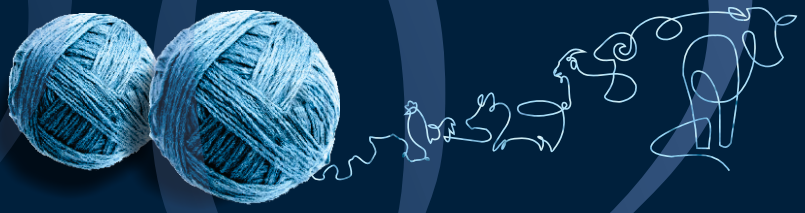
14th INTERNATIONAL SYMPOSIUM

MODERN TRENDS IN LIVESTOCK PRODUCTION

2023



BOOK OF ABSTRACTS

4 - 6 October 2023, Belgrade, Serbia

Institute for Animal Husbandry

Belgrade - Zemun, SERBIA

14th INTERNATIONAL SYMPOSIUM

MODERN TRENDS IN LIVESTOCK PRODUCTION

2023

BOOK OF ABSTRACTS

4 - 6 October 2023, Belgrade, Serbia

PATRONS

Ministry of Science, Technological Development
and Innovation of the Republic of Serbia
Ministry of Agriculture, Forestry and Water Management
of the Republic of Serbia

ORGANIZER

Institute for Animal Husbandry
Autoput 16, P. Box. 23,
11080, Belgrade-Zemun, Serbia
Tel: +381 11 2691 611; +381 11 2670 121; +381 11 2670 541;
Fax: + 381 11 2670 164;

PUBLISHER
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

Editor
Zdenka Škrbić, PhD, Principal Research Fellow
Institute for Animal Husbandry, Belgrade-Zemun

The Book of Abstracts is printed by the Institute for Animal Husbandry,
Belgrade, 2023

biotechnology.izs@gmail.com
www.istocar.bg.ac.rs
Circulation 100 copies.

ISBN 978-86-82431-81-7

INTERNATIONAL SCIENTIFIC COMMITTEE

CHAIRMAN

Prof. Dr. **Giacomo Biagi,**
Department of Veterinary Medical Sciences,
University of Bologna, Italy

SECRETARY

Dr. **Nikola Delić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

MEMBERS

Dr. **Dragana Ružić-Muslić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Vlada Pantelić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Aleksandar Stanojković,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Miloš Lukić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Zdenka Škrbić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Čedomir Radović,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Prof. Dr. **Marjeta Čandek-Potokar,**
Agricultural Institute of Slovenia, Ljubljana, Slovenia
Dr. **Giuseppe Bee,**
Agroscope Posieux, Posieux, Switzerland
Prof. Dr. **Zoran Stanimirović,**
University of Belgrade, Faculty of Veterinary Medicine, Serbia
Prof. Dr. **Stayka Laleva,**
Agricultural Institute, Stara Zagora, Bulgaria
Prof. Dr. **Maya Ignatova,**
Institute of Animal Science, Kostinbrod, Bulgaria

INTERNATIONAL SCIENTIFIC COMMITTEE

INTERNATIONAL SCIENTIFIC COMMITTEE

Dr. **Sam Millet,**
ILVO, Flanders Research Institute for Agriculture, Fisheries and Food, Belgium
Prof. Dr. **Antonella Dalle Zotte,**
Departmernt of Animal Medicine, University of Padova, Italy
Prof. Dr. **Snežana Trivunović,**
University of Novi Sad, Faculty of Agriculture, Serbia
Prof. Dr. **Predrag Perišić,**
University of Belgrade, Faculty of Agriculture, Serbia
Prof. Dr. **Martin Škrlep,**
Agricultural Institute of Slovenia, Slovenia
Dr. **Violeta Caro Petrović,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Nevena Maksimović,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Prof. Dr. **Vesna Gantner,**
Josip Juraj Strossmayer University of Osijek,
Faculty of Agrobiotechnical Sciences, Osijek, Croatia
Dr. **Maria Munoz,**
Departamento Mejora Genética Animal,
INIA, Spain
Dr. **Violeta Mandić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Prof. Dr. **Pero Mijić,**
Josip Juraj Strossmayer University of Osijek,
Faculty of Agrobiotechnical Sciences, Osijek, Croatia
Prof. Dr. **Zoran Luković,**
University of Zagreb, Faculty of Agriculture,
Department of Animal Science and Technology, Croatia
Prof. Dr. **Dubravko Škorput,**
University of Zagreb, Faculty of Agriculture,
Department of Animal Science and Technology, Croatia
Prof. Dr. **Aleksandar Simić,**
University of Belgrade, Faculty of Agriculture, Serbia
Prof. Dr. **Simeon Rakonjac,**
University of Kragujevac, Faculty of Agronomy, Serbia

INTERNATIONAL SCIENTIFIC COMMITTEE

Dr. **Jasna Prodanov-Radulović,**
Scientific Veterinary Institute "Novi Sad", Serbia
Prof. Dr. **Rosa Nieto,**
Departament of Physiology and Biochemistry of Animal Nutrition Estacion Experimental del Zaidín, CSIC Armilla, Granada, Spain
Dr. **Jordan Marković,**
Institute for Forage Crops, Kruševac, Serbia
Dr. **Juan M. García Casco,**
Departamento Mejora Genética Animal, INIA, Madrid, Spain
Dr. **Slavica Stanković,**
Maize Research Institute „Zemun Polje", Belgrade, Serbia
Dr. **Vesna S. Krnjaja,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

ORGANIZING COMMITTEE

CHAIRMAN

Dr. **Nikola Delić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

SECRETARY

Dr. **Maja Petričević,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

MEMBERS

Dr. **Marina Lazarević,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Marija Gogić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Vladimir Živković,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Nenad Mićić,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Dr. **Vesna Dragičević,**
Maize Research Institute „Zemun Polje", Belgrade, Serbia
Prof. Dr. **Tanja Vasić,**
Faculty of Agriculture, University of Niš, Serbia
Prof. Dr. **Tanja Petrović,**
Faculty of Agriculture, University of Belgrade, Serbia
Dr. **Nataša Tolimir,**
Institute for Science Application in Agriculture, Serbia

SYMPOSIUM SECRETARIAT

CHAIRMAN

Dr. **Maja Petričević,**
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

MEMBERS

Slavko Maletić, grad. econ.
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Olga Devečerski, grad. prof.
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Bogdan Cekić, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Miloš Marinković, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Nenad Stojiljković, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Ivan Ćosić, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Tamara Stamenić, MPharmSc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Tanja Keškić, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Danijel Milenković, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Nemanja Lečić, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia
Aleksandra Petrović, Msc,
Institute for Animal Husbandry, Belgrade-Zemun, Serbia

Address:

Institute for Animal Husbandry,
Autoput 16, P. Box 23,
11080, Belgrade-Zemun, Serbia

Tel:
+381 11 2691 611
+381 11 2670 121
+381 11 2670 541
Fax:
+381 11 2670 164

E-mail: biotechnology.izs@gmail.com
www.istocar.bg.ac.rs

CONTENT

POSTER SECTION

GUEST SPEAKER PRESENTATION

THE SCIENTIFIC CONFERENCES OF THE ZEMUN INSTITUTE - A REVIEW AND OUTLOOK

Martin Wähner

Anhalt University of Applied Sciences Bernburg, Germany
Corresponding author: Martin.Waehner@hs-anhalt.de

Abstract: The congresses and symposiums of the Zemun Institute for Animal Husbandry look back on a 30-year tradition. That deserves respect and congratulations. In all years, a demanding scientific program with close practical relevance was offered. The conferences were in the past a reflection of the changes in agriculture. This is also the case today and will continue to be so in the future. As a podium for scientific and practical discussions, the meetings proved to be guideposts for future developments. The conferences had an international focus from the start. Guests from 35 countries gave lectures and presented new scientific results. In cooperation with the relevant ministries, the tasks of the institute have expanded. Here is the centre of breeding and husbandry for the important livestock breeds. New topics and methods are increasingly determining the farm animal industry. Major challenges arise from changes in societal attitudes towards agriculture and animal-based foods. In the complex field of tension between economic efficiency, new social perspectives on agriculture, alternative production processes and sustainability, but also internationality and competitiveness with market presence, viable solutions must be developed.

MERGING GENOMICS AND PHENOMICS WILL BOOST ANIMAL BREEDING AND THE SUSTAINABILITY OF THE LIVESTOCK PRODUCTION SECTOR

Luca Fontanesi

Department of Agricultural and Food Sciences, University of Bologna, Viale G. Fanin 46, 40127 Bologna, Italy
Corresponding author: Luca Fontanesi, luca.fontanesi@unibo.it
Invited paper

Abstract: Genomics has already invaded all biological disciplines not only to clarify basic biological mechanisms and principles but also to design novel applications for a renewed “genomics economy” that is already boosting agriculture, including the livestock production sector. The advent of genomic selection has completely revolutionized animal breeding and selection: genomic selection is already a routinary approach in dairy cattle and is becoming the standard methodology in the breeding programmes of several other livestock species. In this context, the next challenges will be to completely open the genetic black box with the aim to understand the function of all nucleotides of a genome and link them to phenotypic information. Currently available phenotyping technologies, extensively used in the animal breeding sector, are, however, still based on traditional methods of recording animal performances. These traits are considered final traits or external traits, as they can be simply measured and are the ultimate results of the sum of many other more precise phenotypes, called intermediate phenotypes, that are usually more complicated and multidimensional. Phenomics is the discipline that will embrace the next revolution in the animal breeding sector, where many novel intermediate phenotypes will be measured, analysed and then used to design novel breeding programmes much better targeted on the challenges that the livestock sector is asked to face. This review will summarise the state of the art in genomics and phenomics with a short-term outlook on potential applications in the main livestock species.

Key words: animal science, genome, genotype, molecular phenotype, selection.

SUSTAINABILITY OF A PLANT-BASED DIET

Vesna Gantner[1], Maja Gregić[1], Čedomir Radović[2]

[1] Faculty of Agrobiotechnical Sciences Osijek, Josip Juraj Strossmayer University of Osijek, Croatia
[2] Institute for Animal Husbandry, Belgrade - Zemun, Serbia
Corresponding author: Vesna Gantner, vgantner@fazos.hr
Invited paper

Abstract: Considering that recently there are more and more different options and dietary trends, vegetarianism is presented as a possible solution for quality nutrition with less impact on the environment, it is necessary to analyze how true such a premise really stands. A plant-based diet implies the consumption of foods that come from plants with some or no components of animal origin. This diet could have some positive effects on the human health of adults (lower risk of chronic diseases such as heart disease, type 2 diabetes, certain cancers, and obesity) but only well balanced and supplemented while in infants, children, and adolescents could cause severe deficiencies in vitamin 9 and vitamin 12 affecting the growth, cognition, social development, and expression of depression. From the point of environmental sustainability, further research is necessary to distinguish the accurate footprint of a plant-based diet as well as of animal production. Finally, it is up to each person to decide, hopefully, based on knowledge and responsibility, what kind of diet will follow. From the point of those engaged in animal production, it is up to us to ensure efficient and sustainable production of high-quality animal products, because the market is only growing.

Key words: plant-based diet, environmental impact, sustainability

INTELLIGENT/ SMART TECHNOLOGIES FOR MORE PRODUCTIVE AND COMPETITIVE ANIMAL HUSBANDRY SECTOR IN BULGARIA

Elena Kistanova[1], Stanimir Yotov[2], Dobri Yarkov[3], Dariva Zaimova[4]

[1]Institute of Biology and Immunology of Reproduction, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria
[2]Department of Obstetrics, Reproduction and Reproductive Disorders, Trakia University,
6000 Stara Zagora, Bulgaria
[3]Department of General Livestock Breeding, Faculty of Veterinary Medicine, Trakia University, 6000 Stara Zagora, Bulgaria
[4]Department of Industrial Business and Entrepreneurship, Faculty of Economics, Trakia University, 6000 Stara Zagora, Bulgaria
Corresponding author: Elena Kistanova, kistanova@gmail.com
Invited paper

Abstract: In the last decades science has been marked by the significant impact of the Artificial Intelligence (AI). Farm management, animal welfare and health have undergone changes that resulted in higher efficiency, improved social and ecological footprint. In this process however the disbalanced regional characteristics and development levels proved as a challenge to fully experience the technical, technological, and economic advances in the commercial animal farming. The National Scientific Program (NSP) "Intelligent animal husbandry" of the Bulgarian Ministry of education and science aims to bridge the gap between the demand for innovative technologies of the agricultural sector and the offered fundamental and applied research by universities, Agricultural academy and Bulgarian academy of sciences. Twelve working packages of NSP cover the key research areas such as animal breeding and bioinformatics; genetics (epigenetics) and breeding; reproductive biotechnologies (semen and embryo sexing, embryo transfer); ecology and biodiversity; food; transport; and energy efficiency, all of which are oriented towards applications of the obtained scientific results in modern farms. The development of automatic and robotic animal husbandry operations such as feeding, milking, and cleaning, the economics and management of farms with the application of information and communication technologies also includes in this NSP. The important part of program is modeling of the processes and phenomena in animal husbandry on the base of large volumes of data using machine learning algorithms. The NSP is expanding the scope of the smart farm activities through pilot testing and validation of the functionalities of the microclimate management devices on the farm (the systems for monitoring the environment, health, growth, behavior, reproduction, emotions and stress of the animals), as well as the prototype of the intelligent cyberphysical systems in a cloud environment for monitoring target parameters in animal husbandry; further development of the unmanned aerial vehicles and the transport robot/ service robot-drone. By uniting and analyzing the obtained results, problems of animal health, reproduction and welfare can be detected early, and timely intervention and treatment can be provided that allow to improve the production and economic efficiency of the precision livestock farming in Bulgaria.

Key words: intelligent technologies, animal husbandry

Acknowledgements
The research are supported from the Ministry of Education and Science of the Republic of Bulgaria under the National Scientific Program INTELLIGENT ANIMAL HUSBANDRY, grant agreement no. Д01-62/18.03.2021.

THE INFLUENCE OF NUTRITION ON CANINE BEHAVIOR AND THE ROLE OF THE GUT-BRAIN AXIS: A COMPREHENSIVE REVIEW

Federica Sportelli, Benedetta Delfini, Costanza Delsante, Carla Giuditta Vecchiato, Carlo Pinna, Giacomo Biagi

Department of Veterinary Medical Sciences, University of Bologna, Ozzano dell'Emilia, Bologna, Italy
Corresponding author: Giacomo Biagi, giacomo.biagi@unibo.it
Invited paper

Abstract: The emotional well-being of our animals plays a crucial role in their overall quality of life, which in turn affects the lives of their owners. The evidence of existence of a gut-brain axis has prompted studies to understand the complex interactions between intestinal microbiota, central nervous system, autonomic nervous system, and other communication pathways, in order to contribute to the improvement of psychological and behavioral balance through diet and targeted supplements. Indeed, studies are investigating the potential of nutritional intervention on behavior by employing nutrients such as amino acids, fatty acids, or additional dietary supplements, which may provide benefits through the interaction with the gut-brain axis.

Key words: gut-brain axis, canine nutrition, intestinal microbiota, central nervous system, behavior, supplements

EFFECT OF THE FATTY ACID COMPOSITION OF THE MATERNAL DIETS OF SWISS LARGE WHITE SOWS ON THE FATTY ACID COMPOSITION OF THE BACKFAT OF THE PROGENY

Giuseppe Bee, Steve Jacot, George Guex, Claudine Biolley

Swine Research Group – Agroscope, La Tioleyre 4, 1725, Posieux, Switzerland
Current address: Swine Research Unit, Agroscope, La Tioleyre 4, 1725, Posieux, Switzerland
Corresponding author: Giuseppe Bee, giuseppe.Bee@agroscope.admin.ch
Invited paper

Abstract: The study aims to determine the effects of two dietary fats (coconut fat [CF] and soy oil [SO]), which differ in their saturated (SFA), monounsaturated (MUFA), and polyunsaturated (PUFA) fatty acid (FA) content, supplemented to the gestation and lactation diet of 16 multiparous Swiss Large White sows on the FA composition of the adipose tissue (AT) of their progeny at 105 kg body weight (BW). At weaning, four females, two with the lowest and two with the highest birth weight (BtW) within the litter from each CF and SO sow were selected and fed a standard starter and grower diet from 9 to 63 kg BW. In the finishing period (63 to 105 kg BW), one low and one high BtW pig was fed a finisher diet with the same FA composition (expressed as % total FA; SFA: 25.8%; MUFA: 26.6%; PUFA: 47.6%) as the grower diet (high degree of unsaturation; dUS-H), whereas one low and one high BtW pig was fed a more saturated (low degree of unsaturation; dUS-L) finisher diet (SFA: 28.8%; MUFA: 25.1%; PUFA: 46.1%). Sow reproduction traits, mature milk FA profile, growth performance, carcass characteristics, and FA composition of the progenies' AT were assessed. Sow reproduction traits and litter performance during lactation were not affected by the dietary FA composition of the gestation diet. Compared to the SO group, the milk of CF sows contained more SFA and MUFA ($P < 0.01$) and less PUFA ($P < 0.01$) than the sow milk of the SO group. Regardless of the diet fed in the finisher period, CF and low BtW pigs were less efficient ($P \leq 0.04$), and low BtW pigs grew slower ($P = 0.02$). The dUS-L pigs had lower ($P = 0.02$) carcass yield, greater ($P = 0.01$) defatted shoulder portions, lighter ($P \leq 0.05$) hearts and kidneys, and heavier livers ($P = 0.02$). The maternal diet and the BtW had minimal effects on the FA composition of the AT of slaughtered pigs. The AT of the dUS-L pigs contained greater amounts of SFA and MUFA ($P < 0.01$) and lower amounts of PUFA ($P < 0.01$) than the AT of dUS-H pigs. These differences were primarily due to greater ($P < 0.01$) levels of stearic, palmitoleic, and oleic acid, and lower ($P < 0.01$) levels of linoleic acid. However, compared to the dUS-H diet feeding, the dUS-L diet decreased the linoleic acid and PUFA content to a greater extent in the pigs AT born from CF than SO sows and increased the stearic and SFA level only in progenies AT of the CF sow (maternal feeding × finisher diet interaction; $P = 0.04$). These findings confirm that the FA composition of the AT depends strongly on the supplied dietary FA in the grower and finisher diet. Furthermore, we show that the FA composition of the gestation and lactation diet has lasting effects and influences how the dietary FA of the grower and finisher diet impacts the AT's FA profile of slaughtered pigs.

Key words: birth weight, dietary fat, maternal nutrition, grower diet, pigs

BALANCING AMINO ACID LEVELS IN PIGLET DIETS

Sam Millet[1,2], Sophie Goethals[1]

[1]ILVO, Flanders Research Institute for Agriculture, Fisheries and Food. Scheldeweg 68, 9090 Melle, Belgium
[2]Department of Veterinary and Biosciences, Ghent University, Merelbeke, Belgium
Corresponding author: Sam Millet, sam.millet@ilvo.vlaanderen.be
Invited paper

Abstract: To maintain optimal performance with low crude protein diets, good knowledge of the amino acid profile within these low crude protein diets is crucial. Amino acid levels will affect piglets' feed intake, growth and feed efficiency. Not only absolute levels but especially the digestibility and balance between amino acids is crucial for optimal health. In this overview, we first discuss the factors and methodology affecting the dietary amino acid requirement of piglets and then we give an overview of amino acid research that has been performed at ILVO. We consider the interaction between lysine and crude protein level, showing that piglets may be fed below their lysine requirement shortly after weaning. Next, we discuss the effect of dietary amino acid level on feed intake and the interaction between amino acids. In particular the branched chain amino acids (leucine, valine, isoleucine) and tryptophan have been of interest in our research. Last, we discuss the relationship between health status of a farm and amino acid requirements.

Key words: amino acid, pig, requirement, health, performance

HEAT STRESS EFFECTS ON IBERIAN PIG GROWTH AND PRODUCTIVITY

Zaira Pardo[1], Ignacio Fernández-Fígares[1], Manuel Lachica[1], Isabel Seiquer[1], Luis Lara[1], Consolación García-Contreras[1], Fernando Sánchez-Esquiliche[2], Rosa Nieto[1]

[1]Department of Nutrition and Sustainable Animal Production, Estación Experimental del Zaidín, CSIC, Profesor Albareda, 1, 18008, Granada, Spain
[2]Sánchez Romero Carvajal Jabugo, Huelva, Spain
Corresponding author: Rosa Nieto, rosa.nieto@eez.csic.es
Invited paper

Abstract: Heat stress challenges pig production resulting in large economic losses because of growth depression, altered carcass and meat quality traits, and mortality. Pigs are extremely sensitive to elevated environmental temperatures because of high basal metabolic heat production, skin insulation due to subcutaneous fat depth and lack of functional sweat glands. Although Iberian pigs are considered adapted to its environment, the thick subcutaneous fat layer could make them more sensitive to elevated temperatures compared to lean breeds. When growing Iberian pigs were under chronic heat stress a reduced growth performance associated to a decreased voluntary feed intake was observed, although the magnitude of reduction was lower compared to values reported for cosmopolitan pigs. Dietary betaine or zinc addition did not improve detrimental effects on performance. Plasma biochemical parameters suggested an increased protein catabolism under heat stress conditions. Meat quality and oxidative status of pigs seemed to be not compromised by prolonged heat exposure. Overall, growing Iberian pigs seem resilient to heat exposure in terms of performance and meat quality.

Key words: Iberian pig, heat stress, meat quality, nutritional strategies, performance

Acknowledgements
Supported by Spanish Ministry of Science and Innovation (grant references PID2021-125059OB-I00 and AGL2016-80231-R). We are very grateful to Sánchez Romero Carvajal Jabugo S.A. (El Puerto de Santa María, Cádiz, Spain) for providing experimental facilities and purebred Iberian pigs, and to Alfonso García-Écija and Miguel Liñán-Fernández for their skillful animal and laboratory work.

VARIABILITY OF MORPHOMETRIC CHARACTERISTICS OF GONADS FROM BOARS OF AUTOCHTHONOUS PIG BREEDS IN SERBIA

Marija Gogić[1], Radomir Savić[2], Vladimir Živković[1], Nenad Stojiljković[1], Maja Petričević[1] Aleksandra Petrović[1], Violeta Mandić[1]

[1]Institute for Animal Husbandry, Autoput 16, P. Box 23, 11080, Belgrade-Zemun, Republic of Serbia
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080, Belgrade-Zemun, Republic of Serbia
Corresponding author: Marija Gogić, gogic.marija@gmail.com
Invited paper

Abstract: The morphometric characteristics of the gonads of male autochthonous breeds of pigs in the Republic of Serbia were examined. The following breeds are included: lasasta mangulica (Swallow-Bellied Mangalitsa), Moravka and Resavka. There were 3 age categories divided by body mass within the group of Swallow-Bellied Mangalitsa. The first group are animals of average body mass 20 kg (n=11). The second group is the average body mass of 45 kg (n=9), and the third group are pigs of body mass of 100 kg (n=13). Number of Moravka male were 8, until number of Resavka was 7 adult animals. The morphometric properties that were investigated were: ZAPSAEP- Volume of testes with the epididymes; ZAPBEZEP- Volume of testes without the epididymes; ZAPEP-volume of epididymes; MASSAEP- Weight of testes with the epididymes; MASBEZEP- Weight of testes without the epididymes; MASEP- Weight of epididymes; DUŽSAEP- Length of testes with the epididymes; DUŽBEZEP- Length of testes without the epididymes; DUBBEZEP- Thickness of testes; ŠIEBEZEP- Width of testes; OBBEZEP- Circumference of testes. The characteristics of length and thickness in the youngest group of Mangalitsa had a coefficient of variation for the left and right testis of less than 30%, as well as for the group up to 45 kg of body weight. Length traits in the oldest group of Mangalitsa had smaller coefficients of variation for the left compared to the right testis (12.70; 10.86 toward 13.76; 12.22%). The absolute size of the left testicle was larger in non-castrated male of the Mangalitsa breed, as indicated by all the morphometric measurements taken on the testicles. The characteristics of testicular volume varied within the Moravka breed, in contrast to the Mangalitsa, in Moravka males, a larger volume of testicles with the epididymis on the right side compared to the left was determined, which is a consequence of the larger volume of the right epididymis. In contrast to the Moravka, lower values of the characteristics of the volume of the right testicle compared to the left were found in male Resavka. Traits of volume, length, depth, and weight in Mangalitsa males had coefficients of variation of less than 30% for left and right testis. In sexually mature animals, the correlation between morphometric measures is strong and positive, which allows us to take one measure (which is the simplest to take), to gain an objective insight into the size of the testes. The association of age and body mass at slaughter with a number of morphometric traits of the Mangalitsa breed was moderate to strong with a positive sign. The connection between the morphometric characteristics of the testicles and the production characteristics of male pigs of the Moravka breed, unlike the Mangalitsa, looking at the established correlation coefficients in the Moravka, it is not possible to draw clear conclusions when it comes to the connection of these groups of characteristics. Within the Resavka breed, of the production traits, only the average lifetime daily gain has a strong correlation with the trait of testis length without epididymis, but with a negative sign.

Key words: morphometric characteristics, gonads, autochthonous breeds, Mangalitsa, Moravka, Resavka

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

ENHANCING PIGLET GROWTH WITH LIVE YEAST: A NUTRITIONAL SUPPLEMENT STUDY

Vladimir Živković[1], Wladyslav Migdal[2], Lukasz Migdal[2], Marija Gogić[1], Nenad Stojiljković[1], Aleksandra Petrović[1], Čedomir Radović[1]

[1]Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia
[2]Faculty of Animal Science, University of Agriculture in Kraków
Corresponding author: Vladimir Živković,vladimirzivkovic_87@yahoo.com
Invited paper

Abstract: The study encompassed 135 piglets of the Large White breed and aimed to evaluate the impact of a live yeast feed supplement on key production parameters—namely, feed intake, average daily gain, and feed conversion—among growing piglets. The trial spanned a total of 39 days, divided into two distinct periods. The initial phase, lasting 28 days (from day 22 to day 49), was followed by a shorter 11-day second phase (day 50 to day 60). Throughout the observation periods, two distinct feed mixtures were employed, as outlined in Table 1. The control groups were provided standard farm mixtures, while the trial groups received the same mixtures supplemented with varying concentrations (3% and 4%) of the commercial live yeast dietary supplement, Biokvas-45. During the initial period, statistical analysis indicated no significant differences ($p>0.05$) across all three observed parameters between the groups. However, notable disparities emerged during the second period. Specifically, feed intake (FI), average daily gain (ADG), and feed conversion ratio (FCR) displayed variation between the T_1 and T_2 groups. The T_2 group exhibited particularly favorable performance, achieving an impressive average daily gain of 563.24 g/d and a commendable feed conversion ratio of 1.92 g/g. Considering the entirety of the trial, the T_2 group consistently outperformed the other trial groups in terms of average daily gain, achieving a rate of 348.26 g/d. The results collectively indicate that the incorporation of the dietary supplement Biokvas-45 holds promise as a beneficial addition to the nutrition of growing piglets. However, further research is warranted to comprehensively assess the supplement's effects on pigs during the fattening phase. These findings contribute to a growing body of knowledge that could potentially lead to more effective nutritional strategies for pig farming.

Key words: nutrition, production parameters, weaning

Acknowledgments
The research was financed by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia No. 451-03-47/2023-01/200022.

VARIATION IN CARCASS, MEAT AND FAT QUALITY OF AUTOCHTHONOUS BREED IN CONVENTIONAL AND ORGANIC PRODUCTION SYSTEM

Bojana Savić[1], Martin Škrlep[1], Klavdija Poklukar[1], Nina Batorek Lukač[1], Marjeta Čandek-Potokar[1,2]

[1] Agricultural Institute of Slovenia, Ljubljana SI-1000, Slovenia
[2] University of Maribor, Faculty of Agriculture and Life Sciences, Hoče SI-2311, Slovenia
Corresponding author: Marjeta Čandek-Potokar, meta.candek-potokar@kis.si

Abstract: The Krškopolje pig, a local Slovenian pig breed, is raised in various housing conditions (indoor, outdoor or combined) and often in organic farming. The aim of the present study was to compare carcass, meat and fat quality of surgically castrated Krškopolje male pigs reared in conventional (CON, n=108) and organic (ECO, n=136) production systems on data continuously collected from 2015 till present. Krškopolje pigs in ECO system were on average older and heavier at slaughter than CON pigs (355 vs. 299 days; 162 vs. 151 kg, respectively). Considering carcass characteristics, ECO pigs exhibited greater carcass length, thicker backfat (at the level of the last rib and at withers) and larger loin eye area (P<0.01). There was a significant difference in meat quality regarding colour parameters (L*, a*, b* and hue) and shear force, indicating that ECO pigs had darker, redder and less yellow meat colour, and more tender meat than CON pigs (P<0.05). The ECO group had also lower saturated and larger n-6 and n-3 polyunsaturated fatty acid contents of backfat than CON group (P<0.001). *Longissimus dorsi* muscle of ECO pigs exhibited lower vitamin E and larger magnesium contents (P<0.05). To conclude, the present study showed that ECO Krškopolje male pigs deposit more fat, which is further reflected in a different fatty acid composition. Although the ECO pigs were older and there was no significant difference in IMF content, their meat was less tough than the meat of CON pigs.

Key words: Krškopolje pig, production systems, carcass traits, meat quality, fatty acid composition

Acknowlegment
Funding by Slovenian Agency of Research (grants L7-4568, V4-2201 and P4-0133) is acknowledged. We thank Jani Debeljak and Petra Štolfa for their help and support in conducting the experiment.

ATTITUDES OF CONSUMERS TOWARDS ANIMAL WELFARE IN UKRAINE AND AZERBAIJAN

Galia Zamaratskaia[1], Ayaz Mammadov[2], Javid Ojaghi[2], Simon Tobias Höxter[1], Oksana Kravchenko[3], Nataliia Hryshchenko[4], Mykhailo Matvieiev[4], Elina Åsbjer[1], Birgitta Staaf Larsson[1], Svitlana Usenko[3], Anders H. Karlsson[1], Hallvard Wie[1], Iveta Kocina[5], Liene Ansone[5], Vytautas Ribikauskas[6], David Richard Arney[7], Ragnar Leming[7], Francesca Carnovale[7], Andriy Getya[4]

[1]Swedish University of Agricultural Sciences, Sweden
[2]Khazar University, Azerbaijan
[3]Poltava State Agrarian University of Ukraine, Ukraine
[4]National University of Life and Environmental Sciences of Ukraine, Ukraine
[5]Latvia University of Life Sciences and Technologies, Latvia
[6]Lithuanian University of Health Sciences Veterinary Academy, Lithuania
[7]Estonian University of Life Sciences, Estonia
Corresponding author: Galia Zamaratskaia, galia.zamaratskaia@slu.se
Invited paper

Abstract: The aim of this study was to investigate the views and opinions of consumers in Ukraine and Azerbaijan regarding the importance of animal welfare. A sample of 147 respondents in Ukraine and 105 in Azerbaijan was included in the study. Ukrainian consumers associated animal welfare with good housing and good feeding, whereas Azerbaijani consumers mainly considered the importance of good feeding, and ranked housing as less important. Only a small proportion of the consumers from both countries considered natural behaviour, happiness and other positive emotions as important. Older consumers expressed higher concerns about animal welfare compared to younger consumers. The majority of consumers from both countries (93% in Ukraine and 85% in Azerbaijan, p=0.058) believed that the welfare of livestock animals in their country should be improved. The major issues identified by the consumers included animal housing, feeding quality and lack of governmental support. Our results highlighted the importance of animal welfare among consumers in Ukraine and Azerbaijan. However, the understanding of animal welfare and the factors affecting it varied among consumers, which underlines the necessity of education regarding the conditions for livestock, animal welfare and animal rights.

Key words: farm animal, animal production, food ethics, animal welfare, animal protection

Acknowledgement
The study was financially supported by the Swedish Institute, Baltic Sea Cooperation, number 01877/2021, Happy animals for Sustainable Production And Consumption, and by the Education, Audiovisual and Culture Agency (EACEA), European Commission, under Grant ”Sustainable Livestock Production and Animal Welfare (SULAWE)”, number 101083023 — SULAWE — ERASMUS-EDU-2022-CBHE. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union nor the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

ORGANIZATION OF CATTLE PRODUCTION IN CONDITIONS OF CLIMATE CHANGE

Ljiljana Samolovac[1], Dragan Nikšić[1], Dušica Ostojić Andrić[1], Vladimir Živković[1], Dragan Stanojević[2], Vlada Pantelić[1], Nenad Mićić[1]

[1]Institute for Animal Husbandry, Belgrade – Zemun
[2]University of Belgrade, Faculty of Agriculture, Belgrade-Zemun
Corresponding author: Ljiljana Samolovac, ljiljanasamolovac@gmail.com
Invited paper

Abstract: The greenhouse effect has led to a changed precipitation regime, an increase in the average temperature, the occurrence of extreme meteorological events (droughts and floods) and the like. All this harms the yield and quality of feed, the incidence of mycotoxins in food, reduced productivity of animals, the incidence of new and non-specific pathogens, the development of diseases, etc. According to the FAO and the World Bank, the countries most affected by climate change are the countries of Central Europe and the Mediterranean. The population of people living in rural areas and engaged in agriculture will be particularly at risk. With difficult working and living conditions and reduced incomes, there will be an increased migration of the population to the cities. The simultaneous decline in agricultural production and increased food demand will lead to a food supply crisis (FAO predicts that by 2050 the global population will increase to 9.6 billion people, resulting in a demand for 70% more food than in 2013).Cattle production is affected by the climate in different ways, directly and indirectly. Livestock condition, production level, reproductive performance, morbidity and mortality are correlated with climatic conditions. The most pronounced negative impact on the health and welfare of animals is a phenomenon called heat stress. Exposure to microclimatic conditions characterized by a combination of high temperature and air humidity overcomes the ability of animals to maintain normal thermoregulation and constant body temperature, leading to an increase in body temperature that exceeds physiological limits. In addition to the direct effects of heat stress on the productivity, reproduction and health status of animals, global warming also affects animals indirectly through reduced soil fertility, water availability, crop yields, quality of plant nutrients and the circulation of pathogenic agents. Finding a solution to mitigate and prevent the consequences of unfavourable climatic and microclimatic conditions is a challenge for the entire scientific and professional community, but also for every cattle breeder. Solutions can be biological and technological. Biological ones refer to the animals themselves (breed selection, selection for functional traits, selection for adaptability to heat stress, use of genomic selection, artificial insemination programs, herd size). Technological solutions relate to how animals are kept (free system, in outlets with canopies, use of grazing), facilities (new materials and technical solutions in the construction of facilities, use of insulating materials, regulation of microclimate conditions in facilities - ventilation and air humidity), nutrition and feeding (feeding method, feeding time, use of new types of feed, continuous water supply, etc.).The goal of agricultural production is to ensure food security in the face of climate change, and it is one of the most demanding tasks facing humanity.

Key words: greenhouse effect, climate change, cattle production

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

DAIRY CATTLE MILK PRODUCTION DURING SUMMER UNDER HEAT STRESS CONDITIONS

Nenad Mićić[1], Dragan Stanojević[2], Ljiljana Samolovac[1], Dragan Nikšić[1], Marina Lazarević[1], Vesna Gantner[3], Vladan Bogdanović[2]

[1]Institute for Animal Husbandry, Department of Cattle Breeding and Genetics, Autoput 16, 11080 Belgrade, Serbia
[2]University of Belgrade, Faculty of Agriculture, Department of Animal Science, Nemanjina 6, 11080 Belgrade, Serbia
[3]University of J. J. Strossmayer in Osijek, Faculty of Agrobiotechnical Sciences Osijek, Department for Animal Production and Biotechnology, Vladimira Preloga 1, 31000 Osijek, Croatia
Corresponding author: Nenad Mićić, micicnenad@hotmail.com
Invited paper

Abstract: The term heat stress in mammals implies the sum of environmental influences that cause an increase in the body temperature of the organism. In dairy cow breeds, heat stress primarily reduces milk yield and milk quality, and then impairs fertility, welfare and causes changes in behaviour. This has especially come into the focus in recent years with the increasingly pronounced consequences of climate change. The aim of the research was to determine the effects of various fixed factors on milk yield performance traits of cows: MY – daily milk yield (kg/day), MF - milk fat content (%) and MP - milk protein content (%). The total data set contained test-day information for the analyzed traits during the summer period, and the effects of breed, breeding location, order and stage of lactation, year and season of calving, as well as the month of control were investigated. From the total set, selected data were used that correspond to the values of the daily temperature-humidity index of at least 72 (THI≥72), as an indicator of the occurrence of heat stress. Manifestation and variability of the studied traits, as well as the influence of individual factors on the studied traits, was determined using appropriate procedures within the SAS statistical program. High statistical significance of all factors included in the model was established ($p<0.001$). Cows achieved the highest daily milk yield if they calved during the spring season, in their third lactation and in the interval of the second stage (61-120 days) of lactation. Milk yield decreased during the summer months from June to September. The fat content was the lowest in cows which calved in the spring season, during the first lactation and the first stage of lactation (<60 days), it was lower during July, August and September compared to the month of June. During the summer, the protein content decreased from June to August, while it increased in the subsequent stages of lactation. The stressogenic impact of the summer period on milk production in cows is present every year to a greater or lesser extent, depending on a combination of several factors. Research confirms that the risk of heat stress, in addition to the summer period, is often present from April until October.

Key words: dairy cattle, heat stress**,** THI**,** test-day milk traits, milk yield

Acknowledgements
This study research was funded by the Agreements on the financing of scientific research work in 2022 between: The Institute for Animal Husbandry and the Ministry of Education, Science and Technological Development, Republic of Serbia, No: 451-03-68/2022-14/ 200022; The Faculty of Agriculture in Belgrade and the Ministry of Education, Science and Technological Development, Republic of Serbia, No: 451-03-68/2022-14/200116.

GOATS AND CLIMATE RESILIENCE

Nevena Maksimović, Dragana Ružić Muslić, Violeta Caro Petrović, Bogdan Cekić, Ivan Ćosić, Nemanja Lečić, Nikola Stanišić

Institute for Animal Husbandry, 11080 Belgrade, Serbia
Corresponding author: Nevena Maksimović, nevena_maksimovic@yahoo.com
Invited paper

Abstract: Climate change poses a major global concern and is therefore an ongoing topic. World's population is expected to reach 9.7 billion people by 2050 and 10.4 billion by 2100, which means that the food resources will become crucial. In that respect, animal protein is considered a vital nutrient for growing human population. However, in the light of ever-changing climate events food and water sources for both animals and humans can become scarce in certain areas. The impacts of higher temperatures, changes in precipitation and extreme weather events pose the most risk on agricultural systems such as livestock. Direct and indirect influence of heat and drought caused by global warming is harmful to livestock. Small ruminants and particularly goats are considered more resilient and better adapted to hot and dry environments compared to other livestock. These animals require less in terms of feed, water and labor than large ruminants and are also more thermo-tolerant. They have certain physiological, behavioral and anatomical advantages aiding their survival during heat and drought. Goats are less of a competition to humans in terms of available food as they can thrive on plants unusable for human nutrition. The review discusses advantages of goats as species in terms of adaptation to changing climate.

Key words: goats, climate, heat, adaptation, thermotolerance

Acknowledgement
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia on the basis of the Agreement on the realization and financing of scientific research work of SRO grant number 451-03-47/2023-01/200022.

CARBON CAPTURE TECHNOLOGIES FOR LIVESTOCK FARMS

Fatmagül Tolun[1], Ergün Demir[2]

[1]Department of Automotive Technology, University of Balikesir, Balikesir Vocational School, Çağış, 10145 Balıkesir, Turkiye
[2]Department of Animal Nutrition and Nutritional Disorders, University of Balikesir, Faculty of Veterinary, Çağış, 10145 Balıkesir, Turkiye
Corresponding author: Ergün Demir, ergundemir10tr@gmail.com

Abstract: The Paris Climate Agreement, signed by 175 countries, has set the goal of limiting “net zero” carbon dioxide emissions and global temperature rise to 1.5°C compared to the pre-industrial level in the second half of the century in international law. The 1.5°C target was reiterated with the 26th United Nations Climate Change Conference held in Glasgow. In order to achieve this target, countries need to stay within a certain carbon budget. The use of renewable energy and the increase in energy efficiency are very important for combating climate change. However, these measures may not be sufficient to stay within the carbon budget and limit the temperature rise to 1.5°C. At this point, carbon capture, use and storage technologies will play an important role in achieving the "net zero" carbon dioxide emission target. The rapid rise in atmospheric carbon, or CO2, concentrations throughout the industrial period is of anthropogenic origin. Today, the most important sectors that cause greenhouse gas emissions are energy, transportation, industry and agriculture. Livestock practices have an important place in the production of greenhouse gas emissions originating from the agricultural sector. Conservation and restoration of farmland that already sequesters carbon is key to increasing carbon capture. Livestock is a unique sector in that it both sequesters carbon and releases it into the atmosphere. Therefore, through suitably managed farming systems and new technologies, the ability to enhance carbon capture can be achieved with the overall outcoreview, it is aimed to specify the technological methods used to capture emissions and carbon in livestock farming.

Key words: carbon capture, livestock, biomass, greenhous gas

DETERMINATION OF NEW WELFARE AND STRESS INDICATORS OF THE ANIMALS ON CATTLE AND PIG FARMS BASED ON DIFFERENT PUBLICATIONS

Slavča Hristov[1], Marko Cincović[2], Branislav Stanković[1], Radojica Đoković[3], Dušica Ostojić Andrić[4], Ljiljana Samolovac[4], Dimitar Nakov[5]

[1]The University of Belgrade - Faculty of Agriculture, Belgrade-Zemun, Republic of Serbia
[2]The University of Novi Sad - Faculty of Agriculture, Novi Sad, Republic of Serbia
[3]University of Kragujevac - Faculty of Agronomy in Čačak, Čačak, Republic of Serbia
[4]Institute for Animal Husbandry, Belgrade – Zemun, Republic of Serbia
[5]Faculty of Agriculture, "Goce Delcev" University in Stip, Stip, Republic of North Macedonia
Corresponding author: Slavča Hristov, hristovs@agrif.bg.ac.rs

Abstract: In recent years, numerous plans and programs, instructions, recommendations, scientific opinions, analyses, reports, best practices, regulations, codes of practices and assurance schemes have been published in publications which were not published in journals and symposiums proceedings that consider indicators of welfare and stress of the animals on cattle and pig farms intending to improve their health and productivity. These indicators were created mainly as results of research in numerous national and international projects. Mentioned projects consider key indicators and prescribe on-farm assessments of animal welfare and stress in cattle and pig farms. In the assessments of the welfare and stress of the animals in different systems of keeping and accommodation, the need to determine new welfare and stress indicators on cattle and pig farms was observed. The publications about plans and programs, instructions, recommendations, scientific opinions, analysis, reports, best practices, regulations, code of practices and assurance schemes related to animal welfare and stress contain numerous indicators. The analysis of these publications aims to determine the main characteristics of the existing and to generate ideas to define new welfare and stress indicators of the animals on cattle and pig farms.

Key words: cattle, pig, welfare indicators, stress indicators, publications

Acknowledgement
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200116 and No. 451-03-47/2023-01/200022.

DETERMINATION OF NEW BIOSECURITY INDICATORS ON CATTLE AND PIG FARMS BASED ON DIFFERENT PUBLICATIONS

Branislav Stanković[1], Slavča Hristov[1], Marko Cincović[2], Radojica Đoković[3], Dušica Ostojić Andrić[4], Ivana Milošević-Stanković[1], Dimitar Nakov[5]

[1] The University of Belgrade - Faculty of Agriculture, Belgrade-Zemun, Republic of Serbia
[2] The University of Novi Sad - Faculty of Agriculture, Novi Sad, Republic of Serbia
[3] University of Kragujevac- Faculty of Agronomy in Čačak, Čačak, Republic of Serbia
[4] Institute for Animal Husbandry, Belgrade – Zemun, Republic of Serbia
[5] Faculty of Agriculture, "Goce Delcev" University in Stip, Stip, Republic of North Macedonia
Corresponding author: Branislav Stanković, baxton@agrif.bg.ac.rs

Abstract: In recent years, numerous plans and programs, instructions, recommendations, scientific opinions, analysis, reports, best practices, regulations and other type of publications have been published in publications, other than in journals and symposiums proceedings that consider indicators of biosecurity on cattle and pig farms in order to improve their health and productivity. These indicators were created mainly as results of research in numerous national and international projects, which consider key indicators and prescribe on-farm assessments of biosecurity on cattle and pig farms. In the assessments of the biosecurity level in different systems of rearing and accommodation on cattle and pig farms, the need to determine indicators was observed. The publication about plans and programs, instructions, recommendations, scientific opinions, analysis, reports, best practices and regulations, related to biosecurity level contain numerous indicators. The analysis of these publications aims to determine the main characteristics of the existing and to generate ideas to define new biosecurity indicators of the animals on cattle and pig farms.

Key words: cattle, pig, biosecurity indicators, publications

Aknowledgement
This paper is the result of research carried out within the "Agreement on the realization and financing of scientific research work in 2023 between the Ministry of Science, Technological Development and innovation of the Republic of Serbia and the Faculty of Agriculture of the University of Belgrade, contract registration number: 451-03-47/2023-01/200116".

CAMELINA SATIVA AS A SUSTAINABLE AND FEASIBLE FEEDSTUFF FOR LAYING POULTRY: A REVIEW

Yazavinder Singh, Marco Cullere, Antonella Dalle Zotte

Department of Animal Medicine, Production and Health, University of Padova, Viale dell'Università, 16, 35020, Legnaro, PD, Italy
Corresponding author: Antonella Dalle Zotte, antonella.dallezotte@unipd.it
Invited paper

Abstract: *Camelina sativa* is a promising oilseed crop with unique characteristics, including rapid growth, drought and frost tolerance, low input requirements, and resistance to pests and diseases. It offers diverse applications in both feed and non-feed sectors, primarily due to its high levels of *n*-3 polyunsaturated fatty acids (PUFA) and antioxidants. However, the presence of secondary plant metabolites in camelina restricts its use in poultry nutrition. These compounds may inhibit some digestive enzymes, increase digesta viscosity, and affect nutrients absorption, potentially compromising bird health and product quality. Various techniques, such as heat treatment, multi-enzyme supplementation, and copper supplementation, have been employed to mitigate the negative effects of these antinutritional compounds. Inclusion at high levels (>10%) of camelina by-products in poultry diets has been found to decrease nutrients digestibility and laying performance. Nonetheless, the inclusion of camelina by-products, particularly oil, in the diets resulted in comparable or improved egg quality. The egg yolk fatty acid profile exhibited a higher content of PUFA, reducing the *n*-6/*n*-3 ratio, thereby enhancing the nutritional value of eggs. Sensory evaluations showed no significant differences in product quality among diet groups. This review highlights the feeding value of camelina by-products and provides a comprehensive overview of the existing literature, focusing on digestibility, performance, and egg quality evaluation in laying poultry diets.

Key words: false flax, feeding, inclusion level, live performance, egg quality, fatty acids, sensory analysis

Acknowledgement
Funding: Financially supported by National funds PRIN (Progetti di Ricerca di Rilevante Interesse Nazionale) - Call 2017 - Prot. 2017LZ3CHF: “Agronomic and genetic improvement of Camelina (*Camelina sativa* (L.) Crantz) for sustainable poultry feeding and healthy food products”.

ORGANIC POULTRY PRODUCTION: GENOTYPE CHOICE AND WELFARE

Simeon Rakonjac[1], Snežana Bogosavljević-Bošković[1], Zdenka Škrbić[2], Miloš Lukić[2], Vladimir Dosković[1], Veselin Petričević[2], Milun D. Petrović[1]

[1]University of Kragujevac, Faculty of Agronomy in Čacak, Cara Dušana 34, 32 000 Čačak, Serbia
[2]Institute of Animal Husbandry, Belgrade-Zemun, Autoput 16, 11080 Zemun, Serbia
Corresponding author: Rakonjac Simeon, simcepb@yahoo.com
Invited paper

Abstract: Organic poultry production has a continuous growth trend that is expected to continue in the following period. Today's consumers expect this method of production to ensure the quality of life and a high level of welfare for the reared animals, which will contribute to the quality of the products produced in this way. Since this is a relatively young and still insufficiently researched rearing system, there are a lot of unknowns and unresolved issues that slow down its faster development. A genotype that would provide optimal production results in this production system has not yet been selected, so either hybrids from conventional production or breeds with poor production characteristics are often used. In addition to the undoubted benefit that the use of the outlet brings, which is reflected in the better quality of the organic products and the greater degree of welfare and vitality of the reared poultry, the negative impact of extreme weather conditions still exists, as well as the increased risk of transmitting various diseases and parasites as well as predator attacks.

Key words: organic poultry, slow-growing genotypes, fast-growing genotypes, dual-purpose breeds, welfare, biosecurity

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of Republic of Serbia, No. 451-03-47/2023-01/200088 and No. 451-03-47/2023-01/200022.

ASSESSMENT OF THE CURRENT STATE OF BIOSECURITY MEASURES ON BROILER CHICKEN FARMS WITH DIFFERENT CAPACITIES IN VOJVODINA

Marko Pajić[1], Slobodan Knežević[1], Jelena Maletić[2], Sava Spiridonović[3], Biljana Đurđević[1], Dalibor Todorović[1], Dušica Ostojić Andrić[4]

[1]Scientific Veterinary Institute of “Novi Sad”, Rumenački put 20, 21000 Novi Sad, Serbia
[2]Institute of Veterinary Medicine of Serbia, Janisa Janulisa 14, 11107 Belgrade, Serbia
[3]Faculty of Agriculture, University of Novi Sad, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia
[4]Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia
Corresponding author: Marko Pajić, markopajic@niv.ns.ac.rs
Invited paper

Abstract: The broiler production faces many challenges, which can cause negative effects on their health and welfare. The great importance for farmers is to prevent disease outbreaks, and biosecurity measures are very significant. This study aimed to quantify the level of biosecurity measures in broiler farms of different capacities, using a standardized procedure, and to identify key aspects that would require improvements. The research was conducted from May to September 2022, and 15 randomly selected broiler farms participated. Five large-size (>30,000 chickens), five middle-size (10,000-30,000 chickens) and five small-size farms (<10,000 chickens) were analyzed. All farms are located in Vojvodina and farmers agreed to participate in the survey. The Biocheck.UGent scoring system (https://biocheckgent.com/en) was used to quantify biosecurity measures. The overall farm biosecurity is a weighted average of the external and internal biosecurity. Our results showed a low level of implementation of internal and external biosecurity measures on all farms (40-63%). The overall rating of biosecurity on farms was lower than the world and country's average. The results of this study suggest that the control of implemented biosecurity measures in broiler farms is very important. Most of the biosecurity risks for broiler farms originate from inappropriate site selection, purchase of day-old chicks of unknown quality, lack of procedures, and training of farm employees. This study should provide a good encouragement for the development of a biosecurity plan, identifying risks and the appropriate way to educate farm owners, as well as farm employees, on the implementation of biosecurity measures.

Key words: broilers, biosecurity measures, questionnaire, farm

Acknowledgment
This study was funded by Ministry of Science, Technological Development and Innovation of Republic of Serbia by the Contract of implementation and funding of research work of NIV-NS in 2023, Contract No: 451-03-47/2023-01/200031.

EXPLORING PORCINE GROWTH AND FATNESS THROUGH LIVER TRANSCRIPTOME ANALYSES IN DIFFERENT IBERIAN GENETIC BACKGROUNDS

María Muñoz[1], Ángel M. Martínez-Móntes[1], Almudena Fernández[1], Josep María Folch[2,3], Ana I. Fernández[1]

[1] INIA, Departamento de Mejora Genética Animal, 28040 Madrid, Spain
[2] CRAG, Plant and Animal Genomics, 08193, Bellaterra, Spain
[3] UAB, Departament de Ciència Animal i dels Aliments, 08193 Bellaterra, Spain
Corresponding author: María Muñoz, mariamm@inia.csic.es
Invited paper

Abstract: Growth and fatness traits play a crucial role in pig production. While Quantitative Trait Loci (QTL) scans have been used to study experimental crosses between divergent breeds, differential expression analyses using RNA-Seq data from animals with contrasting traits offer additional insights into the underlying genetics and molecular mechanisms. The liver, being vital for metabolic homeostasis and involved in regulating blood sugar levels and processing dietary fats, is likely influential in the variability of these traits. Therefore, the objective of this study was to identify genes associated with pig growth and fatness traits through transcriptome analysis of the liver in two different Iberian backcrosses, using RNA-Seq technology. A total of 43 and 59 differentially expressed genes (DEGs) were found in F1 (Iberian x Pietrain) x Pietrain (BC_PI) and F1 (Iberian x Landrace) x Landrace (BC_LD), respectively, between extreme groups for growth and fatness. In BC_PI, DEGs were enriched in biological pathways mainly related to the immune system, while BC_LD showed enrichment in pathways mainly involved in cholesterol metabolism. Although the differences observed in liver were less pronounced than those found in the hypothalamus in previous studies, several promising candidate genes associated with growth and fatness traits were identified. Notably, genes such as *PPP1R13B*, *STK33*, *CXCL14*, *ISG20*, *MRC1*, and *CYP7A1* emerged as potential targets for selective breeding and genetic improvement in the livestock industry. In conclusion, this study sheds light on the genetic mechanisms underlying growth and fatness traits in pigs. However, further investigations and functional analyses are needed to fully comprehend the complex genetic pathways contributing to these traits.

Key words: pig, growth, fatness, RNA-Seq, liver

Acknowledgment
This research was supported by the project AGL2014-56369-C2 from the Ministry of Economy and Competitiveness (MINECO). The animal material used in this study was obtained under the CPE03-010-C3 INIA grant. We express our gratitude to all the members of the INIA, IRTA, and UAB institutions for their contributions to the generation and collection of the animal samples used in this study.

ADVANTAGES AND DRAWBACKS OF REARING ENTIRE MALE AND IMMUNOCASTRATED PIGS

Martin Škrlep, Nina Batorek Lukač

Agricultural Institute of Slovenia, Hacquetova ulica 17, SI-1000 Ljubljana, Slovenia
Corresponding author: Martin Škrlep, martin.skrlep@kis.si
Invited paper

Abstract: Although surgical castration of piglets is still the predominant practice in Europe, rearing entire males (EM) or immunocastration (IC) are being increasingly used as alternatives. Present paper reviews the advantages and drawbacks of EM and IC concerning the animal welfare, productivity, pork quality, and public acceptance. Rearing of EM avoids the pain and infections associated with surgical castration while the problem of aggressiveness, injuries and stress appears during fattening. Thus from the animal welfare standpoint, IC is more favourable. Due to a better feed conversion and leanness, the rearing of EM is more profitable. However, costs occur due to slaughtering at lower weight, detection of boar taint and carcasses sorting at slaughter. The IC benefits the EM growth potential until the second vaccination, after which an accelerated growth occurs, accompanied by increased fat deposition. The main quality problem of EM meat is boar taint, however EM raw material exhibits other quality flaws related to fat tissue (low intramuscular fat, highly unsaturated fats), increased hardness of meat and lower water binding capacity. These drawbacks negatively affect the quality of meat products, though several strategies have been proposed to overcome the mentioned problems. The IC largely solves the problem of boar taint, its influence on meat quality looks positive but needs more research to further substantiate that. Stakeholder acceptance of the alternatives is country dependent and influenced by familiarity with the agricultural sector.

Key words: pigs, entire males, immunocastration, pros and cons, welfare, productivity, product quality, acceptance

Acknowledgment
Funding by Slovenian Agency of Research and the Ministry of agriculture, forestry and food of the Republic of Slovenia (grants P4-0133, V4-2024, Z7-9416) is acknowledged

OPTIMUM CONTRIBUTION SELECTION: PRACTICAL IMPLEMENTATION IN BLACK SLAVONIAN AND BANIJA SPOTTED PIG

Dubravko Škorput, Danijel Karolyi, Ana Kaić, Zoran Luković

University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25 10 000 Zagreb Croatia
Corresponding author: Dubravko Škorput, dskorput@agr.hr
Invited paper

Abstract: Breeding programmes in autochthonous pig populations are mostly oriented to conservation of genetic diversity, which includes preservation of typical exterior and avoiding inbreeding at the same time. In order to improve the ability of the breed to survive in a sustainable way, breeding programmes should include genetic improvement for the traits of interest. However, genetic improvement and conservation of genetic diversity are usually conflicting goals, and balancing between the genetic improvement for the traits of interest and preservation of genetic diversity of the population is a key problem in small populations. Various methods have been developed in order to optimize genetic gain and the level of inbreeding in the population using optimal contribution selection (OCS) framework. OCS is an optimisation of genetic contributions of selection candidates to the next generation such that expected benefit and risks are balanced. A common way to achieve this goal is to maximise genetic gain at a predefined rate of population inbreeding by restricting selection of candidates that are closely related. Also, there is a possibility to minimise inbreeding by minimising the average kinship of the population accounting also for breeding values since inbreeding arises from the mating of related parents. Both scenarios were analysed when implementing the OCS procedures on the populations of Black Slavonian pig and Banija spotted pig. While the genetic diversity parameters allowed the implementation of OCS on Black Slavonian pig, the main breeding goal in Banija spotted pig is preserving of genetic diversity.

Key words: optimal contribution selection, genetic diversity, Black Slavonian pig, Banija spotted pig

IMPROVING THE REPRODUCTIVE CHARACTERISTICS OF THE PUREBRED IBERIAN PIG: A CHALLENGING ENDEAVOR

Fernando Sánchez-Esquiliche[1], Patricia Palma-Granados[2], Luisa Ramírez Hidalgo[1], Alberto Márquez[1], María Muñoz[3], Juan M. García Casco[2]

[1] Sánchez Romero Carvajal S.A., Ctra San Juan del Puerto s/n, 21290 Jabugo, Spain
[2] Iberian Pig R&D Center, Dpt. Animal Breeding and Genetics, INIA-CSIC, Ctra Ex101 km4.7, 06300 Zafra, Spain
[3] Dpt. Animal Breeding and Genetics, INIA-CSIC, Ctra. de la Coruña, km 7.5, 28040 Madrid, Spain
Corresponding author: García Casco J.M., garcia.juan@inia.csic.es
Invited paper

Abstract: The reproductive performance of the Iberian pig breed is generally lower compared to most commercial breeds, which poses a challenge for selection programs aimed at improvement. In addition, the relatively small size of the herds and the strong influence of environmental effects are additional factors that need to be addressed in these programs. This study focuses on a review of several factors affecting the productivity of Iberian sows. These factors include: boar genotype, farrowing season, parity order, inbreeding depression and sow age at first farrowing. Finally, variance component analyses were performed for the reproductive traits under consideration. The results emphasize the importance of incorporating these factors into the analysis models. In addition, these findings supported estimates of genetic and environmental parameters obtained in previous studies.

Key words: litter size, maternal aptitude, environmental factors, genetic parameters

AN UPDATED INSIGHT INTO THE HISTORY AND GENETIC MAKEUP OF ROMANIAN LOCAL PIGS AND CURRENT CONSERVATION CHALLENGES - A REVIEW

Valentin A. Bâlteanu[1], Mădălina I. Siteavu[1], Attila Zsolnai[2]

[1]University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Institute of Life Sciences, Calea Mănăștur 3-5, 400372 Cluj-Napoca, Romania
[2]Hungarian University of Agriculture and Life Sciences Kaposvár Campus, Guba S. u. 40., 7200 Kaposvár, Hungary
Corresponding author: Valentin A. Bâlteanu, avbalteanu@yahoo.com

Abstract: Archaeological data evidenced that pigs were primarily domesticated around 10,500 years ago in South-Eastern Anatolia. However, across the European continent several important domestication centers were identified (ex. British islands). A Near-Eastern pigs gene flow, occurring around 7,000 years BC *via* human migration, had a minor genetic influence on locally domesticated European pigs. The most important process that led to the creation of the current European pig breeds was artificial selection of primitive populations and / or admixture. A significant reshaping of genetic background of some British breeds occurred in the 19th century by Chinese pig introgression, aiming to increase fatness and prolificacy. This Asian influence is still visible in the majority of commercial pig breeds, as the British breeds played a major role in their formation. Additionally, admixture events with wild boars were documented in Iberian and Hungarian Mangalitza pigs. In Romania, two local pigs experienced a strong demographic decline due to competition with commercial breeds / hybrids. We evidenced that Mangalitza red population display a reduced diversity at mitochondrial and autosomal levels, has a European genetic makeup and it is differentiated from wild boar. Furthermore, we evidenced that *SLC45A2* gene polymorphism was a major determinant in the formation of red and blonde Mangalitza strains. In contrast, a high MT-CYTB diversity was noticed in Bazna, corresponding to several contributing European and Asian maternal lineages. This was not unexpected since this belted breed originates from old crosses between Mangalitza and British breeds. We are currently investigating these aspects at broader extent.

Key words: local pigs, origin, genetic diversity, conservation

STREPTOCOCCUS SUIS, TWO-FACED GAME CHANGER

Aleksandar Stanojković[1], Nikola Stanišić[1], Nikola Delić[1], Ivan Bošnjak[3], Violeta Mandić[1], Aleksandra Stanojković-Sebić[2], Jakov Nišavić[4]

[1] Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Republic of Serbia.
[2]Institute of Soil Science, Teodora Drajzera 7, 11000, Belgrade, Republic of Serbia
[3]Ministry for Human and Minority Rights and Social Dialogue, Bulevar Mihajlo Pupin 2, 11070 Novi Beograd, Republic of Serbia
[4] Faculty of Veterinary Medicine, Bulevar Oslobodjenja 18, 11000, Belgrade, Republic of Serbia
Corresponding author: Aleksandar Stanojković, izs.aleksandar@gmail.com
Invited paper

Abstract: *Streptococcus suis* infection is one of the major health problems in the swine industry worldwide. During the last decade, the number of reported human cases due to *S. suis* has dramatically increased, and while most sporadic human cases of infection appear to be due to close occupational contact with pigs/pork products. *S. suis* infection is considered to be multifactorial, with transition from subclinical to clinical that depends on many factors. These factors can be divided in two groups, host-based and external factors. Pathogenesis of *S. suis* infection can be divided into 4 phases: adherence to and colonisation of mucosal and epithelial surfaces, invasion into deeper tissues and entering the bloodstream, crossing blood-brain barrier and inflammation. *S. suis* virulence-associated factors are divided into the following 4 groups: surface/secreted elements, enzymes (such as including proteases), transcription factors and regulatory systems and other factors (such as transporting and secreting systems). Therefore significant research support is needed to obtain a vaccine as a valuable and universal protection against disease caused by *S. suis* strains and thus national and international support will be crucial for the aim many researchers hope for.

Key words: *Streptococcus suis*, pigs, commensal, pathogen, virulence factors

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

RELEVANT BIOSECURITY MEASURES TO PREVENT THE SPREAD OF AFRICAN SWINE FEVER IN THE DOMESTIC PIG PRODUCTION SECTOR IN SERBIA

Jasna Prodanov-Radulović[1], Jelena Petrović[1], Siniša Grubač[1], Milijana Nešković[2], Slavča Hristov[3], Jovan Bojkovski[4]

[1]Scientific Veterinary Institute “Novi Sad”, Rumenački put 20, 21000 Novi Sad, Serbia
[2]Veterinary Specialist Institute Zaječar, Izvorski put bb, 19000 Zaječar, Serbia;
[3]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun, Serbia
[4]University of Belgrade, Faculty of Veterinary Medicine, Bul. Oslobođenja 18, Belgrade, Serbia
Corresponding author: Jasna Prodanov-Radulović, jasna@niv.ns.ac.rs
Invited paper

Abstract: African swine fever (ASF) is currently the most important viral infectious disease affecting domestic pig production worldwide. The first case of ASF in Serbia was confirmed in 2019 in a backyards domestic pig population. Since then, numerous outbreaks in domestic pigs and wild boar have been reported throughout the country despite the efforts of the veterinary authorities to control the disease. The lack of an effective vaccine is one of the main constraints, and the only currently available option to prevent ASF infections is the application of biosecurity measures. However, in the currently prevailing extensive smallholder and backyards farming systems, farm biosecurity is largely non-existent. The aim of this review was to identify specific relevant biosecurity measures as the way to minimise ASF-risks factors and prevent disease spreading in the current pig production sector in Serbia. Moreover, the main risk factors for ASF spreading and transmission at the domestic/wild boar interface, biosecurity practices in different production systems, and possible future control measures are discussed. The identified relevant biosecurity measures as well as risk factors need to be strictly addressed in order to prevent further ASF spread in Serbian pig production sector.

Key words: African swine fever, biosecurity, domestic pig, Serbia

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of Republic of Serbia by the implementation and research work contract funds of NIV-NS in 2023, contract no: 451-03-47/2023-01/200031.

SIGNIFICANCE OF *LISTERIA* ISOLATED IN ABORTED MATERIALS FROM COWS

Igor M. Stojanov[1], Doroteja A. Maričić[1], Radomir D. Ratajac[1], Jasna Z. Prodanov Radulović[1], Stevan G. Rodić[1], Jelena B. Apić, Ivan M. Pušić[1]

Scientific veterinary institute Novi Sad, Rumenački put 20, 21000 Novi Sad, Serbia,
Corresponding author: Igor M. Stojanov, igor@niv.ns.ac.rs

Abstract: *Listeria* is a microorganism widely distributed in nature and can be found in different types of ecological surroundings, water, wastewater, soil, different types of food, organs, and excreta of animals and humans. The effect of pathogens on health status in animals and humans is very similar. A perinatal and adult form of the disease is present. The course of the perinatal form is most often asymptomatic in females, with mild flu-like symptoms 2 weeks before the abortion. The clinical findings in adults are manifested by the appearance of meningitis with accompanying nervous symptoms. For livestock production, especially in cattle, infection with listeria can lead to abortion, which on the one hand leads to significant economic losses, while on the other hand, since it is a zoonosis, it threatens the health safety of farm employees. Considering that Listeria represents ubiquitous microorganisms, as well as the fact that, in addition to listeria, cow abortions can be caused by various other microorganisms (viruses, bacteria, or protozoan parasites), it is not easy to precisely diagnose the biotic or abiotic causes of abortion. In our study, we monitored the presence of *Listeria monocytogenes* in aborted fetuses of cows. Our goal is to determine the prevalence of these microorganisms in the analyzed samples as well as their importance for the occurrence of abortions and animal health. In 3.5 years, we analyzed a total of 65 aborted samples, of which 7 were positive for *Listeria monocytogenes*. It can be concluded that a relatively small number of samples were examined in the observed period, which indicates a low interest of livestock keepers in monitoring abortion samples. On the other hand, concerning the number of examined materials, the percentage of *Listeria* isolates (>10%) is relatively high.

Key words: abortion, cows, *Listeria monocytogenes*

Acknowledgement
This study was funded by Ministry of Science, Technological Development and Innovation of Republic of Serbia by the Contract of implementation and funding of research work of NIV-NS in 2023, Contract No: 451-03-47/2023-01/200031

COENUROSIS OF SHEEP IN SERBIA - CASE REPORT

Ivan Pavlović[1], Stanko Minić[2], Violeta Caro Petrović[3], Milan P. Petrović[3], Ivan Dobrosavljević[4], Nemanja Zdravković[1], Jovan Bojkovski[5], Ana Vasić[1], Marija Pavlović[1], Aleksandra Tasić[1]

[1] Scientific Veterinary Institute of Serbia, Belgrade, Serbia
[2] Veterinary Ambulance Minić, Starčevo, Serbia
[3] Institute for Animal Husbandry, Belgrade-Zemun, Serbia
[3] Veterinary Institute Požarevac, Požarevac, Serbia
[5] Faculty of Veterinary Medicine, Belgrade, Serbia
Corresponding author: Ivan Pavlović, dripavlovic58@gmail.com

Abstract: Coenurosisa is a zoonotic disease caused by the larval forms of *Taenia multiceps* which are great host's animals from the family of canids. The disease is global distribution but is most present in the Mediterranean, Middle East, Central Africa and Australia. Larvae exhibit tropism toward brain tissue, and cysts are usually located in the left hemisphere of the brain of small ruminants. Involvement of the brain can cause increased intracranial pressure, seizures, loss of consciousness, and focal neurologic deficits. During 2022 we examinee one flocks of 78 milking sheep reared on hilly pastures located below the Zmajevac hill (397 m), between the branches of the Osimćki mountains and the river Zapadna Morava, at an altitude of 178 m. Symptoms of ataxia, such as unsteady gait and stumbling, and depression were observed in 12 animals. In 5 sheep, continuous aimless or circular movement, wandering, was also manifested. In addition to these symptoms, in one sheep that died, visual disturbances were observed depression and unilateral blindness. All affected sheep were slaughtered and a pathoanatomical examination was performed. In the brain of all animals we revealed the presence of infestation with one to four coenuri 4.1-5.5 cm in size. The sites of predilection were the left hemisphere (48%), followed by the right hemisphere (40%) and the cerebellum (12%). The coenurus has a thin wall surrounding a single cavity that contains a clear fluid. When the cysts were opened, numerous scoleces were found inside, from 2 to 3 mm in diameter attached to the cyst wall. Each scolex has four circular suckers and two rows of hooks on a rostellum. The hook lengths are 147 to 165 µm and 87 to 125 µm.The results show that *C. cerebralis* was a major cause of the nervous manifestations of cenurosis in clinically affected sheep.

Key words: *Coenuris cerebralis, Taenia multiceps,* sheep

Acknowledgment
The study was funded by the Serbian Ministry of Science, Technological Development and Innovation (Contract No. 451-03-47/2023-01/200030, and No. 451-03-47/2023-01/200022).

INVESTIGATION OF THE USE OF PROPOLIS IN BROILER FEEDS AND ITS EFFECTS ON HEALTH AND PERFORMANCE PARAMETERS

Yunus Emre Ata, Kemal Çelik

Çanakkale Onsekiz Mart Üniversitesi Ziraat Fakültesi-17100-Türkiye
Corresponding author:Kemal Çelik, kcelikcomu@gmail.com

Abstract: Numerous scientific studies have shown that propolis, with its various bioactive compounds, has enormous potential as a natural additive in poultry nutrition. Research findings have shown that propolis added to poultry diets supports immune function, improves gut health, increases antioxidant activity, and provides positive effects on overall performance. In this study, 180 equivalent chicks from 27.000 head Ross 308 broiler chicks were divided into groups with equivalent body weight averages and 60 chicks were randomly assigned to each group, and control and experimental groups were formed. In the study, 0-13 days chick starter feed, 14-24 days chick feed, 25-37 days chicken rearing feed and 38-42 days pre-slaughter finisher feed and water were provided ad libitum. Propolis used as an additive was supplied with drinking water as 1 cc/L and 2 cc/L. In the study, the data of the 2nd week, the data of the control group I. and II. Compared to the animals in the experimental groups (1 cc/L water and 2 cc/L water), the body weight averages were found to be higher. However, it was determined that the live weight averages of the animals in the experimental group given the 4th and 5th data 1 cc /L propolis were higher than the other groups ($P<0,05$ $P=0,042$). At the end of the study, ALT values were included in the reference values for all groups in the analysis of blood parameters. Total serum cholesterol was found to be lower in the control group, different from the reference value. As a result, the findings; It indicates that 1 cc/L propolis improves body weight, organ characteristics and blood parameters.

Key words: propolis, broiler, performance, blood parameters

CURRENT APPROACHES TO THE RELATIONSHIP OF ZEARALENONE AND FERTILITY IN LIVESTOCK

Muhittin Zengin[1,3], Ergün Demir[1], Abdulkadir Keskin[2]

[1]Department of Animal Nutrition and Nutritional Disorders, University of Balikesir, Faculty of Veterinary, Çağış, 10145 Balıkesir, Turkiye
[2]Department of Obstetric and Gynecology, University of Bursa Uludağ, Faculty of Veterinary, Görükle, 16059, Bursa, Turkiye
[3]Department of Obstetric and Gynecology, University of Bursa Uludağ, Institute for Health Science, Görükle, 16059, Bursa, Turkiye
Corresponding author: Ergün Demir, ergundemir10tr@gmail.com

Abstract: There has been an increase in the rates of infertility, embryonic death, and stillbirth in ruminants with increasing productivity levels in recent years. The basis of these problems in livestock depends on nutrition, however, these problems are not always related to unbalanced rations, but also to the consequences of global climate changes in the world. The source of these threats should be identified and a solution to the main problem should be sought. Zearelenone (ZEN), which causes infertility with its estrogenic effect in ruminants, is among the issues that animal nutritionists should pay attention to. Because this product can contaminate many crops such as corn, wheat, and soybean that make up the diet and harm farm animals. ZEN is a resorcyclic acid lactone, a mycotoxin with non-steroidal estrogenic action. Due to its structural similarity to estradiol, ZEN can chronically affect the reproductive performance of female animals. This mycotoxin, which can be metabolized in the rumen, causes the formation of five metabolites. The effects of these mycotoxins and their metabolites can be reduced by the use of enzymes, probiotics, antioxidants, clay minerals, and activated carbon, which can bind toxins or aid degradation. In this review, it is aimed to present the effects of zearalenone, which has caused significant fertility problems in ruminants in recent years, and current approaches that can be used to eliminate the negative effects of zearalenone.

Keywords: livestock, mycotoxins, zearalenone, fertility

THE USE OF STARCH IN THE MEAT PROCESSING INDUSTRY

Jack Bergsma

Royal Avebe, Zernikelaan 8, 9747AA Groningen, The Netherlands
Corresponding author: jack.bergsma@avebe.com
Invited paper

Abstract: Starch is extensively used as an additive in the modern food industry. Various starch sources are applied in the meat industry with multiple functions, such as water binding, emulsifiers, fat substitutes, stabilisers and texturisers. However, in many processing conditions, using native starch does not always give the desired result, given functionality. Modification of native starch is therefore carried out to give the starch the properties desired in these cases. This article overviews different starch properties, their modifications and their application in the meat industry.

Key words: native starch, starch modifications, fat mimicry, meat products

EFFECT OF FAT LEVEL ON QUALITY CHARACTERISTICS OF TRADITIONAL SUCUK SAUSAGES. PART 1: PHYSICO-CHEMICAL CHANGES DURING PRODUCTION

Nikola Stanišić[1], Nikola Delić[1], Slaviša Stajić[2], Maja Petričević[1], Slobodan Lilić[3], Tamara Stamenić[1], Aleksandar Stanojković[1]

[1] Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Republic of Serbia
[2] University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Republic of Serbia
[3] Institute of Meat Hygiene and Technology, Kaćanskog 13, 11000 Belgrade, Republic of Serbia
Corresponding author: Nikola Stanišić, nikola0135@yahoo.com
Invited paper

Abstract: This trial aimed to investigate changes in pH, proximate composition and fat rancidity parameters during the production of traditional Sucuk sausage (dry fermented sausage) with different fat levels. Three groups of sausages were produced from beef meat and fat: LF (low fat, with 10% added fat), MF (medium fat, with 20% added fat) and HF (high fat, with 30% added fat). The production was carried out in a traditional smoking house, and fermentation and ripening lasted 28 days. Samples were analysed after stuffing (day 0) and on days 7, 14, 21 and 28 of production. The higher fat content of the HF group probably influenced the lowest pH value at the beginning of production (day 0) ($p<0.05$). The HF group also had the mildest drop in pH ($p<0.05$), while the MF and LF groups had a similar trend in pH decline. Fat content had a significant effect on the proximate composition of the products, best reflected at the end of the production process, where the HF group had significantly higher fat and lower moisture and protein content ($p<0.05$). A higher total free fatty acids (FFA) content was obtained in the LF group, showing greater lipolysis than in MF and HF groups. Interestingly, sausages with higher fat content had lower peroxide values during production ($p<0.05$).

Key words: sucuk sausage, fat level, proximate composition, peroxide value, free fatty acid value

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

EFFECT OF FAT LEVEL ON QUALITY CHARACTERISTICS OF TRADITIONAL SUCUK SAUSAGES. PART 2: TEXTURE, COLOUR AND SENSORY QUALITY

Nikola Delić, Nikola Stanišić, Aleksandar Stanojković, Maja Petričević, Tamara Stamenić, Nevena Maksimović, Tanja Keškić

Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Republic of Serbia
Corresponding author: Nikola Delić, delicnikola68@yahoo.com
Invited paper

Abstract: Traditional dry fermented sucuk sausages were made from beef and formulated with 10, 20 and 30% of added fat (LF, MF and HF group, respectively). The production was carried out in a traditional smoking house, and fermentation and ripening lasted 28 days. After the end of the production process, colour (CIE L*a*b*), texture TPA parameters and sensory quality were analysed. An increase in fat content significantly affected the reduction in TPA values for hardness, springiness, cohesiveness and chewiness ($p<0.01$). Data obtained in this study indicate that sausages with higher fat content were less firmly bound (lower cohesiveness) and less elastic (lower springiness). Additionally, fat content significantly influenced an increase in lightness (L*) and yellowness (b*) and a decrease in redness (a*) of sucuk sausages ($p<0.05$). The lowest sensory scores were obtained for HF sausages, especially for consistency, cut appearance and taste.

Key words: sucuk sausage, fat level, colour, texture, sensory quality

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

MEAT OF NATIVE PIGS BREEDS AS A RAW MATERIAL FOR TRADITIONAL PRODUCTS OBTAINED IN SERBIA AND POLAND

Władysław Migdał[1], Čedomir Radović[2], Vladimir Živković[2], Maria Walczycka[1], Anna Migdał[3], Łukasz Migdał[3]

[1]Department of Animal Product Technology, Faculty of Food Technology, University of Agriculture in Krakow, Balicka 122, 31-149 Kraków, Poland
[2]Institute for Animal Husbandry, Autoput 16, P. Box 23, 11080, Belgrade-Zemun, Serbia
[3]Department of Animal Genetics, Breeding and Ethology, Faculty of Animal Science, University of Agriculture in Kraków, al. Mickiewicza 24/28, 30-059 Kraków; Poland;
Corresponding author:Władysław Migdał, wladyslaw.migdal@urk.edu.pl
Invited paper

Abstract: The global tendency to increase the productivity of livestock leads to the displacement of native animal breeds by modern, selected breeds or production lines that grow faster and are characterized by better meat yield. However, with an increase in productivity, resistance to adverse environmental conditions decreases, the morbidity of animals increases. An alternative are native breeds that are adapted to local (often difficult) climatic conditions, are an important element of the landscape and constitute an invaluable genetic resource for the population and genetic variability. An example can be the native breeds of Serbian (Mangalica, Moravka, Resavka) or Polish (Puławska, Złotnicka White, Złotnicka Spotted) pigs. The aim of the study was to analyze the quality of meat and cold cuts from pigs of the Mangalica and Moravka, as well as Puławska, Złotnicka White and Złotnicka Spotted breeds. The meat of pigs of native breeds was characterized by very good culinary and processing quality. Particularly noteworthy is the higher content of intramuscular and intermuscular fat, which has a positive effect on the taste of cold cuts and marbling of meat. The fatty acid profile of the fat of breeds kept in Serbia was more favorable compared to Polish breeds - higher content of essential fatty acids. Serbian and Polish cured meats differed in taste, color parameters and the level of polycyclic aromatic hydrocarbons. The Carpathians are the limit of the variety of cold cuts, especially sausages.

Keywords: pigs, native breeds, meat, traditional products

ASSESSMENT OF WATER-HOLDING CAPACITY IN DIFFERENT MEATS USING EZ-DRIPLOSS METHOD: A REVIEW OF KEY METHODOLOGICAL FACTORS

Ana Kaić, Dubravko Škorput, Danijel Karolyi, Zoran Luković

University of Zagreb Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia
Corresponding author: Ana Kaić, akaic@agr.hr
Invited paper

Abstract: The water-holding capacity (WHC) of meat is the ability of the *post-mortem* muscle to retain moisture/water even when external influences are applied to it. The quality of different meats depends largely on their WHC, which is related to processing technology and consumer acceptance. The WHC of meat is influenced primarily by intrinsic and extrinsic factors, and secondarily by specific methodological factors that should not be neglected when a specific treatment/method is used for its determination. EZ-DripLoss is a gravimetric method for measuring the drip loss of meat and is widely used in the industry and science for quantifying meat quality. In this method, meat is suspended in a special airtight EZ container for 24 hours, with gravity applied to the meat sample. This review summarises the specific methodological factors associated with the EZ-DripLoss method, i.e., muscle and sampling area position, sample core fiber orientation, weighed/non-weighed sampling procedure, dabbing of the sample, and the storage period/measurement interval. Future research should aim to provide more in-depth information and standardization of the EZ-DripLoss methodology.

Key words: water-holding capacity, meat quality, methodology, EZ-DripLoss

PATH COEFFICIENT ANALYSIS BETWEEN BODYWEIGHT AND SOME REAL-TIME BODY MEASUREMENTS OF GRAZING CATTLE ON DIFFERENT ARTIFICIAL PASTURES

Yalcin Bozkurt[1], Mevlüt Türk[2], Sabahattin Albayrak[3]

[1]Isparta University of Applied Sciences, Faculty of Agriculture, Department of Animal Science, 32260, Isparta, Turkey
[2]Isparta University of Applied Sciences, Faculty of Agriculture, Department of Plant Science, 32260, Isparta, Turkey
[3]Ondokuz Mayıs University, Vocational School of Bafra, Samsun-TURKEY, Samsun, Turkey,
Corresponding author: Yalcin Bozkurt, yalcinbozkurt@isparta.edu.tr
Invited paper

Abstract: This study was conducted to determine characters effecting bodyweight in different artificial pastures by using simple correlation coefficient and path analysis. Two different artificial pastures were established, each covering 1.5 ha area during the first year of the research. Twenty Holstein male calves with 6 months old were assigned to the experimental areas randomly, each pasture containing 10 animals. Each group was weighed and monitored on a fortnightly basis, using electronic weighing scale. Body weight (BW) and some body measurements were determined on the animals. The results showed that there were significant association between bodyweight measurements and the bodyweight. Positive and significant relationships were found between the bodyweight and Body Length (BL) (0.890**), Wither Height (WH) (0.877**), Heart Girth (HG) (0.929**), Hip Height (HH) (0.834**) and Hip Width (HW) (0.839**). Several traits affected the liveweight directly or indirectly. Standardized correlation coefficients for BL and HH were found non-significant and removed from regression model. The optimum multiple regression equation for animals was obtained with a determination coefficient (R^2 of 0.93). The results indicated that the traits (HG, WH, HW and BD) were statistically significant as direct effects on BW of cattle. Most of the indirect contributions of the variables were realized by HG. It could be concluded that HG is important parameter and meausuring HG would allow small scale farmers to predict bodyweight of cattle with a high degree of accuracy even on grazing conditions.

Keywords: bodyweight, beef cattle, path analysis, body measurements

EFFECT OF CONDENSED TANNINS CONCENTRATIONS ON PROTEIN DEGRADABILITY OF RED CLOVER, ITALIAN RYEGRASS AND THEIR MIXTURES

Jordan Marković[1], Vladimir Zornić[1], Ratibor Štrbanović[2]

[1] Institute for Forage Crops Kruševac, 37251 Globoder, Serbia
[2] Institute for plant protection and environment, Teodora Drajzera 9, 11000 Belgrade, Serbia
Corresponding author:Jordan Marković, jordan.markovic@ikbks.com
Invited paper

Abstract: Growing grasses in a mixture with legumes leads to more profitable production, better quality of forages, an increase in soil biogenicity and fixation of a significant amount of nitrogen. The experiment was established as a two factorial trial by the method of randomized complete block design in three replications. Italian ryegrass – monocrop (IR), red clover – monocrop (RC) and their mixtures – IR:RC (15:5 kg ha^{-1}), IR:RC (15:10 kg ha^{-1}), IR:RC (20:5 kg ha^{-1}) and IR:RC (20:10 kg ha^{-1}) were planted in November 2016, with the first cutting in the spring 2017 – on May the 9th, and the second cutting in the early summer – on June the 22nd. The aim of this study was to investigate the concentrations of phenolic compounds such as condensed tannins in Italian ryegrass, red clover and their mixtures, as well as their concentrations impact on protein degradability in the rumen depends on the seeding rate in the mixtures and harvested in the spring and early summer. Results obtained in this study showed that higher concentrations of non-protein nitrogen and soluble protein in forages harvested in the spring influenced higher rapidly degradable protein concentration in investigated mixtures. The highest rumen undegradable protein was determined in Italian ryegrass monocrop harvested in early summer, and we assume that high condensed tannins concentration influenced the slower protein degradability. Our recommendation for plant breeders is that cultivars with higher content of condensed tannins should be created and introduced in animal nutrition.

Key words: protein degradability, condensed tannins, red clover-Italian ryegrass mixtures

Acknowledgements
The research in this paper is part of Project No.: 451-03-47/2023-01/200217 which is financed by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

TREND OF MILK YIELD TRAITS OF BULL MOTHERS OF THE HOLSTEIN-FRIESIAN BREED

Marina Lazarević[1], Vlada Pantelić[1], Dragan Stanojević[2], Dragan Nikšić[1], Nevena Maksimović[1], Miloš Marinković[1], Ljiljana Samolovac[1]

[1]Institute for Animal Husbandry, Belgrade-Zemun, 11080 Zemun, Serbia
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun Serbia
Corresponding author: Marina Lazarević, marinaplazarevic@gmail.com
Invited paper

Abstract: The research was conducted on 175 cows of the Holstein-Friesian breed that were selected as bull dams and achieved 400 lactations. Animals are reared on 5 farms of the "Belgrade" Agricultural Corporation. Bull dams are the offspring of 32 bulls calved between 2007 and 2014. The research included the following characteristics of milk yield in standard lactation (305 days): milk yield (kg), milk fat yield (kg), milk fat content (%), protein yield (kg), protein content (%). The variability of traits and the influence of factors (farm, lactation in order, season and year of calving, bull-sire) were evaluated by the method of least squares using the GLM (General Linear Model) procedure in the SAS software package. The average milk yield of bull dams is 9617.11 kg, with 3.44% milk fat and 3.21% protein. The average yield of milk fat and protein is 329.56 kg and 308.65 kg, respectively. The largest positive deviation of milk yield from the general average is 363.64 kg, while the largest negative deviation is -1021.36. The largest negative deviation of milk fat yield and protein yield is -21.74 kg and -36.09 kg, respectively. The largest positive deviation of milk fat yield is 18.35 kg and protein yield is 9.46 kg. The influence of the farm is present in the variability of all the observed traits of milk production except milk yield. Lactation in turn had a statistical effect ($p<0.05$) on all traits included in the research, except for protein content. The influence of the calving season is present in the variability of milk yield and protein yield, while it had no effect on the other traits included in the research. Calving year statistically ($p<0.05$) had a significant effect on the variability of all observed milk yield traits. The sire bull influenced the phenotypic expression of milk yield traits, while his influence on the variability of milk fat and protein content was not significant.The results of the research indicate that the established variability of milk yield traits in the population of the Holstein-Friesian breed provides enough room for their further improvement through selection.

Key words: bull dams, milk traits, variability, genetic trend, Holstein-Frisian breed

Acknowledgment
Research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

FARMER EXPERIENCE IN TRANSITION FROM CONVENTIONAL TO ROBOTIC MILKING

Tina Bobić, Pero Mijić, Vesna Gantner, Mirjana Baban, Maja Gregić

Faculty of Agrobiotechnical Sciences Osijek, Josip Juraj Strossmayer University of Osijek, 31000 Osijek, Croatia
Corresponding author: Tina Bobić, tbobic@fazos.hr
Invited paper

Abstract: The aim of the study was to present some of the farmers experience in transition from conventional to robotic milking. Survey were conducted with dairy farmers in the Republic of Croatia witch had transition from conventional to robotic milking. The survey had 21 questions, separated in two main sections: personal data's and about experiences during using milking robots. Based on the conducted research, it can be concluded that farmers had positive experiences and fulfilled expectations in transition from conventional to robotic milking. Most of the examined farmers (95 %) managed to improve quality of life and improve health of cows regarding to: reproduction, mastitis, hooves, etc. About 90 % of them doesn't have any negative experiences with milking robots. The vast majority of respondents (84 %) increased milk production per cow and the quality of milk also increased in amount of 58 %. Farmers pointed out that certain education could be helpful for them for better using milking robots, for example in the selection of bulls suitable for robotic milking and for the interpretation of data from the robotic software.

Key words: farmer experience, transition, conventional milking, robotic milking

Acknowledgement
The research was done within the framework Research project Fitness Potential of Animals in Economically Sustainable Agricultural Production, Faculty of Agrobiotechnical Sciences Osijek.

DEVELOPMENT OF PCR METHODS FOR THE DETECTION OF COMMON MEAT ADULTERATION

Evangelia D. Apostolidi[1], Ioannis Tzavaras[2], Andreas Tzouanopoulos[2], Konstantinos Paraskevopoulos[2], Maria Babetsa[1], Loukia V. Ekateriniadou[1], Evridiki Boukouvala[1]

[1]Hellenic Agricultural Organization DIMITRA, Veterinary Research Institute of Thessaloniki, Campus of Thermi, 57100 Thermi, Thessaloniki, Greece
[2]Department of Microbiology Laboratories Address, C’ Military Veterinary Hospital, Thermi, Thessaloniki, Greece
Corresponding author: Evridiki Boukouvala, boukouvala@elgo.gr

Abstract: Meat is a valuable source of essential nutrients and is easily absorbed by the body. It serves as a source of water and fat, with a protein content ranging from 20% to 35%. Despite the existence of national and international laws that oversee the quality and safety of meat and meat products, meat adulteration remains widespread. Some adulteration occurs accidentally during processing, while the majority is economically motivated adulteration deliberately conducted. Such actions, whether intentional or due to negligence, are raising significant issues regarding serious public health risks, economic and religious concerns. To safeguard consumers against fraud and adulteration, various methods have been developed to determine the animal species present in food products. The aim of the present study was the development of methods of very high sensitivity, accuracy, speed and of low cost able to detect adulteration and identification of beef’s, sheep’s, chicken’s, goat’s and pork’s meat. For this purpose, a total of 25 mg of each fresh meat sample was used for DNA extraction. A series of five pairs of primers, published by other investigators, (*Lahiff et al., 2001; Bottero et al., 2003; Doosti et al., 2011; Dalmasso et al., 2004*) and one designed by our laboratory (*Tsirigoti et al., 2020*), were combined in two different multiplex PCRs. The first was a triplex-PCR for the simultaneous detection of bovine, ovine and caprine meat origin, and the second was a duplex-PCR for the simultaneous detection of caprine and poultry meat origin. The suggested methodology has exhibited high specificity and sensitivity (less than 0.1ng) for determining the source of meat. Our future research aim is to develop additional PCR methods for the detection of equine and soya DNA, in order to enrich our diagnostic ability over the aforementioned protein sources.

Key words: PCR methods, meat, origin

BROMOTYMOL BLUE TEST SCORES FOR DETECTING RAW MILK QUALITY IN BUCKET MILK SAMPLES OF JERSEY COWS

Savaş Atasever

Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Husbandry, 55139, Samsun, Turkey.
Corresponding author: Savaş Atasever, satasev@omu.edu.tr

Abstract: Raw milk quality is keeping its popularity in dairy sector. Indirect analysis methods have constantly been investigated for this aim. The objective of the present study was to reveal the reliability of bromotymol test scores (BTS) for detecting bovine milk quality. A total of sixty bucket milk samples collected from small-scale Jersey farms located in Samsun province of Turkey was used as the material. To obtain BTS data, change of color of milk after the bromotymol reaction was assessed by a scale (1=green/normal; 2=blue/alkali and 3=yellow/acidic) and obtained data were evaluated as two subgroups (BTS1: normal and BTS2: acidic or alkali). To evaluate the reliability of BTS, the samples were compared with somatic cell count (SCC). In SCC analysis, direct microscopy was used. To evaluate raw values, two SCC subgroups (*SCC1: ≤400x10^3 cells/ml and SCC2: >400x10^3 cells/ml*) were divided. To ensure homogeneity of variance, the SCC values were transferred to log10 base in the statistical processes. Pearson correlation coefficient of BTS and SCC was estimated to be weak (r=0.284). The regression model was calculated to be $\hat{Y}$=-0.534+0.363X and the coefficient was found to be insignificant. Obtained findings clearly pointed out that using BTS values is not a favorable method to decide raw milk quality level in bucket milk samples of Jersey cows.

Key words: Bucket milk; milk acidity; raw milk quality; somatic cell count

PRODUCTION AND QUALITY ASPECTS OF PROBIOTIC FERMENTED MILK WITH ADDITION OF HONEY

Amila Milišić[1], Zlatan Sarić[1], Lejla Biber[1], Amila Oras[1], Munevera Begić[1], Tarik Dizdarević[1], Miroljub Barać[2], Svijetlana Sakić-Dizdarević[1]

[1]University of Sarajevo, Faculty of Agriculture and Food Sciences, Zmaja od Bosne, 71000 Sarajevo, Bosnia and Herzegovina
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun, Serbia
Corresponding author: Zlatan Sarić, z.saric@ppf.unsa.ba

Abstract: Probiotic fermented milks are known as high-value functional and sensory food. There is a limited range of fruit-flavoured probiotic fermented milks on the market. However, probiotics with added honey are not commonly found. In addition to sensory attributes, honey, as a natural ingredient, contributes to improving the functional properties of probiotic fermented milks. Therefore, the aim of this study was to investigate the possibilities of producing probiotic fermented milk with added honey and to analyze its chemical, physical and sensory properties. Milk with different fat content was used for probiotic fermented milk production. Probiotic beverage was produced using yogurt starter culture with probiotic strains. Two indigenous types of honey produced in Bosnia and Herzegovina were used, meadow and mountain honey. The raw materials used in the production of honey-flavoured probiotic fermented milk were analyzed. Chemical, physical (dry matter, fat, protein and acids content, pH, viscosity, water activity) and sensory properties of produced beverages were done. Chemical composition of honey-flavoured probiotic fermented milk was (%): dry matter 16.23-18.38; fat 0.90-2.80; protein 2.61-2.77 and acidity 0.750-0.789. pH and water activity ranged from 4.37 and 0.941 to 4.60 and 0.945 resp. Viscosity of samples was between 147 and 370 mPas. A good quality of honey-flavoured probiotic fermented milk was obtained, which was sensory highly rated. The best rated was the one with 2.80% of milk fat and addition of meadow honey.

Key words: probiotic fermented milk, honey, physical-chemical properties, sensory characteristics

REMEDIATION OF EMERGING MYCOTOXINS USING A PREMIUM MYCOTOXIN REMEDIATION PRODUCT

Jog Raj, Hunor Farkaš, Svetlana Ćujić, Zdenka Jakovčević, Marko Vasiljević

PATENT CO, DOO, Vlade Ćetkovića 1A, 24 211, Mišićevo, Serbia
Corresponding author: Jog Raj, jog.raj@patent-co.com

Abstract: Testing and reporting on the prevalence of aflatoxins, deoxynivalenol (DON), T-2 toxin, fumonisin (FB), ochratoxin and zearalenone in feed and feed materials has increased in recent years, but many mycotoxins continue to go undetected. One such group of growing concern are emerging mycotoxins, and just like DON, T-2, FB_1, and zearalenone, they are also commonly produced by various fungi of the *Fusarium* genus. These mycotoxins are the most common co-contaminants in feed with major mycotoxins, as one fungal species can synthesize many of them. Fusaric acid (FA), enniatin (ENNs), beauvericin (BEA), and moniliformin (MON) are the most common emerging mycotoxins. MycoRaid, developed by Patent Co., is a premium mycotoxin adsorbent for the adsorption and bioremediation of polar and non-polar mycotoxins. In this report, MycoRaid has been tested at pH 3.0 for adsorption and pH 6.5 for desorption with emerging mycotoxins using LC-MS/MS. The overall efficacy was calculated using adsorption and desorption data. The results showed that MycoRaid can effectively remove 56% MON, 89% BEA, and more than 95% fusaric acid and enniatin. If used in livestock production, this result means that MycoRaid can remediate mycotoxins and their carry-over from animals to humans.

Key words: mycotoxins, emerging mycotoxins, MycoRaid, LC-MS/MS.

PHENOTYPIC PARAMETERS OF THE TYPE TRAITS OF SIMMENTAL PRIMIPARIOUS DAIRY COWS

Dobrila Janković[1], Snežana Trivunović[1], Ljuba Štrbac[1], Radica Đedović[2], Denis Kučević[1], Momčilo Šaran[1]

[1]University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun, Serbia
Corresponding author: Dobrila Janković, dobrila.jankovic@stocarstvo.edu.rs

Abstract: The aim of the research was to estimate the phenotypic parameters of Simmental primiparious dairy cows for type traits, as well as the deviation of the average linear grades from the ideal grades defined by ‘System 97’. The research was conducted on a data set of linearly evaluated cows that was provided by the Central cattle breeding organization in AP Vojvodina. Data consisted of 19,781 primiparous cows from 2,237 breeders, linearly evaluated in the period from 2012 to 2022 by 31 evaluators in 12 regions of Vojvodina. Primiparous cows were individually evaluated for 19 type traits, classified into 4 functional units (frame, muscularity, legs, udder) on a numerical scale from 1 to 9. Phenotypic parameters of type traits, including average scores for the mentioned traits, were analyzed using standard statistical procedures in the software Statistica 13.2 (StatSoft, 2017). The average linear grades of type traits for 19,781 evaluated cows ranged from 4.84 for teat thickness to 6.60 for hock development. The average grades in relation to the ideal, differed the most in the udder traits, namely the fore udder length and fore udder attachment. Based on the calculated averages of the linear trait grades of the Simmental cows in Vojvodina and their deviation from the ideal grades, it can be concluded that the selection should improve the type traits, but primarily the traits of the udder, because a well-built udder ensures high milk yields and is less prone to diseases, and good udder connection protects the udder from bacterial contamination.

Key words: Simmental primiparious cows, phenotypic parameters, type traits, average values

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200117.

EFFECT OF SYSTEMATIC FACTORS ON MILK PRODUCTION PER MILKING, PRODUCTIVE AND LIFETIME DAY IN SIMMENTAL COWS

Milun D. Petrović[1], Vladan Bogdanović[2], Snežana Bogosavljević-Bošković[1], Simeon Rakonjac[1], Radojica Đoković[1], Radica Đedović[2], Miloš Ži. Petrović[1]

[1]University of Kragujevac, Faculty of Agronomy in Čačak, Cara Dušana 34, Čačak, Republic of Serbia
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade-Zemun, Republic of Serbia
Corresponding author: Petrović D. Milun, milunp@kg.ac.rs

Abstract: One of the very important functional characteristics of dairy cows is milk production per milking, productive and lifetime day. Due to the pronounced action of both genetic and paragenetic factors, the phenotypic expression of this trait is characterized by high variability.The effect of fixed (breeding area - farm, season and year of birth, total number of lactations) and continuous (age of cows at first insemination) paragenetic factors was carried out on a sample of 2 548 Simmental cows distributed in three breeding areas: Zlatiborski Suvati farms with free-stall housing system (n=502), farms in Dobrichevo with a tie-stall housing (n=956) and individual tie-stall in the area of the Agricultural Cooperative "Voćar" from Kotraža (n=1090).Based on the statistical analysis using the GLM procedure, it was determined that the general average for milk production per milking, productive and lifetime day was 12.79 kg, 9.31 kg and 5.47 kg, respectively.Breeding area, year of birth and total number of lactations significantly influenced ($P<0.01$) the phenotypic expression of all the traits. Season of birth did not significantly affect any of the observed functional traits ($P>0.05$), while age at first insemination as a continuous factor significantly affected milk production per milking day ($P<0.05$) and especially milk production per productive and lifetime day ($P<0.01$).

Key words: Simmental breed, milk production, milking day, productive day, lifetime day

Acknowledgement

This study was funded by the Ministry of Science, Technological Development and Innovation of Republic of Serbia, No. 451-03-47/2023-01/200088 and No. 451-03-47/2023-01/200116.

THE EFFECT OF MASTITIS PREVALENCE RISK ON THE DAILY PRODUCTION OF DAIRY COWS CONCERNING THE MILK RECORDING YEAR

Vesna Gantner[1], Ivana Jožef[2], Vera Popović[3], Maja Gregić[1], Dragan Solić[4], Klemen Potočnik[5]

[1] J. J. Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Croatia
[2] University in Novi Sad, Faculty of Agriculture, Serbia
[3] Institute of Field and Vegetable Crops, Novi Sad, Serbia
[4] Croatian Agency for Agriculture and Food, Osijek, Croatia
[5] University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Ljubljana, Slovenia
Corresponding author: Vesna Gantner, vgantner@fazos.hr

Abstract: Aiming determination of the mastitis prevalence risk in the dairy cattle population as well as the effect of mastitis prevalence risk on milk production (daily milk, fat and protein yield) at successive milk recordings concerning the year of milk recording test-day records of dairy Simmental and Holsteins collected from 2005 to 2022 were analysed. The obtained results indicate the variability in mastitis prevalence risk as well as the differences in the effect of mastitis risk due to the milk recording year. Furthermore, higher prevalence risk was determined in the Simmental breed as well as the lower increase of daily milk yield at the first successive milk recording. Furthermore, in both breeds there is a visible trend of increasing percentage of healthy animals in the past 6 - 7 years, most likely caused by improved management and preventive measures at dairy cow farms. The determined results indicate that the daily lactose content can operate as an excellent indicator of a possible mastitis problem on dairy farms and prevent a set of various costs without any additional investments on the farm except for employee education enabling more efficient and environmentally sustainable dairy cattle farms.

Key words: milk production, daily lactose content, mastitis prevalence risk, dairy cattle

MEDICINAL AND AROMATIC PLANTS IN LIVESTOCK FARMING: A PROMISING APPROACH FOR BOOSTING HEALTH AND PERFORMANCE

Dušica Ostojić Andrić[1], Slavča Hristov[2], Branislav Stanković[2], Violeta Caro Petrović[1], Marko Pajić[3], Dragan Nikšić[1], Ljiljana Samolovac[1], Miloš Marinković[1]

[1]Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia
[2]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun, Serbia
[3]Scientific Veterinary Institute “Novi Sad”, Rumenački put 20, 21000 Novi Sad, Serbia
Corresponding author: Dušica Ostojić Andrić, andricdusica.iah@gmail.com

Abstract: In recent times, there has been a revived interest in utilizing medicinal and aromatic plants (MAPs) for the treatment of diseases and enhancing the productivity of farm animals. Thanks to their bioactive compounds, MAPs can enhance the immune system, reduce the risk of disease and improve overall health and welfare. This is especially important in the post-antibiotic era, where the search for alternative options is becoming increasingly urgent. Although the mode of their action is still unclear, today it is known that MAPs can modulate the microbiota and promote gut health, leading to improved digestion and nutrient absorption. Some components of MAPs act against viruses, bacteria and parasites. Additionaly, the use of MAPs in livestock farming can also have environmental benefits. Livestock methane emissions are a significant contributor to greenhouse gas levels. Recent studies have shown that certain bioactive compounds found in MAPs could inhibit methanogenesis and reduce the number of methanogenic microbes in animal gastrointestinal tracts. As a result, researchers are exploring the potential of MAPs in methane reduction strategies. Plants could also play a prominent role in obtaining functional and enriched foods to contribute to animal product quality and human health in general. This review highlights the importance and potential of using medicinal plants in farm animal breeding, particularly in the context of the One Health concept, which acknowledges the interconnectedness of human, animal, and environmental health.

Key words: medicinal plants, livestock, health, performance, phyto additives, ethnoveterinary medicine

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022 and No. 451-03-47/2023-01/200116.

IMPROVING THE DEVELOPMENT OF THE COMPETITIVENESS OF PIG AND CATTLE PRODUCTION IN THE REPUBLIC OF CROATIA BY APPLYING GENERIC STRATEGIES

Dragan Dokić [1], Vera Popović [2], Maja Gregić [3], Vesna Gantner [3]

[1] Erdut Municipality, Dalj, Croatia
[2] Institute of Field and Vegetable Crops, Novi Sad, Serbia
[3] J.J. Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Croatia
Corresponding author: Vesna Gantner, vgantner@fazos.hr

Abstract: Livestock production should be considered from an existential point of view, because meat is an input that is used daily for human consumption. Statistical data show that the total livestock production does not meet the total demand for meat. Scientific research has shown that it is necessary to improve the competitiveness of production by implementing generic strategies that reduce costs, differentiate production and focus on a specific product. For this reason, it is necessary to maintain the competitiveness of pig and cattle production, as well as strive for continuous production growth. The aim of this paper was to show how the competitiveness of pig and cattle production in the Republic of Croatia can be increased by implementing business strategies. The emphasis was to show how tax relief contributes to the competitiveness of production. In the research results, a supply and demand curve for pigs and cattle was formed based on current prices and production volume, and quantitatively was shown how much are the differences when the tax burden is reduced. Raising the level of competitiveness of production, in addition to being significant for the company, is also very significant for the state, as it also increases the total GDP.

Key words: generic strategies, competitiveness, pig production, cattle production, tax relief

THERMOREGULATION OF SPORTS HORSES

Maja Gregić [1], Tina Bobić [1], Dragan Dokić [2], Vesna Gantner [1]

[1]J.J. Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Croatia
[2]Erdut Municipality, Dalj, Croatia
Corresponding author: Maja Gregić, mgregic@fazos.hr

Abstract: Horses are very well adapted to various weather/climate conditions due to their thermoregulation mechanisms. Thermoregulation is the result of complex and sophisticated biological processes that are affected by many environmental factors, not just the ambient temperature. In addition to the weather/climate, there are other factors that reduce or even limit the function of natural thermoregulation. Metabolic processes naturally generate a large amount of heat and thus make an emphasized contribution as a component of regulatory mechanisms. The challenges of sports horses are numerous, but through care and proper work, the consequences of equestrian sports can certainly be mitigated. Due to different climatic conditions and extremes, the horse through millions of years of evolution has adapted to the extremes through different mechanisms of thermoregulation. In order to ensure proper management and increase the various well-being of horses, further research is necessary in order to gain a deeper understanding of the mechanisms of thermoregulation in horses.

Key words: horse, thermoregulation, care

POPULATION TRENDS OF GOATS IN SERBIA AND CROATIA FROM 2012 TO 2021

Ivan Vlahek[1], Nevena Maksimović[2], Aneta Piplica[1], Maja Maurić Maljković[1], Nikola Delić[2], Marina Lazarević[2], Velimir Sušić[1]

[1]Faculty of Veterinary Medicine University of Zagreb, Vjekoslava Heinzela 55, 10000 Zagreb, Croatia
[2]Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia
Corresponding author: Ivan Vlahek, ivlahek@vef.unizg.hr

Abstract: This paper aims to examine the state of goat production and the population trends of goats in Croatia and Serbia from 2012 to 2021. Goat keeping in both countries suffered immensely in the second half of the 20th century as a result of the infamous Law on Prohibition of goat keeping, which was unique of its kind and which led to the almost complete annihilation of the goat sector in countries which were at the time part of Yugoslavia. With the abolition of this law, both countries have made an effort to revive goat production by importing high-producing breeds, crossbreeding domestic breeds, herd book keeping and government funding. In the past ten years, Serbia has experienced a significant rise in the number of herd book goats and a decline in the total number of heads of goats. The Republic of Croatia had a positive trend in the total number of goats which increased by about 10.6%, and a higher percentage of herd book goats compared to the total number of goats compared to Serbia. However, Serbia has about 2.7 times bigger total goat population. Total production of goat milk and meat in both countries is considered low when seen from the perspective of Europe, as only 1.3% and 0.5% of European goats are raised in Serbia and Croatia, respectively. In Serbia, production systems are still predominantly extensive to semi-intensive, and therefore production potential of animals is not exploited to the maximum. Also, Serbia has weak and unstable markets for goat milk and meat, making this production unpredictable and varying. Even though the goat sector has come a long way since its downfall in 1954, it still has a long way to go to become sustainable. On the other hand, in Croatia, goat milk has been a sought-after product in recent years, and farmers have achieved fair prices, establishing the goat dairy industry. After Croatia joined the European Union, goat farmers gained access to several significant sources of financing, making it the most important event for the goat sector in Croatia.

Keywords: goats, Croatia, Serbia, breeds, production, population and trends

Acknowledgements
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia based on the Agreement on the realisation and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

HAIR GOAT BREEDING AND SUSTAINABILITY IN TÜRKİYE: THE CASE OF PAMUKKALE DISTRICT OF DENIZLI PROVINCE

Selda Manav, Murat Yılmaz

Department of Animal Science, Faculty of Agriculture, Aydin Adnan Menderes University, Aydin, Türkiye
Corresponding authors: Selda Manav, seldaavci@adu.edu.tr; Murat Yilmaz, myilmaz@adu.edu.tr

Abstract: In 2022, the number of goats in Türkiye was recorded as approximately 12.325.000. Despite its natural and economic conditions, agricultural structure, traditions and being a country suitable for widespread goat breeding, Turkey experiences various problems in sustainable goat breeding. This study was carried out with the aim of determining the current situation and investigating the sustainability of the hair goat breeding sample in Pamukkale district of Denizli province, where goat breeding is intense, in terms of Turkey hair goat breeding and sustainability. In order to evaluate the hair goat breeding in Pamukkale district of Denizli province, the data obtained by conducting face-to-face surveys in 16 enterprises engaged in hair goat breeding in the district were evaluated. Within the scope of the survey, questions were asked about the factors of hair goat breeding and sustainability. In the study, United Nations Food and Agriculture Organization (FAO), Türkiye Statistical Institute (TUIK), Ministry of Food, Agriculture and Forestry and other secondary data sources were used. As a result of this study, most of the breeders are male and primary school graduates, the average age is 51, the average herd size is 145 heads, the average number of brood goats is 76, the number of broodstock per billy goat is 14.5, more than half of the women in the enterprises do not want to continue raising hair goats, and they do not want their children to do this job; it has been determined that the biggest problems are lack of grazing land, wolf attacks and high feed prices. In Pamukkale district, it is possible that there will be problems in hair goat breeding and sustainability in the coming years due to the decrease in the number of goats in parallel with the decrease in the rural population, the high average age of the breeders, the unwillingness of their children to do this job, the grassland problem and other economic, social and environmental reasons. Considering the results of similar studies conducted in different regions of Turkey, it is necessary to encourage and support the rural female and young population in goat breeding in order to make goat breeding sustainable throughout the country. The necessity of protecting pastures and grazing lands and preventing the constructions that will hinder grazing has become evident.

Key words: hair goat, Denizli, Pamukkale, sustainability.

Acknowledgment
The authors would like to thank the employees of the Animal Health and Breeding Department of Agriculture and Forestry District Directorate of Pamukkale in Denizli city.

COMPARISON OF BODY WEIGHT, FAMACHA © BCS AND HAIR SCORES İN SAANEN GOATS DURING PREGNANCY AND BIRTH PERIOD

Alkan Çağli, Hasan Coğan, ve Murat Yilmaz

[1]Department of Animal Science, Faculty of Agriculture, Adnan Menderes University Aydin, Turkey
Corresponding authors: Alkan Çağli, alkancagli@gmail.com; Hasan Coğan, hasanncogann@gmail.com; ve Murat Yilmaz, myilmaz@adu.edu.tr

Abstract: The aim of this study was to compare FAMACHA © card scores, BCS scores, body weight (BW) and hair score values at the beginning of gestation, advanced gestational and parturition periods in 22 Saanen goats whose oestrus was synchronized. Every 15 days from the mating period to the postpartum period, eye score scoring, BCS scoring, hair scoring and FAMACHA © card scoring of 22 had Saanen goats were determined and live weights were weighted. In terms of the properties measured in the study, the averages of the early period of pregnancy and the advanced period of pregnancy and the birth periods were compared. As a result of statistical analysis, the effect of BCS on body weight was found to be statistically significant. Correlation between BCS and FAMACHA © Graphic score was found to be negative (-0.392) and moderate significant. In the initial period of pregnancy, the effect of BCS on Famacha and body weight wasn't statistically significant, but its effect on hair scoring was found to be significant ($P < 0.05$). The effect of BCS on BW, FAMACHA © and hair score in late pregnancy period and delivery period was found to be statistically significant ($P < 0.05$). As a result of good care and feeding practices during the pregnancy period, BCS of Saanen goats increased during the birth period and body weight and FAMACHA © were positively affected.

Key words: Saanen goat, pregnancy, FAMACHA © card, BCS, hair Score, body weight

NEW ASPECTS IN RISK STATUS EVALUATION OF SMALL RUMINANT LOCAL BREEDS IN SERBIA

Bogdan Cekić[1], Dragana Ružić Muslić[1], Nevena Maksimović[1], Violeta Caro Petrović[1], Ivan Ćosić[1], Nemanja Lečić[1], Zsolt Becskei[2]

[1]Institute for Animal Husbandry, Belgrade - Zemun, Autoput za Zagreb, 11080 Zemun, Serbia
[2]Faculty of Veterinary Medicine, University of Belgrade, Bulevar Oslobođenja 18, 11000 Belgrade, Serbia
Corresponding author: Bogdan Cekić, bcekic@istocar.bg.ac.rs

Abstract: Several factors have led to a decline in autochthonous breeds, and the need for conservation programs based on risk assessment has increased. The aim of the study was to compare and validate two models for risk assessment of local small ruminant breeds in Serbia. The first model considered only the effective population size (Ne), while the alternative model included Ne, the number of females and sub-factors representing the influence of different elements. The results indicate an increasing trend in most breeds and populations over the last five years, with the exception of Tsigai and Chokan Tsigai, which showed a decrease. However, the increasing trend is insufficient, especially for Pirot, Karakachan, and Bardoka, as well as for the Domestic (Serbian) white goat, which is classified as critically endangered in both models. Vlashko vitoroga, Chokan tsigai, and the Balkan goat were at high risk. The models produced different results for the Krivovir, Sjenica, and Svrljig strains. In the first model, Krivovir was classified as potentially endangered, whereas Sjenica and Svrljig were not. In the second model, Krivovir was classified as highly and the other two strains as potentially endangered. These differences are due to the additional factors in the second model, which lead to a more comprehensive assessment for future risk assessments. Although the new model is appropriate for Serbia, it is important to test it on a variety of native species to increase confidence. Future conservation programs should also include genetic characterization and implement adaptive models to obtain more reliable conclusions.

Key words: sheep, goat, genetic resources, endangerment assessment, conservation

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia on the basis of the Agreement on the realization and financing of scientific research work of SRO grant number 451-03-47/2023-01/200022.

PRNP GENE POLYMORPHISMS IN HEALTHY GREEK SHEEP FROM 2017 TO 2022 - NATIONAL DATABASE FROM RESISTANT RAMS

Maria Babetsa, Evangelia D. Apostolidi, Loukia V. Ekateriniadou, Evridiki Boukouvala

Hellenic Agricultural Organization - DIMITRA, Veterinary Research Institute, Campus of Thermi, 57100 Thermi, Thessaloniki, Greece, 2310 365399
Corresponding author: Evridiki Boukouvala, boukouvala@elgo.gr

Abstract: Scrapie is a slowly progressive infectious disease of sheep and goats that causes central nervous system degeneration. It is one of several transmissible spongiform encephalopathies (TSEs). The main constituent of the infectious agent is the scrapie isoform (PrP^{Sc}) of the normal cellular (PrP^{C}) prion protein (PrP). In sheep, three polymorphisms of the host *PRNP* gene that encodes the PrP, at codons 136, 154, and 171 are closely linked to susceptibility or resistance to natural and experimental scrapie. This information is used to implement national breeding programs to reduce the susceptibility to scrapie. For many years, Greece was a country with a high percentage of positive cases, but after the implementation of the National Surveillance Programme, scrapie cases have decreased. In the present study, we present the PrP Types (1 to 5, according to the UK National Scrapie Plan) of 11569 blood samples collected from clinically healthy rams during 2017-2022, in comparison with blood samples analyzed at 2012-2016. Samples were analyzed by Real - Time PCR (SNP detection - TaqMan probes). Types 1 and 2 linked with resistance to the disease showed an exceptionally high percentage, especially in 2019 (53.76% and 46.24, respectively). In contrast, Type 3, associated with susceptibility to the disease, was relatively reduced in 2019 (15.88%). The private initiatives of farmers, in collaboration with the Veterinary Research Institute, have resulted in the establishment of a substantial number of farms with a significant population of resistant rams.

Key words: Scrapie, scrapie types, sheep, Real-Time PCR

MORPHOLOGICAL CHARACTERISTICS OF OOCYTES AND CUMULUS-OOCYTE COMPLEX OBTAINED FROM OVARIES WITH OR WITHOUT CORPORA LUTEA

Hristina Blagova, Rossen Stefanov

Institute of Biology and Immunology of Reproduction, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria
Corresponding author: Hristina Blagova, blagovahristina@gmail.com

Abstract: The development of an affective protocol for oocyte quality is of great importance for their further in-depth study as well as a reliable method for predicting the success of in vitro maturation (IVM). The aim of our study was to evaluate morphological characteristics of oocytes and cumulus-oocyte complex obtained from ovaries with or without corpora lutea. The oocytes were divided into 2 groups - with corpus luteum and without corpus luteum and 30 oocytes from each group were examined - a total of 60 porcine oocytes of the Sus Scrofa species. Both groups were cultured in vitro. The dependence was analyzed using a stereomicroscope. We did not find a significant difference in the relationship between the presence or absence of corpus luteum with the quality of the cumulus oocyte complex after morphological evaluation. However, after culturing for 24h in Ca^{2+} ionophore, the cumulus oocyte complex (COC) of oocytes with corpus luteum was affected and visibly more compact, as we observed and evaluated the expansion of both the cumulus and the crown separately. These studies confirm the conclusions obtained by other authors, namely that the quality of oocytes is better when they are surrounded by more layers of cumulus cells.

Key words: oocytes, cumulus cells, corpus luteum

Acknowledgment
This work was supported by project INFRAACT for RI development, grant agreement DO1-178/29.07.2022.

THE EFFECT OF THE APPLICATION OF MELATONIN IMPLANTS IN THE SPRING ON THE MANIFESTATION OF ESTRUS AND FERTILITY IN ILE DE FRANCE SHEEP

Nikola Metodiev

Institute of Animal Science, 2232 Kostinbrod, Bulgaria
Corresponding author: n_metodiev@abv.bg

Abstract: The aim of the present study was to determine the effect of the application of melatonin implants in the spring on the manifestation of estrus and fertility in Ile de France sheep. The experiment was carried out with 67 ewes (aged 3-6 years), divided in 2 groups – experimental (EG) (n=22) and control (CG) (n=45) during spring, 2021. The experimental group was treated with implants (Melovin, Ceva Animal Health) on 12th March and the breeding started two months later. Control group was not treated. The observation lasted 1 month (from 12th May to 10th of June). During the observed period, the ewes that came in estrus from the EG was 81.82 % vs. 71.11% from the control group. The fertility was 77.78% and 71.87%, respectively for EG and CG. The obtained results showed that melatonin implants, given solely, didn’t have synchronization effect on estrus and fertility.

Key words: sheep, melatonin, estrus, fertility

DIFFERENCES IN SOME BIOCHEMICAL PARAMETERS IN TWO HERDS OF KARAKACHAN SHEEP DEPENDING ON ENVIRONMENT

Ivan Yanchev, Nikola Metodiev, Penka Moneva, Maya Ignatova

Institute of Animal Science – Kostinbrod, Agricultural Academy, Sofia, Bulgaria
Corresponding author: Ivan Yanchev, ijantcev@mail.bg

Abstract: The aim of the present study was to estimate the values of some biochemical parameters - ALAT, ASAT, AF, Fe and glucose of two Karakachan sheep herds, reared at different altitudes (740 and 1150 m above sea level with different body condition score (BCS) and hematocrit (HCT) levels. The research was carried out in the experimental base "Zlatusha" of IAS-Kostinbrod and in a farm in the locality "Govedova voda", Vratsa Balkan Mountain (near Milanovo village) in June 2022. From the two herds of sheep (1.5-7.5 years old) representative excerpts were selected consisted by 50 animals each, from which blood samples were taken by jugular venipuncture. Analysis of biochemical parameters was performed in extracted plasma with a BTS-350 Semi Automated Biochemical Analyser. For the purposes of the research, in addition to the general sample, the same statistical indicators were also analyzed on formed groups of 10 animals each - those that showed the values with the highest and lowest HCT in the analysis of the same whole blood samples. The BCS of the sheep from the herd of IAS - Kostinbrod was better than that of the animals from the village of Milanovo, as the difference was significant for the herds overall ($p<0.05$). The HCT levels of the sheep from the IAS - Kostinbrod herd were also higher than those of the animals from the village of Milanovo, both for the herds as a whole and in the group with low HCT, and the differences were not significant. The activity of ALAT (99-132 U/L) was increased according reference values (22-38 U/L) was significantly lower in the sheep from the village of Milanovo compared to those from the IAS in general for the herds ($p<0.001$) and in the group with low HCT ($p<0.01$). The activities of ASAT (162-231 U/L, normally 60-280 U/L) and AF (25-74 U/L) - decreased according reference values (70-390 U/L), as well as in the levels of plasma iron (10-17 μmol/L) - decreased according reference values (30-40 μmol/L) and glucose (0.86-3.56 mmol/L, normally 1.7-3.6 mmol/L), the exact opposite pattern was present in the same groups. The differences were significantly higher in the sheep from the village of Milanovo compared to those from the IAS in general for the herds (ASAT, AF, Fe and glucose - $p<0.001$) and in the group with low HCT (AF - $p<0.05$, ASAT and Fe - $p<0.01$ and ASAT - $p<0.001$). In the group with a high HCT, there were no significant differences in all biochemical parameters. Our assumption was that the increased metabolism (for increased BCS and glycogen synthesis, respectively) in the sheep from the IAS perhaps in all likelihood compensated the higher altitude in the animals reared in the village of Milanovo but sheep with high HCT levels in both herds demonstrated low variability in all investigated samples.

Key words: Karakachan sheep, biochemical parameters, altitude, hematocrit, body condition score

SURVEILLANCE FOR INFECTIOUS CAUSES OF ABORTION IN RUMINANT ANIMALS IN SOUTH BACKA AND SREM REGION

Ivan M. Pušić, Doroteja A. Marčić, Radomir D. Ratajac, Igor M. Stojanov, Jasna Z. Prodanov-Radulović, Jelena B. Apić, Živoslav M. Grgić

Scientific Veterinary Institute “Novi Sad”, Rumenacki put 20 Novi Sad
Corresponding author: Ivan M. Pušić, ivan@niv.ns.ac.rs

Abstract: Abortion and infertility in ruminant animal species causes a significant economic loss and remains a major obstacle in farming business profitability. Beside the noninfectious causes of abortion that include genetic factors, exposure to teratogenic and toxic agents or plants, nutrition deficiencies, injuries and blunt trauma, physiological disorders and hormonal dysfunction, a considerable percentage of abortion are of infectious origine. According to the State Veterinary program for monitoring abortions in domestic animals, a total of 61 bovine sera from animals with abortion in period 2020 - 2023 in a South Backa and Srem Region, were serologicaly examined for presence of antibodies against *Brucella sp., Leptospira sp., Chlamidia sp., Coxiella burnetti* (*Q-fever*), *Neospora caninum, Bovine Viral Diarhea (BVD) and Infectious Bovine Rhinotracheitis (IBR).* Also, fetal and placental tissue from 56 aborted calves, were examined by PCR for genomic presence of *Brucella sp., Leptospira sp., Chlamidia sp., Q-fever, BVDV, IBR, Toxoplasma gondii* and *Neospora caninum* pathogens, or by bacteriological cultivation for Lysteria monocitogenes. Results indicate that 47 samples of blood sera (77.05%) were positive to one or more of the monitored diseases, while 19 fetal tissue samples (33.93%) were positive on PCR test, and 6 (10.71%) yielded a positive bacterial culture for *L. monocytogenes*. During the same period, a total of 21 sheep sera or fetal tissue samples were examined serologically, and by PCR method for identification of genomic presence for specific pathogens. The only goat sample submitted turned out to be negative to all tested diseases.The number of pathological samples examined, suggests that only a small percentage of abortions were submitted for laboratory testing, thus leaving a significant proportion of cases undiagnosed and not reported. On the other hand, successful abortion disease diagnostics, requires a thorough investigation and team work of all stake holders, producer, veterinary practicioner and epizootiologist as well as diagnostic laboratory.

Key words: abortion, ruminants, infectious agents, surveillance

INFLUENCE OF MILK FAT-TO-PROTEIN RATIO ON REPRODUCTIVE PERFORMANCE OF HOLSTEIN DAIRY COWS

Teodora Angelova[1], Krum Nedelkov[2], Jivko Krastanov[1], Daniela Yordanova[1]

[1] Agricultural Institute, 6000 Stara Zagora, Bulgaria
[2] Faculty of Veterinary Medicine, Trakia University, 6000 Stara Zagora, Bulgaria
Corresponding author: Teodora Angelova, teslacow@abv.bg

Abstract: The objective of the present analytical study was to evaluate the milk fat-to-protein ratio (FPR) and its effect on reproductive performance of highly producing Holstein dairy cows. The study included 2,849 cows from first to sixth parity and the total number of 25,462 milk production records. The higher risk of incidence of subacute ruminal acidosis (SARA) estimated by FPR was observed at cows during the first 100 days of lactation. Changes in FPR were associated with extended days open (DO) period as the longest interval was found at FPR values of 1.4. The reproductive performance determined by the calving intervals (CI) was slightly affected by the FPR which was within a narrow range of 1.18 to 1.20 for both shorter and longer CI. However, the early-lactation cows experiencing ketosis, predicted by milk FPR, had much longer DO compared to health and SARA cows. It was also observed a relatively longer CI of 462 days in early-lactation cows experiencing ketosis. The current analysis indicated that the milk FPR by which the SARA and ketosis could be easily identified is one of the major factors influencing the reproductive performance of Holstein dairy cows.

Key words: dairy cows, fat-to-protein ratio, reproductive performance

GENE POLYMORPHISM FREQUENCIES IN KRŠKOPOLJE PIG BREED

Klavdija Poklukar[1], Marjeta Čandek-Potokar[1,2], Nina Batorek Lukač[1], Marie-José Mercat[3], David Picard Druet[3], Martin Škrlep[1]

[1]Agricultural Institute of Slovenia, Ljubljana SI-1000, Slovenia
[2] University of Maribor, Faculty of Agriculture and Life Sciences, Hoče SI-2311, Slovenia
[3] IFIP – Institut du Porc, Le Rheu, France
Corresponding author: Martin Škrlep, martin.skrlep@kis.si

Abstract: Genetic polymorphisms are associated with different production traits in pigs and some of them have major effects. In local pig breeds, which are usually characterised by small effective sizes, elimination of unfavourable alleles is more challenging because care must be taken to maintain genetic diversity. Therefore, the aim of the present study was to analyse the frequency of several causal mutations in the local breed Krškopolje pig associated with fatness and meat quality and to estimate the selected diversity parameters. A total of 253 DNA samples of Krškopolje pigs were analysed with Choice Genetics' custom SNP-chip. We observed a relatively high frequency (0.17) of stress syndrome mutation (mutated c. 1843T allele at *RYR1*). The mutated c.749A allele at *PRKAG3* gene (Arg250Gln or RN^-) associated with high muscle glycogen deposition was absent. The frequency of the variant at *PRKAG3* (Ile249Val) encoding 249Ile (associated with higher pH, fatness, darker colour, better water holding capacity) was 0.22, and of the variant encoding 102Ser was 0.50. The frequency of *MC4R* 892A allele associated with high lipid deposition and growth was 0.57. The average observed and expected heterozygosity values were 0.37 and 0.36, respectively, which is relatively high for a local pig breed. The present results demonstrate high frequencies of both unfavourable and favourable alleles affecting meat quality in Krškopolje pigs. Further monitoring of key polymorphisms and genetic diversity parameters is needed to develop conservation and breeding strategies.

Key words: local pig breed, candidate genes, SNPs, breeding program

Acknowledgement
Funding by Slovenian Agency of Research (grants P4-0133, J4-3094) and project GEroNIMO (EU H2020 GA no. 101000236) are acknowledged.

THE EFFECT OF *PRKAG3* AND *RYR1* GENES ON MEAT QUALITY TRAITS IN THE LOCAL KRŠKOPOLJE PIG BREED

Klavdija Poklukar[1], Marjeta Čandek-Potokar[1,2], Nina Batorek Lukač[1], Marie-José Mercat[3], David Picard Druet[3], Martin Škrlep[1]

[1]Agricultural Institute of Slovenia, Ljubljana SI-1000, Slovenia
[2] University of Maribor, Faculty of Agriculture and Life Sciences, Hoče SI-2311, Slovenia
[3] IFIP – Institut du Porc, Le Rheu, France
Corresponding author: Martin Škrlep, martin.skrlep@kis.si

Abstract: Polymorphisms in *PRKAG3* (Ile199Val and Gly52Ser) or *RYR1* (Arg615Cys) genes have been reported to exert a major effect on pig meat quality. In the present study, the effects of these polymorphisms were investigated in 234 Krškopolje pigs genotyped with the Choice Genetics' custom SNP chip. The observed genotype frequencies for *RYR1* N/N were 66.2% and for N/n 33.8%. The frequencies of *PRKAG3* Ile199Val were 4.7%, 33.8% and 61.5% for Ile/Ile, Ile/Val and Val/Val, respectively, and Gly52Ser frequencies were 28.6%, 42.3% and 29.1% for Gly/Gly, Gly/Ser and Ser/Ser, respectively. Pigs carrying recessive “n” allele on *RYR1* exhibited paler colour with higher drip loss ($P<0.05$). As for *PRKAG3* polymorphisms, the Ile/Ile genotype (Ile199Val) was associated with lower muscle thickness, whereas Val/Val genotype was associated with higher monounsaturated fatty acids content ($P<0.05$). Gly/Ser heterozygotes (Gly52Ser) exhibited lower muscle pH 24h *post-mortem* ($P<0.05$) and brighter meat colour compared to Ser/Ser genotypes ($P<0.05$). By combining different genotypes of *RYR1* and *PRKAG3*, we could not confirm the hypothesis that the negative effects of the *RYR1* mutation could be counterbalanced by certain favourable *PRKAG3* alleles (like 199Ile) due to their low frequency.

Key words: local pig breed, SNPs, meat quality, breeding program

Acknowledgement
Funding by Slovenian Agency of Research (grants P4-0133, J4-3094) and project GEroNIMO (EU H2020 GA no. 101000236) are acknowledged.

PHENOTYPIC AND GENOTYPIC VARIABILITY OF TRAITS OBSERVED IN THE PERFORMANCE TEST OF GILTS

Nenad Stojiljković[1], Dragan Radojković[2], Čedomir Radović[1], Marija Gogić[1], Vladimir Živković[1], Aleksandra Petrović[1], Nikola Delić[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080 Belgrade, Serbia
[2]Faculty of Agriculture, University of Belgrade, Nemanjina 6, 11080 Belgrade, Serbia
Corresponding author: Nenad Stojiljković, nenads9103@gmail.com

Abstract: The aim of this research was to determine the phenotypic and genotypic variability of the observed traits in the performance test of gilts: age at the end of the test - final age (FA), back fat thickness 1 and 2 (BFT1 and BFT2) and back muscle depth (MLD). Production performance of gilts was examined in two pig pens in three consecutive years. The research included 3610 gilts, 3 genotypes, originating from 84 sires. At the end of the test, the body weight and back fat thickness (BFT1 and BFT2) and MLD depth were measured using a MLD-ultrasound device. There were 1228 gilts in the first pen, and 2382 tested gilts in the second pen. In the first year, 885 gilts were tested, in the second 1145, and in the third 1580 gilts. Based on the obtained results, it was determined that the genotype of gilts had a statistically significant effect ($P<0.001$) on BFT1, BFT2 and MLD, while it had no effect on the FA trait ($P>0.05$). Taking into consideration the farm as a source of variation of gilts' traits, it was concluded that it had a very high statistically significant influence on the investigated traits ($P<0.001$). The year of testing of gilts as a source of variation of their traits showed a high statistical effect ($P<0.001$) on all tested traits. The observed properties of back fat thickness 1, 2 and MLD depth were highly statistically dependent ($P<0.001$) on the weight at the end of the test. Medium heritabilities were determined for production traits in the performance test of gilts, for age at the end of the test 26%, back fat thickness 1 - 37%, back fat thickness 2 - 35%, and for depth of MLD 23%.

Key words: gilts, performance test, heritability, age, back fat thickness, MLD

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, based on the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

CONSUMERS' ATTITUDE TOWARDS THE POSSIBILITY TO AVOID CULLING OF MALE LAYER-TYPE CHICKENS: A SURVEY ON THE ACCEPTABILITY OF THE OBTAINED MEAT PRODUCTS

Evgeni Petkov[1], Krasimir Dimov[2], Teodora Popova[1], Maya Ignatova[1]

[1]Agricultural Academy, Institute of Animal Science- Kostinbrod, Pochivka sn., 2232 Kostinbrod, Bulgaria
[2]Agricultural Academy, Institute of Cryobiology and Food Technologies, 53" Cherni vrah" blvd., 1407 Sofia, Bulgaria
Corresponding author: Evgeni Petkov, e_petkov@ias.bg

Abstract: A pilot study as a survey on the attitude of the participants towards the widespread practice of culling male layer-type chickens was carried out. An alternative solution to the problem has been proposed by raising these birds for meat. Two products were prepared - "Little Cockerel" and "Big Cockerel", from chickens at the age of 5 and 9 weeks respectively, weighing 200g and 900g. The opinion of the respondents was in favor of the product with the higher weight. Sensory evaluation of the preferred product was done. The volume of production that the respondents would buy at different price ranges was determined. According to the results of the case described by us, we can conclude that the "Big Cockerel" test product corresponded to a larger extent to the preferences of the participants in the survey for an innovative poultry meat product. It demonstrated potential for successful commercial implementation with maximum utilization of the production produced in the country.

Key words: male layer-type chickens, survey, meat

Acknowledgements
The authors would like to thankfully acknowledge the funding provided by the Bulgarian National Science Fund, Ministry of Education and Science in Bulgaria (Project INOVAMESPRO, Contract Nº КП-06-Н56/10, 12.11.2021).

ADAPTED QUALITY PROTEIN MAIZE IN BROILER DIETS HOLDS NUTRITIVE AND FINANCIAL ADVANTAGES

Marija Kostadinović, Jelena Vančetović, Nenad Delić, Dragana Ignjatović Micić

Maize Research Institute Zemun Polje, Slobodana Bajića 1, Belgrade, Serbia
Corresponding author: Marija Kostadinović, kmarija@mrizp.rs

Abstract: Quality protein maize (QPM) can be beneficial for use in feeds as it was shown that substitution of standard maize (SM) with QPM can improve livestock performance and decrease costly dietary lysine supplementation and protein ingredients. Herein, nutritional and financial effects of QPM adapted to temperate climate in broiler diets were tested. Feeding experiment was performed on two groups of broilers – control (fed with SM) and treatment (fed with QPM). Duration of each feeding trial was 42 days, comprising three phases - starter (1-14), grower (15-35) and finisher (36-42). Diets for all growth phases were formulated based on the biochemical analysis of SM and QPM kernels. Body weight of the chickens was measured on days 1, 7, 14, 35 and 42. Feed intake (FI), body mass gain (BMG), average daily gain (ADG) and feed conversion ratio (FCR) were calculated at days 14, 35 and 42. Two trials were performed. In the first, SM was completely replaced with QPM in treatment group diets. As the results indicated better FCR in the treatment group for grower (1.49:1.54) and finisher (1.55:1.60) phases, in the second trial QPM was increased and soybean component decreased for 3%. That led to better results as FCR was even lower but in all three phases, confirming the results of the first trial and further confirming the effects of QPM on feed conversion. Moreover, significant financial reduction in feed was observed, as the price of soybean is usually two to four times higher than the price of maize.

Key words: broilers, feed conversion ratio, lysine, soybean, quality protein maize

Acknowledgements
The research was financially supported by the Innovation Fund, Republic of Serbia, under the Proof-of-Concept Program (ID 5679).

THE INFLUENCE OF POLLEN IN THE CHICKEN DIET ON THE SHARE OF TISSUE IN MAJOR CARCASS PARTS AND ON THE CHEMICAL COMPOSITION OF DARK AND WHITE MEAT

Veselin Petričević[1], Miloš Lukić[1], Zdenka Škrbić[1], Maja Petričević[1], Simeon Rakonjac[2], Vladimir Dosković[2], Danijel Milenković[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Republic of Serbia
[2]Faculty of Agronomy, University of Kragujevac, Čacak, Republic of Serbia
Corresponding author: Veselin Petričević, veselin5@live.com

Abstract: The goal of the research was to examine the effect of adding different concentrations of pollen to broiler feed mixtures on the share of tissue in major carcass parts and the chemical composition of dark and white meat. The research was carried out in the Institute for Animal Husbandry using Cobb 500 hybrid chickens up to the age of 42 days. A total of 1200 day-old chicks of both sexes were divided into 5 groups. There were 6 repetitions for each group. During the test, broilers were fed with two mixtures (starter and finisher), food and water were ad libitum during the test, and the composition of the mixtures differed in the amount of added pollen. No pollen was added to the control group (C). Chickens of the (I) group consumed mixtures with the addition of 0.25% pollen, in (II) group 0.5% was added, in group (III) 0.75% was added, while in group (IV) 1.0% pollen was added. At the end of the experiment, one bird was taken from each treatment and of both sexes from each repetition using the random sample method, a total of 60 chickens, from which after slaughter and dissection, the thighs and breast were taken, to determine the share of muscle, fat and bone tissue and skin. After that, samples of thigh muscle tissue and breast were taken with the aim of determining the chemical composition of dark and white meat. By processing the obtained data, significant differences ($p<0.05$) were determined for the proportion of fat tissue in the thighs. Chickens of group III had significantly lower ($p<0.05$) share of fat tissue in thighs compared to chickens of group I. The share of muscle and bone tissue and skin did not differ under the influence of the examined factor. By processing the obtained data for the chemical composition of dark and white meat of broiler chickens of both sexes, no significant differences ($p>0.05$) were found in the content of water, fat, ash and protein under the influence of different diets. The use of mixtures with different levels of pollen addition in the diet of broiler chickens did not have a negative effect on the quality of chicken meat.

Key words: chickens, pollen, chemical composition of meat

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022 and No. 451-03-47/2023-01/200088.

CHEMICAL COMPOSITION AND THE CONTENT OF FATTY ACIDS IN TABLE EGGS FROM DIFFERENT PRODUCTION SYSTEMS

Lidija Perić, Mirjana Đukić Stojčić, Sava Spiridonović

University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, Novi Sad, Serbia
Corresponding author: Sava Spiridonović, sava.spiridonovic@stocarstvo.edu.rs

Abstract: The aim of the research was to determine the chemical composition and content of fatty acids in eggs from different production systems. For the purpose of this research, eggs from conventional cage system, free range system and eggs enriched with n-3 fatty acids were used, 30 from each system. The highest protein content in the albumen was found in eggs from the cage system (10.64%) and was significantly different ($p<0.05$) compared to 9.78% and 9.95% from free range and n-3 enriched eggs, respectively. Eggs enriched with n-3 fatty acids had the highest fat content (27.5%), and eggs from the cage system had the lowest (25.69%). However, no significant differences were found between the systems ($p>0.05$). As expected, the highest content of docosahexaenoic acid (DHA) was found in eggs enriched with n-3 fatty acids (0.91%), followed by eggs from the cage system (0.34%), and the lowest content was found in eggs from the free range system (0.20%). The differences were significant between all three systems ($p<0.05$). A lower content of eicosapentaenoic acid (EPA) was found in cages and n-3 eggs compared to eggs from the free range system ($p<0.05$). The highest content of total polyunsaturated fatty acids (PUFA) was found in eggs enriched with n-3 fatty acids ($p<0.05$). Based on the results, it can be concluded that production system and egg enrichment influenced the chemical composition and content of PUFA.

Key words: egg quality, production system, EPA, DHA, PUFA

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200117.

EGGS FROM DIFFERENT HOUSING SYSTEMS AND PRODUCTION PROGRAMS ON THE MARKET OF THE CITY OF BELGRADE

Nataša Tolimir[1], Marijana Maslovarić[1], Zdenka Škrbić[2], Miloš Lukić[2], Jelena Nedeljković-Trailović[3]

[1]Institute for Science Application in Agriculture, Bulevar Despota Stefana 68b, 11000, Belgrade, Republic of Serbia
[2]Institute for Animal Husbandry, Autoput 16, 11080 Belgrade-Zemun, Republic of Serbia
[3]Faculty of Veterinary Medicine, University of Belgrade, Bulevar oslobođenja 18, 11000 Beograd, Republic of Serbia
Corresponding author: Nataša Tolimir, ntolimir@ipn.bg.ac.rs

Abstract: In the year when the already extended deadline for egg producers in Serbia to shift from cage farming to hen housing systems expires, the aim of the study was to analyse the egg market in Belgrade, as the largest market in Serbia. The representation of eggs from different housing systems and production programs in 11 supermarkets, covering the majority of retail chains in Serbia, was examined. In addition, the survey of 247 consumers was conducted in order to determine their views on the housing system and the price of eggs. Results showed the presence of 9 egg producers on Belgrade market, 8 of which provided eggs from the cage system, 5 from the floor system, while 4 offered free-range eggs. Cage eggs were represented in all supermarkets (11), floor eggs in 9 supermarkets, free-range eggs in 6, eggs from the functional food program (ω-3 enriched) in 7, and organic eggs in one supermarket. The analysis of the prices of eggs in different supermarkets, showed that the price per egg from the cage system, for a package of 10 eggs, varied between 0.13 and 0.21 EUR for Grade M, and between 0.14 and 0.25 EUR for Grade L eggs. The price for floor eggs (Grade M) ranged between 0.17 and 0.25, free-range eggs 0.20 and 0.28, ω-3 eggs 0.26 and 0.32 EUR, while it was 0.55 EUR for organic eggs. By comparing the average price of Grade M cage eggs (0.18 EUR), with eggs from other housing systems and production programs, it was found that the price of floor eggs was 25% higher, free-range eggs 41% higher, ω-3 eggs 56% higher and eggs from organic production 206% higher, respectively. Housing system and the price of eggs, as factors affecting decision when purchasing eggs, were not important for 35.19%, and 34.07% of respondents in the survey, respectively. It can be concluded that eggs from the cage system are still the most represented in Belgrade supermarket, but, compared to the similar research from 2017, the supply of eggs from the floor and free-range housing systems has increased. This indicates that the changes in the regulation influenced the transition of egg producers to permitted housing systems. Supply of ω-3 eggs is satisfactory, while other types of designer eggs are lacking. The supply of organic eggs in supermarkets is insufficient.

Keywords: eggs, production systems, Belgrade market, consumer attitudes

Acknowledgements
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022 and 451-03-47/2023-01/200045.

QUALITY OF EGGS FROM BANAT NAKED NECK AND ISA BROWN LAYERS DURING STORAGE

Zdenka Škrbić[1], Miloš Lukić[1], Veselin Petričević[1], Simeon Rakonjac[2], Vladimir Dosković[2], Nataša Tolimir[3], Danijel Milenković[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Republic of Serbia
[2]Faculty of Agronomy, University of Kragujevac, Cara Dušana 34, 32000 Čačak, Republic of Serbia
[3]Institute of Science Application in Agriculture, Bulevar Despota Stefana 68b, 11000, Belgrade, Republic of Serbia
Corresponding author: Zdenka Škrbić, zskrbic@istocar.bg.ac.rs

Abstract: The genotype of the hens, as well as the production system and the diet of the hens, determine the quality of the eggs that are best at the moment of oviposition. In addition to the initial quality of the eggs, the duration and conditions of storage are factors that determine the quality of the eggs that reach the consumer. The aim of the work was to determine the sustainability of the egg quality of the native Banat Naked Neck (BNN) hens and to compare it with the eggs of the ISA Brown (ISA) hybrid laying hens under the same conditions of production and storage. The eggs were stored in a refrigerator at a temperature of 8℃ for 2 or 4 weeks, and in accordance with the Rulebook on Egg Quality (2019). Eggs were sampled in 3 repetitions, and two groups were formed: storage time 2 weeks (ST2) and storage time 4 weeks (ST4) each with 90 eggs, i.e. 45 eggs per genotype and duration of storage. The analysis of the initial quality of BNN and ISA eggs showed differences ($p<0.01$) in the ratio of egg structural parts, that is, yolk and white, which were maintained throughout the entire storage period. The eggs of BNN had a higher share of egg yolk and a lower share of albumen compared to the eggs of ISA layers. Egg weight of BNN and ISA layers did not initially differ and was 62.06 g and 62.78 g, respectively. However, egg weight loss during the storage period was lower ($p<0.01$) in BNN (1.20% after 2 weeks and 2.66% after 4 weeks) compared to ISA eggs (1.98% after 2 weeks and 4.24% after 4 weeks). Albumen height and Haugh Units (HU) showed higher values initially and after two weeks of storage ($p<0.01$) in ISA laying eggs. After four weeks of storage, there were no significant ($p>0.05$) differences between eggs of BNN and ISA layers in terms of albumen height and HU. In accordance with the mentioned parameters of egg freshness, the pH value of the albumen was higher ($p<0.01$) in BNN hens after two weeks of egg storage. After four weeks of storage, these processes were more moderate and the determined differences between the eggs of BNN and ISA layers were at a lower level of significance ($p<0.05$). In conclusion, BNN eggs during the storage period have more moderate processes of loss of freshness and egg weight compared to eggs of ISA layers, which after four weeks of storage brings them into an equal relationship in terms of quality, although the initial quality of eggs of ISA layers was better.

Key words: egg quality, storage, laying, Banat Naked Neck, ISA Brown

Acknowledgments
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022, No. 451-03-47/2023-01/200088, and 451-03-47/2023-01/200045.

INFLUENCE OF DIFFERENT PLANT-BASED DIETS ON FATTY ACIDS COMPOSITION OF GOAT MEAT

Boris Pisinov[1], Tanja Keškić[2], Maja Petričević[2], Gordana Kulić[3], Tamara Stamenić[2], Sveto Rakić[3], Sanja Đurović[1]

[1] Institute for Plant Protection and Environment, Teodora Drajzera 9, 11040 Belgrade, Serbia
[2] Institute for Animal Husbandry, Autoput Beograd-Zagreb 16, 11080 Belgrade, Serbia
[3] University of Belgrade, Faculty of Agriculture, Nemanjina 8, 11080 Zemun
Corresponding author: Boris Pisinov, boriss752002@yahoo.com

Abstract: Goat meat quality depends on many factors, primarily diet, race, gender, stress, environment, management. Goat meat contains low quantity of saturated fatty acids and cholesterol, and fatty acids composition depends on nutrition. The main objective of this study was to examine the influence of plant-based diets from different regions (hilly and plain) on fatty acids composition of fresh goat meat. The fresh meat is obtained from Balkan goats breed (about 4 years old) originating from hilly and plain regions. Gas chromatography with flame-ionization detector (GC-FID) and fatty acids methyl esters (FAMEs) derived by transesterification from fats are used to determine fatty acids profile according to ISO 12966 method. Statistically significant difference ($p<0.05$) is noted between values of saturated and unsaturated fatty acids of compared fresh goat meat originating from different regions. The amount of examined monounsaturated fatty acids is lower in fresh goat meat from plain area. Polyunsaturated fatty acids, such as alpha-linolenic (n-3 FA), linolelaidic and linoleic acids are found in higher percentage (1.2%, 0.4% and 3.0%, respectively) in goat meat from hilly region. The results suggest that plant-based diet consist of different species of herbs distinctive to certain regions has an impact on the composition and quality of goat meat fatty acids profile.

Key words: diet, fatty acids, goat meat, gas chromatography, meat quality

PHOSPHATES AS FOOD ADDITIVES IN MEAT PRODUCTS MANUFACTURED IN REPUBLIC OF SERBIA

Maja Petričević[1], Tamara Stamenić[1], Tanja Keškić[1], Nikola Stanišić[1], Veselin Petričević[1], Violeta Mandić[1], Boris Pisinov[2]

[1] Institute for Animal Husbandry, Autoput Beograd-Zagreb 16, 11080 Belgrade, Serbia
[2] Institute for Plant Protection and Environment, Teodora Drajzera 9, 11040 Belgrade, Serbia
Corresponding author: Maja Petričević, majanovakovic@live.com

Abstract: The widespread use of food additives has experienced a remarkable increase in recent years. Within the realm of processed meat and meat products, the indispensability of phosphates as additives is evident, as they significantly enhance the functionality of meat proteins. Furthermore, their application in meat product manufacturing offers a plethora of advantages, encompassing pH modification and stabilization, augmented water holding capacity leading to heightened yields, diminished weight loss during cooking, and an overall enhancement in texture and sensory attributes such as tenderness, juiciness, color, and flavor. Notably, they serve as a valuable source of essential phosphorus for consumers, crucial for the growth, maintenance, and repair of all living organisms' tissues and cells. The Rulebook ("Official Gazette of RS", No. 50/2019 and 34/2023) of the Republic of Serbia establishes the acceptable phosphate levels in various meat products, stipulating that the amount in cooked sausages should not exceed 8.0 g/kg. This study aims to examine the phosphate content in meat products available in the Republic of Serbia's market. It seeks to determine whether producers accurately incorporate additives into their products. Over a period of two years, the phosphate content in meat products was monitored in the group of cooked sausages within the subgroups of finely and coarsely ground cooked sausages. Over a span of two years, the phosphate content was meticulously monitored selected cooked sausages, both finely and coarsely ground in three lot years resulting in 156 samples. The study examined 52 meat products available on the market were examined: 37 finely ground and 15 coarsely ground cooked sausages. The phosphate content in the products varied greatly and ranged from 2.01g/kg - 6.98g/kg for finely ground sausages, while the phosphate content for coarsely ground sausages ranged from 3.33g/kg - 9.15g/kg. The phosphate content was higher than the maximum allowed concentration in only one sample of one lot series of the single coarsely ground sausage (9.15g/kg). Based on the comprehensive market survey, it can be confidently concluded that producers appropriately employ phosphates in their products, despite the diversity in scope and technology involved in meat product preparation.

Key words: phosphates, additives, meat products, Republic of Serbia

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

MONITORING OF NITRITE LEVELS IN EMULSION TYPE - COOKED SAUSAGES - CASE OF SERBIAN MANUFACTURERS ON REGULATORY AND SAFETY ISSUES

Tamara Stamenić[1], Maja Petričević[1], Slađana Šobajić[2], Tanja Keškić[1], Nikola Stanišić[1], Boris Pisinov[3], Vanja Todorović[2]

[1]Institute for Animal Husbandry, Autoput Beograd - Zagreb, Serbia, Belgrade, Serbia
[2]University of Belgrade, Faculty of Pharmacy, Vojvode Stepe 450, Belgrade, Serbia
[3]Institute for Plant Protection and Environment, Teodora Drajzera 9, Belgrade, Serbia
Corresponding author: Tamara Stamenić, tstamenic169@gmail.com

Abstract: Rising processed meat consumption globally increases health concerns due to potential adverse effects from nitrite metabolites like nitric-oxide and N-nitroso compounds. This study assessed the food safety of processed meat products in the Serbian market, focusing on domestic manufacturers. Nitrite levels (expressed as $NaNO_2$) were assessed in emulsion-type cooked sausages on the last day of storage - as labeled by product manufacturers. The contribution to acceptable dietary intake (ADI) of nitrites was also evaluated. During a one-year period (2022-2023), the study analyzed a total of 59 meat products: 35 finely grounded cooked sausages (29 small diameter, and 6 large diameter sausages) and 24 coarsely grounded cooked sausages. Each product was evaluated based on three different lot numbers, following the standard ISO procedure. The nitrite levels in coarsely grounded cooked sausages ranged from 17.82 to 69.99 mg/kg, while finely grounded cooked sausages had nitrite content ranging from 3.72 to 68.22 mg/kg for small diameter sausages and 28.85 to 62.87 mg/kg for large diameter sausages, which was well below maximum allowable concentrations determined by national legislation (150 mg/kg). The Serbian population's estimated dietary intake (EDI) of nitrites (as $NaNO_2$) from consuming cooked sausages was 0.021 mg/kg BW/day, significantly below the EFSA-recommended ADI of 0.1 mg/kg BW/day - it accounted for 20.57% of the ADI.

Key words: processed meat, nitrite levels, food safety, Serbian market, dietary intake

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

ADHERENCE TO LEGISLATIVE LABELING OF COOKED SAUSAGES ON THE SERBIAN MARKET

Tanja Keškić[1], Tamara Stamenić[1], Maja Petričević[1], Boris Pisinov[2], Nikola Stanišić[1], Marija Gogić[1], Violeta Mandić[1]

[1] Institute for Animal Husbandry, Autoput Beograd - Zagreb 16, 11080 Belgrade, Serbia
[2] Institute for Plant Protection and Environment, Teodora Drajzera 9, 11000 Belgrade, Serbia
Corresponding author: Tanja Keškić, tanjakeskic@gmail.com

Abstract: The most common form of communication between producers and consumers is a food labelling that provides essential and necessary information to consumers at the time of purchase. The correct declaration provides answers to questions about product safety and quality, information about technological innovations, prevents a negative impact on consumer delusion and deception, and above all on compliance with legal regulations. In addition, checking the declared parameters is of great importance for the protection of consumer health. The aim of the research is to screen the declaration of compliance with the legal labelling of cooked sausages on the Serbian market. In this study, a total of 60 samples of meat products from the group of cooked sausages were analysed. 30 samples from the subgroup of finely chopped sausage (Group I) and 30 samples from the subgroup of coarsely chopped sausage (Group II). The results show that in the first group, 19 (63.33%) samples have a specified country of origin, and 8 (26.67%) samples have a specified origin of meat as the main ingredient. In group II, 26 (86.67%) samples have a specified country of origin, and 14 (46.67%) specified the origin of meat as the main ingredient. 15 (50.00%) samples of Group I and 22 (73.33%) samples of Group II have a declared percentage of the main ingredient, of which only 2 (6.67%) samples of Group I and only 1 (3.33%) sample of group II have the listed category of meat as the main ingredient. 17 (56.67%) samples of Group I have a defined shelf life, storage conditions, and shelf life after opening. In group II, 21 (70%) samples have a defined shelf life, storage conditions, and shelf life after opening. Of the total examined samples, we can say that only 2 (6.67%) samples of Group I and only 1 (3.33%) sample of Group II have a complete declaration that meets the legal regulations on basic data that must appear on the declaration. The results show that in both examined groups 60 (100%) samples have correctly declared nutritional content. On the other hand, producers are aware of this, so they place special emphasis on that part - the nutritional value. However, the correct declaration and clear definition of all elements prescribed by legal regulations on the label of meat products is extremely important for the protection of consumer health. Food manufacturers, competent inspection services as well as food testing laboratories are responsible for compliance with labelling regulations. Deviation from these requirements raises questions about product quality and safety, has a negative impact on misconceptions and misleading consumers, and above all, disrespect and application of legal regulations. Food manufacturers need to improve food labelling to comply with regulations as well as to instil confidence in consumers. Correct interpretation enables information about the health, nutritional, and specific properties of the given product, and they also play a decisive role in the purchase decision.

Key words: legislative labelling, cooked sausages, declaration, Serbian market

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

EFFECT OF DIFFERENT pH AND RENNET CONCENTRATIONS ON COAGULATION PROPERTIES OF GOAT MILK

Marina Hovjecki, Mira Radovanovic, Zorana Miloradovic, Jelena Miocinovic

University of Belgrade, Faculty of Agriculture, Department of Animal Source Food Technology, Nemanjina 6, 11080 Belgrade, Serbia
Corresponding author: Marina Hovjecki, marina.hovjecki@agrif.bg.ac.rs

Abstract: Goat milk produces fragile rennet gel due to its specific composition, resulting in increased production losses. Adjusting coagulation parameters could improve goat milk rennet gel properties and the cheese yield as well. This research investigated the influence of different pH and rennet concentrations on rennet coagulation of goat milk. Raw Alpine goats' milk (3.16% protein, 3.63% fat, 11.97% dry matter) was adjusted to pH 6.5, 6.3 or 6.1, then coagulated at 31°C with three rennet concentrations (0.05, 0.02 or 0.01 g/l). The coagulation was monitored by the small oscillation rheology, following frequency sweep test to obtain rennet coagulation time (RCT), aggregation rate (AR), modulus of elasticity after 60 min as a measure of gel firmness (G'_{60}) and GF (gel firmness determined by varying frequencies test). Lowering pH from 6.5 to 6.3 significantly reduced RCT and increased AR, G'_{60}, slightly increased, although not significant ($p<0.05$), when milk was coagulated with 0.05 and 0.02 g/l of rennet. Coagulation with 0.01 g/l resulted in the weak gel of the used milk adjusted to pH 6.5, but a marked increase in firmness occurred when pH decreased to 6.3. Overall, decreasing milk pH reduced time to coagulate and either increased gel firmness or it was unchanged with all rennet concentrations. However, the high amount of rennet (0.05 g/l) did not significantly increase G'_{60}, compared to 0.02 g/l (at pH 6.5 and 6.3). This suggests that lowering milk pH to 6.3 and the rennet concentration of 0.02 g/l would shorten the coagulation process while maintaining optimal rennet gel strength.

Key words: goat milk, rennet coagulation, rheology

INFLUENCE OF β-LACTOGLOBULIN CONTENT ON TEXTURE AND SENSORY PROPERTIES OF GOAT SET-TYPE YOGHURT

Mira Radovanovic, Marina Hovjecki, Mirjana Panic, Andjela Matkovic, Jelena Miocinovic

University of Belgrade, Faculty of Agriculture, Department of Animal Source Food Technology, Nemanjina 6, 11080 Belgrade, Serbia
Corresponding author: Mira Radovanović, m.radovanovic@agrif.bg.ac.rs

Abstract: In recent years, goat milk products have attracted considerable research attention due to their specific nutritional benefits, which make them particularly interesting dairy products. In this work, the influence of β-LG content on texture, sensory properties and whey separation of goat set-type yoghurt was investigated. Yoghurt samples were prepared from reconstituted goat milk powder (3.1% fat and 2.7% protein) with different proportions of β-LG in the total proteins (8.50% and 16.50%) and similar proportions of α- LA (about 5%) according to the usual manufacturing procedure. The protein profile of yoghurt was examined by SDS PAGE under reducing and non-reducing conditions. Whey separation was determined by a centrifugation method (6°C, 1000g, 20 min). Texture analysis was performed using a back extrusion test using a texture analyzer after 1 day of storage. Sensory evaluation of yoghurt quality was assessed by using a five-level quality scoring method. β-LG was completely denatured and bound in complexes with casein in all yoghurt samples, whereas the residual amount of α-LA was almost three times higher in yoghurt with a lower proportion of β-LG. The percentage of drained whey in yoghurts with 8.50% β-LG was 44% on average, while in yoghurts with 16.50% β-LG it was only 29%. The increase in the proportion of β-LG also resulted in higher firmness, consistency and cohesiveness of the obtained yoghurts, so these samples were characterized with high sensory quality, while yoghurts with lower β-LG proportion had a very weak texture with extensively separated serum and were therefore discarded.

Key words: goat milk yoghurt, β-lactoglobulin, SDS PAGE, texture

ANTIOXIDANTS IN GRAIN OF ORGANICALLY PRODUCED MAIZE

Vesna Dragičević, Milena Simić, Milan Brankov

Maize Research Institute “Zemun Polje”, Slobodana Bajića 1, 11185 Zemun Polje, Republic of Serbia
Corresponding author: Vesna Dragičević, vdragicevic@mrizp.rs

Abstract: Organic maize production could be challenging, particularly when feed production was considered. Owing to the climate change, greater fluctuations in meteorological conditions limits crop production, especially in dry-land farming. Thus, it is of particular importance that genotypes used in organic farming are highly adaptable with reasonable grain yield and desirable nutritional profile. When grain quality of organically produced maize for human nutritionis considered, it is superior in regard to the commonly produced maize. Nevertheless, analysis of maize grain and its quality for feed was rarely considered. From this point, status of protein and non-enzymatic antioxidants (phytic acid, glutathione, phenolics, yellow pigment), as well as capacity to reduce DPPH radical, in grain of organically produced red coloured maize variety, in dry-land conditions, over 2012-2021 period was estimated. Grain yield followed variations in meteorological conditions during vegetative period, with the lowest values ($\leq$ 1 t ha^{-1}) achieved in years with high temperature and very low precipitation level during anthesis and grain filling period, while the highest yield (1.53 t ha^{-1}) was realised in a year with moderate temperature and high precipitation amount. Stressful conditions during vegetation, and particularly during grain filling period expressed the greatest impact on protein and concentration of antioxidants in maize grain. Thus, during the dry season, such as 2013, the highest concentration of protein, phytic acid, phenolics, yellow pigment, and DPPH reduction capacity was noticed, while in the 2012, the season with severe drought, the lowest concentration of phytic acid, phenolics, and yellow pigment was observable. Among all analysed antioxidants, phenolics varied in the greatest extent, 519.6-1383.6 mg g^{-1}. It is important to underline that significant and positive correlation between grain yield and concentration of glutathione and yellow pigment, as well as negative correlation between grain yield and phenolics and maize grain was present. Principal Component analysis indicated that grain yield and glutathione correlated positive with the 1st axis, while phenolics and DPPH reduction capacity correlated negative. Phytic acid, yellow pigment and protein correlated positive with the 2nd axis. It could be concluded that meteorological conditions have a great impact on productivity and antioxidants level in grain of organically produced maize. It could be also said that grain yield was closely tied to the accumulation of glutathione, while protein level was dependable on yellow pigment and phytic acid concentration. Variation in phenolics level was mainly responsible for the antioxidant capacity of maize grain, influencing also maize productivity, but in a way of greater expenditure as a way to support yield.

Key words: maize grain yield, protein concentration, phytic acid, phenolics, yellow pigment, glutathione.

DEPENDENCE OF MAIZE GERMINATION AND SEEDLINGS GROWTH ON pH

Violeta Mandić[1], Vesna Krnjaja[1], Aleksandar Simić[2], Maja Petričević[1], Marija Gogić[1], Milan Brankov[3], Aleksandar Stanojković[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080, Belgrade-Zemun, Serbia
[2]Faculty of Agriculture, University of Belgrade, Nemanjina 6, 11080 Belgrade, Serbia
[3]Maize Research Institute „Zemun Polje”, Slobodana Bajića 1, 11185, Belgrade-Zemun, Serbia
Corresponding author: Violeta Mandić, violeta_randjelovic@yahoo.com

Abstract: Maize is the top-produced crop in the world. Its chemical composition makes it suitable for human consumption, animal feed, and industrial uses. The total world production of maize in 2021 was 1210 billion tonnes from cultivating about 205 million ha. However, there are many limiting factors for cultivation, such as soil pH. Acidic soils are present on 30%–40% of the world's arable land, while more than 1 billion hectares are alkaline soils. It is important to choose genotypes of crops tolerant to high or low pH. Therefore, we conducted research in laboratory conditions on the influence of pH values (5, 6, 7, and 8) on seed germination and seedling growth of two maize Serbian hybrids ZP 4708 and ZP 5797. The hybrid ZP 4708 had higher germination energy (GE), shoot length (ShL), shoot fresh weight (ShFW), shoot dry weight (ShDW), germination rate index (GRI), and seedling vigor index (SVI) than hybrid ZP 5797. GE, root length (RL), ShL, root fresh weight (RFW), ShFW, root dry weight (RDW), ShDW, and SVI have the highest values in treatment with optimal pH 7, and lowest in treatment pH 5. However, these parameters did not differ significantly between the treatments pH 6 and pH 7.

Key words: germination, maize, pH, root, shoot, seedling

Acknowledgment
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, on the basis of the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022.

AFLATOXIN AND FUMONISIN CONTAMINATION OF MAIZE GRAINS HARVESTED DURING 2018–2022 IN SERBIA

Vesna Krnjaja[1], Slavica Stanković[2], Ana Obradović[2], Violeta Mandić[1], Tanja Petrović[3], Nikola Stanišić[1], Nikola Delić[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080 Belgrade, Serbia
[2]Maize Research Institute „Zemun Polje”, Slobodana Bajića 1, 11185 Belgrade, Serbia
[3] Faculty of Agriculture, University of Belgrade, Nemanjina 6, 11080 Belgrade, Serbia
Corresponding e-mail: Vesna Krnjaja, vkrnjaja@istočar.bg.ac.rs; vesnakrnjaja.izs@gmail.com

Abstract: Maize is a staple food worldwide, used in human nutrition and as the main component of livestock feed. It contains nutrients such as carbohydrates (sugars and starch), proteins, fibres, minerals and vitamins and has the highest polysaccharide starch content (more than 70%). Maize grains are a suitable substrate for fungal infection and are frequently contaminated by the species from the *Aspergillus* and *Fusarium* genera. These fungi produce toxic secondary metabolites named mycotoxins. Aflatoxins (AFs) and type-B fumonisins (FBs) are the most detected mycotoxins in maize grains. Maize intoxication with AFs and FBs can lead to human and animal health disorders, causing acute and chronic mycotoxicosis. Aflatoxins produced by *Aspergillus* spp. have immunosuppressive, carcinogenic, and hepatotoxic properties and induce growth impairments. Fumonisins produced primarily by *Fusarium* spp. have neurotoxic, nephrotoxic, and hepatotoxic effects in animals and are classified as potentially carcinogenic in humans. The co-occurrence of AFs and FBs in maize has synergistic toxicological effects and poses a greater risk to human and animal health. The natural occurrence AFs and FBs in 65 maize grain samples collected during harvest in 2018 (13 samples), 2019 (11 samples), 2020 (9 samples), 2021 (14 samples) and 2022 (18 samples) was evaluated using the enzyme-linked immune sorbent assay (ELISA). The average levels of AFs and FBs in mycotoxin-positive samples were 3.02 and 2910 μg kg^{-1} (2018), 5.28 and 2710 μg kg^{-1} (2019), 2.35 and 10980 μg kg^{-1} (2020), 6.81 and 4950 μg kg^{-1} (2021) and 5.32 and 20310 μg kg^{-1} (2022), respectively. The co-occurrence of AFs and FBs was detected in 23.08% (2018), 18.18% (2019), 22.22% (2020), 64.29% (2021) and 22.22% (2022) of maize samples. The maximum limits of 10 μg kg^{-1} for AFs in maize and 4000 μg kg^{-1} for FBs in unprocessed maize, prescribed by regulations of the European Union and Serbia, were exceeded for AFs in 14.29% (2021) and 5.56% (2022) of tested maize samples and for FBs in 7.69% (2018), 66.67% (2020), 28.57% (2021) and 41.67% (2022) tested maize samples. These results indicate the need for continuous monitoring of the health status of harvested maize grains and risk assessment of the potential presence of mycotoxins in the food chain to avoid adverse effects on human and animal health.

Key words: maize, aflatoxins, fumonisins

Acknowledgement
This study was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, based on the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022, No. 451-03-47/2023-01/200040 and No. 451-03-47/2023-01/200116.

FUSARIUM AND DEOXYNIVALENOL CONTAMINATION OF WINTER WHEAT DEPENDING ON GROWING SEASON AND CULTIVAR

Vesna Krnjaja[1], Violeta Mandić[1], Slavica Stanković[2], Ana Obradović[2], Tanja Petrović[3], Tanja Vasić[4], Marina Lazarević[1]

[1]Institute for Animal Husbandry, Autoput 16, 11080 Belgrade, Serbia
[2]Maize Research Institute „Zemun Polje”, Slobodana Bajića 1, 11185 Belgrade, Serbia
[3]Faculty of Agriculture, University of Belgrade, Nemanjina 6, 11080 Belgrade, Serbia
[4]Faculty of Agriculture, University of Niš, Kosančićeva 4, 37000 Kruševac, Serbia
Corresponding author: Vesna Krnjaja, vkrnjaja@istočar.bg.ac.rs; vesnakrnjaja.izs@gmail.com

Abstract: Wheat is the most important staple food in the world and the main source of carbohydrates, fibre, proteins, vitamins, minerals and phytochemicals for human consumption. The nutrients from wheat kernels can also be used as livestock feed. Fusarium head blight (FHB), caused by fungal species of the *Fusarium* genus, is one of the most important wheat diseases worldwide. The lack of FHB management strategies results in significant economic losses in yield and quality of wheat kernels. In this study, the influence of growing season and wheat cultivar on some FHB and yield component traits, as well as on the trichothecene mycotoxin deoxynivalenol (DON) levels during the harvest period in 2014 and 2015, was investigated. Significant influence of growing season (year) and wheat cultivar on disease (FHB index – FHBI, incidence of *Fusarium*-damaged kernels – FDK and levels of DON) and yield parameters (spike weight – SW, kernel weight per spike – KWS, and 100-kernel weight) was found. FHBI, FDK, and DON were higher in 2014, while SW, KWS, and 100-kernel weight were lower in 2014 than in 2015. The mid-early wheat cultivar Simonida had lower FHBI, FDK, and levels of DON and significantly higher SW, KWS, and 100-kernel weight than the mid-late cultivar NS 40S. There was a significant effect of year × cultivar interaction on FHBI, FDK and 100-kernel weight.

Key words: Fusarium head blight, *Fusarium* and deoxynivalenol contamination, yield component traits, winter wheat

Acknowledgements
This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, based on the Agreement on the realization and financing of scientific research work of SRO No. 451-03-47/2023-01/200022, No. 451-03-47/2023-01/200040, No. 451-03-47/2023-01/200116 and 451-03-47/2023-01/200383

SPONSOR AND DONOR

==========
CIP - Каталогизација у публикацији Народна библиотека Србије, Београд

636/638(048)(0.034.2)
631/635(048)(0.034.2)

INTERNATIONAL Symposium Modern Trends in Livestock Production (14 ; 2023 ; Beograd)
Book of Abstracts [Elektronski izvor] / 14th International Symposium Modern Trends in Livestock Production, 4-6 October 2023, Belgrade, Serbia ; [organizer]
Institute for Animal Husbandry, Belgrade - Zemun ; [editor Zdenka Škrbić]. - Belgrade : Institute for Animal Husbandry, 2023 (Belgrade : Institute for Animal Husbandry). - 1 USB fleš memorija ; 1 x 3 x 6 cm

Sistemski zahtevi: Nisu navedeni. - Nasl. sa naslovne strane dokumenta. - Tiraž 100.

ISBN 978-86-82431-81-7

a) Сточарство -- Апстракти b) Пољопривреда -- Апстракти

COBISS.SR-ID 125638921

14th INTERNATIONAL SYMPOSIUM
MODERN TRENDS IN LIVESTOCK PRODUCTION
4 - 6 October 2023 - Belgrade, Serbia

BOOK OF ABSTRACTS

INSTITUTE FOR ANIMAL HUSBANDRY
Autoput 16, P. Box 23, 11080, Belgrade - Zemun, Serbia
www.istocar.bg.ac.rs

ISBN 978-86-82431-81-7

2023