



## 16<sup>th</sup> WELLMANN INTERNATIONAL SCIENTIFIC CONFERENCE

# BOOK OF ABSTRACTS



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**16<sup>TH</sup> WELLMANN INTERNATIONAL SCIENTIFIC  
CONFERENCE**

**"Hello Modern Agriculture!"**

**Book of Abstracts**

**University of Szeged Faculty of Agriculture  
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# PLENARY SESSION



## DEVELOPMENT OF BIOCONTROL STRATEGIES BASED ON ANTAGONISTIC *TRICHODERMA* STRAINS

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Species of the genus *Trichoderma* (Hypocreaceae, Ascomycota) play important roles in various agricultural environments, therefore the genus has a long history as a popular subject of basic and applied mycology research. Several *Trichoderma* species have the potential to act as biocontrol agents of plant pathogenic fungi and nematodes by antibiosis-, competition-, and/or mycoparasitism-based antagonistic action. Environmentally friendly agricultural practices may also benefit from the ability of certain *Trichoderma* species to induce systemic resistance and promote growth of the crop plants.

The development of *Trichoderma*-based biocontrol strategies generally starts with the isolation of *Trichoderma* strains, which is preferably performed at the agricultural habitat of the crop plants to be protected. This is followed by laboratory screening of the isolates for antagonistic potential against the target plant pathogens, in order to select potential biocontrol agents (BCAs). As a key step of the process, the *Trichoderma* strains selected as BCA candidates should be subjected to an exact, species-level identification by sequence-based molecular tools, to avoid biocontrol product development from potentially harmful members of the genus, like the causal agents of green mould infections affecting cultivated mushrooms, or the species capable of causing opportunistic infections in humans. Genetic transformation, protoplast fusion and classical mutagenesis are potential tools for improvement of BCA candidate *Trichoderma* strains, however, the application of genetic manipulation for this purpose may result in restriction of the resulting BCA's applicability in countries with strict GMO regulations. Further crucial steps of the biocontrol strategy development are the optimization of fermentation conditions for the

selected BCA and the development of proper strategies for formulation and delivery. Greenhouse and field trials should confirm the beneficial effects of the *Trichoderma* strain(s) as BCA candidate(s) before the procedure continues with the registration process, market introduction and commercialization. The development of specific monitoring tools for the applied *Trichoderma* strains could be useful tools to study the population dynamics and performance of the BCA in different agricultural habitats.

This presentation aims to provide an overview of the above-mentioned procedure of *Trichoderma*-based biocontrol strategy development, with examples deriving from the experience accumulated at the Department of Microbiology, Faculty of Science and Informatics, University of Szeged, including the development of the multicomponent soil biofertilizer product BioeGO, as well as the efforts aimed at the biological control of forest-damaging white rot fungi from the genus *Armillaria*.

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## **MODERN FINANCE: A CATALYST FOR TRULY MODERN AGRICULTURE**

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The research gap at the crossroads between financial innovation and innovation in agriculture is the main focus of this paper. It takes inspiration from the fallacies in the financial industry that prevent it to adequately satisfy the needs of a large share of the world population and especially of smallholder farmers, who are mostly underbanked and often have no choice but to rely on informal financial channels; as a consequence, valuable efforts aimed at making of the agricultural sector a truly modern market segment run the risk of being vanished.

What sounds especially appealing is the pursuit of the 17 Sustainable Development Goals that were adopted by the United Nations in 2015 and that cover challenging issues, such as ending poverty and hunger, responding to climate change, sustaining natural resources, as well as promoting sustainable agriculture and financial inclusion, in sight of fulfilling the generation pact. Based on these thoughts, the main objective is to investigate the crucial role that the three pillars of the financial system – i.e. financial markets, products and institutions – are likely to play in order to speed up the process of modernization in agriculture: four main areas of interest can be identified that consist of sustainable, inclusive, blended and rural finance, and that embody a set of strategic tools; their support to the agricultural sector ranges from its most traditional side to unprecedented forward steps, such as those that pertain to novel foods and simulated “Martian gardens”.

Focusing on finance, this is a qualitative research that draws upon empirical evidence and success stories: a framework for analysis is provided, in an attempt at promoting rural finance as a specialized discipline from a theoretical point of view and a peculiar market segment for operating purposes, with relevant sub-sets such as agricultural finance, agricultural value chain finance and agricultural microfinance. The proposed analysis allows to state that the financial industry should be called to pursue its modernization as a precondition for moving forward steps in the art of “doing” modern agriculture, being money a scarce resource and innovation a risky, capital intensive process.

The chosen approach has been crafted in order to properly combine the local and global perspectives, as suggested by the wider and wider endorsement of the *glocal* philosophy, and to join the search for the appropriate mix of competition and cooperation, in line with the *co-opetitive* vision. Conclusions encompass key messages and recommendations for policy interventions, as well as for further research and development: the rationale behind them features best practices that might be usefully disseminated, to the benefit of both the financial and the agricultural sectors, with related market segments too being involved; academic challenges also surface, that lead to emphasize the need for upgrading financial competence by furthering financial education and literacy, especially in rural areas and even within the context of lifelong learning activities.



## **ECOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF *TRICHODERMA* STRAINS ISOLATED FROM SERBIAN SOILS**

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Fungi belonging to the genus *Trichoderma* spp. are soil borne cosmopolitan species present in different ecosystems with important ecological and biological roles. Their application in various fields of biotechnology and agriculture is based on their diverse beneficial effects. As plant endophytes they are involved in control of plant diseases, and also in the induction of plant tolerance to various biotic and abiotic stresses. Due to the production of different enzymes they can be used in preparations of commercial products, such as biopesticides. However, for their adequate use and application, their identification at the molecular level is of great importance.

Investigations on *Trichoderma* spp. in Serbia were scarce so far. In total 41 isolates which belonged to 9 species were isolated from different soil types, as described previously (Racić et al., 2017). Physical and chemical characterization of the examined soil samples indicates that the richest source of *Trichoderma* species are weakly alkaline soils, with better water availability and higher contents of available K and P. However, metal presence in soil samples and soil microbial characteristics did not affect *Trichoderma* diversity in different soil samples. Selected isolates showed good antagonistic properties against tested phytopathogens *in vitro*, with high biocontrol index (BCI) values. The results of *in vitro* antagonism experiments and API-ZYM tests could be used for the selection of isolates for further *in vivo* investigations.

### **Acknowledgements**

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Racić, G., Körmöczi, P., Kredics, L., Raičević, V., Mutavdžić, B., Vrvić, M. M., Panković, D. (2017). Effect of the edaphic factors and metal content in soil on the diversity of *Trichoderma* spp. *Environmental Science and Pollution Research*, 24(4), 3375-3386.

## **ROMANIA'S FOOD AND RELATED CONSUMPTION PATTERNS ALONG ITS PRE-ACCESSION AND INTEGRATION TO EU**

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The paper aims to observe and identify any patterns related to the food and related consumption in Romania during its pre-accession period and integration to the European Union. Since the consumption is related primarily to the number or the volume of consumers, their active or inactive professional status, their income variations these elements will be considered before looking at any changes in purchase and consumption. Reading the variations and eventual trends in these first steps will help understanding the changes induced by or influencing at their turn the internal migration at regional level and the active involvement in economic activities of people and companies leading to generation of income. The income availability is regarded as the central factor aside the availability in influencing the opportunity and the purchase/consumption. Equally the lack of sufficient income all the way to poverty and severe material deprivation are taken into account and analysed. The acquisition by purchase of food and related stuff is analysed by monthly averages at individual and household level. One important category to observe is represented by the monthly consumption of bread and pastry since old knowledge places this category among the important ones, Romania being among the first in Europe when it comes to annual bread consumption per capita. Further the share of foodstuff and livestock, alcohol and tobacco are analysed as contribution to the total imports along the last programming period. The reason for not going behind that boundary is given by the transitory harmonisation after the EU accession that might distort the observations. Overlapping the sum of findings, including the monthly average net income allow the drawing of the current consumption patterns and the general profile of the average consumer. No radical changes are observed by activity categories: employees, self-employed, retired, unemployed and farmers. All categories follow a relative uniform increasing path leading to the consumption growth, with explainable not significant variations. The analysis is concluded for all and every category of consumers taking into account their age, occupational status and the region of residence. The average consumer profile

indicate less activity leading to income growth (as an individual choice), systematically increased earnings and spending and increased consumption of all categories of foodstuff and related products. The consumption patterns and the expenditure are far from reflecting the benefits of the structural adjustments performed during the pre-accession and the integration to EU and their positive impact, these evolutions resulting rather from the opportunity, the availability and the proximity all generated by the open common market.

# THEMATIC SESSIONS



## EXAMINATION OF FISH CONSUMPTION HABITS AMONG STUDENTS OF A SECONDARY SCHOOL IN SZEGED AND OF A UNIVERSITY FACULTY

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The topic of my research is examining fish consumption habits among Miklós Radnóti Secondary Grammar School students and the students of University of Szeged Juhász Gyula Faculty of Education. The importance and actuality of my topic choice is confirmed by the book titled *Táplálkozásmarketing* [Nutrition Marketing] by Zoltán Szakály, published in 2011. In this book the author lists the factors which show the features and attitudes of the conscious consumer.

My work can be divided into two parts of research. I conducted secondary research in which I have concluded the statements of the relevant literature. Amongst the one that nowadays the endeavour to healthy way of life is getting more and more important. Regular consumption of fish can be a basic element of optimal nutrition for our organism. So we can get fat-soluble vitamins (e.g.: A and D vitamin) and water-soluble ones (B<sub>1</sub> and B<sub>2</sub> vitamin), too. Besides, fish contains omega-3 fatty acid in large quantity, which cannot be produced by our organism, but essential to its proper operation. During my primary research I have compiled a questionnaire, which was filled in by students in the two above mentioned educational institutes in Szeged. The questions in the questionnaire referred to the fish consumption habits of the interviewed and to their related attitudes. Furthermore, an important part of the questionnaire was to uncover the obstacles of fish consumption as well as the possible tools necessary to make fish consumption permanent in nutrition. To be able to reach the research results, 429 persons helped my work with filling the questionnaire in. I have implemented PSPP statistical system to evaluate the questionnaires. In the introduction of this work I formed three hypotheses which were examined via Z-test on the basis of the replies received in the questionnaires. After evaluation, two out of the three were accepted and only one rejected at a 5% significance level. As the result of hypothesis investigation I make the following statements.

Among the interviewed there are more people who consume fish than those who do not. Beside fish, the most commonly consumed meat types are pork and poultry. The reason of this is that their prices are lower—according to the

interviewed. During the Christmas period fish consumption is higher, so a significant seasonality appears. The 5% VAT introduced in January, 2018, may increase fish consumption and gives possibility to further research of this topic.

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## **TRENDS REGARDING RURAL TOURISM**

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Many governments and the European Union recognize the fact that rural tourism represents a way to save agriculture and cultural heritage, being an activity in full ascension, with a positive impact on local development. Minister of Tourism and Rural Development, from Luxembourg, said that "over the next 20 years, tourism will be a key component of the economy, and rural tourism will become tourism of the future." To support this claim, the present paper is intended to be a way of highlighting the main trends in tourism in the present, which will be amplified in the 2020 perspective and of which rural tourism must also take account.

Rural areas will have to define new functions, more ecological and recreational, increasingly important, being new developmental alternatives for those involved in agricultural field. [1] In this context a major role will be played by the development of a multitude of tourism activities in rural areas. Specifically, for European economies, rural tourism brings an essential contribution to the integration process. This explains why, starting with the second half of the last decade, tourism and, implicitly, rural tourism, has entered the European Commission's agenda in a more systematic manner, in a more institutional context created by The Treaty of Maastricht. Rural tourism, in recent times, has a strong evolution and enjoys greater attention. The reason? The authenticity of rural areas is a growing quality and more and more demanded, in the conditions of the present life. [2,4,5,6] Many governments in the European Union recognize that rural tourism is an alternative that can save agriculture and that "over the next 20 years tourism will be the core component of the rural economy, and rural tourism will become tourism of the future."

## **EFFECT OF UHT TREATMENT ON LIQUID EGG PRODUCTS**

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The heat treatment is one of the oldest types of conservation of food. Until this moment, the evolution of the technology of heat treatment is not accomplished. Each month, each year, new a new equipment for heat treatment appears. Nowadays, the important aim is how to reduce the temperature of the treatment for the heat-sensitive products as the egg and egg products while preserving their qualities after treatment. Ultra Heat Treatment (UHT) is one of the known technology that we used for heat-sensitive products.

Consequently, our aim is to study the effect of UHT treatment on Liquid Whole Egg (LWE) (70°C for 190 seconds), Liquid Egg White (LEW) (56°C for 190 seconds) and Liquid Egg Yolk (LEY) (approximately 67°C for 190 seconds). We used Tubular Pasteurizer 2000 kg Liquid Egg/h (600 kg Egg Yolk/h) specialized for the liquid egg.

During twenty-one days, the colour was measured every seven days for all the samples. In concert, emulsion stability was studied by heat stability of mayonnaise. Same for the foamability we calculate the percentage of foamability, foam volume stability, and foam liquid stability.

## UHT TREATMENT OF LIQUID EGG YOLK

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Egg and egg product are easily perishable aliments because they have a very high amount on nutriment specially protein. So, their shelf-life is reducible. Many researches are made to increase it. Heat treatment is one of the treatment use it. Although, egg and egg products are heat-sensitive. In order that, a very low temperature is needed or a high temperature for a very short time. Ultra-Heat Treatment (UHT) is one of the known technology that we used for heat-sensitive products.

Our aim is to study the effect of UHT treatment on Liquid Egg Yolk (LEY) and Liquid Egg Yolk with additive (LEYA) (approximately 67°C for 190 seconds). During twenty-one days, the pH and color were measured every seven days for all the samples. In concert, emulsion stability was studied by the methods of heat stability of mayonnaise.

Unfortunetlley, the reference samples (raw LEY) show changed on the color and smells highlight microbial contamination that makes us stopped their tests while the treat samples retain their properties.

## RELATIONSHIPS BETWEEN REPRODUCTION PARAMETERS IN DAIRY COWS

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The main goal of the reproductive management of dairy farms is to keep low the days in milk (DIM). Milk production can be profitable only in that case. Calvings make only low DIM. From the economic point of view, to evaluate the amount of the calving is not easy because in many cases the insemination and the calving are not in the same year. We wanted to find a reproduction parameter, which is easy to record, available real time, and correlate well with other parameters. Our hypothesis is that the number of the pregnant cows (correlated to the average number of cows) correlate with the other reproduction parameters thus may be this parameter represents the reproductive performance of the farms accurately. Moreover, the pregnancies assumably have an economical benefit, because pregnancies will become calvings which will keep the DIM low.

We collected reproduction data from 21 farms from 2016. All these farms use RISKÁ farm system. Average numbers of cows, number of the ai (artificial insemination) in cows, number of cows pregnancies, open days (OD), service period (SP), time of first ai (TFAI), conception rate of first ai (CRFAI), conception rate of all ai (CRSAI) were collected. The number of the pregnant cows were grouped, pregnancies under 120 days after calving -U120- and pregnancies above 200 -A200- days after calving. Correlation between reproduction parameters were evaluated by SPSS statistical software package.

The economical effect of open days (origin of calving interval -CI) are well-known. OD correlated with the rate of the pregnancies under 120 days after calving ( $r = -0.802$ ;  $P \leq 0.001$ ). The open days correlated with the rate of the pregnancies above 200 days after calving ( $r = 0.889$ ;  $P \leq 0.001$ ). If the rate of U120 is high, the rate of pregnant cows (ROPC) will be high too ( $r = 0.611$ ;  $P = 0.003$ ). A200 is in negative relation with ROPC ( $r = -0.525$ ;  $P = 0.015$ ). OD

correlated with TFAI ( $r = 0.562$ ;  $P = 0.008$ ). ROPC correlated with TFAI ( $r = -0.457$ ;  $P = 0.037$ ). OD correlated with SP ( $r = 0.778$ ;  $P \leq 0.001$ ). SP is in negative correlation with CRFAI and CRSAI ( $r = -0.577$ ,  $P = 0.006$ ;  $r = -0.773$ ,  $P \leq 0.001$ ). SP correlated with U120 and A200 ( $r = -0.572$ ,  $P = 0.007$ ;  $r = 0.788$   $P \leq 0.001$ ).

Our study shows that the rate of the pregnant cows are statistically correlated with many important reproduction parameters. The measurement of the number of pregnant cows is easy, available real time and it has important economical effect on milk production. In summary, the number of pregnant cows is a useful parameter to evaluate the reproductive performance and current status of the farms.

## **WATER USE AND WASTEWATER TREATMENT ON DAIRY CATTLE FARMS**

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Environment protection, and potable water protection is a great challenge nowadays. Out of the total water consumption in the world, domestic water consumption represents 10%, industrial purposes 20%, while 70% is for agricultural use. Irrigated plant production is responsible for the largest agricultural water consumption. Livestock production requires about 30 % of agricultural water use including irrigation water for feed crops, drinking water for livestock and water for servicing (cleaning, washing, cooling etc.). Eighty percent of consumptive water (CW) use is green water applied on agricultural land. In livestock production this value is 90%, however the amount of CW depends on rainfed grazing lands. Approximately 8% of the consumptive water use of the livestock is blue water for drinking water, servicing and feed mixing. Considering livestock production, the dairy cattle sector is one major water consumer within agriculture. On dairy cattle farms water is used as drinking water for the animals, plate cooler water and for plant washing as well (bulk tanks, parlour plant). In addition to water consumption, wastewater treatment is equally important since in case it enters surface waters, it can contaminate aquatic organisms, the soil, and through these, the drinking water quality as well. This paper wishes to present the reasons for using different amounts of water in cattle production, the importance of collecting yard and parlour washing down and the possibilities of water treatment, with special attention to waste water reuse as a real double saving.

## **ECONOMIC MODELLING OF DAIRY FARMS REGARDING MASTITIS**

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Last year we reported our first results on our investigations of the profitability of cows that were just diagnosed with mastitis. Our conclusion was that based on nationwide data of dairy farms, we can build a suitable stochastic model, and its extensive microsimulation can suggest us a much better decision concerning the selling or keeping of the animal. The simple program that is capable to solve such problems with available input data can be downloaded for smart phones and tablets (having Android 6.0 or newer operating systems) from

[www.inf.u-szeged.hu/~banhelyi/Buu](http://www.inf.u-szeged.hu/~banhelyi/Buu)

This time we extend our model giving more details regarding the lactation curve, and we utilize the amount of produced milk as a basis of decision on selling or keeping cattle. Also, we enrich our model to cover a full dairy farm with many cows. Here we take into account also the dependent stochastic variables related to infections, or similar disasters harming many cows the same time. We also consider the wide picture of the summed up economic profitability of the farm with respect to managing the cattle population actively. In the conference talk we shall report on the first results obtained with the new model that confirm our research expectations in terms of improvement of the business decision. The ongoing research will focus on a decision support system based on data mining technology that can utilize the peculiarities of the actual dairy farm in question, and to validate the additional advantage arising from using such a system.

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## **CAPONIZING NATIVE HUNGARIAN SPECKLED CHICKENS**

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The indigenous varieties become endangered because of the spread of intensive poultry varieties and hybrids. Our old species cannot keep up with the industry-like economical production they are not compatible with the modern ones. For this reason, we must endeavour to preserve our old species and to keep their important characteristics that can be utilized for breeding later. Beside the gene preservation, we endeavour to find the best way for the production-purpose utilisation of our speckled chicken stocks. The experiment was designed to revive an old traditional method, the caponizing, to produce special products with culinary curiosities. In capon production experiments, two-year slaughtered values were compared. As a result, we can say the Hungarian old speckled chicken varieties are suitable to produce special and marketable products.

## **ENHANCED BIODEGRADABILITY OF DAIRY SLUDGE BY MICROWAVE ASSISTED ALKALINE AND ACIDIC PRE-TREATMENTS**

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Microwave irradiation has been widely used for material processing. Numerous advantages have been verified over the conventional heat treatments, for example the short process time demand, intensive heating and high digestion efficiency. Considering the rapid, volumetric and selective heating effect of microwaves the microwave assisted chemical methods could provide appropriate alternatives for conventional thermal methods in sludge processing. Microwave irradiation alone is suitable to accelerate the hydrolysis stage of anaerobic decomposition of sludge resulted in accelerated biogas production rate and in higher biogas yield. Alkaline pre-treatments increase the organic matter solubility and suitable for disintegration of sludge particles. In some study are concluded that acidic conditions help the disintegration of waste activated sludge and assist in the solubilisation of carbohydrates and proteins which led to increased higher biogas production, as well.

Beside the promising results related to effects of microwave pre-treatments on anaerobic digestion of sludge there are very few reports on the investigation of combined acidic/alkali-microwave pre-treatment method for food industry originated sludge. Hence, our study focused on the examination of the effects of combined microwave-alkali and microwave-acidic pre-treatment on aerobic and anaerobic biodegradability of sludge produced in dairy industry. Aerobic biodegradability was given based on biochemical oxygen demand measurements. Anaerobic biodegradability was characterized by biogas production in batch mesophilic anaerobic digestion tests.

Our experimental results verified, that microwave irradiation with alkaline dosage improve the solubility of organic matters in the pH range of 8-12. But enhancement of disintegration was not correlated linearly with biodegradability. During the pre-treatment stage applying pH over 10 the aerobic biodegradability show decreasing tendency. Applying of acidic condition during microwave irradiation resulted in lower disintegration degree than obtained for microwave-alkaline sludge pre-treatment method. But with microwave assisted acidic pre-treatments a higher aerobic biodegradability could be achieved than with alkaline dosage. In microwave pre-treatments

acidic condition was preferable to increase the shorter time (5 days) aerobic biodegradability; the alkaline condition was favourable to accelerate the anaerobic digestion process. It was verified that beside the irradiated energy the specific microwave power intensity also affect significantly the biodegradability of dairy sludge.

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## **ESTIMATION OF NITROGEN STATUS OF GRASS-LEGUME SWARDS UNDER FOUR N FERTILIZATION RATES**

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The aim of this study was to estimate nitrogen nutrition index of pure lucerne and their three mixtures with grasses subjected to four different levels of nitrogen in three years duration. The experiments had a randomised block design with four replicates and eight treatments in experimental scheme. Examined treatments were pure lucerne crop and three different mixtures of lucerne and grasses in the same proportion (lucerne and orchard grass, lucerne, orchard grass and tall fescue and lucerne, orchard grass, tall fescue and sainfoin) and four nitrogen fertilization rates (0, 70, 140, 210 kg ha<sup>-1</sup>). Pure lucerne achieved higher yield by 12.8% than their mixtures. Forage production was the highest at 210 kgN ha<sup>-1</sup> which was 14.6% more than treatments without nitrogen. Nitrogen uptake by the plant that received nitrogen fertilization was significantly higher than the plants without N. In all three experimental years control nitrogen treatment had satisfactory value of nitrogen nutrition index while other N treatments showed luxury consumption. Soil nitrogen reserves and nitrogen fixation when N was not applied, were sufficient to ensure enough biomass production. Any application of mineral N leads to accumulation of reserves in plant tissues.

## EXAMINATION OF CONSUMER BEHAVIOUR IN CONNECTION WITH THE FOOD PACKAGING

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In this poster, we intended to re-evaluate the findings of a previous thesis based on the different aspect of corporate responsibility. The primary research was conducted by interviewers, it was carried out in paper format, using proportional and stratified sampling. The survey was filled out in 4 district capitals by 100 people in each. 243 females and 157 males filled out the survey in total. The findings were analysed with the PSPP statistical analysis program. The findings proved that LOHAS values are not included in the aspects of shopping and that young consumers focus on packaging and brand the most. Customers also find the product's origin and the producer important, and they will check information related to these aspects, when a new product is introduced. It can be established that the importance of charity, environmental protection, and a healthy lifestyle are not communicated adequately to consumers, for which marketing tools should be used, as trends shift towards these aspects. Value creation and establishing a unique corporate culture has become important in gaining a competitive advantage.

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## **ENTREPRENEURSHIP AN IDEAL SOLUTION FOR YOUNG PEOPLE IN ROMANIA**

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Entrepreneurial activity is a planned and willing behavior, and the formation of entrepreneurial intentions depends on personal attitudes towards the act of setting up a business. In this paper we intend to present some theoretical aspects regarding entrepreneurship in Romania. From the European Union, Romania is the first country in terms of entrepreneurial intentions, 27% of Romanians saying they intend to start a business on their own, while 71% consider entrepreneurship as an option to have success in life.

## **ADVANTAGEOUS TRAITS OF HUNGARIAN TOMATO ACCESSIONS FOR FUTURE UTILIZATION**

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Due to its production and consumption volume, tomato is one of the most important vegetable of the World. Extensive efforts have been made to overcome genotypic difficulties that decelerated gradual increase of yield. Throughout this improvement, plant genetic resources (PGRs) with unfavorable vegetative and generative characteristics together with possibly valuable traits (e.g. rich flavor, outstanding nutritional content, uncommon fruit size, color, and shape, high adaptation to environmental extremities) have been lost. The side-effects of modern breeding progress, such as loss of flavor, lower nutritional content are measurable now in modern varieties. Tomato PGRs collected by gene banks are available for screening and for re-use of advantageous genes; for this, accession-level testing has to be executed. The hypothesis of the present study was that the selected Hungarian tomato accessions have valuable yield characteristics, which can be utilized in future breeding programs.

In a three year (2012-2014) open field trial, four PGRs with pepper-shaped fruits were grown together with San Marzano variety as a reference point. The PGRs were the followings (place of origin in brackets): RCAT030271 (Kozárd), RCAT031255 (Soltvadkert), RCAT031257 (Gyöngyös), and RCAT060349 (Nagykáta). The location was the certified organic land of SZIE Soroksár Experimental and Educational Station, Hungary. The propagation material was provided by Research Centre for Agrobiodiversity (NöDiK), Tápiószele. Weight of weekly yield was measured; the fruits were separated to three fractions, i.e. intact, cracked, and infected fractions. Coherences with weather parameters were also investigated.

The potential yield (summary of all fractions) of PGRs were comparable with that of San Marzano variety in 2012, however, the cracked fraction of PGRs

were significantly higher. The arid weather of 2013 reduced the ratio of cracked fractions in the case of all PGRs and the variety. The extremely humid season of 2014 was favorable especially for RCAT031257, the intact fraction of which was significantly higher than those of San Marzano. The potential yield of PGRs, with the exception of RCAT060349, was two-fold higher than the value of San Marzano. It was concluded, that scanning Hungarian tomato PGRs for useful traits (e.g. high yield in weather extremities, novel fruit color and shape) is reasonable; these characteristics can possibly be utilized by future breeding efforts.



## **EFFECT OF FREEZE-THAW ON THE TEXTURE OF GLUTEN-FREE PIE CRUST DOUGH**

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Developing new products that fit the expectations of consumers is very important. In this study, the freeze-thaw stability of two different gluten-free pie crust dough was measured. The texture is one of the most important sensorial properties, and has a great influence on consumer acceptance. A quick frozen pie crust dough should be easily cut, but non-crumbling after baking. The aim was to measure the texture of two different dough with a Texture Analyser to determine the hardness and the brittleness before and after the freeze-thaw process, to decide which dough fits the expectations better. The results showed that the dough with more rice flour was harder than the other and it became harder after the freeze-thaw process while the other dough's hardness have not changed during the process. The first dough was less brittle than the second, also before and after the freeze-thaw. A harder, and less brittle dough allows cutting with less crumbs. Considering the expectations, in the future the first recipe should be used to make a quick-frozen pie crust dough product.

## SEPARATION OF AFLATOXINS WITH CENTRIFUGAL PARTITION CHROMATOGRAPHY

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Mycotoxins are the secondary metabolites produced by filamentous fungi. Within these metabolites, aflatoxins are playing an outstanding role, due to their high-level toxicity, which could cause remarkable problems in food and feed industry. Plenty of methods are available for monitoring or measuring these compounds from various matrices, which require relatively high amounts of pure aflatoxins as standard compounds for qualification and quantification. Aflatoxins could be obtained synthetically or via production of a microorganism. Related the purifications of this mycotoxin from the fermentation environment, the liquid-liquid chromatography could take a remarkable part. This technique is based on a distribution of components between two phases in a biphasic solvent system, and one of the implementation of this technique is called Centrifugal Partition Chromatography (CPC).

In this study, the aflatoxins were extracted from the culture of an *Aspergillus parasiticus* strain (SZMC 2473) using a three-step extraction procedure. The resulted crude extract was used to find the best ternary biphasic solvent system in order to achieve proper separation. All the constructed ternary systems are based on the best solvent method. The systems contained a solvent, which is best to dissolve the desired aflatoxins and two additional “bridge” solvents. One of these solvent is much polar and the other is less polar, compared to “bridge” one. Applying these solvents in different ratios to solve the crude extract, the valuable component and the impurities could be shifted from one phase into the other. With chloroform, acetone and acetic acid as best solvents, numerous ternary systems were tested. After the selection of the best one, the preparative separation of aflatoxins was carried out by using centrifugal partition chromatography. At the end of our work the purified aflatoxins were analysed by LC-HRMS to check their purity and identity.

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## MYCORRHIZAL INOCULATION OF ONION (*ALLIUM CEPA* L.) IN THE EARLY DEVELOPEMENT STAGES

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The onion (*Allium cepa*) is one of the most widely cultivated vegetables. Its close relatives the garlic, shallot, leek or chive. As a food item, they are usually served cooked, as a vegetable or part of a prepared savoury dish, but can also be eaten raw or used to make pickles or chutneys. Also in Hungary it is an important vegetable, it is the base of many national dishes.

Mycorrhiza fungi is a special fungi, which lives in connection with plant roots. It is a symbiotic fungi which has three main types: arbuscular mycorrhiza (AM), ectomycorrhiza and ectendomycorrhiza. AM are probably the most widespread plant symbionts and are formed by 80–90% of landplant species. Crops inoculated with AM have higher yield and quality, and those plants reacted to stress factors better (e.g. drought, high temperature). Several *Allium* spp. responded with growth promotion on AM inoculation. Onion (*Allium cepa*) plants inoculated with AM, grown in pots with mineral soil had a higher biomass than non-inoculated plants and reached marketable size 2-3 weeks earlier. According to studies AM fungi also has a positive effect on nutrient content.

The aim of our experiment was to find an appropriate method for inoculation of onion seedlings, and define the minimum time for the appearance of symbiosis under greenhouse conditions.

The experiment took place at Szent István University Faculty of Horticultural Science, at the experimental glasshouse of the Department of Vegetable and Mushroom growing, 11th September 2017. We used Daytona F1 onion seeds, the media was Latagro KB2 type peat and two types of mycorrhizal product: MycoGrowth and Aegis Irriga. The experiment was made with 12 treatments with 30-30 seeds per each treatment. During trial chemically treated and non-treated seeds were used. The seedlings were sampled 5, 7 and 14 weeks after sowing, 5-5 seedlings from each treatment per time. Altogether 96 painted and prepared samples were checked, each with 3-3 roots with a Zeiss Axio Imager A2 microscope.

The results showed the appearance of mycorrhizal fungi in a few treatments. In our examination not only typical AM fungi was found, but also in a treatment we found hyphae with big amount of septas.

Results show opportunity of artificially infecting transplants after a few weeks with mycorrhizal products. However, continuing the experiment is necessary with some modification of the factors, to make the procedure more effective.

## **HUMAN RESOURCES IN PUBLIC ADMINISTRATION FROM ROMANIA**

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As in other sectors in the public administration for carrying out the tasks, persons with a certain specialized training must be included, their material base being provided by the state, the county or the common one. The persons in public office are individual persons appointed in public administration, civil servants. These public funders are the basic human resource in the administration, invested by appointment or election in a public office.

## **UNDERLYING CAUSES OF GLOBAL FOOD PRICE CHANGES**

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There is a significant increase in food prices all over the world. Rate of annual increases in prices of all kinds of food is more than 100 percent. However, this can lead to long-term food crisis. The research aims to find out the factors that contribute to a large increase in food prices, as well as to predict the likely consequences of food price increases. Then potential solutions related to specific problems should be highlighted. In this study several factors were determined, which were contributed to central (global food price increase) and general problems. These problems were separated by cause and consequences, they were structured and ordered hierarchically. Through outline the problems it can be improved that in global market of foods both demand and supply are influenced by many factors. The most important factors affected demand are: increase of population and urban population all over the world and increase of income level and internal migration in emerging countries. Supply is influenced by the following factors: a decrease in the yield of agricultural crops, low level of productivity in agricultural sector, as well as reduction in food crops production area because of unfavourable weather and increased production of biofuels. Most of general and specific factors, which affect food price increase, are related to each other causally but there are also separate factors. The most effective solution to the problem is increasing of agricultural productivity at the same time investments into agricultural researches and rural infrastructure.

## **SWEET POTATO [*IPOMOEA BATATAS* (L.) LAM] YIELD INFLUENCED BY SLIPS' ORIGIN ON ALLUVIAL SOIL IN SOUTH HUNGARY**

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Sweet potato (*Ipomoea batatas* L.) is an herbaceous dicotyledonous plant belonging to the family *Convolvulaceae*. It is one of the most widely grown root crops in the world and cultivated throughout the tropical and warm temperate regions. Globally, it is among the important food crops in the world, after wheat, rice, maize, Irish potato, and barley. Along with several European countries, it is also grown in Hungary. In spite of the published cultivation technology sheets and experiences, yield security is still not fully solved, growing site- and genotype-specific advices are still missing. Internationally, sweet potato is usually planted on ridges, depending on the soil conditions. It is important to determine whether among the local conditions planting on ridges or without ridges planting technology give higher yields. Our main objectives in the current work to comparison of the effect of planting primary or secondary cuttings on yield. To produce high quality planting material it can be an important information whether slips directly cut from sprouting storage roots (primary cuttings) or those derived by sprouting of the primary cuttings (secondary cuttings) result in higher yield. The cuttings were planted at the end of May 2016 and early June in 2017, in an amount of ca. 1,000 pieces on the whole experimental area of 300 m<sup>2</sup>. The cuttings were planted manually, followed by thorough irrigation. The experiment was performed in Deszk, South-Hungary on clay loam soil of medium to very good nutrient content. The experimental design was Randomised Complete Block Design (RCBD). We used the Ásotthalmi-12 orange-fleshed sweet potato variety. Ridges were formed on one half of our experimental area, on the other half rows were formed without ridges. The experiments with the planting material were started early April in 2016 and 2017. In both years minimum 5 plastic trays were chosen where the sprouting of sweet potato storage roots had already been started in both years. The primary cuttings were cut directly from the storage roots, watered, the lower leaves removed, and the slips were planted into the experimental trays. Secondary cuttings were derived from the sprouting of the primary ones. Both primary and secondary cuttings were used in the field experiments to get information that the primary or the secondary cuttings will



give us more yield. The experimental plots were harvested on 15th October 2016 and 2017. These plants had grown from primary or secondary cuttings, respectively. The first five plants from each row were harvested and weighed separately. These plants had grown from cuttings from tubers (primary cuttings) or from shoots (secondary cuttings). In 2016 and 2017 on ridges planting the secondary cuttings gave the best results. In 2016 with ridges technology, the difference between the yields of plants originating from primary and secondary cuttings (29.83 vs. 38.04 t ha<sup>-1</sup>) can be even 9 tons. In 2017 with ridges technology the difference between the yields of plants originating from primary and secondary cuttings (19.39 vs. 27.59 t ha<sup>-1</sup>) can be even 8 tons. Data were subjected to analysis of variance (ANOVA) using. Significant differences between treatment means were separated using least significant difference (LSD<sub>5%</sub>) test at 5% level of significance. On ridges technology between 2016 and 2017, with primary and secondary cuttings indicated significant differences. In Hungary, this is a new set of experiments focusing on sweet potato slips' origin. This year, our aim is to continue the experiments and we hope that it will be of particular value for researchers, producers and farmers in the future.

### **Acknowledgements**

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## **PROLONGATION OF LIQUID WHOLE EGGS' SHELF LIFE WITH DIFFERENT METHODS**

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The aim of our study was to examine the effect of preservatives used in general practice on the shelf life and calorimetric properties of salted, pasteurized liquid whole egg. The added preservatives included sodium benzoate, potassium sorbate and their mixture in 1:1 ratio. First, 15 samples were made with different concentrations in the range of 250-5000 mg/L of each preservatives, and an expert sensory panel determined the concentrations that did not greatly affect the sensory properties of scrambled eggs made from the samples. Samples of these concentrations were subjected to a 4-week storage experiment in which their microbiological status was investigated. We defined total plate count and the number of Enterobacteriaceae of the different samples with plate counting method ones a week. Samples were considered appropriate if their total number of bacteria did not reach 10<sup>5</sup> CFU/g and the number of Enterobacteriaceae was less than 10<sup>2</sup> CFU/g according to Hungarian regulations. Calorimetric properties were examined with MicroDSC III instrument on the first day. Liquid egg samples were heated up from 20°C to 95°C with a heating rate of 1.5°C/min. We used distilled water as reference solution. The device of evaluation was Callisto Processing software. Statistical analysis was performed by IMB SPSS Statistics 22.0 software. In our studies, we found that 2250 mg/l of potassium sorbate, 1000 mg/l of sodium benzoate and 2000 mg/l of the mixture did not change the sensory characteristics. By adding potassium sorbate, the 10-day long shelf life can be increased for about 4 weeks. In addition, it was found, that preservatives in the added concentrations did not significantly affect the calorimetric properties of the product.

## THE EFFECT OF FERTILIZATION ON THE YIELD AND YIELD COMPONENTS OF WINTER WHEAT

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We studied the effect of fertilization on the yield and some yield component of winter wheat in 2016/2017 years. The experiment was set up in three replications on the area of SZTE Tangazdaság Ltd in Hódmezővásárhely. The soil was meadow soil. The preceding crop was sunflower. Six fertilizer levels were applied besides the control: N80PK30, N100PK30, N130PK30, N150PK30, N170PK0, N170PK50 kg/ha active ingredients. The year 2016-2017 was unfavourable for winter wheat production. The amount of precipitation in the vegetative period of winter wheat was lower by 80.2 mm than the average. The distribution of precipitation was unfavourable. The obtained data were processed by single factor variant analysis. In the control treatment the yield was 4.20 t/ha. The maximum yield 5.60 t/ha was reached with N130PK30 kg/ha fertilizer treatment. The yield difference between the two treatments was statistically justified. The nutrient doses higher than N130PK30 did not increase the yield of wheat.

The number of spikes/m<sup>2</sup> was 564.67 in control treatment. In N100PK30 and N130PK30 treatments we measured significantly higher values 567.67 and 677.33 spikes/m<sup>2</sup>. The grain number in spike was 36.5 pieces in non fertilized parcels. We reached the highest value 43.77 pieces in N130PK30 treatment. The difference was not significant. The thousand seed weight changed slightly due to the fertilization. We measured 31.08 g in control treatment. The maximum value 32.71 g we got in N130PK30 treatment. The difference was not statistically justified. Our scientific results showed, that the N130PK30kg/ha fertilizer level was the optimum for the winter wheat in 2016/2017.

## **STUDY OF DIFFERENT FERTILIZER DOSES ON THE YIELD AND SOME QUALITY PARAMETERS OF WINTER WHEAT**

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The influence of different fertilizer doses on the yield and quality of winter wheat was studied on meadow soil in 2016-2017 years in Hódmezővásárhely. The experiment was set up on the area of SZTE Tangazdaság Ltd, in three replications. The preceding crop was sunflower. Six fertilizer steps were applied besides the control: N80PK30, N100PK30, N130PK30, N150PK30, N170PK0, N170PK50 kg/ha active ingredients. The year 2016-2017 was unfavourable for winter wheat production. The amount of precipitation in the vegetative period of winter wheat was lower by 80.2 mm than the average. The distribution of precipitation was unfavourable. The rainfall in October, November, April and May was more than the average, while in December, January, February, March, June, and July less rain fell compared the average. The obtained data were processed by single factor variant analysis. In the control treatment the yield was 4.20 t/ha. The maximum yield 5.60 t/ha was reached with N130PK30 kg/ha fertilizer treatment. The yield difference between the two treatments was statistically justified. The nutrient doses higher than N130PK30 did not increase the yield of wheat.

17.60 % crude protein content was measured in the N0PK0 treatment. The highest content of crude protein (18.70%) was in the N100PK30 and N130PK30 treatments, which was not statistically justified higher, compared the control value. Compared to this value in the higher treatments the crude protein content decreased. The Zeleny number was 70.40 ml in the control treatment. In N130PK30 treatment reached the maximum value, 76.0 ml. We can conclude, that, the N130PK30 kg/ha fertilizer dose was the most favourable concerning the yield and quality parameters of the examined winter wheat variety.

## **AGRICULTURAL FINANCING IN THE EU: THE CAP FRAMEWORK**

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Agriculture is a very critical economic activity in the European Union (EU). The regional bloc estimates that 22 million of its citizens are dependent on primary agricultural activities for their livelihoods. The organization of agricultural activities in the EU ranges from small family- owned and run farms to larger and commercialized farms which produce on a sizeable scale. Apart from that, agriculture also supports 44 million jobs in value addition activities such as food processing, food retail, and other food- related activities. Further, the EU relies on food exports for upwards of €130 billion in export revenues each year, further underlining the importance of the sector (European Commission, 2015). The numbers here illustrate just how key agriculture is for the economy in the European Union. They may not even capture the true picture which would require one to include other linkages and spillover effects to other industries. Just like any other economic activity, agriculture requires financing.

## **THE RECOGNITION OF THE EU ORGANIC LABEL AMONG THE HUNGARIAN CONSUMERS**

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The organic label of the European Union was introduced in 1991 and tries to promote the organic production and to draw consumers' attention on the labelled products.

The production of organic agricultural products and foods have gained a high importance in several countries, especially in Austria and Sweden, where the 21% and 17% of the total cultivated lands is for organic, while the number of involved farmers is also very high, 20.976 and 5.709, respectively. According to IFOAM, in 2016 Hungary was far behind the EU average with 2% of organic land and 1.971 farmers (the average of the EU28 is 6% and 9.583 producers).

The market share of the organic products was between 8-10% in Denmark, Sweden, Luxembourg, Switzerland and Austria, while the highest per capita organic consumption was measured in Switzerland (274,3 EUR/year/capita). The organic consumption in Hungary is still in its infancy, in 2016 the per capita value was only 3 EUR/year, while the EU average was 53,7 EUR.

The abovementioned datasets clearly show that in Hungary the organic production is much higher than the consumption, the majority of the Hungarian organic products are exported to Western-European markets. On the other hand, in the supply of the international food chains the number of organic products is increasing and the supply consists of imported products, the majority of them labelled with the EU organic label.

The aim of this paper is to measure the recognition of the EU organic label among the Hungarian consumers. Therefore, results of previous consumer surveys conducted by the Eurobarometer are compared by the results of our survey. As part of a H2020 research project an online consumer survey (n=1.019) was implemented during the second half of 2017.

Results show that among the European food quality labels the organic label is one of the most recognized ones in Hungary, but its average awareness is still very low: less than every fourth Hungarian consumer knows what this label is for, on average. On the other hand, this low recognition could be explained by the fact, that the EU label is not very self-explanatory, and parallel with the community system the national systems with their own labels in every member states – also in Hungary – coexist.

## **WATER FOOTPRINT OF PROTEIN YIELD OF FIELD CROP SPECIES BASED ON EVAPOTRANSPIRATION PATTERNS**

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Water availability is one of the major physiological factors influencing plant growth and development. An assessment study has been done at the Szent István University, Gödöllő to evaluate and identify the water footprint of protein yield of field crop species. Six field crop species (Sugar beet *Beta vulgaris*, winter barley *Hordeum vulgare*, winter wheat *Triticum aestivum*, maize *Zea mays*, potato *Solanum tuberosum*, and alfalfa *Medicago sativa*) were involved in the study. Evapotranspiration patterns of the crops studied have been identified and physiologically reliable protein ranges within crop yields were evaluated.

The results obtained suggest, that water footprint of cereals proved to be the lowest, however maize values were highly affected by the high variability of protein yield. Alfalfa, potato and sugar beet water footprints were in accordance with their evapotranspiration patterns.

## **COMPARISON OF ENVIRONMENTAL EFFECTS OF CONVENTIONAL AND ORGANIC FARMING WITH MATERIAL FLOW ANALYSIS**

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Since the beginning of the earth, great changes have taken place, initially by inanimate environmental factors. The appearance of life had a bigger effect to living beings in Earth. The environmental impact of initial human factors was negligible. Nowadays the significance of the human factor is outstanding. The start-up of the industrial revolution and the polbegins with serious challenges such as the effects of climate change and the growing demand for food.

At present, the population has already surpassed 7.5 billion people and is expected to reach a population of 9.2 billion by 2050. So, population growth and the resulting food pressure are cause for serious concern. Another problem is that natural resources: soil, biodiversity, plant nutrients, energy and water are limited. Thus, the use of efficient management methods, the reduction of resource use and the increase of recycling are becoming increasingly urgent.

To find the best solution I compared two farming methods: ecological and conventional farming.

It is a question of which form of farming system is more resource-efficient. During my research all my data were performed by a material flow analysis (MFA). This type of analysis allows us to consider the flow of specific materials at a given place and time, but it doesn't take into account the economic and environmental impacts of these materials.

I compared three conventional and three ecological management calculations.

The results show that the output of one kilogram of organic farming requires 0.37-0.77-3.7 kg Stock for wheat, 0.69-1.4-5.77 kg Stock for sunflower and required for wheat 0,11-0.18-1.47 kg; in case of sunflower 4.1-12.15-12.63 kg Input consumption.

In the case of conventional crops, wheat cultivation requires 0.48-0.77-1.62 kg Stock; in the case of sunflower 0,69-0,81-2,43 kg Stock. On the other hand wheat requires 0,09-0,12-0,14 kg Input in order to produce one kilogram of output and sunflower requires 0.08-0.12-0.14 kg Input to produce 1 kilogram of production.



## DEVELOPMENT OF *LYCORIELLA INGENUA* AND *BRADYSIA IMPATIENS* ON DIFFERENT PHASES OF *AGARICUS* COMPOSTS

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Fungus gnats are abundant all around the world, excluding places with extreme climate, like arid deserts and frozen wastelands. They dwell in damp soil, feeding on organic debris and on fungi hyphae, but can also be found in manure piles or under the bark of trees. Most species are not considered harmful in agriculture but some can cause damage mostly in protected crops and in mushroom houses. In mushroom production, the fungus gnats are regarded as the most important pests. The damage caused by them can lead to dire yield loss and low-quality product, which results in huge crop losses for the farmers. The two most commonly found species in Hungarian mushroom farms are *Lycoriella ingenua* (DUFOUR, 1839) and *Bradysia impatiens* (JOHANNSEN, 1912) from the family *Sciaridae*. The gnats proliferate rapidly in mushroom cultivation, which means that the critical number of gnats which results in severe loss can be reached quickly, so maintaining their abundance is imperative.

During compost production the different phases are transported by the help of conveyer belts, wheel loaders and trucks, from which some compost unintentionally falls off, thus creating potential food source for gnats. Mushroom production requires manual labor – especially in cellars, where production takes place on individual plastic bags – that inevitably leads to some compost ending up on the floor and remaining uncollected. In this study we aimed to find out if the two most prevalent fungus gnat species can survive on the most commonly found organic matter in the mushroom industry; the compost. We compared unspawned white button mushroom compost (phase 2) and spawned compost, which has been colonized by the mycelia of *Agaricus bisporus* (phase 3). In the experimental trial we have created breeding pots that either contained phase 2 or phase 3 compost. Each treatment had 12 replicates and the breeding pots were maintained under 23°C and 85% RH in a growth chamber in the absence of light. We recorded the time the first adults emerged in the breeding pots; the number of emerged insects per day sorted by sex; and the amount of time the whole swarming took place. We found that gnats

emerged only from phase 2 compost. Neither *Lycoriella ingenua*, nor *Bradysia impatiens* could develop into adult stage on phase 3 compost diet, furthermore, not even pupae were observed in these breeding pots. A total of 1607 adult fungus gnats emerged from pots containing phase 2 compost. Out of them 653 was *Bradysia impatiens*, and 954 *Lycoriella ingenua*. The observed sex ratio for the two species was different. For *B. impatiens*, the number of females were 1.36 times greater than males, in *L. ingenua* there were 1.7 times more males than females in total. Development time was approximately 6 days for *B. impatiens* and 10 days for *L. ingenua*. We concluded that phase 3 compost, which is well interwoven with *Agaricus bisporus* mycelia, is not suitable for *Bradysia impatiens* and *Lycoriella ingenua* to complete their life cycle.

## HOME RANGE OF THE BROWN HARE (*LEPUS EUROPAEUS*) IN AN AGRICULTURAL ENVIRONMENT

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The brown hare (*Lepus europaeus*) is a keystone species in agro-ecosystems. Its population declines all over Europe, which is suspected to be caused by the negative outputs of the modern agriculture. In order to mitigate the negative trends, the factors affecting its population must be determined. A telemetry-survey have been established by our Institute since 2015 in Jászágó, Hungary. The fieldwork included sampling from hunting bags, spotlight surveys, and our main project: the attachment and tracking of telemetry collars. At the beginning, seven specimens were live-captured and then three more in the next year. Ecotone Felis GPS-GSM collars were used to survey the home-range and habitat-use of the hares. The devices were set to collect 4 localization points per day. The localization points of each specimen were divided into seasonal (Winter/Summer) and daily (diurnal/nocturnal) groups. The localization points were analyzed with Kernel Home Range and Minimum Convex Polygon methods at various percentages, which were statistically tested between seasons, parts of the day and individuals. The results show that nocturnal home ranges were significantly bigger than diurnal ones during Winter in 2016. There was no clear difference between seasons, due to the big deviation of data. In many cases, the home range of the specimens was bigger than we previously suspected, and at a specimen, a seasonal home-range shift could be perceived too.

## **ANALYSIS OF TROPHY PARAMETERS IN FALLOW DEER (*DAMA DAMA*) IN HUNGARY, 1998-2016**

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Nowadays, trophy hunting is considered one of the most important aspects of big game conservation and management. Trophy hunting of Fallow deer (*Dama dama*) provides not only remarkable income source for many game managers, but specific antler parameters can also be used as bioindicators of the populations. Therefore, it is essential to examine the trends of the trophy size and quality in this species. Assessment of the trophy quality is often based on the measured values of the individuals with the strongest (e.g., heaviest, longest) antlers. However, there is little knowledge about the reliability and representativity of this approach.

In Hungary, it is compulsory to present each antler for evaluation (scoring), and the long-term datasets collected by the hunting authority are available in the National Game Management Database. In the present study, we used the dry weight of the Fallow deer antlers and the mean of main beam length on the two sides of the antlers, as these had been measured on each buck. We have analyzed the trend of the annual number of evaluated trophies between 1998 and 2016 and the temporal variation in the values of dry weight and main beam length during the study period on the population level and in the case of the shot bucks with the best quality antlers.

The annual number of the presented trophies (n=42,059) increased from 894 to 3,795 with an exponential trend (Pearson-correlation,  $R=0.97$ ,  $P<0.001$ ). The measured values were examined in 3 estimated age classes (young: up to 4 yrs, middle-aged: 5-9 yrs, old: from 10 yrs). As distributions of annual data differed from the normal distribution in most cases (Shapiro-Wilk test), the groups (year  $\times$  age class) were characterized by the median. The largest values were picked in each group by selecting the lowest value among the individuals belonging to the upper 1%, 5% and 10% of the sample size. In many cases, the top values and the group median did not follow the same trend, which resulted in the variability of the difference between the group median and the largest values. In general, the difference between the group median and the largest values showed the highest variability in case of the 1% threshold. Our results suggest that in

Fallow deer, the assessment of the quality of an entire population based on the largest trophies may be misleading.

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## **ANTIOXIDANT PROPERTIES OF DIFFERENT APPLE CULTIVARS**

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Dietary antioxidants can be an important part of the healthy diet. Polyphenols from the commonly consumed apple can be possible sources of intake these phytochemicals. In our study the antioxidant properties of six apple cultivars harvested at commercial maturity, were examined. Flesh and skin were separated and total phenolics by the Folin-Ciocalteu assay, ferric reducing antioxidant power (FRAP) and radical scavenging activities using DPPH method were determined for each. For all apples polyphenol content and antioxidant activity of the skin was significantly higher than the flesh. Regarding the cultivars there was an obvious difference between the antioxidant activities of the examined apples. The green variety Granny Smith showed the best results followed by the red-skin apples while yellow-skin apples had the lowest activity.

## **THE EFFECT OF DIFFERENT WEED CONTROL TECHNOLOGIES ON YIELD OF MAIZE AND PROFITABILITY OF MAIZE PRODUCTION**

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In our investigation we used different weed control technologies in the different phenology states of the maize. The farm experiment have been carried out in 2017, in Hungary, Kunágota, on good quality chernozem soil, on 20 x 50 m plots.

The experiment can be regarded as 9 weed-control strategies where, in addition to the untreated control, two chemicals are applied (*Laudis*, *Capreno*) in different doses, two mechanical weed-control technologies, and two combination of chemicals and mechanicals weed-control technologies were used. Mechanical weed-control place connected to the herbicide treatments in different times: until 4-6-leave age weedless, in 4-6-leave age hoed once, in 4-6-leave age cultivation once.

Our farm experiment were assessed the number of plant, length of plant, leaf number of maize, corncob-number, corncob-lengt, line number of corncob, thousand seed weight yield and profitability of maize production. Our results were evaluated by a one-factor analysis of variance.

## GENETIC DIVERSITY OF LINSEED ACCESSION

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Flax (*Linum usitatissimum* L) is the third largest natural fiber crop and one of the major oil crops in the world. In this study genetic diversity of 33 flax cultivars were assessed. Fifteen polymorphic microsatellite markers (SSRs) were used. A total of 117 alleles were detected with an average of 7.93 alleles per locus ranging from 3 (LU6 and LU22) to 13 (LU8 and LU27). The polymorphic information content (PIC) value of each SSR primer pairs ranged from 0.34 to 0.80 with an average of 0.62. Cluster analysis based on Jaccard's similarity coefficient using UPGMA grouped the 33 flax varieties into three clusters. The Jaccard's similarity ranged between 0.42 to 0.96. The genotype Lidgate showed the least similarity with Norman. These two genotypes could be well used as parents in breeding program for developing improved varieties.



## **SOWING DATE AND NITROGEN RATE EFFECTS ON QUALITATIVE PARAMETERS OF MAIZE GRAIN**

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Field experiment with the maize hybrid ZP 434 was conducted on the calcareous chernozem soil at Institute for Animal Husbandry in the Republic of Serbia during 2016 and 2017. The experiment included two sowing dates (8 April - first date of sowing and 21 April - second date of sowing) and four nitrogen rates (0, 60, 120 and 180 kg ha<sup>-1</sup>). Results show that the year, sowing date and nitrogen rate had highly significant effect on moisture, starch, protein and oil contents of maize grain. The moisture, starch and oil contents were higher while protein content was lower in 2016 than in 2017. The long drought stress during late vegetative development and grain filling stage in 2017 increased protein content in grain. The higher moisture and protein contents and the lower starch and oil contents were recorded for the first date of sowing. The moisture, protein and oil contents significantly increased while starch content significantly decreased with increasing nitrogen rate from 60 to 180 kg ha<sup>-1</sup>. The results documented a significant inverse correlation between starch and protein contents, which prevents breeders from improving these two parameters simultaneously. In order to improve the protein content of the maize grain, the late sowing and fertilization with 120 kg N ha<sup>-1</sup> are justified, because the high protein of grain is related to high grain quality for animal feed.

## SEASONAL EFFECT OF QUALITY OF MILK IN COW

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**Background:** The amount, composition and properties of the milk produced at the beginning and end of the lactation period different from those of the intervening period. A series of simple steps milk processing, the process during the annual milk production is influenced by seasonal effects, so it is necessary to know the exact production conditions.

**Aim and methods:** In this study the *goal* was a long term monitoring for the altered milk and products of cottage-cheese. We examined the quantitative changes in the indicators of nutritional values in raw milk samples collected by Szekszárdi Tolnatej Zrt Company during one year and monitored a seasonal changes of the finished product made from milk samples of cottage-cheese content values. During one year, we validated amount of protein, carbohydrates, lipids and other parameters changed in the seasons.

**Results:** Seasonal periodicity altered moderately in raw milk in the measured parameters suggested different feeds in cows. The cottage-cheese may also arise from that in these times of dairy animals hormonal balance changes. However, the kind of productive cows can be different in certain geographical areas, which cover specific nutritional values of milk. Throughout our investigation the seasonal change was moderated in the composition of raw milk of cow during a year as was expected. One of the main reasons is the feed of animals and the obedience training of cows in Hungary. The seasonal changes in the product of cottage-cheese were measured due to the altered parameters in the milk. For he standardized production of manufacturing process and the quality of

cottage-cheese more investigation is needed in the future. First of all, protein values in the vat has to be taken account parallel to the fat values as well as we take into consideration for the yield in the compounds of cottage-cheese.

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## POSSIBLE USE OF MULTIVARIATE STATISTICAL PROCESS CONTROL IN FOOD INDUSTRY

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At the first stage of our work, the theoretical knowledge needed to use the multivariate statistical process control (MSPC) was explored. Previously, we clarified the sometimes confused concepts, equations and formulas (Mihalkó and Rajkó, 2016). At the second stage, R project simulation studies and some food industrial practical model investigations are carried out for confirming the MSPC advantages compared with the univariate ones. Furthermore, we analyze, using principal component analysis (PCA), what could cause the outlying values, moreover we will demonstrate how to use the MYT-decomposition.

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## **THE EFFECT OF MILKING TECHNOLOGY ON THE BEHAVIOUR PATTERN OF DAIRY COWS**

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Animals react on environmental effects with the changes of their behaviour. In case of major negative effects production loss will be the response. It is extremely important on dairy cattle farms since when milk production falls back it means significant economic consequences. That is the reason why it is vital to observe behavioural differences. Unfamiliar humans and any technical novelty might appear as threat for the dairy cattle, and trigger fear in the animals. Fear can make handling and milking harder and it can also delay milk let-down and reduce milk yields. In general, usually the following behaviour traits can be examined in dairy cattle: communication, aggression and social structure, biological rhythm, sexual behaviour, food and water intake (etc.). All the above can have an impact on the production level. The parameters of rest, movement and habits of the animals are analysed. Flinch, step, and/or kick (FSK) score has been considered as an indicator of comfort/discomfort while the milking unit is on the cow.

Research has been carried out on the following topics: Differences between feeding and milking behaviour a conventional milking parlour or automatic milking system; Stepping and kicking behaviour during milking in relation to response in human–animal interaction; Individual differences in behavioural and physiological responsiveness of dairy cows to machine milking; etc.

Our goal was to present the results of this research, highlighting the effect of milking technology on the behaviour pattern of dairy cows.

**CERTAIN PARASITOSIS OF THE WILD BOAR AND THEIR IMPORTANCE IN WILDLIFE MANAGEMENT IN HUNGARY AND IN CERTAIN HUNTING REGIONS OF HEVES COUNTY**

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The wild boar stock has significantly increased recently in Hungary. In veterinary health point of view we should consider the following fact, that a strain sow gives birth to 7–8 piglets on average, but half a year later she raises only 3–4 pigs. The mortality can be caused by the lack of food, predators' effect, or just illnesses. Besides viral and bacterial diseases parasitosis also plays an important role. Even prevention is possible against the above mentioned diseases, especially in game gardens. Eimerias declaredly with such samples have not been searched in wild boars by anybody in Hungary. Having regard the results the significance of parasites within cells, supposedly, is much higher than we would expect, especially in the case of young pig mortality. Protection against these infections can be done by giving the right type of antiparasitic treatment.

## **INFLUENCE OF PLASTIC MULCH BETWEEN ROWS ON THE YIELD AND QUALITY OF WATERMELON (*CITRULLUS LANATUS* L.)**

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The watermelon (*Citrullus lanatus*, L.) is an important and valuable vegetable crop that has in Hungary the 3<sup>rd</sup> largest cultivated area in open field.

Melon growers face continuous challenges, one of the main problems is the lack of labor. Growers are increasingly looking for technology solutions that have the least manual labor needs. The appearance of the plastic mulch between the rows was a major step forward in the growing technology.

The main objective of our two-year (2016, 2017) experiment was to compare the effects of different colored plastic mulches between rows on the quantitative and qualitative values of the yields. Our experiment was set up in the largest and most intensive melon growing area in Hungary, at Dombegyháza in Békés County. 5 rows were planted out, in 2016 with 4, in 2017 with 3 repetitions. 35 plants per repeat were used. Between the rows was 2,2 meter and inside the rows between two plants the distance was 0,5 meter. After planting, the seedlings were covered with a lowplastic tunnel.

Our investigations were carried out with the *Grizzly* watermelon variety and during the experiment 5 different colors of plastic mulch (purple, transparent, green, black, and butter coloured) were used, the control was uncovered. The width of the foils was 180 cm in both years with 0,02 mm thickness.

In the field we examined the average weight of the fruits. The fruits were balanced, in both experimental years the values ranged from 7,5 to 8 kg. In the case of purple and green covers, the average values were around 8 kg in both test years.

During our laboratory measurements we examined the following nutritional characteristics: invert and reducing sugar content, refraction and acidity. Reducing sugar content was 4-6% in both experimental years and invert sugar content in 2016 was over 8% except for green covering, in 2017 was also over 8% except for purple covering. Highest reducing sugar (5,41%) and invert sugar (8,67%) content were obtained on the transparent foil. The refraction was between 10-12 Brix ° in both experimental years, with the highest average in 2017 on transparent colored coverage. The acid content was between 0,08 –



0,1% in each test year, except in the case of in 2017 on purple cover, where a slightly lower value were obtained.

For the statistical evaluation of our field and laboratory results, IBM SPSS 23.0. statistical software package were used. Our experimental results were evaluated by two-factor variance analysis (ANOVA) for all variables.

Based on the results of the two years of our study we can state that the different color of the plastic mulch did not show significant differences in the examined quantitative and qualitative parameters. Using plastic mulch soil covering between the rows in the watermelon production is likely to continue due to the fact that the fruits remain clean, between the rows the soil remain weed-free, and the problem of labor shortage can be solved with this technology.

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## **MICROBIOLOGICAL STATUS AND OXIDATION PROPERTIES OF MINCED CHICKEN BREAST MEAT TREATED WITH DIFFERENT CONCENTRATION OF ALLYL-ISOTHIOCYANATE**

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Due to its biological composition poultry meat is perishable by nature and susceptible to quality deterioration such as; microbial spoilage and oxidation changes. Meat and meat products with healthy, extended shelf-life and good organoleptic properties are highly demanded by consumers. In current study, the antimicrobial and antioxidant effects of Allyl-isothiocyanate (AITC) as a natural additive on raw chicken meat during chilling storage were determined. For this purpose, samples of minced were treated with different concentrations of AITC (100, 200, 300 and 500 ppm) and control no AITC added, the samples packaged and stored for 8 days at 4 °C. Fluctuations with no significant effect were noticed in TBARS values during the storage period. Simioulatnesly AITC with higher concentration showed lower mesophilic aerobic counts compared to control and meat containing a low concentration of AITC. Moreover, compared to the beginning of storage, AITC decreased water holding capacity (WHC) of meat this can affect other physicochemical properties of meat. Further study needed to determine the effect of AITC on the physicochemical properties of meat and food products.

## **THE INFLUENCE OF NUTRIENT SOURCES ON THE YIELD AND MARKETABILITY OF SWEET POTATO [*IPOMOEA BATATAS* (L.) LAM.]**

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The consumers' continuously increasing demands for sweet potato [*Ipomoea batatas* (L.) Lam.] during the last decades have considerably stimulated the producers' interest in numbers of European countries. Besides the decades-long experiences in production, development of each steps of technology based on experimental results can significantly improve yield stability of sweet potato also in Hungary.

Our experiments were performed with the Hungarian certified cultivar 'Ásotthalmi-12' in Hódmezővásárhely on sandy soil in 2017. We examined the effects of various fertilizers, a plant conditioner and their combinations on the yield of sweet potato as well as on the proportion of first- and second-class storage tubers and foliage mass. Altogether, 18 treatments were applied in four repetitions set up in randomized block design. The products involved were: (1) Phylazonit soil inoculant (*Pseudomonas putida*, *Azotobacter chroococcum*, *Bacillus circulans*, *Bacillus megaterium*); YaraMila (2) 8-24-24, (3) 8-11-23 (N-P-K) and (4) YaraLiva NITRABOR (N, Ca, B) fertilizers; (5) YaraVita BORTRAC (N, B), SENIPHOS (N, P, Ca) and SAFE K (N, K) foliar fertilizers. The treatments were: untreated control; 1; 2; 3; 1+2; 1+3; 2+4; 3+4; 1+2+4; 1+3+4; 2+5; 3+5; 1+2+5; 1+3+5; 2+4+5; 3+4+5; 1+2+4+5; 1+3+4+5. At the harvest, the storage root yields, the amounts of 1<sup>st</sup> and 2<sup>nd</sup> grade storage roots and the mass of foliage were determined per plot.

The highest yield (708.75 g) per plant was achieved with Yara 8-24-24, followed by Yara 8-11-23 (700 g) and Phylazonit (692.25 g). The highest rate of 1<sup>st</sup> grade storage roots (78%) as well as the biggest foliage mass per plant (326 g) was also achieved with Yara 8-24-24. The usual benefits of the combination of plant conditioners and fertilizers were not observed here. The complex application of foliar fertilizers had negative effect on each parameter determined. The extrapolation of 'per plant' results to one hectare (33,333 plants per hectare) showed that the application of the bacterial soil inoculant 'Phylazonit' resulted in a yield (23.1 tons Ha<sup>-1</sup>) only 0.5 ton lower than that of

the Yara 8-24-24 (23.6 tons Ha<sup>-1</sup>). The differences between the yields, however, can even reach 9 tons per hectare, depending on the treatments.

Based on our results, it can be concluded that bacterial soil inoculants can successfully replace fertilizers if organically informed cultivation is preferred. Further experiments are needed to explain the benefits of a fertilizer of higher phosphorous content on a soil of exaggerated phosphorous content - contradicting the general information about the moderate needs of sweet potato for this element.

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## RESEARCH OF MIDSEASON POTATO VARIETIES SUITABLE FOR ORGANIC GROWING

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In 2011, most Hungarian organic farms planted potato varieties that are common in conventional agriculture, although not all of these were suitable for organic growing. The choice of variety was based solely on farmers' experience, as research results were not available. To improve organic potato cultivation, ÖMKi initiated an on-farm participatory research program for evaluating potato varieties with different resistance attributes for organic growing. The variety trials were carried out during 2012-2015 in all together 22 organic farms in several growing regions of Hungary. The four-year trials were conducted with participatory on-farm research methods: potatoes were planted and cultivated following farmers' usual practice, so cultivation conditions and technology were different across experimental sites. Quantitative and qualitative parameters of 13 midseason potato varieties were assessed; the set of varieties was modified during the year, based on previous trial results. Those varieties were chosen for testing, which according to their breeders had certain degree of resistance to any relevant potato disease or abiotic stress. At harvest yield was recorded. Unsorted samples of 50 tubers were taken from each test plot of each variety. Visual inspection was conducted on tubers' surface and infections of *Streptomyces*, *Rhizoctonia*, *Fusarium*, and *Erwinia* were recorded. Moreover, severe damage by animals, *Agriotes* larvae, and machines was registered. We also assessed deformed or greened tubers.

Average yield of varieties varied between 2.19-3.45 kg/m<sup>2</sup> throughout the four years. The most relevant quality problem was *Streptomyces* infection (15,9% of tubers). The damage of animals (6,23%) and *Rhizoctonia* infection (5,9%) occurred on a lower level. No significant differences could be shown among the varieties regarding the assessed parameters. However, regarding the likelihood of soil-borne infection (*Streptomyces*, *Rhizoctonia*, *Fusarium*), significant correlations (using Spearman's correlation) were found with several elements of the cultivation technology (irrigation, fertilization) and certain soil parameters (e.g. soil pH, soil sticky point).

After summarizing the data of the four-year trials, we could not identify one variety among all midseason genotypes tested, which would have performed best on every location. Varieties could be recommended to farmers according to the location and specific characteristics of their farms. Generally these well

performing varieties were Hungarian bred resistant varieties. Besides summarizing and sharing research results, regular field trips and winter meetings were arranged within the on-farm network. The communication was highly improved among the participants of the organic potato sector, and a well-working organic potato working group was formed. Also an outcome of the working group's activity is a published technical leaflet on organic potato cultivation.

## RELATION OF WHEAT SPECIES AND GENOMES IN AMINO-ACID COMPOSITION

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As regards wheat varieties constituting a natural ploid series the issue of analysing diploid, tetraploid and hexaploid species is topical since ancient varieties can play significant roles in contemporary agriculture as well. Seventeen winter wheat varieties, out of which two diploid varieties carried genome A, nine tetraploid types had genomes AB, two varieties had genomes AG and four varieties were hexaploid ones with genomes ABD, were analysed from the point of view of their amino acid compositions. The amino acid contents of Asp, Thr, Ser, Glu, Gly, Ala, Cys, Val, Met, Ile, Leu, Tyr, Phe, His, Lys, Arg, Pro (a total of 17) were determined in those varieties mentioned above.

It has been found that the amino acid contents of the grains genotype AA *Triticum boeoticum* and *T. monococcum* exceeded the amino acid content of *T. aestivum* in respect of all the amino acids analysed in this experiment, with Glu being the only exception. In comparison with the *aestivum* wheat, essential amino acid contents showed a similarly favourable picture in the diploid varieties mentioned. As regards type AB tetraploid varieties excesses of 13-16%, in comparison to the *aestivum* wheat, were found in essential amino acid contents. The amounts of non-essential amino acids in all the winter wheat varieties showed decreases irrespective of the ploid level.

What concerns the total amino acid content, all the winter wheat varieties with the exception of *T. monococcum* (A), *T. dicoccoides* (AB) and *T. dicoccum* (AB) contained less amino acid than the *aestivum* wheat. All the monocarbonic acid and aromatic as well as heterocyclic amino acid contents of the wildy growing *Triticum boeoticum* (A) and the grown *Triticum monococcum* (A) (with polaric, apolaric R groups, diamino radicles) exceeded the same contents of *T. aestivum*. The value of the monoamino-dicarbonic acid, however, was lower in our experiment.

**EFFECT OF DIFFERENT EXTRACTION METHODS ON THE METABOLITE PROFILE OF *ASPERGILLUS* SP. ISOLATED FROM *JUNIPERUS COMMUNIS***

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Nowadays, several studies have focused on the metabolite profiling of different living organisms. Numerous approaches are available for this purpose, but for the identification and characterization of metabolites the HPLC-HRMS and <sup>1</sup>H-NMR techniques are the most popular due to their high accuracy and efficiency. One of the key element regarding these analyses is the extraction of metabolites. If a non-representative extraction method is used, the metabolite profile will be deformed due to the losses of metabolites. Mostly both polar and non-polar compounds are of interest, thus an extraction method with desirable performance for both groups is needed. Until now several papers have been written in this topic and one phase solvent mixtures are the most prevalent containing polar and non-polar solvents as well. In the other hand there is no a “gold standard” method, which is perfect for all kinds of matrixes and metabolites. Extraction methods usually should be adjusted for the determined set-up. In this work seven extraction methods were tested to determine the metabolite profile of *Aspergillus* sp. Two solvent mixtures from literature and two self-developed ones were compared. The effect of freeze-drying, evaporation and parallel extraction on the metabolite profile was also investigated. It has been found that extraction solvents and various sample-preparation treatments have a crucial effect on the measurability of the metabolites. Applying various extraction methods, the alteration in the quantity and the quality of identified compounds was observed.

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## **THE EFFECT OF REPLACING FISH MEAL WITH HERBAL PROTEIN IN THE LAMB DIET**

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The paper presents the effects of replacing fish meal with vegetable protein on the intensity of the growth and feed utilization of lambs of the MIS population, in intensive fattening. The trial was carried out on 40 lambs, age of 30 days, divided into 2 groups. Animals were fed a concentrated mixture and lucerne hay at will, in addition to mothers' milk. The effect of using isoprotein feed mixtures, which differed in terms of the protein component, on the production parameters of the lambs in fattening, was examined. The lambs on the treatment I received fish meal as a source of protein, while the animals on treatment II consumed Eko fish meal - herbal substitute for fish meal, consisting of domestic feeds of known origin such as genetically unmodified and thermally processed meal of peeled soybean grains, isolate of soy protein, gluten, livestock yeast with the addition of minerals, amino acids, vitamins, enzymes and other additives.

Statistical processing of the obtained data was carried out using the SPSS Statistica program, Version 20. The average daily gain of lambs on treatments I and II was 0.320 and 0.283 kg, respectively. Consumption of dry matter, protein and energy in analogue treatments was 0.819: 0.823 kg; 152.62: 157.04 g and 5.65: 5.73 MJ, respectively. The conversion of dry matter (kg/kg of gain) was 2.56: 2.91; of total proteins 476.9: 554.9g and energy (MJ NEM/kg) 17.65: 20.25, respectively. The efficiency of protein utilization - PER (g of gain/g of consumed protein) in the above treatments was: 2.09 and 1.80, respectively. There were no statistically significant differences between the examined treatments ( $P > 0.05$ ).

Since the source of protein did not significantly affect the intensity of growth and the food utilization in lambs of Mis population in intensive fattening ( $P > 0.05$ ), fish meal can be replaced by Eko fish meal - plant protein, since according to Commission Decision 9/2001 on protection BCE (OJEC, 2001), there is a distance to the use of fish meal, as a source of protein.

## **CO-FERMENTATION OF AGRICULTURAL ORGANIC WASTE, MAIN AND BY-PRODUCTS**

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My research work proposes the study of the impact of the biogas production by co-fermentation of agricultural products. The basic substance is the dangerous liquid pig manure of the concentrated stock of big pig farms. The utilization of these materials as an energy source means large income for the agricultural enterprises, saving the replacement of plant nutrition by utilization of bio-manure, increasing the performance of the plant production, making harmless the dung which means a big environmental load. Because of the profitability of bioenergy utilization depends on the local conditions it is necessary to do experiments to try the available composition of organic wastes in the ratio of the formation in advance. I measured the quantity and the methane and CO<sub>2</sub> content of the biogas released from the substrate. The experiment simulated real biogas plant conditions at mesophyll temperature through a continuous biodegradation process. It can be considered, as a semi industrial size. It can be provable based on my research and literature references, that the qualitative and the quantitative properties of the biogas releasing in the biogas plants largely depends on the portioned liquid dung, the additives, and the features of the applied technology. Our experiments justified the yield improving effect of the agricultural main and by-products and wastes because of the low organic matter content of the liquid pig manure. It may be hypothesized, that these additives and the technological parameters of the biogas production influence on a favourable direction the features of the fermented manure and through this for example the opportunities of the substrate recirculation with only additives. The results provide a comprehensive overview of the effect of the different additives in the energy production aimed biogas releasing.

## DEVELOPMENT OF MELATONIN LEVEL IN BOVINE'S MILK

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According to the scientific literature, naturally originated melatonin hormone can greatly help the handling of sleep problems. After 22.00 o'clock, besides artificial lightening, any activities significantly decrease the melatonin production of the human and animal body. In that case, despite the well-functioning metabolism, sleeping problems can occur. The long-term consequence of sleep deprivation is health damage, and ultimately it deteriorates life expectancy. The beneficial

effect of milk melatonin is reflected in folk tradition. Drinking a glass of warm milk before bedtime, helps to fall asleep. Milk and milk products containing high level of melatonin could be a new possibility to handle and solve sleep deprivation related problems. Considering the circadian and circannual rhythm, the melatonin production in mammals shows significant differences. Melatonin level in milk is influenced by the time of milking, feeding regime and breeding technology. Based on these correlations, I would like to give an insight into the development of melatonin in bovine's milk, in order to produce melatonin rich milk. One of my motivations is to check the possibilities to create a new milk product group. In Ireland and in New Zealand night-milked, separately collected and processed cow-milk is already marketed, but these products derive mainly from family-run farms. There is no data of high melatonin milk products coming from intensive milking cow breeding. During our examination, we collected milk samples in an intensive dairy farm, so that we could get accurate data about the daily development of melatonin level in bovine's milk. The results present the effect of heat treatment on the melatonin level of the raw milk, and the daily development of melatonin level of raw cow's milk as well.

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## EXAMINATIONS RELATED TO THE INVESTMENTS IN SARKAD

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We were searching for the first part of the development period from 2014 to 2020 in Sarkad, which mainly covers infrastructural investments. The purpose of our research is to investigate how the inhabitants think about the investments at a given time, and also to investigate the effect of the overall investments that they have experienced in Sarkad, in their own part of the city or in their own lives. The opinions of the participants in our questionnaire suggest that the upgrading's should be continued and, moreover, more investment for job facilities should be made by the local government in the city. This way, the satisfaction of the population could be maintained and the degree of emigration could be reduced

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## EFFECTS OF DIFFERENT CASING ONTO THE YIELD OF BUTTON MUSHROOM

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In Europe just like in Hungary the most widely cultivated mushroom is the button mushroom (*Agaricus bisporus*). The market competition and the increasing costs of production needs the of optimalization cultivation conditions and upgrading the intensive production technologies. In button mushroom cultivation the casing of the growing substrate is a necessary technological step. Casing is important because of several reason: it helps to protect the substrate against some pathogens, also protects the compost from dramatic temperature changes. Button mushroom fruit bodies contain about 90% water, that is mainly provided by the casing soil. This substrate is also a reservoir for the microbiota, like *Pseudomonas putida* which has important role in pin heading stage. Casing soils origine from different places but the major component is usually some kind of peat, like Sphagnum peat or black peat and lime. But there is many contradiction about the effect of this casing soils onto the mushroom production under the cultivation. In this study, we collected 7 different casing soils (1 Dutch, 2 Polish, 2 Romanian and 2 Hungarian) and monitored the changing of electric conductivity (EC) and pH during a small-scale cultivation and examined this casings effects onto the yield. According to our experiment the pH had been decreasing and the electric conductivity had been increasing during cultivation. There was no significant difference between the casings in the total yield, but our results underlined, that quality of casing has a major importance onto the mushroom cultivation.

## **COMPARISON OF DIFFERENT METHODS OF TREATMENTS AGAINST WHEAT YELLOW RUST**

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Stripe rust caused by *Puccinia striiformis* var. *striiformis* is major biotic threats in many wheat growing area of the world. Infection intensity varies depending on climate conditions, sensitivity of wheat varieties and agricultural practices. In this study four treatments of 28 winter wheat entries, including untreated control, were evaluated for control the stripe rust on the field in Szeged-Óthalom location in 2016. The tested fungicide was epoxiconazole and was applied (i) none (control) (ii) once (tillering), (iii) once (heading), (iv) twice (tillering and heading). Stripe rust severities were scored using 0-100 percent. Grain weight measurements were taken after harvesting. The trend of reduction on stripe rust severity was already maintained after the once fungicide application. Zero rust severities were observed after twice time spraying. The main grain yield among the treatments ranged from 7.79 to 8.13 t/ha which were 7 to 11 % higher than the untreated control.

## **EFFECTS OF MINIMAL PROCESSING AND VITAMIN C ENRICHMENT ON MICROBIOLOGICAL SAFETY AND VISCOSITY OF LIQUID EGG WHITE**

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Emerging technologies, like High Hydrostatic Pressure, heat treatments on low temperatures, ultra-sonication, have an increasing tendency in industrial application. Vitamin enriched foods, like eggs, are considered as functional foods, but for high retention of biological active compounds adequate minimal processing technologies are needed. In our study vitamin C enriched liquid egg white was examined to meet consumer's expectations.

Several combinations of low temperature pasteurization (57 - 63°C, 5 – 7 min) and High Hydrostatic Pressure (350 – 400 MPa, 5 min) were used to provide microbiological stability of vitamin C enriched (1000 mg/l) liquid egg white. After enrichment and treatments samples were examined for mesophyll aerobic and Enterobacteriaceae cell counts and viscosity attributes.

Our results show that microbiological stability is not significantly influenced by vitamin C enrichment, but the different parameters of heat treatments and HHP have a strong effect.

Viscosity attributes (measured with Anton Paar MCR 92) analysed by Hershel-Bulkley models point out that higher pressure of HHP has a stronger influence on viscosity than the temperature of pasteurization. Our results show a great opportunity for industrial use of minimal processing technologies for liquid egg white.

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## **EFFECTS OF COMBINED HHP AND HEAT TREATMENT ON NUTRITIONAL QUALITY OF VITAMIN-C ENRICHED LIQUID WHOLE EGG**

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Egg is recognized as a nutrient dense food containing high quality proteins which make it to a functional food [1]. Already a highly nutritional all-natural food source—as attested by the ability to develop and maintain a 21-day-old embryo—eggs enriched with vitamins represent an opportunity to provide a more functional food source, especially for geographical areas most susceptible to vitamin deficiencies. Of the 13 commonly accepted vitamins, all but vitamin C are present in the egg [2].

A great opportunity for increased vitamin-intake is the consumption of vitamin enriched products. On the markets there are no vitamin-C enriched egg products, although that is a great opportunity to satisfy the daily requirement of vitamin C. The goal of our experiment was the examination of effects of added vitamin C in whole egg. In our study the effects of HHP and heat treatments is highlighted. Vitamin C was added to homogenise liquid whole egg (LWE) in different ratios (500 – 1000 mg/L). For preservation HHP (350 – 500 MPa, 5 min) and heat treatment (57 – 64 °C, 10 min) were used in different combinations. Antioxidant and vitamin C content were measured. Our results show that only slightly decreases are in vitamin C and total antioxidant content caused by HHP. The effects of heat caused higher decreases. Our experiment showed the optional industrial application of HHP for LWE.

### **Acknowledgements**

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## EFFECT OF NUTRIENT SUPPLY ON THE MORTALITY RATE OF CALVES

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The main products of each dairy company are the calves which are able to determine the future production and income. However, these young and sensitive animals are usually affected by multiple diseases. The mortality of the calves can be caused by several reasons, in turn, the environment, followed by the animal health status, and labour or technological problems. According to most of the breeders in practice, gastrointestinal diseases are the main causes of the calf- mortality. Due to this fact, there is a growing need for the milk replacing and digestion-supplementing products worldwide. The milk replacers can be able to provide cost-efficient and good health status. Owing it most of farmers use milk replacer in Central-Europe. Each company add a different recommendation to the use of this kind of products, however, the amount of the supplement can easily vary depending on the needs of the animal. Some new products are able to intend the increase the growing intensity, on the other hand, farmers still afraid of innovations and scientific results. The aim of the study was to try two of these milk replacing products and studying the effects of mortality and production traits. The data collection took place on one of the best-equipped Hungarian dairy farms in 2016 and 2017; between 1st of April and 30th of November each year. The total number of cows was 1750. The health status of the examined calves was similar, and they were kept with the same technological conditions. The total number of calves born alive were 919 in 2016 and 937 in 2017. In the first year, the calves drank milk replacer „A” which contained 21,5% crudeprotein and 17,5% fat with 145g/l dilution ratio. The fed quantities of the product changed four times until weaning according to the growth of the animals. In the second year product „B” was used, 27% crudeprotein and 18% fat with 160g/l dilution ratio and changed the fed proportions with growth as the same as in the first year but different amounts and intensity. Altogether 55970g of product „A” and 61920g from product „B” was used per calf. Mortalities were calculated monthly and the percentage of calves born alive in the given month was added to the calculation for a better comparison. There was no significant difference ( $P>0.05$ ) between the two technological periods for all of the mortality. In group „A” the calf loss was 37 (4.03%), while in the group „B” it was 32 (3.42%). After the experiment, the

mortality reasons could be easily determined. Thus, they were separated into four main groups according to their origin: calving and vitality problems, abdominal and umbilical inflammations, respiratory illnesses and digestive disorders. However the main causes of the mortality were examined, it was observed that the amount of the mortality from the digestive disorders was quite different. 1.3% in group "A" and 0.21% in group "B", resulting in the positive effect of the higher protein and fat content of the diet on calves vitality ( $P < 0.05$ ). Thus, improved nutritional supply reduces the number of deaths from digestive diseases ( $P < 0.05$ ). On this farm always measured the weight of calves after birth and at the time of weaning. Owing to these parameters we could calculate easy the daily weight gain. The method of calves nutritional supply contribute to the health of digestive system. That calves, whose were fed with milkreplacer "A" gained less, than the group "B" ( $P < 0.01$ ) ( $635 \pm 37$  g/day vs.  $688 \pm 39$  g/day). Due to improve the quality, the losses can be reduce and increase the efficiency.

## DIFFERENT ATTITUDES TOWARDS NATIONAL AND EUROPEAN FOOD QUALTY LABELS IN HUNGARY

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Food is a credence product therefore the information asymmetry between the producers and the final consumers should be decreased. Beside food safety issues, food labels are known as effective tools for promoting also food quality. On community level, the European Union has several food quality labels playing an important role in the European food quality policy. The EU organic label was introduced in 1991, while the system of the geographical indications (Protected Designation of Origin - PDO, Protected Geographical Indications – PGI and Traditional Speciality Guaranteed – TSG) exists since 1992.

Parallel with the EU food quality labels all EU member states have their own label. In Hungary dozens of such labels try to attract the consumers, many of them are managed by the government, but some successful labels are result of private initiatives. The two most well-known state owned Hungarian food quality labels are the “Quality food from Hungary” and the “Traditions-Flavours-Regions”. Both labels were introduced in 1998 and by the end of 2017 had 59 and 170 registered products, respectively.

The aim of this paper is to measure the differences between the recognition of the selected four EU and the two Hungarian food quality labels among the Hungarian consumers. Therefore, results of previous consumer surveys for the EU labels conducted by the Eurobarometer are compared with the results of our survey, a special attention given to the differences between the Hungarian and the EU labels. As part of a H2020 research project an online consumer survey (n=1.019) was implemented during the second half of 2017.

Results show that among the Hungarian consumers the recognition of the national labels are much higher than the EU labels. This significant difference can be explained by numerous reasons. First, the Hungarian consumers are less aware of the EU community level food quality system. As far no relevant marketing campaign was implemented in Hungary to draw their attention. On the other hand, the EU food quality scheme contains only a limited number of registered Hungarian products and even the registered products are often not labelled with these EU logos.

## ANTIMICROBIAL ACTIVITY OF ENDOPHYTIC FUNGI ISOLATED FROM *SOPHORA FLAVESCENS*

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Medicinal plants have been used for centuries as remedies for human diseases due to their components with remarkable therapeutic value. Recently, the endophytic microbes of the medicinal plants have been come to the fore of the microbiological research because of their excellent secondary metabolite secretion abilities. These metabolites are often highly bioactive, involving also in certain cases antimicrobial potentials. Screening for these antimicrobial effects within the endophytic isolates novel lead molecules could be found for the pharmaceutical industry and for future practical applications.

The aim of this study was to investigate the antimicrobial activity of extracts from endophytic fungi isolated from medicinal plant, *Sophora flavescens* occurring on the territory of Dornod province, Mongolia. Totally, 15 endophytic fungi were isolated after a surface sterilization procedure on PDA plates. The strains were characterised taxonomically based on molecular techniques with the PCR amplification and sequencing of ITS region of the genomic DNA. For antimicrobial assay, three organic solvents with different polarities (hexane, chloroform, ethyl-acetate) were applied for the extraction of both mycelia and ferment broth of isolates, which were tested against bacterial strains including *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Streptomyces aureus*, *Bacillus subtilis*, *Micrococcus luteus* and *Staphylococcus albus* with micro dilution method based on the guideline of Clinical and Laboratory Standards Institute.

Our experiments revealed, that, generally, hexane extracts of both the ferment broths and the mycelia showed low inhibitory activity against the examined bacteria. When ethyl-acetate used as a solvent, the ferment broth extracts showed higher activity than the mycelial extracts, while with chloroform solvent, both the extracts of the ferment broths and the mycelia showed equally high activity against the examined bacteria.

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## THE EFFECT OF DIFFERENT WEED CONTROL TECHNOLOGIES ON WEED SPECIES COMPOSITION OF MAIZE

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In our investigation we used different weed control technologies in the different phenology states of the maize. The farm experiment have been carried out in Hungary, Kunágota, on flat surface, homogeneous quality chernozem soil, on 1000 m<sup>2</sup> plots, in 4 replications.

The experiment can be regarded as 9 weed-control strategies where, in addition to the untreated control, two chemicals are applied (*Laudis*, *Capreno*) in different doses, two mechanical weed-control technologies, and two combination of chemicals and mechanicals weed-control technologies were used. Mechanical weed-control place connected to the herbicide treatments in different times: until 4-6-leave age weedless, in 4-6-leave age hoed once, in 4-6-leave age cultivation once.

Our results were assessed by chemical efficiency examination in five periods.



## ANTIMICROBIAL ACTIVITIES OF THE SECONDARY METABOLITES OF ENDOPHYTIC FUNGI ISOLATED FROM *JUNIPERUS COMMUNIS*

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The microbial endophytes are important components of the plant micro ecosystem residing in healthy internal tissues of plants asymptotically. These microorganisms play a significant role in influencing the synthesis of metabolic products in plants and they are proved to be an excellent reservoir of bioactive compounds.

The aim of the present study was to isolate the endophytic fungi from the medicinal plant *Juniperus communis* and evaluating the antimicrobial potential of these isolates. Altogether, 138 endophytic fungi were isolated from 217 cuttings of healthy twigs, roots, cones and leaves of *J. communis*. Out of 138 isolates, 80 strains were cultivated in shaken flask cultures; after the cultivation both the mycelia and ferment broth were extracted with the mixture of chloroform and methanol (4:1). The crude extracts were tested for their antimicrobial potential against six bacteria such as *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Streptomyces aureus* and *Micrococcus luteus*. Amongst 160 extracts, 78 extracts showed more than 90% inhibitory activity against a minimum of one tested bacterium. Most of them were active against *B. subtilis* (77), *Staph. aureus* (93), *Strept. aureus* (101) and *P. aeruginosa* (65) showing inhibition over 60%, whereas *E. coli* and *M. luteus* were barely inhibited. The extracts were also tested against two fungal species: *Candida albicans* and *Aspergillus niger*. Three ferment broth extracts of strains isolated from twigs of the host plant caused remarkable zone of inhibition against both fungi. The mycelial and ferment broth extract of strain J.S 29 exhibited the highest inhibition zone (~50 mm after 3 days) against *C. albicans*.

Our results highlighted that *J. communis* harbours many endophytic fungi, which have remarkable potential to produce bioactive compounds.

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## **EFFECT OF HIGH PRESSURE TREATMENT ON PHYSICAL PROPERTIES OF RAW MEAT BATTER**

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The product after the meat was chopped and adding the required additives is called meat batter. The qualities of the raw meat batter essentially determine the quality of the product. Based on the scientific literature, high hydrostatic pressure treatment (HHP or HPP) on raw meat batter has a positive effect on gelling, technofunctional properties and microbiological status. The moderate nature of the HPP offers a great opportunity to develop nutritional and sensory quality of innovative foods.

In this study the effect of 100, 200 and 300 MPa on physical properties of raw meat batter was examined. After the meat batter samples were prepared and pressurized color (CIELab), cooking loss (%), extrusion and adhesivity (N) were measured. Based on the color changes due to HHP treatment, the pressure applied affects the color of the meat batter. HHP treatment decreased the lightness ( $L^*$ ) of meat batters, while only the 300 MPa treatment resulted in significant difference. The pressure treatments significantly decreased redness ( $a^*$ ) of batters. Pressure had no significant effect to yellowness ( $b^*$ ).

From the results of the measurement of the cooking loss it can be concluded that the cooking loss is increased by the pressure treatment of the meat batters. By using a higher pressure the loss was 5 – 8% higher. Consequently as a result of pressure, a product releases some of the water during the heat treatment added during production.

Based on the results of extrusion it can be stated that in the case of pressure treated batters a much smaller force was required to compress the sample. It can be concluded that the pressure treatment results in a much softer batter than the control and the batter treated at 100 MPa. The HHP treatment significantly influences the adhesion of the samples. The treated meat batters were less sticky than the control samples. Its technological advantage is that the HHP treated samples make it easier to fill into casing.

## PURIFICATION OF SECONDARY METABOLITES FROM THE FERMENT BROTH OF ENDOPHYTIC FUNGI OF *TAXUS BACCATA*

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Fungal endophytes are living in plant tissues without any harmful effects. Remarkable part of these microorganisms are able to produce secondary metabolites resulted from the high biochemical pressure of the host environment. Furthermore, these synthesized metabolites could be beneficial for host plants to facilitate their nutrient uptake, to take part in the systemic regulation, to keep the fitness at high level or to prevent the pathogen infections. Moreover, due to the various bioactivities of these secondary metabolites involving the antimicrobial effects, they could be potential candidates for the future applications in medical treatments against human pathogenic microorganisms.

In this study, the extracts of ferment broths originated from the endophytic isolates of *Taxus baccata* were screened for their antibacterial effects. Tests were carried out against selected bacteria including *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Micrococcus luteus*, and *Pseudomonas aeruginosa* on microtiter plates. For further examinations, the H1-3a-RB endophytic isolate (identified as *Penicillium sp.*) was selected based on the remarkable inhibitory effect of its ferment broth on *B. subtilis* and *E. coli*. For large scale purification it was cultivated in large volume and the secondary metabolites were extracted by ethyl-acetate. Pooled extracts were introduced into an activity guided multi-step chromatographic separation. The first step within the procedure was a flash chromatographic separation using normal phase cartridges and toluene/isopropanol as mobile phase. For the injection, the extract was directly evaporated onto the stationary phase. During the separation 70 fractions were collected with equal volumes; all of these were tested against *B. subtilis* on microtiter plates. The active fractions were further examined by a UHPLC-HRMS instrument using J'sphere ODS-H80 (250\*2,1 mm, 4 µm) column and water/methanol gradient containing formic acid. Than the pooled crude fractions were subjected onto a reverse phase preparative column, where the collected fractions were tested again in the antibacterial

bioassay and analysed with UHPLC-MS. The recorded total ion chromatograms of both crude and partially purified extract were compared, and some constituents of the metabolite were identified.

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## ANTIMICROBIAL EFFECT OF SECONDARY METABOLITES EXTRACTED FROM ENDOPHYTIC FUNGI OF *TAXUS BACCATA*

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Endophytes are a group of highly diverse microorganisms living in plant tissues without initiating diseases; moreover, they could be even beneficial for their host. Endophytes are reported to be producers of various secondary metabolites, among others those which could be effective against microbial pathogens. Potentially, these bioactive secondary metabolites could be used in medical treatment, for example in antimicrobial therapy.

In our study, *Taxus baccata* samples were collected from the Botanical Garden of University of Szeged from 13 individual plants. Altogether, 249 endophytic fungi were isolated and until now 90 isolates were taxonomically identified. The endophytic isolates were cultured in potato dextrose broth for 10 days at 25 °C to produce secondary metabolites. After the incubation, each ferment broths were extracted sequentially with hexane, chloroform and ethyl-acetate. In the next step, the bioactivity of each extract was tested on microtiter plate against 5 different bacteria including *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Micrococcus luteus* and *Pseudomonas aeruginosa*. Against *B. subtilis*, the extracts of a *Penicillium sp.* (H1-3a-RB), three *Trichoderma harzianum* (C3/2-1a-PDA, J3-1L-PDA and F2-5a-RB), a *T. citrinoviride* (H1-1a-RB), an *Alternaria sp.* (F2-2L-RB), a *Fusarium sp.* (I1-2a-PDA/1), and a *Sordaria sp.* (A3-2a-PDA) were the most effective. In the case of *E. coli*, remarkable inhibitions were observed with the extracts of a *Penicillium sp.* (H1-3a-RB), a *T. atroviride* (B2-2a-PDA) and a *Trichoderma sp.* (M1-1a-RB). Against *S. aureus*, *M. luteus* and *P. aeruginosa* the *Penicillium sp.* (H1-3a-RB) showed the strongest inhibitory effect, which was followed by a *Diplodia seriata* (C1-1a-PDA), a *Shaeropsis sapinea* (C2-3L-RB), a *T. harzianum* (H2-2a-RB) and a *Fusarium sp.* (E3-3a-RB) isolate.

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## PRODUCTION OF BIOACTIVE PHENOLIC COMPOUNDS FROM MANGO RESIDUES

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There is growing interest for application of phenolic antioxidants as natural additives in functional foods. Mango peel residues contain such phytochemicals; however, these phenolic antioxidants mostly occur in conjugated forms with sugar residues, which reduce their bioavailability. Carbohydrate-cleaving enzymes, i.e. cellulases and pectinases, can hydrolyze these glycosides releasing the phenolic aglycones. Foodborne pathogens and spoilage bacteria cause serious problems in the food industry and severe infections in humans. Because synthetic preservatives in foods provoke serious concern in consumers, there is a need to develop new bioprocesses to produce natural antioxidative molecules able to control diseases. The abovementioned phenolic compounds can enhance the stability and shelf life of food products, increase their antioxidative capacity, and inhibit the growth of a range of bacteria and fungi.

Therefore, our goal was to mobilize bioactive phenolic compounds from mango byproducts via *in vivo* solid-state fermentation (SSF) with the cellulolytic fungus *Rhizomucor miehei* NRRL 5282, or *in vitro* substrate treatment using *R. miehei* cellulase and *Aspergillus niger* pectinase enzyme cocktails. We expect that the obtained phenolic rich extracts can be used as sources of natural food additives.

After SSF, the beta-glucosidase activity increased and reached a maximum at the 18th day, but negative association between beta-glucosidase activity and antioxidant potential was found. However, the enzymatic treatments significantly increased the antioxidant activity of the samples. In addition, the cellulase and cellulase/pectinase treatments increased the antimicrobial activity of the extracts as well. The treated extracts efficiently inhibited the growth of



*Listeria monocytogenes*, *Staphylococcus aureus*, *Escherichia coli*, *Salmonella enterica* and *Bacillus subtilis*. Moreover, anti-biofilm forming activity of the extracts was also examined using the abovementioned bacteria, in which the biofilm formation inhibition was enhanced about 60% to 80% after the enzymatic treatments.

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## EXAMINATIONS RELATED TO THE INVESTMENTS IN GYOMAENDRŐD

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We are describing the results of a survey on people satisfaction related to an investment called „With Soul Along The Rivers Körösök” (2014-2015). Our survey was focused on what the population thinks about the utility of the above-mentioned investment, whether they are satisfied with it or think it useless, what their opinion is about financing the maintenance, also what suggestions they have about future investments. To get answers to these questions we carried out a questionnaire survey. As a result of the questionnaire assessment, we could conclude that people of different age groups have different views on the investment, their level of satisfaction is different. It also came to light that the residents like living here but many of them would leave the town because there is not enough work opportunity. Most of the residents cannot see whether the town council would finance the maintenance of investments from its own source or from some external source. Though the population is satisfied with the investment, they do not visit it too often

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## THE INVESTMENTS OF TÓTKOMLÓS ABOUT THE POPULATION'S CONTENTMENT INVESTIGATION

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In our investigation, our aim was to assess the satisfaction of the population of Tótkomlós with regard to investments in recent years. For our primary research we chose a questionnaire based on paper-based questionnaire, a questionnaire interviewer. A total of 229 women and 146 men answered our questions. The evaluation was done with a PSPP statistical program. As a result of our research we came to the conclusion that the majority of respondents were satisfied with the investments investigated, while the rescue station and school renovation positively affected the quality of life of those living there, while the setting up of the surveillance cameras and the renovation of the houses and landscape had a neutral effect. In the future, however, it would be necessary to improve the quality of the roads and to create jobs in the settlement. All in all, it can be said that the quality of the aforementioned investments has resulted in quality improvements in the life of the city, so the journey had a good start.

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## **ECONOMICAL ASSESSMENT OF AN INVESTMENT RELATED TO THE ESTABLISHMENT OF A NEW FARROWING PLACE AND PIG-REARING BUILDING**

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In our research work we aimed at carrying out an economical assessment of an investment and development of substantial volume. The examined project was completed at a pig-farm during which a new farrowing place and pig rearing building were built, as well as the renovation of the existing pig-farm. All of them were financed partly from the firm's own source, partly from a non-repayable aid granted by the state, and finally from a credit granted by a commercial bank. The term of the credit is 10 years and the return of the investment expected by the investors is 8%, so we carried out our calculations according to these data. We examined the three possible ways of financing the investment from the economical point of view, as a result we proposed three hypotheses. Our hypotheses are: Hypothesis 1 (Case „A”): The investment will be financially recovered within the examined period of 10 years if it is financed from the firm's own source, the state grant and the bank credit. Hypothesis 2 (Case „B”): The investment can be economically completed within the given period of time if the project meets the costs from the firm's own source and the credit. Hypothesis 3 (Case „C”): The investment will be economically accomplished within the examined 10 years provided the firm finances the project from their own source and the state grant. In our calculations we used the net present value (NPV), the internal rate of return (IRR), the payback time (PB), the discounted payback time (DPB) and the profitability index (PI) as economy indicators. We carried out our calculations regarding 10 years to be able to compare the results since the term of the granted credit is 10 years, too.

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## NPV, IRR, PI AND DPB CALCULATIONS TO A SMOKE TECHNOLOGY INVESTMENT OF A PORK PROCESSING PLANT

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In the future and nowadays pig farming, pork production and processing together with their logistics is in amore and more problematic situation. Considering it, it is getting more and more demanding for anentrepreneur to start and run a pork processing plant in a way to stay economical. The smoking system is a very important part of a plant like this, which has effect not only on the taste and smell ofthe processed meat but also on its lasting, too. We completed the economical calculations of asmoking system like this, calculating the payback time, the discounted payback time, the net presentvalue, the internal interest rate and the profitability index. We examined them at the output levels of 20, 40, 60, 80 and 100%. After the completion of these calculations, it can be concluded that the investment can be considered as profitable from the level of 60%.

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**Interreg-IPA Cross-border Cooperation Programme  
Hungary-Serbia**

**‘PLANTSVITA’  
SEMINAR**

**PLANTSVITA project (HUSRB/1602/41/0031)**





## OVERVIEW OF RESPECTIVE AIMS AND EXPECTED RESULTS OF THE PLANTSVITA IPA HU-SRB PROJECT

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One of the most important ways of protecting plants and plant products from harmful organisms and improving agricultural production and its efficiency is application of chemical pesticides and fertilizers. However, this leads to the occurrence of their residues (xenobiotics) in soil, which can have negative effects on plant production, involving risks and hazards to the environment and humans through the inevitable transfer to the food-chain and drinking water. In order to ensure a high level of human health and the protection of the environment, and, at the same time, to safeguard the competitiveness of the cross boarder (CB) agriculture, there is a constant need for alternative, environment-friendly and sustainable soil treatment strategies with favorable effects on crops. The main research aims of PLANTSVITA, project approved through the last IPA call Interreg-IPA Cross-border Cooperation Programme Hungary-Serbia, 2014-2020, are to develop and demonstrate the application efficiency of two multi-component microbial products, PLANTSVITA AC (for acidic soils) and PLANTSVITA AL (for alkaline soils), to minimize the pesticide risks and hazards, implementing and promoting in this way the principles of Ecological Pest Management (EPM) in the CB region. Through development and demonstration of the new products and the technology of their production and application, PLANTSVITA supports enforcement of the agricultural production, enabling alternative soil quality management solutions based on green and sustainable approaches, which has a positive influence on CB agriculture and food industry for providing affordable, high quality crops grown with consideration to the environment.

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## LIPOPEPTIDE PROFILING OF A *BACILLUS AMYLOLIQUEFACIENS* STRAIN EXTRACT BY HPLC-HRMS TECHNIQUE

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Cyclic lipopeptides are mainly produced by *Bacillus* spp. and they are proven to possess various biological activities such as antimicrobial, anti-inflammatory and anti-tumor effects. These properties propose various possible therapeutic and environmental applications. Such depsipeptides are surfactin, iturin and fengycin; all of them produced mainly by the Gram-positive *Bacillus amyloliquefaciens*. Structurally these molecules are consisted of a short cyclic peptide linked to a fatty acid chain. While surfactin and iturin have heptapeptide “head” parts, fengycin consists of ten amino acids at this part. The chemical composition of these lipopeptides may vary in terms of the length of the lipid chain and the amino acid sequence of the peptide loop, thus forming a number of homologues and isomers of all three depsipeptides. To characterize the variants produced by a *B. amyloliquefaciens* strain, we examined the crude extracts of its ferment broth by high performance liquid chromatography combined with high resolution mass spectrometry (HPLC/HRMS). To identify the different molecules based on the MS<sup>2</sup> spectra, we carried out the analyses in parallel reaction monitoring mode. For quantitative measurements full MS mode was applied. The results of the qualitative analyses indicated the presence of all three examined cyclic lipopeptides, in forms of numerous homologues and isomers. The quantitative assessments showed that surfactins were the most dominant in our sample, while the amount of fengycin found in the ferment broth was the smallest, although this amount was enough for their comprehensive identification.

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## DETERMINATION OF VALINE AND LEUCINE ISOMERS IN PEPTAIBOLS

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Peptaibols are peptid-like oligomers produced as extracellular secondary metabolites by *Trichoderma* species. Some peptaibols known as effective antibacterial and antifungal agents. They are amphiphilic, which allows them to form voltage-dependent ion channels in cell membranes causing leaks, which finally lead to the death of the cells. These compounds contain non-ribosomally synthesized, non-proteinogenic amino acids, like  $\alpha$ -aminoisobutyric acid, ethyl-norvaline, isovaline, and hydroxyproline. Regarding these molecules, the N-terminus is acetylated, and the C-terminal is an amino-alcohol. Due to their diverse nature and bioactivities, the comprehensive elucidation of the structure of newly discovered peptaibols is important.

A lot of efforts have been made to analyse the amino acid sequence of peptaibols using mass spectrometry, however, the isobaric amino acids cannot be specified, thus the configuration of the compounds could not be determined. The hydrolysis of peptaibols followed by liquid chromatographic separation both problems could be solved-, e.g. isobaric amino acids could be separated, and due to chiral derivatisation D-, and L-isomers can be distinguished.

In this work, we focused on the achiral and chiral separation of the isobaric amino acids, valine, isovaline, leucine and isoleucine by HPLC-UV analysis. For these purposes, two HPLC methods were developed. For achiral separation the standard amino acid mixture was firstly derivatised with o-phthalaldehyde (OPA) and then 9-fluorenylmethoxycarbonyl chloride (Fmoc). For chiral derivatisation, Marfey's reagent was used to separate the D-, and L-amino acids. Finally, the developed methods were applied for hydrolysed pure peptaibol fractions.

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## INFLUENCE OF AGRO-ENVIRONMENTAL POLLUTANTS ON A BIOCONTROL STRAIN OF *BACILLUS VELEZENSIS*

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There is an increasing request for new process in plant protection to manage control over diseases and minimize the negative impacts of synthetic pesticides. Integrated Pest Management is an eco-friendly alternative agricultural approach in which biological, chemical and physical devices, resistant crop cultivars and modification of cultural practices are combined to give stable, long-term protection, and prevent or reduce pest infestations. Biological control has an importance for the reduction of plant diseases. Pesticide-tolerant biocontrol agents are preferred in integrated pest management as such strains can be applied in combination with different pesticides or after the pesticide treatment. Biocontrol agents are environmentally friendly and can remarkably control plant diseases, but these agents could be sensitive to the different xenobiotics used in the agriculture. We studied the effects of some widely used herbicides and fungicides on the growth of potential biocontrol agent *Bacillus velezensis* strain. The presence of sulfonylurea herbicides, like bensulfuron-methyl, cinosulfuron, chlorsulfuron, ethoxysulfuron, triasulfuron and primisulfuron-methyl strongly inhibited the biomass production of the strain at the concentration of 6.25 mg l<sup>-1</sup>. Contact fungicides like captan, maneb, mancozeb and thiram resulted in total inhibition at the concentration as low as 6.25 mg l<sup>-1</sup>. The sterol-biosynthesis-inhibiting fungicides imazalil, fenarimol, penconazole and tebuconazole showed inhibition in a concentration dependent mode.

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## POTENTIAL APPLICATION OF MICROBES FOR XENOBIOTIC-REMOVAL IN AGRICULTURAL SYSTEMS

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To provide a sufficient level of pest control a wide range of pesticides are used in the modern agriculture. Additionally, agricultural areas are also exposed to various further pollutants of human origin. Organophosphorous (OP), carbamate (CB) and organochlorine (OC) pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and other persistent organic pollutants (POPs) as well as heavy metals and their residues can remain in the soils of cultivation fields causing high environmental hazard. As these compounds might be retained in the crops as well, they also threat human health due to their adverse (e.g., carcinogenic, endocrine disrupting, teratogenic, and mutagenic) effect, resulting in an enhanced risk for the development of numerous severe human diseases such as different types of cancer, cardiovascular disease, damage of kidneys, liver and muscles, disorders of the endocrine and nervous systems. Therefore, the removal of these toxic substances from agricultural systems is of particular importance. Various microbes (e.g., *Pseudomonas*, *Alcaligenes* and *Rhodococcus* species) were found to be capable of degrading certain xenobiotics during their metabolic processes, which makes them potential candidates for bioremediation applications. Within the frames of the proposed review lecture, the potential use of microorganisms for the removal of xenobiotics from agricultural systems will be presented and discussed. This presentation will cover some previously published data as well as our new results, together with the introduction of our recently started research project PLANTSVITA.

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