as for the production of some antianaemic bio-preparations with a predicted content of this bioelement and bioactive principles.

Thus, the performed researches have resulted in the development of 3 processes for obtaining Spirulina biomass with predicted iron content as an effective component part „SP^{Fe1}”, „SP^{Fe2}”, „SP^{Fe3}” according to which there are obtained three products.

MICROBIAL CAPACITY FOR SOLVING OF BIOECOLOGICAL PROBLEMS OF MOLDOVA

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Key words: *micromycetes, streptomycetes, antifungal, antibacterial activity*

It is known that for the development of ecological agriculture, mainly biological drugs are used to protect plants from diseases, not protection chemicals – pesticides. Compared with plant protection chemicals - pesticides, biological drugs have low toxicity and are less dangerous to humans, animals and the environment, do not violate the natural links in the biocenosis, have a selective effect (no effect on beneficial insects - entomophages) do not contribute to the emergence of resistance in insects – pests. Biological drugs are used alone, as well as in integrated protection methods. A biological method to protect plants is based on the use of microbial antagonists. The mechanism of action of these microorganisms on the phytopathogens includes competition for food, the effective colonization of the rhizosphere, the synthesis of antibiotic substances, etc. The most promising producers of biological drugs for crop protection include spore-forming bacteria, fungi and streptomycetes.

200 micromycetes and 223 streptomycetes were isolated from 6 soil samples of Central Part of Moldova. The antimicrobial properties of the tested micromycetes and streptomycetes were determined by using method of agar blocks (Egorov, 2004). As test-cultures were used: *Aspergillus niger; Alternaria alternata; Botrytis cinerea; Sclerotinia sclerotiorum; Thielaviopsis basicola; Rhyzoctonia solani; Penicillium expansum; Fusarium solani; Fusarium oxysporum; Fusarium gibbosum; Fusarium graminearum; Fusarium nivale; Xanthomonas campestris, Bacillus subtilis* and *Corynebacterium miciganense.*

From 1-st soil sample, major interest presented strains of micromycetes № 1, 2, 5 and 8, antifungal range which is 3-10 test strains of fungi. These strains are able to inhibit the growth of *Alternaria alternata, Botrytis cinerea* and *Sclerotinia sclerotiorum*, the zone of growth inhibition ranged from 15 mm to 25 mm. The strains isolated from samples 2 and 3 are less active as compared to the strains from soil sample 1 and only strains № 32 and 62 are able to inhibit the growth of 10 plant pathogenic fungi, and they are active against the phytopathogenic bacteria such as *Corynebacterium miciganense* and *Bacillus subtilis*. Inhibition of zones of growth ranged from 20 to 38 mm. Strains isolated from soil samples 4 and 5 are more active against fusariums and less active against bacteria, and strains isolated from the contaminated soil practically are not active to pathogens.

Comparing the antifungal activity of streptomycetes strains isolated from various soil samples, it should be noted that from the first sample strains № 9, 12, 14, 17 and 37 had antifungal spectrum ranged between 3-12 test fungi. Metabolites of strains № 9 and 12 had the ability to inhibit the growth of 10-12 pathogenic fungi. Such strains as streptomycetes № 10, 23, 33 and 37 are able to completely suppress the growth of *Alternaria alternata*, strains 10 and 17 – the growth of *Botrytis cinerea*, strain 9 – *Sclerotinia sclerotiorum*. From the 2-nd soil sample, interest presents strains № 44, 66, 76, 120, whose antifungal spectrum consists of 4-11 phytopathogenic fungi (inhibition of zone of growth of the test fungi – from 14 to 29 mm). Strains isolated from 3, 4 and 5 soil sample, characterized by smaller spectrum (phytopathogens amount is 2-7 strains with their inhibition of their zones of growth by metabolites, of isolated from soils of Moldova of streptomycetes strains from 10 to 27 mm). The antifungal activity of the strains isolated from soils contaminated by pesticides was low – zones from 10 to 20 mm. The antibacterial activity of these strains of streptomycetes was also low – 12.0-19.0 mm, compared with strains such as 9, 23, 42, 52, 66, 151 and 172, which metabolites inhibit the active growth of such phytopathogenic bacteria as *Xanthomonas campestris* and *Corynebacterium miciganense* (zones of 20 to 27 mm).

Thus, isolated from soil of Moldova streptomycetes and micromycetes, can be considered as a basis for obtaining effective biological drugs against pathogens of crops widespread in Moldova.

MAINSTREAMING BIODIVERSITY CONSERVATION INTO ENVIRONMENTAL ASSESSMENT PROCESS

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Currently the World Bank is in the process of updating its environmental and social policies by creating a new Environmental and Social Framework which builds on the decades-old safeguard policies and aims at consolidating them into a more modern, unified framework that is more efficient and effective to apply and implement. The proposed framework would, inter alia, strengthen the conservation of biodiversity, taking the existing safeguard policy on natural habitats and forests and introducing more stringent requirements, as well as more clarity on how risks and adverse impacts on natural habitats must be mitigated. This issue is of great importance also for Moldova, as the existing legal documents in this regard (the Law on Ecological Expertise and Environmental Impact Assessment (1996) and on Environmental Impact Assessment (2014)) do not provide the necessary clarity and guidance on ensuring biodiversity conservation within both policy documents and concrete projects of economic activities.

The proposed Framework includes a special *standard on Biodiversity Conservation and Sustainable Management of Living Natural Resources* which recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. Its main objectives are: (a) to protect and conserve biodiversity; (b) to maintain the benefits from ecosystem services; and (c) to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities. The requirements of this Standard are applied to projects: (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the client has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g., agriculture, animal husbandry, fisheries, forestry).

During the environmental and social assessment, the Borrower should determine whether their projects affect biodiversity giving special consideration to affected communities whose use of and dependence on biodiversity resources are affected by the project. If the assessment identifies potential impacts on living natural resources, the Borrower will need to develop appropriate measures to manage these sustainably. Overall the proposed Standard follows the main stipulations of existing operational policies on natural habitats and forests but provides also several new and important requirements, and in particular the following: (a) *no significant conversion or degradation of critical habitats*: The new framework strengthens the conservation of biodiversity and the management of living natural resources through introducing clearer requirements for mitigating impacts of Bank-financed projects on biodiversity. Under the new framework, Bank funds cannot be used to finance or support projects that would involve a significant conversion or degradation of critical habitats; (b) *requirements relating to Supply Chain:* Where Borrowers are purchasing primary production such as food and fiber commodities that is known to take place in regions with a risk of significant conversion of critical habitats, the proposed Standard sets out stringent requirements relating to screening its primary suppliers; (c) *protection of man-made habitats:* The current safeguard policies cover only natural resources. In the proposed Standard, it is recognized that biodiversity in man-made habitats often needs to be protected; and (d) *precautionary approach*: Borrowers will need to take informed decisions on how natural living resources can be used in a project without damaging the long-term viability of the resources and the environment.

The new World Bank Standard should be regarded as an opportunity for Moldova in its way of reforming and modernizing the national Environmental Assessment system, which the country committed to, inter alia, under the EU Association Agreement. The introduction in the national environmental assessment practice of clearer requirements for assessing risks and impacts on biodiversity and ecosystem services that might be generated by new projects will likely to result in a more comprehensive system that will ensure a higher degree of biodiversity conservation, protection of ecosystems, and their sustainable management in Moldova.

CONSIDERATIONS ABOUT THE CONCEPT "HISTORIC GARDEN"

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Keywords: *notion, landlord park, historic garden*

In this paper, we present the opinion of different scientists about the concept "historic garden", in English and "parc moşieresc" in Romanian.

We used several methods in our study: documentation, analysis, synthesis and comparison. The data base for the study consists of local (legislation of Republic of Moldova) and international legislation and works in this field.

Firstly, it will be presented the conception of local scientists about the notion "historic garden" and its reflection in the local legislation. Secondly, it will be presented the international concept about this term. The study of landlord parks on current territory of Republic of Moldova started after the Second World War [1]. As Russian was the language of the science, the term "усадебный парк" was used for "historic garden". It can be found in the works of scientists studying this subject [1-4]. Later, it was published a monograph [5], where it was used the expression "парк мошиереск" written in Romanian with Cyrillic alphabet. The expression is the translation for the Russian term mentioned above.

After declaring its independence, in 1991, in the republic is used Romanian with Latin alphabet. And nowadays, scientists concerned by this subject, use the term "parc moşieresc" [6, 7]. In 2013 was published a monograph [8] where the author operates with the expression "parc boieresc". The term "boieresc" comes from the Romanian word "boier", boyar being the title for local nobility.

In Moldavian legislation, the expression "усадебный парк" was found in the standard GOST 28329-89 [9] and was explained as „a garden (park) of an old mansion, that has a significant cultural and natural importance and is a territory with limited use." In other documents it was not identified. Scientists from other countries use the term „historic garden", „grădină istorică" translated in Romanian; it is also used in the international legislation [10]. In the Florence Charter, the historic garden is defined as "an architectural and horticultural composition of interest to the public from the historical or artistic point of view" and "an architectural composition whose constituents are primarily vegetal and therefore living, which means that they are perishable and renewable". As we can see, both definitions are close and recognize the inestimable value of historic gardens.

In conclusion, we add that all notions mentioned above reflect the same term, highlighting different characteristics of historic gardens.

BIBLIOGRAPHY

1. Леонтьев П. *Парки Молдавии*. Кишинёв: Картя Молдовеняскэ, 1967. 95 с.
2. Белкин А. *Ландшафтная архитектура Молдавии*. Кишинев: Картя Молдовеняскэ, 1976. 127 с.
3. Кравчук, Ю. и др. *Заповедники и памятники природы Молдавии*. Кишинев: Штиинца, 1976. 312 р.
4. Дормидонтова В. *Гармония искусства и природы*. Кишинёв: Штиинца, 1992. 142 с.
5. Leontiev, P. *Bătrâne parcuri = В парке стариноном = In the ancient park land.* Chişinău: Timpul, 1983. 96 p.
6. Tarhon P. S. O. S. *Parcurile noastre. Parcul moşieresc din Corestăuţi.* În „Natura", 2009, august nr. 8 (210), p. 3.
7. Cocîrţă P., Ciobanu C. *Parcurile vechi moşiereşti din zona centrală a Republicii Moldova.* În Mediul Ambiant, 2013, nr. 2 (68) aprilie, pp. 41-45.
8. Tarhon P. *Parcuri vechi boiereşti din Republica Moldova.* Chişinău: Pontos, 2013. 637 p.
9. *Catalogul documentelor normative în domeniul standardizării.* Chişinău: Institutul Naţional de Standardizare şi Metrologie, 2008, vol. I şi II. 658 p.
10. *Historic gardens (The Florence Charter 1981).* Adopted by ICOMOS in December 1982. http://www.international.icomos.org/charters/gardens_e.pdf, (accessed 30.07.2015)

THE APPEARANCE OF SOIL DEGRADATION IN THE RECEPTION BASIN "NEGREA"

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Keywords: *degradation, ordinary chernozem, soil losses, reception basin, Republic of Moldova.*

In the Republic of Moldova about 80 percent of agricultural land is located on slopes and exposed to erosion or erosion danger. The presence of large areas with poorly eroded soils indicates potential possibility of increased erosion on agricultural lands as a result of their irrational management. Soil degradation processes, including through erosion, are conditioned both the natural factors as well as anthropogenic activity (Cerbari V.V, 1996).

The research aim consists of the prominent influence of the degree of soil erosion on runoff and soil loss from rural area in the village Negrea, the central part of the country. The relief of the basin framework consists of two primary surface heights denudation, with altitude 226 - 227 m, which starts from two elongated ridges ending in the valley of the rivulet Lapusnita. The inclination of relicts of surface denudation is about 1^0 (Andries al., 2003). Rill erosion comprises 40-50 percent of the surface of demonstration fields. Soil washing from the surface is associated with the laminar course of water down the slope. In this sense, a transfer of soil particles and their resubmission at the bottom of the slope as deluvial deposits takes place. The intensity of soil washing varies on different surfaces (Cerbari V.V, 1996; Nour D., Balteanschi D., 2004).

The research was performed on sloppy clay-loam ordinary chernozems in the reception basin "Negrea", Hincesti district. Reception basin "Negrea" is located in the middle of the hydrographic basin of the rivulet Lapusnita and is typical for the reception basins formed as a result of fragmentation by erosion of high terraces of the Prut River and its left tributaries. High terraces of the tributaries of the Prut River and the Prut River itself were synchronously formed in the Pleistocene and represent a unique relief in terms of genesis and lithology of rock surface, characteristic of the Middle Prut Plain (Andries al., 2003). Mapping the soil cover of the reception basin was performed at the scale 1:5000, after the detailed research. The increase in the volume of liquids that leaks from poorly eroded at the strong eroded is explained by the decrease in hidrostability of structure, increasing degree of compaction and reducing lacunar space (Boaghe Lilea, 2010).

The natural factors which favor soil erosion are: highly fragmented relief, the character of torrential atmospheric precipitation in the warm seasons of the year and low ability of soils to resist erosion (Cerbari V.V, 1996). Erosion in the territory of reception basin "Negrea" became the main factor of unrecoverable destruction of agricultural soil profile and diminished its production capacity. Therefore, on the slopes, lands with inclination less than 1 ° and without risk of erosion of arable soils occupy not less than 20 percent (Constantinov I.S., 1987; Krupenikov I.A al., 2006). This regularity has also been demonstrated for ordinary chernozems in the south of the republic (Boaghe Lilea, 2010; Constantinov I.S., 1987).

According to statistics, the level of silting aquatic basins as a result of soil erosion varies from 11-54 % (Nour D., Balteanschi D., 2004).

BIBLIOGRAPHY

1. Andrieş S. şi al. *Programul de conservare a solului din bazinul hidrografic al râului Lăpuşna pentru reducerea poluării cu nutrienţi a resurselor de apă*. Chişinău, 2003. p. 60.
2. Boaghe Lilea. *Însuşirile şi regimurile cernoziomurilor obişnuite din zona de sud a Moldovei şi măsuri de prevenire a degradării accelerate.* – Autoreferatul tezei de doctor în biologie. Chişinău, 2010. 29 p.
3. Cerbari V.V. *Buletin de monitorizare ecopedologic (pedoerozional).* Ediţia a treia. Chişinău, 1996. 84 p.
4. Nour D., Balteanschi D. *Eroziunea solului.* Chişinău "Pontos", 2004. 473 p.
5. Константинов И.С. *Защита почв от эрозии при интенсивном земледелии.* Кишинёв, «Штиинца», 1987. 239 с.
6. Крупеников И.А и др. *Экологический аспект консолидации земель.* / Agricultura Moldovei, nr. 7-8, 2006. с. 14-16.

THE QUANTITATIVE ESTIMATION OF CALCIUM AND MAGNESIUM IN HERBACEOUS PLANTS FROM ECOSYSTEMS OF NATURAL RESERVE "CODRII"

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It is known that some plants can serve as indicators of environmental factors, including the noxious ones. The current knowledge gained in botany and ecology has established that classification of species in different environmental categories is based on complex research of flora and soil. Herbaceous plant species, being quantitatively lower rank layer than trees, are very significant for stationary factors (anthropic and natural factors). It is important to remember that most forest herbaceous plant species are managed as medicinal species and as food for animals, which require quantitative estimation of mineral elements in their composition.

Our research was targeted toward evaluation of the relationship between Ca and Mg content in herbaceous plants and soil in seasonal dynamics; tentatively to determine the ecological group of plants with preferences to degree of saturation of soil with bases. Most studied plants are known in the literature as ***mesothrophic*** and ***eutrophic*** species (A*sarum europaeum, Dentaria bulbifera, Euphorbia amigdaloides, Isopirum thalectroides, Galium odoratum, Mercurialis perennis, Dactylis glomerata* etc.) and fewer ***eurimesotrophic*** (*Campanula ranunculoides, Melica uniflora*). Magnesium and calcium content was quantitatively determined in the aforementioned plant species.

The investigations were conducted on three European-forest ecosystems, experimental plots demarcated territorial area of 1800 m^2: *common oak with hornbeam* forest on typical gray clay forest soils over clay-sandy loam (**A)**; *sessile oak* with *linden* and *ash* forest on brown clay soils over deeply gleyed clay (**B**); *beech* with *sessile oak* forest on brown sandy loam soil over clay-sand (**C**). The samples were taken from each of eight allotted 1 m^2 areas in each type of forest.

Calcium. The calcium content (average values) in plants varied from 0.48 up to 0.7% (the min. 0.3%, max. 1.9%) for species *Carex brevicollis* L. and *Carex pilosa* L. Scop., up to 3.6% for *Mercurialis perennis* L. (min. 1.1, max. 3.8%) and 4.0% for *Lunaria redeviva* L. (3.8 to 4.2%).

Although $\mathbf{Ca^{2+}}$ was found at comparative lower levels in brown sandy loam soil over clay-sand (**C**), average – in gray clay forest soils over clay-sandy loam (**A)** and large – in brown clay soils over deeply gleyed clay (**B),** the last two being with enormous accumulations of $\mathbf{Ca^{2+}}$ in some areas, plants showed variations in small intervals. In an interval with values of $\mathbf{Ca^{2+}}$ less than 1% common species such as *Carex pilosa* Scop. and *Carex brevicollis* L. (for A, B, C forests) were included. *Hordelymus europaeus* (forest B) and *Melica uniflora* Retz. (Forest A, B) were also included in the 1% interval. Most studied species were within 1 - 2%. Species *Alliaria petiolata* (Bieb.) Cavara et Grande (forest B), *Gallium odoratum* (L.) Scop. (forests A,B,C), *Lamium maculatum* L., *Syphytum tauricum* Willd. (forest B) were framed within the limits of 2-3%. Just for the species *Mercurialis perennis* L. (ABC) and *Lunaria redeviva* L. (forest B) the amount of $\mathbf{Ca^{2+}}$ was in the range of 3-4%.

Magnesium. Magnesium is at the boundary between macro and micronutrients. **Mg** content in the investigated plants varied mostly within 0-1%, most plants having less than 0.5%. Species *Campanula rapunculoides* L.(forest A), *Carex brevicolis* L., *Carex pilosa* Scop.(A,B,C) were all characterized by values less than 0.3%. Species *Asarum europaeum* L. (forests A,C), *Dentaria bulbifera* L. (forests A,B,C), *Euforbia amigdaloides* L. (forests A,B), *Mercurialis perennis* L. (forests A, B, C) and *Viola hirta* L. (forests A,B) contained values greater than 0.5%.

The studied soils were characterized by a high degree of base saturation. Most plants were known as *eutrophic, mesothrophic*, some *megatrophic* and *eurimesotrophic*. However, quantitative ratios of **Ca** and **Mg** in the soil comparing with the ones in the plants, at the moment, cannot express veridical interdependencies.

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INFORMATION, COMMUNICATION AND ENVIRONMENTAL EDUCATION IN REPUBLIC OF MOLDOVA

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Keywords: *environmental education, climate change, civil society, information*

Environmental education is an issue of concern for different authorities working in different domains of environmental management. Actual practices show that relevant education could start in kindergarten. This will allow educating of sustainable consumption of natural resources and goods by people of different ages and occupations, thus leading to reduction of illegal cutting of forests, soil erosion, improving waste management practices etc.

Environmental education is the set of activities directed towards the formation and development of intellectual and moral (ethical) traits, people's consciousness to comply with rules and principles of conduct, caring for nature, environment, for everything living. The base is training (formal and informal) ecological (environmental) and bioethical principles [1]. Environmental issues are urgent and must be addressed by the entire community, and environmental education should be an integral part of the solution. Climate change, the consequences of which are often fatal, currently escalates.

The accelerated pace of climate change and the country's agrarian orientation are conditioning scientists and climatologists to conduct the Climate Vulnerability Assessment on civil society involvement in the adaptation [2]. One of the important elements in the study was the development of agriculture. The project "Climate Forum East" held the final regional conference "Towards Climate Change Adaptation to Joint Actions in Eastern Partnership Countries" organized by the Red Cross of Belarus, Moldova team came up with a sketch of mini-advocacy, in order to artistically convey the message regarding the consequences of climate change. The presentation of the sketch consisted of the most representative crops, which convinced the participating countries, the production and quality will decline in the coming years. In this context they proposed a series of measures to adapt to climate change.

Subsequently, this representative mini-skit was brought to the attention of many students in the media campaigns of civil society in the field of climate change adaptation. In the years to come, increasing temperatures and frequent manifestation of dry periods will adversely affect crops of sunflower, maize in the Republic of Moldova. What's agrarian country without these basic crops? Even tomatoes, legume species commonly cultivated in the country, suffer from these changes. For perennial crops, warming will influence favorably the broadening of cultivation to the North, especially thermophilic species such as: peach, apricot, vine.

Under our leadership with direct support of high schools, students were informed about the essential need for climate change adaptation. They conducted a series of concrete measures, such as planting trees, shrubs, to stop soil erosion; renovation of surrounding localities, sources for multipurpose use; organizing and conducting public information campaigns (in the nursery, pupils were informed through games, in the school / high school – through skits, posters, contests, sanitation of difficult sectors; in rural areas, in order to inform people of any age, village meetings were conducted, where each came with his own opinion and call for awareness of climate change adaptation measures).

In this vein, even after the successful implementation of the project, we continue the media campaign to adapt to climate change. Voluntary action takes place in each school, students continue sanitation. In autumn 2015 students of several schools will continue to replant with trees and shrubs the sectors planted in spring. More details to carry out project implementation Climate Forum East come in an article in „Journal of Botany".

BIBLIOGRAPHY:

1. Dediu, Ion. *Enciclopedie de ecologie,* Acad. De ştiinţe a Moldovei, Institutul de Ecologie şi Geografie, Acad. Oamenilor de Ştiinţă din România, Acad. Naţ. De Ştiinţe Ecologice din Rep. Moldova. Chişinău: Ştiinţa, 2010, p.239, ISBN978-9975-67-728-8
2. Nedealcov Maria, Cotofana Ion and Luidmila Baranciuc *National Climate Vulnerability Assessment* MOLDOVA, Climate Forum East (CFE) and ECOSPECTRU, Moldova, 2014.

USING SHRUBS IN THE LANDSCAPE PARK "ALEXANDRIA". HISTORY AND MODERNITY

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Keywords: *landscape park, shrubs, history, modernity*

Shrubs have always been a compulsory part of the old parks. They were planted as independent elements of the park landscape or were members of other plantations. Landscape Construction appreciates trees because of their size, variety of crown shapes and leaf colors. Shrubs are significantly smaller than the trees and have a smaller variety of crowns, but they have very interesting variants of flowers, foliage and crown structure. No flowerbed can produce such colorful decorative effect, which create large tracts planted with decorative shrubs [4].

Dendrological park "Alexandria" NAS of Ukraine is one of the largest and most famous dendroparks of Ukraine, founded in 1788.

Woody shrubs have been used in the park since its inception. About this, we know from memoirs of contemporaries. The earliest information about the use of shrubs we can find in notes of August Pelletier de la Garde (1824): "I wandered around in the bushes of lilacs, passing along the wall .... Then, surrounded by roses, myrtle and exotic plants can be seen the temple of white marble ..." [1]. About roses also mentions Aftanaziv R. (1993), in his work there are drawings of Wilibald Richter "Island of Roses" (the middle of the XIX century) [5]. Drawings of Napoleon Orda (1872), which show the various pavilions surrounded by shrubs, are presented right there. Unfortunately, the list of plants that are grown in "Alexandria" is not preserved. In the estate of Al. Branitsky, 166 taxa of deciduous shrubs and 9 taxa of conifers grew [3].

Today the collection of the park "Alexandria" has 545 kinds and cultivars of shrubs, it is 44.7 % of the total number of woody plants [2]. Some of them are located in the scientific and collection areas "Coniferetum" – 89 taxa of conifers and 21 taxa of deciduous shrubs; "Frutitsetum" – 4 taxa of conifers and 156 taxa of deciduous shrubs; "Siringary" – 30 varieties of *Syringa vulgaris* L. and 22 taxa of deciduous shrubs; "Rosary" – 115 varieties of roses from 10 garden groups.

On the landscaped areas of the park, bushes are used to create arrays, curtains (*Juniperus Sabina* L., *J. sabina* ‘Variegata’, *J. chinensis* ‘Pfitzeriana Glauca’, *Taxus baccata* L., *T. cuspidata* Sieb. et Zucc., *Cotinus coggygria* Scop., *Berberis vulgaris* L., *Buddleja alternifolia* Maxim., *Symphoricarpos albus* (L.) Blake, *Hydrangea arborescens* L., *Forsythia* x *intermedia* Zab., *Daphne cneorum* L. and others), planted on the edges (*Cornus mas* L., *Swida sanguinea* (L.) Opiz, *Deutzia* x *lemoinei* Lemoine ex Bois., *Philadelphus coronarius* L., *Syringa vulgaris* L., *Rubus odoratus* L., *Spiraea* x *vanhouttei* (Briot) Zal., *Viburnum lantana* L.), strengthening of the slopes (*Juniperus Sabina*, *Microbiota decussata* Kom., *Rhus typhina* L., *Rh. typhina* ‘Laciniana’, *Zanthoxylum americanum* Mill.), hedgerows (*Mahonia aquifolium* (Pursch) Nutt., *Buxus sempervirens* L., *Deutzia scabra* Thunb., *Physocarpus opulifolius* (L.) Maxim., *Rosa multiflora* Thunb.), and a single landings (*Taxus cuspidata* Sieb. et Zucc., *Cercis siliquastrum* L., *Kolkwitzia amabilis* Graebn., *Lonicera tatarica* L., *Weigela florida* (Bunge) A. DC., *Laburnum anagyroides* Medic., *Ribes aureum* Pursh, *Exochorda grandiflora* (Hook.) Schneid. and others).

Work on replenishment of the collection of shrubs with decorative forms for the purpose of putting them into the landscape of the park continues.

LITERATURE:

1. Галкін С.І., Гурковська О.Л., Чернецький Є.А. *Структура та символіка старовинного парку "Олександрія"*. — Біла Церква: Вид. О. В. Пшонківський, 2005. — 96 с.
2. *Каталог деревних рослин дендрологічного парку Олександрія» НАН України* [Калашнікова Л.В., Дойко Н.М., Бойко Н.С., Драган Н.В. та ін.] Довідник / Під загальною ред. С.І. Галкіна. – Біла Церква: ТОВ «Білоцерківдрук», 2013. – 64 с.
3. Небеский А.О. *Список древесных и кустарних пород растений акклиматизированных в саду графа А. Браницкого близ Киева* // Труды отдела ботаники императорского общества акклиматизации животных и растений. Т.1., 1899. – С.122-132.
4. Рубцов Л.И. *Красивоцвоцветущие кустарними для зеленого строительства УССР*. – К.: Изд-во Академии наук УССР, 1952. – 74 с.
5. Aftanazy R. *Materialy do dziejow rezydencji/Pod redakcja A.J. Baranowskiego.* Tom XI A. Dawne Wojewodztwo kijowskie. Uzupelnienia do tomow I-XI – Warszawa, 1993-719 s.

ECOLOGICAL EDUCATION THROUGH THE ENVIRONMENTAL PROJECTS AIMING THE NATIVE LOCALITY

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Key words: *environment, protection, education, project, pedagogy.*

Environmental protection is an issue of global importance, which must become a national priority that targets directly the living conditions and health of the population, achievement of economic interests, as well as capacities for sustainable development of society. Environmental protection, however, can not be fully realized if not correlate legislative and administrative measures with educational ones [1].

The *environmental project*, one of the recent methods used in environmental education is a research carried out by students, coordinated by teacher and pursuing an environmental issue or problem. The main focus, in such kind of research, is based on communities, which are the form of organization in which students and the inhabitants can get involved in formation of environmental durability and through that can be developed a sense of local belonging – ***"I live here"***, so the students should be more involved in conservation and environmental protection. At the same time, every student learns with pleasure about nature and is indicated, for the teacher, to be guided by this enthusiasm, in his work, and help them to understand the links between different systems around us [1, 2]. Current pedagogical and innovative methods in Education for Sustainable Development, recommended that process of teaching and learning phenomena, components and problems concerning the environment, should focus on the prevalence of methods including active participation, learning through experience, visits, field study, etc [2].

In the environmental project, as research, the students use different methods: methods of oral communication (presentation, querying, reasoning, problem solving, demonstration etc.); written communication methods (manual with map work, text analysis); methods of direct systematic exploration of reality (systematic observation, documents research, case study); methods of working in the field (field observations, evidence collection, interviewing civil society and the authorities dealing with environmental issues); laboratory study methods, analytical method, historical method, etc.

Steps to achieve an environmental project by students, aiming the native locality include:

1. General information about the village (physical and geographical position, topography, climate, hydrographic network, vegetation and animals, soils), according to data from the literature and field observation; **2.** History of native village (legends, myths), according to local folklore and historical data; **3.**Description of general ecological status (characterization of environmental components and argumentation of their functions in the ecosystem, the ecological status according to environmental reports); **4.** The environmental problems identified in native village. The algorithm for characterization of environmental problems, recorded during the study, included the following steps: *causes / sources of pollution - consequences / impact –measures of control and prevention.* It is not enough for the student to identify and analyze environmental problems. Very important is to find solutions that can solve the studied problems, so their research can try to improve a situation or may be the first step in solving environmental problems through the prism of critical thinking; **5.** Conclusions – deduction of conclusions reached by the student, after research. They must be interrelated with the purpose and objectives initially proposed in the study; **6.** Bibliography – it is passing in alphabetical order: author, title, publisher, year, consulted pages, internet sites, etc.; **7.** Appendices - may include attached press articles, photographs, tables, etc.

So, environmental education through environmental project, focused on local horizon, can complete a large scale of objectives such as: awareness and assumption of responsibility for environmental protection; individual / group initiative adopted to find new solutions for solving environmental problems at national and local level; conservation and environmental protection, beginning with the native environment (the nearest as physical and emotional affiliation) and use of gained knowledge to information, awareness and education of population.

BIBLIOGRAPHY:

1. *Codul Educaţiei al Republicii Moldova***.** COD Nr. 152 din 17.07.2014. http://lex.justice.md/md/355156/, accesed 15.07.2015.
2. *Education for Sustainable Development in Biosphere Reserves and other Designated Areas – A Resource Book for Educators in South-Eastern Europe and the Mediterranean*. United Nations Cultural Organization. Venice Office. Man and the Biosphere Programme, 2013, 258 p.

STRENGTHENING SUSTAINABLE FOREST MANAGEMENT IN MOLDOVA

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Key words: biodiversity conservation; forestry; institutional reforms; climate change; forest inventory

As forest ecosystems provide shelter for the greater part of the national biodiversity and are the location of the majority of the nation's protected areas, their role in the sustainable development of the country warrants priority at a national level. This would require not only further increasing forest cover in the country but also strengthening forest management, reducing corruption and illegal cutting, improving forest productivity and resilience to climate changes. The recent study conducted by the World Bank with the participation of international and local consultants[1] offers an outside view of the Moldovan forest sector, provides some strategic advice to help define sector goals, and identifies opportunities for consideration in the continued development of the sector and in the implementation of the Moldova/World Bank Country Partnership Strategy.

As the first step in strengthening forest management, the WB report proposes the implementation of the national Strategy for institutional reforms which focuses on the separation of the management from the regulatory and control functions and modernizing and strengthening the regulatory and monitoring capacity of forestry and environmental authorities which would in turn help address the root causes of illegal forest activities and corruption. Furthermore, the need to develop a more market-based economy within the sector is recognized. This can be started by more actively engaging the private sector and creating enabling environment for Small and Medium Enterprises which could provide services in areas such as harvesting, afforestation and other forest activities (e.g. NTFPs production and processing), thereby reducing the dominance of the state sector. A number of medium priority actions are also recommended including combating corruption in the sector, preventing unsustainable levels of wood removals from forests, and introducing sustainable forest management plans for Local Public Authorities forests. The report also recognizes the importance of improving the public perception of the forestry sector and Moldsilva and the need for the continued development of consensus among the main stakeholders on the sector's development.

The study highlights the urgent issue of preventing degradation and ensuring sustainable management of forest managed by the Local Public Authorities (LPAs). Currently the LPA forests are under significant anthropic pressure from illegal harvesting and will continue to degrade unless remedial measures are introduced. The future of sustainable management of the LPA's forests will depend on a combination of the institutional reform and the introduction and implementation of forest management plans (FMPs) together with initiatives to secure professional management of these areas for the benefit of local communities.

The report recommends expanding country's forest cover through a long term national Program of afforestation. The total forest cover currently is 11.1%, which is much below the European average (45% - EU average). Although in the past 15 years there is an increasing tendency in the percentage of forestation, the path of forest cover is slow, and the share of native species – reduced. Expansion of forest areas to 15% (proposed by the country's Environmental Strategy)[2] is to be achieved by planting 150,000 ha of forest and forest plantations with promoting higher proportion of native species as well as by rehabilitating and establishing of new shelterbelts in the wider landscape to help protect agricultural soils, to reduce erosion and to prevent further soil degradation. One of important

[1] Republic of Moldova: Forest Policy Note / World Bank/Andrew Mitchell, Arcadie Capcelea, Nina Rinnerberger [et al.]. – Ch.: Î.E.P. Ştiinţa, 2015 (Combinatul Poligrafic). – 68 p. (available at: www.moldsilva.gov.md)

[2] Republic of Moldova: Environment Strategy for 2014-2023. (http://apps.unep.org/publications/pmtdocuments/-Environmental_Strategy_for_the_years_2014-2023-2014Moldova_EnvironmentalStrategy_2014-202.pdf)

activity while conducting afforestation in Moldova is proposed increasing Moldova's energy security through implementing a national wood energy program with a target afforestation area using short rotation, high yielding forest energy crops (suited to the projected climate change impacts) and thus ensuring a sustainable wood supply. This would improve rural population livelihoods and reduce country's Greenhouse Gases Emissions. At the same time, the report proposes building and maintaining stable and diversified forests adapted to climate change. All these activities would help support Moldova's national and international commitments towards low-carbon development by reducing greenhouse gas emissions through increased carbon sequestration.

Another major problem faced by the forestry sector is the unsustainable level of wood consumption. The action to reduce the considerable losses caused by illegal logging are still insufficient. The problem of illegal logging persists, mainly due to poverty in rural areas and to weak institutional capacity. The officially recorded timber/firewood harvest is around 400,000 m^3/per year which equates to 32 percent of the annual increment (the EU on average harvests 58 percent of the annual increment). The total consumption of fuelwood however, is estimated at 1.1 million m^3 per year[3] (nearly three times the official harvest). This represents 80 percent of the total increment. The difference between the officially recorded removals and the estimated consumption is most likely due to unregulated and uncontrolled harvesting. These levels of illegal removals are unsustainable, and will result in significant degradation of Moldovan forests. The gross value of this unofficial harvest is estimated at between US$15 million and US$17 million m^3 per year. These levels of unofficial removals are unsustainable as these harvests will be concentrated in areas of easy access and where there is limited control and monitoring, resulting in some areas becoming significantly degraded.

Climate change will have a significant impact on Moldovan forests. Even small changes in temperature and precipitation could severely impact forest growth and survival. During 2010-2039, forest health is projected to worsen in the north of the country where areas susceptible to die-back will expand by around 15-25 percent. By 2040-2069, conditions will deteriorate further, extending southwards. Adaptation to climate change will require research on species selection, adaptive provenances and genotypes. In this regard building and maintaining stable diversified forests adapted to climate change presents a significant challenge and will require on-going measures including research on species selection including adaptive provenances and genotypes.

Expanding forest cover in the country as well as the new challenges related to climate change require targeted scientific studies. In this regard the report proposes a strategic research agenda (SRA) for the forestry sector that would provide direction and prioritize research. The immediate need is to address the potential impact of climate change. Other important areas include scientific substantiation for the afforestation of degraded lands, biological disease control agents and the most appropriate species and cultivation methods for fast-growing energy crops. Inventory and mapping of biodiversity in PAs is also an important area for research. Applied GIS research would facilitate a cross sectoral landscape approach to the research. Improving and promoting the holistic management of landscapes can help reduce the incidence and scale of damage from catastrophic events such as landslides, flooding and forest fires.

Agency "Moldsilva" should initiate and conduct the necessary studies that would allow the completion of ta national forest inventory as a basis for the development of forest policy and strategic forest sector decision making. A combination of such inventory and the implementation of current legislative provisions regarding land registration would afford policy makers and other relevant stakeholders a better and more informed view of the resource and would also facilitate the required international reporting.

[3] Galupa D., Ciobanu A., Scobiola M., Stangaci V. & Lozan A. (2012): Illegal Logging in Moldova. Analytical Study 2010-2011 (available at: www.moldsilva.gov.md)

LANDSCAPING THE AREA NEAR THE BUASVM „KING MICHAEL I OF ROMANIA" FROM TIMISOARA IN A MIXED STYLE

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Keywords: *green area, vegetation, harmony, aesthetic*

The area for landscaping is located in Timişoara, District of Timiş, 119, Calea Aradului. The necessity for landscaping this area is a result of the town becoming larger and larger and of the building of the new University building. Timişoara has always been known as a "garden town" as it has great areas covered with public parks and gardens.

We need as many green areas as possible both because of the noxious effects of pollution and of the increasing number of inhabitants.

Site analysis. From an administrative point of view, the District of Timiş is bordered by three districts: Arad, in the north, Hunedoara, in the east and Caraş-Severin, in the south; the northern-eastern limit is that with the state border with Hungary. With its 8678 km^2, the District of Timiş is the largest district in the country.

Natural conditions. The relief of the District of Timiş is the result of a very long evolution process in which internal and external morphological and genetic factors have worked together.

Pedologic conditions. The soil in Timişoara, in the area north from Calea Aradului, which is to be landscaped, is a cambic mold weak gleyed [4].

Climate conditions. The average annual air temperature is of 11-12ºC. The annual sum of positive daily average temperatures is between 4200-4400ºC. The annual average of rainfall is between 600-700 mm [1].

Economic resource analysis. After the erection of the new building of the University, the students of the Horticulture Department will elaborate the landscaping project; part of the seeding material will come from the Didactic Base Timişoara nursery.

General solution: presentation and argumentation. Composition principles used in planning. General principles of composition in planning green areas aim at harmonising aesthetic and useful, and built areas with natural ones. The principle chosen and used in landscaping this green area is that of usefulness [2]. It supposes a functional division of volumes, areas and plant shape.

Landscaping green areas will be done at the outskirt of Timişoara, on an area of 31,348 m^2, and will embrace two distinct areas: the reception area, which will outline the building, in a geometrical style; the recreation area, in a landscaping style, separated from the classical area by an alignment of *Acer pseudoplatanus* [3]. The arrangement will be of a geometrical style, as this is the best suited to the function it is to have. It will have the following elements: a pedestrian alley allowing students and teaching staff access to the Faculty, a drive way allowing vehicles access to the parking area, two artesian wells, rocks, and areas for relaxation. The landscape will also contain a main entrance, a secondary entrance, two interior parking areas, and alleys bordered by turf, flowers, benches, architectural elements, and tree alignments. The alleys will have different sizes, depending on position and importance in the composition. There will be 5.0 m wide main alley, 2.5 and 2.0 m wide secondary alleys. Thus, traffic ways in the reception area will be in the geometrical style, as the surround of the building; one of the two ways allowing access to the university is for the students, while the other one is for the vehicles. Aesthetic value of the area is conferred by the fact that green areas are the active element linking both urban architecture to humans, and urban activity to area architecture.

Total cost evaluation = 391.196.000 RON

BIBLIOGRAPHY

1.Atlas Climatologic al Republicii Socialiste România, 1966. p.102
2.Iliescu Ana felicia 2003. Arhitectura peisajului Editura Ceres. p. 62
3.Poşta Daniela Sabina 2009. Arboricultura ornamentala Editura Agroprint. p 185
4.Tarau Dorin 2000. Cadrul natural şi particularităţile zonale ale judeţului Timiş. p.40

THE GREENSPACE ARRANGEMENT IN A PRIVATE GARDEN

IN THE AREA DUMBRĂVIȚA

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Keywords: *improvement, landscaping style, private garden Location.*

Dumbrăvița is a village in the Banat Timis County. It was founded in 1891 by settlers in the town of Szentes (hence the name Újszentes Hungarian, Romanian in New Sentes) in the colonization policy of the Hungarian government of the time. Immediately after 1918 the Romanian authorities introduced Sânteşti name, later abandoned. At the 1930 census, the town was listed under the name Uisenteş [6].

The area that will be arranged is situated in Dumbrăvița near the town Timişoara, in the North part of the city. The green space arrangement is situated at the end of the street *Simfonia* and it serves only its owner. The land is rectangular shaped [1], measuring 0.5 ha. The arrangement will be equipped with all amenities demanded by customer while the trees and herbaceous vegetation [3] were chosen in order to fit the composition and to produce a decorative aspect and at the same time to prove functional.

Soil conditions.

In Dumbrăvița, on the outskirts where the garden will be constructed, the soil composes of specific moist black soil. This soil type is found almost in the whole Western part of the country and with large frequency in the region between Mureş-Bega and Mureş-Crişul Alb[5].

The proposed solutions and motivation.

The beneficiaries proposed the construction of this private garden in such manner to surround the house and comprise the following elements: small alleys to allow owner's access and walking in the garden, driveway, a small pond, rock garden, playground, a small corner for relaxing and a gazebo. Each garden element mentioned above was chosen so that the beneficiary enjoys his leisure time in a quite pleasant manner. The land shape and position allows us to create a special garden. Thus, the access alleys are designed in a landscape style, with sinuous shapes mingling with wood vegetation. The house has a terrace and a garage and it is placed in the middle of the garden.

Around the building there is a paved sidewalk of 50 cm wide. The house is surrounded by a pavement of 50 cm wide. The garden is surrounded by a concrete fence covered with *Clematis x jackmanii* [4] running plants. The alleys are paved with natural stones of different sizes and the spaces between them will be filled with grass. At the back of the garden the pond will be installed crossed by a wooden bridge. The pond will be decorated with water lilies, reeds and other water species. The rock garden is designed in an irregular shape, the rocks being decorative through their shapes and their way of piling up. The playground will consists of a hole filled with sand, a small house with a slider and cradles. Partially, this area is protected by a green fence of *Carpinus betulus*, 1,5 m high and 50 cm wide and at the ends there are planted two *Betula pendula* tree and a *Fraxinus excelsior* [4] in a order to shade the place the vegetation was carefully selected in order to assure a large range of colors and shapes. Due to the fact the garden surface is quite large, the main access is done directly from street and at the same time the house has a lateral access door to introduce the materials. The principle that was chosen and applied to project the garden is one of the most important and this is the functionality principle [2].

Total landscaping costs: 277.363.000 RON

BIBLIOGRAPHY

1.Florincescu Adriana 1999. Arhirectura peisajului. Editura Divya. p. 85
2.Iliescu Ana felicia 2003. Arhitectura peisajului Editura Ceres. p. 137
3. Moisuc Al. şi colab.2001. Gazonul ştiinţă şi artă. Editura Agroprint, Timişoara.p. 25
4.Poşta Daniela Sabina 2009. Îndrumator arboricultură ornamentala Editura Eurobit. p. 49,53,91,138
5.Tarau Dorin 2000. Cadrul natural şi particularităţile zonale ale judeţului Timiş. p.40
6. www.Wikipedia Recensământul general al României din 29 Decemvrie 1930, vol. II, p. 471

ANTIFUNGAL ACTIVITY OF MICROMYCETES IN STRESSFUL SITUATIONS

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Key words*: micromycetes, antifungal activity, strains nutrient medium, glucose.*

Soil fungi are an extremely active group, takes an important part in the processes of ecology and formation of soil. Their enzymes contribute to the decomposition of various materials into the soil and converting a portion of the recycled materials in the components of their body. They are the main destroyers of plant residues. This is primarily due to the reaction of acidic plant substrates, which favors the growth and development of fungi. If there were no fungi in nature, the entire surface of the Earth would shortly be coated with plant residues. As part of the plant, residue mass is dominated by plant cell wall materials, i.e. cellular tissue, cellulose, hemicelluloses and lignin – complex compounds, which include Carbon. Therefore, fungi play a very significant role in the Carbon cycle. Soil microscopic fungi are involved not only in the cycle of Carbon, but also – of Nitrogen. Remains of plants and animals, containing Nitrogen, fall into the soil and are destroyed by bacteria, actinomycetes and fungi. In the soil fall also specific substances such as feathers, hooves and horns of animals, remains of their scalp, chitin shells of insects and other animals. On them, specific complexes of fungi are developing, eventually leading to its complete degradation. There is a fungus that is confined to the soil soaked with oil, and often develops on kerosene, diesel fuel, and various lubricants (kerosene fungus) [1, 2].

Fungi promote destructuration of soil, thus improve and increase aeration and water supply. It is believed that the formation and destruction of humus is also associated with the activity of soil fungi in the course of their life and, after the death of the mycelium, substances that may be involved in the synthesis of humus are abundantly allocated into the environment. Some soil fungi are capable of decomposing humus, of using it as the unique source of Carbon and Nitrogen. Fungi are actively involved in the conversion of insoluble Phosphorus in the soluble and therefore available to higher plants.

Microscopic fungi stood at the origins of the development of biological means of protecting plants from pests, diseases and weeds, there are kinds of soil fungi that form substances that stimulate plant growth.

Fungi are organisms heterogeneous in their needs to the sources of Carbon nutrition.

The aim of our study was to investigate the growth, development and antifungal activity of micromycetes grown on media with different concentrations of glucose and trifluralin.

The antimicrobial properties of the tested micromycetes were determined by using method of agar blocks (Egorov, 2004) [3].

As test-cultures were used: *Fusarium solani*; *Fusarium oxysporum*; *Fusarium gibbosum.*

Studies have been conducted to determine the growth of filamentous fungi on agar and liquid medium Czapek with different concentrations of glucose. It was found that all 50 strains of studied micromycetes are able to grow on poor media with minimal glucose 10 g/l, on the medium without glucose, 28 strains had weak growth of the mycelium, and 22 strains of filamentous fungi do not grow. Investigation of antifungal activity of exometabolites of strains depending on the concentration of glucose in the medium showed that antagonism against phytopathogenic decreases gradually but remains even in variants without glucose. Experiments with herbicide trifluralin showed that even at a concentration in the nutrient medium of 500 mg/l fungi are growing, some harder than on Czapek medium without glucose. This suggests that the fungi use this herbicide as a source of carbon and the antifungal activity of metabolites of these strains is at the level of the data obtained in the control group.

Thus, it is shown that the fungi can grow and develop in the most stressful situations, using all accessible sources of carbon.

BIBLIOGRAPHY:

1. Билай В. И., Элланская И. А., Кириленко Т. С. и др. ***Микромицетов почвы***- Киев: Наук. думка, 1984. 264 с.
2. Бакаева М-Д- ***Комплексы микромицетов нефтезагрязненных и рекультивируемых почв*** Автореферат диссертации на соискание ученой степени кандидата биологических наук-Уфа-2004- 25с-
3. Егоров Н.С. *Основы учения об антибиотиках*. М. Высшая школа, 2004. 448 с.

INTEGRATING BIODIVERSITY CONSERVATION IN ROAD REHABILITATION PROJECTS IN MOLDOVA

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With the assistance of various International Financial Institutions, in the last decade, Moldova has initiated a large Program of rehabilitation of its national and local road network. The existing up to date experience in integrating biodiversity conservation requirements into road Environmental Impact Assessment (EIA) allow us to conclude and propose the following.

The conducted EIA studies do not reflect all necessary requirements specified in the World Bank Operational Policy on „Natural Habitats" and do not contain relevant avoidance and mitigation measures in this regard. While the baseline description contains general data with regard to biological environment, this information is drawn from official reports and thematic maps, scientific or other literature and internet sources, but without conducting field surveys and in particular of sensitive habitats and species of flora and fauna alongside the roads. None special observations have been done on potential migratory corridors which could be identified in the areas of forest ecosystems and wetlands. Only in few cases, the EIAs mention potential impacts on migrating fauna species (amphibian and mammal species), without undertaking field surveys and identifying follow-up mitigation and monitoring measures. Taking into consideration the EIAs for most of the road segments have been officially commissioned, it is proposed the State Road Administration (SRA) will organize a country wide field study within most important natural habitats on migration fauna corridors and based on that will identify what measures may be proposed during the rehabilitation and operational phases.

The proposed study should involve at least two rounds of field investigations – in the spring, before spawning and/or breeding, and in the fall – before hibernation. While preparing the TORs for the study, it would be necessary to specify the following: (a) identifying the types and boundaries of important natural habitats along the selected roads; (b) identifying and mapping important biological corridors and migrating species, especially of those included in Moldova Red Book; (c) providing schemes and /or geographic maps showing the exact locations and important habitats and endangered species; (d) documenting the frequency of cases with impacts of the traffic of migratory fauna; (e) proposing mitigation measures for inclusion into the detailed design; (i) for mammal crossings, possible mitigation measures would be the provision of warning signs in accordance with relevant road safety standards. In addition, reflectors may be provided on trees in the critical sections; application of repellents at the edge of forest adjoining the road for the purposes to scare away hoofed animals and prevent their coming out to the road and thus to reduce risk of traffic accidents; (ii) for sections with seasonal amphibian migrations, mitigation may be achieved by providing suitably designed amphibian tunnels; (iii) for both mammals and amphibians, it is also recommended provision of special road signs: "Wildlife" for gradual speed reduction and prohibiting signs and/or "Maximum speed limit" during dusk, night and morning time. Selection of specific locations for these structures and activities can be adjusted with regard to results of engineering survey and upon approval of the relevant local hunting services. Design options shall be approved by experts of the Institute of Zoology of the Academy of Sciences; (f) biodiversity monitoring activities. Annual monitoring on fauna shall be carried out during spring and fall periods for assessement of their status, growth and possible damages. These activities should be carried out during the period of the Project implementation and subsequent 2-3 years of the road operation.

All specified above activities should be part of all EIA studies and taken in consideration during planning, design and building new or rehabilitating existing roads as well as for their operation. This is especially important as during next decade Moldova intends to build up several bypass roads as well as rehabilitate hundreds of local roads.

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