Faculty of Agriculture
Goce Delcev University - Stip

1st INTERNATIONAL MEETING
AGRISCIENCE & PRACTICE (ASP 2018)

BOOK OF ABSTRACTS

10th - 11th May 2018
Stip, Republic of Macedonia

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Publisher:
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CIP - Каталогизација во публикација
Национална и универзитетска библиотека "Св. Климент Охридски", Скопје

631/635(062)(048.3)

INTERNATIONAL meeting agriscience & practice (ASP 2018) (1 ; 2018 ; Stip)
Book of abstracts / 1 st international meeting agriscience & practice (ASP 2018), 10 th - 11 th May 2018 Stip, Republic of Macedonia. - Stip : Goce Delcev University, Faculty of agriculture, 2018. - 62 стр. ; 25 см

ISBN 978-608-244-526-7

а) Земјоделство - Собири - Апстракти
COBISS.MK-ID 107168778

1st INTERNATIONAL MEETING AGRISCIENCE & PRACTICE
ASP 2018

Organized by

FACULTY OF AGRICULTURE
GOCE DELCEV UNIVERSITY - STIP, REPUBLIC OF MACEDONIA
10-11 May 2018, Stip, Republic of Macedonia

In the past ten years the educational, research and applicative activities of the Faculty of Agriculture – Stip, Goce Delcev University – Stip, contributed to the development of agriculture sector in the country and broader region.

The Faculty of Agriculture organizes the 1st International Meeting Agriscience & Practice (ASP 2018), giving an opportunity to the participants for presentation and discussion of original scientific and practical results in different fields of agriculture.

The 1st International Meeting Agriscience & Practice (ASP 2018) is organized with intention to bring together all agricultural stakeholders for sharing their knowledge, experience and obstacles. One of the main aims is to link research and field work in agricultural sector in the country and broader, giving it an international dimension.

The main goal of the Meeting is to connect and promote scientific achievements and practical knowledge presented in different thematic areas.

We are pleased to welcome you at the Faculty of Agriculture and we wish you active participation in the Meeting.

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TABLE OF CONTENTS

Agricultural economics

UNIVERSITY-ENTERPRISE KNOWLEDGE TRANSFER: CAN AGRICULTURE BE PRECISE? (Plenary lecture)

Kiril Bahcevandziev*

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Abstract

There are hectares and hectares of cultivated land almost without human intervention on one hand and farmers who see their activity replaced by automatisms, robots or artificial intelligence on the other. As always, there are those who see this evolution as a threat and others who see it as a challenge and an unprecedented opportunity. This revealed the digital evolution and the perspectives of technological innovation in several areas, particularly in the integration of new technologies in agribusiness. Agricultural biotechnology (double haploids), growth of equipment (NFT, drone), novel farming systems (urban gardens, seaweed use) and bioenergy (crop waste) will be discussed as linking current actors in agriculture with start-ups that enhance the capabilities of current operators.

Key words: agribusiness, technological innovation, new technologies, novel farming systems

DEVELOPMENT OF FAMILY BUSINESS IN TOBACCO PRODUCTION ACTIVITIES

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Abstract

Concerning the development of modern family business, with tobacco production as its basic activity, it is necessary to develop management with the overall activities and appropriate motivation of the engaged members. In this way, greater efficiency and effectiveness in operations, lower production costs, increased productivity and improved performance are achieved. It should be directed in accordance with the trends of contemporary world achievements in the activity. This implies increasing attention to the production itself, both its quantitative limitation and its qualitative suitability, the protection of the environment, social security, economic effectiveness, healthy way of growing and developing plants, meeting the demands of a large number of non-governmental organizations and the World Health Organization, etc. The development of a modern tobacco manufacturing business involves the obligation of tobacco farmers to take into account the numerous factors, greater commitment, greater engagement and control over all operations and processes in tobacco production. In this paper, through the text, tables and graphs the production trends of tobacco are presented, with engaged vendors and sown hectares, as well as their correlation dependence.

Key words: motivation, managerial functions, yield, correlation, business

TRANSITION PROCESSES IN AGRICULTURE IN THE REPUBLIC OF MACEDONIA WITH ACCENT ON THE VEGETABLE PRODUCTION

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Abstract

Agriculture is the key sector in Western Balkans, but contrary to its importance, it has been neglected in the transition process. Therefore, the goal of this research is to review the transformation of the agricultural sector in Macedonia in the transition period, with focus on the vegetable production. The analysis is based on socio-economic parameters, such as GDP, employment, farm structure and trade, and policy measures influence on type of crops produced, total area of production and yield for the period from 1995 to 2016. The results show worrying trends. While the number of agricultural farms is growing, the size of the farms is getting smaller. The foreign trade exchange of agricultural products indicates years of unfavourable trend, because of the growth imports, creating a huge deficit of 317 million $ in 2013. The migration processes from rural areas have significant impact on the structure of the vegetable production (rural population has decreased from 42.2% in 1990 to 32.1% in 2010), resulting in changes of produced crops that are less labour intensive. This is most evident in cabbage production in tunnels where the total area grew from 350ha in 1995 to 2545ha in 2016. The results showed decreasing trends for open field tomato production from 8200ha in 1995 to 5609ha in 2016, while in the greenhouses, total area decreased from 200ha in 1995 to 154ha in 2016. Additionally, the poor financial condition of farmers is limiting the access for improved technologies and state financial support is not sufficient to cover more significant investments.

Key words: agriculture, transition, vegetable sector, trends, yield

ECONOMICAL PROFITABILITY OF TOMATO (Solanum lycopersicum L.) OPEN - FIELD PRODUCTION

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Abstract

The production of industrial tomatoes (*Solanum lycopersicum* L.) can be highly profitable if modern technologies, appropriate agro technical measures and hybrid seeds having high yield potential, are applied. The purpose of this research was to investigate the economical profitability of growing high-yielding industrial tomato, hybrid UGX-8168. Standard agronomical measures, dropping irrigation and production of tomato seedlings in controlled conditions are used for breeding the plants. The investigated hybrid is characterized with high yield potential and resistance to common tomato diseases. Plants were grown on the area of 2.45 ha. A total yield of 112 000 kg, i.e. 45.7 t/ha of tomato fruit was obtained. The obtained amount is cost-effective but still does not meet the expectations of its genetic properties regarding the yield potential. In order to increase the economic viability and to have influence on the profit, the cultivated area should be monitored constantly, regarding water supply and the presence of diseases and pests. From the economic point of view, the larger the cultivated area is, it will increase the costs in smaller percentage compared to the profit that could be obtained as the result of the increased area of production.

Key words: industrial tomatoes, hybrid UGX-8168, yield, profit

Plant biotechnology

APPLICATION OF PHYTOHORMONES IN IMPROVEMENT OF AGRICULTURAL AND HORTICULTURAL SPECIES IN IN VITRO AND IN VIVO CONDITIONS

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Abstract

There are many areas in agriculture, and particularly horticulture, where phytohormones can be used in successful cultivation for obtaining higher yield and improvement of plant species. The methods of plant biotechnology have crucial role in plant improvement, where the role of phytohormones is irreplaceable. The method of *in vitro* cultivation of plant cell and tissue cultures is used for vegetative propagation or micropropagation of plants. The vegetative propagation of the plants in *in vitro* conditions enables to reduce the process of selection, enhance the genetic stability of plants and improve the production of healthy plants free of viruses. These powerful methods of plant biotechnology are unusable without the application of phytohormones and plant growth regulators. The interaction between plant varieties and different phytohormone concentrations are highly significant for successful micropropagation, as well as any kind of plant improvement in *in vitro* and *in vivo* conditions. The application of phytohormones, especially auxins as growth regulators, in nursery rooted production is used to increase the number of seedlings and plants, to shorten the rooting time, to increase the root number per plant and uniformity of the root system. This paper presents an overview of the application of phytohormones and plant growth regulators in the improvement of agricultural and horticultural species in plant tissue culture in *in vitro* conditions, as well as their applications in *in vivo* conditions.

Key words: plant growth regulators, plant tissue culture, auxins, cytokinins, gibberellins

IN VITRO MULTIPLICATION OF THE BALCAN ENDEMIC SPECIES *Stachys leucoglossa* Griseb. AND *Stachys balcanica* P.W.Ball

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Abstract

Stachys leucoglossa Griseb. and *Stachys balcanica P.W.Ball*. are Balkan endemic species included in the Red Data Book of Bulgaria with the national conservation status: "endangered" (EN). There is no available data on *in vitro* propagation and *ex situ* conservation of *S. leucoglossa* and *S. balcanica* and scarce information about their chemical composition is available. In the present work we aimed to develop a protocol for induction of *in vitro* shoot cultures of both species and their subsequent multiplication and maintenance in an *in vitro* collection. *In vitro* shoot cultures of the Balkan endemic species *S. leucoglossa* and *S. balcanica* were induced from ripe dry seeds, collected from *in situ* growing wild plants and micropropagated on basal MS medium with 30 g/L sucrose and 7 g/L agar. Regenerated *S. leucoglossa* plants had low growth index, shortened internodes and poorly developed root system on hormone free MS medium, while in *S. balcanica* vigorous growth and a well-developed root system were observed. Then the effect of different concentrations of cytokinin BA (6-benzylaminopurine) on the *in vitro* multiplication of *S. leucoglossa* was examined. All tested concentrations of BA (0.1; 0.5; 1.0 mg/L) stimulated shoot development and leaf formation but more effective was MS medium supplemented with 0.5 mg/L BA and approximately 96% of explants showed shoot proliferation and produced 6.80±0.2 shoots per explant. A collection from *in vitro* tissue cultures, which is an approach for preservation of *S. leucoglossa* and *S. balcanica* has been established.

Key words: *ex situ* conservation, *in vitro* cultivation, shoot culture, cytokinin, growth regulators

EFFICIENT PROTOCOL FOR MICROPROPAGATION OF *Artemisia annua* L.

Ely Zayova[1], Trendafil Nedev[1], Ludmila Dimitrova, Alexandar Tomov[2], Detelina Petrova[2], Aneliya Raycheva[2], Ganka Chaneva[2*]

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Abstract

The present work was focused on *Artemisia annua* L., a widely used medicinal plant producing high amounts of biologically active substances, including artemisinin. As a result of our investigations, an effective protocol for in vitro propagation of *Artemisia annua* L. was developed by examining different concentrations of 6-benzylaminopurine (BAP) and indole-3-butyric acid (IBA) in the medium. It has been found that full Murashige and Skoog nutrition medium (MS), supplemented with BAP, was the most appropriate for successful induction and multiplication of *Artemisia* shoots. The results indicated that micropropagation of *Artemisia* required higher cytokinin concentration – the largest number of shoots (with an average height 3.5 cm) were observed at 1.0 mg/l BAP in the medium. The best plant rooting - 100% (with an average root length 15.1 cm), was recorded on ½ MS medium supplemented with 0.1 mg/l IBA and 2.0% sucrose, after five weeks of cultivation, i.e. auxin effectively enhanced root formation in *Artemisia*. These cultivating conditions resulted in the accumulation of the highest levels of total phenol and flavonoid content in the plants, and the increase of total antioxidant activity, as well. The multiplied plants were further successfully adapted to ex vitro conditions and 65% survival was observed when the mix of soil, perlite and sand (2:1:1 v/v/v) was used for acclimatization. The developed effective protocol for shoot micropropagation could facilitate a large-scale commercial production of *A. annua* and thus, obtaining the biomass with enhanced biological activity for pharmaceutical use.

Key words: *Artemisia annua*, *in vitro* cultivation, plant hormones, antioxidant activity

MICROPROPAGATION OF ORNAMENTAL PLANTS: PRACTICAL APPLICATION AND OPPORTUNITIES IN REPUBLIC OF MACEDONIA

Ivana Velesanova[1], Fidanka Trajkova[1], Liljana Koleva Gudeva[1*]

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Abstract

Planting material of ornamental plants is in great demand for commercial production as well as for domestic gardens and landscaping. Good quality planting material is a basic need of growers for improving productivity. The most recent data show that 700 million plants worldwide are produced *in vitro*. USA, India, Israel, Colombia, Ecuador and Brazil are leading countries in production of ornamental plants via *in vitro* propagation. Ornamental industry has applied immensely *in vitro* propagation approach for large-scale plant multiplication of elite superior varieties. As a result, hundreds of plant tissue culture laboratories have come up worldwide, especially in the developing countries due to cheap labour costs. However, micropropagation technology is more costly than conventional propagation methods, and unit cost per plant becomes unaffordable compelling to adopt strategies to cut down the production cost for lowering the cost per plant. There are many reports about the use of biotechnological tools and methods for improvement of ornamental plant production. This paper presents a review underlining the application of biotechnology on *in vitro* manipulation and propagation of ornamental plants in Republic of Macedonia, with special emphasis on petunia, pink dianthus, ornamental cabbage and ageratum.

Key words: ornamental plants, micropropagation, petunia, pink dianthus, ornamental cabbage, ageratum

CURRENT APPLICATION OF ANTHER CULTURE AS A TOOL FOR IMPROVEMENT OF HORTICULTURAL CROPS

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Abstract

Anther culture is one of the plant biotechnology tools utilized for creation of haploid and spontaneous dihaploid plants from different horticultural crops. Androgenesis can be defined as a set of biological processes leading to an individual that genetically originated exclusively from anther microspores that represent the mail genotype. The main objective of *in vitro* anther culture is to obtain dihaploid homozygous lines with high practical value for breeders, but research in this area also have theoretical importance for fundamental biological sciences. After spontaneous, or induced genome doubling, dihaploids that are completely homozygous can be utilized differently in fundamental and practical research programmes. From the standpoint of plant breeding, androgenesis has a power to reduce the typical 7–9 inbreeding generations necessary to stabilize a hybrid genotype to only one. It is the key advantage of dihaploid technology in the context of plant breeding.
Since pepper, tomato and eggplant are one of the most important Solanaceae crops worldwide, the improvement of their diversity is possible by engagement of the methods of classical breeding, but also by plant biotechnology which can advance the breeding process. During the past years, *in vitro* anther culture research of numerous horticultural crops is extended although its successful application depends on different factors. Hence, *in vitro* anther culture is one of the biotechnological tools which is often exploited in different solanaceous and other horticultural species pre-breeding programmes.

Key words: anther culture, androgenesis, solanaceous crops, haploids, dihaploids, breeding

MODULATION OF THE PRIMARY METABOLISM OF Pisum sativum L. BY GIBBERELLIC ACID

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Abstract

Pea (*Pisum sativum* L.) is an annual legume plant with high nutritional value and used as a model plant. The aim of the study is to investigate the impact of the phytohormone gibberellic acid (GA) on the primary metabolism of pea. Seedlings were cultivated as hydroponic culture for 6 days followed by 7 day-application of GA concentration series. The increase of exogenous GA promoted shoot growth by stimulating stem elongation and leaf number. We focused on the fully developed second leaf and observed that GA induced leaf expansion by increasing mesophyll cell number and cell size. Respectively to the positive effect on growth, all applied GA concentrations caused accumulation of reducing sugars. In opposite, GA application reduced the content of plastid pigments. Analyses of the chlorophyll a fluorescence showed that the light absorption per active reaction centre 'ABS/RC' is increased compared to the control which reflects a bigger antenna size. The efficiency of the photochemical reaction in photosystem II (PSII) 'φ_{Po}' and the intersystem (PSII to PSI) electron transport 'φ_{Eo}' was lower compared to the control which led to respective reduction in the productivity of PSII. Since GA is known as a promoter of shade avoidance growth, we hypothesize that GA application signals to the plant "to prepare" for escaping shade conditions which lowers PSII productivity and promotes starch degradation to reducing sugars that are assimilated for plant growth. This effect could cause reorganization of the thylakoid membrane system and we plan to track for structural changes in the chloroplast apparatus, too.

Key words: phytohormone, morphology, leaf, pigments, reducing sugars, photosynthesis

EVALUATION OF TOTAL PHENOLS IN ALFALFA (Medicago sativa L.), COLLECTED FROM DIFFERENT LOCALITIES IN THE REPUBLIC OF MACEDONIA

Valentina Butleska Gjoroska[1*], Marija Krstikj[2], Ivana Jovanovska-Klincharska[2], Ana Cvetanovska[3], Lenka Cvetanovska[2], Liljana Koleva Gudeva[1]

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Abstract

Phenols are secondary biomolecules, in which structure an aromatic ring with one or more substituents are contained, unlike the plants in which secondary metabolism synthesize these compounds which contain one or more phenolic groups. Phenolic compounds participate in biochemical processes that are important for the plant protection against infections caused by fungi and viruses, mechanical damage, regulation of metabolism, and more. Phenolic compounds are oxidized by phenol oxides to quinines, thus releasing hydrogen directly participate in the exchange of matter. The intensity of the biosynthesis of phenolic compounds increases after the plant infection with pathogenic microorganisms. Therefore, the amount of total phenolic compounds in the plants can be used as biochemical parameter and indicator in the selection of plants for resistance to fungi, bacteria and viruses. Phenolic compounds are intensively synthesized in mechanical damage to plants, whereby they build protective film with active condensation in damaged areas. In this way they prevent the degradation of the cell wall during the infections caused by the necrotrophic pathogens that destroy the cells in order to build their colonies on the dead plant tissues. This paper presents the results from the research on the evaluation of the total phenols determined in three regions of the Republic of Macedonia, collected from 20 different locations. The content of the total phenols in the dry plant material of alfalfa, in three slopes, was determined by routine method in Folin-Chioclateau (1927). The quantitative determination of total phenols in the plant ethanol extract was performed spectrophotometrically at a wavelength of 765 nm.

Key words: secondary biomolecules, spectrophotometry, phenolic compounds

ADVANCED TECHNIQUES FOR OBTAINING PLANT FORMS TOLERANT TO OSMOTIC STRESSES

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Abstract

Drought and salinity significantly decrease plant vegetation and productivity. Genetic changes can be the reason for higher stress tolerance. Useful mutation may occur at the intact plant level or it appears during *in vitro* cultivation. In each case this event is rare. Cell selection, as a method, gives the opportunity to discover genetically modified single cells with required feature. We propose to detect variants with higher levels of osmotic stress tolerance via cell selection with heavy metal ions (HMI). There are several HMI harmful at trace concentrations. Barium (Ba^{2+}) and (Cd^{2+}) cations are among them. Ba^{2+} disturbs transport of K^+ ions. Cd^{2+} represses inner water fluxes and water penetration. From the other hand it is known, that osmotic stresses interfere plant water and ion (K^+) balances. So we used those HMI for obtaining osmotolerant plant forms. We elaborated selective systems with the addition of lethal for normal cell cultures doses of Ba^{2+} and Cd^{2+} cations. Ion-resistant cell lines of tobacco, soybean, wheat, maize were selected. The frequency of the appearance was 10^{-6}. Those variants were cultivated under lethal osmotic stress conditions. Ba^{2+} resistant cultures challenged salinity (sea water salts). Cd^{2+} resistant lines tolerated water stress (mannitol). Tobacco regenerants and R1 progeny are developed under *in vitro* and in *vivo* osmotic stresses.

Key words: cell selection, heavy metal ions, salinity, drought

Plant production

EFFECT OF ABIOTIC AND BIOTIC STRESS AND CROP MANAGEMENT ON HEALTH CONDITION AND YIELD OF CEREALS

Radivoje Jevtić[1*], Vesna Župunski[1], Mirjana Lalošević[1], Novica Mladenov[1], Bojan Jocković[1]

(Plenary lecture)

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Abstract

Wheat production became a global problem due to the climate change impact on wheat farming systems, pest management and control. Analysis of the most influencing factors on yield losses is challenging, knowing that yield is complex trait. Yield loss predictions are usually made using regression models with either biotic or abiotic factors as predictor variables, but only few of them considered combined effects of multiple diseases and climatic conditions. Moreover, efficacy of fungicides in pest control and their effect on yield increase is usually analysed in respect to the level of disease index and yield achieved in untreated plots without taking into consideration the influence of other environmental elements. This study was conducted in order to determine combined effects of biotic factors (disease indices) and abiotic factors (climatic elements and efficacy of fungicides) on yield achievements of winter wheat varieties. Field trials were set up under naturally occurring inoculum of the prevalent economic pathogens of wheat in the period 2006-2017. Model varieties Barbee and Durumko, known to have various degrees of susceptibility to wheat pathogens, were used in the study. All analyses were made using general linear model function of Minitab 17 (trial version). The yield loss in untreated plots is significantly influenced by the combined effects of multiple diseases and climatic elements which was determined in the study. Moreover, it was determined that the relationship between fungicide efficacy and yield achievements was not straightforward and that should be analysed in respect to the combined effects of biotic and abiotic factors.

Key words: wheat pathogens, efficacy of fungicides, yield loss

DRONES AND THEIR APPLICATION IN PRECISION FARMING

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(Panel discussion)

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Abstract

Agricultural production is related to the solution of questions such as how to combine land, water, raw materials such as fertilizers and plant protection products, machinery and technologies so as to produce the maximum amount of food and fibre. Farmers use conventional technologies related to the use of large quantities of artificial raw materials and preparations. Searching for optimization of applied raw materials in the field, improvement of yield and quality of production and preservation of the environment some of the farmers are oriented towards precision farming. The use of unmanned drones has been increasingly used in precision farming. From multispectral images of terrain and crops to spraying and sowing, their application and development is becoming more and more popular in the public sector. Through the use of additional sensors and equipment, technology helps farmers to take optimal management decisions. The aim of the present study is to analyse the data from various problems associated with crops breeding and to illuminate the whole process from data collection to real usage of the received information.

Key words: drone, precision farming, multispectral images

EXAMINATION OF SOME QUALITY FEATURES OF OATS GROWN IN CONDITIONS OF ORGANIC PRODUCTION

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Abstract

The research was conducted in 2015 and 2016 on 11 oats genotypes in terms of organic production. Three of the varieties were domestic: *Krivogastani*, Trebenista and Kuceviste. The rest were international varieties, including *Rajac*, *Slavuj* and *Lovcen* from Serbia and the areas *Kupa*, *Baranja, Explorer*, *Sampionka* and *Istra* from Croatia. In the first year of the study, the energy of germination of oats seed of oats ranged from 70% in *Rajac* variety up to 96% for the *Kupa* variety. In the second year of the study, the energy of germination was 81% for the *Kupa* variety to 96% in *Istra* variety. Compared between areas, it is pointed out that there are statistically significant differences. The total germination of oat seeds, cultivated under conditions of organic production, is statistically different between different genotypes, in both years of research. In 2015, the *Rajac* variety showed minimum germination (70%), and in 2016, the *Lovcen* variety (82%). *Krivogastani* variety showed the greatest overall germination in both experimental years (96% in 2015 and 97% in 2016). Regardless the year and the method of production, the best genotype of the tested variants for the highest absolute mass of grain is proved in the variety *Istra* with 34,6g in 2015 and 29,6g in 2016. The smallest absolute mass in both experimental years had the *Krivogastani* population, 12.3g in 2015 and 14.9g in 2016. There is statistically significant difference between varieties.

Key words: variety, population, energy of germination, germination, absolute mass

ORGANIC GRAIN CROPS IN INSTITUTE OF AGRICULTURE – KARNOBAT, BULGARIA

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Abstract

Cereals occupy a special importance in organic farming. Their advantages include to ease agrotechnics, relatively ease mechanical weed control, disease control and pests through rational rotation, to appear as an important addition to the feed of farm animals and more. At the Institute of Agriculture - Karnobat in the certified organic field naked oats, barley, rye, triticale and wheat grain is kept which can be used to produce children's and dietetic foods. The article summarizes data from trials, phytosanitary monitoring studies and comparison of the various predecessors and time of sowing.

Key words: organic farming, cereals

ADVANCEMENT OF PRODUCTIVITY BREEDING OF WINTER OATS (*Avena sativa* L.) AT THE INSTITUTE OF AGRICULTURE IN KARNOBAT, BULGARIA

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Abstract

The study was conducted from 2002 to 2017 at the Institute of Agriculture in Karnobat, Bulgaria. A number of 1555 breeding lines were tested in competitive varietal trials. The dynamics of the indicators grain yield (kg/da) and 1000-grain weight (g) were traced. The results from the breeding work on winter oats showed that an average increase of productivity was achieved by 27.8% of 1000-grain weight – by 16.8% compared to the standard. The average yield of the tested breeding lines over the last 5 years (2013-2017) increased by 41.9% compared to the initial period of breeding (2002-2006). The minimum yield values had an average increase of 62.6%, and the maximum ones – of 44.9%. Improvement was also observed for the indicator 1000-grain yield. Compared to the period of 2002-2006, 1000-grain weight average for the tested lines increased by 9.5%, the minimum values – by 16.7%, and the maximum values – by 7.8%. As a result of the conducted breeding, there was a great improvement in the direction of productivity, two new varieties of winter oats named Kehlibar and Telerik have been recognized, both realizing yields of over 800 kg/da. They form big grain, with a high percentage of kernel and can be used for both forage and food purposes.

Key words: winter oats, breeding, productivity, variety

CHARACTERIZATION OF SOME DOMESTIC AND INTRODUCED COTTON VARIETIES IN THE AGRO ECOLOGICAL CONDITIONS OF STRUMICA REGION

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Abstract

During 2015-2016, research with 10 cotton varieties (lines *5136*, *5140* and *5141*, created at the Institute in Strumica and Bulgarian varieties *Chirpan 539*, *Veno*, *Perla 267*, *Avangard 264*, *Colorit 409*, *Helius 288* and *Natalia 361*) was done in the agro ecological conditions of Strumica region. The aim was to study the biological and agricultural characteristics of cotton varieties. The experiments were done in three repetitions following a randomized block system and with size of experimental field parcel to 14 m^2. All examined varieties in agroecological conditions in Strumica fall in medium early-matured varieties, with a vegetation period of 125-130 days. The lines belong to the group of early-matured varieties with a vegetation period of 116-118 days. The yields of the dry cotton in the years of research are from 2853 kg/ha at the Bulgarian variety *Colorit*, to 5158 kg/ha at the variety *Veno*. The highest randman from the domestic genotypes has the line *5141* (42.6%), and from the Bulgarian genotypes *Chirpan 539* (45.4%) and *Helius 204* (43.8%).

Key words: *Gossypium hirsutum*, cotton, randman, yield, fibre length

PREPARING MAIZE DESCRIPTIONS FOR DUS Stamen Dimitrov[1*], Ivan Zhalnov[2], Chavdar Dochev[3]

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Abstract

The preparation of descriptions of maize hybrids is of great importance not only for entering them in the country Variety List, but also for making descriptions of the hybrids that will then be used to check the hybrid on the field or to prepare the post control descriptions. They verify the authenticity of seed production hybrids and, respectively, the quality of the seed harvested. Without such descriptions, it is impossible to produce authentic seeds of all crops. When seed production of foreign hybrids in Bulgaria is carried out without the prior written description of our specialists, it is not possible to obtain quality seeds because the expression of a not-small part of the hybrids may sometimes differ materially from those, maiden by the official authority of the country concerned. Only those characteristics that actually change at least and / or vary very little when changing soil and climatic conditions are used to make such descriptions. In the period 2012 - 2014, we tested hybrids to study their yields and other qualities and made descriptions of 4 hybrids American selection for distinctness, uniformity and stability. They do not indicate their names and the company that provided them for testing because they are strictly confidential. This was the reason why we have delayed the presentation of the data so far.

Key words: maize, hybrids, distinctness, uniformity, stability, DUS testing

TESTING OF GERMAN MAIZE HYBRIDS FOR ECONOMICAL QUALITIES

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Abstract

The need to provide more and better-quality forage always stood before Bulgarian agriculture. In the last 20 years, except for feed, bioethanol has also been received from cereals. Although is spoken and written too much about the need to cultivate early mays hybrids, they are very difficult to get into production. The reason is, besides the traditional Bulgarian scepticism, the fact that in the recent past the yields they received were lower than this of the latest hybrids. The advantages of the earliest hybrids are known: a shorter vegetation period, which ensures timely and quality treatment after them, avoiding the most important stages of the development of the crop in the unfavourable conditions in summer when the air temperature is high and the rainfall is extremely insufficient. In the country the irrigated areas are not enough for corn production. The new early hybrids are with equal opportunities with those with a longer vegetative period. Another advantage is that due to the smaller amount of effective temperatures they can be grown in areas where it has not been possible or was risky so far. This increases the range of crops sown in semi-mountain and mountain conditions and facilitates to a lesser extent livestock. During the period 2013-2015 years three corn hybrids of the German KWS company belonging to early early-age groups were studied: from FAO 220 to FAO 330, the difference being about 1/2 group. This makes it easier to identify the differences in crop productivity and which of the hybrids is the most profitable. As a result of the investigation, the Ricardinio hybrid, which is sufficiently early, with high yield and has the lowest grain moisture at harvest, is found to be most suitable for cultivation in the Sofia area.

Key words: mays, testing, grain yield, vegetation period, moisture on harvest

VARIATION OF MORPHOLOGICAL PROPERTIES IN SOME VIRGINIA TOBACCO VARIETIES

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Abstract

The properties that identify the type of tobacco or the variety in one type are known as qualitative and quantitative. The morphological properties belong to the group of quantitative (metric) and are regularly conditioned from the impact of a larger number of genes with additive effect (minor genes or polygens), and also they depend on the environment factors and applied agrotechnology. The investigations are done in 2016 on Experimental field in the Scientific Tobacco Institute in Prilep, with four repetitions concerning the following varieties: Virginia MV-1 (CMS) – control, Virginia McNair-944, Virginia K-394 and one newly created perspective line MV-1/14 (CMS). The results from the research are processed statistically by these parameters: average value ($\bar{x}$), average value error ($S_{\bar{x}}$), standard deviation (S), variation coefficient (CV) and variation width (WV). The aim of these investigations is to show the variability of the most important morphological properties: height of the plant with inflorescence, the number of leaves per plant and the length and width of the biggest leaf in tobacco type Virginia. From the investigation we confirmed that the tested varieties are very stable, the variation in the morphological properties is very low, since the variation coefficient everywhere showed a value less than 10%. We emphasize that the newly created line MV-1/14-CMS has the smallest variation, while at the same time it has the largest leaves, which is a positive property in large-leaf tobacco of the type Virginia.

Key words: tobacco, type Virginia, quantitative properties, variability

AGROECOLOGICAL CONDITIONS FOR GROWING SOME HYBRIDS OF SUNFLOWER IN OVCHE POLE REGION

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Abstract

Sunflower is a very important agricultural crop in the Republic of Macedonia and in other countries around the world. It is a high-yielding oilseed industrial culture, and it is characterized by high fatness that ranges up to 50% of the total weight of the seed in newer hybrids. This study used the latest hybrids that are grown in Macedonia without irrigational conditions in the Ovce pole region (dry and warm region). These characteristics in the production of sunflower were a challenge to set up and examine 12 varieties of hybrids in the Ovce pole region in the period from 2016 to 2017, from the sowing stage (April 2016/17) up to the phase of the sunflower harvest (Sept. 2016/17). In addition to the examined standardized characteristics (yield and sensitivity of diseases and pests), the emphasis in the research was to produce cold press oil and to check its quality. The hybrid varieties that were the subject of the research are: Experto, Armoni, Fortimi, Adagio, Neoma, Torino, Arisona, Bacardi, Feliks, Neostar, Kondi and Talento. The varieties were grown under irrigational conditions, in order to examine the agro-ecological conditions for growing sunflower. The results of the survey in the two comparative years showed that the yield of seed sunflower in the 2016 season was significantly higher than 2017 (4,320 kg/ha in 2016, compared to 2017 2,539 kg/ha) due to the higher rainfall in 2016 compared to 2017 (295 L/m^2 in 2016 compared to 2017 167 L/m^2).

Key words: oilseed, hybrids, irrigation, sowing stage, sunflower harvest

EXAMINATION ON YIELD AND YIELD ASSOCIATED PARAMETERS IN DIFFERENT RICE GENOTYPES

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Abstract

The aim of this paper was to evaluate the grain yield and some yield related traits in different rice genotypes grown in the Republic of Macedonia. Nine rice genotypes (*Prima Riska*, *78/12-3-1*, *79/22-2*, *Ronaldo*, *Onice*, *Opale*, *Gloria*, *Pato* and *San Andrea*) were used for this research. All rice genotypes were from Italy except *Prima Riska* variety and two promising lines (*78/12-3-1* and *79/22-2*) which have Macedonian origin. The field experiments were carried out during 2014 and 2015 on the field areas in Kocani, Republic of Macedonia. Each genotype was set up on 5 m^2 test area in three repetitions in randomized block design. Grain yield and some important yield associated traits, like plant height, panicle length, 1 000 grain weight and the number of plants per m^2 were evaluated. This study investigated the effect of genotype and environment, but also their interaction on the grain yield. Besides the importance of genotype, the analysis of variance showed that the grain yield was strongly affected by environmental conditions (over 87 %). During the first experimental year, *Ronaldo* variety had the highest value for grain yield (11 000 kg/ha) and the lowest was recorded by *Gloria* (6 400 kg/ha). In second testing year, the grain yield was highest by *Prima Riska* variety (4 482 kg/ha) and the lowest was obtained by *Pato* (2 867 kg/ha). The average grain yield for all tested genotypes during the period of study was 6 100 kg/ha.

Key words: grain yield, rice, agronomic traits, genotype, environment

PROTEIN PROFILE OF SOME GENOTYPES OF FLAX (*Linum usitatissimum* L.) IN THE STRUMICA REGION, REPUBLIC OF MACEDONIA

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Abstract

Flax (*Linum usitatissimum L.*) is an industrial crop and has a great importance for humans and economy. An analysis of five different flax genotypes, produced in the Strumica region, Republic of Macedonia, in 2014 and 2015 is being made, regarding the protein content in the flaxseed. The experiment consisted of five variants in three repetitions, divided by the method of randomized block system. During the vegetation, standard farming practices for field flax production were used. Analysis of the protein content in flaxseed was made in the Laboratory for plant and environmental protection, at the Faculty of Agriculture, "Goce Delcev" University – Stip (Standard: ISO 20483:2006). The content of protein in flaxseed was analysed by *Kjeldahl method*. The results were statistically processed by the method of *analysis of variance*, and the differences were tested by *LSD – test.* The content of protein in flaxseed of the tested genotypes ranged from 26.9% to 29.4%. All flax genotypes had higher percentage of proteins in the seed. But, the genotypes *Belinka* (29.3%) and *Velušina* (28.5%) are characterized by the highest average content of protein in the seed, regardless the year of production. *Belinka* and *Velušina* are perspective genotypes for the food industry, as they have higher content of proteins in the seed than the other analysed genotypes.

Key words: flax, seed, content, genotype, percent, protein

OPPORTUNITIES AND RECOMMENDATIONS FOR CULTIVATION OF CHICKPEAS (*Cicer arietinum* L.)

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Abstract

Chickpeas (C*icer arietinum L.*) production may be imperative for agricultural producers who carry out production without the possibility of irrigation. This paper explains the breeding technologies and recommendations for achieving a satisfactory yield and health state of the chickpea. Initially, the economic significance and utilization value of the chickpea, as well as the significant statistical indicators of the distribution and surfaces of the world are listed, which according to the data of FAOSTAT 2017, in 2016, the production of chickpea in the world was 12.1 million tons, India participates with 64%. Botanical characteristics, classification, varieties from the region, agrotechnical measures are described in separate chapters with particular reference to recommendations for ways of sowing, fertilization and implementation of significant measures for care during the vegetation. The number of published works in Macedonia and the region for this culture is small, therefore we appreciate that this work is of special importance for agricultural producers who would like to include the production of chickpea in crop rotation in agricultural production in arid conditions.

Key words: production, arid conditions, crop rotation, care, yield

GENETIC AND ENVIRONMENTAL EFFECT ON THE GRAIN YIELD OF SPRING BARLEY VARIETIES CULTIVATED IN THE REPUBLIC OF MACEDONIA

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Abstract

The aim of this paper was to evaluate the genetic and environmental effect on the grain yield of spring barley varieties cultivated in the Republic of Macedonia. Five spring barley varieties (*Makedo*, *Xanadu*, *Josefin Variety*, *Gladys* and *Scarlet Variety*) were used as an experimental material. *Makedo* is a Macedonian variety and the other barley varieties are introduced. The field experiments were carried out during 2013 and 2014 on the field areas in Probistip, Republic of Macedonia. The experiment design was randomized complete block with three replications. The results were analysed to synthesize the relative proportion of the influence factor (η %) such as variety or year, as well as the interaction between variety and year on the grain yield. Besides the year conditions, the impact of variety contributed significantly to the overall variability of yield (over 98 %), compared to the influence of year and the interaction between variety and year. Two year average yield was in range of 4 904 kg/ha to 6 895 kg/ha. The average grain yield for all tested varieties during the period of study was 5 910 kg/ha. In both years of study, the highest value for yield was obtained by *Makedo* variety (6 886 kg/ha in the first experimental year and 6 801 kg/ha in the second testing year) and the lowest was showed by *Scarlet* variety (4 965 kg/ha and 4 934 kg/ha, consequently). Also, *Makedo* variety has the highest values for number of spike per m^2 and number of grains per spike.

Key words: grain yield, barley, genotype, agronomic traits

STUDY OF QUANTITATIVE CHARACTERISTICS IN ORIENTAL TOBACCO GENOTYPES

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Abstract

Ten genotypes of oriental tobacco (three varieties and seven newly created lines) were investigated for some major morphological and agronomic traits: height of the plant without inflorescence, leaf number per plant, length/width of the middle belt leaves and dry mass yield/plant. The trial was set up in the Experimental field of Tobacco Institute–Prilep in 2016 and 2017, in randomized block design with four replications, using traditional agricultural practices. Measurements of the first three traits were made in the stage of butonization and beginning of flowering, while the dry mass yield was recorded during the treatment of cured tobacco. The results were statistically processed.
The aim of the research is to study the quantitative traits of Oriental genotypes, to determine the stability of the population through their variability and to emphasize the best among the selected assortment. From the set of genotypes we selected three superior lines with a high degree of homogeneity. The coefficient of variation of quantitative traits in these lines was lower than 10%, which is a sign of their stability. After their acceptance by the Commission for recognition and approval of varieties within the Ministry of Agriculture, Forestry and Water Economy of R. Macedonia, these genotypes will be placed on the market.

Key words: tobacco, oriental genotypes, quantitative traits, variability

THE EFFECT OF BACKCROSS METHOD IN TOBACCO BREEDING Jane Aleksoski*

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Abstract

The paper encompasses investigations of four oriental tobacco varieties (P10-3/2, P-23, P-84 and YK 7-4/2) and their diallel crosses F_1, F_2, BC_1 (P_1) and BC_1 (P_2) crosses in the course of 2016 and 2017, for the characters leaf number per stalk and dimensions of the middle belt leaves. The research was carried out on the experimental field of the Scientific Tobacco Institute - Prilep in randomized block system with four replications. The measurements were made in the stage of rapid growth (butonization), and the values obtained were processed by variational-statistical analysis. Heritability (h^2) of the traits was calculated using the Mather and Jinks method. The aim of the research is to study the effect of backcross breeding on improving the quantitative traits of tobacco, to open up the possibility of selecting individuals at the maximum number of crosses enabled by diallel cross of parental genotypes and to offer directions for further selection. The obtained results showed different modes of inheritance in all generations studied. Heritability of the crosses was over 95%, which is a sign of high heritability of the studied traits. The offered pattern for further successive selection can also be used for other plant species to improve a range of traits, including resistance to diseases.

Key words: tobacco (*Nicotiana tabacum* L.), backcross, diallel cross, heritability

DEGUSTATIONAL PROPERTIES OF SOME BASMAK TOBACCO VARIETIES

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Abstract

Degustational properties of tobacco are one of the most important parameters that determine the quality of tobacco in smoking. Investigations of these properties were performed in 2009, 2010 and 2011 year on one varieties of Yaka type and three varieties of the oriental type Basmak: JK 7-4/2 Ø, MK-1, MB-2, MB-3. Degustational properties of tobacco varieties were evaluated by the Taste panel of Tobacco Institute – Prilep, composed of seven members, by the method of "anonymous tasting" according to the standard and the "Key for taste evaluation of oriental aromatic tobacco". The aim of this paper was to make comparative investigation on degustational properties in some varieties of Basmak tobacco grown under same conditions and to mark all the differences among them. The best average results regarding the investigated properties were obtained in the variety MK-1 (68.39 points). Common opinion of the Taste panel is that all investigated varieties show good degustational properties that are typical for oriental tobacco, but MB-2 and MB-3 are the most prominent among them. The investigations have shown that Basmak varieties, due to their good tasting characteristics, can be successfully grown in the Republic of Macedonia.

Key words: oriental, (*Nicotiana tabacum* L.), testing, type

Plant protection

DETECTION OF *Pectobacterium carotovorum* subsp. *carotovorum*, BACTERIAL STALK AND HEAT ROT DISEASE ON SUNFLOWER SEEDS

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Abstract

The important protection measurement in sunflower production is to check the quality status of the seeds, by health control. The most spread diseases on sunflower transmitted by seeds or during the season are stalk rot (*Sclerotinia scletoriorum*) and downy mildew (*Plasmopara halstedii*), which were the only quarantine pathogens observed on the fields in Macedonia. Many sunflower pathogens have never been reported in Macedonia, such as bacterial diseases. Although, the diseases can reduce yield and seed quality, they occur only intermittently and seldom are of any economic concern. *Pectobacterium* (formerly *Erwinia*) *carotovorum* subsp. *carotovorum* is a Gram-negative plant-specific pathogen, and also catalase positive, oxidase negative and pectolytic. In our observation this bacteria damages the sunflower seeds before seedling season, during checking the health condition of seeds in UNILAB (laboratory for plant health control), in the season 2018. Biochemical laboratory analyses were done to confirm *Pectobacterium*, but also the morphological status of bacteria was viewed with SEM (scanning electron microscopy). This is the first paper about *Pectobacterium carotovorum* subsp. *carotovorum* on sunflower seeds which damages the seed and it is known as a bacterial stalk and head rot in the field.

Key words: sunflower, health control, *Pectobacterium,* gram-negative, SEM.

STUDY OF STOLBUR PHYTOPLASMA ON WINE GRAPEVINE VARIETY IN THE REPUBLIC OF MACEDONIA

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Abstract

Phytoplasmas are microorganisms that besides the grapevine also attack other plant species, such as corn, tomato, pepper, periwinkle and some wild plants. The disease seriously modifies the structure of leaf the grapevine phloem, the chlorophyll content and the functioning of sink–source system. Insect vectors and insufficiently tested planting material are the most common way for the transfer of phytoplasmas to Macedonian vineyards. In the Republic of Macedonia, they are known under the name *yelowing* or *redness* on the grapevine. The characteristic symptoms occur on the leaves (yellowing / redness, bending of the edges to the inside of the nervous system), the rosters (incomplete retention), and the bugs (sputtering). The grapevine field crops visited in the period from October 2015 to September 2016, were fully and thoroughly analysed and the field analysis confirmed the presence of phytoplasmic disease. To prove phytoplasmas in the grapevine, the already established method for isolating DNA and molecular PCR reaction was used. Total number of 105 grapevine wine samples were collected from the Tikves vineyards in Macedonia. All samples were analysed on three stolbur specific genes: *tuf, stamp* and *vmp*, because all of the results on tested samples from vineyards in Macedonia, show the presence only on stolbur phytoplasma. The study continuously checks and confirms the present status of stolbur in the biggest vineyards in Macedonia, in Tikves regions.

Key words: grapevine, phytoplasma, yellowing, redness, DNA, PCR

IMPACT OF AMPELOTECHNICAL MEASURES IN THE GRAPEVINE PROTECTION FROM OCCURRENCE OF GREY MOULD (Botrytis cinerea)

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Abstract

Grey mould (*Botrytis cinerea*) is one of the most important economical disease on grapevine, whose progress and development during vegetation causes serious economic losses. The aim of this study, was to determine how ampelotechnical measures influence on the development of the disease in order to reduce the number of chemical treatments. Locality Kraiste, Kavadarci, Republic of Macedonia, was the experimental field with black variety Vranec which was continuously observed. Working hypothesis was to follow the development of the disease after 14 days from the last treatment, when the impact decreases of the fungicide and by applying agrotechnical measures and green operations to control the development of the disease. Those variants where there was a reduction of irrigation, and to which were applied ampelotechnical measures, had significantly lower intensity of infection in relation to control.

Key words: grey mould, ampelotechnical measures, green operations, infection, control

USE OF SOME ESSENTIAL OILS IN BIOLOGICAL CONTROL OF PLANT PATHOGENIC FUNGI

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Abstract

Biologically active essential oils represent a rich potential source of an alternative and perhaps environmentally more acceptable disease management compounds. In phytotherapy, they can present a serious candidate to replace the various chemical pesticides commonly used against infectious diseases of fungal origin. The aim of this study was to evaluate the antifungal efficacy of anethole, alone, and in combination with several other essential oils against some important plant pathogenic fungi. The *in vitro* activity of different concentrations (1%, 0.5%, 0.25%, 0.125%, 0.0625%, 0.03125%, 0.015625% and 0.0078%) of anethole, alone, and in combination with other essential oils (cimetaldehid, eugenol, α-pinen, γ-terpinen, menthol, karvon, β-pinen, camphor, linalool, estragol and fenchon) was investigated. Minimal Inhibitory Concentrations (MICs) and Minimal Fungicidal Concentrations (MFCs) were evaluated by broth microdilution method. As test microorganisms we used plant pathogenic fungi: *Aspergillus ochraceus* FNS- FCC 46, *Alternaria alternata* FNS- FCC 47, *Fusarium oxysporum* FNS- FCC 48, *Botrytis cinerea* FNS- FCC 49, *Penicillium* sp. FNS- FCC 50, *Plasmopara viticola* FNS- FCC 51, *Aspergillus niger* FNS- FCC 52 and *Aspergillus niger* ATCC 16404. All tested EOs showed valuable antimicrobial activity against all tested isolates, with MICs between 0.25% - 0.0625%, and MFCs between 1% - 0.25%. As the most susceptible microorganism *Alternaria alternata* FNS- FCC 47 was found, while as the most resistant microorganisms were *Aspergillus niger* FNS- FCC 52 and *Aspergillus niger* ATCC 16404. The results indicate that tested combination of EOs have strong antifungal activity. The results of this study confirmed the possibility of using these oils in agriculture to prevent the growth of plant pathogenic fungi and they have the potential to replace the synthetic fungicides in the future.

Key words: essential oils (EOs), antimicrobial, plant pathogenic fungi, fungicides

EFFECTIVE CONTROL OF THE TOBACCO SEEDLINGS FROM DAMPING OFF DISEASE IN DUAL INFECTION IN BEDS

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Abstract

Damping off disease is caused by pathogenic fungi *Rhizoctonia solani* and *Pythium debarianum*. Its control is very difficult because of the similarity of symptoms and use of non-compatible fungicides for the target pathogens. The biggest problem is the dual infection which is very often, therefore the use of the correct control is necessary. According to these facts, the aim of this study was to determine the most effective way of control. The investigations were carried out in tobacco beds. There were two applications of fungicides. They were chosen by instructions, and the results from artificial inoculation and the previous practice. The most effective control is combination of two fungicide who act separately to each pathogen. The highest effectiveness is achieved by two combinations: Orvego (300g/L amectradin + 225g/L dimetomorph) 0.1% + Manfil 80WP (800 g/kg mancozeb) 0.25% - 88.64% and Orvego 0.1% + Signum 33 WG 0.1% - 84.23% effectiveness. Fungicides which suppress both pathogens in artificial inoculation, also achieved the highest results: Quadris 25 SC (250g/L azoxystrobin) 0.15% - 100% effectiveness and Signum 33 WG (267 g/kg boscalid + 67g/kg pyraclostrobin) 0.1% - 85.05%. These fungicides are good chemical controllers for damping off disease in dual infection by two pathogens in tobacco beds.

Key words: damping off, fungicides, effectiveness, Quadris 25 SC, Signum 33 WG, Orvego

IMPLEMENTATION OF MODERN IT TOOLS IN AGRICULTURAL PRACTICE

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Abstract

The modern agriculture is based on utilization of laboratory analyses and different tools for reaching high and good quality yields, with implementation of environmental friendly production practices. The Online Pesticide Database and the Online Calculator for Fertilizer Use were developed in order to facilitate and support the modern concepts of agricultural production in Republic of Macedonia. The Online Pesticide Database is Open Resource Character, providing information about diseases, pests and weeds for different crops, the pesticides for their control and the active ingredient of pesticides. Online Calculator for Fertilizer Use is created to support application of correct amounts of fertilizers. This on-line tool provides recommendations for necessary application of nitrogen, phosphorus and potassium to different crops, based on existing data on pre-crop, nutrient demand of next crop and laboratory analysis for already available nutrients in the soil. Both tools are freely available to any interested party and they are created in a manner that the data is accessible with IT tools operating on Windows, iOs or Android platform, and accordingly they are accessible even from the field. The Online Pesticide Database and Online Calculator for Fertilizer Use are created to support agricultural production in accordance with the principles and guidelines of Good Agricultural Practice (GAP) in Macedonia.

Key words: IT tools, online pesticide database, online calculator for fertilizer use, online application, pesticide, fertilizer calculator

Xylella fastidiosa – POSSIBLE THREAT IN PRODUCTION OF GRAPEVINE AND OLIVE TREES IN THE REPUBLIC OF MACEDONIA

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Abstract

Pierce's disease, caused by bacteria *Xylella fastidiosa*, was recorded in South America in 1884 for the first time, and it was later described by Pierce in 1892 who had given its name by him. For a long time, Pierce's disease (PD) was thought to be caused by a virus, but, the real cause of the disease was determined in 1978 with electron microscopy from xylem, where the presence of bacteria was established. Diseases caused by *X. fastidiosa* are mainly tropical or subtropical. They seem to be rare or absent in the cold winter regions. Grapevine is the main host of the disease, but it can also cause disease on olives, almond, burning of peach etc. The disease can be transmitted by insect vectors from the *Cicadellidae* family. The bacteria is not present in Europe. In the Republic of Macedonia, it has already a quarantine status.

Key words: disease**,** bacteria**,** virus**,** insect

Quality control and food safety

PARTICULAR FEATURES OF THE HORSE MEAT AGING Stefan G. Dragoev[1*], Dessislava B. Vlahova-Vangelova[1], Dessislav K. Balev[1], Kolyo T. Dinkov[1], Aco Kuzelov[2]

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Abstract

Over the last decade the horse meat went deeper into the field of vision of both consumers and scientists. The objective of this study is to identify the specific features during aging of the horse meat. The changes in microstructure, morphology, protein autolysis, soluble proteins, pH, WHC, drip loss and colour was studied in horse m. *Longissimus dorsi* during 12 d of wet aging at 0 – 4°C. At 3 d post mortem the A- and I-zones were more difficult to distinguish. Some shortening of the sarcomere was observed. The rigor mortis period in the horse meat occurs between day 3 and day 5. In this period the muscle fibres are contracted, the red colour component was decreased by 2-3 units, the pH and the WHC were minimal - 5.80 and 13 - 14%, respectively, and the drip losses were maximum about 20%. In intra-cellular spaces release of free water was found. After 5 d post mortem, single cracks and strains were observed - an indicator of the ongoing autolytic processes. The solubility of the proteins stabilized at about 1.750 mg/ml. An increased share of protein fractions with a molecular weight of 28-23 KDa, considered as an indicator of increased meat fragility, was found after 5 days. From 5 to 12 d, higher levels of α-actinin, deskman and light meromyosin were found. After 7 d of post-mortem destructive changes were deepening. Z-lines were very torn. A- and I-discs were difficult to distinguish. Myofibrils were highly fragmented and I-zones were not distinguishable.

Key words: m. *Longissimus dorsi,* microstructure, morphology, protein autolysis, soluble proteins, drip loss, colour

MONITORING UDDER HEALTH AND MILK HYGIENE ON-FARM USING QUICK SCREENING METHODS

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Abstract

In this paper the use of on-farm screening methods for monitoring udder health and milk quality are discussed. Special attention was given to evaluation of usefulness of California mastitis test (CMT) as quick field screening test for detection of udder quarters with an intra-mammary infections caused by major mastitis pathogens. Application of CMT in dairy herd health management in period of early lactation is illustrated through the two years cross sectional study that was carried out to screening the quarter milk samples with abnormal milk secretion (AMS) and using of microbiological culture for detection of intramammary infections (IMI). The quarter milk samples were obtained in two periods of early lactation: the period from calving until 21st day in lactation and period from 22nd to 42nd day in lactation. The quarter level prevalence of AMS and IMI in the first 21 days in lactation was 5.33% and 4.03%, and up to the 42 days in lactation the prevalence of AMS and IMI was 5.45% and 4.38%, respectively. The prevalence of AMS and IMI from udder quarters that show positive reaction on CMT in the first 21 days in lactation was 56.96 and 55.42; and 55.42 and 44.58 in the period from 22nd to 42nd day in lactation, respectively. The results indicated that positive CMT reaction in early lactation may be good indicator for IMI; there was a significant association between the frequency of isolation of major pathogens and the CMT score in milk samples obtained in the period of early lactation (Pearson's χ^2=240.031, df=9, P<0.001).

Key words: california mastitis test, dairy cows, intra-mammary infection

CHARACTERIZATION OF LEAD ISOTOPE RATIOS IN VARIOUS PLANT FOODS AND BEVERAGES WITH APPLICATION OF Q-ICP-MS

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Abstract

Studies of the isotopic composition of lead are commonly used in the environmental science. If lead is present in the soil, a plant will take up small amounts and subsequent isotope ratio studies might provide unique means of differentiating between different plant sources of origin. Among all the naturally occurring lead isotopes, only ^{204}Pb is non-radiogenic, whereas, ^{206}Pb, ^{207}Pb and ^{208}Pb are the daughter products of the radioactive decay of ^{238}U and ^{235}U and ^{232}Th, respectively. Small Pb isotope abundance variation occurs in nature and the isotopic composition of lead in the environment is dependent on local pollution sources. Being able to accurately measure all of the Pb isotopes is very important for the number of investigations. Quadropole inductively coupled plasma with mass spectrometry (Q-ICP-MS) was used to investigate whether this chemical application can offer a reliable and practical solution to the problem of the polyatomic overlap in the presence of organically based matrix samples. Very good sensitivity was obtained for ^{206}Pb, ^{207}Pb and ^{208}Pb isotopes, while, ^{204}Pb suffers from isobaric interference from ^{204}Hg. Satisfactory linearity (R) was obtained in the range from 5 to 100 μg/L. The study summarizes the instrument optimization procedure for Pb isotope measurements in plant food and wine samples. The calculated isotope ratios ranges: a) ^{207}Pb/^{206}Pb: from 0.985 to 1.122 with standard deviation of data distribution of 0.038 and b) ^{208}Pb/^{206}Pb: from 2.221 to 2.998 with standard deviation of data distribution 0.21. The isotopic ratios were presented for samples from the same and different geographical regions.

Key words: lead, isotope ratio, plant food, wine, Q-ICP-MS

DETERMINATION OF THE INFLUENCE OF CATTLE BREEDS ON THE COLOUR OF CALF MEAT

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Abstract

Three breeds „Busha“, „Friesian“and „Simmental” were examined in the analysis for determining the influence of cattle breeds on the colour quality of the meat. As the most attractive colour quality analyses were taken on muscles (*m. Semimembranosus*) and (*m. Longissimus dorsi*). Analysed parameters for determining the quality of meat colour were: intensity of the colour L *, the red component of the colour a * and the yellow component of the colour of the meat b *.The L* values of colour of the long muscle *Longissimus dorsi* were higher and statistically significant (p>0.05) at analysed samples taken from the "Simmental" breed - 33.54, in contrast to the meat from the breed "Friesian"- 27.61 and from meat of the Busha breed - 25.65. The L* values of Semimembranosus muscle were higher in meat from breeds "Friesian" - 32.20 and "Simmental" - 31.59. In the results of these two breeds, statistically significant levels (p>0.05) were not observed, unlike the results of meat obtained from the Busha breed, which showed significantly lower (p>0.05) values - 29.18. From the obtained results, a conclusion can be reached and that is that characteristically darkest colour on two analysed muscles were obtained at Busha breed, and most attractive rich red colour was obtained at the muscles of the "Simmental" cattle breed.

Key words: m. *Semimembranosus, Longissimus dorsi,* intensity of the colour, *Friesian*, *Simmental*, *Busha*

SEASONAL CHANGES ON BOVINE BULK TANK MILK QUALITY FROM THREE REGIONS IN MACEDONIA

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Abstract

The aim of this study was to give an overview of the milk quality parameters and to investigate variations of milk composition, Somatic Cells Counts (SCC) and Total Bacteria Counts (TCC) by season of year and region of milk collection. The present study was conducted during the period of eight months in three regions in Republic of Macedonia: Berovo, Pehcevo and Delcevo. Raw bulk tank milk samples were collected from the selected dairy factories. The correlation between observed parameters was calculated with Pearson's coefficient of correlation using all data. All results of the research were processed using one-way analysis of variance (ANOVA). The Pearson's coefficient of correlation showed that there was statistical significant interdependence at level $p<0.01$ between region of collected milk and fat content, raw milk temperature and acidity level and total bacteria count. Statistical significant correlation existed between months in year when milk samples were collected and content of dry matters and proteins, raw milk temperature, specific gravity and acidity level. There was found statistical significant difference ($p<0.001$) in fat, dry matter and protein content, the presence of added water, mean raw milk temperature, specific gravity and milk acidity level between regions where milk samples were taken. The contents of fat, dry matter and protein, the presence of added water, mean raw milk temperature, specific gravity and milk acidity level were statistically significantly differed ($p<0.001$) depending on months in year when milk samples were taken. The other milk quality characteristics did not differ depending on months in year.

Key words: Raw milk composition, somatic cell count, bacteriological quality

CHANGES IN FATTY ACID COMPOSITION OF POULTRY MEAT AFTER HEAT TREATMENT

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Abstract

The purpose of the paper is to determine the changes in the fatty acid composition of fat in poultry meat after the heat treatment, after frying in different types and combinations of fats. Lard, sunflower oil, palm oil and a combination of three parts of lard and one part of sunflower oil, three parts of lard and one part of palm fat and three parts of palm fat and one part of sunflower oil were used for the examination. After frying with lard in the meat, there is a greater change in the fatty acid composition, where the fatty acid C18:1n9c of 45.84%, which it had before frying, increased to 49.05%, C18:O decreased from 10.18% to 7.45% and decreased C16:O from 29.55% to 27.45%. After frying in sunflower oil and palm oil, there has a formation of new fatty acids in insignificant amounts. In combination of three parts of lard and one part of sunflower oil, minimal changes in the fatty acid composition of less than 1% have been observed. In frying with three parts of lard and one part of palm fat fatty acid C14:O from 0.88% to 23.81%, fatty acids C16: O decreased from 27.24% to 1.72%, C18:1n9c from 48.05% to 15.16% and C18:2n6c from 12.44% to 0.20%. After the heat treatment of the meat in three parts of palm fat and one part of sunflower oil, there is an increase in the content of fatty acid C18:2n6c from 8.42% to 11.62%

Key words: quality, frying, lard, palm oil, sunflower oil

ANTIMICROBIAL ACTIVITY OF POMEGRANATE PEEL EXTRACTS FROM "KARAMUSTAFA" AND "IDŽIS" VARIETIES

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Abstract

The aim of this study was determination of antimicrobial activity of pomegranate peel extracts from "Karamustafa" and "Idžis" varieties. For this purposes, the peel of the two varieties of pomegranates was dried, powdered and extracted three times by methanol: water solution (80:20). After evaporation, the extracts were investigated for their "in vitro" antibacterial and antifungal properties using a disk-diffusion method in Petri dishes. The pomegranate peel extracts were tested for antibacterial activity against one Gram-positive bacterial strain *Staphylococcus aureus* (ATCC 25923), and against one Gram-negative bacterial strain *Escherichia coli* (ATCC 25922), and for antifungal activity using *Candida albicans* (ATCC 1023). In brief, each microorganism was suspended in Mueller Hinton (MH) broth and diluted approximately to 10E6 colony forming unit (cfu)/mL. Gentamicin (20 µg/well), nalidixic acid (30 µg/well), ciprofloxacine (5 µg/well) and erytromicine (15 µg/well) were used as positive control. The antibacterial activity is ranked from no activity (-: inhibition diameter < 10 mm), low (+: inhibition diameter between 10 and 15 mm), moderate (++: inhibition diameter between 15 and 20 mm) and high activity (+++: diameter inhibition ≥ 20 mm). All tests were performed in triplicate and clear halos greater than 10 mm were considered as positive results. Our results showed very high antimicrobial activity of the extracts from both variety against *Staphylococcus aureus* (ATCC 25923) with inhibition zone of 40 mm. The antifungal activity against *Candida albicans* (ATCC 1023) was very low with inhibition zone of 10 mm.

Key words: pomegranate extracts, antibacterial, antifungal, disk-diffusion method, *Staphylococcus aureus*.

Soil science and hydrology

AEROBIC GRANULATION TECHNOLOGY FOR COST EFFICIENT MUNICIPAL AND INDUSTRIAL WASTEWATER TREATMENT <GRANULIS>

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Abstract

Nitrogen load in municipal and industrial wastewater is an important parameter for the quality of treated wastewater. Therefore, there is a constant need to improve the treatment efficiency and reduce the use of energy on the existing and new wastewater treatment plants. Aerobic granular sludge is a promising technology to be applied in various industrial and municipal wastewater treatment plants (WWTP) The purpose of the project is to establish, fine-tune and scale up a novel aerobic granular process, which are applied on small and medium industrial and domestic WWTPs and also used to upgrade the existing medium and large WWTPs. Aerobic granules are prepared using pre-selected microorganisms, with known properties for granulation. At least 30 microbial strains (based on 16S rRNA characterization) are used for "basic granules" preparation. Formation of granules are done on chemically defined medium containing acetate as a primary carbon source and (NH4)2SO4 as a nitrogen source. This project resulted with new and optimized protocols for fast aerobic granulation process, new operating protocol for scale up of aerobic granules production, high quality and quantity production output due to controlled conditions in laboratory facility. A comprehensive microbial, chemical and biological profile of aerobic granules was developed, which has been patented and trademarked product ready for market application. The newly established Research Centre for Applied Microbiology and Biotechnology received an ISO 17025 certification that offers new innovative services to the existing market in the region. The novel aerobic granular process for nitrogen removal and WWTPs upgrade will lead to beneficial impact on environmental issues (reduction of energy consumption, reduction of wastes, water resources saving and sustainable production processes) and therefore adequately support the "Environmental Action Plan for sustainable development" of the European Communities (COM 122-2002), as well as the "EU Water Framework Directive".

Key words: granulation, nitrification, denitrification, wastewater treatment, ISO certification

THE INFLUENCE OF THE PERLITE AS A SUBSTRATE FOR IMPROVING ON SOME WATER PROPERTIES ON THE FLUVIAL SOIL WITH AN APLICATION OF RETENTIONAL CURVES

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Abstract

This work is focused on the determination of potential of moisture retaining in perlite and fluvial soil. For assessing this parameter, the method of Bar extractors and Porous plate extractors have been explored. The method is applied on 7 different regimes of pressure, (0.1; 0.33; 1; 3; 6.25; 11; 15 bars), in samples composed of perlite and fluvial soil, where different ratios of 20/80, 30/70, 50/50 are present. The major goal of this study is to explore the experimental results of moisture content and to show the effectiveness of the water retention properties of perlite. Water retention curve is the relationship between the water content, and the soil and substrate water potential. This curve is characteristic for different types of soil and substrate, and is also called the soil moisture characteristic. The retention curve reflects the moisture content during a different tension. The data determined in this work are useful to assess the effective zone of the root system. We show that perlite exhibits specific features in respect to the water retention in several types of soils. Because of the good physical properties and the high porosity, the expanded perlite has a significant role in maintaining and improving of the water-air regime in the fluvial soils. In addition, it gives better accessibility of air and moisture for the plants, having a very positive influence on the soil features.

Key words: perlite, fluvial soil, retention curves

Viticulture, enology and fruit production

THE EFFECT OF PRUNING ON FRIUTING CAPACITY OF MICHEL PALIERI TABLE GRAPE VARIETY, GROWING IN TIKVES VINEYARD

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Abstract

The subject of research was the table grape variety Palieri, grown in the Tikves vineyards. The aim of this paper was to determine the effect of various types of pruning on fruiting of Michel Palieri variety, given that no research has been done so far for this variety. The research lasted three years (2014, 2015 and 2016), and three pruning variants were used (16, 20 and 24 buds/vine). Different values were obtained for the examined elements primarily as a result of the varietal specificity and the extent of the load on the vines with the native buds. In the years of examination, the percentage of fruiting buds in all variants is quite stable and with insignificant variations. The coefficient of variation ranges from 2.74 (variant 2) to10.24 (variant 3). The average number of bunches per fruiting canes (absolute coefficient) is in the range of 1.3 to 1.4 and with high stability both in variants and in the years of examination. The average mass of bunches ranges from 401 g (variant 2) to 492 g (variant 3). After several years, significant variation in variants 1 (28.84) and 3 (20.25) was observed in the mass of bunches.

Key words: table grape, pruning, fertility, mass of bunches

AGROBIOLOGICAL ESTIMATION OF GRAPEVINE VARIETIES FOR WHITE AND RED WINES

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Abstract

A comparative agrobiological estimation of grapevine varieties for white and red wines from different ecology-geographical groups have been done through application of mathematical methods - analysis of variance, cluster and factor analysis. It has been established that the varieties Fetească albă, Fetească regală, Pamid, Dimiat and Mavrud distinguish statistically which has been proved according to almost all examined characteristics. The importance of the analysed indicators in the structure of the yield in the case of the oriental varieties is summarized in five factors, in the case of those from the Black Sea – in four, which are enough to explain more than half of their common variability. With the biggest proved direct impact on the yield in the case of all varieties from the first group are the indicators from the summarized factor F_3, and from the second – F_1. Other factors which are not analysed also have an impact on the formation of their yield.

Key words: analysis of variance, cluster analysis, agrobiological indicators, wine grape varieties, agrobiological estimation

VINEYARD IRRIGATON SYSTEMS CONTROLLED ONLINE THROUGH GSM MODULE

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Abstract

In this paper we show how solar energy is used by farmers in the Republic of Macedonia for irrigation and remote management using a GSM module. Over the last three decades, a number of advanced process controls have been installed in production plants. The need for upgrading these systems over an Internet network provides opportunities for design and analysis of remote-controlled systems with immense stability and reliability. In the last two decades, web based systems in real time play an important role in the production of a quality product, in our case raw grapes. This paper is a solution that allows us to obtain quality and remote-controlled equipment for low-cost equipment with the purpose of activating and disabling the pumps powered by solar energy and serving to irrigate vineyards. Use existing available technologies that are free to use and in combination with the new solutions from this paper, a managed system is run that will work seamlessly with mechanisms through which all errors will be annulled. Several systems that offer cheap solutions that will meet the requirements of the growers are considered in the Republic of Macedonia.

Key words: grape production, remote management, irrigation systems

1st INTERNATIONAL MEETING
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10th - 11th May 2018, Stip, Republic of Macedonia

BOOK OF ABSTRACTS

1st INTERNATIONAL MEETING
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Faculty of Agriculture, Goce Delcev University - Stip
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ISBN 978-608-244-526-7