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FACULTY OF FOOD AND TOURISM

International Conference

"Climatic changes, a permanent challenge for agricultural research on potato, sugar beet, cereals and medicinal plants"

Abstract of Papers and Posters

May 25 – 27, 2016
Brasov, Romania

PROGRAM International Conference - Brasov 25-27 May, 2016	
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Climate changes and the impacte on potato production in Republic of Moldova Petru Iliev, Anatol Meleca, Irina Ilieva (Republic of Moldova)	10.15 – 10.30
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Foreword

Scientific session organized in NRCDPSB Brasov, year after year, along those over 45 years of existence is a wonderful opportunity for meeting all those interested in research and development in potatoes, sugar beets, medicinal and aromatic plants, animal selection: researchers, farmers, agricultural producers, suppliers of in-puts.

There are moments of analyzing the results and establishing new research directions in the future. In 2016, this session is devoted to essential elements for sustainable agriculture: the potato, sugar beet and medicinal plants.

Potato, sugar beet and cereals are agrarian - food of national security, their importance is evident when we refer to the special contribution in the economic, social and environmental plant. Medicinal plants, in addition to their importance for human health is another key element for sustainable agriculture and their effect on certain pathogens and pests of crops being complex and insufficiently studied.

We must not forget the impact of climate change on the environment and therefore on agricultural production. Their study and influence on crops technologies can provide new references in assembly measures for increasing production and ensuring human consumption in the future.

We believe that abstracts presented in this volume fail to answer the question: why there can be no sustainable agriculture without potato, sugar beet, cereals and medicinal plants? The pleading for this answer is convincing, pursuing in particular the promotion and transfer of new knowledge and bold ideas as concern the culture of these plants.

The organizing committee

Influence of the climate change on the potato crop in central part of Romania

Gheorghe Olteanu[1], George Pristavu[2], Maria Ianoşi[1], Adrian Ghinea[1]
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The central part of Romania is considered one of the most favorable area for potato crop. The climatic changes observed in the last period has affected this area and based on the current forecasts involves, among others, adaptation of new potato farming technology, new potato variety tolerant to drought and the need to use irrigation systems. The paper presents a multi-year study regarding the climatic changes in Brasov area (Central of Romania) and the influence on the potato crop. For a period of more than 100 years (1910 – 2015) it was calculated the variation and tendency of hydrothermal index, as well as the extreme climatic variables. The hydrothermal index take into consideration the rainfalls during winter period, coefficient of soil retention, rainfalls quantity and the temperatures sum (>0.0°C) in vegetation period. The authors correlated this index with the respective potato yield. Continuous tracking of the phytoclimate conditions for the potato crop has become a very important factor for addressing the challenges of potato crop management under the new conditions and adaptation to the ever changing climate conditions. The result of the study indicates that the changing climate conditions in Brasov area has a significant influence on crop yield levels, a variance and it was found out that this hydrothermal index is better correlated with the performance of potato crop than temperature and rainfalls.

Key words: *potato crop, climate change, yield, hydrothermal index, irrigation*

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Climate changes and the impact on potato production in Republic of Moldova

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The beginning of XXI century is characterizing with stable increasing of global temperature. For southern Europe, were Republic of Moldova is located the major effects area summer and winter increasing of temperatures and reduction of water availability, and as a results a shorter growing period due to less favorable time for potato growing and developments. High temperature and abiotic stress push researches and potato growers to find solution for adaptation of new conditions. The most important solutions to increase yields or maintain at the same level are introduction a new varieties with high heat tolerance, short and rapid bulking period, resistant to main diseases and pests. This measure in combination with technological methods such as irrigation, presprouting, early planting in ridgers made in autumn, crop rotation and high quality seeds permit to obtain an high quality yield and save production cost.

Key words: *heat tolerance, abiotic stress, variety, yield, tuber quality, diseases*

New challenges in potato breeding to cope with climate change: dual tolerance to heat and drought

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Potato is a cool season crop with an optimal growth temperature between 17 and 21 ºC, and it also very sensitive to drought stress. All climate scenarios indicate that the global climate is changing and will continue to change in the near future. The main challenges from climate change to agriculture and food production are the more frequent and severe drought and floods as well as adverse effects of high growth temperatures. The total global yield in the regions currently cropped with potato was calculated to decline up to 32% without adaptation to climate change. The breeding of heat and drought tolerant potato cultivars is one of the most feasible and practical approaches to cope with global warming. However, breeders are generally focused on development of heat or drought tolerant potato cultivars instead of dual tolerance to both stresses. Previous studies indicate that tolerance mechanism for heat and drought is different in potato. Screening of many breeding lines against heat and drought stress under field conditions during early generations is not feasible for many breeding programs due to high cost and labor requirements. Therefore, rapid and reliable screening methods are needed to evaluate large populations in early generations. Biotechnological tools offer some advantages to breeders for screening large populations especially against biological stress factors, but no sound achievements obtained for abiotic stress factors in potato up to now. Currently our research group has several projects to develop novel screening tools to identify heat and drought tolerant genotypes.

Key words: *Solanum tuberosum* L.*, abiotic stress, water stress, temperature, phenotyping*

Potato breeding, meeting the challages of climate change

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Potato, the third most important food crop, originates from temperate climatic zone characterized by moderate and even precipitations. Current climatic changes in Central European region mean serious challenges to the potato and growers. The average daily temperature in the growing season is generally above the optimum and the required precipitation is less than needed. Climatic changes manifests in increasing frequency of hot days and alternating drought and wet periods. Connected to this and as the consequence of global trade the danger of spreading new pathogens and pest especially quarantine ones is dramatically increasing too. Potato in general is sensitive to biotic and abiotic stresses having many pathogens, pest and week root system. However a dramatic difference exists between genotypes. Stress sensitivity may manifests in yield decrease and quality loss. Cultivation of stress resistant varieties is the base of profitable potato production under stressful conditions. Our institute deals with resistance breeding since 1960 focusing on the release of varieties suitable for Central European agro-ecological conditions due to their resistance against major stress factors. The applied breeding strategy is a complex approach applying negative selection for sensitivity under natural stressful condition, positive selection for biotic stress resistance after artificial infections, DNA marker based selection for positive traits, use of resistant genotypes as parents and a complex parental line evaluation system for breeding value estimation. Detailed interpretation of the Keszthely's breeding strategy and some of the recent results will be discussed in the presentation.

Key words: *potato, breeding strategy, MAS, physiological disorders*

Relation between PVY (Potato virus Y) occurrence and aphids activity in the seed potato production in Belgium

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Since the eighties in the last century, the CRAW laboratory for potato virology situated in Libramont (Belgium) performs DAS-ELISA analysis for the Walloon and Flemish departments in charge of the official certification of the seed potato production in Belgium. At the same time, CRAW manages two suction traps (Rothamsted type) located in Libramont (Ardennes region, south of Belgium) and Gembloux (Silty soils region, center of Belgium) in order to follow, on a daily basis, the aphids flights with the objective of making an evaluation of the PVY (Potato virus Y) infection risks in the seed potato multiplication fields. The daily aphids flight informations are sent to the seed potato growers in order to help them in protecting their fields. There is a strong relation between alate aphids activity and the downgrading rate of the seed potato lots after their laboratory control. To establish this relation, we use the weekly Infection Pressure index (wIP) which is calculated by using the weekly abundance of twelve species or group of species, their specific effectiveness for PVY transmission (REF, relative efficiency factor) and the mature plant resistance (MPR). The sum of the individuals wIP during the vegetation period gives a seasonal Infection Pressure index (sIP) for the whole season which fits significantly with the downgrading rate of the seed potato lots following the laboratory analysis results.

Key words: *seed potato, Potato virus Y (PVY), aphids, infection pressure, Belgium*

Preliminary studies regarding the incidence of Potato virus Y in seed potatoes in Romania (for several cultivars)

Carmen L. Bădărău[1,2], Sorin C. Chiru[1], Elena Rakosy-Tican[3], Adriana Aurori[3], Gheorghe Olteanu[1], Adrian Ghinea[1], Daniela Donescu[1], Andreea Tican[1], Mihaela Cioloca[1]

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Surveys during two consecutive years (2014 and 2015), in five main seed potato growing areas of Romania, for ten varieties, revealed large differences in Potato virus Y (PVY) incidence. Potato varieties witch demonstrate some resistance to PVY can be managed effectively in most regions and maintain their certification status. However, knowledges regarding each cultivar's reaction to PVY and the various strains of PVY (especially the necrotic one) are critical. The samples tested were from the following cultivars: Christian, Roclas, Productiv (romanian cv.), Riviera, Carrera, Bellarosa, Jelly, Red Fantasy, Hermes and Red Lady. The tests confirmed the presence of the PVYN group in all the regions. So, serological investigations showed that 49.2% of the PVY positive samples in 2014 and 46.5% in 2015, viruses belonging to the PVYN group were found. The prevalence of recombinant PVYN (especially for the cv. Hermes and Carrera) was confirmed by the tests.

Key words: *seed potato, Potato virus Y, necrotic strains*

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Research on biological sugar content and extractable sugar content of the topping beet compared to defoliated sugar beet and crown for extraction in the future in factories of sugar from the whole sugar beet plants

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In this paper was traced the variation of white sugar content and extractable sugar, of biological sugar production and extractable sugar from classical scalped beets compared with defoliated beets and crown. The research was conducted in two locations with different climatic conditions (Brasov and Roman). In each location were studied 10 monogerm of sugar beet hybrids. The experimental results from data obtained this year in both locations shown that:

- the average sugar content in biological and extractable sugar content of classic topping beet is greater than on defoliated beet;

- the average sugar content in biological and extractable sugar content of the classic crown is less with 1-4 ºS than content of beet topping;

- sugar production of leafless biological root is greater than the biological production of sugar classic topping beet;

- the extractable sugar (white sugar) production of the defoliated root is greater than the extractable sugar production of the topping beet.

Key words: *sugar beet, topping beet, defoliation beet, crown of beet, extractable sugar*

Effects of artificially drought induced by chemical desiccation in an assortment of winter wheat genotypes

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Climate changes, especially changes in temperature characterized by serious drought represent a topical issue and have led to an increasing frequency of drought years.

In 2013-2014 and 2014-2015 field experiments were conducted in Romania at A.R.D.S. Turda. In order for study the tolerance to drought induced by applying the desiccant NaClO3 2%, on main elements of productivity and quality of winter wheat, there were used 143 local and foreign winter wheat genotypes. Drought resistance testing was done using a simple and economic method, proposed by Blum in 1988 and also used by the Cereal Research Non-Profit Company Szeged in Hungary (CSEUZ et. al., 2002). It had allowed a rigorous selection on biological material existing in the Cereal Breeding Laboratory from A.R.D.S. Turda in terms of tolerance to this stress factor.

By analyzing the influence that the desiccant had on the main elements of productivity it was noted that the grain number/spike was very little influenced by the treatment while the TKW and the grain weight/spike suffered major changes. By calculating the reduction rate of the grain weight/spike, there were easily identified the genotypes tolerant to the water stress generated during the post-blooming process using NACIO3 desiccant in a concentration of 2%, most of them had a medium tolerance to this stress factor.

Key words: *climate changes, drought, winter wheat, desiccant, productivity*

Medicinal and aromatic plants grown for Romania

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The paper presents a study on impact of significant medicinal and aromatic plants have had in the last 25 years in the Romanian society - is used not only in formulations specific phytotherapy or aromatherapy but also in new food-type dietary supplements and food functional or natural additives in bio-organic products. The study conducted on monographs for medicinal plants in the Romanian Pharmacopoeia of the first edition (1862) to edition X (1993) found that after 1990 there has been massive growth in consumption of medicinal and aromatic plants by the appearance manufacturers of dietary supplements, functional foods, phytotherapy products and phytocosmetics with great impact on consumers. Doing an analysis of biologically active substances and how to exploit them depending on specific actions, we conclude that Romanian farmers are far from meeting the needs of herbs and aromatic quality required of companies processing, imports of these products in various forms is a safe solution for many processors Draw a warning, totally justified to promote nationwide a policy of encouraging and supporting growers of medicinal and aromatic plants in Romania and the research teams that can deliver propagation material selected and technical advice.

Key words: *medicinal plant, aromatic plant, biologically active substances*

Characterization of bacterial enzymatic complex used in leather wastes degradation and evaluated as bioactive potato fertilizer

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Leather is a carbon-based, protein rich material, which is used to increase organic matter and nitrogen content of soil and has been shown to benefit crop production, at least in the short-term. Based on short-term evaluation, there are no known detrimental interactions with other components of an organic farming system (Waters, Parker). Studies have been conducted for isolation and characterization of tanned leather degrading bacterium. The hydrolytic bacteria where isolated from compost of leather. The isolated colonies show their ability to synthetize various hydrolytic enzyme as proteinase (1.975 U/ml), lipases (80 U/ml), collagenases (1.275 U/ml), amylases (4.35 U/ml), keratinases (0.911 U/ml) and it can be use in different biotechnological processes. The proteolytic enzymes have an important value in the biotechnological sector and obtaining process presented in this paper is a nonpolluting alternative to current disposal system.

Key words: *bacterial isolation, leather degradation, proteinase, fertilizer, potato*

Importance of crop rotation in potato production

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Cropping sequence and length of rotation play an important role in potato production. Potato yield are very sensitive to the selection and sequence of rotation crop. Usually minimum 3-4 years rotation is used, however often growers aplay for short-term, cropping system or monoculture. This is happening due to limited irrigated areas, or respective predecessory crop, but some time also due to quick economical interest which potato crop offers. In researches with 3 and 4 years crop rotation gradually was increase a percentage of potato from 25-33 till 100%. This led to yield reduction with 13 and 19% in comparation with rotation 33% of potato, and with 9.17 and 26% in comparation with 25% of potato. Shorter rotation drive up production cost, reduce yield and tuber quality, and increase the percentage of tuber attacked by Fusarium, Risoctonia comon scab in special using low class planting material.

Key words: *crop rotation, productivity, yield, tuber quality, diseases*

Innovative way of "in vitro" microcuttings storage of potato in biokapsuls

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Encapsulation is an innovative way providing reliable biomaterial safety. This type of insulation is carried out to ensure the safety of the encapsulated object to protect it from the environment or other negative factors. Microcuttings from microplants are used as encapsulated explants. A practical way of bioexplants conserving into a special shell allows keeping the qualitative characteristics of the health "in vitro" material, using it systematically in the process of micropropagation and replicating the original material in the form of microplants to the necessary extent. Recommended innovative way to store potatoes accessions in an "in vitro" culture in the form of biokapsul is classified as short-term storage. If it is necessary to use biokapsuls intoa technological process they are placed in a test tube with a nutrient medium. Microplants regeneration depends on the period of storage and high-quality features of conserved explant. In our studies, the use of this method of preservation during one calendar year using potato varieties at different ripening dates ensured the continued viability of biological material conserved at the level of 60%. According to received information viability of bioinkapsulated microcuttings was in direct proportion to the period of preservation. With the increaseof the storage period of the capsules safety of the canned biomaterial is reduced. Preservation developed technology of "in vitro" potato cuttings in the form of biokapsuls can significantly reduce material costs for maintaining an active collection of the initial material in the form of microplants and retain their quality characteristics.

Key words: *potato, collection "in vitro", microplants, conservation, bioincapsulation, safety*

Cosiana - new Romanian potato variety

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Potato breeding is oriented to obtain varieties with resistance to biotic and abiotic factors and with high yield capacity to satisfy the both quantitative and qualitative needs of consumers. Productivity, quality and stability are achieved through crop improvement works to promote new varieties with traits performance. Among the achievements of National Institute of Research and Development for Potato and Sugar Beet in 2015 was registered variety Cosiana. The variety is obtained through sexual hybridization and individual clonal selection. As vegetation period are enroll in the group middle varieties. Cosiana has a high yield capacity, is resistant to black wart (Synchitrium endobioticum), middle resistant to late blight (Phytopthothora infestans) and to different viruses (PVY0 and PLRV). The variety is conceived for autumn-winter consumption, being suitable for most culinary preparations, from salad to mash potatoes.

Key words: *new potato variety, genealogy, characterization, yield capacity*

Preliminary study regarding the effects of some combined treatments of PVY infected potato plantlets cv. Roclas

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Elimination of PVY from potato supply is essential for seed potato production. This is the reason because in this study, efficiency of some techniques (chemotherapy, electrotherapy) in decreasing the infection level of PVY infected plants and producing virus-free plants was evaluated. At the same time, the behaviour of the treated plants and their chlorophyll and anthocyanin content were estimated. Plantlets (Roclas variety) obtained from PVY (necrotic strains) infected material (mechanically inoculated) were used in the experiments. Electrotherapy was applied in several variants: the infected plantlets were exposed to either 40, 50 or 100 mA, for 5, 10 and 20 minutes, washed, divided into single node cuttings and multiplied "in vitro". Chemotherapy was undertaken with ribavirin (RBV) and oseltamivir (OSMV) (RBV 40 mg l^{-1} + OSMV 40 mg l^{-1}). Solanum tuberosum L. *plantlets regenerated were removed from the culture medium, acclimated in green house. The survivor plants were indexed (DAS ELISA). The variant leading to highest rates virus elimination and plant regeneration was estimate using the Therapy Efficiency Index (TEI). Monitoring the vegetative state of healthy regenerated plant was done by estimation the chlorophyll content of leaf (portable device SPAD 502 Chlorophyll Meter) and the anthocyanin content of leaf (portable device ACM 200 plus, Antocianin Chlorophyll Meter). Electrotherapy (100 mA, 10minutes) applied to infected plantlets, chemotherapy (RBV 40 mg l^{-1} + OSMV 40mg l^{-1}) led to the highest rate of virus eradication, the maximum values of the therapy efficiency. This study revealed that applying this combined therapy could have beneficial effects on PVY elimination from potato plant tissues.*

Key words: *Potato virus Y, electrotherapy, chemotherapy, chlorophyll, anthocyanin*

Acknowledgements *This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDI-UEFISCDI, PN-II-PT-PCCA-2013-4-0452, project number 178/2014*

The NPK fertilization effects on culinary and technological potato quality

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In this research we propose different levels of fertilization and NPK ratios, for Roclas and Christian potato varieties. The experiment was done in Brasov in a non-irrigated crop, studied during 2013-2014. Research methods in laboratory included analysis, qualitative and quantitative determinations designed for tubers using purpose. This permits multicriterial qualitative characterization of production from the studied fertilization variants. We analyzed the culinary quality traits and the correlations with tubers starch content before storage. Also we studied the average suitability for processing into chips and correlations between dry matter, starch, reducing sugar, efficiency to processing into chips and chips color before storage. Comparing variants of fertilization, on Roclas variety, tubers from variant with N100 P100 K100 louder crashed on boiling, pulp consistency is more reduced, are more farinaceous and moisture toward the rest of variants for both years, tubers starch contents positively significantly correlate with appreciation notes for milling, moisture and starch structure. With the increase of the NPK ratio from 1:1:1 to 1:0.9:2 and with increasing nitrogen dose combinations from 100 to 200 kg N/ha the decline in yield is found in chips. Notes for the chips' color have a tendency to decrease, which indicates a darker color of chips with increasing doses of nitrogen on variants with ratio 1:0.9:2, on both varieties and both experimental years. No significant correlation was obtained between reducing sugar and color of chips tubers for data achieved in the years 2013-2014, before storage for the studied varieties. The correlation between the efficiency to processing into chips and the color of chips was significant only for Christian variety (0.444).*

Key words: *potato, fertilization, culinary quality, technological quality*

Behaviour of different potato varieties by simulating "in vitro" of hydric stress conditions

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The water deficit, extreme temperatures and low atmospheric humidity lead to drought, which is one of the limiting factors affecting crop quality and quantity. "In vitro" selection may shorten considerably the time selection of desirable traits and completes selection in the field. "In vitro" tissue culture can be used to determine the drought tolerance of the various varieties assuming that there is a correlation between plant cells "in vitro" and "in vivo". For determining the resistance to water stress, the research was conducted in the Laboratory of Vegetal Tissue Culture and experience consisted of two factors: variety and nutritive medium with different osmotic agents. With the increasing amount of sorbitol and PEG, water absorption becomes difficult for plantlets from nutrient medium and thus was simulate the effect of drought over microplants. With the increasing amount of sorbitol or PEG into the growth medium, the drought intensity was bigger. Observations were made for different parameters: the average number of leaves; the average number of internodes; the average height of plantlet (cm); the average root length (cm); the average weight of fresh plantlet (mg); the average fresh root weight (mg). This study was performed in order to determine the best osmotic agent put into the "in vitro" medium for simulate the water stress, as well as for testing the particular genotypes on different culture media causing selection pressure of water stress.

Key words: *drought, "in vitro", stress, Solanum tuberosum* L.

Effect of antiviral chemicals on the morphological traits of "in vitro" potato shoots

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Dual effects of the Virasole (high phytotoxicity) and Zidovudine (low phytotoxicity) on the morphological changes in potato shoot cultures were studied in virus elimination experiments. Concentration of 10; 20; 30 and 40 mg l^{-1} Virasole were combined with 40; 30; 20 and 10 mg l^{-1} Zidovudine and were added to Murashige-Skoog media. Eight potato breeding clones with different virus infection were included in experiments. Potato shoot cultures were grown on these media for 4 weeks, and the rate of survive, discoloration, shoot multiplication and microtuber development and the lengths of shoots were observed weekly. Morphological responses were depended on the genotype with interaction by treatments. In general, as Virasole concentration increased in the combination the rate of survive of shoots decreased, development of microtuber and shoot multiplication increased. The lengths of shoot were also significantly decreased. All shoot cultures with yellow discoloration died even though their shoot tips were passed on fresh medium without antiviral chemicals. Present experiments were supported by the Hungarian Government; project number: AGR_PIAC_13_1_2013_0006 ("Research on disease resistance of potato for decreasing the effect of climate change").

Key words: *potato, antiviral chemicals, "in vitro"*

Producing potato microtubers under the effect of food colorant

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Three Romanian potato genotypes (Solanum tuberosum L.*) Roclas, Rustic and Zamolxis were induced to form microtubers under the influence of six food colorants red, yellow, blue, violet, green and colourless (control medium). The objective of this study was to investigate whether an adition of food colorant in Murashige & Skoog medium would improve microtuberization. It was analyzed two parameters: number of microtubers/plant and weight of a microtuber. Green food colorant registered good results regarding the second element had studied (wieght) for Rustic and Zamolxis varieties (0.6266 g and 0.6129 g).*

Key words: *plantlets, varieties, microtubers, food colorant*

The behavior of some potato genotypes (Solanum tuberosum L.*) to water stress induced "in vitro" using sorbitol and polyethylene glycol*

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National Institute of R-D for Potato and Sugar Beet, Brasov, Romania

The potato is a crop that plays a strategic role in world food security. The purpose of this study is the "in vitro" response of potato genotypes to water stress induced artificially by adding sorbitol and polyethylene glycol in culture medium, given the context of the current climate and that the determinants of abiotic stress threatens potato crop in more extensive regions of the world. The study was carried out at the National Institute of Research and Development for Potato and Sugar Beet Brasov, Research Laboratory for Plant Tissue Culture. Biological material analyzed in the experiment was represented by a perspective line LP 11-1525/1, creation of the AMSEM department (NIRDPSB, Brasov) and two isogenic lines LI 101 and LI 102 belonging to Dutch company Bejo Zaden. The studied potato genotypes behaved differently depending on the analyzed parameters and the treatment of "in vitro" inducing water stress. However, it was noted that the line LP 11-1525/1 achieved good results for most of the growth parameters, and lines derived from true potato seed behaved well, in some cases even exceeding line derived from meristems. Therefore, of the lines derived from true potato seed evidenced LI 101-6 that has performed very well in all analyzed parameters, both on sorbitol and PEG medium. Also, lines LI 101-7 and LI 102-4 have achieved good results on both variants of medium that induce water stress. There is the possibility to identify drought tolerance individuals within populations derived from true potato seed.

Key words: *drought, "in vitro", stress, Solanum tuberosum*

Preliminary studies on the correlation between total flavonoid content, total anthocyanin pigment and antioxidant activity

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Currently, there is a remarkable global interest to identify antioxidant compounds from plants. Varieties of pigmented potato (Solanum tuberosum L.*) are an important source of anthocyanins. In the last decade research activities have focused on anthocyanin from fruits and potato because it is a water-soluble pigment that can be used as food dye in different products, but also on bioactive properties (with implications for human health). This research present the correalation between flavonoids, anthocyanins and antioxidant activity. For the extraction of flavonoids and anthocyanins pigments we used ultrasound assisted extraction. In this techique we investigated the effect of three factors (sonication time, ultrasaund amplitude and solid/solvent ratio). In order to determine the total flavonoid and total anthocyanin contents were used crude extracts from purple potato (Albastru-Violet de Gălăneşti variety). The amount of total flavonoid (TFC) were analysed using aluminium chloride colorimetric assay and the amount of total anthocyanin (TAC) were analysed using pH differential assay. For the antioxidant activity we used ABTS method. Pearson correlation coefficient was used for correlation statistical analysis, all determinations were made in triplicate. This paper prove that flavonoids and anthocyanin pigments are strongly corelated with antioxidant activity.*

Key words: *anthocyanin pigments, flavonoids, ABTS assay, antioxidant activity, purple potato*

Monitoring of aphid flight activity and population structure in potato crop

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Aphids are the most efficient vectors of pathogenic viruses. Thus, the monitoring of virus vectors is essential to determine if a potato area is suitable for seed potato production. A sixteen years survey (2000-2015) was conducted to monitor aphids in potato field in Brasov, to assess the relevance of the aphid species structure and their abundance on potato crop. Aphid monitoring was started immediately after the emergence of potato and continued until vines started yellowing and was done using the method of yellow water traps. It is a suitable method for studies on aphid population structure, abundance and flight activity. During the sixteen year studies, over 14,293 specimens were collected and a total of 125 different taxa of aphids were identified. Great differences were observed on aphid structure, abundance, distribution and flight activity over the studied years. Some aphid species were more or less regularly trapped on potato crops during the years. These were: Aphis fabae Scopoli, Aphis craccivora Koch, Aphis sambuci L., Aphis gossypii Glover, Aulacorthum solani (Kaltenbach), Brevicoryne brassicae (L.), Hyalopterus pruni (Geoffroy), Macrosiphum euphorbiae (Thomas), Myzus persicae (Sulzer), Phorodon humuli (Schrank), Rhopalosiphum padi (L.). The most abundant aphid populations were on 2002 (2171 speciments) and 2015 (2541 speciments). The lowest populations were on 2005 and 2013 (252 speciments). The most abundant were polyphagous species as: Aphis fabae Scopoli, Aphis craccivora Koch, Aphis sambuci L., Brevicoryne brassicae (L.). The populations of the most important vector of potato viruses Myzus persicae, were extremely different over the years. The climatic conditions during winter time and on growing season influenced aphid flight activity, the abundance and number of species. In 2000 and 2015 the aphid populations were very high in May and June and represented a real threat for virus diseases of potato crops.

Key words: *aphids, potato, monitoring, abundance, virus vectors*

Influence of leaf fungicides over production level and root rotting by sugar beet

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Experiments were carried on during the 2012-2015 period on the North part of Moldova, under the conditions of natural infection. The paper presents results regarding the behavior of several sugar beet varieties with and without leaves protection towards sugar yield and root rot level.

Leaf spot disease caused by Cercospora beticola Sacc. *is the most destructive foliar pathogen of sugar beet worldwide. In addition to reducing yield and quality of sugar beet, the control of leaf spot disease by extensive fungicide application incurs added costs to producers and repeatedly has selected for fungicide-tolerant Cercospora beticola strains.*

Hybrids with low resistance allow getting satisfactory harvest under the condition, that the fungicides would be repeated used. By such a way we raise the prime cost of the production. Creation and using of the hybrids with the partial resistance to cercospora in the production allow to get good harvest with lower prime cost and to protect nature due to the reduction of the fungicide's use and the reduction of the treatments.

Key words: *Cercospora beticola, leaves protection, sugar beet varieties, sugar yield, root rot*

Creation of an initial material with the use of individual selection and efficiency of new sugar beet hybrids in the Republic of Moldova

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In this article the methods of individual selection on beet of first and second year of vegetation applied in the laboratory of sugar beet selection at the Selectia RIFC to develop highly productive initial material with root uniformity and a high percentage of sterile MS-lines, monogerm, plump and big seeds are considered.

The new sugar beet hybrids Rada and Vodolei are notable for their resistance to the compelx of leaf diseases. They exceed the standard in sugar yield by 7,4-7,6% and in sugar recovery by 7,3-8,0%. When tested in the state variety test, increase of sugar yield amounts to 1,6-2,6 t/ha.

Key words: *sugar beet, line, hydrid, monogermity, production*

Cultivation of sugar beet is actually economic with soil and climatic changes in years respectively

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The article highlights the research varies sorts of sugar beet productivity and quality. Appropriate mechanized technological methods of sugar beet cultivation for industrial purposes were used on the basis of prevailing soil and climatic conditions of the year. In 2013-2014 years the harvest of sugar beet was in the range of 60 t/ha and in 2015 was in the range of 40 t/ha. Despite this, profitability was similar.

The real profitability increases with the proper use of technical means in the performance of the technological process.

Key words: *sugar beet, cultivation, industrial purposes, soil, climatic, productivity, quality, technological process, profitability*

Aspects about amelioration of the species Ocimum basilicum L.

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The research on improvement of the Ocimum basilicum L. *was carried out using the method of individual selection repeated in the initial population. As a result of improvement works (2004 - 2010), there were selected and recorded three varieties of basil - «Lămâiță» - a lemon-flavored plant that can be used in medicinal tea, «Frunză verde» - leafy plants which add a pleasant taste to salads, and «Purpuriu» - a flavored spice for seasoning and ornamenting meat dishes. In order to diversify and further enrich the starting material, there were used more basil samples of different origin, and applied different methods of selection. In this material, individual and in group selections were made and their recombinant ability was assessed.*

As a result of these investigations, constant varieties were obtained, showed high productivity of raw material and pleasant taste and aroma due to the changes in the components of essential oil.

Varieties with phenotypic changes in the shape and size of bushes, leaves and inflorescences have been detected.

Two of the outlined forms - (BVi named «Opal-mini» and BVgcr named «Creţişor») were sent for testing, in 2012, to the State Commission for Variety Testing, to be registered as varieties. The average production of fresh feedstock of the forms «Opal- mini» is 4.3-4.4 t/h and – of «Creţişor» – 8.3- 8.6 t/h. The content of volatile oil in fresh feedstock is of 0.1-0.6%. These varieties, in 2014, were registered in the Catalogue of Plant Varieties of the Republic of Moldova, with the recommendation to be used as fresh spices, in the preparation of vinegar, wine, spiced oil.

Key words: *Ocimum basilicum, amelioration, selection, volatile oil, spice, aromatic, phenotypic*

Some medicinal plants gathered from natural areas

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The Black Sea Region located in temperate climate zone of Turkey has quite rich flora and vegetation. In this vegetation, there are many medicinal plants that were consumed and collected from the nature by local people. The most common ones are; Trachystemon orientalis L., *Ornithogalum sigmoideum/O. orthopyllum* L., *Oenanthe pimpinelloides* L. , *Smilax aspera* L., *S. excelsa* L. *and Urtica dioica. The plant mixture is defined as "yazı pancarı" by local people and contains several different plant species. The present study gathered data from public market surveys about consumed parts of plants, medicinal properties of them, encountered problems of collectors and consumers, future threats awaiting these plants, the issues to be considered in terms of consumption of some of these gathered plants from nature in villages of Samsun province and districts.*

Key words: *Trachystemon orientalis* L., *Oenanthe sigmoideum* L., *Smilax aspera* L., *medicinal properties*

Maintaining biodiversity of medicinal and aromatic plants and producing biological superior category of seed from representative species of hills and mountains areas

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The project suggest the introduction in the culture of important species of medicinal and aromatic plants from spontaneous flora foreign and autochthonous in the view of establishment of cultivation technology and expansion of the cultivated areas with this species.

Malva sylvestris L. *(mallow forest) is a biennial and herbaceous species. The root is jib, fleshy and little branched. The stem is erect, branched, high of 25-100 cm. Leaves are with long pigtails, round up to the form of kidney, 3-7 lobed, serrated edges. The flowers have the peduncle of 1-3 cm and are arranged by 2-6 in the armpits of the leaves. The corolla has a radial symmetry, with 5 free petals of 2-3 cm, of red-purple color, with different nuances. The fruit is in the shape of a disc, blooms in the period of May-October.*

Cassia angustifolia Vahl. *(Senna or Siminichia) is an herbaceous plant, of Fabaceae family. The leaves in the even number composed with 5-9 pairs of little bright leaves, longish, with the edge of the whole and almost without tail. Yellow flowers, with a single plane of symmetry, on type five, in the form of clusters axillary. Every flower presents 5 sepals, 5 unequal petals, 10 unequal stamens, with free filaments. The gynoecium with a single chapel. The fruit is a pod flattened with brown color, long of 5,5 cm. Multiply by seeds, Cassia prefers sandy soils, easy, well drained.*

Expected results: the introduction in culture and elaboration of technology of cultivation for these medicinal species of plants (Malva sylvestris L. *and Cassia angustifolia* Vahl.*), producing seed and material for planted from high biological categories, promotion of medicinal plants and the expansion of the cultivated areas with those species, elaboration of cultivation technologies for these species and their patenting.*

Key words: *medicinal plants, culture, technologies of cultivation*

Diversity of varieties as a factor for stabilization of winter barley yields in the Republic of Moldova

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In this paper, as a result of years of work, are analyzed nine varieties of winter barley of the Moldavian RIFC breeding, which are included in the State Catalogue of plants varieties. These varieties belong to two biological groups: winter and half-winter, and differ by major economically valuable attributes. It is given their brief characteristics. It is shown the advantage of one group of cultivars over the other on specific attributes and properties.

Different genotypes are characterized by the response norm to growing conditions. It is shown the reaction of cultivars to favorable and unfavorable external conditions. Varieties better able to achieve their genetic potential productivity at secured predecessors are revealed. A group of genotypes which are suitable for less wealthy predecessors is selected. Standing out high stability varieties, as well as varieties with high plasticity and good stability are shown.

Key words: *winter barley, varieties, stability, plasticity, response norm*

Using the germplasm of Triticum aestivum L. *to create the initial breeding material in Balti steppe conditions*

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In this article is presented and analysis of the use of genetic plasma of different winter wheat collection samples that allow, on the basis of their hybridization with the best local cultivars, to create a variety of initial breeding material and select the new competitive genotypes.

Based on this was created and registered in different periods of time common winter wheat cultivars of local breeding – Piticul, Dnestreanka, Belichaka 7, Dumbravita, Capriana, Lautar, Meleag, Vestitor, and other ones with a good level of productivity and adaptability to the conditions of their cultivation.

Key words*: winter wheat, collection, initial breeding material, cultivars*

Evaluation of osmotic stress tolerance of winter wheat landraces

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Responses of 50 winter wheat (Triticum aestivum L.*) landraces to osmotic stress induced by polyethylene glycol (PEG, Mw 600) were studied during early development of seedlings in hydroponic experiments. Seeds were soaked in aerated tap water for 24 h then they were placed in transparent polystyrene boxes onto horticultural perlite previously soaked by 60 ml water (control treatments) or PEG 600 solution (10%). Seedlings were cultured in plant growth chamber, under 10 h illumination, 80% relative humidity and 20°C for 11 days. Water supply was made twice a day by spraying of water or PEG 600 solution (10%). At the end of experiments the length of shoots and roots were measured and stress index (SI) was calculated for comparing genotypes (growth parameters of PEG treated seedlings/growth parameters of control seedlings x 100). Seedlings showed significant differences in their growth parameters in control treatment: the longest shoots developed on 'Marcaltói', 'Nagyatádi' and 'Pócspetri' landraces (196; 192 and 190 mm, respectively), while the shortest shoots were detected on 'Gégényi', 'Gamási' and '1407-KV' landraces (125, 130 and 130 mm, respectively). The longest roots were observed on 'Bánkúti marquis' (171 mm), while the shortest roots developed on 'Jászárokszállási' (71 mm) landrace. Considering SI values 'Gamási' and 'Fóti' landraces exhibited exceptionally good results (SI indeces were above 90) in osmotic stress tolerance in both growth characters. 'Homokszentgyörgyi' and 'Háromfai' landraces also showed good stress tolerance in their shoot growth, while 'Jászárokszállási' in its root growth.*

***Key words**: osmotic stress tolerance, winter wheat*

Integrated food protection of maize - based food security and safety of corn

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Food corn is attractive host for a number of pests and pathogens that invades all plant organs at the time of germination up to the stage of maturity.

Protect food corn seed treatment is performed by preparations for plant protection from outbreaks of pests. The integrated protection is used legally possible actions of principles organic farming such as biological means using antagonistic microorganisms limiting the pathogens. An important role in integrated protection of grain corn specifically for food industry occupies the creation and implementation in production of corn hybrids resistant to diseases and pests.

The breeding complexity lies in improving grain quality with optimum combination of plant productivity and resistance to pathogens and pests. Developing productive and resistant hybrids, essentially depends on the genetic genotypes used as parental forms. Inbred lines resistant to pests and diseases is behind the creation of hybrids. Genetic variability for resistance to pathogens and pests, food corn is limited and sources of resistance have poor taste qualities. In the works to improve the focus was on the use of recurrent selection dent lines as donors of productivity and resistance. The development and evaluation resistance inbred lines and hybrids was carried out by different methods of selection in the field in monoculture and the incorporation and inoculation of the infection. The breeding in the last 15 years have resulted in the development of several inbred lines with flint kernels and high content of vitamins, grains specifically for popcorn and sweet corn that contributed to the inclusion in the Catalogue of Plant Varieties of the Republic of Moldova has 17 new hybrids of food corn.

Key words: *food corn, protection, food safety, hybrid, breeding, disease resistance*

New samples for national reference collection to corn important in test distinctiveness

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Technical examination of varieties is conducted by UPOV Convention by developing and approving Guidelines for testing DUS. Guidelines are presented in reference varieties for each traits expression. Often absent reference varieties are replaced with samples selected from the collections of existing breeders. The aim of the work is the creation of national corn collection reference. The research are included 25 lines were maintained in the collection of the Institute, including (A632, F2, W117 and A654), recommended by UPOV. These lines were included in the survey, in order to appreciate the expressiveness of qualitative and pseudo-qualitative traits that mark their expressiveness and other features.

During the plant vegetation, inbred lines were evaluated after 12 qualitative and 29 quantitative traits. The samples included in the study were assessed in two independent cycles of vegetation.

In this publication presents data obtained in field test in the time of panicle (trait 8), time of ear flowering (trait 15) and the group of traits (1, 9, 10, 11, 16, 17, 19, 20 and 41) related to the presence and intensity of anthocyanin color in different parts of the plant.

In the resulting were highlighted samples Z10, Co125, F2, W117 that can be included in the national collection of reference varieties for registration of varieties expressive traits 8 and15, respectively with scores 1, 2, 3 and 4.

Related to the anthocyanin color gradation observed variability of the most traits. This variability may be due to genotype of inbred line, the influence of the environment or researcher appreciation, therefore we continue along the way to completing investigations initiated collection 2 - 3 markers at all levels of expression related to anthocyanin color.

Key words: *distinctness, flowering Age, tassel flowering stage, silk flowering stage, anthocyanin pigmentation, Maize, population, reference variety*

The results of sunflower breeding in the republic of Moldova, problems and modern tendency

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For four decades, at the RIFC „Selectia" are being carried out breeding works of the sunflower. The main directions and objectives were and are creating highly productive hybrids (3.5-4.0 t/ha) and with a high percentage of oil in seeds (48-52%), resistant to major diseases and pathogens such as Sclerotinia sclerotiorum, Botrytis cinerea, Plasmopora helianthi, Phomopsis helianthi, Sclerotium bataticola and Alternaria spp. A special role in breeding occupies the creation of forms resistant to Orobanche spp., where besides field study is carried out experiments in greenhouses (350-400 samples) annually. During this period were created 30 interlinear hybrids, of which 21 have successfully passed state tests and entered in the register of RM, and 5 of them were registered abroad. Created hybrids meet the requirements of mechanized cultivation, and allow cultivating not only in the traditional technologies but also in eco or organic farming.

Key words: *plant breeding, hybrid, sunflower*

The soybean plant breeding for the instable climate conditions of the Republic of Moldova

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In the PI Research Institute of Field Crops "Selectia" special attention is paid to the creation of new varieties of soybean adapted to stressful environmental conditions.

In order to reduce the influence of the drought on the plant production, new varieties with different plant vegetation periods were created. These new characters of the soybean contribute to the easier overcoming of the periods with insufficient humidity and the achieving of stable production in unfavorable years.

The research was conducted in the years 2013-2015. The most favorable year for the development of soybean plants was 2014 with 240 mm rainfall during the plant vegetation period and the least favorable was 2015 with only 162 mm of precipitation.

The most stable 3-year average production of 1733 kg/ha was achieved by the mid-early ripening variety Enigma. In the severe drought of 2015 the early-ripening variety Deia formed the best production – 1396 kg/ha.

Unfavorable environmental conditions have influenced negatively the quality of soybean grains. The highest crude protein content in grains of 41.07% in 2014 and only 38.25% in 2015 was obtained by the early-ripening Deia. The maximum oil content of 19.75% in 3-year average was recorded by the variety Aura.

Key words: *Soybean, variety, productivity, protein content, oil content*

Achievements and general aspects in leguminous crops breeding

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The proposed article summarizes the recent progress achieved in leguminous crop breeding at the RIFC "Selectia".

The Republic of Moldova belongs to the group of countries with risky farming, where the limiting factor of plant productivity is the hydro-thermical regime.

Attendance in the last 15-20 years of agricultural drought has led to partial or complete compromise of the production levels demonstrating the reduced capacity of leguminous crops adaptability to stressful environmental conditions. Therefore in the breeding research programs, primary objective is directed towards creating new idiotypes with high ecological plasticity.

In the laboratory of leguminous crop breeding at the RIFC "Selectia" are carrying out researches to improve such crops as peas, soy beans and dry beans.

In the last 5 years in the Catalogue of Plant Varieties of the Republic of Moldova were registered two new varieties of peas (MZ-7-06 and MZ-13-12), which is highlighted by the high level of production (3900-4100 kg/ha) associated with resistant qualities to lodging and beans shaking.

For soybean crop in the Catalog were included three new varieties (Deia, Magic, Moldova) with high production capacity (3000-3500 kg/ha), with different degrees of maturity and modeled architecture type of plant.

Latest achievements in dry bean breeding is manifested by creating and recording 2 new varieties - Garofița and Marita, which can accomplish grain yields of 2800-3100 kg/ha with high culinary qualities and suitable for mechanized harvesting.

Key words: *winter barley, varieties, stability, plasticity, response norm*

Hyperspectral analysis used for monitoring crop vegetation status

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The paper presents the ways in which the crops vegetation status can be determined and monitored using spectral information. For the hyperspectral analysis, authors used an experimental model that contains VIS (350-800 nm) and NIR (650-1100 nm) Ocean Optics mini spectrometers, with 1.5 nm optical resolution. A Raspberry Pi microcontroller development system controls the entire acquisition process. The acquired data allow the calculation of different vegetation indices. Correlating indices with GPS coordinates, maps of favorability and risk for crops can be generated. Results are validated in laboratory. Information are stored in a database which is an extremely useful tool for real time intervention on the crops vegetation status in precision agriculture.

***Key words**: precision agriculture, crop vegetation status, hyperspectral, vegetation indices*

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Data acquisition application for precision agriculture domain

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This paper proposes a software solution for data acquisition in precision agriculture domain. Nowadays the trend is to acquire geo-referenced measurements for some parameter which provides information about the crop. The data is used to estimate the production or to determine the soil fertilization need. At this moment the data acquisition procedure is not very modern and, depending on the characteristics of the sensor, the observations are stored on sensor flash memory or on paper. After that, in the office the engineer have to align the data and persisted into a database. All these steps have a high risk of human error.

The objective of this work is to develop some software applications which can simplify and reduce the human error risk for the data acquisition step.

The applications can be used to fulfill the following steps:

- *Monitor and manage in real time the data acqusition process;*
- *Stocking in a database the acquired observation via an user interface;*
- *Achieving a communication interface with the computer field sensors*

There are two main applications which have been developed during the execution of this project. The first application allows the management of the acquisition process and should be used by the precision agriculture engineers. The second one is used the technicians and simplifies the data acquisition process.

***Key words**: precision agriculture, geo-referenced data acquisition*

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Contribution to the arthropod biodiversity in sweet potato (Ipomoea batatas L.*) crops under sandy soils conditions from southern Romania*

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The present study, conducted during 2013-2014 at the Research - Development Centre for Field Crops on Sandy Soils Dăbuleni experimental fields aimed to evaluate the arthropod fauna community in sandy soil cultivated with sweet potato crop variety Pumpki. The experimental conditions were under irrigated in two variants: with and without chemical treatments. Pitfall traps were used to sample arthropod fauna. After sorting and identifying the soil epigeic arthropods taxonomical abundance, species richness and dominance were estimated. The variant with chemical treatment had the highest fauna abundances but species richness and diversity was higher in the untreated variant. The results presented in this paper contribute towards the identification of phytophagous insects damaging sweet potato and entomophagous species complex and represents a scientific basis for the further development of integrated pest management recommendations.

***Key words**: arthropod biodiversity, sweet potato, Ipomoea batatas* L., *sandy soils*

NOTE

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