410 ÉVE AZ OKTATÁS ÉS A TUDOMÁNY SZOLGÁLATÁBAN, 100 ÉVE SZEGED ÉS A RÉGIÓ FEJLŐDÉSÉÉRT.

19th WELLMANN INTERNATIONAL SCIENTIFIC CONFERENCE

BOOK OF ABSTRACTS

28th April 2022
Hódmezővásárhely

University of Szeged Faculty of Agriculture
Hódmezővásárhely (Hungary)

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara
Faculty of Agricultural Management (Romania)

Hungarian Academy of Sciences Regional Committee in Szeged (Hungary)

Foundation for Agricultural Modernization and Rural Development, Hódmezővásárhely (Hungary)

19TH WELLMANN INTERNATIONAL SCIENTIFIC CONFERENCE

Book of Abstracts

University of Szeged Faculty of Agriculture
28th April 2022

Published by:
University of Szeged
Faculty of Agriculture
Andrássy út 15.
6800 Hódmezővásárhely, Hungary

Responsible publisher:
Edit Mikó
dean

Executive editor:
Orsoly Kiss

ISBN 2978-963-306-860-1

CONTENTS

PLENARY SESSION

GREEN MANURING, A TOOL FOR SUSTAINABLE AGRICULTURE

László Zsombik [1], Vivien Pál [1]

[1] University of Debrecen, Institutes for Agricultural Research and Educational Farm, Research Institute of Nyíregyháza, Nyíregyháza

Intensive production and crop rotations containing few species reducing the organic matter content of soils. Significant soil degradation processes occur at a time of year when the soil is not covered with vegetation. The use of green manure crops has several advantages for the soil and for the next crop. The most commonly used green manure plants are leguminous and cruciferous species, and species which has large root system and develops great biomass. The most commonly used leguminous green manure species are common vetch (*Vicia sativa*), hairy vetch (*Vicia villosa*), white lupine (*Lupinus albus*), egyptian clover (*Trifolium alexandrinum*) and crimson clover (*Trifolium incarnatum*). Cruciferous green manure species are oil radish (*Raphanus sativus* conv. Oleiformis), white mustard (*Sinapis alba*) and tillage radish (*Raphanus sativus*). Other commonly used green manure plant species are phacelia (*Phacelia tanacetifolia*), buckwheat (*Fagopyrum esculentum*), black oat (*Avena strigosa*) and rye (*Secale cereale*). Leguminous green manure plants provide a source of nutrients for the subsequent plant, while some green manure plants loosen the soil with their deep-rooted roots and improving infiltration and hydraulic factors of the soil. Correctly chosen mixtures can reduce the need for fertilizers and pesticides in crop production. By taking advantage of these benefits, we can increase the yield of the next crop in an environmentally friendly and sustainable way. In an experiment set up by the Research Institute of Nyíregyháza (RINY) Institutes for Agricultural Research and Educational Farm University of Debrecen, we examined the effects of four green manure plants (lupine, common vetch, oil radish, buckwheat) on soil moisture content and yield of the subsequent crop. Green manure crops incorporated into the soil had a long-term effect on soil moisture content. In the growing season of the next crop, the moisture content of soils that treated with green manure proved to be more favorable during the drought compared to the areas without green manure treatment. The green manure value of lupine, spring vetch and oil radish proved to be equivalent to the yield-increasing effect of 80 kg N ha^{-}1 fertilizer in case of maize and triticale. In the case of oats the green manure value of spring vetch exceeded the effect of fertilization containing 80 kg N ha^{-1} in terms of yield. The insertion of green manures into crop rotations could be a justified and well-founded alternative to sustainable nutrient replenishment methods, furthermore the use of green manure reduce CO_2 footprint and also contribute to the protection of soils.

HOMELAND SECURITY AND PASTURE BASED FARMING

Andras Halász

MATE, Szent Istvan Campus, Institute of Animal Husbandry
Pater Karoly str. 1., 2100 Godollo, Hungary
halasz.andras@uni-mate.hu

Self-sufficient agriculture is a corner stone in national economy. Sustainability, low external-input technology and nature reservation are all parts of Agro-SMEs' (small and medium enterprises) activities. Building decision support database, introducing heat tolerant cultivars and breeds, directing farm products straight to the consumers and taking all the opportunities what space industry offers are all parts of secure food production.

Hungarian Grassland Management Database is being built with national cooperation. Remote sensing and on farm data collection are used. Survey data set and decision support system help to evade forage- and supplement shortages, also protect short food chains from halting.

Heat resistant and low water-consuming animals could be a natural response to climate change and droughts.

European small and medium stakeholders have serious concerns about MERCOSUR and Green Deal. Direct trade allows farmers to negotiate better prices with consumers and processors. Locally processed meat, milk and wool need to be integrated into national commercial activity.

CubeSat technology is an economical solution to test new plant cultivars, materials or life support systems. Mini space labs are available for every farmers or small enterprises, therefore custom products can be developed.

INVESTIGATION OF THE SECONDARY SUCCESSION OF ABANDONED AREAS FROM DIFFERENT CULTIVATION IN THE NORTHEASTERN FOOTHILLS OF THE BÜKK MOUNTAINS

Czóbel Szilárd[1], Saláta Dénes[2], Szirmai Orsolya[3]

[1] Institute of Plant Sciences and Environmental Protection, Faculty of Agriculture, University of Szeged, H-6800 Hódmezővásárhely, Andrássy Street 15., Hungary; email: czobel.szilard.endre@szte.hu
[2] Department of Nature Conservation and Landscape Management, Hungarian University of Agriculture and Life Sciences, H-2100 Gödöllő, Páter Károly Street 1., Hungary
[3] Institute of Animal Sciences and Wildlife Management, Faculty of Agriculture, University of Szeged, H-6800 Hódmezővásárhely, Andrássy Street 15., Hungary

Areas abandoned for various reasons are widespread in Europe, with a significant proportion in some regions of Hungary, such as the North Hungarian Mountains. Our knowledge of vegetation dynamics in abandoned lands is incomplete, in part because research comparing types abandoned from different cultivars is limited. This study compared the textural and structural changes of previously extensively treated vineyards, arables, and grasslands over a 30-year timescale in secondary succession studies. Based on the botanical surveys, it can be said that the total species number and diversity of abandoned vineyards and arable lands did not increase linearly in the four age groups studied. The way of secondary succession of former vineyards and arable lands showed many similarities. In these types, rapid regeneration of natural vegetation can be observed, the rate of which can only be reduced by the abundance of a few strong competitor species. However, the abandonment of extensively grazed and mowed grasslands has reduced species numbers and diversity, which may reduce the resilience of such grasslands to environmental factors. In abandoned lands, the mosaic landscape and previous extensive small-plot farming appear to have a positive effect on the rate of secondary succession and regeneration, as the species-rich vegetation patches provide a suitable propagule source for regeneration.

THEMATIC SESSIONS

NUTRITIONAL AND PHYSICAL ASPECTS OF BAOBAB FOOD PRODUCTS: REVIEW

Abdelhakam Esmaeil Mohamed Ahmed[ab,*], Massimo Mozzon[c], Ayaz Mukarram Shaikh[a], Nasradeen A. H. Gadallah[bd], Eljaily Mohamed Ahmed Mohamed[e] , Béla Kovács[a]

[a] Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Food Science, University of Debrecen, H-4032, Böszörményi str. 138, Debrecen, Hungary

[b] Faculty of Forestry, University of Khartoum, Postal Code 13314, Khartoum North, Sudan.

[c] Department of Agricultural, Food and Environmental Sciences, Università Politenica delle Marche, Via Brecce Bianche 10, 60131 Ancona, Italy

[d]African Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture, University Felix

Houphouet-Boigny, Abidjan, Ivory Coast

[e] Forestry and Gum Arabic Research Centre, Agricultural Research Corporation, Postal Code 12211, Khartoum South, Sudan.*****

Africa has endowed a plethora of unique plant species with high health-promoting substances. The baobab tree is widely used in Africa for a variety of purposes including, medicinal, food and fruity beverages. This review aims to focus on nutritional value and physical aspects of baobab food products. Baobab leaves, seed oil and fruit pulp are considered as most valuable foodstuff. For the most part, baobab fruit pulp contains a large amount of vitamin C (3-499 mg/100 g) and other essential minerals such as calcium, potassium, phosphate and essential chemical components like sugar, fibre protein content, and lipids. Additionaly, the extracted baobab seed oil (BSO) is an alternative source of unsaturated fatty acids (Oleic and Linoleic) and vitamins (D and E). The physical properties of BSO on the other hand, have been examined and it characterized by: (14.79 wt.%) moisture content, (0.867 g/cm^3) density, (35.03 mm^2/s) viscosity, (0.874) specific gravity and (30.63%) linoleic acid. Whereas the baobab leaves encompass 13-15% protein, 6-7 % carbohydrate, 4-10 %, fat was 4-10 %, 11 % of crude fibre and 16% ash. Accordingly, the energy values of baobab leaves have been well tended to range from 1180 to 1900 KJ/1g. These results showed varied compositions in terms tree's organs characteristics. Therefore, further studies in the physical and chemical characteristics of raw materials of baobab products is needed to provide essential information for food engineering and unit operations systems and predict the behaviour of innovative baobab products.

RESEARCH REGARDING THE ANALYSIS OF AGRITOURISM ACTIVITY IN APUSENI MOUNTAINS AND POSSIBILITIES TO IMPROVE IT

Tabita Cornelia Adamov[1], Tiberiu Iancu[1], Luminița Pîrvulescu[1], Elena Peț[1], Gabriela Popescu[1], Ramona Ciolac[1], Anka Roxana Șuba[1], Marius Gordan[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

The aim of this paper is to follow the development degree of this field at national level, to identify the resources with agritourism potential from the studied area, to highlight the degree of interest for the area and for agritourism, and based on the conclusions to come with some proposals.
The motivation for choosing the Apuseni Mountains area derives from the fact that it has a high agritourism potential. The surface of the Apuseni Mountains region represents about 7% from the country's surface and content six counties-Alba, Arad, Bihor, Cluj, Hunedoara and Salaj. The urbanization degree of this region is low, about 30%. Many of the localities from the mountain areas are very good keepers of traditions. If the local mountain natural resources and the traditional products are added to the traditions and customs, should result a valuable tourist product.
The complexity and tourist value of the Apuseni Mountains is a very important element in promoting this activity, as evidenced by the many forms of tourism that are currently taking place, the development of tourist and agritourism guesthouses that highlight the potential value of caring for this area.

GROWTH AND PLANT PHYSIOLOGY STUDIES OF JUVENILE BLACK LOCUST CLONES: EARLY EVALUATION

Tamás Ábri[1], Zsolt Keserű[2], József Csajbók[3]

[1] Department of Plantation Forestry, Forest Research Institute, University of Sopron, Farkassziget 3, H-4150 Püspökladány, Hungary; abri.tamas@uni-sopron.hu

[2] Department of Plantation Forestry, Forest Research Institute, University of Sopron, Farkassziget 3, H-4150 Püspökladány, Hungary; keseru.zsolt@uni-sopron.hu

[3] Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Crop Sciences, University of Debrecen, Böszörményi Str. 138, H-4032 Debrecen, Hungary; csj@agr.unideb.hu

The purpose of our paper was to present the early results of growth and plant physiology studies of newly selected, vegetatively propagated black locust clones ('PL251', 'PL040', 'NK1', 'NK2') and the 'Üllői' black locust cultivar, with a view to assess their suitability for the establishment of industrial plantations for the production of high quality timber in marginal sites. In the evaluation of the results, we found significant differences ($p < 0.05$) between the clones tested for height, diameter at the base, net assimilation rate, transpiration and water use efficiency. Based on our results, *Robinia pseudoacacia* 'NK2' performed to be the best in all studied parameters. However, the clone 'PL040' also seems to be promising in terms of drought tolerance, and 'PL251' in diameter at the base: there were no significant differences between 'NK2' and 'PL040' clones in water use efficiency, and 'NK2' and 'PL251' in terms of diameter at the base values. The study of industrial plantations is of great practical importance. To be able to produce good quality industrial wood on the plantations, it is essential to study the phytophysiological properties of the trees (biomass production, photosynthetic activity, water use efficiency) in addition to the traditional stand full inventories.

COMPARATIVE EXAMINATION OF *SORGHUM BICOLOR*'S TANNIN CONTENT UNDER DIFFERENT AMOUNT OF NITROGEN SUPPLY

Adam Mate[1], Eszter Muranyi[2], Jozsef Zsembeli[2], Szilvia Veres[1]

[1]Department of Applied Plant Biology, Institute of Plant Science, Faculty of Agriculture, Food Science and Environmental Management, University of Debrecen, Boszormenyi street 138., Debrecen, Hungary
[2]Research Institute of Karcag, Hungarian University of Agriculture and Life Sciences, Kisujszallasi street 166., Karcag, Hungary

In our days, the relevance of sustainable agriculture gets more and more important. Maintaining the environmental safety rules should be strived for on the way of satisfying increase demands. One of the main influencing factors based on sustainable agriculture is fertilizer applications, namely a not adequate quantity – mostly nitrogen fertilizer – can be a big risk for the environment. Furthermore, due to increasing climate change the identifying and breeding the high nutritional and low toxic content plant get more important. Consequently, the plant of our research was sorghum (*Sorghum bicolor* (L.) Moench) that has high drought tolerance, adequate yield under poor conditions and excellent content value. Our goals were the comparative examination of 9 different genotype's tannin content under different amount of nitrogen supply (60 kg ha^{-1} and 120 kg ha^{1}) for three years. Based on our results by increasing nitrogen supply the amount of tannin also increased. Furthermore, there were examined genotypes – Zador, GK Emese, Alfoldi 1 – that have tannin content over 0,3% (m/m) which is the upper limit for registration in the European Union. Project no. TKP2021-NKTA-32 has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary, financed under the TKP2021-NKTA funding scheme. Furthermore, New National Program of Excellence 21-2 also contributed for finance of the research.

FOLIAR FERTILIZER AND CROP PRODUCTION: A REVIEW

Akasairi Ocwa[1,2], Safwan Mohammed[1], Endre Harsanyi[1]

[1] Institute of Land Use, Technical and Precision Technology, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, 138 Boszomenyi street, 4032, Debrecen, Hungary
[2]Department of Agricultural Production, Faculty of Agriculture, Kyambogo University P.O. BOX 1, Kyambogo, Kampala, Uganda
: ocwa.akasairi@agri.unideb.hu or ocwaakasairi@gmail.com

Recently, the production and marketing of foliar fertilizers has increased. This is owed to foliar fertilization ability to enhance crop yield and quality. The main aim of this work is to give a comprehensive review about the negative and positive sides of foliar fertilization. Scientifically, foliar fertilization has many positive sides, such as, friendliness to environment, rapid supply of nutrients to crops at critical stages and faster correction of deficiency symptoms. Besides, balanced plant nutrition with micro nutrients has been more possible through use of blended foliar fertilizers. Effectiveness of foliar fertilizers depends on whether they are used solely or in combination with soil application keeping other factors constant. Majority of the research indicate that foliar fertilization shouldn't be used as substitute for soil fertilization but as a compliment. On the contrary, some reports have indicated that foliar fertilization alone can enhance productivity of crops provided the right formulation and amount is applied at the most critical stages of the plant. In both situations, understanding foliar nutrient uptake pathways and processes is critical in optimizing nutrient use efficiency by crops and preventing the negative effects of inappropriate nutrient or fertilizer formulations and application rates. With concern of environmental pollution caused by over pumping of soil with fertilizers, more specific studies need to conducted to find sustainable ways of increasing foliar application with minimal soil fertilization to enhance crop productivity.

COMPREHENSIVE EVALUATION OF GEMMOTHERAPY EXTRACTS GENERATED EFFECTS USING ANIMAL MODELS

Amina Alaya[1], Endre Máthé[1,2]

[1] Doctoral School of Animal Science, Faculty of Agriculture and Food Sciences, and Environmental Management, University of Debrecen, Hungary
[2] Institute of Nutrition, Faculty of Agriculture and Food Sciences, and Environmental Management, University of Debrecen, Hungary

Phytotherapy and health promoting activities of plants are gaining an increasing attention among scientists. Accordingly, we analyzed the bioactive compounds of the olive (*Olea europea*), almond (*Prunus amygdalus*) and back mulberry (*Morus nigra*) plant bud extracts also gemmotherapy extracts (GTEs) using the HPLC-MS. We identified different active compounds for each extract in which the biggest percentages were flavonoids, amino acids and polyphenols. Each identified compound was literature reviewed for their health promoting effects. Approximately, 42% of all the identified bioactive compounds of the three extracts with reported biological activities, proved to feature anti-inflammatory activities, anti-cancer activities, antioxidant activities and anti-microbial activities. To confirm these reported health promoting activities, the *Drosophila melanogaster* model systems was used during this research to assess the effects of olive, almond and black mulberry GTEs on the viability and developmental timing. We used the high-sugar type of model, which is a situation when the synchronized *Drosophila* larvae raised on a high-fructose diet (HS-media) would induce inflammatory state besides multiple life-threatening effects. We were able to prove that the Normal Sugar experiments performed at 25°C and 28°C temperatures conclude that the GTEs showed clear concentration dependent effects that would interfere antagonistically with the temperature dependent metabolic rate regulation, while at HS conditions some rescue effects were also apparent.

APPLICABILITY OF BIOEFFECTOR *BACILLUS* STRAINS FROM THE RECOMPOSTING PROCESS OF SPENT MUSHROOM COMPOST

Allaga Henrietta[1], **Horkics Dóra**[1], **Bordé Ádám**[1], **Kovács Terézia**[2], **Csutorás Csaba**[3], **Bajzát Judit**[3], **Bakos-Barczi Nóra**[3], **Misz András**[3], **Vágvölgyi Csaba**[1], **Kredics László**[1],

[1]Department of Microbiology, Faculty of Science and Informatics, University of Szeged 6726 Szeged, Közép fasor 52.
[2]Biological Research Centre, Institute of Plant Biology, H-6701 Szeged, Hungary
[3]Új Champignons Ltd., 1224 Budapest, Bartók Béla út 162.

Good quality casing layer is influenced by the composition of its microbiota. Microorganisms present in spent *Agaricus* compost include bacteria from the genera *Bacillus*, *Alcaligenes*, *Pseudomonas*, and *Microbacterium*. Many representatives of *Bacillus* and *Pseudomonas* are considered as beneficial.
Our aim is to develop healthy casing layer alternatives from spent mushroom compost. Microorganisms are isolated from spent mushroom compost samples taken during the natural recomposting process. A total of 15 *Bacillus* strains were isolated from the samples and identified. The resulting *B. licheniformis* (4), *B. velezensis* (4), *B. subtilis* (4), *B. cereus* (2) and *B. paralicheniformis* (1) strains were tested for their temperature-, pH- and water activity-dependence, extracellular enzyme activities, and indole acetic acid production. *In vitro* confrontation assays showed 3 *B. velezensis* and 1 *B. licheniformis* strains having good antagonistic potential against both mushroom-pathogenic (*Trichoderma, Lecanicillium, Hypomyces*) and plant pathogenic fungi (*Fusarium, Gaeumannomyces*). A selected *B. velezensis* strain was studied in spent mushroom compost and plant growth experiments. The dry matter content of treated tomato plants ranged from 8.94 to 10.0 %, while that of untreated plants ranged from 5.41 to 14.56 %. Total chlorophyll content of plants grown in media prepared from treated and untreated compost varied from 2027.32 to 1730.53 μg/g for treated, and from 1388.44 to 590.01 μg/g for untreated samples. We also determined the photosynthetic parameters of the plants such as Fv/Fm and YII.

This work was supported by Hungarian Ministry for Innovation and Technology (2020-1.1.2-PIACI-KFI-2020-00111) and by grant ÚNKP-21-4 (New National Excellence Program) to H.A.

QUERCETIN CONTAINING PLANT EXTRACTS AND THEIR EFFECTS ON AGING

[1]Diellez Arifi, [2]Maria Jolji, [1]Bence Pecsenye and [1]Endre Máthé

[1]Institute of Nutrition, University of Debrecen, 4032 Debrecen, Hungary
[2] Doctoral School of Nutrition, University of Debrecen, 4032 Debrecen, Hungary

[1]diellezarifi@gmail.com, joulji1991@gmail.com, [1]bence.pecsenye92@gmail.com, [1]endre.mathe@agr.unideb.hu

Polyphenols, which include flavonoids, are widely distributed in plants and contribute to our daily diet in numerous ways. Many fruits and vegetables contain quercetin, one of the most prevalent flavonoids. Diets rich in fruits and vegetables have long been considered healthy, increasing longevity, and reducing morbidities. As a result of basic research investigating the potential mechanisms, it has become evident that plant-based foods have beneficial effects due to the high amounts of bioactive phenolic compounds they contain. The supplementation of polyphenols, specifically quercetin, has indeed been shown to have a variety of health-promoting effects, especially among the elderly. An unanswered question in medicine, aging is a multifactorial process resulting in the loss of functionality of organs, tissues, and cells. Slowing down the ageing process is entirely feasible, even if it is impossible to prevent ageing. Different types of natural and synthetic phenolic compounds have been tested in vitro for their anti-aging effects. Our scientific work examines experimental evidence demonstrating the beneficial effects of polyphenols on aging-related diseases through review and analysis of antioxidant capacity and content on *Castanea sativa* and *Aesculus hippocastanum* extracts. This study may provide a framework for the concept of cellular stress-based population stratification for clinical trials. The research may reveal a more consistent and significant impact of flavonoids on health.

STUDY OF CHEMICAL CONTROL OPTIONS AGAINST CHESTNUT BLIGHT DISEASE

Andrea Cheradil[1], Gabor Tarcali[2], Kitti Csüllög[3], Mariem Boukhili[4]

University of Debrecen, Faculty of Agricultural, Food Sciences and Environment Management, Plant Protection Institute, Debrecen
andreaebdc@gmail.com

Cryphonectria parasitica, the causal agent of chestnut blight, is a destructive Ascomycota fungal disease infecting European chestnut (*Castanea sativa*) and American chestnut (*Castanea dentata*) trees. On susceptible host trees, necrotic lesions (cancers) are caused by the disease on the bark of the trunk and branches. The disease leads to wilting and destruction of the chestnut trees.
Protection against the pathogen is difficult. Biological control using hypovirulent strains of the pathogen is a good option, but its implementation requires a lot of preliminary testing, as well as compatibility between the virulent pathogen strain that infects the area and the hypovirulent strain used for treatment. Thus, this procedure is a rather complicated and slow process. Chemical control against the pathogen is not currently widespread, as its implementation is also difficult due to the large size of the trees and the nature of the forest-like plantations, and there are currently no available pesticides. At the same time, protection with chemical pesticides may be feasible in plantations in which the size of the trees allows for application (lower-sized trees or young plantations). Therefore, it is necessary to find fungicides that can be used effectively, which is the purpose of this experiment. *In vitro* efficacy of four chemical pesticides (Pictor, Amistar Sun, Score, Cuproxat) has been tested against *Cryphonectria parasitica*. Score and Amistar Sun were the most effective fungicides, given that they inhibited fungal growth even at the lowest concentrations of the test solution.

RECEPTIVITY OF INJURED AND AGED COCONUT PETIOLE FOR OVIPOSITION BY *RHYNCHOPHORUS FERRUGINEUS* OLIVIER

Rajan Shelke[1], Andrea Cheradil [2]

Don Bosco College of Agriculture Sulcorna, Quepem- Goa, India 403 705
rajanshelke6691@gmail.com

University of Debrecen, Faculty of Agricultural, Food Sciences and Environment Management, Plant Protection Institute, Debrecen

Red palm weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) is a key pest of palm-based ecosystem. Globally *R. ferrugineus* is reported from 50 countries infecting 40 palm species. *R. ferrugineus* are attracted to wounded, damaged, dying palms or apparently healthy palms. *R. ferrugineus* gains entry into a palm when female weevils are drawn to palm tissue volatiles to lay eggs. The females use the rostrum to bore into palm tissue to form a hole for oviposition. Because of its cryptic feeding habit management of *R. ferrugineus* is difficult leading to death of palms. The laboratory study was conducted with the aim to assess the ovipositional preference of injured and aged coconut petiole (var. Benaulim) to red palm weevil *R. ferrugineus* (Coleoptera: Curculionidae). Results reveals that freshly injured coconut petiole was most preferred for egg laying by *R. ferrugineus* (mean egg lay: 4.11) and was statistically at par with one and two-day old, injured coconut petiole, indicating that injuries and wounds on coconut petiole between 0-2 days after damage emit palm volatiles that are most attractive to female *R. ferrugineus* adults for egg laying. It concludes that injured part should be treated with effective insecticides immediately after damage to prevent further losses.

COMPARATIVE ANALYSIS OF MOLECULAR BIOLOGICAL MARKERS OF DIFFERENT SWEET CORN (ZEA MAYS L. CONVAR. SACCHARATA KOERN) GENOTYPES

Zsuzsanna Bakos-Cintia Demeter

University of Debrecen, Institute of Land Use, Engineering and Precision Farming Technology, Debrecen, Böszörményi Road 138. H-4032
*bakos.zsuzsi82@gmail.com

The leaf and crop samples required for our examination were collected from the campus of the Faculty of Agricultural and Food Sciences and Enviremental Managment of the University of Debrecen from the beginning of July to the end of July at 5 times. In our study we aim to follow the molecular biological markers of lutein biosynthesis by targeted gene expression studies in three sweet maize varieties: Dessert R78, Messenger and Honey during the generative phase of the plants. Quantitative real-time PCR (qPCR) is an effective tool for measuring gene expression levels at first, reliable reference genes will be identified for data normalization. During the sample collection to preserve the RNA replicates were collected and frozen immediately in liquid nitrogen and then stored at -80 °C until analysis.Previously we selected four reference genes for our studies, which encode tubulin (TUB), ubiquitin (UBI), actin (ACT) and a thioredoxin-like gene (TLG). From these four candidate reference genes three (TUB, UBI,ACT) gave satisfactory results and selected for further downstream studies. The PCR products have also been confirmed by sequencing and sequence alignment to respective genes. For lutein biosynthesis gene expression, 7 target genes and 8 pairs of primers were selected for preliminary studies (PSY,HYD,CYP97C,PDS,ZDS,LCYB,LCYE). These indicated that all real-time PCR reactions are suitable for further studies in our selection of sweet corn varieties.

ANTI-DIABETIC AND ANTI-INFLAMMATORY EFFECTS OF GILABURU, KIZILCIK AND ALIÇ PLANTS USED IN TRADITIONAL TURKISH FOLK MEDICINE

Serap Balaban[1], Endre Máthé[2]

[1] Nutrition and Dietetics, Faculty of Health Sciences, University of Ankara
[2] Institute of Nutrition, Faculty of Agriculture and Food Sciences and Enviromental Management, University of Debrecen,

Viburnum opulus L. (gilaburu), Cornus mas L.(kızılcık), and *Crataegus microphylla (alıç)* have been used as a traditional remedy in Turkish folk medicine since ancient time to treat diabetes. In folk medicines, the fruits and other parts of these plants have been used for prevention and treatment of diabetes. *Vilburnum opulus L.* is named guelder rose, snowball tree or cranberry bush rose and it was suggested to display anti-inflammatory properties, providing health benefits for diabetes by improving blood glucose uptake, and improving lipid metabolism. *Cornus mas L.* is named cornelian cherry or kızılcık; trees reach 7–8 m in height and can grow in temperate climate on drained soils. Fruits are edible with an oval or pear-like shape and ranging in colour from red to purple. The phytochemicals present in *Cornus mas L.* have anti-inflammatory and anti-oxidant properties for diabetes via the attenuation of hyperglycemia and advanced glycation and oxidation protein formation or accumulation. *Crataegus microphylla* is named hawthorn or alıç, which has also anti-inflammatory properties and provide a reliable protection against the memory impairment in diabetes. The aim of this review is to present an overview of anti-diabetic, anti-inflammatory properties and usefulness as a nutritional supplement of *Viburnum opulus L., Cornus mas L.,* and *Crataegus microphylla.*

EVALUATION OF NDVI, SPAD VALUES AND YIELD OF TWO DIFFERENT MAIZE (*ZEA MAYS* L.) GENOTYPES UNDER FOLIAR FERTILISATION

[1]Ibtissem Balaout, [1]Annabella Zelenák, [2]Anikó Nyéki

[1]University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management
Institute of Land Utilisation, Engineering and Precision Technology, Debrecen, Böszörményi út 138. H-4032
[2]Széchenyi István University, Faculty of Agricultural and Environmental Sciences
Department of Biosystems and Food Engineering, Mosonmagyaróvár

Ensuring global food security has become a matter of great concern with the constantly increasing population growth, resulting in rising food demands. Simultaneously, climate change, global warming, and land degradation pose major risks to agricultural production. Maize is one of the most produced crops globally and maize yields must be increased to meet the population's needs. Fertilisation is considered indispensable for the crop growth and development. Foliar fertilisation, unlike root fertilisation, enables rapid access of nutrients to plants while sustaining the environment. Our research was carried out at Látókép in 2021, where, foliar sprays of Natur Plasma T biostimulant, Natur Active complex foliar fertiliser, Zinc and Sulphur Mono additives were applied at the 8-leaf stage on two maize hybrids, Mv 352 (FAO 350) and Mv Anissa (FAO 510). The main objectives were to examine the treatment's effect on crops at critical phenophases (12-leaf stage, silking, maturity), besides determining its impacts on the harvested yields. Based on our findings, foliar nutrients had positively influenced the NDVI and SPAD values of both crops. Furthermore, in comparison with the control plots, the yield of Mv Anissa was 9% higher, while that of Mv 352 was 5.4% higher. Consequently, Mv Anissa produced the highest yield of 21.345 t/ha, i.e. 2.8 tons higher than that obtained by Mv 352. Moreover, the treatment increased their thousand-grain weight. Thereby, our study demonstrates the efficiency of the foliar fertilisation method in improving maize vegetative growth and development in addition to its productivity by enhancing its final yield.

COMPARISON OF THE STRUCTURE-ACTIVITY RELATIONSHIP OF PURIFIED PEPTAIBOLS EXTRACTED FROM TWO *TRICHODERMA ROSSICUM* STRAINS

Dóra Balázs, Ákos Rozsnyói, Tamás Marik, András Szekeres, Csaba Vágvölgyi, Chetna Tyagi, László Kredics

Department of Microbiology, Faculty of Science and Informatics, University of Szeged, Szeged, Közép fasor 52. H-6726 Szeged, Hungary

A significant percentage of the 415 filamentous fungal species identified so far from the genus *Trichoderma* plays an important role in agriculture and biotechnology, due to their potential application in biocontrol of phytopathogenic microorganisms and their plant growth-promoting effects. Numerous *Trichoderma* species produce enzymes, as well as secondary metabolites with favourable properties, to which the largest group of peptaibiotics, the peptaibols also belong. Peptaibols are produced by non-ribosomal peptide synthetases (NRPSs) with modular structure. Due to the way of synthesis and the incorporation of non-proteinogenic amino acids to the sequences, the peptaibols are characterized by a high degree of amino acid variability in their sequences. In our study, purified peptaibol extracts from two strains of *Trichoderma rossicum* (TUCIM 3235 and TUCIM 889) were investigated for structure-activity relationships (SAR-s). The two strains produce sequences with similar amino acid composition but different lengths. Their minimal inhibitory concentration values (MIC, mg ml^{-1}) were determined against commonly known eleven Gram-negative and Gram-positive bacterial strains. Through modern molecular modeling techniques such as accelerated molecular dynamics (aMD) we can gain a deeper insight to the structural properties of peptaibol sequences and can improve the knowledge of correlational relationships between conformation and bioactivity. The MIC values and the results of aMD simulations were compared to correlate folded peptaibol dynamics affected by their amino acid content and sequence length to their expressed bioactivity. Results obtained during SAR-s can lead to an efficient selection of peptaibiotic compounds for the practical application in agriculture and plant treatment.

EXOGENOUS HYRDOGEN PEROXIDE ALLEVIATES SEVERE DROUGHT STRESS EFFECTS ON SOYBEAN MORPHO-PHYSIOLOGY

Oqba Basal[1], Tahoora Batool Zargar[1], Szilvia Veres[1]

[1] University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Department of Applied Plant Biology

Drought periods are expected to increasingly occur, and hence to affect the yields of, especially, drought-susceptible crops, including soybean. On molecular level, drought elevates the concentrations of reactive oxygen species (ROS) such as hydrogen peroxide (H_2O_2), resulting in cellular damage. However, lower concentrations of ROS can regulate several mechanisms on the physiological level under drought conditions. An experiment was conducted in a controlled environment to evaluate the influence of different (0, 1, 5 and 10 mM) concentrations of H_2O_2 exogenous spray on several morpho-physiological traits of 2 soybean {Coraline (drought-susceptible) and Speeda (drought-tolerant)} genotypes under severe drought stress conditions during flowering stage. Furthermore, the plants of each treatment were further divided into 2 groups, one group was allowed to recover from drought following the flowering stage, whereas the other group was kept under drought. Our results showed that after 3 days of application, drought stress significantly decreased chlorophyll *a* and *b*, total carotenoids, stomatal conductance, plant biomass and pod weight, but significantly increased the root length of both genotypes. The application of 5 mM and 1 mM H_2O_2 foliar spray on "Coraline" and "Speeda", respectively measurably enhanced these traits. The plants of the group where continuous drought was maintained failed to produce pods, regardless of H_2O_2 application and concentration and gradually deteriorated. "Speeda" showed better performance under drought conditions. It could be concluded that low concentrations of foliar H_2O_2 can help certain soybean genotypes overcome the effects of severe drought during even sensitive stages.

AUTUMN DIET OF EUROPEAN HARE (LEPUS EUROPAEUS) IN THE NASZÁLY HILLS

Regina Benda, Zsolt Biró

Institute for Wildlife Management and Nature Conservation, Hungarian University of Agriculture and Life Sciences, H-2100, Gödöllő, Páter Károly utca 1., Hungary

The European Hare (*Lepus europaeus*) is an important but declining game species in most of Europe and the availability of food is an important limiting factor. We investigated the Autumn diet of hares in a small orchard farm in Northern Hungary to determine what proportion of their food was composed of fruits and protein rich fabaceous plants with the expectation that fabaceous plants would be more important in the diet. European Hare faecal pellets were collected on a single day, the entire study area was systematically searched for pellets. Additionally, reference samples were made of fruit and fabaceous plants collected on the study site the same day. The diet was investigated using microhistological analysis of the epidermis fragments found in the European Hare pellets. The diet was separated into four categories: seeds, fruits, fabaceous plants and other. It was also investigated if the number of pellets taken from different droppings used for the analysis would have a significant impact on the results. The distribution was tested using the Chi^2 test and was found to be insignificant, the results suggest for a study area of such small size the number of pellets used to investigate the diet is not important. European hare did not consume high amounts of fruit and fabaceous plants, each only accounted for less than five percent of their diet and fabaceous plants were not consumed in a significantly higher amount compared to fruits on this farm area.

MUSKWEED *MYAGRUM PERFOLIATUM* L. IS AN EMERGING NEW POTENTIAL WEED IN HUNGARIAN OILSEED RAPE FIELDS

Gábor Bese[1], László Hódi[1], Tamás Keller[1], Roland Szabó[2]

[1]CPR Erope Kft. Szombathely
[2]SUMI AGRO Hungary Kft.

Winter oilseed rape is the second most important oilseed crop in Hungary after sunflowers.
Its area has almost ten times increased in the last thirty years and its average yield has almost doubled. With the intensification of rapeseed cultivation, weeds are becoming more and more prevalent. 20-30 years ago, rapeseed was sown at cereal row spacing with 10-20 kg/ha of seed. In practice, rape provided its own weed control by suppressing weeds. Nowadays, the row spacing has increased (30-45 cm), the seed rate has decreased (1.5-3.0 kg/ha) and precision sowing and wide crop row spacing (76 cm) have become common practice in many areas, increasing the chances of weeds controlling winter rape. As a consequence, intensive control of the most important weeds causing economic damage to oilseed rape is necessary, including cruciferous weeds (flixweed, shepherd's purse, wild mustard, wild radish, field pennycress), which are difficult to eradicate from oilseed rape and are related to the crop. In the South-Eastern Region of the country, the muskweed, *Myagrum perfoliatum* L. is increasingly found in winter rape fields and is well adapted to the intensive agrotechnical and plant protection technology of the crop. *Myagrum perfoliatum* L. is a sporadic native species in the Transdanubian region, and was of much greater importance as a weed control agent, especially in the 19th century. For the reasons outlined above, we have recently observed a renewed increase in its occurrence. Due to its high water demand, its appearance should be expected primarily in rainy periods or in the deepest parts of the arable lands.

THE REASONS FOR THE RANGE EXPANSION OF THE GREY WOLF, COYOTE AND RED FOX

Hanna Bijl, Sándor Csányi

Department of Wildlife Biology and Management, Hungarian University of Agriculture and Life Sciences, H-2100, Páter Károly u. 1., Gödöllő, Hungary

Canidae is a species-rich, abundant, and widespread family. Several wild canid species, in particular, have shown a significant range expansion and increased abundance in the last few decades or even in the last century. The grey wolf (*Canis lupus*), coyote (*Canis latrans*), and the red fox (*Vulpes vulpes*) are resident on whole continents or even on multiple continents. Although canids share common behavioural and ecological characteristics, the formula of species-specific elements contributes to their success. This review investigated which factors have contributed mainly to the expansion of the grey wolf, coyote, and red fox. Analysis of the literature review shows that the grey wolf has dramatically benefitted from legal protection, reintroduction programs, and the ability to colonise areas naturally because of its particular social system, early reproduction, high fecundity, and rapid physical development. As a meso-carnivore, the coyote has shown a rapid spread after the extermination of apex predators in several regions in North America. Along with changes in land use, their high adaptability and hybridisation with wolves have all contributed to their prolonged success. The red fox has shown the largest expansion among canids even though it is a solitary species. Their morphological, reproductive and behavioural traits have facilitated their expansion to all corners of the world. The species benefitted from human-caused changes like land conversion and the almost complete eradication of rabies in Europe. It is crucial to change management policies for grey wolves and increase control measures to regulate the three species and mitigate potential human-carnivore conflicts.

DETAILED ECOPHYSIOLOGICAL STUDIES OF *BACILLUS LICHENIFORMIS* STRAINS FOR THE DEVELOPMENT OF A MICROBE-BASED FOLIAR FERTILIZER IN SWEET POTATO

Bordé, Ádám[1,2], Allaga, Henrietta[1], Monostori, Tamás[2], Vágvölgyi Csaba[1]

[1]Department of Microbiology, Faculty of Science and Informatics, University of Szeged, 6726 Szeged, Közép fasor 52.
[2]Institute of Plant Sciences and Environmental Protection, Faculty of Agriculture, University of Szeged, 6800 Hódmezővásárhely, Andrássy str. 15

In the frame of this study, we isolated more than 150 fungal and bacterial strains from the surface (epiphytes), plant tissues (endophytes) and rhizosphere of sweet potato (*Ipomoea batatas*) plants from different plantations. Among them, about 50 isolates have been identified by sequencing.
Recently, detailed ecophysiological studies of *Bacillus licheniformis* strains have been carried out (indoleacetic acid producing ability, siderophore and ammonia production, phosphorus solubilization). We are currently working on further testing of *Bacillus licheniformis* strains (e.g., *in vitro* confrontation tests, analysis of depsipeptide production, germination tests). Furthermore, isolation work is ongoing from further sweet potato samples.
The final objective of our work is to create a high depsipeptide content foliar fertilizer formulation stabilised with chitosan nanoparticles using fungal and bacterial strains with biocontrol capabilities. This foliar fertilizer treatment planned to test extensively under greenhouse and field conditions.

Acknowledgement
„SUPPORTED BY THE ÚNKP-21-3-SZTE-383 NEW NATIONAL EXCELLENCE PROGRAM OF THE MINISTRY FOR INNOVATION AND TECHNOLOGY FROM THE SOURCE OF THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION FUND.”

ALLELOPATHIC EFFECT OF FOUR INVASIVE PLANTS ON SEED GERMINATION OF WILD MUSTARD

Mariem Boukhili[1], Arnold Szilágyi[2], Andrea Cheradil[3]

University of Debrecen, Faculty of Agricultural, Food Sciences and Environment Management, Plant Protection Institute, Debrecen
mariemboukhili22@gmail.com

Presently, chemical control is most used method for plant protection. However, it is not an approach that is environmentally sustainable. Alternative IPM methods include biological control such as Allelopathy. Allelopathy is defined as a direct or indirect interaction, whereby allelochemicals released by one organism influence the physiological processes of other neighboring organisms.
Laboratory experiments were conducted to investigate the allelopathic effect of four weeds, *Eriochloa villosa* (ERIVI), *Panicum miliaceum* (PANMI), *Cannabis sativa* (CANSA), *Sorghum halepense* (SORHA), *Asclepias syriaca* (ASCSY) on germination and growth of wild mustard (Sinapis arvensis L.). These weeds are dangerous during field cultivation and their weed control is difficult.
The extracts from the leaves and stem were used to examine the potential of inhibition of germination, root length, shoot length and full plant. Water extracts were prepared in a laboratory assay at 1, 5, and 10% concentrations.
The phenomenon of allelopathy was detected in the examined plants. In the case of plants, the allelopathic effect also increased with increasing concentration. The results show that extracts of Johnson grass had the most significant inhibition effect of growth followed by common milkweed, woolly cupgrass, hemp and common millet. The extracts of Johnson grass had the most significant effect of germination and followed by *Cannabis sativa, Asclepias syriaca, Panicum miliaceum and Eriochloa villosa.*

ISOLATION OF BACTERIA FROM CASING MATERIAL OF BUTTON MUSHROOM (*AGARICUS BISPORUS*) AND THEIR BIOCONTROL PROPERTIES

Büchner Rita, Borbély Evelin Ilona, Kredics László, Hatvani Lóránt, Vágvölgyi Csaba.

University of Szeged, Faculty of Science and Informatics, Department of Microbiology

The white button mushroom (*Agaricus bisporus*) is the most popular cultivated mushroom in Hungary. During its cultivation, many pathogens and pests may occur that can lead to yield reduction. Adult flies contribute to the spreading of bacteria and fungi as vectors, but the greatest damage is caused by the larvae feeding in the mushroom growing material. Some fly species feed on the young, growing mycelia or cause direct damage to the fruiting bodies, while others on the organic matter in the compost. The use of chemicals in mushroom cultivation is highly regulated in the EU due to the accumulation of chemical residues in food and their negative impact on the environment. Instead of chemical control, biological control could be an alternative strategy against mushroom flies. A total of 80 bacterial strains were isolated from the casing material derived from a white button mushroom growing facility. The strains were tested in dual plate assays to examine their effect on the growth of white button mushroom. The strains that least inhibited the growth of white button mushroom were selected for further examination. Bacterial suspensions were tested against larvae of *Lycoriella sativae* in a Panasonic Versatile Environmental Test Chamber. Larvae used in the tests were reared in 300 mL glass jars, on peat with the addition of oatmeal and yeast as the food source. The biocontrol properties of the bacteria were determined by counting the number of live adult flies. Most efficient biocontrol strains were E10, E13, E20.

SUPPORTED BY THE UNKP-21-4-SZTE-479 NEW NATIONAL EXCELLENCE PROGRAM OF THE MINISTRY FOR INNOVATION AND TECHNOLOGY FROM THE SOURCE OF THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION FUND."

MOTIVATIONS OF SMALL-SCALE PRODUCERS TOWARDS TOMATO LANDRACE UTILIZATION

Adrienn Tihanyi[1], László Csambalik[1]

[1] Department of Agroecology and Organic Farming, Institute for Rural Development and Sustainable Production, Hungarian University of Agriculture and Life Sciences, H-1118 Budapest, Villányi út 29-43, Hungary;

Old varieties and landraces of cultivated crops has gradually been excluded from commercial production as new varieties and hybrids overperformed them in yield quantity and in resistance to pests and diseases. However, these old genetic materials can act as a genetic pool for advantageous traits, therefore their maintenance is reasonable from a breeding point of view. The landraces are the elements of the extensive production systems as these do not require the use of synthetic fertilizers and pesticides. Their production can contribute to agrobiodiversity in species- and variety level as well. Ex-situ conservation of these genetic materials is done by centralized gene banks. In-situ maintenance, however is less organized, as it is based on the choice of farmers. In our study, we investigated the motivations of Hungarian small-scale farmers and amateur gardeners to adopt tomato landraces in their production. The evaluation of the questionnaire revealed the strong interconnection of producers to their chosen genetic materials. This emotional-based link seems to be a good foundation to the small-scale maintenance, utilization, and survival of this agricultural heritage.

CONTENT PARAMETERS OF WET-FRACTIONATED FIBRE OBTAINED FROM LEAVES AND STEMS OF DIFFERENT BATATA SPECIES (*IPOMOEA BATATAS*)

Gábor Csatári [1], Bence Eged [2], Szilvia Kovács [3]

[1] University of Debrecen MÉK, Department of Applied Plant Biology, PhD student
[2] University of Debrecen MÉK, Department of Applied Plant Biology, MSc student
[3] University of Debrecen MÉK, Department of Applied Plant Biology, assistant professor

The subject of the present research is the batata, which is mainly grown for its tubers. The leaf has also excellent nutritional parameters, which justify its inclusion in human nutrition. The consumption of its leaves is popular in Asia and Africa, but is still in the process of being discovered in our country. The fibre in leaves can be an excellent ingredient for functional foods.
Two batata varieties (purple and white flesh batata) that can be grown under indoor growing conditions were selected, each variety was set up in 3 replicates under different growing conditions. The leaf blade and stems with petiole were harvested separately and the fibre was produced by wet fractionation. The amount of photosynthetic pigments, protein, phenol and flavonoids from lyophilized fibre samples was determined by spectrophotometric method.
For leaves, chlorophyll-a was 13.52-5.58 ug/mg, chlorophyll-b 7.07-2.77 ug/mg, carotenoids 6.15 - 2.55 ug/mg, xanthophylls 0.61-0.47 ug/mg. For the stem, chlorophyll-a was 1.32-0.31 ug/mg, chlorophyll-b 0.71-0.16 ug/mg, carotenoids 0.69-0.17 ug/mg, xanthophylls 0.22-0.021 ug/mg. The values of phenol content in leaves were 226.51-120.17 mg/g and in stems 15.83-30.32 mg/g. Within the phenolic content, flavonoids in the leaf ranged from 10.13 to 6.74 ug/g, while in the stem from 3.59 to 1.62 ug/g. In terms of protein content, we measured 525.19-387.73 mg/g in leaves and 34.17-12.18 mg/g in stem. The results basically show that the values measured in the leaf far exceed those measured in the stem. Furthermore, we measured more favourable values in the white flesh batata we used.

„SUPPORTED BY THE ÚNKP-ÚNKP-21-3-I-DE-339 NEW NATIONAL EXCELLENCE PROGRAM OF THE MINISTRY FOR INNOVATION AND TECHNOLOGY FROM THE SOURCE OF THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION FUND."

EFFECT OF EXOGENOUS MELATONIN ON MORPHOLOGICAL CHARACTERISTICS, RELATIVE WATER CONTENT AND CELL MEMBRANE STABILITY OF *RANUNCULUS ASIATICUS* UNDER WATER DEFICIT STRESS

Eisa, E.A.T.M., Honfi, P., Tilly-Mándy, A.

Hungarian University of Agriculture and Life Sciences (MATE)

Melatonin, an indoleamine a pleiotropic signal molecule, has the potential to control a variety of physiological and biochemical processes in response to a variety of environmental conditions, including drought. ***Ranunculus*** seedlings were treated with control condition, drought stress condition, humidity (200 mbar) and foliar application of melatonin with 50,100 and 200 µM concentrations was applied four times during the experiment period, along with drought and irrigation conditions. Subjecting ***R. asiaticus*** plant to water deficit stress caused significant decreased in growth criteria is expressed as plant height, number of leaves, area per leaf, fresh and dry vegetative weight and delaying the emergence of flower buds, also reduced relative water content, meanwhile increased relative electrolyte leakage. On the other hand, foliar treatment with different concentrations of melatonin significantly boosted growth parameters of ***R. asiaticus*** plant at normal and drought-stressed conditions in comparison to their corresponding untreated controls (M0). Foliar treatment with 200 µM melatonin exhibited the greatest growth criteria of ***R. asiaticus*** plants at either normal irrigation or under drought stress followed by100 and 50 µM, respectively. In lower concentration of MT promoted the emergence of flower buds two weeks earlier, meanwhile all concentrations increased the relative water content and reduced the electrolyte leakage compared with plants under normal and stress conditions. These results demonstrate that supplemental melatonin could effectively enhance the seedlings adaptability to drought stress.

EVALUATION OF SHORT FOOD SUPPLY CHAINS IN A RURAL AREA

Levente Komarek[1], Árpád Ferencz[1], Anita Csiba[1]

[1]University of Szeged Faculty of Agriculture, Institute of Economics and Rural Development

One of the priorities for rural development is the establishment of Short Food Supply Chains which means reducing distance between local producers and local consumers and prioritizing local markets. In our work, we aimed at mapping the place of local producers within the distribution channels and evaluating local producer groups. We were looking at what tender opportunities producers are utilizing that can directly or indirectly link them to the Short Food Chain Program. To this end, we have set up several hypotheses. Firstly, we assumed that the change in consumer habits greatly influences producer's supply. Second, we investigated whether producers choose the sales channel where they can sell at the highest price or where the most products can be sold. Our hypothesis was also that more and more of the local producers are also involved in product processing. The research was conducted via questionnaires, during which 265 forms were filled out at traditional markets and also at cafeterias and restaurants. Small and wholesale producers are both involved in short supply chains, however, this form of sales is mainly used by small businesses in Hungary. Our surveys also reveal the need to broaden the use of SSC channels, which could, among other things, help increase both demand for processed products and willingness to engage in this activity. Our research reveals that young producers primarily opt for sales channels where they can sell at the highest price or where the most products can be sold. In contrast, older producers often also show emotional investment in their marketing practices. Unfortunately, in many cases, consumers associate farm products with high prices and fluctuating quality, and they are also missing the option of home delivery. The in-depth interviews show that public catering companies primarily choose products acquired through SSC based on price. At the same time, some caterers regularly buy from local producer as they want to establish long-term clientele through quality service.

MEASURING THE EFFECTIVENESS OF ACCOUNTING EDUCATION FOR AGRICULTURAL STUDENTS: A COMPARISON BEFORE AND DURING COVID

Zsuzsanna Deák

[1] Óbuda University, Keleti Faculty of Business and Management, Institute of Enterprise Development and Infocommunications

In the context of online learning, online exams have become increasingly popular as an efficient assessment method since longdistance learners can easily administer exams. However, the use of online exams has not become common in Hungary until the mandatory online education during the first waves of the corona virus epidemic. The following research aims to look at testing of accounting knowledge in agricultural education. Bachelor level students at Neumann University in three different agricultural majors were taking end of semester tests in two accounting courses. Test results in spring of 2019 (before pandemic) and spring of 2021 (during pandemic) were compared with the purpose of analyzing students' performances in online tests and comparing the results with respect to student performances in paper-based tests.

COMPARISON OF DIFFERENT SUBSTRATES FOR ORGANIC SEEDLING PRODUCTION

Anna Divéky-Ertsey[1], László Csambalik[1], Péter Pusztai[1], Krisztina Madaras[1], Izóra Gál[1]

[1] Hungarian University of Agriculture and Life Sciences, Institute for Rural Development and Sustainable Production, Department of Agroecology and Organic Farming, H-1118 Budapest, Villányi út 29-43, Hungary;

Propagation from seedlings is generally accepted in the horticultural sector. Cultivation from seedlings has many advantages including earlier harvest; more efficient use of land, time, energy, and seeds; and healthy and homogenous production. In conventional large-scale horticulture, seedling cultivation has already become a separate sector. The basis of successful seedling production is the use of the right substrate. The physical and chemical quality of the growing medium is crucial. There can be significant differences among the growing media available on the domestic market. For own substrate farmers put together a mix of different peat, perlite and nutrients according to a unique recipe. According to the Regulation (EU) 2018/848 of 30 May 2018 on organic production and labelling of organic products only organic seed and seedling can be used during the plant production. Therefore, seeds, fertilizers, plant protection and disinfection substances are allowed to be applied if only they have been authorized for use in organic production by the regulations. Recently, there are only a few professional organic seedling producers in Hungary. Most of the organic farmers are producing their own seedlings. For this purpose, commercially available certified organic medium, or home mixed substrates are used. In our study two commercially available organic substrates are compared with two farmers' mixtures: peat - compost and peat – pelleted cattle manure. The physical and chemical properties of the substrates are investigated.

EFFECTS OF HEAT STRESS ON THE PERFORMANCE OF PRIMIPAROUS AND MULTIPAROUS SOWS AND THEIR PROGENY: A REVIEW

Arth David Sol Valmoria Ortega[1,2], and Csaba Szabó[1]

[1]University of Debrecen, Faculty of Agriculture and Food Sciences and Environmental Management, Institute of Animal Science Biotechnology and Nature, Department of Animal Nutrition and Physiology, Böszörményi Street 138, 4032, Debrecen, Hungary
[2]University of Debrecen, Doctoral School of Animal Science
Email: ortega.david@agr.unideb.hu

High ambient temperature (AT) is a burden that can negatively influence the productivity of pigs. Highly prolific sows with high metabolic demands during gestation and lactation are sensitive to hot temperatures. High AT exacerbates their metabolic heat production during these stages of reproduction, and they can suffer heat stress (HS). Considering the possibility of varied responses of sows at different parity to HS, this paper aims to review the effects of gestational HS on the reproductive performance of primiparous and multiparous sows. Concerning the possible difference in their performance, this paper will also look into the production performance of their progeny. Based on the reviewed manuscripts, gestational HS experienced by sows at any time of gestation can negatively affect their reproductive performance. Primiparous and multiparous sows' response to gestational HS differs, with the former having been highly affected by the stressor. Primiparous sows are less capable of thermoregulation upon HS challenge and greatly suffer from its reproductive consequences. The impact of HS was also observed in the production performance of their offspring. The growers and finishers born from primiparous sows had lighter average daily gain and were less efficient in converting feed into body weight gain, respectively, than the offspring of multiparous sows. Nevertheless, offspring from both parities responded with similar carcass quality. Although we reviewed these differences, the lack of research on this topic limits our information on the progeny's production performance differences at the weanling stage. Therefore, further research in this area is needed.

FOOD SECURITY IN A CHANGING CLIMATE WORLD

Andrea Feher[1,2], Miroslav Raicov[2], Cosmina Simona Toader[1], Claudia Elena Sîrbulescu[1], Rhida Ben Saleh[3]

[1] Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I[st] of Romania" from Timisoara, Faculty of Management and Rural Tourism, Romania

[2] Romanian Academy - Branch of Timisoara, Research Center for Sustainable Rural Development of Romania

[3] University of Zawia, Faculty of Economics, Libya

E-mails: andreafeher@usab-tm.ro; mikiraicov@gmail.com; cosminatoader@usab-tm.ro; claudiasirbulescu@usab-tm.ro; bensaleh@zu.edu.ly

The purpose of this article is to analyze the potential impact of climate change on food security. Global environmental changes coupled with socio-economic changes are a major food security issue and challenge. The main findings show that all four key elements of food security, namely availability, stability, use and access are significantly affected by changes in the environment. The most vulnerable segment of the population is those whose living conditions and livelihoods are strictly dependent on climate change and their ability to adapt is the lowest due to household income. This category includes children and women, poor people, the elderly and all those who depend on agriculture, animal husbandry, fishing and other natural resources.

ECONOMIC EFFECTS OF ENVIRONMENTAL CHANGE ON THE RURAL AREAS

Árpád Ferencz[1], Levente Komarek[1], Anita Csiba[1] Zuzsanna Deák[2]

[1]University of Szeged Faculty of Agriculture, Institute of Economics and Rural Development
[2]Óbuda University, Department of Business Development and Infocommunications

In our work, we examine climate change in Hungary, projecting it into agriculture where extreme weather conditions are most noticeable. As a testing area, we chose the Hungarian Sand Dunes area because of the diversified agricultural production here and because this part of the country is most affected by climate change. The Homokhátság occupies a significant part of Hungary and has always been a major agricultural production center. The homestead farms established here define the image of the Hungarian Great Plain. Interviews with local farmers provide an overview of the local impacts of climate change and measures to mitigate the expected and future damages in the farms surveyed.Each of the surveyed farmers is aware of climate change and is monitoring its effects. As to the impact of climate change on agriculture, they are mainly focusing on short-term losses. Quantitative and qualitative deterioration of yields has come to the forefront as a result of the degradation of the soil or the decline in water resources. Water conservation, the use of water retention techniques, and sustainable use of water wells could improve the situation. Farmers' livelihoods depend to a large extent on the extreme weather conditions that are becoming more and more commonplace due to climate change. The losses generated by extreme weather conditions are so high that they already threaten the operations of farms. As far as subsidies are concerned, the producers are well aware of the opportunities and take advantage of them. They are primarily in need of specific financial support, but there is also a growing demand for knowledge transfer of new methods to mitigate risks.

Acknowledgements
This research is supported by by the National Office for Research, Development and Innovation with the support of the Scientific Patronage Competition entitled "Agricultural Innovation 5.0" with the identification number MEC_N 140587.

COMBINED ACTION OF NATURAL PHENOLICS AND SYNTHETIC PRESERVATIVES AGAINST FOOD SPOILAGE YEASTS

Bernard Gitura Kimani[1], Patrick Otete Anjeche[1], Erika Beáta Kerekes[1], Judit Krisch[2], Tamás Papp[1], Csaba Vágvölgyi[1], Miklós Takó[1]

[1] Department of Microbiology, Faculty of Science and Informatics, University of Szeged, H-6726 Szeged, Közép fasor 52, Hungary
[2] Institute of Food Engineering, Faculty of Engineering, University of Szeged, H-6724 Szeged, Mars tér 7, Hungary

In recent years the search for safe and environmentally friendly methods of food preservation has gained attraction as sustainability and food waste reduction becomes crucial in the food systems. Plant phenolics have received great attention due to their natural origin and broad bioactivity. These compounds could alleviate safety concerns associated with chemical additives. The present investigation aimed at determining the antimicrobial efficacy of binary combinations of natural phenolics and synthetic additives against planktonic and biofilm growth of food spoilage yeasts as well as their antiadhesive properties using the checkerboard method. The phenolics used were vanillin and cinnamic acid, while the synthetic additives were sodium benzoate, potassium sorbate and sodium diacetate. The results demonstrated synergistic interaction between vanillin and sodium benzoate against planktonic growth of *Pichia anomala* with a fractional inhibitory concentration index (FICI) of 0.47. In *Schizosaccharomyces pombe* and *Saccharomyces cerevisiae*, synergism was observed between vanillin and potassium sorbate for their planktonic growth with FICI values of 0.5 and 0.33, respectively. Synergism was also observed in *S. pombe* when vanillin and potassium sorbate combinations were used as antiadhesive agents with FICI value of 0.375. Most of the binary combinations of phenolics and synthetic antimicrobials revealed additive effect against the biofilm growth of food spoilage yeasts. Our results showed that some plant phenolics as additives may reduce the concentration of synthetic compounds to be used in preservation. These natural substances can provide numerous alternatives in food preservation. This research was supported by NKFI FK 134886.

STUDY ON THE ANTIOXIDANT CAPACITY OF SWEET AND HOT SPICE PEPPERS

Ferenc Lantos[1], Ingrid Gyalai[2]

[1,2] University of Szeged - Faculty of Agriculture, Institute of Plant Sciences and Environmental Protection

Peppers (Capsicum annuum L.) are the most widely cultivated vegetable plant in our country, and depending on the species, they are used for food or food colouring. It is considered one of the most popular spices in the world, thanks in part to the capsaicin, which is responsible for its pungent flavour. Peppers are cultivated, grown and consumed primarily for their gastronomic and culinary properties, rather than for their medicinal properties, but the literature often describes the disease-preventive and health-promoting properties of different types of capsicum. The antioxidant effects of different types of peppers have been well established in several studies. The anti-free radical mechanism of peppers is thought to be due to capsaicinoids, carotenoids and polyphenols. Based on its beneficial properties for medicinal use, we were considered important to investigate it further. Our aim was investigated the antioxidant capacity of sweet and hot spice peppers grown in a foil tent and in open field conditions using the ORAC method. The method is carried out by neutralizing free radicals by antioxidants, during which a fluorescence change occurs. The higher the value, the higher the antioxidant capacity of the sample. From our results, it can be seen that sweet (1.25 TE) and hot (0.78) spice peppers grown in a foil tent had the highest antioxidant capacity of the given samples. The sweet (0.72 TE) and hot (0.45 TE) spice peppers from the open field showed a lower free radical absorption capacity.

THE OVER HARVEST OF PORCUPINE SPECIES FOR BUSHMEAT AND TRADITIONAL MEDICINE IN MALAYSIA

Siti Mastura Hasan, Sándor Csányi

Department of Wildlife Biology and Management, Institute for Wildlife Management and Nature Conservation, Hungarian University of Agriculture and Life Sciences, Gödöllő, Hungary

Abstract: The commercial harvesting to supply the demands of the regional market and beyond with bushmeat and traditional medicinal products has exerted pressure on porcupine species which have reduced population densities in Malaysia regions. This study determined the over-harvested and poaching of the porcupine species in Malaysia by investigating confiscated data of porcupine species and their parts from 2011 to April 2021. A total of 31 confiscated cases were obtained amounting to an estimated 320 porcupines. Based on the results, porcupines are harvested for bushmeat, traditional medicines, and trophies. This study proved that porcupines are being illegally poaching and over-harvested in Malaysia because of the poor legislation and management. Lack of awareness of the implications of unsustainable harvesting and difficulty in monitoring by the relevant authorities and organizations appear to be the main challenges to porcupine conservation in Malaysia. This study highlights the lack of research study documenting the harvesting of the porcupine and the implication of these results are important for future adaptive porcupine management in Malaysia.

HUMOUR IN FOOD ADVERTISING

Iasmina Iosim, Gabriela Popescu, Anka Suba, Claudia Sirbulescu, Carmen Dumitrescu

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

Humour is known to help relational outcomes. In business, business sectors (product-based *vs* service-based) and humour styles (constructive *vs* offensive) play a defining role. This study aims to identify how humour impacts the selling of food products. This study is based on studies about humour effects in business, management, marketing, and psychology. Food advertisements are analysed in an attempt to identify the ways in which humour determines consumers to buy one food product or another. Constructive humour has positive effects on business performance and work relationship quality no matter the business sector. The only limitation of the research concerns the cultural context (only Romanian advertisements are analysed). This study allows strategic insights into how to use humour in an advertising context. To the best of the author's knowledge, no previous Romanian study has until now examined the impact of humour on the selling of food products due to advertisements.

EVALUATION OF TOTAL POLYPHENOL AND FLAVONOID CONTENT OF MALT FLOUR EXTRACTS AND ANALYSIS OF THEIR EFFECTS ON THE VIABILITY OF *DROSOPHILA* S2 CELLS

[1]Md. Aminul Islam, [1]Bence Pecsenye and [1]*Endre Máthé

[1]Institute of Nutrition, University of Debrecen, 4032 Debrecen, Hungary
[1]aminul21.sust@gmail.com, [1]bence.pecsenye92@gmail.com [1]endre.mathe64@gmail.com

Increasing attempts to utilize malt flours in the food industry have been made in recent years because of their biological as well as antioxidants properties. In this study, a hot water extraction method was applied to obtain extracts that were further used to determine the Total Flavonoid Content (TFC) and Total Polyphenol Content (TPC). Since the antioxidants and particularly flavonoids, have the capacity to regulate several cellular activities in a dose dependent manner; we set to analyze the viability of *Drosophila Schneider* 2 (S2) cells by assessing seven different malt flour extracts and each of them at five different concentrations (200µL, 100µL, 50µL, 25µL, 12.5µL) at the 3rd and 7th day of the administration period. Previous studies showed that the duration of germination and roasting might affect the TPC and TFC content which would be paralleled by the antioxidant capacity of malt flours.The assessed malt flours showed the TPC to vary in between 451.67±0.58 mgCE/100g and 20.00±2.00 mg/100g. Moreover, the TFC ranged from 73.770±66 mgCE/100g to 9.370±73 mgCE/100g. The TPC and TFC data are indicating that our malt flours polyphenol content is heavily influenced by the nature of the utilized raw materials and fabrication technologies. The *Drosophila* S2 cells-based viability test indicated a concentration dependent increase in the case of every malt extract on the 3rd day, while at the 7th day, the viability seemed to decrease. All our observations are suggesting that the analyzed malt flours represent raw materials with high nutritive values, and as a consequence they can be used for the fortification of newly developed foodstuff.

STUDY OF BIOSTIMULATOR PRODUCTS IN MAIZE PRODUCTION

Péter Jakab[1], Levente Ódry[1], István Kristó[2], Mihály Sárvári[3], Levente Komarek[1]

[1] University of Szeged, Faculty of Agriculture, Institute of Plant Sciences and Environmental Protection, Hódmezővásárhely, Hungary
[2] Hungarian University of Agriculture and Life Sciences
Szeged, Hungary
[3]University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Plant Sciences, Debrecen, Hungary

In our experiment, we examined the influence of some biostimulators (foliar fertilization products) on the yield amount and grain quality of maize in 2019. The experiment was set in three replications, random blocks on the area of SZTE Tangazdaság Ltd. in Hódmezővásárhely. The soil of the experiment was meadow chernozem. We sprayed out three different foliar fertilizer products individually and combined with each other as well, so there were six treatments and the control to be examined. In 2019 the amount of precipitations was higher with 76 mm than the average, but its distribution was not favourable for maize. The monthly average temperature in the vegetative season of maize was higher with 2.45 °C than the average of the last several years. We evaluated the experimental data by single factor analysis of variance. We measured 9.90 t/ha yield amount in control treatment, and with the foliar fertilization the yield ranged between 10.40-10.90 t/ha. The foliar fertilization products increased the yield of maize, but this difference compared to the control yield was not significant. We examined the effect of foliar fertilizers on the protein and starch content of maize grain too. The foliar fertilizer products did not caused significant change in these parameters. These scientific results showed, that the examined biostimulators has positive effect on the yield of maize and small effect on the examined grain quality parameters.

IMPACT OF ABIOTIC STRESS FACTORS ON THE PERFORMANCE OF VIABILITY AND INITIAL DEVELOPMENT OF SOYBEAN (*GLYCINE SOYA* L.MERR) SEEDS

Kiet Huynh Anh, Ákos Tarnawa, Katalin M. Kassai, Zoltán Kende, Márton Jolánkai

Agronomy Institute, MATE Hungarian University of Agriculture and Life Sciences, Gödöllő

Abiotic stress factors may have adverse impact on the growth and development of crop plants. In a crop physiology experiment at the MATE University, Gödöllő, Hungary soybean seeds were exposed to various levels of temperature, salinity and water supply. Viability, initial growth of plumule and radicle were evaluated. The results obtained suggest that:Viability and early development of soybean plants depends on the optimum level of abiotic external factors like temperature, salinity and water availability.Soybean germination was proved to be best at 20 °C. Higher temperatures have obstructed germination processes. The lowest level of germination rate was observed at 30 °C temperature. Also, the higher the temperature the longer the germination period was observed.NaCl concentrations had diverse impact on viability, growth, and development. The elevation of salt concentration resulted in delay of germination as well as reduction in germination rate. 1 % NaCl solution applications were 24 h slower in germination in comparison with that of the 0 control. 1,5 % concentrations have never reached the level of the control and the germination rate remained on a significantly low level only.The most characteristic impacts were observed in the case of various water availability treatments. The three water supply treatments applied had similar germination rate records during the first two days, but in later stages the higher water doses resulted in lower germination rate compared to the smaller ones. The results suggest that water logging may deteriorate soybean germination activities and reduce the number of germinated seeds.

EVALUATION OF THE NUTRITIONAL VALUE OF CHESTNUT (CASTANEA SATIVA, AESCULUS HIPPOCASTANUM) AND WALNUT (JUGLANS REGIA) GEMMOTHERAPY EXTRCTS FOR THE DEVELOPMENT OF HEALTH-PROMOTING FOODSTUFF

[1,2]Maria Jolji, [2]Bence Pecsenye, [2]Zoltán Györi and [2]Endre Máthé

[1]Institute of Nutrition, University of Debrecen, 4032 Debrecen, Hungary
[2] Doctoral School of Nutrition, University of Debrecen, 4032 Debrecen, Hungary
[1]joulji.1991@gmail.com, [2]bence.pecsenye92@gmail.com,
[2]gyori.zoltan@unideb.hu, [1,2] endre.mathe@agr.unideb.hu

The importance of Mediterranean diet has been well documented for the prevention of many non-communicable diseases (Dernini et al., 2017). The chestnut and walnut health-promoting effect has been suggested by many studies (Chauhan et al., 2020; Morling et al., 2018; Zhao et al., 2018). Nuts are rich in unsaturated fatty acids, bioactive compounds, high-quality vegetable protein, fiber, minerals, tocopherols, phytosterols, and phenolic compounds etc. We carried out an HPLC-MS evaluation of the mentioned species specific gemmotherapy extracts, and were able to describe several bioactive compounds that belong to polyphenols, flavonoids, alkaloids, coumarins, amino acids, fatty acids, etc. Research data have shown the diverse health benefits of the walnut through many clinical studies. Based on such data we decided to evaluate the nutritive properties of our gemmotherapy extracts. The obtained data are suggesting no relevant toxic effects as seen on *Drosophila* cell culture lines, though substantial antimicrobial effect could be observed in the case of walnut extract. Currently we are evaluating the putative anti-diabetic effects of the extracts.
We are also considering the chestnut flour for food fortification since it contains fatty acids, phenolic compounds, dietary fiber and vitamins aiming for the development of foodstuff that would be suitable for elderly people nutrition.

EXAMINATION OF THE IMPACTS OF SEWAGE SLUDGE TREATMENT ON THE PHYSIOLOGICAL CHARACTERISTICS OF SPINACH

Dávid Kaczur[1], Brigitta Tóth[2]

[1] Institute of Food Science, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen
[2] Institute of Food Science, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen

The examination of sewage sludge as a sustainable fertilizer is one of the most common studies nowadays. The increase in human population demands more and more nutrient supply during fertilization. This study aimed to examine the impacts of sewage sludge treatment on relative chlorophyll content (SPAD-Unit), the concentration of photosynthetic pigments (chlorophyll-a, chlorophyll-b, and carotenoids), dry weight, and element concentrations in the shoots and roots of spinach 30 days after treatment. *Spinacia oleracea* plants were grown in a climate chamber. The control plants were grown using modified Hoagland's nutrient solution, the sewage sludge treated plants were grown utilizing distilled water containing 4g/L sewage sludge. The relative chlorophyll content did not change significantly in the second leaf but was significantly higher in the third and fourth leaves in the sewage sludge treated plants compared to the control. On the other hand, no significant differences were measured in the concentration of photosynthetic pigments between the treatments. Additionally, the dry weight of shoots and roots also was not significantly different. The concentration of calcium, chrome, iron, potassium, magnesium, and sulfur was lower in the sewage sludge treated plants relative to the control. While, the concentrations of aluminum, copper, iron, sodium, and manganese were 26, 1.5, 1.5, 2, and 7 times higher in the sewage sludge treated plants compared to the control. The concentrations of magnesium, phosphorous, sulfur, and potassium were also higher. These results suggest that the examined sewage sludge would be a potential alternative nutrient source in crop production.

EVALUATION OF MINERAL CONCENTRATION IN HUNGARIAN PROSO MILLET (PANICUM MILIACEUM L.) VARIETIES

Maha A. Khalfalla [1], Dr. Zoltán Győri [2]

University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Nutrition and Food Sciences, Boszormenyi utca 138.
(phone: +36 52 508-444)
maha.khalfalla@agr.unideb.hu

Millets are indeed gluten-free cereals that are grown around the world for human consumption, energy, feed, and forage, but in recent years, attention has increased to the cultivation of millets. It is now feasible to biofortify important millets using strategies such as traditional breeding, identification of candidate genes for the translocation of important minerals, and genome-editing technologies. as well as intensified research on the health properties of whole grains. This summary is to illustrate the research trends relating to having released a comprehensive assessment of different genotypes of landrace from Hungarian millet and their concentration of mineral content. The mineral contents of the various varieties differed noticeably. The quality of their grains is influenced by visual quality and nutritional quality, including mineral digestibility and concentrations. More data is needed about them for nutritional advice for people with gluten sensitivity and as a source of a significant mineral concentration. In our study, we were examining the micro and macro elements content of the seeds of 3 different varieties of millet. In comparison to other cereals as a source of a high mineral concentration, whole grain millet appears to have a higher dietary mineral content. The elements' measurements were conducted by ICP-OES techniques. We have information about elements (N, P, K, S, Ca, Mg, Fe, and Zn). Where these are considered the most important mineral components of food, they need to be integrated into the food chain.

CORRELATION BETWEEN FPD (FOOD PAD DISEASE) AND FORAGE IN BROILER FEEDING

Brigitta Kiss, Márta Erdélyi

Hungarian University of Agriculture and Life Sciences (MATE)

The first signs of FPD (food pad disease) in a flock that kept on a moistened, used litter, begin to appear in a few weeks old population. After the injuries on the soles we can see redness, discoloration, then necrosis. In severe cases deep ulcers can appear and the disease can spread to the tendons, ligaments and joints of the feet (Ribács 2018). In this case the weight gain of the animals decrease, which is caused by pain-induced loss of appetite. Excessive sodium intake can predispose to the symptoms, as it can increase the water intake of broilers and thus increase litter moisture. Poor quality powdered feed, protein overeating, poor quality fats can lead to similar effects (A.A. El-Wahab et al. 2013). Fibers in feed, especially water-soluble hemicelluloses can also cause sticky faecal syndrome by altering the viscosity of the intestinal contents The use of NSP-degrading enzymes in poultry forage is justified by the fact that many feed materials, which are favorable for poultry, contain significant amounts of NSP substances that are indigestible or have an antinutritive effect, reduce the digestibility of certain vital nutrients and contribute to the emergence of sticky stool syndrome. In addition, NSPs increase the rate of bacterial metabolism of bile acids, resulting in less bile acid being reabsorbed from the posterior part of the small intestine, and also reducing the efficiency of fat digestion (Babinszky et al. 2019).

THE EFFECT OF ADMIXTURE OF NEW BLOOD ON THE GENETIC STRUCTURE OF THE HUNGARIAN LIPIZZAN HORSE POPULATION

Máté Kovács, Sándor Mihók

University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Department of Animal Breeding
H-4032, Debrecen, Böszörményi út 138.

*corresponding author: kovacsmate25@gmail.com

The rapid development of animal husbandry in recent decades is profoundly changing the genetic structure of domestic animal populations. The stock size of the varieties and utilization types corresponding to the fashion trends of the age, which undoubtedly have outstanding primarily breeding properties, is increasing significantly, at the same time many genotypes containing valuable traits are disappearing permanently. The protection of gene reserves has become an important task of livestock farmers in the 21th century, which required research into gene conservation.The history of the Lipizzan horse breed creates a special situation for dedicated breeders living in all the successor states of the Austro-Hungarian Monarchy. This almost unique situation make a number of opportunities and obligations that must be reflected in the conservation of the entire genetic stock of the variety, which results in its long survival.In our research, we examined the effect of admixture of new blood in the Hungarian Lipizzan horse population.The imports of mares in recent years have had a number of positive effects on the Lipizzan horse breeding in Hungary. With the purchases of breeding animals, all the mare families of Fogaras in Hungary can be found again, the preservation of which is especially important due to their origin in Mezőhegyes. With the import of the 9 original, Croatian and Slovenian mare families that have arrived in Hungary, new genotypes appeared in the Hungarian herd which have not been so far in the Hungarian population. In the Hungarian population, the individuals which classified in these families continue to be bred with the breeding animals already in Hungary, thus they entered the Hungarian population.In recent decades, there has been an exemplary cooperation between state studs in Hungary and other breeding countries in terms of breeding animal exchanges (admixture of new blood). As a result, mainly stallions entered the Hungarian population. The maintenance of these processes is justified for the future as well, as it's application together with the mare imports helps the survival of the entire genetic stock of the breed in the Hungarian population, at the same time it protects the whole breed.Overall, it can be said that with the help of the mentioned processes, the degree of inbreeding in the Hungarian population decreased and the genetic structure characteristic of the breed became more complete.

LIBERATION OF PHENOLICS FROM SORGHUM SAMPLES USING SOLID-STATE FERMENTATION WITH *RHIZOMUCOR MIEHEI*

Tamás Kovács[1], Ítalo José Lemos De Oliveira[1], Dóra Anna Papp[1], Mónika Varga[1], Bernadett Langó[2], Andrea Palágyi[2], Csaba Vágvölgyi[1], Judit Krisch[3], Miklós Takó[1]

[1]Department of Microbiology, Faculty of Science and Informatics, University of Szeged, Közép fasor 52, H-6726 Szeged, Hungary; kovacstomi16@gmail.com
[2]Cereal Research Non-profit Ltd., Alsó kikötő sor 9, H-6726 Szeged, Hungary
[3]Institute of Food Engineering, Faculty of Engineering, University of Szeged, Mars tér 7, H-6724 Szeged, Hungary

Phenolics are important plant secondary metabolites. These molecules have beneficial effects on the human health through antioxidative, anti-inflammatory, antimicrobial and anticancer properties. However, majority of these compounds are conjugated to plant polysaccharides via ester or glycosidic bonds resulting in a less bioavailable form. Sorghum grain contains considerable amount of bioactive phenolics and the fermentation with cellulolytic and lipolytic fungi can be an eco-friendly strategy for their mobilization. Here, a solid-state fermentation (SSF) approach using *Rhizomucor miehei* as the fermenting organism was tested to liberate phenolics from different sorghum samples. For SSF substrate, grounded sorghum material was mixed with soy flour as nitrogen source, and moistened with distilled water. The growth medium prepared were inoculated with *R. miehei* and incubated at 37 °C for 18 days. During incubation, four flasks were taken on every third day for analytical measurements. Two flasks were extracted with distilled water, and the extracts were used for enzyme activity measurements. Two flasks were extracted with 50% ethanol solution for total phenolic content (TPC) and antioxidant activity (e.g., free radical scavenging capacity and ferric reducing antioxidant power) measurements. Results showed increased lipase and beta-glucosidase activities in the early stages of fermentation, which was generally associated with an increase of TPC. Moreover, the fermentation increased the antioxidant capacities of the sorghum extracts. In conclusion, fermentation with *R. miehei* can support the release of phenolics from sorghum samples. This research was supported by NKFI FK 134886.

IMPROVEMENT OF *IN VITRO* ANTHER CULTURE OF CEREALS AND UTILIZATION IN CR LTD.'S BREEDING PROGRAMS

Csaba Lantos[1], Ferenc Békés[2], László Cseuz [1], Lajos Bóna [1], Szandra Purgel [1], Katalin Ács [1], Bernadett Mihály-Langó [1], Mihály Jancsó [3], Árpád Székely [3], Róbert Mihály [1], János Pauk[1]

[1]Cereal Research Non-Profit Ltd., Biotechnology Laboratory, Szeged
[2]FBFD PTY LTD, Sydney, Australia
[3]Hungarian University of Agriculture and Life Sciences, Institute of Environmental Sciences, Research Center of Irrigation and Water Management, Szarvas

In modern plant breeding and research programmes, the importance of doubled haploid (DH) plant production methods is incontrovertible. These methods (chromosome elimination, anther- and isolated microspore culture) serve the quickest way for the production of homozygous lines to accelerate the plant breeding and applied research.In Biotechnology Laboratory of CR Ltd.'s, the improvement of *in vitro* androgenesis of crop plants have been in the focus of research for more decades. Recently, the *in vitro* anther culture methods are applied routinely for production of thousands of DH plants in cereals (common and spelt wheat, triticale, barley and rice). The produced DH lines have been integrated in CR's breeding programmes. After a strong selection system, the best lines can take part in Hungarian national tests (NÉBIH). In 2021, a new DH variety 'GK Déva' have been protected.However, the efficiency of *in vitro* anther culture is low in tetraploid *Triticum* species for example durum wheat, and the *in vitro* androgenesis induction remained a scientific challenge in einkorn (*Triticum monococcum* L.). Androgenesis was induced in *in vitro* anther culture of einkorn and the development of microspore – derived ELS was observed in anther cultures. Furthermore, some green and albino plantlets were regenerated from the microspore – derived ELS. The regenerated green plantlet was determined as a haploid plant by flow cytometric analyses.

The research programmes was supported by scientific projects (TKP2020-NKA-21, OTK*A-K_21-K138416, OTKA-FK_21-FK138042, GINOP-2.2.1-18-2018-00005 and OD002).*

REQUIREMNTS OF KOSHER VEGETABLE AND FRUIT PRODUCTION (REVIEW)

F. Lantos[1], O. Búzás-Bereczki[1], Gy. Szabó[2], T. Róna[3]

[1] University of Szeged - Faculty of Agriculture, Institute of Plant Sciences and Environmental Protection
[2] Hungarian Jewish Heritage Foundation
[3] Hungarian Jewish Prayer Association

The rules of educational and upbringing of religions have opened up to human society a moral path to follow that has become dominant for particular communities of life.The guidance of the Torah, and thus the strict observance of religious laws, plays a very important role in the life of the Jews. Kosher (a word of Hebrew origin that is appopriate, suitable in the original translation) is a summary name for the food-related laws of the Jewish religion. Kosher is therefore the same age as Judaism, dating back about 3300 years. It is obligatory for all Jews! The rules for kosher food apply not only to the purity of vegetable crops, but also, of course, to products obtained from fruit production and viticulture and winemaking activities. It also regulates the consumption of foods containing meat, milk and eggs. Regarding vegetables and fruits, four main categories are distinguished when examining their insect infected: pure, very rarely infected, rarely infected, most often infected.The purity of the kosher product is checked and supervised by the given rabbinates. Quality expectations are the same, but views may differ on the acceptance of certain food ingredients. By default, the Torah governs. Tests require so-called periodic rabbinical inspections for most foods of plant origin. The control is called an auditing!

CAN THE DISTRIBUTION OF RED FOX BURROWS INDICATE THE CHAFER LARVAE DENSITY?

Mihály Márton[1], László Szabó[1], Miklós Heltai[1]

[1] Institute for Wildlife Management and Nature Conservation, Hungarian University of Agriculture and Life Sciences, H-2100, Gödöllő, Páter Károly street 1., Hungary

Due to their general occurrence the European badger and the red fox have an important role in most of the ecosystems of the Carpathian basin. Both species use burrows for resting and cub rearing. Based on the previous studies, difference were found in the burrow site selection of these predators. The differences can be seen in case of the vegetation type, the soil texture and the density of primary food sources. This knowledge is important for wildlife managers and nature conservationists, but maybe useful for other sectors as well. In the present study, we have taken plant protection approach. Our question was the following: does the chafer larvae density differ in the surrounding of badger and red fox burrows? The study area is located between Gödöllő and Valkó, in the Gödöllő Hills. Its size is 3728 ha and mainly covered by forests (96%). Two methods were used during the study. At first strip transect method was implemented to find the burrows. 81 burrows were found in total, 14 of them were used by badger and 14 by red fox, 53 of them were abandoned. The second method was the chafer larvae density and biomass measurement. Eight samples were taken per each active burrow, it means 224 samples in total. Our results showed higher chafer larvae density and biomass in case of red fox burrows, than in case of badger burrows. We conclude that the soil texture could be in the background of this difference.

SITE-SPECIFIC PLANT NUMBER CONTROL IN PRECISION SUNFLOWER (*HELIANTHUS ANNUUS L.*) PRODUCTION

Szabolcs Monoki[1], Gabor Csornai[2], Janos Nagy[1]

[1]University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Kalman Kerpely Doctoral School, Boszormenyi Street 138, 4032 Debrecen, HUNGARY
[2] COSIMA Ltd., Szendroi Street 49, 1126 Budapest, HUNGARY
monoki.szabolcs@icloud.com

We consider sunflower as a plant that uses the soil moisture to the extreme. Hybrids utilize soil water resources with varying degrees of efficiency, which is also greatly influenced by the planted number of plants. In our study, we examined the applicability of the applied precision sowing technique as a function of the number of seedlings and the distance between seedlings, and attempted to determine the sunflower plant number range that best fits the heterogeneous productivity zones of the given crop area. The productivity zones were created using GIS methods. For both sample areas, three well-separable zones in terms of productivity (high, average, low) were identified. Considering the feasibility aspects of the experiment, three seedling steps were used in each fertility zone in four replicates. Based on the results of the control of the number of plants and the distance between the plants, the accuracy and applicability of the sowing technology decreases inversely with the increase of the number of seedlings. In areas with high and medium productivity, moderately increased seedlings yielded higher yields, while in low productivity zones, moderately reduced planting yields did not yield lower yields than base planting. The thousand grain weight decreased significantly with increasing the number of seedlings, while the oil content increased significantly with increasing the number of seedlings.

EFFECT OF ACTIONS SUPPORTED BY THE NATIONAL GAME MANAGEMENT FUND ACCORDING TO THE HUNTERS IN HUNGARY

Zsolt Biró[1], Krisztián Katona[1], Mihály Márton[1], Gergely Schally[1], Sándor Csányi[1]

[1] Institute for Wildlife Management and Nature Conservation, Hungarian University of Agriculture and Life Sciences, H-2100, Gödöllő, Páter Károly street 1., Hungary

Since 2017, grants from the National Game Management Fund support the development of the habitats for the game species by providing hiding and feeding places for them, and by the effective control of their predators. We evaluated the effects of these management actions on the local wildlife populations with a questionnaire survey among the game managers that have been supported between 2018–2020. We asked them about their impressions or measured data regarding the size and quality of the game populations treated during the program, comparing the condition before and after the interventions, specifying the methods in case of measurements. The 241 answers covered 35% of all the supported hunting units. The majority of applicants (94%) rated their own management actions as effective, while only 2% reported the contrary. Wildlife managers collected data to measure the efficiency relatively infrequently (14 ± 9% of the beneficiaries for each variable group in each target area, min-max: 3–44%). Much more often they relied on their non-scientific observations and intuitions (63 ± 14%, min-max: 36–93%). We recommend that it is also necessary to evaluate the efficiency on the basis of scientific data, at least with smaller samples at the level of game management units. They should measure the use of the treated areas by the game species, and the changes in the quantity and quality of the populations (e.g., camera trapping at drinking and feeding sites; spotlight counts of brown hares, estimating the reproduction, condition or trophy quality indices).

DIVERSITY OF LACTIC ACID BACTERIA IN RAW MILK IN KOSOVO DETERMINED BY 16S RIBOSOMAL DNA ANALYSES

[1]Diellez Arifi, [1]Ibrahim Mehmeti

[1]UBT (University of Business and Technology), Prishtina 10000, Kosovo
diellezarifi@gmail.com, ibrahim.mehmeti@ubt-uni.net

Milk and several milk products perform an important role in human body due to their nutritional values (fat, protein, vitamins, and minerals). Due to their diversity in microbiological aspects raw milk can be used as a probiotic and in fermentation processes in different aspects. Lactic acid bacteria are the main group of these diversity due to their role in food, the environment, and humans due to the metabolic processes. Different raw milk samples have been used and analyzed in molecular aspects for their diversity and identification of raw milk in Kosovo. Samples are identified by 16S ribosomal DNA sequencing and different bioinformatical programs are used to analyze the phylogenetic tree and diversity of these bacteria in in raw milk. Our results indicate that high genetic diversity of lactic acid bacteria (starting from *Lactoccoccus* spp, *Enterococccus* spp., *Leuconostoc* spp. *Lactobacillus* spp.) in raw milk do they exist. These it concludes that, raw milk in Kosovo can be used as a good food with high nutritional values and diversity of lactic acid bacteria.

SYNERGISTIC IMPROVEMENT OF YIELD AND GRAIN PROTEIN CONTENT OF DURUM WHEAT THROUGH CO-FERTILIZATION OF MULTIPLE NUTRIENTS

***Anteneh Agezew Melash, Éva Babett Ábrahám**

Institute of Crop Sciences, Faculty of Agricultural, Food Sciences and Environmental Management, University of Debrecen, H-4032 Debrecen, Böszörményi str. 138, Hungary.

*Correspondence: antenehagezew2008@gmail.com

Improving durum wheat yield and grain quality is an eternal topic in agronomic research because of an increase in market demand for acceptable grain quality. This aim is, however, hampered due to nutrient management practices, genetic variation, and their interaction with the environment. A field experiment was conducted to appraise the effect of nutrient supply on grain yield, protein content, and physio-morphological traits under drought condition. A split-split plot design was employed comprising two nitrogen doses (control, 60 kg ha^{-1}), and three-level of nutrients (control, zinc, sulfur) combined with four durum wheat varieties. Zinc and sulphur were applied foliarly at the flag leaf stage, both at a rate of 3 and 4 litter ha^{-1}, respectively. Results showed that, under drought conditions, chlorophyll content was found more significant for grain yield formation than spikes per m^2. A significant *($p < 0.05$)* genetic variation was observed for grain yield, plant height, NDVI, SPAD, spike density, and protein content. Nitrogen fertilized varieties with lower spike density showed a better yielding formation. A significant and simultaneous improvement in protein content and grain yield was observed under 60 kg N ha^{-1}. Co-fertilization of nitrogen and zinc improved the grain yield of variety *Duragolg* by about 21.3%. Although robustness and reduction were observed, LAI, NDVI, and SPAD values were improved in nitrogen and developmental stage-dependent manner, even a small adjustment in the nitrogen application dose could cause significant alterations to these traits. The positive effects of sulphur, nitrogen and zinc application on protein content, physio-morphology, and yield formation substantiate the need to include these elements in the durum wheat cultivation system.

SOME PRELIMINARY RESULTS OF AN EIP-AGRI PROJECT ON SWEET POTATO CULTIVATION

Tamás Monostori[1], Róbert Bráj[2], Andrea Bartók[3], Zsolt Gombos[4], Adrienn Szarvas[1], Ádám Bordé[1], Péter Jakab[1], Viktor Vojnich[1], Zsuzsanna Táborosiné Ábrahám[2], Klára Marótiné Tóth[2]

[1] University of Szeged Faculty of Agriculture, Hódmezővásárhely, Hungary
[2] Hungarian University of Agriculture and Life Sciences, Institute of Horticulture, Szeged, Hungary
[3] agricultural engineer, Tiszasziget, Hungary
[4] horticultural engineer, Tiszasziget, Hungary

The main objective of our EIP-AGRI project is to eliminate the yield stability problems regularly occurring in sweet potatoes, by elaborating site- and cultivar- specific technological solutions based on experimental results covering most aspects of cultivation. In parallel, the cultivar-specific adaptation and integration of the *in vitro* micropropagation method can make the first step towards establishing a pathogen-tested production system of the propagating material. During the first two years (2019-2021) of the 3-year project, the following preliminary results were recorded:

- Under the climatic conditions of South-East Hungary, the cultivation of sweet potato in greenhouse is not recommended due to the extremely poor storage root yields achieved. At a large foliage of all the 8 genotypes involved, the yield per plant values were between merely 358 grams (cv. 'Tápió 96') and 18 grams (cv. 'Purple'). In general, the white-fleshed genotypes tolerated the protected growth conditions better.
- The beneficial effect of flat planting compared to ridge planting without mulch cover was detected on sandy soil. The cv. 'Ásotthalmi12' yielded 579 vs. 474 g plant^{-1} in the two cultivation systems, respectively, but the difference was not statistically significant.
- Omission of irrigation had significantly negative influence on the storage root yield of cv. 'Purple' (drip-irrigated: 2,690 vs. non-irrigated: 1,455 g plant^{-1}). The over-average yield, however, could be achieved due to a beneficial distribution of precipitation in the crop-year.
- The hormone composition of the induction media can influence the multiplication rate in *in vitro* micropropagation. MS-based media both with and without the addition of BAP can result in better results, depending on the sweet potato genotype.

The research was supported by the "VP3-16.1.1-4.1.5-4.2.1-4.2.2-8.1.1-8.2.1-8.3.1-8.5.1-8.5.2-8.6.1-17" Rural Development Program, in connection with the grant document with the identification number 1924527185.

DIGITALIZATION IN THE FOOD INDUSTRY – APPLICATION OF BLOCKCHAIN TECHNOLOGY AS A SUSTAINABLE BUSINESS MODEL

Juan Carlos Montenegro Hernandez[1]

[1] MATE Hungarian University of Agriculture and Life Sciences, Doctoral School in Management and Organizational Science

Background: Blockchain technology is rapidly becoming a common word and promises to solve many problems related to the lack of trust. Despite its popularity and the great interest it has received from public and private parties, the technology is still far from being well understood and is surrounded by a great deal of exaggeration and hype. This paper intends to present the application areas of the blockchain technology in the food industry and to analyse the potential benefits and barriers of the implementation in the food industry through the latest existing literature review. Methods: a literature review was conducted using academic documents written in English language and published in peer-reviewed scientific journals. The relevant papers were analysed and were searched systematically in ScienceDirect, SpringerLink and Emerald databases. A complementary search in Google Scholar was also executed. Results: 11 papers fit the criteria, allowing for qualitative analysis only. he papers were categorized into three groups: food safety (1), food traceability (2) and food supply chain management (3). Conclusions: Food safety is a relatively new approach in the food industry. New technologies need to be used together with the blockchain technology in order to increase acceptance with consumers and to provide an efficient and robust mechanism for enhancing food traceability and a transparent and reliable way to evaluate quality, safety and sustainability. Blockchain technology offers a promising approach to foster a future food-system, which is safer, traceable, more sustainable and reliable.

IDENTIFICATION OF *SR31* AND *SR36* STEM RUST RESISTANCE GENES IN HUNGARIAN WHEAT CULTIVARS

Tungalag Munkhbat[1], Csaba máté[1], Melinda Tar[2], László Purnhauser[1]

[1]Cereal Research Non-Profit Ltd., Szeged
[2]MATE, Applied Agronomy Research Station, Szeged

In Hungary, the occurrence of stem rust disease caused by *Puccinia graminis* f. sp. *tritici* is less frequent, but due to the severity of infection it can pose a great hazard for wheat production. The breeding and use of resistant cultivars offers an economical, safe, and effective approach to protect wheat from this disease. In this study, 65 Hungarian wheat cultivars registered from the year 2005 to 2020 were investigated using molecular markers to determine the presence or absence and frequency of the two important stem rust resistance genes *Sr31* and *Sr36*. These genes were originated from 1BL.1RS wheat-rye translocation and a wheat-*Triticum timopheevii* chromosomal introgression, respectively. Our results indicated that *Sr31* is more widespread (21.5%) than *Sr36* gene (9.2%) in Hungarian wheats. The two main Hungarian breeding programs, Martonvásár (37 cultivars) and Szeged (26 cultivars) showed a different rate in the exploitation of *Sr31* (27.0 and 15.4%, respectively), however *Sr36* was found only in Szeged cultivars (23.1%). These data may help breeders to incorporate effective *Sr* genes in their future wheat improvement programs.

The research programmes were supported by scientific projects (TKP2020-NKA-21, OTKA-K_21-K138416, GINOP-2.2.1-18-2018-00005).

CHARACTERIZATION OF BETA-GALACTOSIDASE CODING GENES OF *LICHTHEIMIA RAMOSA*

Bettina Volford, Miklós Takó, Csaba Vágvölgyi, Tamás Papp, Gábor Nagy

Department of Microbiology, Faculty of Science and Informatics, University of Szeged, Közép fasor 52, H-6726 Szeged, Hungary

Beta-galactosidase enzymes of Mucoromycota fungi are rarely studied, although this group of filamentous fungi is an excellent source of many industrial enzymes. In our recent studies, a *Lichtheimia ramosa* isolate proved to be an excellent beta-galactosidase producer, and the corresponding enzyme secreted by the fungus has also been purified and characterized. In connection with the enzyme production studies, we aimed to identify beta-galactosidase coding element(s) in the *L. ramosa* genome and investigate its/their expression level under different cultivation conditions. Two beta-galactosidase coding genes (*bgal1* and *bgal2*) were recognized in *L. ramosa.* The relative transcript levels of the coding genes were examined on malt extract agar and wheat bran via quantitative real-time PCR. In our study, *bgal1* gene showed a higher transcript level than *bgal2* gene. The relative transcript levels of *bgal1* and *bgl2* reached their maximum on the 6th day on wheat bran, while no significant changes in expression level were observed on malt extract agar. These observations are in agreement with the results of our former studies in which the highest overall enzyme activity was obtained in a wheat bran-based fermentation system. In an additional study, a plasmid-free CRISPR-Cas9 system was applied to create a *pyrG* auxotrophic mutant of *L. ramosa*. This strain is applicable as recipient strain in the future gene manipulation experiments (overexpression or gene disruption). Using this method, one-to-five nucleotide long-targeted deletions could be induced in the *pyrG* gene. This research was sponsored by NKFI FK 134886. B.V. was supported by ÚNKP-21-3.

EVOLUTION OF MAIZE LEAF AREA INDEX DYNAMICS UNDER DIFFERENT NITROGEN LEVELS

Atala Szabó, Árpád Illés, Csaba Bojtor, János Nagy

University of Debrecen, Faculty of Agriculture, Food Science and Environmental Management, Institute of Land Use, Engineering and Precision Farming Technology, University of Debrecen

Maize is one of the most important industrial crops in Hungary. Maize cultivation is significantly encumbered by dry, rainless periods and atmospheric drought during critical phenological phases. In addition to the favorable climatic conditions, maize also appreciates the optimal nitrogen supply. The goal of our experiment was to examine the evolution of Leaf Area Index (LAI) values, as the growing season progresses using different nitrogen levels. It was carried out at three nutrient levels: N0 - 0 kg N ha^{-1}, N2 - 120 kg N ha^{-1}, N5 - 300 kg N ha^{-1}. The hybrid included in the experiment belongs to the FAO420 maturation group. Its properties include excellent nutrient response, high yield potential hybrid. The measurement dates examined were as follows: 16th June 2021, 23th June 2021, 15th July 2021. The obtained results were the average of four replicates. In terms of measurment dates, the highest LAI was measured in 15th July for all three nutrient levels (N0: 2.1, N2: 2.9, N5: 2.9). In the average of the measurement dates, the highest LAI value was measured at the N5 level (2.2). The evolution of LAI was 2.1 at the N0 level in 15th July, obtained 2.9 LAI value at the N2 level in 15th July, and finally obtained 2.9 LAI value at the N5 level in 15th July. This results obtained in this study demonstrate the advantages of Leaf Canopy Analyses System as an useful tool to estimate essential agronomic features, such as biomass and predict yield.

EVALUATION OF FACTORS INFLUENCING THE BIOACTIVE COMPOUNDS OF RED AND WHITE SORGHUM GRAINS

Róbert Nagy[1], Judit Remenyik[2] , Péter Sipos[3]

[1 3] University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Nutrition Science, Debrecen
[2] University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental

Management, Institute of Food Technology, Debrecen

Sorghum is one of the most widely grown cereals and contains numerous bioactive components, like phenols, flavonoids, vitamins, and bioactive lipids. Many of them have strong antioxidant property and play a great role in the prevention and regulation of several chronic diseases, like cardiovascular diseases, type 2 diabetes, and have anti-cancer, and anti-inflammatory effects as well. The amount of these compounds are influenced by factors like variety, genetical and environmental conditions, such as variety, soil, weather conditions and nutrition. Nitrogen is considered especially important in plant' grown, which can influence the composition of grains. In this study we analysed 6 sorghum varieties grown in Hungary (red and white) in 3 years. Grains were grown with (60 kg/ha) or without nitrogen fertilization. During the study we estimated total protein content using Kjeldahl method, while condensed tannin (CTC), total phenol content (TPC) and antioxidant capacity were assayed using spectrophotometric methods. Nitrogen addition didn't influence these values significantly, but we found significant ($P<0,05$) differences between varieties and years. Red varieties usually exhibited greater antioxidant activity compared to white ones. They contained a higher amount of phenolic components, condensed tannin, (7,1-fold and 7,4-fold higher) a flavonoid type compound being one of the most important among them. This can explain the higher antioxidant capacities. We found that there is great diversity among sorghum varieties and even between grains in the same colour group, especially for red sorghum. Furthermore, environmental conditions also can be an important factor for the accumulation of bioactive compounds.

SELECTION AND CARACTERIZATION OF CANDIDATE BIOCONTROL *TRICHODERMA* STRAINS ISOLATED FROM AGRICULTURAL SOILS

Viktor Dávid Nagy[1], László Kredics[1], Biljana Škrbić[2], Dejana Panković[3], Csaba Vágvölgyi[1]

[1]University of Szeged, Faculty of Science and Informatics, Department of Microbiology, 6726 Szeged, Közép Fasor 52., Hungary
[2]University of Novi Sad, Faculty of Technology, 21000 Novi Sad, Bulevar cara Lazara 1., Serbia
[3]Educons University, Faculty of Ecological Agriculture, 21208 Sremska Kamenica, Vojvode Putnika 87., Serbia
viktor.david.nagy@gmail.com

The European Commission of Food Safety decided to put efforts to reduce the use of chemical pesticides in agriculture by 50 % until 2030. Environmentally friendly approaches are required in witch Microbiological agents and their products may provide an appropriate solution.
Trichoderma species are filamentous fungi degrading plant residues in soil and may also promoting growth and inducing systemic resistance in plants. They are useful agents against plant pathogens – especially other fungi – through their antagonistic abilities, production of secondary metabolites, efficient competition for space and nutrients and eventually mycoparasitism.
We isolated 41 *Trichoderma* strains from carrot, tomato, pepper, batata and sweet tomato fields and identified them based on the sequence analysis of a partial sequence of *tef1α*. Cellulose degrading and phosporus mobilizing enzyme activities of the isolates were measured. Based on the enzyme activities and identification data, we selected 10 strains (*T. guizhouense, T. afroharzianum, T. atroviride, T. virens, T harzianum, T rodmanii, T ghanense, T. gamsii*) for further studies including the measurement of the effect of abiotic environmental factors, such as pH, temperature, water activity and heavy metals on mycelial growth. We also tested the production of antibiotic compounds by the isolates against Gram-positive and Gram-negative bacteria as well as their resistance to several fungicides. Biocontrol index (BCI) values and chitin degrading enzyme activity were also determined for the 10 selected *Trichoderma* strains.
Based on the data we selected several strains useful for different agricultural purposes.

This work was supported by the Interreg-IPA CBC Hungary-Serbia Programme (PLANTSVITA; HUSRB/1602/41/0031).

DEVELOPMENT OF CONVENIENCE PRODUCTS USING SORGHUM FLOUR

Jyoti Semwal[1], Chaima Neji[1], Dr. Peter Sipos[1]

[1]University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Nutrition, Debrecen

Sorghum is a sustainable crop from agro-economic perspective and has numerous health benefits. It contains fair amount of non-allergenic protein and phytochemicals, which makes it a suitable ingredient as functional food. Therefore, the present investigation was aimed at the development of convenience products using commercial sorghum flour (SF). Three products, namely, tortilla, pancake and crepe were developed using SF and wheat flour (WF) was used as the control. Tortilla was prepared using two types of dough: dough from untreated flour (UF) and cooked flour (CF). Flours were evaluated for techno-functional properties and products were subjected to color, textural and organoleptic evaluations. Results demonstrated that the SF exhibited significantly higher water and oil absorption capacity and lower water solubility index when compared to WF. Textural analysis showed higher extensibility for wheat dough (UF) compared with wheat (CF) and sorghum dough (CF). Burst-rig test of the products revealed that the sorghum tortilla (CF), pancake and crepe exhibited comparable breaking strength and extensibility as the control. Color measurement highlighted higher values of L* and b* and lower values of a* for wheat flour, dough and products than sorghum. Organoleptic evaluation showed that sorghum crepe was highly accepted among all the sorghum products. Sorghum crepe was on par with wheat crepe in terms of appearance, taste, texture and extensibility. Therefore, it can be concluded that the sorghum can be a potential ingredient for the preparation of convenience gluten-free convenience products, however, there shelf-life studies are the further aim of investigation.

IN VITRO PROPAGATION RESULTS OF SORBUS ARIA 'GRAN SASSO'

Máté Ördögh, István Dániel Mosonyi

Hungarian University of Agriculture and Life Sciences, Institute of Landscape Architecture, Urban Planning and Garden Art, Department of Floriculture and Dendrology

In this study, we want to find the best media type during *in vitro* multiplication and rooting of *Sorbus aria*'Gran Sasso', additionally, to eliminate endogenous bacterial contaminations with the use of silver nitrate ($AgNO_3$). Prepared buds or single nodes from twigs or shoot tips were successfully surface sterilized in different ratios (41.8 and 90.9%), and produced significantly more and longer shoots on half-strength Murashige and Skoog (1962) medium with 20 g/l sucrose, 7 g/l agar, plus various doses of meta-topolin (mT), benzylaminopurine (BA) and benzylaminopurine-riboside (BAR). The best cytokinin concentrations/types were 0.4 mg/l BA and 0.8 mg/l BAR (effected 6.2 and 9.6 shoot reached 31.8 and 35.8 mm). In case of hormone-free medium, the number of shoots was only 1.7 with 22.3 mm length. On the other hand, 0.1 and 0.2 mg/l mT increased the leaves' length (up to 22.9 and 22.2 mm) and 0.1-0.4 mg/l KIN resulted the highest total chlorophyll contents (2002-2900 μg/g), however, the hardest (0.8 mg/l) concentration decreased these leaf parameters in every cytokinins. Thus, BA and BAR stimulated shoot proliferation better than KIN and mT (which were more effective for leaf development). We observed the best rooting values (3 and 3.6 root) on hormone-free media contained 0.5 and 0.75 g/l activated charcoal (AC), but induction (as pre-treatment with the use of 15 mg/l IBA auxin supplementation until 24 or 72 hour) was essential. Additionally, longer induction time resulted longer (80-121.8 mm) roots and higher rooting ratio (up to 28%). Culturing period (after induction: 2, 3 or 4 month) also affected shoots' length: if plants had more time, they produced longer (34.22-37.6 mm) shoots. The use of $AgNO_3$ in different dosages (0.5-5 mg/l) moderately reduced endogenous bacterial contamination, but higher concentrations (especially from 2 mg/l) definitely shortened shoots and leaves.

EFFECTS OF FLUORESCENT LAMP AND TWO DIFFERENT LED LIGHTING ON THE RELATIVE WEIGHT OF HATCHING EGGS AND ONE DAY OLD CHICKENS IN BROILER BREEDING PAIRS

Tibor István Pap, Rubina Tünde Szabó, Mária Kovács-Weber

Hungarian University of Agriculture and Life Sciences, Institute of Animal Husbandry Technology and Welfare, Department of Animal Husbandry and Welfare, Páter Károly u. 1, Gödöllő, Hungary (paptiboristvan@gmail.com)

Light has a significant effect on the reproduction of birds. In addition to the length of illumination, the wavelength of light can also play a significant role. Our study was to investigate two different wavelength LEDs (LED1: UV supplement, light intensity between 500-650 nm, 50% compared to LED2) of broiler breeding pairs and a fluorescent lamp (FL) in a large-scale, deep litter (6000 birds/house- 6 birds/m^2 - 9:1 sex ratio). The breeding egg weight (weight of 162 breeding eggs per group) and the relative weight of hatched chickens (weight of chickens hatched from 162 breeding eggs under the same hatching conditions in proportion to the weight of eggs per group) at 23, 31, 39 and 47 weeks of age were investigated.At 23 weeks of age, the highest egg weight was measured in the FL group (50.02 g). At 31 weeks of age, the LED2 (60.25 g) group had the highest egg weight, with significant differences ($p<0.0001$) between LED1 (58.25 g) and FL (59.85 g) and between LED1 and LED2. At 39 weeks of age, the LED1 group (64.89 g) achieved the highest egg weight, with a significant difference ($p<0.05$) between LED1 and FL (63.22 g) and between LED1 and LED2 (63.75 g). At 47 weeks of age, LED2 (65.94 g) achieved the highest egg weight. The relative weights of hatched chickens were highest at 23 weeks of age in the LED1 group (68.7%), at 31 weeks of age in the LED2 group (69.5%), at 39 weeks of age in the LED1 group (66.9%), and at 47 weeks of age in the LED1 group (69.5%).Although the highest egg weights were not always found in LED-lighted birds, the relative weights of hatching chickens were still the most prominent in LED1 and LED2 groups.

CHARACTERIZATION OF INDIGENOUS WILD COLORED HUNGARIAN DUCK AND THEIR POTENTIAL FOR EGG AND MEAT PRODUCTION

Lan Phuong TN[12], Bódi László[12], Bócsai Andrea[1], Csicsely Anikó[1], Dong Xuan DT[2], Szalay I.T[2]

[1]National Centre for Biodiversity and Gene Conservation – Institute for Farm Animal Gene Conservation (NBGK-HGI)
[2]Association of Hungarian Animals Gene Conservation (MGE)

Indigenous wild colored Hungarian duck originated from Carpathian Basin and have been bred in Hungary for centuries. Currently, two varieties (vadas and dusnoki) are maintained in the *in vivo* gene bank. This study aimed to evaluate and compare their important productivity, meat, and egg quality traits. Their survival rate was relatively high (97.5% to 100%). At the age of 12 weeks, their body weight ranged from 2.59 - 2.93kg (female) to 3.06 - 3.55kg (male). Daily feed intake and feed conversion ratio were 163.36 - 149.86g, 4.51 - 5.59 kg/kg for males and 183.76 - 180.45g, 4.49 - 4.89 kg/kg for females, respectively. Their carcass, breast, and thigh weight were 2.38 - 2.98kg, 267.5 - 314.2g and 385.5 - 506.5g respectively. Their 1st egg lay started at the age of 28 weeks and lasted approximately 8 months. Egg production reached 50% by 37-38 weeks of age and remained above 50% for 20-21 weeks. Fertility and hatchability were 92.0 - 92.3%, 79.0% - 80.3%, respectively. Dusnoki ducks have better growth performance than vasdas variety. Significant difference between two varieties could not be seen in egg production. Utilization of wild colored Hungarian duck for meat and egg production is potentially promising.

WATER QUALITY INVESTIGATION OF DUG WELLS IN VISNYESZÉPLAK AND GYŰRŰFŰ ECO-VILLAGES

Viola Judit Prohászka[1], Eszter Kovács Tormáné[2], János Grósz[3], István Waltner[3]

[1]Hungarian University of Agriculture and Life Sciences, Institute of Landscape Architecture, Urban Planning and Garden Art
[2]Hungarian University of Agriculture and Life Sciences Institute for Wildlife Management and Nature Conservation
[3]Hungarian University of Agriculture and Life Sciences, Institute of Environmental Sciences

Nowadays, the good quality of subsurface water is crucial all over the world, including Hungary. In areas, where no running water is available and the inhabitants use dug wells for water for their everyday life, paying attention to water quality is extremly important. Visnyeszéplak and Gyűrűfű are such areas. These are the two oldest eco-villages in Hungary, where the inhabitants apply nature-friendly farming. Both research areas are located in South-West Hungary, in South-Zselic micro-region, as part of the settlement of Visnye and Ibafa. Approximately 180 people (35 families) live in Visnyeszéplak and 30 people (10 families) in Gyűrűfű. In Visnyeszéplak most families have dug wells (all in all 33), but in Gyűrűfű there are only 4 dug wells. Between October 2020 and November 2021, a total of 34 dug wells (Visnyeszéplak: 30; Gyűrűfű:4) were examined 7 times, based on 8 parameters (temperature, pH, dissolved oxygen, conductivity, nitrite, nitrate, ammonium, phosphate). The measurements were performed on site, using by a photometer, pH meter, dissolved oxygen meter, conuctivity meter and temperature meter. The last two measurements were carried out within the ÚNKP grant agreement. From the results, nitrate, nitrite and ammonium values were analyzed for this conference. We used the 201/2001. (X. 25.) on the quality requirements of drinking water and the order of control for the determination of the limit values. Based on this, 47% of the wells in Visnyeszéplak are above the limit value in terms of nitrate, while in the case of Gyűrűfű it is 25%. In the case of nitrite, on the other hand, the values did not exceed the limit value in Gyűrűfű and values above the limit were measured only 4 times in Visnyeszéplak, too. In the case of ammonium, 27% of the wells in Visnyeszéplak were above the limit value on average, and in Gyűrűfű 25%.

THE GENETIC DIVERSITY ASSESSMENT OF NEW POTATO VARIETIES OF DIFFERENT MATURITY GROUPS BY SSR MARKERS

L. Prysiazhniuk, T. Sonets, Yu. Shytikova, S. Hryniv

Ukrainian Institute for Plant Variety Examination

Ukraine is one of the five world leaders in potato (*Solanum tuberosum* L.) production – 22 million tons of tubers on an area of 1.5 million hectares. Around 40 varieties are applied for DUS (distinctness, uniformity and stability) examination annually. In this case the increasing of number new varieties requires the involving the additional molecular methods for manage refence collection within DUS test. The simple sequence repeat (SSR) markers have proved to be highly efficient and reproducible, and allow the rapid differentiation of potato varieties.

Twenty-four potato varieties of different maturity groups (very early, yearly, medium, late) were investigated by 8 SSR markers (STM0019, STM3009, STM2005, STM2028, STM3012, STM3023, STM5136, STM5148) for genetic diversity assessment. PIC for each of SSR marker was detected in order to evaluate markers set ability of varieties differentiation. To assess the genetic diversity of studied varieties, the cluster analysis was performed and the genetic distances between varieties were determined.

As results of PCR analysis from 6 to 10 alleles were determined by each marker with an average of 7.88 alleles. The most polymorphic marker was STM2028 with PIC 0.89. The lowest value of PIC (0.78) was obtained for STM3012 marker. For other studied markers values of PIC were from 0.82 to 0.88. Thus, the high values of PIC demonstrate rather uniform allele distribution. As results of cluster analysis, 8 clusters were obtained. It is determined that the most similar varieties by studied markers are varieties with genetic distance 3.74: Pravda and Riviera, Pravda and Vzirets. Pravda and Riviera varieties are located in the one cluster; Vzirets variety is in adjacent cluster. The most different varieties turned out to be Vzirets and Lilly varieties with genetic distance 6.00. Thus, it was found that the major of studied varieties formed cluster grouts according their maturity groups; the similar varieties by studied SSR markers are belonged to one maturity group – very early.

SAFETY AND STABILITY OF PLANT-BASED MILK – CAN PREDICTIVE MICROBIOLOGY HELP?

Maha Rockaya[1], Mariem Ellouze[2], József Baranyi[1]

[1]Doctoral School of Food Science and Nutrition, University of Debrecen
[2]Nestle Research, Lausanne, Switzerland

Plant-based milk has become an important commodity for the health-conscious segment of consumers. While its health-benefits are widely documented, much less is known about its microbiology, from either safety or spoilage point of view.
Predictive food microbiology was born in the ‘80-s for the very objective to draw predictions from microbiological experiments in laboratory media to bacterial kinetics in food environment. While it has been proven to be practical and useful for wide range of food products, among them bovine milk and infant formulae, it does need at least some experiments relevant to the specific food in question which allows its results to be extrapolated to new areas.
In this talk, we summarize what data are available for this research and how we could integrate them into a database with well-defined ontology. A properly set-up database is key to find patterns in the data and to draw conclusions and predictions. It also helps to find gaps and fill them with new laboratory observations. Predictive modelling and computational means will be decisive for a scientifically proper exploration of the issue with the microbiology of plant-based milk.

EURASIAN WOODCOCK MONITORING IN HUNGARY BETWEEN 2009‑2021

Gergely Schally[1], Sándor Csányi[1]

[1] Department of Wildlife Biology and Management, Hungarian University of Agriculture and Life Sciences, H-2100, Páter Károly u. 1., Gödöllő, Hungary

To preserve the traditional spring hunting of the Eurasian Woodcock (*Scolopax rusticola*) in Hungary, while also assuring its sustainability, a monitoring program was maintained with the coordination of the Hungarian Hunters' National Association. The primary goal of the program was to estimate the size of the migrating population in the country based on synchronized census data and to track its long term changes.

The program was maintained successfully with national coverage in the last 13 years, and it was based on synchronized roding surveys performed weekly, 12 times each spring. The observers used standardized paper forms to record data on the number of contacts (woodcocks seen and/or heard). Hunting of woodcock between 2010–2021 was only allowed for the participants of the monitoring program with strict regulation and obligatory sample collection from each bird. The main purpose of sample collection was to assess the sex- and age structure of the population and to evaluate their trends.

According to the results, no significant trend could be observed either in the population size or the sex- and age composition between 2009 and 2021. The proportion of males was above 75% each year, while the proportion of first-year birds and adults was almost identical in the annual hunting bags. The measure of harvesting was very low, compared to the size of the population, and it had no significant, detectable impact.

GENETIC VARIABILITY OF MAIZE GENOTYPES FOR GROWTH, YIELD, AND YIELD COMPONENTS

Mohamed[1,2], Ahmed Ali [3], Rania Alrasheed[1.,4] Akasairi Ocwa[1,5], Janos Nagy[1]

[1] Institute of Land Utilisation, Technology and Regional Development, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, 138 Boszomenyi street, 4032, Debrecen, Hungary.

[2]National Center For Research - Medicinal and Aromatic Plants Research and Traditional Medicine Institute. Department of Agrotechnology-Mac Nimir Street -P.O.Box 2404 Khartoum - Sudan.

[3]Sudan University of Sciences and Technology, College of Agricultural, Department of crops production-p.o Box 407-Khartoum -Tel@83771514-Fax@83778639-sca@sustec.edu.

[4]Environment,Natural Resources and Desertification Research Institute, National Center for Research, Sudan- Mac Nimir Street -P.O.Box 2404 Khartoum -Sudan.

[5]Department of Agricultural Production, Faculty of Agriculture, Kyambogo University P.O. Box 1, Kyambogo, Kampala, Uganda.

Corresponding author: hajer.mohamed@agr.unideb.hu

Global changing crop growth conditions dictate selection of well adapted crops. Therefore, a study of selected maize genotypes (*Zea mays* L.) at demonstration farm of College of Agricultural Studies, Sudan university of science and technology shambat in 2010 was carried out to determine of genetic variability for growth, yield and yield components using a randomized complete block design with three replications.

The parameters assessed included investigate the phenotypic and genotypic variances, genetic coefficient of variation (GCV%), heritability(h^2) and genetic advance (GA). The results showed high significant differences in days to 50% tasselling and silking, leaf area, stem diameter. Non-significant differences were observed for, plant height, Number of leaves per plant, length of cob, weight of grains per plant, 100-grain weight, number of grains per cob and grains yield per hectare. The highest genetic coefficient of variation (339.1%) was obtained for leaf area whereas the lowest (0.35%) for the number of leaves per plant The high estimated heritability (h^2>60%) were recorded for days to 50% tasselling and silking while the lowest estimated (h^2<40%) for leaf area, stem diameter, plant height, length of cob, number of leaves per plant, 100-grain weight, number of grains per cob.

VARIABLE NITROGEN AND ZINC NUTRITION EFFECTS ON RELATIVE CHLOROPHYLL CONTENT OF DIFFERENT MAIZE GENOTYPES

Attila Simko, Szilvia Veres

University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Crop Sciences, Department of Applied Plant Biology, Debrecen, Hungary
simko.attila@agr.unideb.hu

In agricultural production due to the environmental requirements, improving the quality of crops is becoming more and more important. Nitrogen (N) is the most widely applied fertilizer worldwide, while zinc (Zn) plays a crucial role as well in physiological processes and important in the improvement of yield quality. An experiment was set for the examination of Zn supply on maize (*Zea mays* L.) genotypes with different nitrogen use efficiency. Plants were grown under controlled conditions on a hydroponic system, and five different $ZnSO_4$ concentrations and two in case of N were applied in the hydroponic solution. Relative chlorophyll contents were recorded with SPAD-502 weekly, three times during experiment on the oldest and youngest fully developed leaves.
At the first sampling time significant difference was found between N levels and genotypes. Higher SPAD values were observed in P9903 genotypes, under reduced N level on both examined leaves. At second sampling time significantly higher values was observed in case of reduced N and in P9903 on the younger leaves. At the third sampling time reduced N caused decrease in the oldest leaves SPAD values, but the value was higher in P9903, than in X, as found before. At the earliest growth stages N deprivation has no negative effect on relative chlorophyll content but genotypic variations can be observed already at younger plants. Based on these results no strong correlation between the reduced N application and Zn nutrition at this early growth stage of maize plants.
Acknowledgements: Supported by ÚNKP-21-4 National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation Fund. Project no. TKP2021-NKTA-32 has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary, financed under the TKP2021-NKTA funding scheme.

ASPECTS REGARDING THE ROLE OF INVESTMENTS AND THE BUSINESS ENVIRONMENT IN ECONOMIC DEVELOPMENT

Claudia Sîrbulescu, Luminiţa Pîrvulescu, Iasmina Iosim, Andrea Feher, Ciprian Rujescu

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism, 119 Calea Aradului, 300645, Timisoara, Romania

The paper presents an analysis of investments as the safest prospect for economic growth. In Romania, investments are needed to recover the economic gaps compared to the European Union countries, but also to reduce the differences between the regions.
Sustainable development of the country must solve the challenges of the transition from the industrial to the digital economy, of adapting and combating climate change, of demographic change, to which must be added the corrections of economic imbalances due to the consumption-based growth model.
Investments can be made by the business environment (large companies, consortia, multinationals) operating in Romania. Investments can also be made through projects that are funded from the European Union budget.
Investment stimulates job-creating economic sectors that will generate economic growth.
First of all, the investments must be financed by allocating funds through domestic possibilities, to which is added the attraction of foreign direct investments. An important role in this regard belongs to the legislative framework created which determines the removal of barriers to investment, but also to the attraction of Romania's economy which is different from one economic sector to another.
In the article, the authors presented the main aspects of investments and aimed to highlight the effect of investments on the business environment.

EFFECT OF PRECISION MAIZE PLANTING FOR CROP GROWING AND YIELD

István Sojnóczki[1]

[1] University of Debrecen, Kerpely Kálmán Doctoral Scool

Corn is very sensitive to environmental influences during germination. The germination period of maize is related to the quality of planting.
The latest precision technologies can be well applied to corn planters. I will present the effects of new precision planter systems for crops in my presentation. These effects are measurable on maize germination homogeneity, maize plant growth, and yield. New precision systems make plant to plant different setup on the planter. Precision systems work based on real-time data, precision systems work automatically. Precision systems adapt to the condition of the soil.
In my presentation I present a 2-season trial of a new corn planting technology solution from 2020 and 2021. My testing system is new. I did the planting in 4 different tillage systems. I worked on 1 parcel with conventional tillage (rotation) and 3 different plots without rotation (reduced tillage system, soil protection tillage system and strip tillage system). I present the results of innovative tillage systems and new planting technology in Hungary. These results are useful for practice.
My presentation shows that homogeneous germination has a significant effect on the yield potential of the crop. I measured the germination of the crop according to the sowing method and tillage method. I marked the plant with different germination times. I measured the unique product of each marked plant. The precision seed drill has a great effect on homogeneous germination. The results of my research show: more homogeneous crops will be, if we use a new system of planting technology.

STUDY ON EFFICACY OF IMMUNOBIOTIC IN BROILERS DIET

Stella Szabó[1], Rubina Tünde Szabó[1], János Fehér[3], Béla Podmaniczky[2], Mária Kovács-Weber[1]

[1] Institute of Animal Sciences, Hungarian University of Agriculture and Life Sciences, Department of Animal Husbandry Technology and Welfare, Szent István Campus, H-2100 Gödöllő, Páter Károly u. 1., Hungary
[2] AgriSearch Hungary Kft., H-2119 Pécel, Hősök útja 85.
[3] NutriPharma Hungaria Kft., H-1021 Budapest. Tárogató lejtő 8.

Our aim was to investigate the substitutes of the antibiotic growth promoters (AGPs), therefore lysed probiotic bacteria and micronized polysaccharide (immunobiotics) were included in the compound feed of broiler chickens. COBB500 hybrids were divided in four groups (n=∑480); into experimental (T♀, T♂; 2 g/kg immunobiotics) and control (K♀, K♂; no additive). We examined live weight, weight gain, feed consumption and feed conversion. During the entire rearing period (42 days), the immunobiotic was added to the feed. Regarding the examined parameters, it can be stated that they were fluctuated throughout the rearing period. However, by the day 42nd, the following results were clear: In terms of live weight, the treated group achieved better results in both sexes (T♂: 2515,6 g, T♀: 2482 g, K♂: 2482,4 g, K♀: 2375,4 g). T♀ achieved an average weight of 107 grams higher than K♀. The same result was obtained for weight gain (T♂: 2472 g, T♀: 2439,9 g, K♂: 2439,9, K♀: 2332 g). T♂ (4257,4 g) consumed an average of 70,9 grams less feed than K♂ (4328,3 g), while K♀ (4227,5 g) achieved better results with an average of 10 grams, than T♀ (4237,7 g). In the case of feed conversion, the treated groups also performed better, with an average of -0.04 kg/kg for both sexes (T♂: 1,72 kg/kg, T♀: 1,74 kg/kg). In the current difficult economic situation, the results achieved with the addition of feed realize a profit of about HUF 252,000 in the case of 10,000 broiler chickens.

EXPERIMENTS OF SWEETPOTATO *[IPOMEA BATATAS (L.) LAM.]* CULTIVATION TECHNOLOGIES IN SOUTH HUNGARY IN 2021

Adrienn Szarvas[1], Tamás Monostori[1], Klára Tóth Marótiné[2], Zsuzsanna Ábrahám Táborosiné[2], Róbert Bráj[2]

[1]University of Szeged, Faculty of Agriculture, Hódmezővásárhely, Hungary
[2]Hungarian University of Agriculture and Life Sciencis Institute of Horticulture Vegetable Research Centre, Szeged Research Station

One of the biggest problems of domestic crop production is that the sowing structure is limited to a few large crops. However, under certain field conditions it is possible to grow special plants, such as sweet potato (*Ipomoea batatas* (L.) Lam.). Sweet potato is an important crop in many parts of the world. Following rice, wheat, potato, maize and cassava, sweet potato is the sixth most important food crop in the world. In Hungary, sweet potato is cultivated for thirty years, but it became well-known in the last five years only. In Hungary the storage root yields ranging between 20 and 25 ha^{-1}, depending on the production site and the applied technology. The experiments was conducted in Deszk and in Ötthalom.

The seedlings derived from the Bivalyos Tanya Family Farm. For the experiments, we used the Ásotthalmi-12 orange-fleshed sweet potato variety. The experimental plots were harvested on the middle of October. The aim of our work was to compare the cultivation technology in two different soil types in two different places. In Deszk we have clay loam soil of medium to very good nutrient content, in Ötthalom the soil type is meadow chernozem soil of medium nutrient content.

We evaluated the yields given by the experiments set up in Deszk and Ötthalom. In the case of sweet potato transplants planted with a 100 x 30 cm set-up in both places, the highest average yield was observed in Deszk (28,05 t ha^{-1}), followed by the average yield in Ötthalom (23,17 t ha^{-1}). In both area we got good yield result, but we had problem with the soil born insects like wireworms. Because of this wireworm damage we could not sell our tubers first class production and it caused us significantly less incomes.

The research was supported by the "VP3-16.1.1-4.1.5-4.2.1-4.2.2-8.1.1-8.2.1-8.3.1-8.5.1-8.5.2-8.6.1-17" Rural Development Program, in connection with the grant document with the identification number 1924527185.

EVALUATION OF INDIVIDUAL AND COMBINED USE OF PLANT CONDITIONERS WITH PHOTOSYNTHETIC AND GROWTH PARAMETERS

Szőke Zsombor, Veres Szilvia

Department of Applied Plant Biology, Institute of Plant Science, Faculty of Agriculture, Food Science and Environmental Management, University of Debrecen, Boszormenyi street 138., Debrecen, Hungary

Due to the continuous subtraction of pesticide active ingredients, the focus of producers are increasingly shifting to the efficient use of yield-enhancing and conditioning agents. In our experiment, we are investigating the effects of plant conditioners and yield-enhancers in production of nursery-gardens and reference plantations, which are based on photosynthetic and growth parameters of saplings and productive stocks. The one-years old apple sapling was UEB 3177/1 variety, usually called Sirius. In addition to the growth parameters (such as size of shoot and trunk), the total chlorophyll and carotenoid content which are determines photosynthetic activity were also examined in both nursery-gardens and reference plantations. The individual and combined application of yield-enhancing and conditioning agents are involved a total of six treatments. The application of iron and humic acid alone or in combination resulted a significant difference in total chlorophyll content compared to the control stock. In the case of the studied growth parameters, the combination of the flavonoid and humic acid containing preparations and the sole use of flavonoid agent proved to be the most effective in the longitudinal growth of the sapling. In the terms of trunk size, the combination of the same formulation proved to be the best treatment compared to the control stock.

Project no. TKP2021-NKTA-32 has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary, financed under the TKP2021-NKTA funding scheme and from New National Program of Excellence 21-2.

PREPARATION OF A PROBIOTIC, MILK-FREE BEVERAGE FROM CARROT JUICE

Nirmeen Tahboub[1], Judit Krisch PhD[2], Prof. Kornél Kovács[3]

[1]Institute of Biology, University of Szeged
[2]Institute of Food Engineering, University of Szeged
[3]Department of Biotechnology, Institute of Biology, University of Szeged

Probiotics have several advantages for human health. Since most of the probiotic foods are dairy products, they cannot be consumed by humans who are vegans, allergic to milk proteins, or have lactose intolerance. While looking for alternative food matrices, the suitability of carrot juice as a raw material for the production of probiotic food with *Lacticaseibacillus casei* and *Levilactobacillus brevis*, and a mix culture of both the strains was investigated. Sterilized fresh carrot juice was inoculated with the above mentioned probiotics and bacterial growth, pH changes and antioxidant status were examined during the fermentation. Both LAB strains were capable of growing well in the carrot juice supplemented with 1 % (v/w) glucose. Moreover, 10^7 CFU/ml initial cell concentrations of the three experimental probiotic solutions resulted in 10^8 CFU/ml after 24 h of inoculation, and were kept viable up to the end of fermentation (72 h). Due to intense metabolism of the bacteria strains, carrot juice media were acidified to a pH level of less than (4.5). Antioxidant status were measured by the ferric reducing power (FRAP) and radical scavenging potential (DPPH). Total phenolic content and total carotenoid content were also determined. Fermentation with the probiotics increased the antioxidant power of the carrot juice.

SWEET POTATO (*IPOMOEA BATATAS* L.) LEAVES: BIOACTIVE CONSTITUENTS AND SHELF-LIFE

Judit Tarek-Tilistyák[1], István Hegedüs[2], Zoltán Cziáky[1], Mohamed Tarek[1]

[1] University of Nyíregyháza, Agricultural and Molecular Research and Service Institute, H-4400 Nyíregyháza, Sóstói Str. 31/b., judit.tilistyak@gmail.com
[2] Nyírségi Édesburgonya ZRt., H-4600 Kisvárda, Rákóczi Str.14/b., histvan2012@gmail.com

As a part of our project of complex utilization of sweet potato we aimed to evaluate the the green biomass' quality, through macrocomposition, colour characteristics, bioactive constituents, and inorganic elements. The shelf life examination included raw sweet potato leaves sealed in plastic packs were stored at 6°C on and 12°C and the microbiological characteristics were monitored for 2 weeks, through measuring of mesophil total plate count, total fungi count. We found, that the sweet potato leaves can be considered as the source of calcium, magnesium and phosphorus among the minerals, of which calcium is the most abundant. We identified 17 types of amino acids, 7 vitamins, mainly vitamins belonging to the Vitamin B family. In addition, it contains carboxylic acids, flavonoids, polyphenols and aromatic compounds. The sweet potato leaves stored at 6°C was of satisfactory microbiological quality on day 14. Our data suggest that the sweet potato leaves could be a valuable source for healthy nutrition.

TEMPOROSPATIAL CHARACTERISTICS OF WILD BOAR ROOTING DAMAGE IN MAIZE FIELDS

Tamás Tari[1], Attila Horváth[1]

[1] University of Sopron, Institute of Wildlife Biology and Management, H-9400 Sopron Bajcsy-Zs. str. 4., tari.tamas@uni-sopron.hu

Damage caused by wildlife species in agricultural areas has increased in recent decades in Hungary. This trend is causing significant problems between wildlife managers and farmers. Big game species (wild boar, red deer and fallow deer) damage agricultural crops through their feeding and movement. In maize fields, rooting damage by wild boar after sowing is a major concern. Several factors can influence the occurrence of damage, and we wanted to avaulate these in our study. The study was carried out in Győr-Moson-Sopron county, western Hungary, on a 5400 ha hunting area for two years. The forest cover of the study area was less than 10%, and the annual wild boar utilisation averaged 118 animals over the two years. The maize fields were visited periodically after sowing. We measured the distance of the rooting damage from the field edges in every 20 m, and we measured the length of the damaged edges as well. We also surveyed the crop in adjacent fields. We recorded the position of the hunting stands and the number of hunting occasions and hours spent hunting. These were used to determine the spatial and temporal patterns of rooting damage, as well as the effects of hunting pressure and the impact of adjacent areas.
Acknowledgements: The publication was supported by the project GINOP-2.3.3-15-2016-00039".

PRELIMINARY RESULTS IN SELECTION OF NATIVE SALT TOLERATING PLANT SPECIES

Andrea Tilly-Mándy[1], Ildikó Kohut[1], Károly Ecseri[2], István D. Mosonyi[1], Zsuzsanna Turi-Farkas[2], Lajos Magyar[1]

[1] MATE Deptartment of Floriculture and Dendrology, Budapest
[2] Neumann János University, Kecskemét

Secondary salinity is spreading all over the world today approximately 20% of soils of the whole globe is more or less saline. This problem afflicts not only the agriculture but, even the green areas of the cities, because most of the ornamental species hardly or completely do not tolerate saline or sodic soils. More than 80% of saline areas of Europe belongs to Hungary, most of them are primary salinity. These areas are rich in salt and drought tolerant species, some of them can have high ornamental value.

In our research, we tried to select lines with high ornamental value of three Hungarian native taxa: *Inula Britannica* L., *Limonium gmelinii subsp. hungaricum* (Willd.) Kuntze and *Tripolium pannonicum subsp. pannonicum*. Best result we obtained with *Tripolium pannonicum subsp. pannonicum* (Jacq.) Dobrocz., a dwarf, richly flowering selection with short flower stems. The vegetative propagation of the plant is more or less easy from sprouts. The self-pollination is limited, most of the seeds are sterile. The progey of very few seeds do not keep this short growing feature. The selection of special habitat of *Limonium gmelinii subsp. hungaricum* started with the seed collection from selected plants in the nature. From these populations we have dwarf and rounded leaf plants and lines. We selected dwarf and high, richly flowering lines from *Inula britannica* cultivated population as well. The examination of progeny did not show the expected features, further selection is needed.

LOCAL GASTRONOMIC BUSINESS - PREMISE FOR THE DEVELOPMENT OF ROMANIAN GASTRONOMIC TOURISM

Toader Cosmina-Simona[1], Feher Andrea-Ana[1], Orboi Manuela-Dora[1], Crainic Daniela[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism, Romania
*Corresponding author's e-mail: cosminatoader2003@yahoo.com

Currently, most tourist destinations in the world are establishing strategies to develop the culinary identity of their territories and to promote local cuisine, based on the fact that gastronomy can have a great influence on the decisions of tourists in choosing tourist destinations. Therefore, the gastronomic specificity of a destination can attract tourists interested in authenticity, specificity and new experiences from a gastronomic point of view.
The gastronomic businesses are some of the most successful businesses, and this is due to a constant demand, which is based on ensuring the need for food.
In Romania, the concept of local gastronomic point was recently introduced. The purpose of the local gastronomic points is the integration of gastronomy and tourism in order to support the local economy. The local gastronomic points can be seen as an invitation to discover the local products, prepared in the Romanian rural kitchens. The local gastronomic points meet the gourmets, the people interested in gastronomic experiences, eager to know and enjoy the specific dishes of the local cuisine, the traditions and customs of the locals, the culture of food preparation.
The gastronomic heritage on the Romanian territory is rich and varied, and represents an element of the Romanian cultural identity. Gastronomy, as part of the national cultural profile can be an engine in the development of the local economy, through local gastronomic points, and involves the practice of gastronomic tourism.
In this article, the authors aim to present the current situation of local gastronomic points in Romania and their importance in the development of gastronomic tourism.

THE EFFECT OF TOXIC ELEMENTS ON THE MICROANATOMY OF THE LEAVES OF THE *SALIX ALBA* L.

Csilla Tóth, Katalin Irinyiné Oláh, Zsuzsanna Uri, Szabolcs Vigh, György Vincze, László Simon

University of Nyíregyháza, Institute of Engineering and Agricultural Sciences, H-4400 Nyíregyháza, Sóstói Str. 31/b.

We started an experiment with plastic growing pots on soil contaminated with toxic elements on a plant species with woody stem (white willow) tolerant to stress factors. Our aim was to examine the effect of toxic elements on the microanatomical parameters of the leaves of the tested plant. We examined the following parameteres: stomatic density, stoma width and lenght, leaf thickness, adaxial and abaxial epidermis thickness, mesophyll thickness, palisad and spongy parechyma thickness, main vein width and lenght. The experiment had the following results: with the presence of toxic elements, the thickness of the leaf increased, within this, there was a significant growth in the thickness of the spongy parechyma. The width and the length of the main vein decreased, so did the extent of the xylem cavities. The extent of the collenchymal stock of the leaf venetion increased. The number of stomas increased, but the size of the stomas decreased. As a result of toxic element contamination, the number of Ca-oxalate crystalts increased within the leaf mesophyll.

QUESTIONNAIRE SURVEY ON SUPPLEMENTARY FEEDING OF ROE DEER (CAPREOLUS CAPREOLUS) IN THE HUNGARIAN GREAT PLAIN

Gergely Tóth[1,2], Krisztián Katona[1]

[1]Hungarian University of Agriculture and Life Sciences, Institute for Wildlife Management and Nature Conservation, Department of Wildlife Biology and Management, H-2100, Gödöllő, Páter K. u. 1., HUNGARY
[2]Ministry of Agriculture, Department of Game Management, H-1055, Budapest, Kossuth Lajos Square 11., HUNGARY

Supplementary feeding of roe deer (*Capreolus capreolus*) is common in Hungary, expecting improveness of this species condition. However, intensive feeding can also have negative effects. For a better understanding of the reasons behind this tradition, we conducted a questionnaire survey at 23 game management units in the Hungarian Great Plain in the hunting year 2018/2019. Our questions were: 1) are they supplementing the roe deer, and if yes; 2) at which time of year, and for how long period; 3) how much feed are they providing; 4) what is the proportion of different feed types; 5) how many feeders do they obtain and 6) whether they suppose a positive effect of supplementary feeding on roe deer population?
Our results showed that all respondents feed roe deer in autums and winters. At 17% of the areas feeding starts in September, 57% in October, 22% in November. At 22% of the areas feeding period closes in February, 61% in March, 13% in April. The all outsourced feed for deer reached 280.8 tons per year. The most important feed were corn (58%), wheat (19%), oat (9%) and pelleted food (5%). Additionally, 401.6 tons of feed in small game feeders could also be accessible for roe deer. During a feeding period, an average of 419 kg of feed was provided in a deer feeder. All respondents, except one, answered that supplementary feeding had a positive effect, but they did not know how to prove it. The effectiveness of this practice should be investigated.

THE RELATIONSHIP BETWEEN DIFFERENT LITTER MATERIALS AND FOOT PAD DERMATITIS

Tóth Márk[1]; Dr. Balláné Erdélyi Márta[1]; Dr. Kovács-Weber Mária[2]

[1]Hungarian University of Agriculture and Life Sciences, Feed Safety Department, Páter Károly Str. 1., H-2100 Gödöllő, Hungary
[2]Hungarian University of Agriculture and Life Sciences, Department of Animal Husbandry Technology and Animal Welfare, Páter Károly Str. 1., H-2100 Gödöllő, Hungary

Today, the appearance of foot pad dermatitis and the associated loss of production and income are a major problem in large-scale poultry farming. The third most valuable part of a broiler chicken is the legs, so the perfect condition of the legs is essential (very important?) for the sale, otherwise they cannot be sold.

Apart from the economic aspect, the farmers also suffer damage that is very difficult to quantify in monetary terms. Animals with foot pad dermatitis (FDP) eat, drink and move less and their bodies are exposed to a constant inflammation, all of which cause a serious loss of income. In addition, animals loaded with FDP die more likely due to secondary infections. Studies have shown that flocks with 40-90% affected.

We must therefore strive for prevention, for which the use of the right litter is essential. The quality of the litter material has been shown to be related to the development of FPD, as the high moisture content of the litter contributes to the softening of the legs. However, it is not only these properties that must be met for well-selected litter. In addition, the appropriate litter is cost-effective, easy to obtain, contributes to the development of near-natural behavior (powder bathing, etc.) and does not promote the development of health problems (foot ulcers, intestinal obstruction, toxicosis, etc.). There are used so many different litters are used in the world which I want to compare in terms of the incidence of FDP.

INVESTIGATION OF UDDER EDEMA IN A LARGE-SCALE DAIRY FARM IN HUNGARY

Violetta Tóth[1], Myrtill Gráff[1], Edit Mikó[1], László Gulyás[2]

[1] University of Szeged Faculty of Agriculture: Institute of Animal Sciences and Wildlife Management, Address: 6800 Hódmezővásárhely, Andrássy street 15., Hungary
toth.violetta@mgk.u-szeged.hu
[2] István Széchenyi University, Faculty of Agricultural and Food Sciences Department of Animal Science, Address: 9200 Mosonmagyaróvár Vár square 2., Hungary

Mastitis is the most common and most costly disease of dairy cows, so great emphasis should be placed on its prevention. There is evidence that udder edema is a predisposing factor for mastitis. Udder edema is specific to cattle breeds with high milk production. In order to maintain proper udder health and avoid mastitis, it is important to prevent the udder from being edematous. The studies were performed in the Holstein-Friesian herd of a large-scale Hungarian dairy farm. The severity of udder edema was scored weekly from 0-3 points one week before calving and for 3 weeks after calving. After calving, we examined the length and diameter of the udder teats. The udder temperature was measured. The elasticity of the skin of the edematous udder was also examined. The aim of the study is to observe whether udder edema increases the incidence of mastitis.

SELECTION AND CHARACTERIZATION OF BACTERIAL STRAINS APPLICABLE AGAINST WET AND DRY BUBBLE DISEASES

András Varga, Anita Klepács, Csaba Vágvölgyi, László Kredics

University of Szeged, Faculty of Science and Informatics, Department of Microbiology

Cultivated mushrooms like the oyster mushroom (*Pleurotus ostreatus*), shiitake (*Lentinula edodes*) and the white button mushroom (*Agaricus bisporus*) have their pathogens with detrimental effects on the crop such as *Cladobotrium mycophilum*, *Hypomyces perniciosus*, *Lecanicillium fungicola*, *Trichoderma aggressivum*, *Trichoderma pleuroti, Trichoderma pleuroticola*, and *Pseudomonas tolaasii*, from which *Trichoderma aggressivum* is the most devastating, especially the subspecies *Trichoderma aggressivum f. aggressivum*.

We selected biocontrol bacteria from the genus *Pseudomonas* and the *Bacillus* group, that were isolated from the casing and compost layer of white button mushroom growing medium, by testing them against two strains of *L. fungicola* and two strains of *H. perniciosus*. We tested the selected strains against white button mushroom, shiitake and oyster mushroom. We examined the tolerance of the selected bacterial strains to various abiotic stress factors such as pH, salinity and temperature, and also their resistance to fungicides. We also tested the extracellular enzyme activities in the cell-free supernatant of the bacteria for proteases, lipases, and chitinases.

The characterisation of selected strains helps us to understand their interactions with the pathogenic fungi and their mechanisms of antagonism, and also provides possibilities for their application in a targeted environment, such as the growing substrate used in mushroom cultivation facilities.

This work was supported by the Hungarian Government and the European Union within the frames of the Széchenyi 2020 Programme through grant 2020-1.1.2-PIACI-KFI-2020-00111, and the National Scholarship for Young Talents (Nemzet Fiatal Tehetségeiért Ösztöndíj, NTP-NFTÖ-21) to A.V. (NTP-NFTÖ-21-B-0269)

ASSESSMENT OF THE HYGIENIC CONDITION OF THE SLAUGHTERHOUSE BASED ON THE EVALUATION OF MICROBIOLOGICAL SWABS

Vargová, Mária

University of Veterinary Medicine and Pharmacy in Košice, Department of Public Veterinary Medicine and Animal Welfare, Slovakia

Slaughterhouse is an establishment used for slaughtering of animals, represent primary production site and their general hygiene requirements are set out in Regulation (EC) No 852/2004 and the commission regulation (EC) No 2023/2006. These regulations contain the minimum rules for cleaning and sanitation of the production sites and requirements for education and training of personnel. Sanitation at a slaughterhouse requires the necessary adaptation to individual production processes in order to ensure the health safety of food of animal origin and consequently to reduce the risk of production affected by unsufficient hygiene of the plant. The objective of present study was to evaluate the hygienic condition of surfaces – cage, wall, floor and lift by microbiological swabs. Microbiological swabs were taken before process of slaughtering, during process and after disinfection from area of 10 × 10 cm. The swabs were placed in a sterile tube containing 10 ml of sterile saline solution. From this mixture 0.1 ml was applied to the different agar plates Meat peptone agar, Endo agar, Sabouraud agar. Disinfectant Virkon S was used in a 1% concentration during exposure time 30 minutes for disinfection of monitored surfaces in slaughterhouse. Disinfectant Virkon S was effective on monitored surfaces – cage, wall, floor ($P<0.0001$) and lift ($P<0.01$), where were determined significant decrease of microorganisms. Despite a significant decrease in the number of microorganisms, after disinfection we recorded $1x10^4$ CFUx10cm^2 of TCB and $2x10^3$ CFUx10cm^2 of CB, which indicates an unsufficient level of disinfection. In conclusion, effective disinfection performed by suitable disinfectant during suitable exposure time in slaughterhouse is essential because it help to prevent the spread of many microorganisms; contamination of products and which could cause seriuos consequences on health status of human.

ENCOURAGING GENERATIONAL CHANGE IN AGRICULTURE — EXPERIENCES OF THE HUNGARIAN YOUNG FARMER SUPPORT SYSTEM

Miklos Vasary[1]

[1] University of Szeged, Faculty of Agriculture

The number of challenges faced by agriculture is very significant and diverse. In addition to the internal, economic and social impacts of each country, the effects of external factors (e.g. markets, inputs) require continuous adaptation and adjustment. Social factors are of great importance among the influencing factors. In particular, the processes affecting the identity of farmers.

In the European Union, including in Hungary, a significant effort has been launched to help the pressure on producers and to encourage the emergence of younger producers through generational renewal. Targeted support and indirect incentives are also available under the Common Agricultural Policy (CAP). Many of these have been used in our country, and since they have been used for several years, it is also possible to summarise the experience. This examination is also important because the results of the 2022 period can be used to assess the environment of the measure to be announced under the CAP cycle 2023-2027.

The aim of this study is to summarise the conditions and effects of the normative support for young farmers available under direct payments. At the same time, a series of results and consequences that the aid scheme can provide in the environment is presented.

IMPACT OF HEAVY METAL POLLUTED WASTEWATER SEDIMENT ON ELEMENT CONTENT AND ENZYME ACTIVITY OF SUDANESE GRASS

Gy. Vincze, Zs. Uri, Cs. Tóth, K. Irinyiné-Oláh, Sz. Vigh, L. Simon

University of Nyíregyháza, 4400 Nyíregyháza, Kótaji u. 9-11.

Growth chamber pot experiment was set up with two varieties of Sudanese grass. Plants were grown in uncontaminated (control) topsoil of the former wastewater settling plant from Debrecen, which was amended with 10% (m/m) of wastewater sediment (P: 5125; Fe: 22756, Pb: 287; Cr: 1027; Zn: 888 mg/kg). The elemental composition of soil and leaves of plants and activities of some enzymes in leaves were measured. It can be concluded that the roots and leaves of plant individuals of both varieties consistently took up higher concentrations of each of the elements from the medium "enriched" with wastewater sediment. The elevated element concentrations were found in some cases in the roots, and in other cases in the leaves (K: ~2000 (soil) - ~13000 (root) - ~30000 (leaf) mg/kg; Na: ~350 (soil) - ~2300 (root) - ~20 (leaf) mg/kg). The accumulation of toxic elements was not observed. The activities of four enzymes were measured in the leaves of plants (glucose-6 phosphate dehydrogenase, G6PDH; isocitrate-dehydrogenase, ICDH; peroxidase, POX; catalase, CAT). The enzyme activities of POX and CAT didn’t change significantly. As a trend, the specific activity for G6PDH increased by 26% (GK Csaba) and 36% (Akklimat), while values for ICDH became higher by 28% (GK Csaba) and 41.5% (Akklimat), for the two varieties studied, respectively.

POLLEN CONCENTRATION DATA SET FOR TREE OF HEAVEN (AILANTHUS ALTISSIMA) ON THE SOUTHERN GREAT PLAIN REGION IN 2019-2020

Viktor József Vojnich[1], Orsolya Udvardy[2], Árpád Ferencz[1], László Makra[1], Donát Magyar[2]

[1]University of Szeged, Faculty of Agriculture, H-6800 Hódmezővásárhely,
Andrássy Street 15
[2]National Centre for Public Health, Laboratory Department, H-1097 Budapest,
Albert Flórián Road 2

Nowadays, there is an increasing emphasis on the problem of invasive species. In areas where the tree of heaven (*Ailanthus altissima*) appears and multiplies, the original vegetation degrades and transforms. The tree of heaven of great importance in urban environments, where it causes building damage, static problems and endangers utilities. In addition, it is worth mentioning that the pollen of *Ailanthus altissima* is an allergenic, although less important than ragweed pollen. Pollen concentration of tree of heaven was measured in three counties of the Southern Great Plain region (Bács-Kiskun county, Csongrád-Csanád county, Békés county) with the 7-day Hirst-type (Burkard) pollen trap. The highest annual total pollen count was detected in 2019 in Bács-Kiskun county (66 pieces) and Csongrád-Csanád county (36 pieces), while in Békés county (16 pieces) in 2020. In Békés county, a trap error was detected when measuring the pollen count of *A. altissima* in 2019, therefore the results cannot be used. Our work draws attention to the differences in the distribution of the tree of heaven in the Southern Great Plain, based on which it can be seen that there can be more than twice the differences between the cities in terms of the total annual pollen count.

OPPORTUNITIES AND CHALLENGES FOR PIG PRODUCTION IN VIENTIANE CAPITAL, LAOS: A REVIEW

Somsy Xayalath[1,2], Jozsef Ratky[3]

[1] Doctoral School of Animal Husbandry, University of Debrecen, Böszörményi Street 138, 4032 Debrecen, Hungary
[2] Institute of Animal Science, Biotechnology and Nature Conservation, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, Böszörményi Street 138, 4032 Debrecen, Hungary
[3] University of Veterinary Medicine, 1078 Budapest, István Street 2, Hungary.

In Laos, pork is the second most common meat source after fish. Year after year, the demand for pork eating grew. Recently, pork production has been in short supply in urban and rural areas, forcing the Lao government to import thousands of tonnes of pork from neighbouring countries, particularly Thailand, Vietnam, and China. This study aimed to look at the current situation of pork production and supply in Vientiane Capital (VC) and the prospects for pork production in VC, Laos. In 2020, Laos had a pig population of about 4.3 million, with over 91 % being native pigs and only 366,000 heads being European pig types, with over 54% being reared in VC. In 2019, Laos had 578 commercial pig farms, with 188 farms (33%) of which were located in VC. Despite the fact that most of the commercial pig farms are located in VC, pork meat demand is still high, with the consequence that consumers need to pay a high price. For example, in 2020, the average price of pork was 46,000 LAK/kg ($ 4.00), up over 22 % from 2019 and 11 % from 2015. Several feed raw materials (maize, cassava, and rice bran) are produced in VC, and nearby provinces, which the farmers can use to combat the dramatic changes or instabilities of feed price. We concluded that there is a high potential to develop pig production in VC, especially local breeds considering the high demand for premium pork and more available raw feed materials.

IMPACT OF DIFFERENT LIGHT INTENSITIES ON SPINACH UNDER DROUGHT CONDITIONS

Tahoora Batool [1], Oqba Basal[1], Szilvia Veres[1]

[1]University of Debrecen
Faculty of Agricultural and Food Sciences and Environmental Management
Institute of Crop Sciences
Department of Applied Plant Biology

Spinach (*Spinacia oleracea* L.) was grown under controlled environmental conditions and exposed to drought (2.5% polyethylene glycol) along with different LED lighting treatments to determine the impacts of normal white light provided with 35% blue light, 48% green light, 15% red light, and 1% far-red light compared to a red+blue LEDs provided 12% blue light, 4% green light, 75% red light, and 10% far red along with the flashes of UVC radiation once a week for five minutes based on the unit of μmol/s. The third treatment was blue+red with 20% blue, 4% green, 66% red, and 10% far-red. Plants subjected to drought and red+blue light with short-UVC radiation could not survive and died within a few days of treatment. An increase in root length was recorded in blue+red light as compared to normal light, however significant decrease in shoot length (39.5%) was observed in blue+red light compared to normal white light along with a significant decrease in SPAD values. A decrease in MDA, fresh root weight, fresh shoot weight, dry root weight, and dry shoot weight was recorded in blue+red treatment compared to normal white light (control). A significant increase in root volume was recorded in blue+red light.

Project no. TKP2021-NKTA-32 has been implemented with the support provided by the National Research, Development, and Innovation Fund of Hungary, financed under the TKP2021-NKTA funding scheme.

ANALYSIS OF GAME DAMAGE ON THE BASIS OF JUDICIARY DOCUMENTS IN NÓGRÁD COUNTY BETWEEN 2015 AND 2019

Levente Zemplényi[1], Krisztián Katona[1]

[1] Hungarian University of Agriculture and Life Sciences, Institute of Wildlife Management and Nature Conservation, Páter Károly Str. 1., H-2100 Gödöllő, Hungary
e-mail: zemplenyi.levente98@gmail.com, katona.krisztian@uni-mate.hu

The common use of habitats by people and game species has been causing conflicts for a long time. With the intensification of agriculture, the level of agricultural damage has also increased. In many cases farmers and game managers try to solve their related disagreements in court, often unsuccessfully. The aim of our research was to find out the reasons for these difficulties and to show possible solutions. We studied 55 judiciary documents in three courts in Nógrád County. Red deer was involved in 42 cases of damages (76%), wild boar 33 (60%), roe deer 21 (38%) and mouflon 3 (5%), caused mainly in maize (23,64%), forest, sunflower (12,73% for both) and grassland (5,45%). Proceedings lasted for 13,65 months on average; their median was 8 months. The average claim of farmers was 1 514 610 HUF, its median was 783 000 HUF. At the end of the suits, farmers received the whole compensation in 8 cases (14,55%) and they got part of the relief on ten occasions (18,18%). Suits were ceased 14 times (25,45%) and no compensation was paid in 23 cases (41,82%). Ignorance of law and unprofessional expertise of farmers negatively influenced the judicial proceedings. Both farmers and game managers should be informed about the exact steps of the procedure for solving these long-lasting conflicts.

POSSIBILITIES FOR REDUCTION OF GREENHOUSE GASSES IN THE AGRICULTURAL PRODUCTION WITH CIRCULAR FARMING

Anita Csiba[1], Árpád Ferencz[1]

[1]University of Szeged Faculty of Agriculture, Institute of Economics and Rural Development

The priorities identified by the EU's and national strategies and the main target areas promoted by the legal regulations concerning this area are precision agricultural and food production, investments and developments, and – in the area of ensuring the resources needed to achieve these – a more efficient agricultural production, the improvement of sustainability and food safety by means of a more efficient use of natural resources. To achieve these objectives, the European Union has identified the widespread introduction of precision technologies using digitization technology in the agricultural economy. The Green Deal declares that climate change and environmental degradation means a threat to Europe and the whole world. In order to be able to respond effectively to the challenges in this context in the European Union, we need a new growth strategy that will transform the EU economy into a modern, resource-efficient and competitive economy where the quantity of greenhouse gas emissions fall to net zero by 2050, economic growth is independent of resource utilization, and there are no underdeveloped regions, i.e. each region has a chance to succeed. This research is a very timely issue, since the current implementation and practical application of digitalization in various sectors of Hungarian agriculture keeps taking place on a larger scale. The effects of widespread proliferation and expansion need to be constantly examined.

THE EFFECT OF IMPROVED COMPOSITION OF BEDDING USED IN DAIRY FARM CONDITIONS ON LEVEL OF INDICATOR MICROORGANISMS

Zigo František[1], Farkašová Zuzana[1], Ondrašovičová Silvia[2], Pecka-Kielb Ewa[3], Bursová Šárka[4], Kiss David Sandor [5]

[1]Department of Nutrition and Animal Husbandry, University of Veterinary Medicine and Pharmacy, Košice, Komenského 73, 04181, Slovakia, frantisek.zigo@uvlf.sk
[2]Department of Biology and Physiology, University of Veterinary Medicine and Pharmacy Košice, Komenského 73, 04181, Slovakia
[3]Department of Animal Physiology and Biostructure Wrocław University of Environmental and Life Sciences, Norwida 31, 50-375 Wroclaw, Poland
[4]University of Veterinary Sciences Brno, Faculty of Veterinary Hygiene and Ecology, Palackého tř. 1946/1, Brno, 612 42, Czech Republic
[5]Department of Physiology and Biochemistry, University of Veterinary Medicine Budapest, H-1078 Budapest, István utca 2., Hungary

Bedding provides comfort to dairy cows spending most of their time in stables. A variety of materials are used to ensure their welfare and create a suitable environment in the bedded cubicles. The aim of the study was to compare improved bedding composition with conventional straw bedding under farm conditions, regarding its effects on the indicator microorganisms influencing hygiene levels. Dairy cows were housed in newly-built stall divided into two parts each with four sections and bedded cubicles arranged in two rows opposite each other. In the first part, the bedded cubicle floors were layered with straw up to a height of 20 cm. In the second part, the cubicles were layered to a height of 20 cm with improved bedding composition consisting of recycled manure solids (RMS; 15 kg), ground limestone (100 kg), water (80 l) and straw (25 kg). After laying, the litter was treated with a concrete selector to provide strength and sufficient resistance. Samples for microbiological examination were taken from four sections according to the time interval of production and littering. Litter samples were taken from three sections according to the improved recipe of bedding with an interval of 1-3 months. A control sample of litter consisting of straw was taken from the last, fourth section. Comparing classical straw bedding with the improved recipe bedding, the total viable count (TVC) and coliforms (CB) in freshly-laid bedding as well as a month after laying were found to be reduced. In addition to TVC and CB, decreased numbers of faecal coliforms (FC) and faecal streptococci (FS) were observed in the freshly-laid bedding as well as in the first, second and third months after laying.

The study was supported by a project Visegrad Fund no. 22010056: Factors determining the occurrence of bovine mastitis in dairy herds situated in marginal regions. The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe. Additional financial support for the implementation of the study was used from Slovak grant KEGA no. 009UVLF-4/2021: Innovation and implementation of new knowledge of scientific research and breeding practice to improve the teaching of foreign students in the subject of Animal husbandry.

A NETWORK APPROACH TO STUDYING RURAL TOURISM IN THE MUREȘ COUNTY RURAL AREA IN TRANSYLVANIA, ROMANIA

Marius-Ionuț Gordan[1], Anka Roxana Pascariu[1], Tabita Adamov[1], Ioana Anda Milin[1], Tiberiu Iancu[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

Rural tourism exerts a positive influence on the welfare of both local communities and guests, by creating jobs, providing an incentive for local businesses to operate and grow, repopulating rural areas, revitalising local crafts, arts and traditions, thus preventing the decline of the rural areas where tourism takes place, as long as the principles of sustainable tourism and development are applied in the area. At the same time, local touristic attractions in rural areas benefit from rural tourism, by means of increased visibility, notoriety and funding (through donations, tickets sold or government funding) and at the same time provide an incentive for tourists to visit rural areas, creating a positive feedback loop.

This study aims to examine rural tourism in the Mureș County, by comparing the number of accommodation units, accommodation capacity, tourist arrivals, total nights spent, average length of stay and occupancy rate for 35 villages and rural townships during the last ten years, which will be considered dependent variables. Corroborated with this approach and attempting to provide an explanation for the variance in the dependent variables studied, a database of touristic attractions located around the studied villages and rural townships was created. This database includes distances, time required to travel to the touristic attraction using a car (or alternatively by walking), Google Maps review score and number of reviews (as a proxy for notoriety of the attractions). A gaussian graphical network was modelled using this data in order to assess the impact of attractions, proximity to the major urban areas, access to the highway network, demography and other variables of interest.

THE NECESSITY OF PROTECTIVE FORESTRY CURTAINS IN ROMANIA IN THE CONTEXT OF CLIMATE CHANGE

Hunor Vass[1], Andreea Lidia Jurjescu[1], Alexandru Pangratie[1], Simona Albu[1], Camelia Mănescu[1], Teodor Mateoc[1], Tabita Cornelia Adamov[1], Nicoleta Mateoc-Sîrb[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

One of the problems exacerbated by climate change is the lack of forest cover. An initiative successfully implemented more than 100 years ago now has no active national programme, and this is accelerating desertification in Romania.

This article aims to analyse the situation of forestry curtains at the national level and to show their importance and necessity in the fight against climate change.

The motivation for choosing this theme is due to the major problem posed by climate change, characterized by long periods of high temperatures and low rainfall that have led to an increased vulnerability towards desertification, making the effects in Romania devastating. All areas are affected, especially the south of the country, where the forested area is extremely deficient (5% of the territory) compared to the national average of 29% and the European average of 35%. Forestry plantations on just 3% of land can increase production by more than 30% in dry years. This is a very good solution both for the environment, roads, railways and waterways, for maintaining and increasing biodiversity, reducing snow clearing costs and maintaining a good microclimate. In addition to all this, forestry plantations absorb a large amount of CO^2 from the atmosphere. Under optimal ecological conditions, a 25 m^2 leaf area can release as much oxygen as a human need in the same unit of time.

Territorial Administrative Units (TAU) should be encouraged to plant at least 15% of their area with protective forests for communities, roads and agricultural land. Municipalities need financial support and expertise for implementation.

THE IMPORTANCE OF IMAGES IN THE PROMOTION OF AGROTURISTIC BOARDING HOUSE IN THE WESTERN REGION OF ROMANIA

Anka-Roxana Pascariu[1], Marius Gordan[1], Iasmina Iosim [1], Tabita Adamov[1], Tiberiu Iancu[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

Whether a business is online or offline, the online presence is vital. Technically, all the information available represents a business, but nothing stands out as images and videos in people's memories. Whether it's a product image, an ad campaign, or just images on the company's website, media content is what attracts people the most. Clients remember most things with the help of images, so most customers will have a memory of the business in their mind, based on the media content they saw.

In turn, the promotion must be supported by the other components of the marketing mix. For example, the product must match promotional messages. If there is a discrepancy between the messages sent through the promotion campaigns and the reality perceived by the public, they will lose their trust in the organization and the effects of the promotion will be the opposite of what they want. Through the product policy, the organization can develop a high quality, unique offer that fully meets the requirements of consumers. However, it is the promotion that makes this known, which gives identity and personality to the company. It actually imposes the company and its offer on the attention and conscience of the public.

The development of a sustained and coherent promotion is extremely necessary at present, due to the numerous economic and social evolutions, as well as to the modification of the lifestyle, of the socio-cultural transformations in the contemporary society. In the face of increasing competition, diversification of products / services that can meet the same needs / desires, it is increasingly difficult for the public to orient and evaluate all the products on the market at a given time.

STUDY OF THE ECONOMIC EFFICIENCY OF FOOD QUALITY

Luminița Pîrvulescu[1], Tabita Cornelia Adamov[1], Cosmin Sălășan, Claudia Sîrbulescu[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

Due to the complex character of the quality of products in practice it is used an aggregate system of indices which measures the level of each characteristic separately or for each group of characteristics, as well as for the product as a synthesis of all. An important position within the system is held by the synthetic index of quality which reflects the contribution of characteristics classified accordingly to their importance, expressed, i.e. numerically and attributively.

The need of monitoring the quality through specific indices has lead to the use of mathematics and statistic methods, considering quality (Q) as a function of the main characteristics analysed according to the consumers' needs and requests.

There are different ways of calculating analytical indices of economic efficiency, mainly of the total production cost index, for different dairy products. In this paper, the total production cost index was obtained by assessing each expense element within the technological process with the help of measurements, corroborations and calculus.

AGRITOURISM ELEMENT OF RURAL DEVELOPMENT-DEFINING CRITERIA

Ramona Ciolac[1], Tabita Cornelia Adamov[1], Gabriela Popescu [1], Diana Marin[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism

The combination of sustainable rural development and tourism arrangements is a "must have", given that changes in attitudes have been paralleled by preferences for return to nature, and various local products. As an activity, agritourism is a form of rural tourism, which aims to revitalize unprofitable agricultural activity and requires the full exploitation of all existing tourist resources. By capitalizing on local resources and products, and combining two activities, the agricultural as a basic activity and the tourist as a complementary activity, the profitability of agritourism is high, being in fact a chance of alternative income for rural areas, with all the more so for areas with declining agriculture. The preservation of a rural world, with everything that is significant from an economic, social, cultural point of view, can also take into account the development of agritourism, it participates in maintaining the viability and stability of rural localities, given that the phenomenon of depopulation is manifested by the departure of young people to urban areas and the abandonment of old households and land.

Agritourism as an activity can be considered an ally of agriculture, from the point of view of conservation and protection of the rural landscape, as well as of the cultural elements, the integration of the tourist business within the localities aiming at establishing adequate correlations.

IMPACT OF DIGITALLY CENTRED INTERGENERATIONAL LEARNING AS BLENDED TRAINING FOR FARMERS

Cosmin Sălășan[1,2], Iasmina Iosim[1], Tabita Cornelia Adamov[1], Luminița Pîrvulescu[1], Raul Pașcalău[3], Sebastian Moisa[1], Carmen Simona Dumitrescu[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism
[2]Romanian Academy, Branch of Timișoara, Research Centre for Sustainable Rural Development of Romania
[3]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I[st] of Romania", Faculty of Agriculture

The intergenerational learning has been successfully tested and implemented in urban centres across Western Europe yet has little to no experience in rural and farming communities. A recently concluded project aiming at exchanging digital abilities and practice for local knowledge used the intergenerational learning as base for progressing in the use of digital tools in agriculture. The task of equipping the less young farmers with the habits and the basic operation of digital devices and different applications to ease their current activities in agriculture went far beyond the expected difficulties adding the lockdown of the pandemic over the planned implementation. The success and impact of the implementation is analysed and presented as out of ordinary achievement highlighting the benefits for farmers, extension workers, facilitators and the international project team. Important lessons were learnt during the methodological and practical preparation as well as during the delivery and the follow-up activities. The analysis results feed the grounds for further dissemination and use of the approach indicating the cornerstones and the critical elements to address. A particular interest of the approach is represented by the possibility to mobilise and exchange important amounts of local knowledge held by the less young participants in the group for the immediate benefit of the younger farmers far better equipped with digital knowledge yet in high demand for local and localised knowledge.

ÚNKP SESSION

REARING OF CARP (*CYPRINUS CARPIO* L.) ON ARTHROPOD FOOD SOURCES IN INDOOR SYSTEMS

Szabolcs Márk Turuczki[1], Péter Mikics[2], Tamás Monostori[1]
[1] University of Szeged Faculty of Agriculture, Hódmezővásárhely, Hungary
[2] Csányi Foundation, Szeged, Hungary

In our experiment performed under the supervision from both the Csányi Foundation's and the University of Szeged Faculty of Agriculture's side, we aimed the modelling of natural feeding conditions by feeding fish with live arthropods. The result is a more natural and feasible way of raising fish in an artificial environment.
The cultures of large water flea (*Daphnia magna*), the algae complex for feeding those, as well as the culture of mealworms (*Tenebrio molitor*) fed for larger fish were established over the previous years. In the current experiment, carp ('Szeged Mirror Carp') fries were housed indoors in rainwater collection tanks (5 fish per 200 l tank). In two tanks, the fish got artificial food, in other two tanks natural food (weeks 1-3: water flea, weeks 4-5: water flea + mealworm, weeks 6-7: mealworm) of the same weight. In the course of the 7 weeks, the feed amount was increased from 0.8 to 3.2 grams per fish. The natural food resulted in significantly larger fish compared to the artificial one after 7 weeks, the growth being from 0.52-56 g and 21-22 mm to 37.62-38.94 g and 95-98 mm, as well as from 0.56 g and 21-22 mm to 9.54-9.92 g and 60-62 mm, respectively. The Average Daily Gain, Specific Growth Rate and Feed Conversion Ratio values showed significant differences between the two treatments. The differences in the Condition Factor, however, were not significant - both feeding strategies resulted in fish of good condition status. In both feeding systems, the correlation was significantly positive between the fish weight and length, as well as between the feed dosage and the body parameters.

„Supported by the ÚNKP-21-1 New National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation Fund."