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28TH INTERNATIONAL SCIENTIFIC-EXPERT CONFERENCE OF AGRICULTURE AND FOOD INDUSTRY

Book of Abstracts

Sarajevo
September 27–29, 2017

28TH INTERNATIONAL SCIENTIFIC-EXPERT CONFERENCE OF AGRICULTURE AND FOOD INDUSTRY

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Faculty of Agriculture, Ege University, Republic of Turkey,

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Editors: Pakeza Drkenda, Belma Dučić; Printed by: TMP d.o.o. Sarajevo

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Açikgöz Z., Kirkpinar F., Bayraktar O. H.

Ege University, Faculty of Agriculture, Department of Animal Science, İzmir/Turkey

Summary

The egg yolk colour is considered to be an important criterion in determining the consumer acceptability. The yolk colour is related to the amount and type of carotenoids stored in eggs. Animals has not the ability to synthesize carotenoids. In egg industry, yolk colour is derived from dietary natural or synthetic carotenoids. Synthetic carotenoids are usually supplemented to diet of commercial layer in order to obtain the desired yolk colour over many years. However, consumers are now concerned about the health risks attributed to these synthetic carotenoids. Thus, natural carotenoids are in high demand because of their health-enhancing and disease-risk-preventing properties. The major xanthophylls in egg yolk are lutein and zeaxanthin. Lutein is present in marigold flower, corn and dark-green leafy vegetables. Because of the high lutein content in marigold flower, it and its extract are recommended to use in diet as a natural pigment source. However, synthetic carotenoids are preferred due to their low cost and high stability. Since humans, like animals, are unable to produce carotenoids in their bodies, they obtain them exclusively from the diet. Carotenoids support antioxidant defence system and immunity due to their antioxidant properties. Recent evidence suggests that lutein may be beneficial in the protection against numerous human diseases, such as age-related macular degeneration, cataracts, heart disease, and cancer. On this context, egg is of interest because of the high bioavailability of lutein. In recent years, some studies has been conducted to enhance the lutein content of egg yolk by dietary manuplation. Results from them have shown that it is possible to increase lutein concentration of egg yolk.

Key words: egg, lutein, human, health.

BLOOD REFERENCE VALUES OF CERTAIN BIOCHEMICAL PARAMETERS IN MERINOLANDSCHAF LAMBS FROM ORGANIC FARMING

Antunović Z., Šperanda M., Klir Ž., Zmaić K., Djidara M., Novoselec J.

Faculty of Agriculture in Osijek, V. Preloga 1, 31000 Osijek, Croatia

Summary

The aim of the present research was to determine reference values of certain biochemical parameters in blood of 40 Merinolandschaf lambs in organic farming. After weaning lambs were fed with feed mixture and meadow hay of organic origin *ad libitum*. Average body mass of lambs was 34.01 kg, and average body condition score was 3.86. Within blood serum the concentrations of the mineral indicators (calcium, phosphorus-inorganic, magnesium and iron), concentrations of the biochemical parameters (urea, glucose, total proteins, albumin, cholesterol, HDL-cholesterol; LDL-cholesterol, triglyceride, BHBA- β-hydroxibutyrate and NEFA-non-esterified fatty acids) and enzyme activity (CK - creatine kinase, ALP- alkaline phosphatase) were found. Most of the biochemical parameters´ concentrations in the lambs´ blood was within reference values for lambs, except albumin (28.05 g/L), Ca and Mg (2.43 and 0.90 mmol/L) concentrations as well as activity of CK enzyme (170.49 U/L) which was bellow or on the lower reference values as well as concentration of globulins (30.02 g/L) which was higher compared to reference values. Determined changes of biochemical parameters in the blood of Merinolandschaf lambs in organic farming indicated the need for redefinition of these parameters as reference values and presents adequate supply of lambs with nutrients through diets. Determined biochemical parameters in the blood of Merinolandschaf lambs in organic production can be used as reliable criteria in assessment of nutrients supply through diets, as well as redefinition of reference values´ limits of these parameters in the blood, as well as their reference values.

Key words: lambs, blood, biochemical parameters, Merinolandschaf, organic farming

POSSIBLE REPLACEMENT OF FISH MEAL WITH MOTHS (LEPIDOPTERA) IN AQUATIC FEEDS

Doğankaya L.[1], Özkan C.[2], Atay İ.[3]

[1] University of Ankara, Faculty of Agriculture, Department of Fisheries and Aquaculture Engineering, 06110 Dışkapı, Ankara, Turkey, [2] University of Ankara, Faculty of Agriculture, Department of Plant Protection, 06110 Dışkapı, Ankara, Turkey, [3] InseFish Aquaculture Industry and Trade Ltd. Co., Ankara University Technopolis, Gölbaşı, Ankara, Turkey

Summary

Fish meal (FM) is the main protein source in aquafeeds due to its high protein content, amino acid profile, digestibility and wide availability. About 20 percent of total fish globally produced is currently used for FM and fish oil production and demand for FM is expected to exceed the annual world supply in the next decade. While the cost of aquaculture feeds represents 40–70% of the total cost of the fish produced, the steady decline in the wild fish catch with a decrease in the availability of FM push up prices in recent years. Some terrestrial animal and plant sources have been subject to research for aquatic feeds but many limitations are of concern. Insects are of interest since they are in natural diets of many marine and freshwater fishes and they have been considered as potential alternatives to FM. Animal feed resources information system (Feedipedia / FAO) is indexing 5 species (black soldier fly larvae, housefly maggot meal, locust meal, grasshoppers and crickets, mealworm, silkworm pupae meal) as feedstuff. While positive results of FM replacement in aquatic feeds with insect meal are reported, the possibility of a total replacement has not been achieved yet. Within the potential of insects for fish feed, we have started an R&D project “Insect Based Ornamental Fish Feeds” supported by the Scientific and Technological Research Council of Turkey and started to R&D in Ankara University Technopolis in 2016. We are focused on different life stages of two species of Lepidoptera which are used in biological control of pests. These species are subjected to fish feeding experiments for the first time and our primary results are promising. Once we achieve positive results in cost-efficient and eco-friendly ornamental fish feed production, a second phase including the studies on finfish feeds is intended.

Key words: Fish meal, insect meal, Lepidoptera, fish nutrition

EXTERIOR CHARACTERISTICS OF DUBIAN PRAMENKA SHEEP

Dokso A., Zečević E., Rustempašić A.

Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina

Summary

Investigation on field external features by measurements of adult sheep and rams were carried out. Research were carried out on the three sheep farms in the area of Unsko Sanski County. In this investigation one hundred adults from three flocks were included, ninety ewes and ten rams respectively.
All measurements were carried out by Lydthin's stick and by tape. Average age of animals were three years. The following external characteristics are measured: height of withers, the length of trunk, chest depth and circumference of the chest with average value 83.26 cm, 94.20 cm, 36.03 cm and 109.00 cm respectively. This investigation shows up larger body measures in investigated group then it is characteristic with this breed.
Body measures of rams had higher values which is common for male animals. Results of this investigation shows potential of this breed in growth since the founded values are higher than earlier data from literature.

Key words: Dubian sheep; exterior, body measurements

EFFECT OF NUTRITION ON THE FATTY ACID COMPOSITION OF SHEEP MILK IN VARIOUS PERIODS OF LACTATION

Džaferović A.[1], Čorbo S.[2], Omanović H.[2], Mujić E.[1]

[1]Biotechical faculty, University of Bihac, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences at University of Sarajevo, Bosnia and Herzegovina

Summary

The aim of this study is to examine the impact of plant sources of fat in food for sheep on the fatty acid composition of milk samples obtained from 210 sheep, of breed Pramenka at the area of Una Sana Canton. The studies were conducted in three periods: winter, spring and summer, and the heard is divided into experimental and control groups of sheep. Extrauted linen has been added to nutrition in experimental group of sheep in every period of research in the amount of 3,5%. The total content of saturated fat was the highest during the summer with the experimental heard (70,75% g/100 fat), which was added to vegetable sources of fat. The most common saturated fatty acids (SAFA) in the analyzed samples of milk are: palmitic, myristic, stearic, capric and lauric, whose values are varied depending on the treatment of nutrition and research period. The differences found in the content of saturated fatty acids between the period of investigation of milk sample and the control group showed statistically very highly significant effect ($p<0,001$). The content of unsaturated fatty acids was the highest during the summer in the control group of sheep (32,00% g/100 fat). Of monounsaturated fatty acids (MUFA) mostly consisted of oleic during the summer period (25,60% g / 100 fat) in the milk control group. Of polyunsaturated fatty acids (PUFA) were most prevalent linoleic acid (3,6% g/100 fat) in the milk of control and α-linolenic (1,90% g/100 fat) milk sample group of sheep in the winter. Statistically very highly significant effect ($p<0,001$), on the content of unsaturated fatty acids showed factor term and factor treatment and their mutual interactions.

Key words: sheep's milk, fatty acids, SAFA, MUFA, PUFA

DIURNAL VARIATION OF SOME SOCIAL AND SPATIAL BEHAVIOR OF SHEEP UNDER EXTENSIVE PASTURE CONFINEMENT

Džomba E., Čengić-Džomba S., Muratović S., Hadžić Dž.

Faculty of Agriculture and Food Sciences, University of Sarajevo,
Bosnia and Herzegovina

Summary

Grazing sheep perform different activities on pastures following specific socio-spatial and temporal patterns throughout the day. Sheep flock consisted of 125 ewes, 11 rams and 176 lambs kept in a pasture of 29.6 ha area. Stocking density was 12.12 animals/ha. Five areas with different characteristics (terrain slope, sun exposure, presence of trees, shrubs and water) were recognized inside the paddock allowing sheep to freely cross virtual boundaries of the areas. Observation was carried out through 8 day for 12 h/d (from 0800 to 2000) during May in order to study some social (number and structure of groups, group size) and spatial (sheep preference for a particular area) behavior. Observations were carried out by a scan sampling technique. The flock structure was recorded every 20 min by direct observation of trained observers. At the beginning of the study herbage mass yield at each of the area was calculated.

Number of groups and group size were affected by sheep category ($P < 0.05$), being largest in mix of ewes, lambs and rams (29.24 ± 23.07 and 66.67 ± 87.82 respectively.) The period of the day did not affect the size of the group and the number of groups in general ($P < 0.05$), but the sheep had tendency to form a different number of groups per particular pasture zone at different period of the day ($P < 0.05$). The study suggests that sheep under free range condition tend to maintain the category segregation but mixed-sex groups are still the most common type of social aggregation forming large number of groups with very frequent changes of its structure during a day.

Key words: sheep, social structure, spatial behavior, pasture

EFFECTS OF FREE RANGE BROILER PRODUCTION ON MEAT QUALITY

Kırkpınar F.[1], Bayraktar Ö. H.[1], Açıkgöz Z.[1]

[1]Ege University, Faculty of Agriculture, Department of Animal Science, İzmir, Turkey

Summary

The interest of consumers in products from free-range systems is increasing mainly because these systems can be environmentally friendly, sustaining animals in good health with high welfare standards and resulting in higher quality and more tasty products. The free-range broiler production system is regulated in the EU by basic guideline (Council Directive 2007/43/EC) which recommends the use of slow-growing strains adapted to the system. Chicken meat sold as "free range" must be derived from chickens: 1) whose indoor housing's stocking rate does not exceed 13 chickens per square metre [1.2 square yards]; 2) who have during at least half their lifetime, continuous daytime access to open-air runs comprising an area mainly covered by vegetation of not less than 1 square metre [1.2 square yards] per chicken; and who are not slaughtered until 56 days of age or later. The quality of poultry carcasses and meat can be also influenced by the production system. Poultry meat quality is made up of its safety in terms microbiological and chemical contamination, nutritive values and sensory characteristics. Free-range systems may influence quality, nutrient composition, and taste of broiler meat, because the chicks are likely to exercise more and have access to diverse feedstuffs such as fresh plant and insects. Overall, free-range access negatively affected slaughter weight, but positively affected meat quality, taste, and composition. The effects of free-range access on meat quality, composition and taste have been studied, but results are not consistent. The objective of this review was to demonstrate the possibilities of using slow-growing strains for free range poultry production of meat for its specific quality features in the light of worldwide researches.

Key words: free range, broiler, meat quality

INFLUENCE OF LIVE YEAST CULTURE *SACCHAROMYCES CEREVISIAE* – YEA SACC^{1026} ON GOAT MILK COMPOSITION

Mušanović E.[1], Čengić-Džomba S.[2], Muratović S.[2], Džomba E.[2], Hadžić Dž.[2]

[1]Public Institution Secondary School of Agriculture, Food Processing, Veterinary Medicine and Service Industries, [2]Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina

Summary

The feeding system of dairy goats in Bosnian mountain region is mostly based on grazing pasture from early spring to late autumn period. In such conditions, the quality of the pasture not meet the needs the animals, especially regarding on protein content as well as energy/protein ratio in the daily rations. The experiment was carried out at goats milk farm located near Sarajevo - Bosnia and Herzegovina. 40 Alpine goats in late lactation were used in feeding trial to determine the effect of addition of live yeast culture *Saccharomyces cerevisiae* – Yea Sacc^{1026} on the milk composition. Four grams of Yeast culture was added in to 20 g of feed mixture and offered to goats in the morning. Goats from both treatments (control and Yeast added) grazed and browsed on pasture. Milk samples were collected at the beginning and the end of the experiment. Obtained data was processing by ANOVA using SPSS 17 statistical software package.
Adding of Yea Sacc^{1026} in rations significantly decreased milk urea content (from 13.26 to 9.97 mg/dl). On protein, milk fat, lactose total dry matter, non fat dry matter and somatic cells content in milk, added yeast had no effect. The obtained results sugested that probiotic effect of Yea Sacc^{1026} would be more pronounced during extended supplementation by yeast.

Key words: goats, yeast, milk composition

GONADOSOMATIC INDEX VALUES AND HISTOLOGICAL ANALYSIS OF THE RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) OVARY FED WITH FOOD FROM TWO DIFFERENT MANUFACTURERS

Pilić S.[1], Jerković-Mujkić A.[1], Katica A.[2], Mlaćo N.[2]

[1] Faculty of Science, University of Sarajevo, Department of Biology, Zmaja od Bosne 33-35, 71000 Sarajevo, Bosnia and Herzegovina
[2] Veterinary Faculty, University of Sarajevo, Department of Histology and Embriology, Zmaja od Bosne 90, 71000 Sarajevo, Bosnia and Herzegovina

Summary

Bosnia and Herzegovina is one of the leading countries in the region in the production of freshwater fish, primarily rainbow trout (*Oncorhynchus mykiss*). Factors affecting the production and reproduction of rainbow trout are numerous, and the type and composition of the food being most certainly one of them.

Comparative study of gonadosomatic index (GSI) and ovary of rainbow trout, fed with food from two different producers was conducted at Magazine Maprim and Eco-project fish farms, where concrete tanks for breeding are used. The Coppens food was used in Magazine Maprim fish farm, while in Eco-project fish farm, the Skreting food was used. Two groups of 30 individuals of the same age were examined. Physicochemical parameters of water were within acceptable values for this species.

The results showed that GSI (16,44 ±0,65) values for females fed with Coppens food, energetic values of 16.41, did not differ statistically from GSI (15,98±1,41) values for females fed with Skreting, energetic values of 15.83. When mean ovary weight was analyzed, statistically significant difference was observed between females fed with Coppens food (270±0,04) and females fed with Skreting food (177± 0,02). Histology of ovaries of the rainbow trout fed with the two experimental diets showed normal development and distribution of oocytes and interstitial cells.

Based on our results, food from Skreting and Coppens manufacturers are quite similar regarding their effect on GSI index and ovary histology of the rainbow trout. Given equal availability of these two goods, we recommend to fish farmers to use the one which is more economical.

Key words: Oncorhynchus mykiss, GSI, Ovary weight, Coppens and Skreting fish food

ORGANIC POULTRY MEAT PRODUCTION

Rustempašić A., Dokso A., Zečević E.

Faculty of Agriculture and Food Science, University of Sarajevo,
Bosnia and Herzegovina

Summary

Increased consumer interest in organic poultry products is evident in recent years. In response to consumer demands, in the EU has increased the number of organic poultry farms. Organic production of broilers meat is arranged in accordance with the principles laid down for this type of production and poses many challenges for farmers. One of the important preconditions for successful production is the use of breeds that are adapts to the organic production system. Activity, vitality, resistance to some disease, feed conversion ratio, lead to preference of slow and medium growing hybrids compared to hybrids used in intensive production systems. Taking into account that the fast growing hybrids in free range conditions may face some health problems which negatively affect the animal welfare, the correct choice of the breed is one of the key issues.
This paper will describe the basic principles of organic poultry production and the correct choice of breeds for meat production.

Key words: poultry, organic production, meat

PRODUCTIVITY OF SEMI-STATIONARY MILKING MACHINE SYSTEMS

Škaljić S.[1], Rakita N.[1], Pekmez M.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Modern agricultural production demands continuous monitoring of work processes with purpose of control and rationalization of work. Machine milking takes important role in work structure. Machine milking includes processes of preparation of milking cow, udder cleaning, extra-milking of herds and washing of the milking parlor at the end. Keeping in mind that mentioned processes are performed early in the morning and the evening, it can be said that there is a great amount of machine and human work engagement that needs to be continuously controlled. Because of the above reason, this research is done at semi-stationary milking system which is present at many farms in Bosnia and Herzegovina. The research is conducted at dairy farm "PD Butmir d.o.o." which has the capacity of about 700 cattle, including calves and heifers. In this experiment, ten milking cows have been chosen for taking of chronographic measurements of consumption of human and machine work during the morning and evening milking. Results show that 51.4% of time is spent on udder cleaning, 21.5% for udder massage, 5.5% for udder drying, 8.7% for getting the first stream of milk and 8.8% for attachment and removal of milking cups. The average engagement of machinery for milking of ten cows used for the research was 129.27 min, whereas 76.9% of time was spent on machine milking, 19.5% on extra-milking and 3.9% on work interruptions. At average, it amounts to 12.9 min for machine milking per cow. As 15.2 liters of milk were collected from one-time milking, it means that approximately 1.84 min was spent for each liter of milk. The research also included indicators of washing of milking parlor for which approximately 113.4 min were spent, out of which 90 min were spent on the washing of installations and equipment and 23.4 min for other operations. In structure of other operations, moving of milking units took 32.3%, connecting of the washing system 22.3% and external washing of milking parlor 45.4% of the time. In light of the results of the conducted research, it can be concluded that machine milking at semi-stationary milking systems takes a lot of time and that larger farms should use more rational milking systems.

Keywords: milking, machine labor, human labor, semi-stationary milking system

EFFECTS OF OREGANO AND GARLIC ESSENTIAL OILS ON HOLSTEIN CALVES PERFORMANCE AND SOME BLOOD PARAMETERS

Ünlü H. B.[1]

[1] Ege University, Faculty of Agriculture, Department of Animal Science, İzmir, Turkey

Summary

Thirty six holstein calves were evaluated for the effects of oregano (*Oregano Onites L.*) and garlic essential oils (*Allium sativa Lillaceae*) supplementation in whole milk (250 mg/calf/day) during the first 6 weeks on growth performance, feed consumption, feed conversion ratio, fecal score, incidence of scours, the count of *Escherichia coli.* and *Lactobacillus spp.* in feces, body measurements as well as on some blood parameters.

Calves were randomly separated as the control and two experimental groups. Thirty six Holstein calves were assigned to one of three dietary treatments (whole milk, added oregano or garlic essential oil into the whole milk), each consisting of 12 calves (6 male, 6 female), from 2 d to 43 d of age during 42 d trial. Calves were fed 4 L whole milk per day in two equal meals at 6 am and 6 pm for 6 weeks. Oregano and garlic essential oils were added each morning meal only. Calf starter feed and fresh water were available *ad libitum* during the experiment. Body weights and feed consumption measured weekly. At the age of 7 day, fresh feces were collected from calves rectum into sterile gaita box stimulated by finger for counting *Escherichia coli.* and *Lactobacillus spp.* Blood samples were taken from *vena jugularis* at 43 day of age. Fecal fluidity scores were monitored daily. At the end of the experiment, there were no effects of oregano and garlic essential oils supplementation in whole milk on calves performance, daily weight gain, whole milk, calf starter and total feed consumption, feed conversion ratio, body measurements, fecal bacteria counts, blood parameters ($P \geq 0.05$). Also the number of scouring days, severity of scouring and fecal score were similar between the groups. Oregano essential oil supplementation reduced significantly fecal total coliform count ($P \leq 0.05$). However fecal *Escherichia coli.* and *Lactobacillus spp.* bacteria counts were similar between the control and the treatments. Adding garlic essential oil decreased blood serum total cholesterol level ($P \leq 0.05$). However, there were no differences in other blood parameters.

Key words: oregano essential oil, garlic essential oil, blood parameters, Escherichia coli, Lactobacillus spp.

NUTRITIVE EVALUATION AND PREDICTION OF CHOCOLATE AS UNUSUAL FEEDSTUFF FOR RUMINANT BY NEAR-INFRARED REFLECTANCE SPECTROSCOPY (NIRS)

Ünlü H. B.[1], Özelçam H.[1], Kirkpinar F.[1], Özdoğan M.[2]

[1] Ege University, Faculty of Agriculture, Department of Animal Science, İzmir, Turkey; [2] Adnan Menderes University, Faculty of Agriculture, Department of Animal Science, Aydin, Turkey

Summary

Near-infrared reflectance spectroscopy (NIRS) were used to predict the nutritive characteristics of 36 chocolate samples as an unusual feedstuffs which were manufactured for human consumption but which are no longer intended for human consumption due to problems of manufacturing or expiration of internal sell-by date. Firstly chocolate samples were analyzed the chemical composition, mineral contents, *in vitro* dry and organic matter digestibility (DMD-OMS), metabolizable energy (ME) and then these analysis values were loaded and read in NIRS.

The differences between DM, CP, EE, CF, sugar, starch, NSC, NDF, ADF, ADL, ME, DMD, OMD and mineral contents of the chocolates samples which were analyzed by both techniques were not important significantly ($P>0.05$). Also the coefficient of multiple determination (R^2), the root mean square error of cross validation (RMSECV) and the residual prediction deviation (RPD) values of chocolates were compatible. NIRS prediction of CP, EE, CF, sugar, starch, NSC, P, Fe and Cu contents were more precise, with high R^2 (0.98, 0.95, 0.90, 0.99, 0.95,0.95, 0.98, 0.98 and 0.94); low SEC (0.27, 1.28, 0.52, 0.02, 0.51,1.21, 0.005, 3.31 and 3.62); and high RPD (8.60, 4.50, 3.72, 0.44, 11, 5.19, 5.63, 7.52, 9.02 and 4.38 respectively). Satisfactory results in NIRS were also obtained for the DM, CA, OM, NDF, ADF, ADL, ME, DMD, OMD, Ca, K, Mg, Na, Zn and Mn prediction.

Chocolate as an alternative valuable energy resource is unusual feedstuffs that are not traditionally used in animal feeding and as other formal feedstuffs, has a variable nutrient content. Before using these feeds in ruminant rations should be done rapid and accurate evaluation. NIRS can be used as a simple analytical method for determining nutrient contents of formal foodstuffs feeds. The study thus should provide practical and theoretical contribution to the defining nutrient contents of unusual feedstuffs.

Key words: NIRS, chocolate, nutrient content, prediction

QTL IN LIVESTOCK - PRINCIPLES, OPPORTUNITIES AND LIMITATIONS

Zečević E., Dokso A., Rustempašić A.

Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina

Summary

This paper reviews the principles, opportunities and limitations for detection of quantitative trait loci (QTL) in livestock and for their use in genetic improvement programmes. Alternate strategies for QTL detection are discussed, as are methods for inclusion of marker and QTL information in genetic evaluation. Practical issues regarding implementation of marker-assisted selection (MAS) for selection in breed crosses and for selection within breeds are described, along with likely routes towards achieving that goal. Opportunities and challenges are also discussed for the use of molecular information for genetic improvement of livestock in developing countries. Gene mapping: identification and mapping of genes and genetic polymorphisms. This paper will treat: Marker genotyping - genotyping of large numbers of individuals for large numbers of markers at a reasonable cost for both QTL detection and routine application for MAS; QTL detection - detection and estimation of associations of identified genes and genetic markers with economic traits. Genetic evaluation - integration of phenotypic and genotypic data in statistical methods to estimate breeding values of individuals in a breeding population and MAS - development of breeding strategies and programmes for the use of molecular genetic information in selection and mating programmes.

Key words: QTL, MAS, genotyping, markers

FOOD TECHNOLOGIES

ALTERNATIVE TECHNOLOGIES FOR STRUCTURE MODIFICATION AND FOOD PRESERVATION

Aganovic K., Toepfl S., Heinz V.

German Institute of Food Technologies (DIL e.V.)
Prof.-von-Klitzing-Str. 7, D-49610 Quakenbrueck, Germany

Summary

Since its invention in 19th century, thermal preservation today still represents one of the most commonly used and well established food preservation methods. Despite significant improvements in thermal processing, thermal treatments can still lead to quality losses and undesired nutritional, organoleptic and structural changes. Therefore, food sector stakeholders are constantly looking into possible alternatives for thermal preservation. These technologies rely on other sources of energy (e.g. mechanical, electrical, electro-magnetic). Among many alternative technologies in research focus, pulsed electric fields (PEF), high pressure (HPP), Ohmic heating, UV and infrared light are recognised as the most promising ones and were investigated for a long period.

Since the first commercialisation of HPP treated fruit jams in Japan in 1990s, today over 300 machines operate worldwide for gentle preservation of different products such as juices, meat and dairy products. Since the first reports of pulsed electric field (PEF) impact on plant, animal and microbial cells in the 1960s numerous applications in food and bioprocessing have been investigated. A low energy requirement, the continuous operability and short processing times are major advantages in comparison to conventional processing techniques. Today, over 60 PEF machines operate for structure modification of solid foods (e.g. potatoes) and gentle preservation of liquids (e.g. juices or cold brew coffee). Rapid and homogeneous distribution of heat as a result of the passage of alternating electrical current through a product acting as a resistor (known as Ohmic heating), allows for applications such as thawing, blanching, evaporation, dehydration or preservation. Light of sufficient energy level has been shown to be an effective photochemical and photophysical/-thermal approach for decontamination of food (e.g. meat) and food-item surfaces.

This works addresses the potential of these technologies, their possible applications as well as advances in the machine design and their scale-up.

Key words: novel technologies, alternative food processing, preservation

EFFECT OF PROCESSING ON THE POLYPHENOLIC COMPOUNDS IN APPLE JUICES

Akagić A.[1], Vranac A.[1], Spaho N.[1], Gaši F.[1], Kurtović, M.[1], Meland M.[2]

1 Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina;
2NIBIO – Norwegian Institute of Bioeconomy Research, Norway

Summary

Recent scientific studies show strong relationship between the phenolic compounds in apple fruit, which have antioxidant activity, and reduced risk of various diseases. Particularly, quercetin glycosides and procyanidins have been linked with strong antioxidant activity in in vitro observations. Phenolic profile varies widely in different parts of the apple fruit. Only small amounts of quercetin glycosides and dihydrochalcones are extracted during juice production because quercetin glycosides are present mainly in the skin and dihydrochalcones in the seeds. The oxadative capacity of certain phenolic group also affects the concentration of total phenolics. During the processing, cell wall is being disintegrated and polyphenoloxidase (PPO), the main oxidizing enzyme bounded to cell walls, starts to degrade phenolic compounds, ascorbic acid and other constituents of the obtained mash. In apple juice, L-ascorbic acid is often added to prevent browning, by acting as an antioxidant, or to replace the vitamin C lost during processing. This paper focuses on the production of apple juices (cloudy and clear) with the addition of L-ascorbic acid (200 mg/kg mash). The effects of L-ascorbic acid addition and blending of apple juices on the composition of phenolics (phenolic acids, flavan-3-ols, flavonols and dihydrochalcones) were evaluated in order to improve polyphenolic profile of apple juices made from predominant commercial apple cultivars grown in Bosnia and Herzegovina. Analyzed juices were consisted from 50 % Idared/Granny Smith juice + 50 % of Tetovka and Paradija juices in different ratios. The content of polyphenolic compounds in blended juices produced with L-ascorbic acid differed significantly from juices without the added antioxidant. In both juices phenolic acids were dominant, while the content of flavonols was the lowest. However, flavonols content was the highest (9,548 mg/L) in blended cloudy juices (50% juice from Idared + 40 % Paradija and 10 % Tetovka) produced with added L-ascorbic acid.

Key words: phenolics composition, L-ascorbic acid, blending, clear and cloudy juices

NUTRITION HABITS OF VEGETARIANS IN THE AREA OF BIHAĆ

Alibabić, V., Šertović, E., Oraščanin, M., Mustafić, D.

University of Bihać, Biotechnical Faculty, Bosnia and Herzegovina

Summary

Data on the diet of the vegetarian population in Bosnia and Herzegovina are very scarce, and as it has a growing popularity especially among the young, research on their dietary habits are ever more important. In this study, the nutrition habits of 11 vegetarians from Bihać were researched, bearing in mind that the zero examinee's nutrition habits were monitored for 30 days, while those of other 10 examinees were monitored for 10 days, with the use of 24-hour recall method. The survey included an estimate of intake of Met, Lys, Thr, Try, vitamins B12, D and B2, minerals Ca, Fe and Zn, as well as long-chain fatty acids.

The study included 63% of women, mostly adults (82%). Reasons for switching to vegetarianism are mostly moral (45%). The transition to vegetarianism for 90% of examinees took place in the teenager and adult age. The most common foods in their nutrition are fruits and vegetables, followed by seeds and legumes. A deficient intake of Met and long-chain fatty acids was identified in the zero examinee, whilst a deficient intake of long-chain fatty acids, vitamin D, Met, as well as B2 and Ca was identified in the remaining 10 examinees. In all respondents, the intake of other monitored nutrients was determined. Deficient intake of long-chain fatty acids, vitamin D and methionine in all subjects could be a risk to health. Therefore, the vegetarian population is recommended to adjust the diet.

Key words: long-chain fatty acids, nutrients, vegetarian nutrition

THE IMPACT OF THE TEMPERATURE ON THE MILK ABSORPTION OF DIFFERENT KINDS OF CEREAL BREAKFAST

Begić M.[1], Tahmaz J.[1], Mulagić A.[1], Semić A.[2], Oručević Žuljević S.[1]

[1]Faculty of agriculture and food sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Health Studies, University "Vitez" Vitez, Bosnia and Herzegovina

Summary

The purpose of this research was to examine the impact of the temperature on the absorption of milk of different kinds of cereal breakfast. Six samples of cereal breakfast were used to conduct the experiment (corn cereals CS1, wheat cereals CS2, barley cereals CS3, chocolate muesli CS4, muesli 5 kinds of fruits CS5 and tropic muesli CS6). The following analysis were determined: moisture, content of ash, proportion of fruit and chocolate (CS4, CS5, CS6), absorption of milk at the temperature of 20 ˚C and 40 ˚C and sensory evaluation. The expanded sample of cereal breakfast had the lowest concentration of moisture content while the extruded samples and samples with fruit and/or chocolate added had higher concentration of water. The expanded sample had the highest concentration of ash. The absorption of milk was higher with an increase of time during the immersion. At most samples, the absorption was higher with milk that was at 40 ˚C except for the muesli with 5 kinds of fruits where the absorption was higher with milk that was at 20 ˚C. The expanded sample of cereal breakfast had the highest sensory total score related to the other samples. Moreover, it had the highest crispness in comparison to other samples. A high degree of correlation was determined among all analyzed samples related to absorption of 20 ˚C and 40 ˚C in time interval.

Keywords: cereal breakfast, temperature, milk, absorption.

FATTY ACID COMPOSITION AND BIOACTIVE COMPOUNDS OF COLD-PRESSED GRAPE SEED OILS FROM RED AND WHITE GRAPE CULTIVARS GROWN IN VOJVODINA

Bjelica M.[1], Vujasinović V.[2], Čorbo S.[3], Dimić S.[4], Pastor K.[3]

[1]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia
[2]The College of Hotel Management, Belgrade, Serbia
[3]Faculty of Agriculture and Food Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[4]Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

Summary

Management and disposal of large amounts of wastes produced by the food-processing industry is a serious environmental problem. New processes for the controlled disposal of wastes are currently being sought, aiming at converting the waste materials into other added-value bio-products.

Grape seed oil is gaining a growing popularity as a culinary oil, and has been studied as a possible source of specialty lipids. In this study, the samples of cold-pressed oil obtained from naturally dried seeds of two different red (Merlot and Hamburg) and two white (Italian Rizling and Sila) grape varieties, grown in Vojvodina (Serbia), were characterized by determining fatty acid composition and nutritive profile parameters. Linoleic acid was the most abundant essential fatty acid in all analyzed oils, contributing between 73.60±0.69% and 85.59±0.05% of total fatty acids. The content of total saturated fatty acids was below 10%, while mono- and poly-unsaturated fatty acids contents were up to 16.37% and 85.79%, respectively. In addition to essential fatty acids, investigated cold-pressed oil samples were rich in other health-beneficial compounds, like tocopherols, from 27.81±2.20 mg/100g up to 57.52±4.46 mg/100g, and phenolics, from 8.09±0.56 to 12.33±0.21mgGAE/kg. Overall, the results suggest no differences between red and white grape seed oils but between the grape varieties. In terms of its nutritional profile cold-pressed grape seed oil can be highly recommended in nutrition.

Key words: Cold-pressed grape seed oil, fatty acid composition, tocopherols, phenols

WINE SERVING TEMPERATURE AS A FACTOR OF SENSORY PERCEPTION OF THEIR QUALITY

Blesić M.[1], Buza E.[1], Spaho N.[1], Smajić-Murtić M.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

The experiment was intended to determine to what extent the wine serving temperature influence sensory perception of their quality. Ten white and 10 red wines of different declared categories (table, quality and high quality wines) were evaluated by the panel of 13 shortly trained laymen. The OIV rating scale up to 100 points was applied. White wines were served the recommended temperature of 14°C, at 4°C, and at 25°C. Red wines were served at the recommended temperature of 18°C, at 4°C, and at 25°C.
Overall, white wines were slightly better rated at all serving temperatures. Five out of 10 rated white wines obtained the highest ratings when they were served at the recommended temperature (14°C), three as too cold (4°C) and, surprisingly, two as overheated (25°C). Only 4 out of the 10 rated red wines obtained the best grades when they were served at the recommended serving temperature (18°C), while 6 wines were best rated when they were served at 25°C. ANOVA showed that the wine serving temperature had a statistically significant effect on the sensory perceived quality with 4 whit and only one red wine. The results of this limited research indicate that white wines of declaratively lower quality categories could be served at lower temperatures than recommended, while red wines of all declared quality categories definitely could be served at temperatures above the recommended one.

Key words: Wine, serving temperature, sensory tasting

CHANGES IN CHEMICAL COMPOSITION OF BLENDED APPLE BRANDY DURING STORAGE IN OAK WOOD

Đukić-Ratković D.[1], Nikićević N.[2], Blesić M.[1], Tešević V.[3], Smajić-Murtić M.[1], Spaho N.[1]

[1]Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina; [2]Faculty of Agriculture, University of Belgrade, Serbia; [3]Faculty of Chemistry, University of Belgrade, Serbia

Summary

Alembic stills yield better aroma and more characteristic fruit distillates but are slow and require more labour. Column still cleans the distillate giving a decent aroma and higher concentration of alcohol but this style of distillation is more effective. In this study apple distillates obtained in column was enriched with 20 % and 40 % of distillates obtained with alembic stills. The distillate blending was carried out before storage in oak wood with aim to gain insight whether different composition of distillates effects on aroma compounds released from wood and to ascertain which of them has better potential for the maturation. Whit this aim in mind, concentration of storage aroma compounds eg. gallic and ellagic acid, vanillin and syringaldehyde have been determinated during 6, 12 and 18 months of aging. Compounds were analysed by LC DAD analysis with HPLC 1100 Series (Agilent Technologies). Samples were subject of sensory analysis as well. The most dominant compound was ellagic acid, then syringaldehyde, vanillin and gallic acid. The content of all investigated compounds were increased over the aging time, except gallic acid. Samples with bigger share of alembic distillate were showed the higher content of ellagic acid and the better sensory score as well.

Key words: aging, ellagic acid, syringaldehyde, vanillin, gallic acid

DIFFERENCES IN CHEMICAL COMPOSITION OF APPLE BRANDY DEPENDING ON THE DISTILLATION TECHNIQUES USED

Đukić-Ratković D.[1], Spaho N.[1], Nikićević N.[2], Tešević V.[3], Blesić M.[1], Smajić-Murtić M.[1]

[1]Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina; [2]Faculty of Agriculture, University of Belgrade, Serbia; [3]Faculty of Chemistry, University of Belgrade, Serbia

Summary

Two distillation techniques are common used in the production of fruit brandy. It is simple alembic pot style so-called French style and batch distillation column so-called German style. In this paper, two techniques were used for production of apple distillates with aim to identify its effect on chemical composition of obtained distillates. Content of acetaldehyde, ethyl acetate, methanol, n-propanol, amyl alcohols (sum of *i*-amyl and optic active amyl alcohol), *i*-butanol and *n*-hexanol were determined by gas chromatography (GC) with a flame-ionization detector (FID). It was observed that concentrations of acetaldehyde, ethyl acetate, amyl alcohols and *n*-hexanol were not influenced by distillation technique used. Otherwise, the content of methanol and n-propanol were significantly higher in samples obtained by column distillation devices than in the samples from alembic pot. In turn, alembic distillates compositions differed significantly in higher content of i-butanol and n-butanol.

Key words: alembic pot, distillation column, volatile compounds, apple brandy

INFLUENCE OF TOBACCO BLEND COMPOSITION ON POLYCYCLIC AROMATIC HYDROCARBONS FORMATION IN CIGARETTE SMOKE

Djulančić N.[1], Radojičić V.[2], Srbinoska M.[3], Tahmaz J.[1]

[1]Faculty of Agriculture and Food Sciences Sarajevo, Bosnia and Herzegovina, [2]Faculty of Agriculture, University of Belgrade, Serbia, [3]Scientific Tobacco Institute, Prilep, Macedonia

Summary

Tobacco selection is the first step in the manufacturing of cigarettes with reduced emission of polycyclic aromatic hydrocarbons (PAH) contained in the smoke. The aim of this work was to examine the influence of three basic tobacco types: tobacco dried in ambient air (AC-Burley), tobacco dried in controlled conditions (FC-Virginia), tobacco dried in sun (SC-oriental tobacco), reconstituted tobacco (RT) and addition of expanded stems, on the formation of PAHs in particulate phase of the mainstream cigarette smoke. All analyzes have been done by using standardized methods. The obtained results have shown that the type and the quantity of tobacco in the blends had significant effect on forming of the average content of total and individual PAHs in cigarette smoke. The greatest quantity (853.97 ng/cig.) of total PAHs was established in the smoke of SC cigarette. The highest efficiency in terms of reduction of the average content nicotine, tar and PAHs was demonstrated by the expanded stem in the quantity of 30%. Physical characteristics of the cigarette and chemical composition of smoke have also had a very strong impact on the PAHs production.

Key words: Polycyclic aromatic hydrocarbons; FC tobacco; AC tobacco; SC tobacco; Recon; Expanded stem; Cigarette smoke

SENSORY AND COLOR PROPERTIES OF BISCUITS IN RELATION TO BARLEY FLOUR INCORPORATION AND BAKING TEMPERATURE

Džafić A.[1], Akagić A.[1], Spaho N.[1], Semić A.[2], Oručević Žuljević S.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina;
[2]Faculty of Health Studies, University "Vitez" Vitez, Bosnia and Herzegovina

Summary

The aim of this study was to examine the sensory and color properties of biscuits produced with barley flour in relation to baking temperature and share of incorporated barley flour.
Five different mixtures of barley and wheat whole meal flours (BWM and WMF) were used for biscuit production: barley/wheat WMF in combinations: 0/100; 25/75; 50/50; 75/25 and 100/0 according to procedure described in AACC method 10-52. The temperatures used for baking were 150 and 205^{0}C for 15 and 11 min, respectively. Total of 10 biscuit samples were made in duplicates, while all analysis were performed in triplicates. Colour was determined by the Croma Meter CR 300 (Konica Minolta, Japan). Measurements of colour properties were conducted on upper and lower surface of biscuits. Biscuits were evaluated by Quantitative Descriptive Analysis (QDA) using scale 1-5 scores on 4 properties: taste, aroma, melting and overall acceptability.
Results showed that barley flour incorporation significantly influenced on colour differences of both, upper and lower surface of biscuits and on overall acceptability, while it didn't show influence on other sensory properties. On the other hand, baking temperature didn't significantly influence on sensory properties and on colour differences of upper surface of biscuits, while it significantly influenced only on colour differences of lower surface of biscuits. Sensory evaluation of biscuit samples revealed that in a 5-scores scale, all sensory results were in range of 3.20-4.05 indicating that these biscuits were moderately acceptable. The best sensory profile was observed in sample with 75% barley WMF, baked on 150^{o}C. The same sample showed the highest colour difference of the upper surface, while the highest colour difference of lower surface was noticed in sample with 100% barley WMF, baked on 150^{o}C.

Key words: Sensory properties, colour properties, barley flour, baking temperature

VOLATILE PROFILE OF VARIOUS SPIRIT DRINKS AS DETERMINED BY GAS CHROMATOGRAPHY

Flanjak I., Jurić D., Cvijetić Stokanović M., Kenjerić D.

Josip Juraj Strossmayer University of Osijek,
Faculty of Food Technology Osijek, Osijek, Croatia

Summary

Spirit drinks produced by distillation of fermented fruits, often aromatised with various additives, like herbs, spices, fruits or nuts are traditional food products of South East Europe. Besides ethanol, spirit drinks contain a number of volatile congeners whose concentration and composition varies based on the fruit used for fermentation as well as on fermentation type, distillation and storage conditions. Characterisation of volatile compounds in spirit drinks is important for determination of spirit type but also for quality evaluation. Volatile profile of 17 spirit drinks from Herzegovina area was determined using gas chromatography with flame-ionisation detector (GC-FID). Following volatile components were analysed: ethanol, methanol, propan-1-ol, 2-methylpropan-1-ol, 3-methylbutan-1-ol and ethyl acetate. Identification of separated compounds was performed based on the retention time and quantification using internal calibration method. Seven samples had ethanol concentration, expressed as alcoholic strength by volume, below 37.5 %, therefore were not in compliance with regulations. All analysed samples had methanol concentration in line with prescribed value; pear spirit samples had significantly higher methanol concentrations (793.50 and 815.82 g/hL a.a., respectively) compared to the other analysed spirits (4.42 – 361.36 g/hL a.a.). Among other analysed volatile compounds, highest average concentration of 3-methylbutan-1-ol was found. Having in mind that more than a half of the analysed samples were from domestic production and not intended for sale but personal use, as well as the fact that consumers' preferences dictate final characteristics of spirit drink, results obtained in this study indicate production of spirit drink with low alcoholic strength by volume in Hercegovina area.

Key words: spirit drink, volatile profile, gas chromatography

FUCTIONALLITY OF MILK FERMENTED DRINKS AT BOSNIA AND HERZEGOVINA MARKET

Ibrović A., Jašarević A., Kasumović E., Sarić Z., Dizdarević T.

Faculty of Agriculture and Food Sciences, University of Sarajevo,
Bosnia and Herzegovina

Summary

It is well known that fermented milks serves as a good source of GRAS bacteria. Depending on type viable cells of lactic acid bacteria and especially probiotic bacteria must be found in such products. By this way they can inhabit human colon after consumption and thus cause many benefits for host. Therefore, they have to comply with functionality criteria i.e. they have to contain more then 10^6 cfu/ml as it is usually labelled by the producer. At Bosnia and Herzegovina market there are wide spectrum of different yogurt type and producer but the choice of probiotic milks is much lower.

The aim of the work was to test functionality of fermented milks at Bosnia and Herzegovina market. For this purpose ten samples of yogurt and 5 samples of probiotic drinks (some combined with yogurt culture) were purchased at the market in capital of Bosnia and Herzegovina, Sarajevo. Total count of viable cells, chemical composition and acidity were measured in chosen samples. All samples were sensory evaluated. In order to check functionality six samples of fermented milks were stored at 4^oC up to 21 day and they are tested to the same parameters. ANOVA with two factors without repetion was done to establish if there are differences among producers and time of storing. Estimated has to comply with functionality criteria.

Mean value for total count of viable cells in yogurt samples was 207 x 10^{10} cfu/ml and in probiotics 137 x 10^{10} cfu/ml which mean that all of them fullfill functionality criteria. At the end of 21 days storing at 4^oC all samples retained higher count of cells then minimum required except one sample of probiotic. In general, the count was decreasing as the time went by. ANOVA did not show significant influence of storing time (except count of *S. thermophilus* at probiotics) as well as producer (except *L. delbrueckii* ssp. *bulgaricus* at yogurt).

Key words: functionality, yogurt, probiotic, viable cells

INFLUENCE OF WINEMAKING PRACTICES AND AGING ON THE COLOUR AND PHENOLIC CONTENT IN MERLOT WINES

Ivanova-Petropulos V.[1], Vojnoski B.[2], Stefova M.[3]

[1]Faculty of Agriculture,"Goce Delčev" University, Štip, Republic of Macedonia
[2]Department for Enology, Institute of Agriculture, "Sts Cyril and Methodius" University, Skopje, Republic of Macedonia
[3]Institute of Chemistry, Faculty of Natural Sciences and Mathematics, "Sts Cyril and Methodius" University, Skopje, Republic of Macedonia

Summary

Colour stability and changes of phenolic contents were investigated in twelve Merlot wines produced under different vinification conditions: maceration time (3, 6 and 10 days), SO_2 (30 and 70 mg/L), yeasts (Vinalco and Levuline), temperature of storage (~15 and ~25°C) and aging (2, 6 and 16 months). The content of total phenols (TP), total anthocyanins (TA), total flavan-3-ols (TF-3_{ols}), total flavonoids (TF), colour intensity (CI) and hue (H) were assessed by spectrophotometry. ESI-IT MS and MS–MS methods were used for identification of the phenolic compounds: nonflavonoids (stilbens, hydroxybenzoic and hydroxycinnamic acids and derivatives) and flavonoids (flavonols, flavan-3-ols and anthocyanins). It was observed that TP, TF, $TF_{3\text{-ols}}$ and TA increased with the maceration time, while SO_2 did not show clear tendency and significant differences (p>0.05). Similarly, there was not statistically significant difference (p>0.05) between phenolics content in wines fermented with both yeasts. The temperature of storage and aging influenced the phenolics content, observing decreased content of anthocyanins during aging at higher temperature. Intensive decrease was especially evident for the wines macerated for 3 days. One-way ANOVA was applied in order to ascertain possible significant differences between the studied wines and Principal Component Analysis (PCA) was used to study grouping of the wine samples.

Key words: wine, polyphenols, colour, hue, winemaking, Merlot

EVALUATION OF THE EFFICIENCY OF DIFFERENT WATER PURIFIERS

Jamaković N., Jurković J., Murtić S.

Faculty of Agriculture and Food Sciences, University of Sarajevo,
Bosnia and Herzegovina

Summary

The water purification is a process of removing unwanted chemicals, biological contaminants, suspended solids and gases from the contaminated water in order to give adequate water for a particular purpose. Most water is purified for human consumption (drinking water) and for various other purposes, including medical, pharmacological, chemical and industrial applications. The most common method of water purification in the home is the use of various pitchers with filters, and boiling of water.

The problem of water purification derived the aim of this investigation, and it is to understand the effectiveness of different ways of purifying water, and assess whether it can really purify drinking water up to adequate level or perhaps remove ions that are needed by the body for life such as calcium and magnesium.

In the research three ways of purifying water are used: filter in the jug available in the market, boiling of water, and activated carbon with a filter paper. We expected that every way of purification would change some of measured parameters, which are: free chloride content, total diossolved solids, conductivity, redox potential, pH, and the concentration selected metals. The results showed that each method of purifying water causes some changes in the studied parameters of various samples of water.

Key words: water purification, filter, boiling, metals

QUANTITATIVE ANALYSIS OF SECONDARY METABOLITES IN Hypericum perforatum, ORIGINATING FROM DIFFERENT LOCALITIES IN BOSNIA AND HERZEGOVINA

Karadža A., Karalija E., Vidic D., Parić A.

Faculty of Science, University of Sarajevo
Sarajevo, Bosnia and Herzegovina

Summary

Hypericum perforatum L. (St. John's wort) has been used for centuries in the treatment of burns, bruises, swelling, inflammation, and anxiety, as well as bacterial and viral infections. The aim of this study was determination of total phenolics and total flavonoids content in *Hypericum perforatum* in populations originating from different locations in Bosnia and Herzegovina. Methanol extracts of flowers and leaves were obtained by the means of ultrasound extraction. The total phenolics and flavonoids content varied with plant part and locality. Content of total phenolics and flavonoids in the flowers extracts was higher than in the leaves extracts. A positive correlation between the amount of the total phenolics and total flavonoids in all methanol extracts was observed. The study confirmed that change in environmental factors may affect the synthesis of phenols and flavonoids in *Hypericum perforatum* L., but also that genetic diversity may contribute to this variation.

Key words: Hypericum perforatum, phenolics, flavonoids, environmental factors

MICROBIOLOGICAL CONTAMINATION OF FRESH CHICKEN MEAT IN THE RETAIL STORES

Karahmet E.[1], Operta S.[1], Hamidović S.[1], Toroman A.[1], Ahmić A.[2], Tanković I.[3], Salkić S.[1]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina
[2]Food and sanitation inspection Zavidovići, Bosnia and Herzegovina
3Food safety inspection Bugojno, Bosnia and Herzegovina

Summary

Cutting-off and further sales of poultry meat is very sensitive process from hygienic and safety aspect, given that it is related with a lot of manual manipulation of the raw poultry meat. There is almost no meat product without presence of poultry meat entirely or as an integral part of the finished product. The aim of this study was to select and analyze ten (10) retail meat stores in Zenica and Bugojno cities. After taking samples of fresh chicken meat: leg-thigh, chicken wings, chicken breast, liver, and hearts microbiological analysis were made.

The aim of the study was the analysis of the level of microbial contamination of fresh chicken meat in ten retail stores, taking swabs and microbiological analysis of meat. The highest number of *aerobic mesophilic* bacteria was found in swabs of trays (6.13 x102CFU/mL) and in refrigerating cabinets swabs (2.77 x102CFU/mL). In the tested samples of fresh poultry meat, number of aerobic bacteria during the sampling was highest in samples of drumsticks (4.75x103 CFU/mL, respectively 4.13x103 CFU/mL), slightly less in the samples of wings (3.78x103 CFU/mL, respectively 3.82x103 CFU/mL) and at least the file patterns (2.87x103 CFU/mL, respectively 2.64x103 CFU/mL). The results showed that the greatest possibility of contamination is a human factor, i.e. hands of the workers. The further problems are the mode of presentation of chicken meat in refrigerated cabinets and the method of packing.

Key words: chicken meat, contamination, retail stores, microbiological analysis

DETERMINATION OF ANTIOXIDANT POTENTIAL AND MINERAL CONTENT IN SWEET AND ACID WHEY

Lisak Jakopović K.[1], Barukčić I.[1], Maltar Strmečki N.[2], Valić S.[2,3], Bilandžić N.[4], Božanić R.[1]

[1]Laboratory for Milk Technology and Dairy Products, Faculty of Food Technology and Biotechnology, University of Zagreb, Zagreb, Croatia
[2]Ruđer Bošković Institute, Zagreb, Croatia
[3]Faculty of Medicine, University of Rijeka, Rijeka, Croatia
[4]Laboratory for Residue Control, Department for Veterinary Public Health, Croatian Veterinary Institute, Zagreb, Croatia

Summary

Today's knowledge of an average consumer about functional food and its health protection grows. Recently, more and more researches are focused on antioxidant activity in food and their ability to reduce oxidants and free radicals. Whey is a by-product in cheese production and presents reach and heterogeneous mixture of nutritional and functional substances. Depends on the type of casein coagulation (enzyme or acid), whey can be sweet or acid. Antioxidant activity of whey is based on high content and bioavailability of amino acid cysteine that helps synthesis of glutathione, which is powerful intracellular antioxidant. The aim of the presented work was to determined differences between antioxidant potential and mineral content in sweet (obtained by enzyme casein coagulation) and acid whey (obtained by mesophilic culture casein coagulation). Determination of antioxidant activity was performed by electron spin resonance (ESR) and mineral content was determined by inductively coupled plasma mass spectrometry (ICP-MS). For the determination of antioxidant activity by ESR spectra, DPPH (1,1-diphenyl-2-picrylhydrazyl) was used as source of free radicals. Drop of free radicals, DPPH, after 20 minutes in sweet whey was 96% while in acid whey drop amounted 82%. Mineral content of sweet and acid whey was quite different. The main differences were between Na, Ca, Mg, Fe and Zn content. Acid whey had much higher quantity of Ca, Mg, Fe and Zn compared to sweet whey while sweet whey had only higher quantity of Na compared to acid whey. Results indicated that acid whey had better antioxidant activity and higher quantities of Ca, Mg, Fe and Zn.

Key words: sweet and acid whey, antioxidant activity, mineral content

INFLUENCE OF HIGH VOLTAGE ELECTRICAL DISCHARGE PLASMA TREATMENT ON THE PHYSICOCHEMICAL CHARACTERISTICS OF WINE

Lukić, K., Tomašević, M., Vukušić, T., Kelšin, K., Gracin, L., Kovačević Ganić, K.

Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia

Summary

The aim of proposed research was to study the influence of high voltage electrical plasma discharges on the physicochemical characteristics of wines, due to the potential use of this technique in winemaking. The effects of plasma discharge frequency (60, 90, 120 Hz) and treatment duration (3, 5, 10 min) with positive electrode polarity on the changes in concentrations of dissolved oxygen, free and bound sulfur dioxide (SO_2) and electrical conductivity in white and red wines were investigated. The analyses were done immediately after treatment, where the dissolved oxygen was measured by oxygen-meter, free and bound SO_2 by potentiometric titration while conductometer was used for electrical conductivity measurements. The results showed that applied treatments influenced the decrease in concentration of dissolved oxygen and total SO_2 in comparison to control wines. On the other hand, electrical conductivity increased after applied treatment, while concentration of free SO_2 was either decreased or increased. The results also showed that physicochemical characteristics of wines were significantly affected by frequency as well as processing time.

Key words: high voltage electrical discharge plasma, wine, physicochemical characteristics

BIOLOGICAL ACTIVITY OF *JUNIPERUS COMMUNIS* L. EXTRACTS

Mahmutović I., Dahija S., Bešta-Gajević R., Karalija E.

Department of Biology, Faculty of Natural Sciences and Mathematics,
University of Sarajevo, Bosnia and Herzegovina

Summary

Juniperus communis L. is one of the plants used in folk medicine, especially juniper berries, for the treatment of many infections, and as a spice and flavour in preparation of some drinks. Data regarding the biological activity of juniper leaves are scattered. In this research paper total phenol and flavonoid content, DPPH radical scavenging activity and antimicrobial properties of methanol extracts of leaves and berries were determined. Also, for extract preparation from female and male plants young and old shoots, and berries from female plants were separated and extraction was performed using 80% methanol. Total phenol content was statistically higher in shoots of male plants, the same was recorded for flavonoid content. The reducing power of methanol extracts was statistically higher than used control (*α*-pinol), and reduction of DPPH radical ranged from 91 up to 94%. Antimicrobial activity of juniper methanol extracts was determined by the paper disc diffusion method. In this research two Gram-positive bacteria *Staphylococcus aureus* ATCC 6538, *Bacillus subtilis* ATCC 6633, two Gram-negative bacteria *Escherichia coli* ATCC 8739, *Pseudomonas aeruginosa* ATCC 9027, and yeast *Candida albicans* were used. Juniper methanol extracts exhibited antibacterial activity against tested strains in variable degree. Gram-negative *P. aeruginosa* was the most sensitive tested strain compared to reference ampicillin antibiotic. The results showed that *Juniperus communis* has a great antioxidant and antimicrobial potential, especially leaves of the male plants.

Key words: antimicrobial, antioxidative, juniper berries, juniper leaves

FRESH CHEESE CHARACTERISTICS PRODUCED WITH DIFFERENT PROTEIN POWDERS

Miočinović, J., Miloradović, Z., Šljivić, N., Živković, A., Puđa, P.

Faculty of Agriculture, University of Belgrade, Serbia

Summary

Fresh acid coagulated cheeses are popular dairy products in Serbia that are produced by traditional and industrial methods. For last decades, popularity of dairy products with increased protein content is increasing and presents a significant part of modern diet.

The aim of this study was to analyse the influence of different protein powders (Total milk protein concentrate – Promilk, Ingredia, France and Whey protein concentrate – Textrion 80, DSM) Netherland) on the properties of fresh acid coagulated cheeses. Fresh cheeses produced with addition of 1 and 2% of both protein powders cheese gels were analyzed for syneresis and water-holding capacity while cheeses were analyzed for composition, textural and sensory properties. Also, the yield of production was calculated.

Addition of protein powders decreased syneresis ability and increased water holding capacity of cheese gels that strongly influence on the properties of final products. Addition of total milk protein powders increased firmness and reduced spreadability of fresh cheeses, while whey protein concentrate showed opposite effect. Whey protein concentrate addition significantly increased the yield of fresh cheese production that could have economic benefit for cheese production as well as contribute to obtain high protein product.

Key words: fresh cheese, milk protein powder, whey protein powder, texture, yield

DISTRIBUTION OF VOLATILE SULPHUR COMPOUNDS AND HEAVY METALS IN KOHLRABI AND LEEK

Mužek M. N.*[1], Đulović A.[1], Buljac M.[1], Omanović D.[2], Kozina T.[1], Sedlar A.[1], Radaš L.[1], Svilović S.[1], Blažević I.[1]

[1] Faculty of Chemistry and Technology, University of Split, Croatia
[2] Ruđer Bošković Institute, Zagreb, Croatia
*muky@ktf-split.hr

Summary

Volatile sulphur compounds and heavy metals were investigated in different parts of the two plants: kohlrabi (*Brassica rupestris* Raf. ssp. *gongyloides* (L.) Janch.; Brassicaceae family) and leek (*Allium porrum* L.; Amaryllidaceae family). Owing to the presence of sulphur, volatile sulphur compounds show particular physicochemical features and interact with a range of molecular and biological targets. The main volatiles in *B. rupestris* were found to be degradation products of glucosinolates: sinigrin (allyl isothiocyanate), glucotropaeolin (benzeneacetonitrile and benzyl isothiocyanate), gluconasturtiin (2-phenylethyl isothiocyanate), and glucoreucin (4-(methylsulfanyl)butyl isothiocyanate), as well as from degradation of *S*-methylcysteine sulfoxide commonly named methiin (dimethyl trisulfide and dimethyl tetrasulfide). On the other hand, the main volatiles in *A. porrum* were derived from *S*-cysteine sulfoxide degradation: methiin, propiin, and isoaliin (methyl propyl trisulfide, (*E*)-propenyl propyl trisulfide, dipropyl disulfide, (*E*)-propenyl propyl disulfide, dimethyl trisulfide, dipropyl trisulfide). Over 500 plants species that hyperaccumulate metals are reported in the literature, among which Brassicaceae has the largest number of taxa. A large number of metals that can be hyperaccumulated are also essential nutrients, thus food fortification and phytoremediation might be considered as two sides of the same coin. Therefore, concentrations of various heavy metals, such as Zn, Cd, Pb, and Cu have also been determined. The trend of metal concentration was found as follows: Zn>Cu>Pb>Cd. Generally, the obtained preliminary results show that the concentration of heavy metals in the *B. rupestris* is higher than in *A. porrum* although they were grown in the same soil.

Key words: Brassica rupestris, Allium porrum, glucosinolates, cysteine sulfoxides, heavy metals

NEW TECHNOLOGIES IN REDUCING TOBACCO HEALTH RISK

Nikolić M.[1], Đulančić N.[2]

[1]PhilliP Morris Services d.o.o. Beograd, Serbia
[2]University of Sarajevo, Faculty of Agriculture and Food Science, Sarajevo, Bosnia and Herzegovina

Summary

Active scientific research about reducing the harm and risk of tobacco products started in the early XX century. The results have shown that the main factor in creating risk is the products of burning of tobacco, and that nicotine itself is not especially hazardous. So, if nicotine could be provided in a form that is acceptable and effective as a cigarette substitute, the health risk that comes from tobacco products could be significantly reduced. Based on these results and ideas, a completely new technology emerged as an alternative for combustible cigarettes- cigarettes without burning. In this paper we present the basics of this new technology without tobacco burning, and the main factors in reducing health risk for consumers of this kind of cigarettes. Using a special device (IQOS) tobacco is only heated up to the temperature of 350 ^{0}C , resulting in formation of vapours, which are also an aerosol, as well as tobacco smoke, but they are completely different in chemical composition. These differences are the main focus of this paper.

Key words: RRPs, smoke, burning, vapour, IQOS

SMART FOOD PACKAGING

Omanovic-Miklicanin E.[1], Maksimovic M.[2]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Electrical Engineering, University of East Sarajevo, East Sarajevo, Bosnia and Herzegovina

Summary

The food packaging is used to protect food from the influence of external environmental conditions like heat, light, presence or absence of moisture, pressure, microorganisms, etc. It provides the consumer with greater ease of use and time-saving convenience. The key safety goal for traditional packaging materials which come into contact with food is to be as inert as possible. Technology innovations move the packaging market from conventional packaging to interactive, aware, and intelligent systems. These smart packaging concepts are based on the useful interaction between the packaging environment and the food ingredients to provide active protection to the food. Smart packaging utilizes chemical sensors or biosensors to monitor the food quality and safety from the farm to the consumers. It may result in a variety of sensor designs that are suitable for monitoring of food quality and safety (freshness, pathogens, leakage, carbon dioxide, oxygen, pH, time or temperature). It is needed as online quality control and food safety in terms of consumers, authorities and food producers. The addition of nanoparticles to food packaging systems may improve characteristics like barrier properties of packaging to different gasses, antimicrobial properties, biodegradability, or may achieve sensors properties that can inform on the food quality, etc. Currently, food packaging materials are the largest category of nanotechnological applications in the food sector.

Smart packaging has great potential in the development of new sensing systems integrated into the food packaging, which are beyond the existing conventional technologies. Therefore, this paper is aimed to make a survey of ongoing scientific research, technology development, and its influence on smart packaging design and implementation.

Key words: Food, smart packaging, nanoparticles, nanomaterials, technology

CHARACTERIZATION OF SARAJEVSKA AND KREŠEVKA SAUSAGES FROM ASPECT OF NUTRITIONAL VALUE AND STABILITY FOR STORAGE

Operta S.[1], Budimir K.[1], Keran E.[2]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina
[2]Meat Industry MIS Stanić, Kreševo, Bosnia and Herzegovina

Summary

The aim of the research was to characterize two sausages, Sarajevska and Kreševka in terms of nutritional value and parameter stability (pH and aw-value). Sausage analysis was performed before loading into the wrappers on the third, tenth, twentieth and thirtieth day (final product) of the production process. The variance analysis showed a significant influence of fermentation and drying on pH, aw-value and loss of moisture (loss of weight) of both sausages. At the end of the production process there were no significant differences between Sarajevska and Kreševka sausages ($p > 0.05$) in aw-value (0.816, 0.815), los of weight (37.96%, 33.98%), water content (21.05%, 21,00 %), fat (41.84%, 44.39%), total protein content (28,90%, 28,58%) and ash (4.84%, 4.95%). Differences ($p < 0.05$) existed in pH values (4.85, 4.74) and in connective tissue protein content (12.99%, 11.59%). Low water content, with pH value <4.85 and aw-value <0.816 classifies sausages Sarajevska and Kreševka into fast fermented dry beef sausages stable for storage after 30 days. Also, these sausages are nutritionally valuable because they have a high content of total proteins and a relatively favorable content of the connective tissue protein. The biggest disadvantage of the researched sausages is high fat content, which should be reduced in future production.

Key words: Fermented beef sausages, characterization, physical-chemical properties

COLOUR FACTORS AND SENSORY QUALITY OF SARAJEVSKA AND KREŠEVKA SAUSAGES

Operta S.[1*], Budimir K.[1], Smailhodžić V.[1], Tahmaz J.[1]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo,
Bosnia and Herzegovina
*sabinaoperta@yahoo.com

Summary

This paper is focused on determining the parameters of colour, salt and sodium nitrite content, and on the sensory quality of two similar fermented sausages (Sarajevska and Kreševka) that are produced in the same controlled conditions. Beef meat and fat for the Sarajevska sausage are cut up in small pieces to the diameter of 6 mm and for Kreševka to diameter of 4 mm. In addition to supplements that are same for both sausages, extract of red pepper was added in Sarajevska while garlic was supplemented in Kreševka. The results of the research show that there were significant differences ($p < 0.05$) in the colour values (L*, a* and b*), the content of residual nitrites, texture, smell and overall quality. Kreševka was brighter, redder and had a lower content of residual nitrites (L* 54.02, a* 11.76; $NaNO_2$ 7.75 mg/kg) in relation to the Sarajevska sausage (L* 42.54, a* 8, 59; $NaNO_2$ 9.80 mg/kg). Sarajevska was yellower (b* 14.73) in relation to Kreševka sausage (b* 10.15). The salt content (3.71%, 3.80%) made both sausages moderately salty. Sarajevska had better sensory quality than Kreševka. In both sausages, appearance was evaluated as "good" and was the best rated property. The texture, appearance and colour of cut section were "acceptable" for both sausages. The smell and flavour were the worst evaluated sensory properties with "satisfactory" evaluation. Total sensory quality of Sarajevska was 64.13% and 60.46% for Kreševka. Larger particles of fat on the cut section and more acceptable colour because of the addition of the red pepper extract contributed to the better sensory quality evaluation of Sarajevska sausage. In the future production of Sarajevska and Kreševka sausages a change of spices is recommended in order to achieve better smell and aroma.

Keywords: fermented sausages, L, a*, b*, $NaNO_2$; NaCl, sensory quality*

INFLUENCE OF THE ADDITION OF DEFATTED PUMPKIN CAKE ON THE CHEMICAL PROPERTIES OF CORN SNACKS

Panak Balentić J.[1], Košpo E.[2], Ačkar Đ.[1], Jozinović A.[1], Babić J.[1], Miličević B.[1], Grec M.[1], Šubarić D[1].

[1] Faculty of Food Technology Osijek, Osijek, Croatia
[2]Faculty of Agronomy and Food Technology, Mostar, Bosnia and Herzegovina

Summary

Extruded snack products are one of the most popular snacks all over the world, since they are tasty and easy to consume regarding chewing and preparation. Because they are not nutritionally rich products, there is a challenge for food industry to improve them with various additives. Regarding to that, the aim of this research was to improve nutritional properties of corn snacks with defatted pumpkin cake.

Defatted pumpkin (*Cucurbita pepo* L.) oilseed cake (DPC) was added to corn grits in 3, 6 and 9 % d. m., 1 % pectin was added with the aim to produce products with properties of ready-to-eat snacks, and mixture moisture was set to 15 %. Prepared samples were extruded in laboratory single screw extruder with 4 mm round die, screw with compression ratio of 4:1, at temperature profile: 135/170/170°C. Obtained extrudates were air-dried and resistant starch content was determined according to AOAC 2002.02 method, starch damage according to AACC 76-31 and soluble and insoluble dietary fiber according to AOAC 991.43.

The obtained results showed that addition of DPC did not have significant influence on resistant starch content. Starch damage content decreased with addition of DPC and content of soluble and insoluble fibers increased by the addition of DPC.

Final conclusion is that the extruded corn snack products were successfully improved with DPC, which is rich in nutritional components, such as dietary fibers and proteins and that is a good example for development of new type of products, interesting for all age groups, from children to retirees.

Key words: pumpkin cake, corn snacks, fiber, resistant starch

COMPARISON OF DIFFERENT METHODS FOR CHLOROPHYLL AND CAROTENOIDS PIGMENTS EXTRACTION FROM *ARONIA MELANOCARPA* L. FRUITS

Pantelić N., Milinčić D., Barać M.B., Kostić A.Ž.

Faculty of Agriculture, University of Belgrade, Serbia

Summary

Aronia melanocarpa L. (black chokeberry) is small, dark-violet fruit, belonging to *Rosaceae* family and it is deciduous shrub originating from North America. During the past few years many studies have been conducted on aronia because of its health-related properties such as anticancer, antibacterial and anti-inflammatory activity as well as cardiovascular diseases connected with aronia's bioactive constituents, including carotenoids, vitamins, polyphenols.

In this study photosynthetic pigments (chlorophyll *a*, chlorophyll *b* and carotenoids) have been isolated from fresh aronia by extraction with different solvents (80% acetone, dimethyl sulfoxide - DMSO, acetone/*n*-hexane - 1:1, and *n*-hexane) and measured by using UV/Vis spectroscopy in order to examine which one is the best extraction solvent for the isolation of these pigments.

Due to the structure of carotenoids their efficient isolation from plant material by using very polar solvent cannot be expected. Mixing of water with polar aprotic solvent such as acetone (1:4), carotenoids have been isolated in concentration of 0.509 μg/mL. Using pure polar aprotic solvent (DMSO) that value is slightly lower (0.461 μg/mL). With increasing of proportion of non-polar solvent, content of isolated carotenoids is reduced. Mixture of acetone/*n*-hexane (1:1) obtained concentration of 0.152 μg/mL, while the lowest value (0.010 μg/mL) was recorded in pure non-polar solvent (*n*-hexane). On the other hand, the best choice of extraction solvent of chlorophyll *a* and chlorophyll *b* is DMSO (0.277 and 0.778 μg/mL, respectively), followed by 80% acetone (0.058 and 0.204 μg/L, respectively), while increasing the proportion of non-polar solvent, concentrations of chlorophyll *a* and chlorophyll *b* are significantly decreased (0.023 and 0.086 μg/mL for acetone/n-hexane; 0.005 and 0.007 μg/mL for *n*-hexane, respectively) and this trend is the same as for extraction of carotenoids.

In conclusion, this study showed that 80% acetone is best extraction solvent for carotenoids, while DMSO is best solvent for chlorophylls.

Key words: Aronia, extraction, chlorophyll, carotenoid, pigments

THE QUALITY OF INDUSTRIAL AND TRADITIONAL FRESH KAJMAK IN SERBIA

Popović-Vranješ, A., Paskaš, S., Krstović, S.

University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia

Summary

Kajmak is a distinct dairy products with soft, creamy consistency and a slightly sour taste. It is usually produced by the traditional method of manufacture but in recent years dairy plants have begun with the industrial production of kajmak. Fresh kajmak is consumed immediately after manufacture and it is a rich source of essential nutrients, in particular, fat, proteins and minerals. Samples of traditional and commercial kajmak were analyzed in the Laboratory of Department of Animal Science, Faculty of Agriculture, Novi Sad, Serbia. Standard chemical analyses were conducted and nutritional values of products were evaluated. Besides descriptive statistics, significance of differences were determined by t-test ($\alpha = 0.05$). Traditional kajmak is product of uneven composition and quality. It is most varied in in terms of dry matter and fat on dry matter basis (CV, 7.03% and 6.38%, respectively). Industrial kajmak, which is produced in substantial improved production conditions, represents more standard products but it was variable in terms of mineral content, especially sodium and phosphorus (CV, 38.87% and 29.32%, respectively). Results of performed t-test showed a significant differences in chemical composition between the two types of products (fat on dry matter basis, protein, ash and pH values). Standardization of the milk used as starting materials and processing control provide products with good nutritional and uniform qualities that meet safety requirements.

Key words: kajmak, industrial, traditional, chemical composition

IMPACT OF SOURDOUGH ADDITION ON THE BREAD QUALITY

Rašević V.[1], Vranac A.[2], Oručević Žuljević S.[2]

[1] Bakery "Croissant", Foča, Bosnia and Herzegovina
[2] Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina

Summary

The aim of undertaken research was to examine the impact of sourdough addition on the quality characteristics of fresh made bread samples, and the quality of same samples during five days storage. For that purpose, 3 flour samples were used: white wheat flour type 500, rye flour type 1250 and wholemeal wheat flour. Bread samples were made without and with sourdoughs in the form of starter culture and preferment.
Analysis of bread samples quality included examination of physical (weight, friability, height, cross-section area and texture–firmness), chemical (moisture, pH, and titration acidity) and sensory properties (crust and crumb taste and melting, aroma, scent, freshness-staleness, and overall impression). During the five days of bread samples storage, evaluations of moisture, texture and sensory attributes were carried out. The obtained results showed that sourdough addition had positive impact on quality characteristics of bread samples in all aspects. By its addition, physical parameters of breads, mainly texture, were improved as well as sensory properties, especially aroma. The impact of sourdough addition was notably evident for breads made from rye and wholemeal wheat flour. With the prolonged time of storage, moisture, texture – firmness and grades for sensory attributes had negative trend which was less drastic for breads produced with addition of sourdoughs. Thus, the use of sourdough with the aim to improve nutritional, technological and sensory quality of bread could be recommended.

Key words: Bread, sourdough, quality characteristics, storage

SUITABILITY OF ACCELERATED SHELF LIFE TESTING METHOD (ASLT) FOR DETERMINATION OF SKIM MILK POWDER SHELF-LIFE

Ružić Š., Matijević B., Šarić G.

Karlovac University of Applied Sciences, Trg J.J. Strossmayera 9, 47000 Karlovac, Croatia

Summary

Dried milk and dairy-based powders represent a significant portion of the trade of dairy products. Milk powders are used directly by consumers and as ingredients in a range of manufactured dairy and food products. Skim milk powder has low moisture and fat contents and when stored in dry, cool conditions, has a shelf life in excess of two years. The aim of this research was to investigate suitability of the accelerated shelf life testing method (ASLT) for of skim milk powder shelf-life. Skim milk powders were stored during 90 days at the following temperature regimes: 20±1 °C, 30±1 °C and 40±1 °C. Quality parameters of the samples, such as water and dry matter content, pH, titratable acidity (°SH) and sensory properties, were tested by standard methods. Different temperatures did not affect pH and titratable acidity, but significantly affected sensory properties of skimmed milk powder during 90 days storage. Changes in taste and smell of skim milk powder were noticed at 40 °C after 30 days and with further storage are becoming more intense. Milk powder stored at 40°C for 90 days did not change colour, while optimal temperature for storage was 20°C. Changes in the sensory properties of skimmed milk powder during storage with the reconstitution become more intense.

Keywords: skim milk powder, shelf-life, ASLT method

QUALITY OF FRUITS-ENRICHED RAHAT LOKUMS

Saračević S.[1], Agić A.[1], Balihodžić E.[1], Prevljak B.[1], Vranac A.[1], Akagić A.[1], Oručević Žuljević S.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Rahat lokum or "turkish delight" is a turkish traditional confectionery product, widely produced and consumed in Bosnia and Herzegovina as well. This delicacy is made mainly from sugar and starch along with other less present ingredients and it does not posses remarkable nutritional nor bioactive value itself. One of the possible ways for improving its bioactive potential is by the addition of fruits during the production. Fruits of particular interest for this purpose are those rich in anthocyanins, such as cherries and raspberries. Beside the strong antioxidative potential due to the high anthocyanins content, these fruits are also valuable sources of red colour and aroma, which is peculiarly important for overall quality of rahat lokum. However, anthocyanins are higly sensitive and easily degraded during the processing of raw material. The main goal of this study was to examine the retention of total anthocyanins content in final rahat lokums with added cherry and rasberry mashes. Moreover, the aim of the study was to analyse total soluble solids content and titratable aciditiy of rahat lokums made as control sample, sample with cherry mash and sample with raspberry mash. Additionally, sensory evaluation of produced rahat lokums was carried out. The obtained results showed drastic loss of anthocyanins content in analysed samples of rahat lokum. The loss of anthocyanins from cherries was more evident during the rahat lokum mixture cooking in comparison with those from raspberries. The highest total soluble solids content was measured in raspberry rahat lokum, whilst cherry rahat lokum had the highest titratable acidity. Sensory evaluation revealed that rahat lokum with added cherry mash had the highest scores for almost all examinated sensory atributtes. Thus, recommendations for fruits mash utilization in rahat lokum production with the aim of bioactive and sensory improvement of final products can be made.

Key words: Rahat lokum, cherry, raspberry, anthocyanins, quality.

URBAN BEEKEEPING IN SARAJEVO

Spiljak L.[1], Glamočlija P.[1], Puškadija Z.[2], Kovačić M.[2]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture, J. J. Strossmayer University of Osijek, Croatia

Summary

Bosnia and Herzegovina (B&H) has exceptional conditions for the beekeeping development. Abundance and diversity of honey plants, terrains and climates, enhance the production of different types of honey. In B&H, stationary beekeeping is predominantly practiced with high share of beekeepers-hobbyists. Poverty and small income have influenced increase in number of beekeepers, where honey and other bee products are produced for home self-consumption. Surpluses are sold in market utilizing different channels and sale tactics. In recent decades, urban beekeeping has attracted interest of public. Modern urban beekeepers are driven by different motives including ecology, relaxation and generation of income. In B&H there is no official register of urban beekeepers and their share in overall number of beekeepers is unknown. Due to the lack of information, urban beekeeping strategies and market potential are undermined. A study was conducted based on surveys, interviews and official database analysis for B&H capital city - Sarajevo. Beekeepers are clustered into the 2 groups: urban beekeepers and beekeepers living in urban area but keeping bee hives in rural arias. Number, type, age, gender, economical status, average yield, bee's hives number, honey types and sale strategies for urban beekeepers are determined. Motives behind both groups are discussed. This study highlights the need for better collaboration among different stakeholders to develop strategies for full exploitation and development of urban beekeeping in Sarajevo. Urban beekeeping can improve pollination for plants in Sarajevo, which in turn helps to improve the overall biodiversity and resilience of this city.

Key words: Urban bees, urban beekeepers, bee products, pollination, biodiversity

EFFECTS OF STORAGE ON THE BIOACTIVE COMPONENTS AND SENSORY PROPERTIES OF PROCESSED WILD BLUEBERRY PRODUCTS

Stanojčić S.[1], Akagić A.[2], Oručević Žuljević S.[2], Spaho N.[2], Gaši F.[2], Vranac A.[2], Bijedić A.[2]

[1]U.S. Embassy to Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Bilberry is an important source of bioactive components, making both the fresh fruit and its processed products widely popular among consumers. Demand for bilberry is growing steadily; however, due to the seasonal character of fresh bilberry, its processed products, such as fruit yogurts, jams, juices, and concentrates, are increasingly popular because they are available throughout the year. Bilberry is exceptionally rich in anthocyanins, which have multiple beneficial effects on human health. However, anthocyanins are also unstable and easily degraded during storage. The aim of this study was to analyze the effect of the storage conditions (temperature and exposure to light) on the content of bioactive components and sensory properties of bilberry products. In this study, were used bilberries from the Fojnica area, which were processed into jam and juice. The jam was cooked using two different methods: closed (high pressure) and open (atmospheric pressure). The jams were stored at room temperature exposed to light, and refrigerated covered with aluminum foil over a six month period. Bilberry juice was also stored over a six month period at room temperature with aluminum foil and exposed to light.
Bilberry proved to be particularly valuable raw material, and despite significant losses of bioactive components that occurred during its processing into jam and juice, each of these products retained a significant amount of these components. The cooking method for jam (high pressure/atmospheric pressure) and different storage conditions used for jam and juice had statistically significant effects on the analyzed bioactive components. However, different methods used for jam cooking did not show a significant effect on the tested sensory attributes.

Key words: Bilberry, jam, juice, phenols, anthocyanins, sensory properties

INFLUENCE OF PRETREATMENTS BY DRYING AND SOAKING IN NaCl AND CITRIC ACID SOLUTIONS ON QUALITY OF POTATO CHIPS

Tahmaz J.[1], Mostić A.[1], Šenderović A.[1], Begić M.[1], Đulančić N.[1], Operta S.[1], Semić A.[1]

[1] Faculty of agriculture and food sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

The aim of this study was to investigate the pretreatments by soaking in different solutions (NaCl, citric acid and their combination) and drying before frying on quality of potato chips. Nowadays, it is believed that soaking before frying could influence many quality properties like taste, colour, crispness and fat uptake. Before frying potato slices were soaked in different solutions at 60°C for 1 hour, dried at 50°C for 30 minutes and fried at 170°C. The analyses were performed on soaked samples fried with and without drying, and on control sample (blanched at 70°C and then fried).
Drying pretreatment caused lower moisture content, considerably better crispness and generally better sensorial evaluation. Samples pretreated in salt solution had the lightest color, highest level of NaCl and the best taste. All pretreated samples had lower moisture content (lower than 3.01%) comparing to control (4.77%) which leaded to better textural properties, especially crispness. The highest level of fat content, the darkest colour and the worst sensorial properties were noticed in samples soaked in citric acid with and without pre-drying. Fat uptake did not differ much between control and pretreated samples. The lowest fat content was noticed in chips pretreated by soaking in combination of salt and citric acid solution.

Key words: potato chips, fat uptake, soaking, drying, pretreatment

QUALITY OF POTATO CHIPS PRETREATED WITH NaCl SOLUTION AND CURRY AS SOAKING AGENTS

Tahmaz J.[1], Šenderović A[1]., Mostić A.[1], Begić M.[1], Đulančić N, Operta S.[1], Alkić M.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Potato chips is the most popular savory snack product. It is widely consumed because of its taste and crispness, but also recognized as unhealthy product because of high level of fat and salt. The aim of this study was to investigate the different soaking pretreatment on quality of potato chips. Before frying potato slices were soaked in different solutions (NaCl, combination of NaCl and citric acid, curry sauce and control - blanching without soaking). The potato slices were kept/soaked in different solutions at 60°C for 1 hour, and after that fried at 170°C until make crispy.

Samples pretreated in salt solution had the lightest color. The darkest color had samples treated in citric acid, but color of samples treated in curry sauce was intensive yellow and evaluated as very attractive. The taste of samples pretreated in curry sauce was improved and assessed as very acceptable. Salt content was between 0.00 to 6.11%. All pretreated samples had lower moisture content (lower than 3.01%) comparing to control (4.77%) which influenced better crispness. Fat uptake did not differ much between control and pretreated samples, but curry-soaked potato chips had higher level of amino nitrogen content. Soaking pretreatments improved many sensorial properties, especially crispiness, taste, and color.

Key words: potato chips, pretreatment, sensorial evaluation, curry, crispness

EFFECT OF HIGH HYDROSTATIC PRESSURE ON THE VOLATILE COMPOUNDS IN WINE

Tomašević M., Lukić K., Bosiljkov T, Kelšin K., Ćurko N., Kovačević Ganić K.

Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia

Summary

Application of high hydrostatic pressure (HHP) as innovative technology for food preservation and processing, has increased substantially during the last decade. Recently, HHP has been identified as potential alternative process for microbial preservation of wine, as well as wine aging accelerator throughout modifying wine physicochemical and sensorial characteristics, primarily phenolic composition, colour and astringency intensity.
Due to the lack of information about its influence on aroma composition, the aim of this paper was to study the effect of HHP on volatile aroma compounds of young white and red wines (*Vitis vinifera* L. Graševina and Cabernet Sauvignon). Wines were pressurized at 200, 400 and 600 MPa for 5, 15 and 25 min and analyzed immediately after treatment. Volatile aroma compounds were identified and quantified by solid-phase microextraction coupled with gas chromatography- mass spectrometry (SPME-GC/MS). Applied treatments resulted in slight changes in concentrations of aroma compounds, primarily decrease of esters in both, white and red wine. But, in most cases the observed differences were not significant. Obtained results suggest that HHP could be potentially used as an alternative process to sulfur dioxide addition, primarily to inactivate bacteria and yeasts without causing quality changes.

Key words: high hydrostatic pressure, aroma compounds, wine, GC/MS

SENSORY EVALUATION OF BLENDED CLOUDY APPLE JUICES

Vranac A.[1], Akagić A.[1], Gaši F.[1], Spaho N.[1], Kurtović, M.[1], Meland M.[2]

[1] Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina, [2]NIBIO – Norwegian Institute of Bioeconomy Research, Norway

Summary

Sensory quality of cloudy apple juices is highly demanded by consumers, along with its nutritional value and bioactive potential. Sensory attributes of an apple juice are directly dependent on the cultivar used for juice production. In Bosnia and Herzegovina, commercial apple cultivars are predominant in industrial production of cloudy apple juices. These cultivars are often lacking in outstanding sensory characteristics, particularly in aromatic profile and mouth-feel sensation. On the other hand, traditional B&H apple cultivars represent valuable source of desirable nutritional, antioxidative and remarkable sensory properties. However, during the juices production, some of the sensory features can be diminished due to the loss of aroma and polyphenolic compounds responsible for flavour, colour and mouth-feel impression. These changes can be mitigated by the addition of antioxidant during the production, such as ascorbic acid. Therefore, the main goal of the study was to improve sensory characteristics of commercial cultivars juices by blending them with juices obtained from traditional cultivars. Thus, sensory attributes of single-cultivar juices (commercial: Idared, Granny Smith; traditional: Prijedorska zelenika, Funtača, Rebrača, Tetovka, Paradija), and blended juices with commercial single-cultivar juices as a bases (50% of juice from Idared/Granny Smith + 50 % of Tetovka and Paradija juices in different ratios) were evaluated. Moreover, these juices were judged as samples with and without the added ascorbic acid. The obtained results indicated that sensory characteristics of single-cultivar commercial apples juices were significantly improved by blending them with those made from traditional apple cultivars. Particularly scent, aroma, harmonious taste and mouth-feel of blended juices received higher sensory scores in comparison with the single-cultivar commercial apple juices. Namely, combination of 50% commercial cultivar juice + 40% Tetovka + 10% Paradija juices was the best graded for the majority of evaluated sensory attributes.

Key words: Sensory properties, apple juices, single-cultivar juices, blending

THE EFFECT OF STORAGE TIME ON SHELF LIFE OF SPREADS BASED ON OILSEEDS AND NUTS DURING 6, 9 AND 12 MONTHS

Vujasinović V.[1], Čorbo S.[2], Dimić S.[3], Pastor K.[4], Bjelica M.[4], Dimić E.[4], Herceg Z.[5]

[1]The College of Hotel Management, Belgrade, Serbia,
[2]Faculty of Agriculture and Food Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina,
[3]Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia,
[4]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia,
[5]Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia

Summary

Fat based spreads from nuts and oilseeds are food products with a very broad range of oil contents prepared without the addition of water. This study included the investigation some of the most relevant parameters necessary to determine the fat spreads´ stability during storage of 6, 9 and 12 months, with the aim to determine their optimal shelf life. Investigations were carried out with spreads (butter) commercially available in Serbian market made from sunflower kernels, naked pumpkin seed, sesame seed, roasted peanut, and walnut. The fatty acid composition of spread's oil phase was determined and the change of stability was monitored by measuring peroxide value (PV), Totox value, as well as the acid value (AV).

The fatty acid composition of the spreads was very different but typical for the oilseed and walnut that were used as a main ingredient. Unsaturated linoleic omega-6 essential fatty acid was present in all spreads, regardless of the spread type, in the range of 9.70±0.3% (peanut butter) to 59±1.5 % (walnut spread). However, polyunsaturated alpha-linolenic omega-3 fatty acid was identified only in the walnut spread in a relatively high amount of 12.90±1.5%. Increase of PV and Totox value during the storage time indicated the decrease of oxidative stability of spreads. The highest PV after 12 months was found in peanut butter, 5.22 ± 0.02 mmol/kg, and the lowest in spread of sesame seeds, 0.26 ± 0.01 mmol/kg. The best quality considering the oxidative stability was maintained in sesame and walnut spreads, where the Totox value after 12 months was 0.85 ± 0.02 and 2.04 ± 0.03, respectively. The increase of the acid value during storage was the most intense in peanut butter, 4.22 ± 0.06 mgKOH/g (104%) and sunflower seed butter, 2.48 ± 0.06 mgKOH/g (60%) after 12 months.

Key words: Fat spread, shelf life, fatty acids, peroxide value, totox, acid value

THE INFLUENCE OF DIFFERENT QUANTITIES OF THE ADDED NaCl ON THE SENSORY PROPERTIES OF "VISOČKA PEČENICA"

Zorlak A., Ganić A.

Faculty of Agriculture and Food Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

Summary

Common salt (NaCl) is the prevalent ingredient of meat products. It affects the formation of some specific technological and sensory properties of meat products. Besides, it significantly increases the water bonding capacity whereas the reduction of water activity in the product has a bacteriostatic effect. Except for the positive effect, the excessive intake of NaCl can cause some negative effects on the consumer's health, such as a direct risk of a heart attack, hypertrophy of the left heart chamber, hardening and decreased elasticity of blood vessels, etc. Therefore, there has been an intention recently to reduce the quantity of NaCl in meat products to the level which will not affect the general quality of the product in a negative way and to a great extent. The aim of the research was to determine the intensity of changes with sensory indicators of the quality of "Visočka pečenica", depending on the salt quantity during the technological procedure.

The hypothesis of the research is that there are changes of the sensory quality of the product due to the reduction of the added quantity of NaCl during the technological procedure.

As the research material we used twenty samples of „Visočka pečenica", divided into four groups. The first group comprised samples with a standard quantity of the added NaCl (4.5%). In the second group the quantity of the added salt was reduced by 10%, in the third group it was reduced by 30%, and in the fourth group it was reduced by 50%. The obtained results were analysed by a descriptive statistical package, the interferential statistics for proving the hypothesis (F test) and the post hoc test LSD (multiple comparison). The testing was done at the significance level $p \leq 0.05$. Statistical tests were done by using statistics software SPSS 22.0.

The obtained results show some statistically significant differences regarding the influence of the reduced salt quantity on the sensory parameters. Besides, it was found that the samples with the standard salt quantity and the salt quantity reduced by 10% got the best sensory marks.

Key words: Common salt, "Visočka pečenica", sensory quality, production technology

PLANT PRODUCTION

DISTRIBUTION OF STEM RUST (*Puccinia graminis* f. sp. *tritici*) IN SINOP, TURKEY

Akci, N.[1], Karakaya, A.[2]

[1]Central Research Institute for Field Crops, Yenimahalle, Ankara, Turkey
[2]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey

Summary

Stem rust caused by *Puccinia graminis* f. sp*. tritici* is an important pathogen of wheat in Turkey. In 2016, a survey was conducted in Sinop province of Turkey in order to elucidate distribution of stem rust in that region. Thirty two wheat fields in Saraydüzü, Durağan, Boyabat and Gerze districts of Sinop province were surveyed. Stem rust was found in 25 fields. No disease was observed in 7 fields. Disease severity was assessed with a 1-9 scale. The severity values ranged between 7-9. It appears that stem rust is common in that region and it could be a threat to wheat cultivation. Precautions should be taken to ensure wheat crop safety.

This study was supported by General Directorate of Agricultural Research and Policies, Turkey (Project No: TAGEM-BS-15/12-01/02-02).

Key words: Stem rust, Puccinia graminis f. sp. tritici, wheat, Sinop, Turkey

THE EFFECT OF CYCOCEL ON MORPHOLOGICAL CHARACTERISTICS OF ALPINE FORGET-ME-NOT (*Myosotis alpestris* F.W. Schmidt)

Avdić, J.[1], Sarajlić, N.[2]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Natural Sciences and Mathematics, University of Niš, Serbia

Summary

Alpine forget-me-not (*Myosotis alpestris* F.W. Schmidt) is a very popular flowering plant for flower beds in public green areas, because of its exceptional aesthetical characteristics and early flowering. It is produced by sowing seeds in greenhouses, during summer and autumn, when, because of very changeable light intensity and high temperatures, young plants tend to elongate, which reduces their aesthetic value and at the same time makes handling and transport difficult. The aim of this paper is to investigate the effect of plant growth retardant Cycocel, commercially available as AgriChem CCC 750, to the height and the number of leaves and flower buds in forget-me-not. Plants were treated with 0,10% and 0,30% water solution, 15 days after replanting. Control group of plants was treated with water. The results showed that AgriChem CCC 750 caused significantly slower growth in young plants. It also affected the number and size of leaves and inflorescences, as well as the flower color intensity in treated plants.

Key words: Myosotis alpestris, growth retardant, CCC, slower plant growth, morphological characteristics

THE IMPACT OF CLIMATE CHANGES ON CROP PRODUCTION IN SARAJEVO CANTON

Bašić F.[1], Đikić M.[1], Čustović H.[1], Karić N.[1], Voljevica N.[2], Haseljić S.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina
[2]Federal Hydrometeorological Institute, Sarajevo, Bosnia and Herzegovina

Summary

In the last decades of the 20th century there is an increased public concern about the impact of global climate change on human activity, particularly in agriculture as its most sensitive part. In this paper, for the area of the Sarajevo Canton, we represented the expected trends of local warming of the atmosphere, and consequently predicted impacts for the same in crop production. The trend of examined parameters was estimated using least squares method. We calculated reducing of the amount of rainfall from the relationship of potential evapotranspiration and precipitation. For calculation we used program KlimaSoft 2.2. Phenological stages of certain plant species were thoroughly analysed. An increase in air temperature on the annually and at the level of all seasons was observed. Comparison of the data for the period 1999-2013 with standard climate period (1961-1990) shows an increase in temperature and potential evapotranspiration, together with simultaneous uneven distribution of precipitation amounts. All together results showed an extension of the growing season for cryophilic and thermophilic species by an average of 14 or 15 days and the rainfall deficite in July and August.

Key words: climate changes, Sarajevo Canton, crop production.

IMPROVED WALNUT CULTIVAR IDENTIFICATION WITH THE USE OF REFERENCE SSR PROFILES

Bećirspahić, D.[1], Kurtović, M.[2], Gaši, F.[2], Grahić, J.[2], Skender, A.[1]

[1]University of Bihać, Biotechnical Faculty, Bihać, Bosnia and Herzegovina
[2]University of Sarajevo, Faculty of Agriculture and Food Sciences, Sarajevo, Bosnia and Herzegovina

Summary

In the last few decades the identification of fruit trees was based on morphological, physiological and agronomic traits. However, traditional cultivar identification based on morphological traits requires extensive observations of mature plants, and it lacks definition and objectivity. The rapid development of molecular markers solved this difficult problem successfully. One of the crucial advantages of molecular markers is the fact that they are not influenced by the plants physiology or environment as is the case with morphological markers. The choice of the marker system depends on the type of genomic information required and their ability to detect polymorphisms in a given population. Microsatellite or simple sequence repeat (SSR) markers have been widely used in agricultural crops because of their ease of analysis. In order to create a list with reference SSR profiles for the most commonly used and the newly introduced walnut cultivars to Bosnia and Herzegovina (B&H), we analyzed 12 international walnut cultivars using ten SSR loci, and determined SSR profiles typical for each cultivar. The gained SSR profile list can be used as a reference in future walnut cultivar identification projects.

Key words: walnut, cultivars, microsatellite, markers, SSR profile.

THE EFFECT OF SEED SIZE AND CHEMICAL TREATMENT OF HYDROGEN PEROXIDE (H_2O_2) ON THE SEED GERMINATION OF SWEET CHESTNUT

Behmen F.[1], Mašinović H.[1], Murtić S.[1], Delić M.[1], Drkenda P.[1], Musić O.[1]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo,
Bosnia and Herzegovina

Summary

The effects of seed size and chemical treatment of hydrogen peroxide on seed germination, and seedling survival and growth of *Castanea sativa* were studied in this study. The seeds were classified into small <2g, medium > 2g and large >4g classes. Larger seeds had better germination parameters than small seeds. Survival percentage and investigated morfological traits determinated that seed size significantly affected seedling survival, shoot height, length of roots, root collar diametar. Studies have shown that treatment with different concentrations of hydrogen peroxide H_2O_2 on chestnut seedlings have statistically significant difference upon the measurement of morphological features as indicators of the efficiency of treatment applied. Effectiveness of hydrogen peroxide was observed only in measuring the mass of roots. In future, application of hydrogen peroxide to improve the root system should be possible.

Key words: chestnut seed, seed germination, seedling morphology, hydrogen peroxide

ANTIBACTERIAL ACTIVITY OF *Lavandulla officinalis* L. AND *Thymus serpyllum* L. ESSENTIAL OILS

Bešta-Gajević R., Čaušević S., Uzunović N., Jerković-Mujkić A.

Faculty of Science, University of Sarajevo, Bosnia and Herzegovina

Summary

Essential oils from aromatic and medical plants receive particular attention as potential natural agents against microorganisams. Moreover, essential oils are proven to have various pharmacological effects, such as spasmolytic, hepatoprotective, antiviral and anticarcinogenic effects.
Antibacterial activity of essential oils obtained from *Lavandulla officinalis* L. and *Thymus serpyllum* L. (Bioaromatica, Croatia) were determined by agar-well diffusion method. Reference strains: *Staphylococcus aureus* ATCC 6538, *Pseudomonas aeruginosa* ATCC 9027 and *Bacillus subtilis* ATCC 6633, as well as clinical isolates (UKC Tuzla): *Klebsiella pneumoniae*, *Escherichia coli, Shigella flexneri*, *Salmonella enteritidis* and *Proteus mirabilis* were used in tests.
Our results showed that essential oils exhibited significant bacteriocidal activity. The data indicated that wild thyme essential oil have a higher antimicrobial effects compared to lavander oil. Tested Gram negative bacteria were more susceptible to investigated essential oils than Gram positive bacteria.

Key words: antibacterial activity, agar-well diffusion, lavander, thyme, essential oil

COMPARATIVE VALUE OF DRY MATTER YIELD OF GRASSES AND LEGUMES OF TEMPORARY GRASSLANDS UNDER DIFFERENT CUTTING REGIME

Bezdrob M.[1], Alibegović-Grbić S.[1] , Simić A.[2]

[1]Faculty of Agriculture and Food Sciencies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture, University of Belgrade, Zemun, Serbia

Summary

Permanent and temporary grasslands are the most important source of roughage forage in Bosnia and Herzegovina, as they account for more than 50% of total agricultural area. Unfortunately, permanent grasslands of B&H are low-yield (0.5-1.5 t ha^{-1}), and forage collected from them is of low to medium quality. Temporary grassland commonly known as grass-legume mixtures, are slightly more productive (2.5-3.5 t ha^{-1}), but forage quality varies a lot depending on botanical composition and stage of plants' growth at mowing.

Temporary grasslands in B&H usually contain red clover *(Trifolium pratense L.)*, bird's foot trefoil *(Lotus corniculatus L.)*, Italian ryegrass *(Lolium italicum L.)*, orchard grass *(Dactylis glomerata L.)* and timothy *(Phleum pratense L.)*, which differ considerably, not only in terms of morphology but also in terms of other biological traits.

Given the above mentioned facts, the objective of this study was to determine the influence of cutting regimes on dry mass productivity of different types of grasses and legumes in the plant community, with special emphases on the cutting regime.

The three year research on dry mass yields shows that the cutting of legumes at blooming stage achieved a significantly higher yield compared to the stages of pasture imitation and budding of legumes, and therefore the mowing regime significantly influences the production of dry mass, irrespective of the botanical composition. Overall, the most productive mixture regardless of the mowing regime was S3, composed of bird's foot trefoil, red clover, Italian ryegrass, timothy and orchard grass (25.64 t ha^{-1} in flowering stage of plant growth; 21.53 t ha^{-1} in budding stage and 20.35 t ha^{-1} at grazing imitation). Mixture S4 composed of Italian ryegrass, timothy and orchard grass was the least productive.

Key words: temporary grassland, cutting regime, DM yield.

CHEMICAL COMPOSITION OF ESSENTIAL OIL OF *Laurus nobilis* L. LEAVES

Boza A.[1], Hepaksoy S.[2]

[1]Ege Forestry Research Institute İzmir, Turkey
[2]Ege University, Faculty of Agriculture, Department of Horticulture İzmir, Turkey

Summary

Laurel (*Laurus nobilis* L.) is an evergreen shrub up to 20 m high, native to the Mediterranean region. This tree belongs to the Lauraceae family and is native to the southern Mediterranean region and widely cultivated in Europe and the USA as an ornamental plant. It is grown commercially for its aromatic leaves in Turkey, Algeria, Morocco, Portugal, Spain, Italy, France and Mexico. It is also known as sweet bay, bay, bay laurel, Grecian laurel, true bay, and Mediterranean bay.

The leaves of laurel are commonly used as a spicy, aromatic flavouring for soups, fish, meats, stews, puddings, vinegars, and beverages and form an essential ingredient of the herb mix. They are also widely used in folk medicine to treat gastrointestinal problems, rheumatism, diuretic, urinary problems and stones.

In this study, essential oil content of trees in Urla and Karaburun which is western part of Turkey was determined. The samples of two years old leaf were taken in June, July, August and September from 65 different genotypes. After collection samples were dried at room temperature and each sample was subjected to hydro distillation by Clevenger apparatus and analyzed by gas chromatography.

Seventy six compounds were found in the leaf and 33 of them were found in all genotypes. Other compounds were present in very little amount. The major component was 1.8-Cineole and there were not significant differences between genotypes. The highest amount of this component was found in September.

Key words: Laurus nobilis, Bay laurel, Essential Oil., 1.8-Cineole, Turkey

A STUDY OF PROCRIDINAE (ZYGAENIDAE) SPECIES BY NEW SEX ATTRACTANTS IN THE MIDDLE ANATOLIA REGION OF TURKEY

Can Cengiz F.[1], Efetov K. A.[2], Kaya K.[1], Kucherenko E. E.[2], Ulaşlı B.[1], Tarmann G. M.[3]

[1]University of Mustafa Kemal, Hatay, Turkey; cezafan_onurcan@hotmail.com
[2]Crimean Federal University, Simferopol, Crimea; efetov.konst@gmail.com
[3]Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Naturwissenschaftliche Abteilung, Hall in Tirol, Austria; g.tarmann@tiroler-landesmuseen.at

Summary

The family Zygaenidae belongs to the superfamily Zygaenoidea of the order Lepidoptera. More than 50 species are found in Turkey. They belong to the two subfamilies Procridinae and Zygaeninae. The identification of endemic and other zygaenid species, the determination of their biology and more information about their distribution and habitat preferences are important for Turkey. Our knowledge on the Zygaenidae of Turkish Anatolia is still insufficient and our project therefore contributes to a better overview on this important key-group for nature conservation.

In our study, Zygaenidae species in the stone, pome fruit (Rosaceae) and grapevine (Vitaceae) areas of some provinces in the Middle Anatolian Region were examined by using sex-attractants newly synthesized in the Crimean Federal University. Three attractants were used: EFETOV-2 (racemic mixture of *R*- and *S*-enantiomers), EFETOV-S-2 (*R*-enantiomer) and EFETOV-S-S-2 (*S*-enantiomer). It was shown that our substances were attractive for the males of four Procridinae species: *Rhagades amasina*, *Adscita obscura*, *Jordanita anatolica*, and *J. subsolana*. *Rh. amasina* came mainly to *S*-enantiomer, *J. subsolana* – to *R*-enantiomer, while *J. anatolica* and *A. obscura* were attracted to the racemic mixture.

By monitoring and controlling species during the day and also by exploring their host-plants and habitats, areas of distribution were determined. New and relevant data on Zygaenidae as potential pests on agricultural crops and information on the importance of Zygaenidae as bioindicators for Turkey were obtained. This study is also an important contribution to the knowledge of the Turkish fauna and is a good base for later studies.

Key words: Zygaenidae, Procridinae, sex attractants, pest, Anatolia Region, Turkey

This project was supported by BAP with Project No. 16525, financed by Mustafa Kemal University of Turkey.

DETERMINATION OF THE REACTIONS OF SOME HULLESS BARLEY LINES TO *Drechslera graminea*

Çelik Oğuz, A.[1], Karakaya, A.[1], Ergün, N.[2]

[1]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey
[2]Central Research Institute for Field Crops, Yenimahalle, Ankara, Turkey

Summary

Barley stripe disease caused by the fungus *Drechslera graminea* (teleomorph: *Pyrenophora graminea*) is an important disease of barley (*Hordeum vulgare*). Twenty-three hulless barley lines were evaluated for their resistance status using 3 single spore isolates of *Drechslera graminea.* Kayseri isolate was found as the most virulent isolate. One, 2 and 5 lines showed resistant reactions to Kayseri, Eskişehir and Ankara isolates, respectively. Three, 11 and 3 lines showed intermediate responses to Kayseri, Eskişehir and Ankara isolates, respectively. Sixteen lines exhibited resistant or intermediate responses against at least one of the isolates used. Line #2 showed resistant response to three isolates used. Line #6 showed resistant response to one isolate and showed intermediate response to other two isolates. Line #23 showed intermediate response to all isolates. Hulless barley lines that showed resistant and/or intermediate responses to isolates could be used in breeding programs.

Key words: Barley stripe, Drechslera graminea, Pyrenophora graminea, hulless barley, disease resistance

EVALUATION OF THE REACTIONS OF SOME HULLESS BARLEY POPULATIONS TO FOLIAR DISEASES UNDER FIELD CONDITIONS

Çelik Oğuz, A.[1], Karakaya, A.[1], Sayim, İ.[2]

[1]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey
[2]Central Research Institute for Field Crops, Yenimahalle, Ankara, Turkey

Summary

Sixty-five hulless barley F5 populations obtained from ICARDA were examined for foliar diseases at adult stages under field conditions in Ankara, Turkey. Each population contained about 25-30 single heads. From 65 populations, a total of 1818 hulless single head barleys were planted. These plants were evaluated for their resistance status to foliar diseases of barley occurring under natural conditions. A number of diseases were found affecting the populations. Net form of net blotch (*Pyrenophora teres* f. *teres*), spot blotch *(Cochliobolus sativus)*, scald *(Rhynchosporium commune)*, powdery mildew (*Blumeria graminis* f. sp. *hordei=Erysiphe graminis* f. sp. *hordei*), yellow rust (*Puccinia striiformis*), leaf rust (*Puccinia hordei*) and stem rust (*Puccinia graminis*) were observed. Spot blotch, scald, leaf rust and yellow rust were present in majority of the populations. Among the populations, the incidence values (number of plants infected of those examined) of net blotch, spot blotch, scald, powdery mildew, yellow rust, leaf rust and stem rust ranged between 3.4-23.3%, 3.5-100%, 4.6-88.8, 2.3-12.5%, 2.3-87.5%, 2.5-94.4% and 5.5-6.6%, respectively. A 1-9 scale was used for disease severity of all diseases evaluated. Populations 33, 35 and 42 were found to be 96.4%, 96% and 92.8% disease free, respectively. Disease resistant lines can be used as a source of resistance in future breeding studies.

Key words: Hulless barley, foliar diseases, disease resistance

DIVERSITY AND DISTRIBUTION OF PHYTOSEIID MITES (ACARI: MESOSTIGMATA) FROM APPLE ORCHARDS IN ANKARA-TURKEY

Çobanoğlu, S.[1], Erdoğan, T.[2]

[1]University of Ankara, Plant Protection Department Faculty of Agriculture, Dışkapı- Ankara- Turkey
[2]University of Ankara, Plant Protection Department Faculty of Agriculture, Ankara-Turkey

Summary

Apple belongs to Rosaceae family, contain vitamins and minerals, so they are the most important groups among the horticultural production. These plants species, are important hosts for the plant parasitic and predatory mite species; as the Ankara Provinces provide suitable ecological habitats for this plants.

Applications of broad- spectrum insecticides, the spider mites, effects relative abundance of mite densities and has contributed to the spider mite problem because of their side effects on the natural enemies. Eventually, the use of pesticides disrupts the beneficial fauna and has negative effects on the ecological balance.

Therefore, the studies were carried out to identify beneficial mite species from apple orchards in Ankara which is Central part of Anatolia-Turkey.

The surveys were conducted randomly in each orchards from March to November at weekly interval in Ankara (Ayaş, Beypazarı, Çubuk, Gölbaşı, Haymana, Kızılcahamam and Kazan) during 2012-2014 years. The sampling were done at diffrent levels of the plants, the samples carried out to the laboratory for extracting by steroscobic microscobes and Berlese funnels, they were mounted in Hoyer's medium after clarification in lactophenol solution. Based on these surveys, the most common and effective predator mite species (Phytoseiidae) were determined. Ten phytoseiid species identified as predators and their distribution provided. *Kampimodromus aberrans* (Oudemans) and *Euseius finlandicus* (Oudemans) (Phytoseiidae) were determined most abundant and common predatory mite species from apple orchards.

The determination of the predatory mites species provide the objective datas' for the mite management programme for apple orchards in Ankara.

Key words: Rosaceae, Acari, beneficial mites, Ankara, Turkey

GOOD AGRICULTURAL PRACTICES AND PEST CONTROL STRATEGIES IN CHERRY BREEDING

Çobanoğlu, S.[1], Kulalıgil, L.[2]

[1]University of Ankara, Plant Protection Department Faculty of Agriculture, Dışkapı, Ankara, Turkey
[2]Ministry of Food Agriculture and Livestock, Eskişehir, Turkey

Summary

Turkey has most appropriate climate for the cherry cultivation in the world and the cherry growing has been increased every year. Cherry Production can easily be performed all around of Turkey except Mediterranean coast line. Since the importance of understanding of the human nutrition, cherry cultivation will become more popular and get importance in coming future. Despite the fact that cherry has rich vitamin and minerals content its' production is required intensive farming system.
Turkey has been much attraction among the European Countries for competition for cherry cultivation.
Good Agricultural Practices (GAP); which uses appropriate agricultural technologies and conservation of natural resources as well as protection of human and animal health beside that protected environment which offer to ensure food safety and agricultural traceability and sustainability will produce solutions to problems threatening the food security.
The aim of this study is to spread the good agricultural practices instead of conventional control methods, In Mihaliccik Eskisehir Province where cherry production is increasing every year become very important.

Key words: Cherry, Good Agricultural Practices, Eskişehir, Pests, Turkey

THE EFFECT OF PRUNING ON FRUITING CAPACITY OF BLACK MAGIC TABLE GRAPE VARIETY

Delić M.[1], Behmen F.[1], Sefo S.[2], Drkenda P.[1], Dimovska V.[3], Sunulahpašić A.[4]

[1]University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina
[2]University "Džemal Bijedić" of Mostar, Agromediterian Faculty, Bosnia and Herzegovina
[3] Goce Delčev University, Faculty of Agriculture, Republic of Macedonia
[4]Ministry of Agriculture, Water management and Forestry of Central Bosnia Canton, Bosnia and Herzegovina

Summary

Black Magic table grape variety is a newly introduced variety in Bosnia and Herzegovina. The aim of this paper was to determine the effect of various types of pruning on fruiting of Black Magic variety in the conditions of Herzegovina, given that no researches have been done so far for this variety. The research lasted three years (2011, 2012 and 2013), and three pruning variants were used (28, 32 and 40 buds/vine). On the basis of obtained results it is evident that the values of the examined parameters were the highest in 2011 (grapes/vine yield of 11.06 kg, total number of productive canes/vine was 24.72, number of productive canes/vine 23.79 and number of clusters/vine 44.87), and the lowest in 2013 (grapes/vine yield 7.49 kg, total number of productive canes/vine 21.02, number of productive canes/vine 21.11 and number of clusters/vine 23.16). Pruning variant III had the highest levels of these parameters in all three experimental years, and variant I the lowest.

Key words: Black Magic, table grapevine, pruning, yield.

THE DISTRIBUTION OF COMMON RAGWEED (*Ambrosia artemisiifolia* L.) IN THE MUNICIPALITY OF KALESIJA

Đikić, M.[1], Muhamedbegović, N.[1], Gadžo, D.[1], Karić, N.[1], Sarajlić, N.[2]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo
[2]Faculty of Natural Sciences and Mathematics, University of Niš

Summary

Common ragweed (*Ambrosia artemisiifolia* L.) is a hardy, herbaceous plant of the *Asteraceae* family. Due to its biological and ecological characteristics, this plant can grow in very unfavorable conditions in nonagricultural grounds and ruderal habitats, becoming a very widespread weed species in a number of agricultural crops. Apart from agricultural aspect, the common ragweed's pollen is one of the main causes of allergic diseases.

The purpose of this work is to investigate the presence, number, height, phase of development and location of common ragweed in the area of Kalesija municipality and its arable and ruderal grounds.

The prevalence of common ragweed was recorded via point quadrat method, which implies the identification of species, the number of individuals, height, mass and the phenophase. Floristic field records were taken in different habitats (stubbles, row crops, meadows and ruderal habitats) of Kalesija municipality. *Ambrosia artemisiifolia* was found in all four types of habitats, and was most common in ruderal sites, which is expected, due to the fact that this is the habitat it colonizes first. It was also found in row crops, mostly in potatoes and corn. The presence was recorded in a number of locations in stubbles as well, so further spread of common ragweed is to be expected in these habitats as well. The smallest number of common ragweed plants was found in meadows.

Given the fact that common ragweed is already well-established in the area of Kalesija, it is necessary to undertake all available measures of suppression in order to prevent further spreading of this invasive plant species.

Key words: common ragweed, Ambrosia artemisiifolia, distribution, Kalesija

THE DISTRIBUTION OF JIMSONWEED (*Datura stramonium* L.) IN THE CITY OF SARAJEVO

Đikić, M.[1], Suljić N.[1], Sarajlić, N.[2], Gadžo, D.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo
[2]Faculty of Natural Sciences and Mathematics, University of Niš

Summary

Jimsonweed (*Datura stramonium* L.) is a strong-scented annual plant of Solanaceae family. The stem is erect, branched, with smooth toothed leaves and single, trumpet-shaped white flowers. The fruit is egg-shaped spiny capsule, filled with small, black seeds. It is native to Central America but was introduced in Europe before 1650 and became naturalized in many warm and moderate regions. It is often found along roadsides, wastelands, garbage dumps, but also in parks, gardens and other sites on nitrogen-rich soils. The entire plant is highly toxic, posing a threat to children and pets in parks and schoolyards, but is also among troublesome invasive alien species that releases allelochemicals to the environment, suppressing the development of native plants. The literature sources on this species in area of the city of Sarajevo are very scarce, so the aim of this paper is to record the sites where jimsonweed is present, in order to be able to monitor its populations in the future and identify the most infested areas of the city in which the eradication measures should be undertaken in order to prevent further invasion of this species.

Key words: Datura stramonium, invasive species, distribution, Sarajevo

ECONOMIC ASPECTS AND INVESTMENT CHARACTERISTICS OF GREENHOUSE TOMATO GROWING IN TURKEY

Engindeniz, S.[1], Yucel Engindeniz, D.[2], Yercan, M.[1], Kinikli, F.[1]

[1]Ege University, Faculty of Agriculture, Department of Agricultural Economics, Turkey
[2]Dokuz Eylul University, Izmir Vocational High School, Turkey

Summary

Turkey is one of the major greenhouse production countries in the world with total of 37,963 ha glass and plastic greenhouse area. Turkey lies between 36 and 42˚ North and 26 and 45˚ East. The main advantage of Turkey in terms of wide spreading of greenhouse growing is mild winter climate which compared to the countries located at higher latitudes is characterized by relatively high radiation and mild temperatures during winter.

In 2015, total protected cultivation area and greenhouse area were 66,362 ha and 38,941 ha in Turkey, respectively. 79% of total greenhouses in Turkey are covered with plastic and the rest with glass. Vegetable production is dominant in greenhouse production in Turkey, accounting for 95.3% of total greenhouse production, and that is followed by flower (3.5%) and fruit production (1.2%). Among the vegetables, tomato is the most prominent while cucumber, pepper, eggplant, squash, watermelon, melon and other vegetables are grown over rest of the area.

Tomatoes were grown in 57% of total greenhouse area in 2015. 75% of greenhouse tomatoes were produced in plastic greenhouses. In 2015, 3.4 million tons greenhouse tomato was produced in Turkey. Greenhouse tomato production increased 62% in 2006-2015 periods. Turkey exported 544,357 tons fresh tomatoes to some countries in the world and total tomato export value of Turkey was 368 million $ in 2015.

The purpose of this study is to analyse economic aspects and investment characteristics of greenhouse tomato growing in Turkey. For this aim, data of 2006-2015 period was investigated. Data was collected from Turkish Statistical Institute, The Turkish Ministry of Food, Agriculture, and Livestock, The Turkish Ministry of Environment and Urbanisation, and Mediterranean Exporter Associations General Secretariat. Further, results of previous studies also were used.

Key words: greenhouse, greenhouse vegetables, tomato, cost analysis, economic analysis.

DIVERSITY AND DISTRIBUTION OF BENEFICIAL AND HARMFUL MITES (Acari: Mesostigmata) FROM ROSEHIP (*Rosa canina*) IN ANKARA-TURKEY

Erdoğan, T.[1], Çobanoğlu, S.[2]

[1]University of Ankara, Plant Protection Department Faculty of Agriculture, Dışkapı, Ankara, Turkey
[2]University of Ankara, Plant Protection Department Faculty of Agriculture, Dışkapı, Ankara, Turkey

Summary

Rosehip which is widely found in natural populations in various regions of Turkey and belongs to Rosaceae family, is a very rich plant group due to its minerals and vitamins. It is also an important plant with the prevention of erosion. Rosehip plant is an important host for beneficial and harmful mites species and Ankara province is very suitable in terms of ecological habitats for these mite species.

Therefore, the studies were carried out to identify beneficial and harmful mites species in plants of rosehip in Ankara which is Central part of Anatolia-Turkey.

In this study, samples were collected each month for each province of Ankara (Ayaş, Beypazarı, Çubuk, Gölbaşı, Haymana, Kızılcahamam and Kazan) from March to November during 2012-2014 years. The sampling were done at diffirent levels of the plants, the samples carried out to the laboratory for extracting by steroscobic microscobes and Berlese funnels, they were mounted in Hoyer's medium after clarification in lactophenol solution.

As a result, when *Tetranychus urticae* Koch, *Amphitetranychus viennensis* (Zacher), *Eotetranycus populi*, *Cenopalpus pulcher* (Canestrini & Fanzago), *Bryobia kissophila*, *Tarsonemus smithi* are detected from harmful mite species; *Typhlodromus* (Antho seius) *psyllakisi*, *Kampimodromus aberrans* (Oudemans), *Paraseiulus triporus* were also identified from useful mite species. Euseius sp. and Stigmaidae of family were also observed. The harmful mites is most seen from the Tetrancyhidae family, while the Phytoseiidae family is the most common among the beneficial mites.

Key words: Rosaceae, Acari, beneficial mites, Ankara, Turkey

EFFECTIVENESS OF RAPID DIAGNOSTIC METHODS IN THE ASSESSMENT OF NITROGEN NUTRITIONAL STATUS OF PEA PLANTS (*Pisum sativum* L.)

Filipović, A.[1], Bagarić, K.[1], Vasilj, V.[1], Ivanković, A.[1], Mandić, A.[1]

[1]Faculty of Agriculture and Food Technology University of Mostar, Bosnia and Herzegovina

Summary

Pea as a leguminous plant has the potential to meet nitrogen requirements via biological fixation. The seeds of pea cultivar Mali Provansalac were infected with ten isolated indigenous strains of S 1, S 10, S 14, S 18, S19, S20, S 5, S 6, S 7, S 13 and one reference of *R. leguminosarum* bv. *viciae* 1001 in the field trial set up 2009 in three replications on the site Hodbina, (Mostar, B&H) In the phase of full flowering 10 complete plants were selected from each plot for the determination of nitrogen in above ground plant parts and grain. Measurements of chlorophyll meter and Cardy ion meter conducted in time before flowering, full flowering time and the phase of technological maturity. Inoculation (inoculated seed) significantly influenced by the nitrogen content of the aboveground part of the peas and pea overall yield relative to the control (un-inoculated seeds), while the number of pods per plant, no significant difference. Chlorophyll meter readings showed no significant differences due to the applied bacterial strains and control, while reading Cardy ion meter was the opposite. Measurements with both devices showed significant differences due to the vegetation period. Results of correlation between chlorophyll content and content of nitrates show very weak and negative relationship with Pearson's correlation coefficient -0.07. Mild association of nitrogen in the above ground plant parts of peas and content of chlorophyll as well between grain nitrogen and plant sap nitrates obtained at the time of technological maturity goes to favor of the methods and their accuracy. Additional investigations needed to determine the reliability of the used methods. The aim of this study was to research efficiency of the use of rapid diagnostic methods Chlorophyll-meter and Cardy ion meter in assess of nitrogen status in peas plant and determined the value of the monitored characteristics and efficiency of applied inoculation.

Key words: Pea cultivar Mali Provansalac, Inoculation, Chlorophyll meter, Cardy ion meter

EFFECTS OF SEEDING RATES ON YIELD AND TOTAL PHENOLIC CONTENTS OF COMMON BUCKWHEAT

Gavrić T.[1], Gadžo D.[1], Đikić M.[1], Ašimović Z.[1]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina

Summary

Common buckwheat (*Fagopyrum esculentum* Moench) is an annual plant from family *Polygonaceae*. Depending on sowing, rates of seed per hectare ranges from 40 to 100 kg ha^{-1} and it can have a significant effect on the yield of grain and total phenolic contents. The main focus of this research was to determine how change of sowing rates reflects on the yield and total phenolic contents of buckwheat. During three years (2011-2013) three different rates of seed were used: 50, 80 and 100 kg ha^{-1}. Buckwheat was sown in the village of Donje Selo, near Ilijaš and the experiment was set up in four repetitions. The seeding rate did not have a significant effect on plant height, but it had a negative effect on the mass of 1000 kernels. Hectoliter mass and the mass of 1000 kernels varied in dependence on the years of investigation. Grain yields were significantly dependent on the year of investigation and sowing rates. The lowest grain yield was recorded in the variant with the lowest sowing rates (812.0 kg ha^{-1}), and the largest grain yield was recorded in variant with the highest sowing rates (1428.9 kg ha^{-1}). Phenol contents ranged from 43.91 to 49.27 mg g^{-1} and depend on the seeding rates and years of investigation.

Key words: common buckwheat, seeding rate, yield, total phenolic

DISEASES AND PESTS OF *Thymus* spp. IN HATAY PROVINCE OF TURKEY

Gazel M., Kaya K., Çaglayan K.

Mustafa Kemal University, Faculty of Agriculture, Department of Plant Protection, Hatay, Turkey

Summary

Thymus spp. is one of the most important medicinal and aromatic plants and has widespread distribution in most temperate regions. Approximately 70% of the world thyme necessity satisfied from Turkey and Hatay is the 5. rank for thyme production. Thyme fields in Altınözü, Samandağ and Yayladağı districts of Hatay province were visited and sampled during 2016. Phytoplasma-like symptoms such as dwarfing of the plants, proliferation, leaf rolling, flower abnormality symptoms were observed on different thyme fields in the province. Several pests were also observed and collected. Aphid species such as *Myzus persicae* and *Aphis gossypii* and their predator, *Coccinella septempunctata* were detected. Possible phytoplasma vectors such as *Circulifer haematoceps, Psammotettix provincialis* were also collected and morphologically identified. Parasitic plant, (dodder) *Cuscuta* spp. and *Orobanche* spp. were also observed in thyme growing areas. DNA extractions from symptomatic plants resembling phytoplasma symptoms were also performed and molecular studies are still in progress.

Key words: Thymus, pests, plant diseases, Turkey

GRAIN YIELD AND SOME YIELD COMPONENTS OF SWEET SORGHUM (*Sorghum bicolor var. saccharatum*) AS AFFECTED BY PLANT DENSITIES UNDER MEDITERRANEAN CLIMATIC CONDITIONS

Geren, H.[1], Demiroğlu Topçu, G.[1], Kavut, Y. T.[1], Özkan, Ş. S.[1]

[1]Ege University, Faculty of Agriculture, Department of Field Crops, Izmir, Turkey

Summary

This study was conducted to evaluate the effects of plant density on the grain yield and some yield characteristics of sweet sorghum (*Sorghum bicolor var. saccharatum*) grown in summer second crop production period, on the experimental fields of Faculty of Agriculture, Ege University under Mediterranean ecological conditions of Izmir, Turkey during two years in 2013-2014. The experiment was carried out with a randomized complete block design with three replication; five plant spacings 70 cm among the rows and 25, 20, 15, 10 and 5 cm within the rows (D_1:57,142; D_2:71,428; D_3:95,238; D_4:142,857 and D_5:285,714 plant ha^{-1}, respectively) were tested. 'Keller' cultivar of sweet sorghum was used as crop material.

Average result of two years indicated that there were significant effect of plant densities on the grain yield and some yield parameters of sweet sorghum. Some yield components like panicle length, panicle diameter and panicle weight per plant decreased as the number of plants in unit area increased (from D_1 to D_5). Densely populated stands (D_4 and D_5) had higher grain yield compared to sparsely populated stands (D_1 and D_2). However, D_3 was the most successful planting density of sweet sorghum regarding grain yield to the regions with Mediterranean-type climates under irrigation, and it is recommended for production.

Key words: sweet sorghum, plant density, grain yield, harvest index.

EFFECT OF DIFFERENT HARVEST STAGES ON SOME SILAGE QUALITY CHARACTERISTICS OF SWEET SORGHUM (*Sorghum bicolor var. saccharatum*) AND BEAN (*Phaseolus vulgaris*) MIXTURES

Geren, H.[1], Durul, G.[1]

[1]Ege University, Faculty of Agriculture, Department of Field Crops, Izmir, Turkey

Summary

Sweet sorghum is ensiled to preserve its nutritive value and it has high metabolic energy value, but crude protein is low. This study was conducted to assess silage and forage values of sweet sorghum (*Sorghum bicolor var. saccharatum*) silage when ensiled with different proportions of bean [*Phaseolus vulgaris*]. Rio cv. of sweet sorghum and Noyanbey-98 cv. of bean were used as crop material. Sweet sorghums were cut 3 different harvesting stages (panicle emergence, anthesis and doughy) and were mixed with bean at sorghum crop:bean ratios of 100:0, 75:25, 50:50, 25:75, and 0:100% on dry matter bases. All crops were chopped using a conventional chopper, and for each mixture 500 g of fresh material was vacuum sealed in a plastic bag and fermented for an average of 40 days, four bags per mixture. Some yield and quality parameters were tested in the experiment such as dry matter (DM) yield, content of lactic & acetic acids, pH of silage, metabolisable energy (ME) and relative forage value (RFV). There were significant differences between harvest stages and mixture rates. Delaying harvest stage affected positively on DM yield and fermentation quality but not ME and RFV. Crude protein (CP) increased as proportion of bean increased in the mixture. In addition, pH and AA increased when bean was added. Silage with 100% bean without sweet sorghum had the highest pH and AA concentration.

Key words: Sweet sorghum, bean, harvest stage, mixture rate, silage quality.

BIOMASS YIELD AND ETHANOL PRODUCTION CAPACITY OF SWEET SORGHUM (*Sorghum bicolor var. saccharatum*) CULTIVARS AS AFFECTED BY HARVEST STAGES

Geren, H.[1], Kir, B.[1], Kavut, Y. T.[1]

[1]Ege University, Faculty of Agriculture, Department of Field Crops, Izmir, Turkey

Summary

This study was conducted in order to determine the adaptability, biomass yield and bio-ethanol production capacity of sweet sorghum grown in summer second crop production period, on the experimental fields of Faculty of Agriculture, Ege University under Mediterranean ecological conditions of Bornova-Izmir during two years in 2013-2014. Two different sweet sorghum varieties (Keller and Rio cv.) were used as crop material. Sweet sorghums were cut three different harvesting stages (panicle emergence, anthesis and doughy). Some traits were tested in the experiment such as fresh biomass and stem yield, sugar content and yield, syrup and ethanol yields. Results indicated that there were significant differences between harvest stages and sweet sorghum varieties in terms of fresh biomass yield and ethanol production capacities. Delaying harvest stage affected positively biomass and ethanol yields. It was also concluded that Keller cv. was superior to Rio cv. with regard to above mentioned traits.

Key words: sweet sorghum, variety, harvesting stage, biomass yield, ethanol production.

A PRELIMINARY STUDY ON THE EFFECT OF DIFFERENT IRRIGATION REGIMES AND POTASSIUM LEVELS ON THE GRAIN YIELD AND SOME YIELD CHARACTERISTICS OF SWEET SORGHUM (*Sorghum bicolor var. saccharatum*)

Geren, H.[1], Simić, A.[2], Özdoğan, T.[1], Krga, I.[2]

[1]Ege University, Faculty of Agriculture, Department of Field Crops, Izmir, Turkey
[2]University of Belgrade, Faculty of Agriculture, Belgrade, Serbia

Summary

Drought is a significant limiting factor for agricultural productivity and generally inhibits plant growth through reduced water absorption and nutrient uptake. Potassium is a valuable nutrient in decreasing the effects of water stress for the survival of crop plants.
A pot study was carried out to determine the effect of different irrigation regimes and potassium levels on the grain yield and some other yield components of sweet sorghum (cv. Sugar drip) under outdoor conditions in 2015. Four different potassium levels (0, 50, 100, 150 kg K_2O ha^{-1}) and five irrigation treatments were applied in the experiment, the first treatment was 100% of the field capacity (FC) as a control, and, the others were received 80%, 60%, 40% and 20% of the FC, respectively as deficit irrigation treatments. The results showed that K application and water stress had significant effects on the grain yield and yield components. Drought stress by reducing the yield components, especially the panicle length per plant and harvest index reduced grain yield per plant and, greatest yield obtained at full irrigation (100% of FC). Potassium increased average grain and biological yield by 342% and 143%, respectively compared to control (0 kg K ha^{-1}) through improving growth conditions.

Key words: sweet sorghum, potassium levels, deficit irrigation, grain yield, harvest index.

MOLECULAR CHARACTERIZATION OF BIH PEPPER (*Capsicum annuum* L.) LANDRACES WITH SSR AND EST-SSR MOLECULAR MARKERS

Glamočlija P.[1], Šutković J.[2], Karić L.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina
[2]International University of Sarajevo, Bosnia and Herzegovina

Summary

With a significant economic value, pepper (*Capsicum annuum* L.) represents a major vegetable crop worldwide. Simple sequence repeat (SSR) markers and expressed sequence tag (EST-SSR) are a powerful tool for genetic studies and breeding of pepper. More than 500 SSR markers have been developed for pepper on the basis of genomic DNA in the last decade. In this study the genetic variability among 14 pepper varieties was assessed by using 9 SSR and 5 EST-SSR markers. 4 local pepper varieties of "Čapljinska paprika" were collected in region of Herzegovina, and 10 commercially available varieties were purchased in markets. Mean expected heterozygosity (He) ranged from s 0.70 to 0.74 in the populations studied, whereas the mean polymorphic information content (PIC) was 0.8. The average polymorphic number of alleles per primer was 2.2 per locus. The genetic relationships among the populations revealed by both UPGMA and NJ analysis showed a clear clustering to three sub-populations making distinct clusters. As expected, all local varieties make up one cluster. The weak genetic differentiation observed between the pepper populations in second cluster, mainly Italian populations, supports the regional cohesion between the populations. The third cluster is represented by only one pepper variety "Kalifornijsko čudo". These results indicate regional genetic variations among pepper population in BiH.

Key words: BiH pepper population, Capsicum annuum L., molecular characterization, genetic markers, phylogeny

EFFECT OF CLIMATE ON THE ONSET AND COURSE OF FLOWERING IN APRICOT *(Prunus armeniaca* L.)

Glišić I., Milošević T., Bokan N.

Faculty of Agronomy Čačak, University of Kragujevac, Serbia

Summary

The Čačak region is famous for apricot growing. The hilly nature of the area lying at an average altitude of 300 – 500 m, characterised by a specific climate and favourable agroenvironmental conditions, ensures good results in apricot production, as well as relative cropping and yield stability. Despite favourable conditions, due to early flowering in apricot, significant differences occurred in the course of flowering across cultivars, but also between years. The paper presents the results from a two-year study on the effect of basic climatic parameters on flowering in 4 apricot cultivars under the climatic conditions of Čačak. In 2016, the average air temperature in February was 7.3 ºC, and maximum daily temperatures during as many as 10 days in February were above 15 ºC. This induced an early onset of flowering (3 March) in this year, but the cold weather ensuing in March led to a very long period of flowering – lasting for as many as 17 days (the mean temperature for the period 3 – 20 March was only 6.2 ºC). In 2017, February was substantially colder (mean daily temperature – 4.3 ºC), and flowering started 15 days later than in the previous year i.e. on 18 March. However, very high temperatures after the onset of flowering caused a short period of flowering lasting for 7 days (during the period 18-25 March, mean daily temperature was 14.4 ºC, and maximum daily temperatures reached 23.7 ºC). In both years, the onset of flowering was earliest in 'Goldrich', followed by 'Betinka' and 'Hungarian Best', and latest in the French cultivar 'Farbaly'. Differences in the onset of flowering among the cultivars ranged from 7 days (2016) to 3 days (2017), which confirmed the effect of thermal sum on the duration of growth and developmental stages.

Key words: apricot, temperature, flowering.

CONTENT OF SOLUBLE SUGARS IN CEREALS AND SOYBEAN SEEDS GROWN UNDER DIFFERENT CONDITIONS

Golijan J.[1], Kostić A. Ž.[2], Pešić M. B.[2], Stanojević S. P.[2], Barać M. B.[2], Lekić S.[1]

[1]Chair of Genetics, Plant Breeding and Seed Production, Faculty of Agriculture, University of Belgrade, Serbia, [2]Chair of Chemistry and Biochemistry, Faculty of Agriculture, University of Belgrade, Serbia

Summary

Seed is one of the most important parts of plants that are included in reproduction process. According to that it is reach in nutritive important components such as proteins, amino acids, sugars, phenolics etc. Also, it is one of the basic plant products that are used in human diet. Soybean (*Glycine max* L.), maize (*Zea mays* L.), spelt (*Triticum aestivum ssp. spelta*) and buckwheat (*Fagopyrum esculentum* Moench) are cultivated crops with applications all around the world. Content of bioactive components in plant is strongly dependent on growing conditions. In case of this investigation content of soluble sugars was determined in different types of cereals and soybean seeds which were grown under conventional and organic conditions and compared. The whole seeds were milled and prepared for further analysis. To determine soluble sugars content standard anthrone method was used. After extraction of ten samples with hot distilled water (100°C) during 40 minutes appropriate aliquot was mixed with anthrone reagent and heated in boiling water bath for 10 minutes. The intensity of the developed blue-green colour was indicator on the smaller/greater presence of soluble sugars in samples. Results were quantified spectrophotometrically (620nm) and expressed as a sucrose content as standard. The obtained results (mg/g) were: conventional and organic soybean (season 2016) – 115.06 and 71.89; organic spelt (season 2015), conventional and organic spelt (season 2016) – 90.62, 215.70 and 76.65; organic maize (season 2015), conventional and organic maize (season 2016) – 141.25, 68.24 and 75.86; conventional and organic buckwheat (season 2016) – 25.70 and 64.75. It can be concluded that in case of soybean and spelt significantly higher sugars content was determined in conventionally growing cultivars. On the other hand, maize and buckwheat seeds grown under organic conditions contained more soluble sugars than plants cultured under the conventional conditions of cultivation.

Key words: soluble sugars, soybean, spelt, maize, buckwheat.

DETERMINATION OF *Cacopsylla* (Hemiptera: Psyllidae) SPECIES BY MORPHOLOGICAL AND MOLECULAR METHODS IN PEAR TREES GROWN IN HATAY PROVINCE OF TURKEY

Gülşen Ö., **Can Cengiz F.**

Mustafa Kemal University, Faculty of Agriculture, Department of Plant Protection, Hatay, Turkey

Summary

Pears come in second place among the soft-seeded fruit cultivated in Turkey. The cultured pear is grown almost everywhere in the world where apple cultivars spread. Pear is less sensitive to temperatures and constants comparing with the culture apples, and it is also important in the hot climate regions of the Mediterranean, where the apple does not grow well. Pear is important export product for our country and *Cacopsylla* spp. (Hemiptera: Psyllidae) is one of the most important pest problem on it. The pest feeds by piercing-sucking on leaves and shoots and it is also important vector of phytoplasmic disease known pear decline. This study was carried out in 2013 and 2014 to determine the existence and the types of *Cacopsylla* species on pear cultivation in Samandağ, Yayladağı, Antakya, Belen, Dörtyol, Erzin and Serinyol districts of Hatay province, and the sampling was done by using atrap and beating sheet. In the first year, the pest 29 locations of 31 locations and in the second year, 13 locations of 36 locations were found. In the second year of the study, an usual morphological characters and molecular techniques were used to determine the species of the pest. As a result of these identification methods, it was determined that the pest was *Cacopsylla pyri* (L.).

Key words: Pear, Cacopsylla, pear decline, phytoplasma, vector

EFFECT OF SHADE ON THE NUMBER OF FLOWERS AND PLANT HEIGHT OF FRENCH MARIGOLD (*Tagetes patula*) AND ALYSSUM (*Alyssum maritimum*) IN THE AREA OF HERZEGOVINA

Hadžiabulić, A.[1], Temim, E.[1]

[1]Agromediterranean faculty University "Džemal Bijedić" of Mostar, USRC „Mithad Hujdur Hujka", Mostar, Bosnia and Herzegovina (alisa.hadziabulic@unmo.ba)

Summary

French marigold (*Tagetes patula*) and sweet alyssum (*Alyssum maritimum*) are important ornamental annual plants which are as typical helophyte flowering plants used in flower beds exposed to the full sunlight. Due to the limited number of annual ornamental plants that can be grown in shade, the aim of this two-year long study (2014 and 2015) was to investigate the effect of different shade intensities on the height and the number of flowers of French marigold (*Tagetes patula*) and alyssum (*Alyssum maritimum*). The experiment was conducted in the area of Mostar, the plants were exposed to artificially reduce light intensity, 30%, 50% and 60% of shading, while the control plants (0%) were exposed to full sunlight. The results showed that with the decrease of light intensity, number of flowers decreased, while height of plants was significantly increased, compared to the sun exposed plants. Since the experiment was set in two meteorologically quite different years, there was a significant influence of that factor on both parameters.

Key words: light intensities, Tagetes patula, Allisum maritimum, number of flowers, plant height

BIOFERTILIZATION AND ITS EFFECT ON SOIL MICROBIAL DIVERSITY AND SOME MORPHOLOGICAL PROPERTIES OF SOYBEAN

Hamidović S.[1], Karić E.[1], Gadžo D.[1], Lalević B.[2], Waisi H.[3], Josip Č.[1], Gavrić T.[1]

[1] University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina,
[2] University of Belgrade, Faculty of agriculture, Belgrade - Zemun, Serbia,
[3] Institute for Water Management "Jaroslav Cerni", Belgrade, Serbia

Summary

Soybean is important crop for human and animal nutrition. In contemporary agriculture production, using of fertilizers is necessary for obtaining of high yield of crops. Except of organic and mineral fertilizers, microbiological fertilizers can also be applied in soybean production. The aim of this paper was to determine the influence of two biofertilizers (Ekstrasol and Megaflu) on microbial characteristics of soil and morphological properties of soybean plants (Balkan). Chemical characterization of soil was performed using standard methodology. Sampling for microbiological analyses was achieved in the phases of sowing, flowering and physiological maturity, using agar plate method. At the end of experiment, plant and root length and weight, as well number of nodules, legumes and seeds per legume, seed weight were determined. The experiment was conducted at Butmir location (Sarajevo canton, Bosnia and Herzegovina) in spring 2016. Lowest microbial number was detected in the time of sowing seeds, and highest in physiological maturity. In most of samples, in control and Megaflu treatment, higher microbial activity compared with Ekstrasol was noticed. In treatment with Megaflu, plant and root weight, number of nodules, legume number per plant, seed number and weight per plant were higher compared to control and Ekstrasol treatment. In other morphological parameters, differences between the treatments were not detected. This study can be useful for improvement of soybean production and further application of microbiological fertilizers in agriculture.

Key words: biofertilization, microbial diversity, soybean.

INFLUENCE OF HERBICIDE Wing P ON MICROBIAL POPULATION DENSITY IN SOIL UNDER CORN

Hamidović S.[1], Žutić A.[1], Đikić M.[1], Jurković J.[1], Raičević V.[2], Pešić M.[3], Sunulahpašić A.[4]

[1]University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina, [2]University of Belgrade, Faculty of agriculture, Belgrade - Zemun, Serbia, [3]Institute of soil science, Belgrade, Serbia, [4]Ministry of agriculture, water management and forestry of Central Bosnia Canton, Travnik, Bosnia and Herzegovina

Summary

Contemporary agricultural production is often linked with presence of pests, pathogens and weeds, which are responsible for significant crop loses. Because of importance of yield quantity and quality, herbicides were introduced to protect the crops from various weeds. However, the increased use of herbicides in agriculture has negative consequences for soil flora, fauna and microorganisms. The aim of this paper was to determinate the impact of herbicide Wing P (BASF) on microbial activity of soil under corn (Pioneer hybrid PR37NO1). The experiment was performed in Ilidža municipality (Sarajevo canton, Bosnia and Herzegovina) by sowing seeds in May 2016, followed by Wing P application in three concentrations (2; 4; and 8 l/ha). Control treatment was untreated soil.

Chemical and microbiological characterization of soil was performed 15; 30; and 130 days from herbicide treatment. Chemical properties of soil were performed using standard methodology. Total number of bacteria, ammonification and nitrogen fixation bacteria, *Azotobacter* sp., fungi and actinomycetes were determined by agar plate method.

The results of chemical analyses showed acid pH value, moderate humus content, and absence of carbonates. The soil is well provided with available phosphorus and potassium. Herbicide Wing P had no inhibitory effect on the activity of microbial population, except of actinomycetes and *Azotobacter* sp. These results suggest the possible adaptation of microbial population to various herbicide concentrations, which can be useful for further research of herbicide characteristics, as well as determination of adaptation period for microorganisms and its capability of herbicide degradation.

Key words: herbicide, microbial population, corn.

PHENOLOGICAL CHARACTERISTICS OF NEWLY INTRODUCED VARIETIES OF NECTARINES ("SUN GRAND", "CALDESI 2000" AND "VENUS") IN HERZEGOVINA

Hasanbegović J.[1], Aliman J.[1], Hadžiabulić S.[1], Džubur A.[1], Leto A.[1], Skender A.[2]

[1]University "Džemal Bijedić" Mostar, Agromediterranean Faculty, Bosnia and Herzegovina
[2]University of Bihać, Biotechnical Faculty, Bosnia and Herzegovina

Summary

The paper presents the results from a two-year long research on phenological characteristics of three newly introduced varieties of nectarines ("Sun Grand", "Caldesi 2000" and "Venus") in ecological conditions of Herzegovina (Mostar region). The research was conducted during 2014 and 2015 and included the identification of flowers types, flowering phenophases monitoring, energy flowering and ripening time. The rootstock for all genotypes is GF 677.

Rose-shape flower type was recorded at nectarine varieties "Sun Grand" and "Venus", while for the variety "Caldesi 2000" bell-shape flower type was recorded. The earliest beginning of flowering in both research years was recorded for "Sun Grand" variety, while the latest flowering was recorded for "Venus" variety. Beginning of flowering, as well as energy of flowering of nectarine varieties, varied in dependence to the year, so all the nectarine varieties had earlier beginning of flowering in 2014 with the longer flowering duration, comparing to 2015. The earliest fruit setting and fruit ripening was recorded for variety "Sun Grand", while the latest was recorded for the variety of "Venus". The shortest period from fruit setting to the rippening was recorded for the variety of "Sun Grand" (56,6 days), while the longest period was observed for the variety of "Venus" (76 days). When it comes to phenological characteristics, all the varieties showed the significant adaptility to agro-ecological conditions of Herzegovina and they may be recomended for comercial production.

Key words: nectarine, newly introduced varieties, flower type, flowering phenophases

POMEGRANATE IN TURKEY: A BRIEF OVERVIEW

Hepaksoy S.

Ege University, Faculty of Agriculture, Department of Horticulture İzmir, Turkey

Summary

Pomegranate (*Punica granatum* L.) is a characteristic species of the Mediterranean area whose use and culture have longstanding tradition. Especially in Mediterranean, Aegean and Southeastern Anatolia regions of Turkey, large scale cultivation of pomegranate has started in wide orchards, not as a boundary tree as in the past. The number of pomegranate orchards is increasing day by day. Not being too selective in terms of soil, pomegranate is highly sensitive to excessive irrigation. Pomegranate (*Punica granatum* L.) becomes more important in terms of fruit growing and foreign trade of Turkey in recent years. It is a fruit specie that grows in different climatic and soil conditions, is traded at a high price in domestic and foreign markets, and can be stored. Turkey is one of the main pomegranate producer countries in the world. It is possible grow pomegranates in all parts of Turkey except some regions. Turkeys' pomegranate production has reached 465.200 ton tons in 2016. The most important growing area of Turkey is the Mediterranean region. Aegean and Southeast Anatolia are other important regions of the country. In this review the production, exportation, diversity and growing of pomegranate in Turkey will be discussed.

Key words: Pomegranate, Punica granatum L., Turkey

EVALUATION OF PRODUCTION TRAITS AMONG HIGHBUSH BLUEBERRY CULTIVARS IN THE INTRODUCTION CENTER "BUTMIR", SARAJEVO

Hodžić A.[1], Kurtović M.[1], Vehabović M.[1], Gaši F.[1], Grahić J.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Fruit crops currently experiencing the largest expansion in Bosnia and Herzegovina, in terms of production, are berries, among which raspberry is the most dominant. However, in regards to commercial potential, highbush blueberry occupies a distinctive place. Although, highbush blueberry is currently cultivated on limited area in Bosnia and Herzegovina, it possess a significant growth trend. In this study, evaluation of several production traits among six highbush blueberry cultivar ('Northland', 'Bluecrop', 'Early Blue', 'Bluegold', 'Goldtraube' and 'Elliot') was carried out at the introduction center "Butmir", Sarajevo, during 2014 and 2015. The production traits, evaluated in this investigation are divided in morphological (length of shoots, number of vegetative buds, leaf length and width, number of flower clusters, number of flowers per cluster, number of developed fruits per cluster) and pomological (fruit weight, length and width). The results of the analyses revealed that 'Elliot' and 'Early Blue' possessed the highest values for all pomological traits, while 'Northland', 'Bluecrop' and 'Bluegold' gave the largest number of fruit per shoots. In regards to the growing season, the values obtained for the traits were higher in 2014 compared to 2015.

Key words: morphological traits, pomological characteristics

ANTHOCYANIN CONTENT IN BILBERRY (*Vaccinium myrtillus* L.) FRUIT FROM THREE POPULATIONS IN BOSNIA AND HERZEGOVINA

Hodžić A.[1], Vranac A.[1], Kurtović M.[1], Grahić J.[1], Memić S.[1], Gaši F.[1]

[1]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Bilberry (*Vaccinium myrtillus* L.) naturally grows at higher altitude on almost all mountains in Bosnia and Herzegovina. Notable populations of this species are located on the Konjuh mountain (north-eastern Bosnia), near Srebrenica (eastern Bosnia) and surrounding the town of Fojnica (central Bosnia and Herzegovina). In these regions, bilberry fruits are traditionally collected from natural populations and used either fresh or processed. Bilberry represents one of the richest natural sources of anthocyanins, which among other things give the berry its specific colour. These bioactive components have a proven health-promoting and anti-inflammatory properties, making them very attractive to consumers, as well as food and pharmaceutical industry. Although anthocyanin content of bilberry fruits has been investigated among populations of this species in central Bosnia and Herzegovina, analysing geographically dispersed populations would allow for a more thorough evaluation. In this study, anthocyanin content of bilberry fruit collected from three populations from north-eastern, eastern and central Bosnia and Herzegovina, during 2015 and 2016, was investigated. ANOVA revealed that both the population and the season had a significant effect on the examined trait, as did the interaction of these factors. A post-hoc test only revealed a significant difference in anthocyanin content of bilberry fruit collected from north-eastern and eastern Bosnia and Herzegovina. A genetic analyses of all three populations as well as of their habitats, which is currently ongoing, might shed light on the results obtained in this study.

Key words: evaluation, berry fruit, geographical dispersion

FIRST EXPERIENCE WITH SOME NEW FLAT PEACH AND NECTARINE CULTIVARS

Hudina M.

University of Ljubljana, Biotechnical Faculty, Department of Agronomy, Ljubljana, Slovenia, E-mail: metka.hudina@bf.uni-lj.si

Summary

15 new flat peach and nectarine cultivars were planted in March 2012 (yellow flesh flat peach cultivars: Plane Gem, Plane Top, Plane Sun, Plane Gold, Ornella, Oriane, Ordigan; white flesh flat peach cultivars: Ufo 3, Ufo 4, Platifirst, Early Sandwich, Platicarpa Bianca, Platibell, Platifun; yellow flesh flat nectarine cultivar: Platimoon) and compared to standard peach cultivars Norman and Veteran. Trees were grafted on GF 677 rootstock, growing spindle, at planting distance of 4 x 2 m. For each cultivar 12 plants (3 x 4) were planted. Flowering and harvest date, number of fruits/tree, yield per tree and hectare, fruit dimension and organoleptic grade were observed. In 2013 we already had the first crop. The highest yield had cvs. Ufo 4 (2.4 t/ha) and Ufo 3 (2.1 t/ha). Flat peach cultivar Oriane and standard peach cultivars Veteran and Norman didn't have yield in 2013 yet. The highest yield in 2014 had cvs. Ufo 4 and Plane Sun (18.7 t/ha and 15.9 t/ha), folowed by Ufo 3 (14.2 t/ha) and Plane Gem (13.7 t/ha). Standard peach cultivars Veteran and Norman didn't have yield also in 2014 yet. The highest yield in 2015 had standard cultivar Veteran (20.1 t/ha), followed by cvs. Plane Gold and Platicarpa Bianca (18.2 t/ha and 16.4 t/ha), Ufo 3 (11.6 t/ha) and Ufo 4 (10.8 t/ha). In 2016 the highest yield had standard cultivar Veteran (35.3 t/ha). The yield higher than 20 t/ha had cvs. Plane Gold (26.4 t/ha), Oriane (24.5 t/ha) and Plane Top (22.6 t/ha). Less than 10 t/ha had cvs. Platifirst, Platifun and Platimoon. Other cultivars had a yield of between 10 and 20 t/ha. The best value of the fruit (excellent) was given to cultivars Ufo 4, Platicarpa Bianca, Platimoon, Platifun and Platibell.

Key words: flat peach, flat nectarine, cultivar testing, yield, pomological characteristics

LEAF DISEASES OCCURRING ON BARLEY AND WHEAT FIELDS IN ÇUBUK DISTRICT OF ANKARA, TURKEY

İlgen, M. Z.[1], Karakaya, A.[2], Çelik Oğuz, A.[2]

[1]Ministry of Food, Agriculture and Livestock, Directorate of Çubuk District of Food, Agriculture and Livestock, Çubuk, Ankara, Turkey
[2]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, 06110, Turkey

Summary

Leaf diseases occurring on barley and wheat fields in Çubuk district of Ankara, Turkey were determined. Eighteen barley fields and 17 wheat fields were inspected for the leaf diseases in 2016. In barley fields, diseases caused by *Drechslera teres* f. *maculata*, *Drechslera teres* f. *teres*, *Drechslera graminea*, *Rhynchosporium commune*, *Blumeria graminis* f. sp. *hordei*, *Puccinia striiformis*, *Puccinia hordei* and *Puccinia graminis* f. sp. *tritici* were found. In wheat fields, diseases caused by *Puccinia striiformis*, *Puccinia recondita* f. sp. *tritici*, *Puccinia graminis* f. sp. *tritici*, *Septoria tritici* and *Pyrenophora tritici-repentis* were found. Prevalence and severity of these diseases were also recorded.

Key words: Barley diseases, wheat diseases, Çubuk, Ankara, Turkey

FIRST REPORT OF *Cucumber mosaic virus* IN GARLIC MUSTARD IN BOSNIA AND HERZEGOVINA

Jerković-Mujkić A., Čaušević S., Ćerimović A., Bešta-Gajević R.

Faculty of Science, University of Sarajevo, Bosnia and Herzegovina

Summary

In spring 2016, many garlic mustard (*Alliaria petiolata* (M. Bieb.) Cavara & Grande) weed plants with virus-like symptoms consisting of leaf mosaic and stunting were found on several locations in Sarajevo area. The same symptoms are seen on garlic mustard in previous years at this locations.
Symptomatic leaves were used for mechanical transmission to test plants: *Cucumis sativus* L. `Cornichon`, *Cucurbita pepo* L. `Greyzini`, *Capsicum annuum* `Sirvija`, *Nicotiana rustica* L. and *Phaseolus vulgaris* L. `Top Crop`. Transmission of virus isolate from infected to healthy test plants was conducted by healthy aphids *Myzus persicae* Sulzer and Aphis (Hemiptera: Aphididae). Reactions of inoculated test plants indicated infection of garlic mustard with cucumber mosaic virus (CMV). Naturally infected *A. petiolata* plants and mechanically infected test plants were ELISA-tested to verify CMV infection using commercial detection kits.
Results of our investigation confirmed the presence of CMV in infected garlic mustard. This finding indicate that *A. petiolata* could serve as natural reservoir of CMV infection from which this economically important virus can spread to the other wild and cultivated plants.

Key words: garlic mustard, cucumber mosaic virus, ELISA, reservoir

DETECTION AND MOLECULAR CHARACTERIZATON OF PLUM POX VIRUS ISOLATES IN PEACH ORCHARDS IN SERBIA

Jevremović D.[1], Paunović S.[1]

[1]Fruit Research Institute, Čačak, Serbia

Summary

Sharka disease, caused by *Plum pox virus* (PPV) is considered one of the most detrimental viral diseases of stone fruits. Three major (PPV-M, -D and -Rec) out of nine recognized strains are present in Serbia. The first PPV infected peach tree in Serbia was detected in 1984 in north-east part of the country close to Hungarian border. To access the PPV diversity in peach orchards a total of 87 symptomatic and asymptomatic leaf samples from 36 orchards located in 15 distinct sites were collected and analyzed. Samples were tested by Immunocapture-reverse transcription-polymerase chain reaction (IC-RT-PCR) using strain-specific primers targeting C-ter NIb–N-ter CP and CIP genomic regions. PCR products were analyzed by electrophoresis in 1.5% agarose gel, stained with ethidium-bromide and visualized under UV light. As a result, 78 samples were found to be infected with PPV. In single infections, PPV-M strain was detected in 73 samples, and PPV-D in 2 samples. Mixed infections (PPV-M+PPV-D) were confirmed in 3 analyzed samples. Not a single tree infected with PPV-Rec was found in peach orchards, even in localities with high inoculum pressure. The partial nucleotide (nt) sequence of the C-ter NIb–N-ter CP was determined for 10 isolates from 8 localities. The nt and deduced amino acid sequences of the isolates were 97.9−99.6% and 97.8−100% identical, respectively. Presented results indicate a strong association between PPV-M and peach in Serbia and low genetic variability among analyzed isolates.

Key words: Plum pox virus, Peach, IC-RT-PCR

GENETIC RESOURCES OF MAIZE (*Zea mays* L.) IN MONTENEGRO

Jovović Z.[1], Pržulj N.[2], Mandić D.[3], Velimirović A.[1], Gadžo D.[4]

[1]University of Montenegro, Biotechnical faculty Podgorica, Montenegro
[2]University of Banja Luka, Faculty of agriculture in Banja Luka, Bosnia and Herzegovina
[3]Agricultural Institute of Republika Srpska, Banja Luka, Bosnia and Herzegovina
[4]University of Sarajevo, Faculty of Agriculture and Food Sciences, Sarajevo, Bosnia and Herzegovina

Summary

Maize, wheat and rice are three major crops in the world. Maize in particular, has enormous economic importance deriving from its use versatility, high productivity and production capacity. Among all grains, maize has the highest genetic yielding potential.

It is believed that domestication of maize began about 9000 years ago in Central America. Columbus brought it in Europe after the discovery of America. Maize arrived in Montenegro in first half of the 16th century, same period as in other Balkan countries and countries in Danube basin. First maize varieties in Montenegro were mostly flint corn varieties. For more than 400 years of cultivation, as a result of mutation, recombination and natural selection, introduced varieties differentiated in a number of local ecotypes of flint corn, characterised with exceptional earliness, good adaptability to local agro-climatic conditions and day length and high content of proteins. Due to mentioned characteristics, as well as excellent genetic purity, Montenegrin flint corn varieties are considered valuable source of genes in the selection of high-quality early hybrids.

There are 68 corn accessions currently stored in Montenegrin Plant Genetic Bank. Majority of these accessions belong to Montenegrin flint corn types with high genetic purity, while fewer are dent and half-dent type, resulting from their cultivation in the vicinity of modern varieties. Unfortunately, these accessions were poorly studied resulting in hampered access to this material. In order to make this precious resource available to all those who express their interest for it, it will be necessary to begin activities on its morphological and molecular identification as soon as possible, and provide as much information about its use-value.

Keywords: maize, genetic resources, local population, accessions

IDENTIFYING A CORE COLLECTION AMONG TWO MAJOR APPLE EX SITU COLLECTIONS IN BOSNIA AND HERZEGOVINA

Kanlić K.[1], Hodžić A.[2], Grahić J.[2], Memić S., Gaši F.[2]

[1]Public enterprise "Bosansko Podrinjske Sume", Goražde, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

Ex situ field collections represent the most secure approach to capturing and sustainably maintaining fruit genetic diversity. A thorough national inventory yields candidate accessions which are then grafted and planted within a main collection and usually a back-up collection, which is needed to ensure against the irreversible loss of diversity which might occur if something catastrophic happens to the main collection. The process of capturing apple genetic diversity in Bosnia and Herzegovina, driven by enthusiast, was not as methodical in its approach and resulted in the establishment of an ex situ collection in the fruit nursery "Srebrenik", which although well maintained, did not encompasses much of the traditional apple germplasm present in Bosnia and Herzegovina. One of the regions which was severely underrepresented was eastern Bosnia. In order to compensate for this a new collection, containing genotypes absent from the "Srebrenik" collection, was established in Goražde. All apple accessions in both collections have been genetically characterized using microsatellite markers, which enable the identification of synonyms and homonyms between the collections, thus allowing the exclusion of all redundancies. Although, the process of identifying new apple genotypes of interest in Bosnia and Herzegovina is very important for capturing the maximal available diversity, the large size of ever-growing collections might in fact hinder the potential utilization of the conserved resource. In order to avoid this scenario, in this study we used the available microsatellite data to identify a virtual core collection of apple genetic resources among two major apple *ex situ* collections in Bosnia and Herzegovina. The identified accessions will be included in a back-up collection.

Key words: Microsatellites, Back-up collection, apple germplasm

DETERMINATION OF THE REACTIONS OF IRANIAN BARLEY LANDRACE POPULATIONS TO FOLIAR DISEASES UNDER FIELD CONDITIONS

Karakaya, A.[1], Çelik Oğuz, A.[1], Aydoğdu, S.[2], Rahimi, A.[3]

[1]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey
[2]Central Research Institute for Field Crops, Yenimahalle, Ankara, Turkey
[3]Urmia University, Faculty of Agriculture, Department of Agronomy, Urmia, West Azerbaijan, Iran

Summary

Twenty two barley landrace populations obtained from different regions of northwest Iran were evaluated for their resistance status to foliar diseases under field conditions in Ankara, Turkey. Landrace populations exhibited differences in terms of disease resistance. Scald caused by *Rhynchosporium commune,* yellow rust caused by *Puccinia striiformis* and leaf rust caused by *Puccinia hordei* were the most common diseases affecting barley landrace populations. Net form of net blotch caused by *Drechslera teres* f. *teres* was present in 6 populations. The percentage of diseased plants ranged between 5%-57.1% among these populations. Scald caused by *Rhynchosporium commune* was present in all 22 populations examined. The percentage of diseased plants ranged between 57.1%-100% among these populations. In eight populations all plants were found infected with *R. commune*. Yellow rust caused by *Puccinia striiformis* was present in 21 populations. The percentage of diseased plants ranged between 4.7%-100% among these populations. Leaf rust caused by *Puccinia hordei* was present in 21 populations. The percentage of diseased plants ranged between 10.5%-85.7% among these populations. Stem rust caused by *Puccinia graminis* was present in 4 populations. The percentage of diseased plants ranged between 4.1%-15.7% among these populations. Powdery mildew caused by *Blumeria graminis* f. sp. *hordei* was present in one population. The percentage of diseased plants was 38% in this population. Severity of these diseases was assessed with a 1-9 scale. Severity values for net blotch, scald, powdery mildew and rust diseases ranged between 1-9, 1-9, 3-7 and 5-9, respectively.

Key words: Barley landraces, foliar diseases, disease resistance

RESPONSE OF IRANIAN BARLEY LANDRACES TO *Drechslera graminea*

Karakaya, A.[1], Çelik Oğuz, A.[1], Rahimi, A.[2]

[1]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey
[2]Urmia University, Faculty of Agriculture, Department of Agronomy, Urmia, West Azerbaijan, Iran

Summary

Barley (*Hordeum vulgare* L.) landraces are good source of disease resistance. In this study, twenty-five Iranian barley landraces obtained from different regions of northwest Iran were evaluated for their resistance status using 3 single spore isolates of *Drechslera graminea,* the causal agent of the barley stripe disease. Virulence differences among the isolates were observed. Kayseri isolate was the most virulent isolate. One, five and six landraces showed resistant reactions to Kayseri, Eskişehir and Ankara isolates, respectively. Six, eleven and eleven landraces showed intermediate reactions to Kayseri, Eskişehir and Ankara isolates, respectively. Landraces #9 and #21 showed resistant responses to two isolates and showed intermediate response to one isolate. Landraces #3 and #22 showed resistant reactions to one isolate and showed intermediate reactions to two isolates. Landraces #7 and #11 showed intermediate responses to all isolates. Landraces that showed resistant and/or intermediate reactions could be integrated into barley breeding programs.

Key words: Barley stripe, Drechslera graminea, Pyrenophora graminea, barley landraces, disease resistance

MOLECULAR DETECTION AND CHARACTERIZATION OF NEW EMERGING VIRUSES BY PCR ANALYSIS IN HATAY AND TEKIRDAĞ VINEYARDS IN TURKEY

Kocabağ, H. D., Gazel, M., Çağlayan, K.

Mustafa Kemal University, Turkey

Summary

The improvements on the next generation sequencing or high-trough output technologies allowed the discovery of several unknown viruses in plants and also in grapevines. A new emerging grapevine disease identified as *Grapevine pinot gris virus* (GPGV), *Grapevine syrah virus 1* (GSyV-1), *Grapevine red blotch-associated virus* (GRBaV) and *Grapevine roditis leaf discoloration virus* (GRLDaV). The aim of the present study was to investigate the occurrence and characterization of these viruses in Tekirdağ and Hatay viticulture production areas by PCR and DNA sequencing analysis. Totally 191 and 111 grapevine samples showing virus-like symptoms were collected from Tekirdağ and Hatay provinces, respectively. Among the tested samples GPGV and GSyV-1 were detected in both local and imported cultivars by the infection rate of 43,62% and 17,07% in Tekirdağ, respectively. In Hatay provice, only GSyV-1 was detected by the infection rate of 11% and all tested samples were found negative for GPGV, GRBaV, GRLDaV. RT-PCR results showed that DNA fragments of 411 bp, 302 bp and 618 bp corresponding to the part of the coat protein (CP) gene, part of the movement protein gene (MP) and 5' UTR and the N-terminus of the replicase gene of GPGV were successfully amplified in Tekirdağ samples, respectively. All PCR products of GPGV were directly sequenced on both strands. All the nucleotide sequences of CP, MP and 5' UTR and N-terminus of replicase genes shared the highest sequence identity with different GPGV isolates deposited in genbank.

Key words: Vitis vinifera, GPGV, GSyV-1, GRBaV, Turkey

A STUDY ON POPULATION DEVELOMENT AND DAMAGE OF OLIVE LEAF MOTH, *Palpita unionalis* (Hübner) (Lepidoptera: Pyralidae) IN OLIVE ORCHARDS IN ANTALYA PROVINCE OF TURKEY

Koçak M., Can Cengiz F.

Mustafa Kemal University, Faculty of Agriculture, Department of Plant Protection, Hatay, Turkey

Summary

Along with many pests species on olives, olive leaf moth, *Palpita unionalis* (Hübner) (Lepidoptera: Pyralidae), is one of the most significant pests, particularly feeding on fresh shoots, leaves and fruits of young and vaccinated gardens. However, there are not many studies done with this pest in Turkey. The surveys were carried out diffent olive orchards and its damages were observed on the leaves, shoots and foliage of the trees the olives in Kaş district. The first study was conducted in 2013-2014 to determine population development of olive leaf moth on olive gardens in Üzümlü, İslamlar and Gelemiş villages in Kaş ditrict of Antalya province in Western Mediterranean Region of Turkey. The light traps for catching adults and daytime visual control method for pre-pubertal periods (larvae and pupae) were used in the study. The pest was found in all sampled olives orchards, observed two generations a year and highest population density of it on olive garden of Üzümlü village.

Key words: Olive, leaf moth, Western Mediterranean Region, pest, Turkey

HYDROXYCINNAMIC ACIDS PROFILE OF SWEET CHERRIE FRUITS (*Prunus avium* L.) INFECTED WITH *Monilinia laxa*

Malenčić Đ.[1], Kiprovski B.[2], Borković B.[1], Prvulović D.[1], Mikulič-Petkovšek M.[3], Veberič R.[3]

[1]Faculty of Agriculture, University of Novi Sad, Novi Sad, Serbia
[2]Institute of field and vegetable crops, Novi Sad, Novi Sad, Serbia
[3]Biotechnical faculty, University of Ljubljana, Ljubljana, Slovenia

Summary

The main objective of this study was to select sweet cherrie cultivars for orchard production and potential breeding and selection, using phenolic parameters of importance to fungal attack induced oxidative stress. We investigated the content of the hydroxycinnamic acid derivatives (neochlorogenic acid, chlorogenic acid, dicaffeoyl-quinic acid, 3-coumaroylquinic acid, 4-coumaroylquinic acid and 3-feruloylquinic acid) in the fruits of nine sweet cherrie cultivars, naturally infected with *Monilinia laxa*. The experimental trees were grown under field conditions in the orchard of the Department of Fruit growing and Viticulture, Faculty of Agriculture, near Novi Sad (Vojvodina-Serbia). Fruit powder, 0.3 g, were extracted with 5 ml MeOH containing 1% (w/v) 2,6-di-tert-butyl-4-methyl phenol (BHT). Determination of individual compounds was performed using HPLC-DAD analysis, on a Thermo Finnigan Surveyor HPLC system with a diode array detector at 280 nm, on a Gemini C_{18} (150x4.6 mm) column. The elution solvents were aqueous 0.1% formic acid in twice distilled water (A) and 0.1% formic acid in acetonitrile (B).
Results showed that the increase in neochlorogenic acid in investigated cultivars occurred only in two of them (Lyon and 3/VAL). This accumulation was especially pronounced in 3/VAL cultivar, ranging from 1.116 mg/kg of neochlorogenic acid in dried healthy fruits, up to 1.947 mg/kg in dried infected fruits. Also, the content of chlorogenic acid, dicaffeoyl-quinic acid, 3-coumaroylquinic acid and 4-coumaroylquinic acids significantly increased only in this cultivar.
Altghough there is no absolute tolerance in sweet cherries to *Monilinia laxa*, on the basis of our results it can be concluded that cultivars such as 3/VAL and Lyon accumulate higher content of hydroxycinnamic acid derivatives, thus expressing increased stress tolerance to phytopathogenic fungal attack. These genotypes could be used in field production as well as for breeding and selection programmes.

Key words: Prunus avium, Monilinia laxa, phenolic acids, oxidative stress

BIOCHEMICAL FRUIT COMPOSITION OF AUTOCHTHONOUS PEAR CULTIVARS FROM BOSNIA AND HERZEGOVINA

Memić S.[1], Vranac A.[2], Drkenda P.[2], Akagić A.[2], Musić O.[2]

[1]BCC Management d.o.o. Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences University of Sarajevo, Bosnia and Herzegovina

Summary

The evaluation of fruit biochemical composition of 10 pear cultivars was conducted over two growing seasons. The study included 9 autochthonous pear cultivars and Druard as commercial cultivar. The experiment was conducted in ex-situ collection located in Srebrenik (north-eastern Bosnia and Herzegovina). Fruits of similar ripeness stage were analyzed in terms of biochemical parameters (total soluble solids, titratable acidity, index of sweetness and total phenolics). The pear cultivars as well as growing season had considerable influences on all observed fruit parameters. Based on the statistical analysis the autochthonous cultivars Dolokrahan and Krakaca had the greatest mean value of total soluble solids. The cultivar Krakaca had the greatest value of titratable acidity, but the lowest value of sweetness index. The cultivars Takisa and Budaljaca achieved the greatest index of sweetness. Regarding the total amount of phenol compounds the cultivar Dolokrahan reached the greatest average content of phenol compounds. In this study were achieved high correlation coefficients with significant differences between the total soluble solids and total amount of phenol compounds (r=+0.67), as well as between the titratable acidity and index of sweetness (r=-0.78). The results of this study indicate diversity of autochthonous pear cultivars in Bosnia and Herzegovina related to biochemical composition of fruits. According to our results it could be recommend the use of cultivars Takiša, Budaljača and Dolokrahan as good raw material in manufacturing of jams and marmalades, but the cultivar Krakaca could be use for juice production.

Key words: biochemical composition, autochthonous, pear, cultivars

EFFECT OF PLANT GROWTH-PROMOTING RHIZOBACTERIA ON THE GROWTH AND YIELD OF STRAWBERRY (*Fragaria x ananassa* 'Joly') IN ORGANIC FARMING

Mihálka V., Hüvely A., Pető J., Király I.

Neumann János University, Faculty of Horticulture and Rural development, Hungary

Summary

There are many microbial fertilizers available on the market, but only a few studies evaluating the long-term effect and efficiency of such products are published.
Therefore, a three-year experiment was started in March 2016, at the experimental garden of Pallasz Athéné University, Faculty of Horticulture and Rural Development (Kecskemét, Hungary) studying the effect of a microbial fertilizer on the growth, yield, leaf macro- and micronutrient content of strawberry in organic farming on sandy soil.
Fragaria x ananassa 'Joly' plants were planted on the 25th of March 2016, with a planting density of 70+40*30 cm. Before planting, one plot was treated with microbial fertilizer -containing 7 different PGPR species- while the other was left untreated (control). Treatment was repeated in March 2017.
Ripened fruits were harvested and the average size and weight of the fruits, number of fruits, total yield/plant and size of leaf area were determined. Data were analyzed using SPSS Statistics 23.0. Though in the year of planting (2016) we did not expect yet remarkable differences, plants grown on the field inoculated with biofertilizer had significantly larger leaf area -based on the results of ANOVA- compared to control.
Results of soil tests showed, that organic matter content and macro- and microelement content of soil increased from 2016 to 2017, but only minor differences were found in the treated soil, compared to control. Collection of second year's data on plant growth and yield, leaf-nutrient analysis, and evaluation of 2017 results are in progress.

Key words: Plant Growth Promoting Rhizobacteria (PGPR), microbial inoculants, biofertilizer, Fragaria x ananassa, organic farming

MORPHOLOGICAL AND POMOLOGICAL CHARACTERISTICS OF PRIMOCANE RASPBERRY CULTIVAR IN AGRO ECOLOGICAL CONDITION OF SARAJEVO

Musić O., Drkenda P., Kurtović M., S. Memić, F. Behmen

Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina

Summary

The study was carried out during the period 2010-2011 at the experimental field of the Faculty of Agriculture and Food Sciences, Sarajevo located in Butmir. The experimental orchard was established in 2010, with a planting distance 2,8 x 0,3 m. The aim of this study is to evaluate and compare three primocane cultivars ('Polka', 'Polana' and 'Autumn Bliss'). The following characteristics were investigated: final cane height (cm), trend of growth, total number of nodes, length of internodes (cm), number of fruiting nodes, fruit weight (g), fruit length (mm), fruit width (mm), fruit shape and the content of total soluble solid (° Brix). In the both experimental years cultivar 'Polka' were the tallest and most vigorous (97,55 cm in 2010, and 165 cm in 2011), in comparison with the other observed cultivars. Cultivar 'Autumn Bliss' had the largest number of nodes (32,85), as well as the number of fruiting nodes (16,94). Cultivar 'Polka' had the significantly largest fruit weight (4,63 g), and the lowest had the cultivar 'Polana' (3,62 g).
According to most of the studied parameters the cultivar with best properties from this field were 'Polka', and it could be recommended for further growing for commercial raspberry production in agro ecological condition of Sarajevo.

Key words: primocane raspberry, cultivar, experimental years, Sarajevo,

MORPHOLOGICAL CHARACTERISTICS OF SOME ORGANS AND DISEASE RESISTANCE IN OBLAČINSKA SOUR CHERRY CLONES (*Prunus cerasus* L.)

Nikolić, D.[1], Rakonjac, V.[1], Milatović, D.[1], Fotirić-Akšić, M.[1], Trajković, J.[2]

[1]University o*f* Belgrade, Faculty of Agriculture, Belgrade-Zemun, Serbia
[2]College of Agriculture and Food Technology, Prokuplje, Serbia

Summary

In the period from 2010 to 2012 morphological characteristics of some organs and disease resistance in 13 Oblačinska sour cherry clones (*Prunus cerasus* L.) were studied. The morphological characteristics were determined by evaluating on the basis of the Descriptor for sour cherry, and the disease resistance was evaluated visually in terms of the natural infection according to a scale of 1 to 9. It has been found that the tree vigor of investigated clones were very weak, weak, and medium. The tree habit was upright in six tested clones, while it was semi-upright in the other seven clones. Five tested clones had a medium tree branching pattern, whereas a strong tree branching pattern was observed in eight clones. Two investigated clones had medium coloration and 11 clones had strong anthocyanin coloration of the young shoot tip. Of the 13 examined clones, only one – clone 3 had nectaries present on the leaf petiole, and their color was orange-yellow. This clone in comparison with the others had a lighter skin fruit color, as well as a lighter juice and flesh color of fruit, suggesting that it represents a unique genotype in relationship to the mentioned characteristics. All tested clones had a round shape of flower petals, reniform fruit shape, soft fruit firmness and round stone shape. The majority of the investigated clones showed high resistance to diseases (*Wilsonomyces carpophylus*, *Blumeriella jaapii* and *Monilinia fructigena*). Based on the results of hierarchical cluster analysis, according to the values of Euklidean distance, all tested clones were classified into three groups of related genotypes. The first and second groups included 6 clones each, while the third group comprised only one clone – clone 3.

Key words: Oblačinska sour cherry, variability of traits, disease resistance, cluster analysis.

PLANT PROTECTION PRACTICES IN ORGANIC VEGETABLE PRODUCTION IN ANKARA PROVINCE, TURKEY

Özkan, C.[1], Sözeri V.[2], Sözeri, Z.[2], Tatlı Ş.[3]

[1]University of Ankara, Faculty of Agriculture, Department Plant Protection, Dışkapı, Ankara, Turkey
[2]Sözeri Organic Farming, Cücük Köyü- Akyurt, Ankara, Turkey
[3]Kırıkkale University, Kırıkkale Vocational School, Plant and Animal Production Department, Organic Agriculture Program, Kırıkkale, Turkey

Summary

This is the multi-year project to develop organic vegetable programs in Ankara Province between the years 2001 and 2017**.** Studies were performed at three different localities. Studies regarding organically grown vegetables were carried out in field and greenhouse conditions. Organic vegetable studies were accomplished in summer and winter seasons. Mix planting systems were used in order to decrease risks of some pest and disease problems. From seedling to harvest, no synthetic substances (e.g. fertilizers, pesticides, pharmaceuticals) were used. In plant protection applications, priority was given to cultural practices and biological control. When needed, botanical insecticides were also used for the pests. As a cultural practice greenhouse windows were covered with plastic tulle to prevent from external pests, increase the efficiency of biological control agents, and use of *Bombus* wasp for pollination. Additionally, different planting dates were employed for escaping from some disease damages. Traps were used for monitoring insect pests and mass trapping. Biological Control is an effective control method in organic agriculture. Coccinelid population was naturally occurred on weeds. These predators were supported with the use of sugar solution (Conservation). When needed, the adults and larvae of the predators were collected, and released to greenhouse for controlling aphids, mites whiteflies. Egg parasitoids (*Trichogramma* spp.) were reared under laboratory conditions on eggs of The Mediterranean flour moth, *Ephestia kuehniella* (Augmentation). When needed, adult parasitoids were released to greenhouse for controlling lepidopteran pests. An egg-larval parasitoid *Chelonus oculator* was reared under laboratory conditions on Almond Moth, *Ephestia cautella* (Augmentation). When needed, adult parasitoids were released to greenhouse for controlling lepidopteran pests. Hot pepper (% 0.3), garlic (% 0.03), tobacco (% 5) and soft soap (% 5) extracts were used to common pests. The results indicate that organically plant protection applications leads to the establishment of natural equilibrium and to the reduction of plant protection problems.

Key words: Vegetable, organic growing, plant protection, Ankara, Turkey.

EVALUATION OF SOME AGRONOMIC PROPERTIES OF IRANIAN BARLEY LANDRACES UNDER GREENHOUSE CONDITIONS

Rahimi, A.[1], Karakaya, A.[2], Çelik Oğuz, A.[2]

[1]Urmia University, Faculty of Agriculture, Department of Agronomy, Urmia, West Azerbaijan, Iran
[2]Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, Turkey

Summary

Some agronomic properties of Iranian barley landraces were evaluated using pot experiments under greenhouse conditions. Different seeds of landraces obtained from different regions of northwest Iran were evaluated for their plant height, number of tillers and length of the spikes. Seeds included 2 and 6 rowed landraces and yellow to tan and dark colored kernels. Plant height values of the landraces were between 48 and 93 cm. Number of tillers were between 1 and 18. Length of the spikes ranged between 4-10 cm. This variation shows the rich genetic potential of Iranian barley landraces.

Key words: Barley landraces, Iran, genetic variation

ECONOMIC ASSESSMENT OF INVESTMENTS IN DWARF EVERLAST PRODUCTION IN RELATION TO DIFFERENT PRODUCTION CHARACTERISTICS OF SOIL

Ramić E.[1], Salčinović A.[2]

[1]Univerzitet "Džemal Bijedić" Agromediteranski fakultet Mostar
[2]Federalni zavod za agropedologiju

Summary

Based on the different types and characteristics of soli suitable for plantation of dwarf everlast (*Helichrysum italicum*) there were studied production and economic indicators which are characterized by numerous specifics and by various financial inputs as final outcome. Calculative value of dwarf everlast cultivation is established with investment and production costs, so that achieved profits represent the input parameters for the financial aspects of dwarf everlast on soils with different production characteristics. For economic analysis of dwarf everlast cultivation in different production conditions, there are necessary relevant information that may be a realistic option for the production praxis of submediterian Herzegowina. In the labor are used: the method of different molding, sensitivity analysis and economic analysis of the basic measure of business success, efficiency and profitability. An analysis of investments in the cultivation of dwarf everlast in different rating soil categories shows, that the investment is economically viable and financially feasible, assuming achieve the expected yield and successful sale of essential oil of dwarft everlast.

Key words: dwarf everlast, economical, profitability, soli categories

EVALUATION OF PROMISING GRAPEVINE HYBRIDS FROM CROSSING COMBINATION Muscat Hamburg x Seedling 108

Ranković-Vasić Z., Sivčev B., Matijašević S., Nikolić D.

University of Belgrade, Faculty of Agriculture, Belgrade-Zemun, Serbia

Summary

The important production traits of two promising grapevine hybrids (19293 and 19295) intended for fresh consumption were investigated in this paper. The investigated hybrids were obtained from crossing combination Muscat Hamburg x Seedling 108. Both hybrids have a very pronounced dark skin color and characteristic flavor. All features of hybrids were compared with the standard cultivar (Muscat Hamburg). At the selected hybrids and standard cultivar the ripening time, grape yield per vine, bunch characteristics (bunch weight, bunch length, bunch width, and number of berries in the bunch), the properties of the berries (berry weight, berry length and berry width), as well as the traits of grape quality (sugar and total acids content in the must, and anthocyanins content in berry skin) were studied. The obtained data were processed by the Analysis of Variance (ANOVA), and the individual testing of differences between each hybrids and standard cultivar was performed using Dunnett's test for significance levels of $P < 0.05$ and $P < 0.01$. It was found that the hybrid 19293 ripens earlier (16.09.), and the hybrid 19295 later (22.09.) compared to the standard cultivar whose ripening time was 18.09. Hybrid 19293 showed a higher grape yield per vine (5.5 kg) as compared to the standard cultivar (4.24 kg). Analysis of Variance showed that for bunch weight, bunch length, number of berries in the bunch, berry weight, berry length and berry width significant differences between the tested hybrids and the standard cultivar were determined. Both hybrids were manifested a lower sugar content, but a higher total acids content in the must than Muscat Hamburg cultivar. The high content of anthocyanins in the berry skin showed a hybrid 19293 (1.42 mg), in which the established values for that feature were more from hybrid of 19295 (0.90 mg) and from Muscat Hamburg cultivar (0.51 mg). The tested hybrids showed satisfactory results in relationship to the standard cultivar so they are recommended for recognition as a new cultivars and further breeding work.

Key words: grapevine, hybrid, breeding, grape quality.

EXAMINING THE PHYTOACCUMULATION POTENTIAL OF SOME PLANTS FOR CERTAIN HEAVY METALS AS A MEASURE OF SUCCESSFUL REMEDATION OF CONTAMINATED SOIL

Salčinović A.[1], Ramić E.[2]

[1]Federalni zavod za agropedologiju
[2]Univerzitet "Džemal Bijedić" Agromediteranski fakultet Mostar

Summary

In this study we have investigated the possibility of using plant spacies: nettle (*Urtica dioica*), spelt (*Triticum spelta*), spinach (*Spinacea oleracea*), phacelia (*Phacelia tanacetifolia*) and buckwheat (*Fagopyrum esculentum*), for the remediation of flooded land of basin of river Bosnia and Spreča which is more or less contaminated with heavy metals: cadmium - Cd and lead - Pb.

The aim of the research was to determine which mentioned plant species and which of their plant organs are most accumulated with lead (Pb) and cadmium (Cd) on flooded land and whether it is worthwhile technology for remediation of heavy metals that could be used in biomonitoring of soil. In plants and soil samples were found concentrations of lead (Pb) and cadmium (Cd) higher then allowable, as a result of anthropogenic redistribution caused by the flood wave of the river Spreča and Bosnia and excessive emissions from metallurgical and thermal power plant. The results confirmed the hypothesis that some plant species show a high coefficient of phytoaccumulation potential.

The highest content of lead (Pb) in the root (2.07 mg / kg) and in above-ground parts (2.64 mg / kg) was found in spinach, and the lowest total content was found in spelt (1.81 mg / kg).

The contents of cadmium (Cd) in the root and in aboveground parts (1.22 mg / kg) was found in spinach, and the lowest was found in buckwheat (0.22 mg / kg). Presented results of these studies, especially interaction effects of the investigated metals and plants species, have exact significance for the improvement of methods of phytoremediation.

Key words: contaminated soil, plant species, heavy metals, phytoremediation

TENDENCY OF DOMESTIC AND DOMESTICATED VARIETIES OF PEARS TO PARTHENOCARPY

Salkić E.[1], Salkić A.[1], Salkić B.[1], Imširović E.[1], Keran H.[1]

Tehnological faculty, Agronomy, Plant production,
Tuzla, Bosnia and Herzegovina

Summary

Parthenocarpy is a phenomenon of development of fruit without fertilization, which means that the fruits do not have seed or seed has no embryo. A small number of fruit species form parthenocarphic fruits. We encountered this kind of fruits in bananas, some citrus, pear, apple and other species, but this has no economic significance.
Some varieties of pears show a genetic predisposition to parthenocarpy. The pears varieties do not show the same tendency towards the parthernocarpy, so the intensity of the appearance of the parthenocarpy in the same variety varies in certain years, and in some years it can completely disappear. The classification of the pear varieties according to the intensity of the parthenocarpy was done on the basis of my own research.
The paper analyzes the structure of the seed of domestic and indigenous pears with the purpose of inspecting the production of fruits with normally developed seeds and fruit plants in which varies the number of empty seeds and initially fertilized ovules, of which in the fruits are present only scones or the remains of integuments.

Key words: parthenocarpy, pear, domestic and indigenous varieties

HORTICULTURAL PROJECT FOR TOURIST – RESIDENTIAL SETTLEMENT SARAJEVO RESORT

Sijahović E.

Faculty of Agriculture and Food Science University of Sarajevo,
Bosnia and Herzegovina

Summary

Tourist Resort the Sarajevo Resort is a modern semi-open, includes area of 160.000 m2 with 160 specialty buildings. It is one of the first but also the largest settlement of this type in Bosnia and Herzegovina. It is located in Osenik, a hamlet belonging to the Hadžići municipality at an altitude of 700 m, near mountain Bjelašnica. Due to its purpose and climatic conditions that dominate the area where the settlement is located, this project requires a professional and planned approach to horticultural design, which will rely on oriental garden style with elements of classical gardens, which is a special challenge in creating the ultimate layout of space. The green areas of the Resort are divided into public and private, so special attention is paid to the choice of plant species that have the purpose of uniting the entire space into a unified whole and fulfilling three basic functions of green areas: sanitary-hygienic, esthetic and cultural-educational. The central and most of the public area is occupied by water, which is one of the basic elements of oriental gardens, and in the resort is in the form of artificial lake. This work from the point of view of horticultural design in relation to the basic requirements of the program represents a well-planned solution, from a biochemical point of view it is documented and in a landscape view it is acceptable.

Key words: Sarajevo Resort, horticultural design, garden elements

IMPACT OF FLOOD ON SOIL FERTILITY AND CORN YIELD IN MODRICA LUG

Sijahović E.

Faculty of Agriculture and Food Science University of Sarajevo,
Bosnia and Herzegovina

Summary

In May 2014, heavy rain hit Bosnia and Herzegovina. After flooding, the samples of soil and sludge were taken from the plot in Modrica Lug, which were mainly sown with corn. Physical and chemical properties and heavy metals content of the sample were done.
The following heavy metals were included: lead (Pb), cadmium (Cd), zinc (Zn), nickel (Ni), chrome (Cr) and copper (Cu). The content of heavy metals in the soil samples was determined by atomic absorption spectrophotometry.
Obtained values for the content of all examined heavy metals in the soils at the examined sites were significantly below the limit values stipulated by the law legislation in Bosnia and Herzegovina, indicating that the examined soils are not contaminated with heavy metals. By comparing the soil analysis from 2011, it can be concluded that the floods did not significantly reduce the quality of the examined soil, but the yield of corn decreased by 20%.

Key words: Floods, Soil analysis, Heavy metals

PRODUCTIVITY AND SUSTAINABILITY INFLUENCED BY SOIL CHARACTERISTICS OF PERMANENT GRASSLAND IN BOSNIA AND MONTENEGRO

Simić A.[1], Dželetović Ž.[2], Vučković S.[1], Mandić V.[3], Bijelić Z.[3], Bezdrob, M.[4], Geren H.[5]

[1]Faculty of Agriculture, University of Belgrade, Zemun-Belgrade, Serbia
[2]Institute for Application of Nuclear Energy, University of Belgrade, Belgrade, Serbia
[3]Institute for Animal Husbandry, Zemun, Belgrade, Serbia
[4]Faculty of Agriculture and Food sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[5]Ege University, Faculty of Agriculture, Izmir, Turkey

Summary

The research was conducted in 2016 on representative *Agrostietum capillaris* type of grassland in two countries. There were five study sites in Montenegro and two in Bosnia and Herzegovina in mountainous region. Extensively managed natural grasslands are predominant in both countries, and in general the productivity of these communities is extremely low. We analysed nutritive status of the topsoil samples collected in summer in each study site, as well as possible presence of heavy metals in the soil. Based on those parameters, the yield potential and floristic composition of grassland were estimated. Identified plant species were classified by their quality into three categories: quality grasses, quality legumes and forbs, without forage value. The experimental fields were cut once in the time of inflorescences formation of the dominant grasses.

In all study sites soil pH was acidic, with low P content, except in a certain site in Bosnia. Generally, the soils were low productive, but according to Regulation of tolerant amount of hazardous and toxic materials in soil, there were not surpassed maximum permissible concentrations of Ni, Cd, Pb and Cr. Dry matter yield was low (2.22-3.89 Mg ha^{-1}), and the protein content was poor (55-93.5 g kg^{-1}), primarily due to the significant number of forbs and limited legume contribution.

Key words: Agrostietum capillaris, heavy metals, protein, yield

MORPHOLOGICAL AND CHEMICAL–TECHNOLOGICAL PROPERTIES OF SELF-SOWN GENOTYPES OF MULBERRY IN NORTH–WESTERN BOSNIA

Skender, A.[1], Alibabić, V.[1], Kurtović, M.[2], Šertović, E.[1], Oraščanin, M.[1], Bećirspahić, D.[1]

[1] University of Bihać, Biotechnical Faculty, Bosnia and Herzegovina
[2] University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina

Summary

In Bosnia and Herzegovina, mulberry is a self-sown fruit species, and for now there is no data on its intensive breeding. For this reason, mulberry fruit is minimally represented in nutrition, and research on this fruit species is very scarce. Although it is at the very top of the nutritionally valuable food scale, it is minimally represented in nutrition. The aim of this study was to examine the basic morphological and chemical–technological properties of self–sown genotypes of black and white mulberry in the North-Western Bosnia.
Samples of self-sown genotypes of black and white mulberry were collected from four localities in the North–Western Bosnia. The analysis of morphometric properties of leaf and fruit was carried out: leaf width, leaf length, leaf petal length, fruit weight, fruit height, fruit width, and stalk length. Also, the basic parameters of the chemical composition were determined: water content, dry matter, sugar and acidity.The study found that the genotypes in the area of Cazin municipality stand out for the fruit size and the chemical composition. Using the ANOVA statistical method, it has been found that there is a statistically significant difference ($p < 0.05$) between the genotypes of a self-sown mulberry from the three sites in terms of morphological and chemical–technological properties.The genotypes from Cazin locality statistically differ significantly in terms of morphological properties (fruit mass, fruit length, fruit width), as well as in terms of chemical properties.The results of the chemical analysis showed that water content in mulberry from Cazin locality ranged from 82.8 to 87% and dry matter content ranged from 13.09 to 17.11%.The content of acids ranged from 0.074 to 0.560%, and the sugar content ranged from 4.40 to 7.97%. It is necessary to continue and extend the research of natural populations of black and white mulberry in our area in order to single out valuable genotypes as well as to select and breed this species.

Key words: mulberry, genotypes, North-Western Bosnia, morphometrics, chemical-technological properties.

MASS PRODUCTION AND STORAGE POSSIBILITIES OF THE BIOCONTROL AGENT, TURKISH STRAIN OF SPODOPTERA LITTORALIS NUCLEOPOLYHEDROVIRUS

Toprak, U.

Ankara University, Molecular Entomology (MOLEN) Laboratory, Dept. of Plant Protection, Faculty of Agriculture, Dışkapı, Ankara, Turkey

Summary

Baculoviruses have great potential as biocontrol agents in pest control. However, mass production and their storage conditions are critical factors limiting their common use. There are two types of production method, *in vitro* and *in vivo*, both contain the occlusion bodies (OBs), the infective unit of the virus. *In vitro* production is considered a more controlled system in terms of OB stability and efficacy but requires more sophisticated procedures and production costs. By contrast, *in vivo* production is less complicated with lower costs and considered as a useful production system, in particular for developing countries. However, loss of stability and activity by time during storage are main obstacles. Regardless of the production type, it is critical to produce maximum OBs in the production facility. In the current study, the efficacy of *in vivo* OB production system in *Spodoptera littoralis* (Lepidoptera: Noctuidae) larvae inoculated at different dosages and stages by Turkish Strain of Spodoptera littoralis nucleopolyhedrovirus was examined. Inoculation of neonates by 10^5, 10^7, and 10^9 OBs/ml resulted in mortality values of 72.9, 83.3 and 93.7%, respectively, while inoculation of 3rd instar larvae by 10^5, 10^7, and 10^9 OBs/ml resulted in mortality values of 68.7, 83.3 and 85.4%, respectively. Efficacy of the OBs produced at 10^9 OBs/ml was examined by time and temperature. OBs stored for 1, 2, 3, 4 and 5 month at 4º C resulted in mortality values of 87.5, 75, 45.8, 31.2 and 18.7%, respectively. By contrast, OBs stored at 25º C for 1, 2, 3, 4 and 5 month resulted in lower mortality values, 62.5, 33.3, 20.8, 12.5 and 10.4%, respectively. In conclusion, it is best to use the fresh stocks or up to 1 month-stored OBs at 4º C produced via inoculation of neonates at a concentration of 10^9 OBs/ml in this production system.

Key words: Baculovirus, in vivo, mass production, storage

PATHOGENIC RACES OF *Exserohilum turcicum* ON MAIN CORN PRODUCTION AREAS IN TURKEY

Turgay E. B.[1], Büyük O.[1], Tunali B.[2], Kurt Ş.[3], Helvacioğlu Ö.[4], Akçali E.[5], Baran B.[6], Enginsu S.[7], Kansu B[8]

[1]Plant Protection Central Research Institute Yenimahalle, Ankara, Turkey
[2]Ondokuz Mayıs University Agriculture Faculty Plant Protection Department Kurupelit, Samsun, Turkey
[3]Mustafa Kemal University, Agriculture Faculty Plant Protection Department, Hatay, Turkey
[4]Maize Research Institute Arifiye, Sakarya, Turkey
[5]Biological Control Research Institute Yüreğir, Adana
[6]Diyarbakır Plant Protection Research Institute Sur, Diyarbakır, Turkey
[7]Black Sea Agricultural Research InstituteTekkeköy, Samsun, Turkey
[8]Ondokuz Mayıs University, Samsun MYO, lkadım, Samsun, Turkey

Summary

Identification of race of *E. turcicum* depends on the virulence to host Ht gene(s). The use of resistant varieties to managing against North Bight Leaf (NBL) diseases always has a risk because of the presence of *E. turcicum* races and new races potential. For this reason, the most important approach to managing diseases, is to detect the pathogenic specialization of the disease in a region or country. Fort this reason , the objective of this study was to identify races of *E. turcicum* isolates which are obtained by the survey was carried out on 7 important corn field province (Sakarya, Samsun, Ordu, Adana, Mardin, Osmaniye, Mersin) of Marmara, Black Sea, Mediterranean, Southeastern Anatolia in Turkey. We found 8 different races of NLB, namely 0, 1, 2, 123, N, 1N, 3N, 12N was found in Turkey. The research was conducted within the frame of TUBITAK 213O227 project.

Key words: Maize (Zea mays L.), Exserohilum turcicum, pathogenic race

THE REACTION OF SOME BREAD AND DURUM WHEAT CULTIVARS AGAINST TO *Zymoseptoria tritici* (Desm. Quaedvlieg&Crous)

Turgay E. B.[1], Büyük O.[1], Yildirim A. F.[1], Ölmez F.[2]

[1]Plant Protection Central Research Institute Yenimahalle, Ankara, Turkey
[2]Field Crops Central Research Institute, Yenimahalle, Ankara, Turkey

Summary

Septoria Leaf Blight caused by *Zymoseptoria tritici* (Desm. Quaedvlieg&Crous) is one of the crucial wheat leaf diseases in Turkey. Although licensed pest control agents are commonly used against to this disease, breeding resistant wheat cultivars can be evaluated as a better approach in terms of more sustainable controlling of the disease. In order to investigate this potential, 22 bread and 5 durum wheat varieties commonly cultivated in Central Anatolia, were taken to a reaction experiment in the yeas of 2015 and 2016 in Ankara District, Turkey. In this research, E-17 and A-69 *Zymoseptoria tritici* isolates with a high virulence were experimentally infected to the selected varieties in a field experiment designed as randomized block design with 4 replicates. The results showed that the disease severity of the varieties were significantly different and changed depending on the isolates (variety x isolate interactions) ($F = 5,738$; $p = 0.00$; $CV = 16.76$). Additionally our results indicated that the most vulnerable bread wheat varieties to *Zymoseptoria tritici* were Tosunbey, Ekiz, Yüreğir-89 and Bezostaja.

Key words: Wheat (Triticum aestium), Zymoseptoria tritici, resistance cultivar

EFFECT(S) OF ATMOSPHERIC COMPONENTS SUCH AS UV RAYS AND OZONE (O_3) ON PLANTS: A GENERAL APPROACH

Ulukan H.

University of Ankara, Faculty of Agriculture, Department of Field Crops, Ankara, Turkey, (ulukan@ankara.edu.tr)

Summary

If the population increase continues at this rate, it will be (9.0-9.5) billion by 2030-2050; for this reason, we need to the world's crop/plant production immediately. However, it is impossible to do it avoid of the effect(s) of atmospheric components such as UV rays and Ozone (O_3) during the production. From them; UV rays, emitted from sun, have [the UV-A (315-400 nm), the UV-B (280-315 nm) and the UV-C (100-280 nm)]. Another important component is O_3. It exists in troposphere and stratosphere and known as a major secondary air pollutant; produced by a complex series of photochemical, biochemical and morphological reactions with the (NOx) and volatile organic compounds (VOCs).

Earth's atmosphere, towards space, has five different layers: i) Troposphere (or bad O_3), ii) Stratosphere (O_3 layer or good O_3), iii) Mesosphere, iv) Thermosphere and v) Exosphere. From them; ii) the stratosphere contributes to the reaction of ozone in itself, and completely absorb the UV-C (100 %), partially absorb the UV-B (5%) and the UV-A (95%). After the interference, remain rays enter to next layer (troposphere) which is closest to the earth. In this layer, ozone (O_3) meets and reacts them; as a result of, the UV-B up to 3-4% and the UV-A up to 75-90% absorb, then they reach to the earth's surface.

Actually, their effects' (the UV-A, the UV-B and the O_3) are not so much different from each other; evenly, more or less, similar, but most common is the UV-B's. Generally, these effects can be classified as i) direct (morphological, phenological, mutation, etc., ii) indirect (physiology, aging, etc.) and iii) interactive. In this paper, related general information will be given about the atmospheric components of the UV rays and the O_3 effects on plants.

Key words: Atmosphere, UV rays, plants, ozone (O_3)

ANALYSIS OF PESTICIDE RESIDUES IN RASPBERRIES BY GC-MS METHOD

Vinčević L., Okić A., Kurtović M., Omanović-Mikličanin E.

Faculty of Agriculture and Food Sciences, University of Sarajevo,
Sarajevo, Bosnia and Herzegovina

Summary

The raspberry (*Rubus idaeus* L.) is a perennial plant of considerable economic importance. It is cultivated on commodity plantations both for the purposes of industrial processing and for direct consumption. This fruit is strongly affected by diseases and pests, especially in years with unfavorable weather conditions, throughout the vegetation season and harvest. Therefore, efficient protection is crucial for commodity crops. Fruit producers apply different plant protection agents. Thus, it is known that raspberries could contain a larger amounts of various pesticide residues with potential toxicological effects on consumers.

The goal of this work was to analyse raspberry fresh fruits with GC-MS method and to determine pesticide residues content. Therefore, 20 samples were collected directly from plantations in the main fruit growing areas of Bosnia and Herzegowina. All samples were analyzed on the presence of 34 pesticides, including insecticides (organophosphorous and organochlorine), herbicides (triazine) and fungicides (dicarboximides and triazoles).

Key words: pesticide residues, raspberry, GC-MS

EFFECT OF PESTICIDES ON THE YIELDS OF CLERY AND JOLY STRAWBERRY (*FRAGARIA VESCA*) VARIETIES

Vojnich V. J., Fábián R.

Neumann János University, Faculty of Horticulture and Rural Development, Department of Environmental, Hungary

Summary

Two strawberry varieties (Clery, Joly) were examined in our research is that the effect of different types of pesticides how the yield changes.
The pesticides used are: DiPel DF; Microthiol special; Switch 62.5 WG; Karate Zeon 5 CS; Zoom 11 SC.
The study was conducted in a 100 meters long, 8 meters wide plastic tunnels area in Kiskőrös (Bács-Kiskun county), Hungary.
In our experiment were used 4 treatments with 2 repetitions.
The treatments are: 1, untreated control; 2, 75% treated with pesticides; 3, 100% treated with pesticides; 4, 125% treated with pesticides.
The results of the experiment have shown that higher dose yields were achieved when the elevated dose of plant protection product was administered (treatment 3. and treatment 4.).
Excessive prevalence of diseases (e.g. *Botrytis cinerea*) was due not only to reduced doses of plant protection products (treatment 1. and treatment 2.), but also due to cultivation technology.
To prevent *Botrytis cinerea* proposed instead of the longer foil tent, to create more, smaller ventilation and to place ventilation windows.

Key words: Strawberry, Clery, Joly, pesticides, yield

PERFORMANCES OF SOYBEAN [Glycine Max (L.) Merr] GENOTYPES GROWN UNDER SECOND CROP CONDITION IN THE AEGEAN REGION

Yildirim A., Ilker E.

Ege University, Faculty of Agriculture, Department of Field Crops Izmır, Turkey

Summary

The aim of this research was to determine yield and important agronomic traits of some soybean varieties and lines which are grown under second crop conditions in the Aegean region of Turkey. The study was conducted at the experimental area of Department of Field Crops, Faculty of Agriculture, Ege University in Turkey, 2015. In this study, ten advanced (F_9) soybean lines improved by General Directorate of Agricultural Research and Policies (KASM-03, KASM-02, KANA, KAMA, BDUS-04, BATEM 207, BATEM 223, BATEM 306, BATEM 317, BDSA 05) and four registered varities (ARISOY, ATAEM-7, BRAVO, NOVA) were used as plant materials. Field trials were conducted in a randomized complete block design (RCBD) with four replications. Results from the analysis of variance for all traits (grain yield, plant height, first pod height, pods per plant, days for maturity, days for flowering, 100-seed weight, crude protein ratio and crude oil ratio) indicated large variations among the genotypes. According to results, KANA (399,83 kg/da), BATEM 317 (389,30 kg/da) and KAMA (367,18 kg/da) lines provided the best result for grain yield while BRAVO (103,7 day), ATAEM-7 (104,7 day) and ARISOY(106,25 day) soybean varities and KASM 03 (106,5 day) lines provided the best result in earliness. According to the results of crude protein ratio and raw fat ratio results from parameters determining quality, the highest crude oil ratio was obtained from KASM-02 (21.93 %) and BATEM 207 (21.15 %) varieties candidates while the highest crude protein ratio was obtained from ARISOY (45.87%) and NOVA (45.86%) registered varieties.

Key words: soybean, second crop, yield, quality, earliness, yield components

YIELD AND QUALITY SELECTED VARIETIES OF LETTUCE (*Lactuca sativa* L.)

Zahirović, Ć.[1], Karić, L.[1], Žnidarčič, D.[2], Murtić, S.[1], Jurković, J.[1]

Faculty of Agriculture and Food Sciences University of Sarajevo,
Bosnia and Herzegovina
Biotechnical Faculty of University Ljubljana, Slovenia

Summary

Lettuce (*Lactuca sativa* L.) is vegetable rich in vitamins, especially in vitamin C, mineral substances and other bioactive compounds with high antioxidant properties. Taking into consideration the fact that lettuce is the most commonly grown vegetable in the world, there is a large selection of varieties. Main goals of modern, contemporary varieties of lettuce are to satisfy particular tastes of consumers, and to make profit for the producer. With correct choice of the variety, the aim is to create balance for both parties.

The aim of research was to determine the contents of vitamin C, phenol, antioxidant capacity, yield and morphological properties in different lettuce varieties. The research was conducted in winter 2016/2017 in greenhouse without heating system, in region of Srebrenik. The experiment was set on split-plot method with three repetitions with varieties of Butterhead (Shangore F_1 i Nansen) and Iceberg / Crisphead (Funly F_1).

Average mass of lettuce head and hence yield of lettuce, varied significantly between different varieties. On the other side, there were no significant differences in vitamin C, phenol contents and antioxidant capacity.

Key words: variety, yield, phenol, vitamin C, antioxidative capacity

THE EFFECTS OF DIFFERENT GROWING TECHNIQUES ON YIELD AND QUALITY OF TOMATO (*Lycopersicon esculentum* Mill.)

Žnidarčič, D.[1], Karić, L.[2], Mirecki, N.[3], Sinkovič, L.[4]

[1]Biotechnical Faculty of University Ljubljana, Slovenia
[2]Faculty of Agriculture and Food Technology University of Sarajevo, Bosnia and Herzegovina
[3]Biotechnical Faculty, University of Podgorica, Podgorica, Montenegro
[4]Agricultural Institute of Slovenia, Ljubljana, Slovenia

Summary

The effect of various growing methods of tomato (Lycopersicon esculentum Mill.) cv. Hector on fruit yield and sensory properties was examined. The growing methods used were: bare soil (BS), black plastic mulch (BPM), bare soil with polypropylene row cover (BS + RC) and black plastic mulch with polypropylene row cover (BPM + RC). The yields of all growing methods were reduced during growing season of extreme rainfall. The results show that the use of BPM + RC resulted in the highest total fruit yield (15.93 t ha-1). By using row cover (BS + RC or BPM + RC) it has been observed that marketable yield could be significantly higher than in the BS and the BPM treatments. Plants grown in the BPM and in the BPM + RC yielded larger number of fruits in comparison to plants in the BS or in the BS + RC. The fruit height and diameter were not affected by the treatments. This study also gives a sensory characterisation of various growing methods as an indicator of suitability for growing and marketing of tomatoes. Tomatoes grown in the BPM + RC resulted in the highest total taste intensity.

Key words: tomato, mulch, yield, sensory evaluation

SUSTAINABLE DEVELOPMENT OF AGROINDUSTRY AND RURAL AREAS

DIRECT PAYMENTS IN BOSNIA AND HERZEGOVINA – THE POLICY OF APPROXIMATION TO THE EU CAP OR THE CONTINUITY OF POLITICAL PRAGMATISM

Bajramović, S.[1], Butković, J.[2], Vaško, Ž.[3], Ognjenović, D.[1], Makaš, M.[1]

[1]Faculty of Agriculture and Food Science, Sarajevo, Bosnia and Herzegovina
[2]Ministry of Foreign Trade and Economic Relation of Bosnia and Herzegovina, Office for Harmonization and Coordination of Payment Systems in Agriculture and Rural Development, Bosnia and Herzegovina,
[3]Faculty of Agriculture, Banja Luka, Bosnia and Herzegovina

Summary

Direct payments as a measure of market-price policy are the most important form of budget support to agricultural producers in Bosnia and Herzegovina. Using the APM (Agricultural Policy Measures) tool and the database on agricultural budgets of the BiH entities, the direct payment policy 2010–2015 has been analyzed from different aspects – scope, structure of the share of respective types of measures (support to production and support to inputs), structure of the production support by the implementation criterion (output-based support or area/animal based support), support based on production type. The analysis has revealed that the current direct payments policy in both BiH entities is unstable and inconsistent, with the total support insufficient and still quite far from the one applied within the EU CAP. On the other hand, the adopted strategic documents in the field of agricultural sector development in both BiH entities have undoubtedly shown determination for European integrations and gradual approximation to the EU CAP. The first years of their implementation don't speak in favor of the set goals. This is why this paper puts the key question to the decision-makers (implementers) in the Federation of BiH and the Republic of Srpska – whether the actual intention is to begin the process of approximation to the EU CAP and gradually adopt clearly defined and structured models and mechanisms of direct payments or only declaratively state the "road to Europe" whereas taking no reform action and, in fact, continue with political pragmatism and implementation of those measures and support to those production types that will cause the fewest political problems. This paper gives some answers and reflections to this question that might come true depending on the future position of implementers of the entity agricultural policies. What is certain is that the road of BiH to the EU has no alternative, that European integrations have remained the prime goal, and that the harmonization with the EU CAP is the greatest challenge facing the decision-makers in the BiH entities.

Key words: direct payments, agricultural policy, pragmatism, Bosnia and Herzegovina, European Union

ECONOMIC VIABILITY OF GREENHOUSE VEGETABLE PRODUCTION IN THE SARAJEVO CANTON

Bećirović, E.[1], Bajramovic, S.[1], Stojanović, A.[1]

[1]Faculty of Agriculture and Food Sciences University of Sarajevo,
Bosnia and Herzegovina

Summary

Greenhouse vegetable production has been expanding significantly in recent years in Bosnia and Herzegovina. Small farms that are characteristic for BiH and high profitability of this type of production are the main reasons behind the fact that greenhouse production has been increasingly adopted on family farms. In the Canton of Sarajevo there is also a growing number of manufacturers involved in the production of vegetables in greenhouses, while economic research on these family farms has been rather modest. The growing importance of greenhouse vegetable production and lack of research on these types of farms are the main motives behind this work.
The main source of research material for determining the production and economic performance of family farms are questionnaires. To carry out the survey on a relevant sample, fifteen production units whose sizes of greenhouses ranged from 100 to 900 m2 were selected. All are located in the Sarajevo Canton. The results are shown through the net profit of farms and the achieved gross margin of two dominant products in greenhouses (tomato and spinach). In order to show more clearly the results of the research, farms were divided into two groups: a group of farms with up to 300 m2 of the greenhouse area and a group of farms with over 300 m2 of the greenhouse area.
Regarding the gross margin for 100 m2 of tomato better results were achieved by farms with smaller greenhouse areas with 2,709 KM compared to the farms with a larger greenhouse surface, where the gross margin amounted to 2,578 KM. The gross margin for 100 m2 in the production of spinach on smaller farms amounted to 577 KM, while for the other group it was 515 KM.

Key words: Kanton Sarajevo, greehouse production, economic achivement

INOVATIVE DEVELOPMENT OF NEW WINE ROADS USING RESEARCH RESULTS ON PREFERENCES TO WINE ATTRIBUTES

Ilak Peršurić A.S.

The institute for agriculture and tourism, Poreč, Croatia

Summary

The creation of new and inovative types of offers in the toursim destination related to gastronomy and food and wine offer is ussually created by the hospitality facilities or by local tourists agencies and boards. The use of institutional capacities of universities and institutes in creating new, inovative segments of tourist offers is used less. Therefore during a cross border Ipa project we have tried to establish a new offer of wine roads connected to preferences of respondents during field research. Nowadays, Istria as a wine tourism destination has seven existing wine roads with quality wine offer. Further development demands new tourist content that will enhance the attractiveness of the destination and push new tourist arrivals.

Our research results showed four different groups of consumers according to wine type and four wine roads (itineraries) were created.

The new wine roads were issued by the mobile Internet application last year for several thousand times (by domestic populationa and tourists).

Key words: Consumers, Wine attributes, Wine tourism, Wine roads, Malvasia istarska

TRANSFER OF RESEARCH RESULTS TO PRAXIS – THE CASE OF ISTRIA YOUNG POTATO

Ilak Peršurić A.S.

The institute for agriculture and tourism, Poreč, Croatia

Summary

The paper shows data about the preferences and opinions of consumers toward young potatoes. The aim was to explain consumer habits and to use it toward the goal of creating a new market brand of young potatoes produced in Istria. The research sample contained 679 consumers approached face to face with a questionnaire. The sample contained consumers overall Croatia of which two thirds were females, most consumers were under 55 years of age, with equally secondary or university education, with monthly income from 700 to 2000 euro, living in 4 member households. We interviewed consumers on the green markets and in shops. As a research tool we have used a questionnaire. Habits of buying considered place, options in prices and quality and comparative features of branded and non-branded potatoes.

Results showed that consumers buy mostly on green markets and in market chains, while less buy direct from the producer. Potato organoleptic attributes (taste) and potato origin (domestic or local production) were crucial in buying behaviour. The main attributes important to consumers were sensory attributes of taste and smell. A brand created for bulk potatoes should confirm the value of the product (quality, domestic production, sensory attribute) and be more recognizable comparing to potatoes sold in bulk. Research results have confirmed that the values of quality and security of the food and local production through a potato market label will be supported by Croatian consumers. The market label of young potato would be supported by younger generations (under 25 years) since they are more responsive to market labels; further in smaller families (up to three family members) with income 800 to 1200 euro and slightly more by men which trust that market labels are a proof of quality.

Key words: research results, transfer, consumers, markets, potato.

HERITABILITY AND THE IMPORTANCE OF GENETIC ANALYSIS IN THE VERIFICATION OF THE SEEDLINGS AND THE PARENT HEARD/FLOCK IN AGRICULTURE

Kazić A.

Institute for Genetic Engineering and Biotechnology (INGEB) of the University of Sarajevo, Bosnia and Herzegovina (BiH)

Summary

Breeding programs, based on genetic principles and good management, including selection and regular genetic monitoring related to the level of inbreeding and genetic diversity, possible DNA introgression of other breeds, as well as other parent-offspring genetic analysis, are important in keeping disease free pure breeds (or known crossbreeds) with good and desired production. For the majority of domesticated animals and plants, there are already developed molecular markers (mainly microsatellites) specific for particular breeds.

For buying and selling planting material (seedlings) and breeding animals, it is already requirement in many countries around the world – to have "a genetic documentation" about them. This "genetic documentation" (as a confirmation of their origin) is now often required even when farmers sell meat and plant products (or processed food) on the market.

Having genetic data about breeding animals and plants is equally important for the farmers in order to secure good agricultural production, to know what they really have and get certification for what they have and produce, but also it is important for buyers and consumers in order to know what they buy and eat, as well as preventing food frauds in the market. There are standardized PCR-based molecular-genetic protocols and methods in order to reveal DNA from agricultural products and processed food for establishing their origin, i.e. whether particular breeding animal, agricultural plant or food is accordingly to the accompanied declaration. In the same way, each farmer should check, if there is any doubt, is it particular breed that bought for his/her farm really what is declared – genetic analysis is the most reliable approach and often the only way to find out about it.

Key words: Genetic markers, "breeding values", DNA introgression, selection, inbreeding

EVALUATING MEMBER SATISFACTION IN AGRICULTURAL COOPERATIVES: A CASE OF DAIRY COOPERATIVES IN IZMIR PROVINCE

Kinikli, F.[1], Yercan, M.[1]

[1]Ege University, Faculty of Agriculture, Department of Agricultural Economics, Turkey

Summary

This study attempts to assess member satisfaction in agricultural cooperatives by use of SERVQUAL model. The SERVQUAL model was developed in 1988 by Zeithaml, Parasuraman and Berry as a multi-item scale developed to assess customer perceptions of service quality in service industry. Cooperatives have a dual nature of specification which members are the costumers in all cooperative activities. Customers/members judge service quality as low or high depending upon whether the service performance meets their expectation or not. The research is based on the survey study. The population of research was the dairy cooperative members in İzmir Province in Turkey (N=5731). So, sample of this study has formed from 116 members. Using SERVQUAL tool, five service quality dimensions using two segments in the form of a questionnaire consisting of 22 questions each have been used for the customers/members. Data were analyzed by SPSS 20 using descriptive statistics and by using data, perceived and expected service quality was evaluated comparatively with gap analysis. Besides, customers'/members' dimensions of perceived service quality were investigated and evaluated by statistical tests for demographic differences. According to questionnaire results, the expected service quality was found greater than the perceived service quality. The general service quality perceived by the members of cooperatives which process the row material was found greater than the members of cooperatives which collect the the row material.

Key words: Agricultural Cooperatives, SERVQUAL Model, Customer/Member Satisfaction

THE EFFECT OF CAPITAL BORROWING ON EQUITY OF FRUIT AND VEGETABLE PROCESSORS IN BOSNIA AND HERZEGOVINA

Kulelija B.[1], Ognjenović D.[1]

[1] University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina

Summary

The most representative indicator for measuring the justification of capital borrowing, or measuring the effect of borrowing capital on change of own capital (equity), is the effect of the financial leverage. Positive values of this indicator indicates the increase of profitability of own capital by mean of capital borrowing, while negative values indicate that borrowed capital is not invested in assets that generate enough revenue to cover the cost of borrowed capital and to make a profit, thus reducing the profitability of own capital.

In this paper, analysis of the effect of the financial leverage was carried out for the fruit and vegetable processing companies in Bosnia and Herzegovina over the period 2008-2014. Financial statements were collected and processed, and relevant indicators for these companies were calculated. Fruit and vegetable processing is a branch of the food industry that should support the development of primary production as B&H has high quality resources for primary fruit and vegetable production. However, the obtained results suggest that companies in this branch dominantly reduce the value of their own capital by capital borrowing, which is unfavourable to the future of this branch. On the average, 38.04% companies had a loss, or a loss over the capital level of the previous period, and had a negative effect on the financial leverage. Only 48.76% of analyzed companies increased return on equity by capital borrowing , while 13.20% companies, although they had a profit, reduced the return on own capital, because the borrowed capital was inadequately used.

Key words: financial leverage, equity, fruit and vegetable processing

EFFECTIVENESS AND PRODUCTIVITY OF AGRO-FOOD SECTOR IN BOSNIA AND HERZEGOVINA

Kulelija B.[1], Ognjenović D.[1], Bećirspahić D.[2]

[1]University of Sarajevo, Faculty of Agriculture and Food Sciences, Bosnia and Herzegovina
[2]Biotechnical Faculty, University of Bihać, Bosnia and Herzegovina

Summary

Effectiveness and productivity are very important indicators of business analysis. Effectiveness measures the effect of cost-effectiveness in achieving the result/effect and it is expressed by the ratio of realized effects and consumed elements, or total revenues and total expenditures. Productivity is an indicator of the effects of using human labour by putting total income or net profit with the number of employees into the ratio with the number of employees.

The effectiveness and productivity of the company from the three main sectors of the food industry of Bosnia and Herzegovina: meat processing, milk processing, and processing of fruits and vegetables were analyzed within this paper. For all companies within these branches that had been operating in B&H over the 2008-2014 period financial statements were collected and the above mentioned indicators were calculated.

The research has shown that the observed subsector is on average effective and it recorded the productivity growth in the analyzed period. On the average, 65.93% of companies had effective business, 33.75% were ineffective, and 0.32% companies operated on the border of effectiveness.

Key words: effectiveness, productivity, meat, milk, fruit and vegetable processing

ASSESSMENT OF BEEF AND MUTTON PRODUCTION IN BOSNIA AND HERZEGOVINA

Makaš, M.[1], Bajramović, S. [1], Volk, T.[2], Bećirović, E.[1]

[1]Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina,
[2]Agricultural Institute of Slovenia, Ljubljana, Slovenia

Summary

Livestock production, thanks to the natural resources and a large number of inhabitants involved in this type of production in BIH, is one of the most important branches of agriculture. However, in an attempt to understand its importance in terms of its share in the production value as the basis for a broader sector analysis, one is faced with the problem of lack of specific data. Data tracked by the entity-level statistical institutes and agencies pertain to the total number of livestock; the number of animals by categories; and net and gross weight of slaughtered animals in slaughterhouses; but data on the total meat production at BiH level are missing. The reason for this is that BiH statistics keeps record only of the number of livestock slaughtered in registered slaughterhouses, but not on individual farms which account for a significant share in the total number of slaughtered livestock. The lack of this data prevents the calculation of various economic indicators that represent the basis for a broader sector analysis. This paper aims to improve the quality of BiH statistical data and to present a method for calculating meat production. The method is based on the calculation of livestock trade, i.e. the difference between conditions at the beginning and the end of the year which takes into account the number of new-born and dead animals as well as the ratio of imported and exported animals. The paper presents the calculation of beef and mutton production in Bosnia and Herzegovina for the period 2010-2015.

Key words: beef and mutton production, statistical data, calculation, method.

ECONOMIC EFFECTS OF MECHANIZATION IN HARVESTING RASPBERRY

Marković, T.[1], Kokot, Ž.[1], Makaš, M.[2]

[1]University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia
[2]University of Sarajevo, Faculty of Agriculture and Food Science, Sarajevo, Bosnia and Herzegovina

Summary

Due to its geographical position, the climatic and soil conditions, Serbia has very favorable conditions for fruit production. Special significance this production has in highland areas, where makes over 90% of total agricultural area. However, one of the limiting factors in fruit production is definitely harvest. In addition to the permanent problem of lack of human labor, with which fruit growers are facing more and more, from year to year, engagement of the existing human labor is accompanied by a series of other problems, especially in terms of transportation, accommodation, food and health care. These problems can be resolved by using mechanization in harvesting, considering that modern breeding technology, among other things, includes the replacement of manual labor by machines. Using the mechanized harvesting of raspberry significantly shortens the period of harvesting, while in the same time the better quality of the harvested raspberry is achieved. Thus the costs of harvesting are reduced by as much as 78%. Reduction of costs of harvesting significantly affects the final financial result, considering that these costs participate up to 65% in total raspberry production costs.

Key words: financial result, harvesting, mechanization, production costs, raspberry

INFLUENCE OF FINANCIAL LEVERAGE ON FIRM VALUE: CASE STUDY – BOSNIA AND HERZEGOVINA BEVERAGE INDUSTRY

Mujčinović A., Nikolić A., Uzunović M.

Faculty of Agriculture and Food Science, University of Sarajevo, Bosnia and Herzegovina

Summary

Nowadays, managing a company is becoming more and more complex task. Factors, such a fast-changing environment, highly competitive market put in focus managers' abilities to recognize investment possibilities, establish flexible capital structure and consequently mitigate level of financial risk and contribute to the overall company stability. One way in achieving above mentioned is efficient use of financial leverage. Therefore, the aim of this paper is to investigate whether capital structure/financial leverage positively influences the value of the firm. This question has been discussed for decades, mostly in developing world, while no similar research is done in B&H. The research is done using secondary data from bon.ba database for a period of last three years. The sample include 30 companies from beverage industry which is fast-growing and one of the strongest industry in B&H. Regression analysis was used to determine the relationship between the variation in firm value and capital structure. The debt to equity ratio (D/E) was used as a proxy for capital structure and the following ratios were used for firm value: Return on Equity (ROE), Return on Assets (ROA), Earnings per Share (EPS), Price Earnings (PE) ratio, operating profit margin and Economic Value Added (EVA). Results of this study will provide valuable inputs for managers of companies as well as potential investors in the sector of beverage industry.

Key words: financial leverage, firm value, B&H beverage industry

RURAL DEVELOPMENT AND FARMERS' SOCIAL EMBEDDEDNESS IN BOSNIA AND HERZEGOVINA

Nikolić A.[1], Uzunović M.[1], Mujčinović A.[2]

[1]Faculty of Agriculture and Food Sciences, Institute of Agricultural and Food Industry Economics, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences, Student, University of Sarajevo, Bosnia and Herzegovina

Summary

Among many ways to determine factors influencing farmers' capabilities to expand, innovate, and improve business activities, stand social embeddedness and social context, which both, drive complex economic, social and political processes, thus defining ability of local actors to activate and use available resources. Both, social embeddedness and context can be viewed as boosting factors of the quality life in rural areas. The aim of this paper is to examine social context and social embeddedness (measured by structural social relations – membership in cooperatives, NGOs etc.) influence on farmers' abilities and intentions to use rural development programs (RDP) in Bosnia and Herzegovina case. For this purpose, the structured questionnaire was developed and distributed in two municipalities (Visoko and Žepče) providing 296 usable surveys. Structural equation modeling along with descriptive statistics was used to analyze farmers' responses. The results show that in Bosnia and Herzegovina low farmers' socio-economic embeddedness restricts access to other capitals, especially natural and cultural, which stands the best chances to foster rural development. Prior participation in rural development programs (RDP), non-farm employment and level of social embeddedness are the main factors influencing farmers' intention to use RDP measures.

Key words: social embeddedness, social context, rural development policies, Bosnia and Herzegovina

CHANGES OF PRODUCTION, CONSUMPTION AND FOREIGN TRADE IN TURKEY'S AGROCHEMICALS SECTOR

Ormeci Kart, M. C.[1]; Isin, S.[1]

[1] Ege University, Faculty of Agriculture, Department of Agricultural Economics, Turkey

Summary

Agrochemicals, including pesticides, are considered a critical aid to improving agricultural production and prevention of crop losses pre and post harvest. This study aims to make an evaluation of the changes in production, usage and the trade of pesticides in Turkey. The principal material of the study comprises data and reports of the Turkish Ministry of Food, Agriculture and Livestock Food and Agriculture Organization (FAO), Ministry of Food, Agriculture and Livestock of the Republic of Turkey and United Nations Commodity Trade (UN Comtrade). Pesticides classified under code 38.08 in the International Convention on the Harmonized Commodity Description and Coding System and include hazardous pesticides, insecticides, fungicides, herbicides, disinfectants and other. In addition, this study benefited from previous similar studies. The relevant data are presented in tables. According to the final data Turkey's pesticides production, consumption and foreign trade show an increment. Turkey agrochemicals market is smaller than EU. Turkey's active ingredients pesticide usage is 400-700 gr per hectare but in some regions is equal with the world's most intensive pesticide-using regions.

Key words: export, herbicide, import, insecticide, pesticide

MAPPING CITRUS TREE PLANTATIONS WITH MULTISPECTRAL IMAGERY AND GIS TECHNIQUE FOR SUSTAINABLE PRODUCTION

Özen, F.[1], Bolca, M.[1], Çokuysal, B.[1], Atalay, M. O.[1], Özege, M. E.[1]

[1]Ege University, Agriculture Faculty, Department of Soil Science and Plant Nutrition, Turkey

Summary

Within the framework of performed exercises, it is aimed to determine the geographical distribution areas of fruit trees known as citrus that are included in product groups with economic value.

The field survey and the laboratory works are performed collaboratively to determine the citrus growing regions. The citrus planted area are determined with the satellite images taken by the Worldview-2 (45x45 cm) high resolution satellite imagery with on-screen digitizing in Kuşadası (Aydın-Turkey). On the multispectral satellite images, other natural and cultural floras that have similar morphological and physiological characteristics with the citrus are differentiated.

The soil samples taken from the research areas of field survey are analyzed and determined the productivity of the citrus planted areas by using the geographical information system database. Besides thematic maps which illustrates the soil characteristics are created. With Evaluating datas which is come from analysis results of the soil samples, it is created map physical and chemical characteristics of soil in the citrus planted area by using the "kriging" method.

Due to the fact that, the cultivation of the citrus fruits is a sustained hard work, it is crutical to determine the climatic and terrestiral needs of the citrus tree in order to implement sound decisions. The upcoming solutions of the problems such as the increase of the input costs in daily basis and the insufficiency of the given support are connected to the obtainment of the sound and confidental informations. In this regard, with the object of evaluating the present information or the information that has a future value, a system with IT infrastructure is formed for an artificial person and a corporate body assigned in the production-planning-decision-assistance stages in the sector.

Key words: Citrus, GIS, Remote Sensing Technique, Sustainable.

SUPPORTS FOR WATER BUFFALO BREEDING IN TURKEY AND PRODUCERS OPINIONS ABOUT SUPPORTS - SAMSUN PROVINCE EXAMPLE

Özkan, Z.[1], Arslan, S.[1], Uçum, İ.[1], Canik, F.[1], Uzun, B.[2]

[1]Agricultural Economic and Policy Development Institute, Ankara, TURKEY
[2]Maize Research Institute, Sakarya, TURKEY

Summary

There were about one million buffalos in 1980s in Turkey. However, this amount decreased to about 100 thousands in 2008. Along with the support to buffalo growers provided by the government from 2008 to 2016, the number of buffalos has increased to about 100 to 141 thousands. Most of the producers that make buffalo farming in Turkey are family type and small scale. The supports for the buffalo breeders were increased the amount of buffalo numbers in the years 2008-2015 in Turkey. These supports were given to mature buffalo and young buffalo calf with breeding project by peoples, breeding buffalo, buffalo milks, and organic buffalo farming. Mature buffalo and organic buffalo supports were cancelled in 2016, and new supports have been given such as young buffalo, genealogy, progeny control and livestock fattening. The conservation support for Anatolian Buffalo was also added in 2015 Fodder supports for all livestock have increasingly continued over the years. All producers that included buffalo farming were included in the investigation. The data belongs to 2013. The research population constitutes the producers in Samsun, representing approximately 18% of the Turkish Buffalo. In the survey, the provinces (Alaçam, Bafra, Çarşamba, Terme, Vezirköprü) were chosen to represent at least 75% of buffalo producers of Samsun. The general problems of the buffalo producers and producers' opinion about the supports were collected through questionnaires. The producers were divided into three groups in terms of the number of buffaloes, with 1-5, 5-9 and 9and more. After the statistics of the collected data are tested for consistency, the distribution of the data is calculated as a percentage. Using the results obtained in Samsun Province, the situation regarding the buffalo breeding and buffalo products sector in Turkey has been discussed.

Key words: Anatolian Water Buffalo breeders, Argicultural supports, Socio-economical analysis

COMPETITIVENESS OF DRINKING WATER AND BEER SECTORS OF BOSNIA AND HERZEGOVINA

Prnjavorac A.[1], Nikolić A.[2], Mujčinović A.[1], Uzunović M.[2]

[1]Faculty of Agriculture and Food Sciences, Student, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences, Institute of Agricultural and Food Industry Economics, University of Sarajevo, Bosnia and Herzegovina

Summary

The effects of Bosnia and Herzegovina's liberal trade policies have been unknown and unexamined in specific sectors, like beer and drinking water sectors. Has Bosnia and Herzegovina produced positive effects of main aim of trade liberalization – creating more competitive and more productive sector, questions is that remains unanswered? Thus, the aim of this paper is to analyze the competitiveness of beer and drinking water sectors on international markets of Croatia, Turkey, CEFTA members (Serbia, Albania, Macedonia, and Montenegro) as well as EU member countries. The competitiveness level was determined using RCA (revealed comparative advantage) index, categorizing two-way trade flows and Grubel-Lloyd IIT (GLIIT) index during the period from 2008 to 2015. International trade data was obtained using UNCATD database. RCA index shows competitive advantages on markets of Montenegro, Serbia and EU member states for drinking water sector, and on markets of Croatia, Serbia, Montenegro and EU member states for beer sector. Trade flow categorization and GLIIT index show competitiveness based on price competition and strong inter-industry trade relations. Overall results indicate that the future policy should encourage industry to improve the quality characteristics of products.

Key words: Bosnia and Herzegovina, beer sector, drinking water sector, competitiveness

NEW GENERATION OF MORE SUSTAINABLE MEAT SUBSTITUTES: INSECT AND MICROALGAE BIOMASS TO IMPROVE TRADITIONAL FOOD PRODUCTS

Smetana S., Aganovic K., Heinz V.

German Institute of Food Technologies, (DIL e.V.), Germany

Summary

Agri-food production is becoming the most environmentally impacting industry of all human activities. The production of food in more sustainable way (with fewer resources consumed and lower rates of environmental impact) is becoming a vital need. One of the most promising ways to reduce the impact is connected with substitution of environmentally expensive meat with analogues based on alternative sources of proteins (vegetable, mycoproteins, milk, insects, microalgae, leaves, etc.). However, such substitution is not always beneficial in terms of nutritional profile and can be more impacting due to the higher rates of natural resources use (energy for processing, good quality feed, etc.). In order to improve the environmental performance of food substitutes (based on other protein sources) the application of various agri-food waste streams is proposed. This research aimed to compare food substitutes using Life Cycle Assessment and nutritional comparison with benchmark products. It relied on own data of food processing (DIL, Quakenbrueck) and background data available in literature and relevant databases such as Agrifootprint and ecoinvent 3. Future scenarios were also modelled in order to include the scale-up effects. The results indicated that state-of-the-art production of analogs based on insects and microalgae is not competitive in terms of environmental impact to benchmark meat (chicken). The application of waste and side streams from agri-food production (molasses, distilled grains, grain brans) could decrease the impact of insect and microalgae production for their use as meat substitutes, potentially making them more sustainable. Improvement in technologies of biomass processing plays a secondary role for the processing of insect and microalgae, but could be substantially improved with the application of new approaches (e.g. High-Moisture Extrusion of whole insects, Pulsed Electric Fields for the protein extraction in microalgae). Proposed meat substitute production (based on insect and microalgae) could reduce the environmental impact by 10-34%.

Key words: alternative sources of proteins, food substitutes, LCA.

INFLUENCE OF THE FLOW OF NOZZLES ON THE QUALITY AND COSTS OF PLANT PROTECTION

Škaljić S.[1], Rakita N.[1]

[1]Faculty of Agriculture and Food Sciences' University of Sarajevo, Bosnia and Herzegovina

Summary

Farmers in Bosnia and Herzegovina mostly use farming sprayers with heterogeneous jets at the nozzle. As they may produce different sizes of drops and different drifts, such nozzles can affect the quality of phytopharmaceutical application. Heterogeneous jets generated by different flows cause differences in coverage of the treated plant surfaces. The quality of phytopharmaceutical application strongly affects the costs of the crops protection and production in general. The average cost of a chemical treatment with herbicides is 64.37 KM/ha, fungicides 79.2 KM/ha and insecticides 18.8 KM/ha. The flow of the nozzle can affect the quality of the phytopharmaceutical application, which can cause an increase or decrease of associated costs.

The experiment was carried out on the nozzles with the same characteristics (flow of 0.4 gallons and spraying angle of 110 degrees) produced by 5 different manufacturers. To test the nozzles, a conventional 330 l farming sprayer, which worked at a pressure of 3 bars and a speed of 6 km/h, was used. The coverage and quality of the treatment was determined by the water-sensitive paper (WSP). After the test, the treated WSP were subjected to the digital processing and analysis tools and appropriate conclusions were drawn from them. The average application coverage for nozzles of different manufacturers ranged from 9.78% to 22.46%, with an average flow ranging from 1140 ml/min to 1700 ml/min. The average dimensions of the nozzle drops were determined on the basis of the digital processing and analysis of WSP and they ranged from 67.93 up to 154.14 pixels. The experiment proved that the flow in the nozzles affects the quality of phytopharmaceutical application, which is reflected in differences in coverage and nozzle drop size.

Key words: Nozlle testing, farming sprayer, quality of phytopharmaceuticals application, drip size, costs of plant protection.

HISTORY OF NATURE PROTECTION AT BOSNIA AND HERZEGOVINA

Vojniković S.[1], Avdić J.[2]

[1]Faculty of Forestry, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia and Herzegovina

Summary

The term "protected areas" has existed in Europe and Asia since ancient times in the form of natural areas that they considered to be of importance for the fulfilment of religious and, later, for spiritual reasons.
Bosnia and Herzegovina has always been dominated covered by forests. The relationship with nature and protection was reflected in the B & H through the relation of the human population to the forest.
In the early Middle Ages of the Bosnian state. The forest was a common property, ie the forests represented the form of tribal forests with undivided rights on the forest. With the development of the nobility of Bosnia and the emergence of landowners, the forests outside the settlement remain tribal or as "*res nullius* - lat. Of property" where everybody freely took what he needs.
Similar practices of destruction and "protection" of the forest continued with the arrival of the Ottoman authorities. Since Bosnia was the richest Balkan country with livestock in the period of Turkish rule, and certainly among the first in Europe in favor of the favoring and livestock branch of the economy, favored the extension of pastoral areas very often at the expense of forest areas. Formal nature protection, ie big game in BiH begins with the arrival of Austria-Hungary. The Austro-Ugrian monarchy tried to protect the forests by establishing a guard service.
After WW II - Democratic Federative Yugoslavia adopted the Law on Protection of Monuments of Culture and Natural Rarities in 1945, and in 1947 the NRBiH adopted the Law on Nature Protection and Natural Rarities.
After the last war (1992-1995), a number of protected areas of a different level of protection have been established.

Key words: Nature protection, forests, Bosnia and Herzegovina.

AN ANALYSING OF ORGANIZATIONAL COMMITMENT OF COOPERATIVE MEMBERS: A CASE OF DAIRY COOPERATIVES

Yercan, M.[1], Kinikli, F.[1]

[1]Ege University, Faculty of Agriculture, Department of Agricultural Economics, Turkey

Summary

Since the 1960s organizational commitment continues to be one of the most interesting issues for both managers and researchers. Organizational commitment is a psychological state that characterizes the members' relationship with the cooperatives. This psychological state has important effects in terms of continuing of membership in the cooperatives. The aim of this study is to analyze the commitment of the members of dairy cooperatives to the organization in terms of demographic and cooperative types such as collector or processer the row material in İzmir province. Developed by Allen and Meyer, "Scale of Three Component Model of Organizational Commitment", which consists of "affective commitment", "continuance commitment", and "normative commitment", has been used in this research. Among the three components examining organizational commitment, affective commitment suggests an affective orientation where individuals become identical with, happy to be members of, and strongly committed to their organizations; continuance commitment infers that an individual continues his/her membership with the organization because of the costs of leaving the organization and/or the scarcity of alternative job opportunities; whereas normative commitment states the commitment that individuals pursue because they feel an obligation with a moral responsibility. As a result of the analysis of the survey data, affective and continuance commitment level of the members have been found to be higher, whereas normative commitment levels are lower. The collector cooperative members' affective commitment levels are highest; continuance commitment levels are lowest. It is interesting that, the processer cooperative members' continuance commitment levels are highest; affective commitment levels are lowest. The general organizational commitment levels of the cooperatives which collect the row material have been found greater than the cooperatives which process the row material.

Key words: Agricultural Cooperatives, Organizational Commitment