



**16th INTERNATIONAL
SYMPOSIUM OF ANIMAL
BIOLOGY AND NUTRITION**

**50 YEARS OF RESEARCH IN
BIOLOGY AND ANIMAL
NUTRITION AT IBNA**

BOOK OF ABSTRACTS

**NATIONAL
RESEARCH-DEVELOPMENT
INSTITUTE
FOR ANIMAL BIOLOGY AND
NUTRITION**

**30 September -1 October 2021
IBNA Headquarters, Balotești**



16th International Symposium of Animal Biology and Nutrition
50 Years of Research in Biology and Animal Nutrition at IBNA

BOOK OF ABSTRACTS

September 30th -October 1st 2021, INCDBNA Balotesti, Romania

Scientific Committee

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- **Van Ilie** - Agriculture and Forestry Academy of Science, Romania
- **Yaman Sema** - Ömer Halisdemir University, Turkey

Symposium Program

THURSDAY, September 30th, 2021

09.00 - 9.30 OPENING SPEECHES

09.30- 13.00 FIRST SESSION OF SCIENTIFIC COMMUNICATIONS

Ilias Giannenas, Aristotle University of Thessaloniki, Greece:

Metabolomics as a valuable tool for the evaluation of eggs after dietary supplementation with oregano, thyme, sideritis tea and chamomile on brown laying hens

Eleftherios Bonos, University of Ioannina, Greece:

Use of insect meals in monogastric animals' nutrition

Teodora Popova, Institute of Animal Science, Bulgaria:

*Growth Performance of Broilers as Affected by Black Soldier Fly (*Hermetia illucens*) Meals in the Diet and Age*

Ionelia Taranu, IBNA, Romania:

Assesment of yeast fermented rapeseed meal capacity to modulate inflammatory and oxidative stress in piglets after weaning

Mihaela Vlassa, Inst Raluca Ripan, Romania:

Evaluation of some purine derivatives biomarkers in cow's milk.

Tatiana Panaite, IBNA, Romania:

Implementing innovative nutritional solutions to farmers market to obtain functional foods

Miuta Filip, Inst Raluca Ripan, Romania.

Assessment of some bioactive compounds in fermented rapeseed fodder

Gina Pistol, IBNA, Romania:

Assessment of bioactive components derived by-products on the epithelial integrity and immune markers in piglets as animal model

Arabela Untea, IBNA, Romania:

Broiler's meat oxidative stability as influenced by dietary natural antioxidants inclusion

Diamanto Lazari, Aristotle University of Thessaloniki, Greece:

Chemical composition and biological activities of selected medicinal-aromatic plants from Greece

13.00 - 14.00 BREAK

14.00 - 16.45 SECOND SESSION OF SCIENTIFIC COMMUNICATIONS

Roua Popescu, Bucharest University, Romania:

Evaluation of the effects of aflatoxin B1 and ochratoxin A co-contamination on protein expression and enzyme activity of some CYPs P450 enzymes in piglets' liver and kidney

Andrei Anghel, IBNA, Romania:

Antibacterial potential of agro-industrial by products

Cristina Lazar, IBNA, Romania:

Review regarding the new genomic era, a fresh start up in sheep milk production for improving the selection with modern applications

Rodica Pelmus, IBNA, Romania:

Estimation the genetic parameters for milk yield in Romanian Spotted, Simmental type cattle breed

Mihaela Saracilă, IBNA, Romania:

Effect of dietary antioxidant sources on growth performance and intestinal microbiota in broiler chickens reared under normal temperature vs. constant heat stress

Alexandru Vlaicu, IBNA, Romania:

Effect of herbal feed additives on broilers meat quality

Gabriela Cornescu, IBNA, Romania:

Nutritional strategies to mitigate production parameters and egg quality under heat stress conditions— a comprehensive overview

Lavinia Idriceanu, IBNA, Romania:

Preliminary study on performances and manure nitrous oxide level of suckling piglets fed with milk from sows fed differently

Nicoleta Lefter, IBNA, Romania:

Nitrogen balance, performance and plasma parameters of growing pigs fed a mixture of leguminous diet

Mihaela Dumitru, IBNA, Romania:

Effects of Bacillus subtilis as probiotic source in weaning piglets diet

Alexandra Oancea, IBNA, Romania:

The effects of including brewers spent yeast in sheep diets on various milk parameters

16.45 - 17.00 BREAK

17.00 - 18.00 THIRD SESSION OF SCIENTIFIC COMMUNICATIONS

KEYNOTE Lecture

Raphael Mrode, Scotland Rural College, UK: *Genetics and genomic approaches for sustainable dairy cattle improvement*

KEYNOTE Lecture

Raluca Mateescu, Department of Animal Science at University of Florida, USA. *Genomic approaches reveal pleiotropic effects for carcass and meat quality in beef*

FRIDAY, October 1st, 2021

09.00 - 11.45 Scientific results from the projects financed through the “Sectoral plan for research and development in the field of agriculture and rural development of the ministry of agriculture and rural development, for the years 2019-2022, "agriculture and rural development - ADER 2022

Mihai Gras, IBNA, Romania:

Use of genomic selection in Romanian cattle genetic evaluation (ADER 8.1.6)

Alexandru Mizeranski, S.C.D.B ARAD, Romania:

Genome-wide association study of somatic cell score in Romanian Brown cattle (ADER 8.1.6)

Reta Drăghici, SCDCPN Dăbuleni, Romania: *Valorization of thermo-hydric stress in the area of sandy soils by promoting in culture of some cow pea genotypes (Vigna unguiculata [L] Walp) (ADER 1.4.2)*

Gabriela Vasile, ECOIND, Romania: *Ranking the dietary treatments of broiler chickens in order to reduce nitrogen pollution of the environment (ADER 9.1.2)*

Daniela Marin, IBNA, Romania:

Mycotoxin occurrence in samples of cereals and feed from South Eastern Romania between 2019-2020 (ADER 9.2.1)

Mihai Palade, IBNA, Romania:

Mycotoxin reduction in animal feed: detoxifying potential of adsorbent materials used as feed additives (ADER 9.2.1)

Iulian Grosu, IBNA, Romania:

The effects of low dose OTA exposure on piglet microbiota (ADER 9.2.1)

Cristina Bulgaru, IBNA, Romania:

Preliminary results concerning the effect and mechanisms of action of zeralenone on intestinal epithelium (ADER 9.2.1)

Cătălin Rotar, IBNA, Romania:

Progress in the genomic characterization of local sheep populations and estimation of genomic breeding values (ADER 8.1.10)

Mihaela Habeanu, IBNA, Romania:

Nitrous oxide prediction in manure from pigs given mustard x grapeseed oil cakes as a replacement for sunflower meal (ADER 9.1.4)

Anca Gheorghe, IBNA, Romania:

Preliminary research on growth performance and carcass quality of a novel crossbreed slow-growing broilers in Romania (ADER 8.1.9)

11.45 - 12 BREAK

12.00-13.00 FORTH SESSION OF SCIENTIFIC COMMUNICATIONS

Alexander Atanasoff, Trakia University, Bulgaria:

The effect of dietary addition of a synbiotic after long-term starvation on certain biochemical parameters and liver structure in common carp (Cyprinus carpio L.)

Ana Cismileanu, IBNA, Romania:

The effects of including brewer's spent yeast in sheep diets on rumen parameters (ADER 24.1.2)

Throude Sindy, IDELE, France & **Cătălin Dragomir**, IBNA, Romania

The LIFE Green Sheep project: for a low carbon and sustainable sheep farming

13.00-13.30 FINAL DISCUSSION AND CLOSING OF THE EVENT

POSTER PRESENTATIONS

Georgeta Ciurescu, IBNA, Romania:

Probiotics in broiler chicks' diet fed with different sources of protein

Mihaela Habeanu, IBNA, Romania:

Dynamic changes in the main class of immunoglobulin and digestive disorders in suckling piglets

Carapirea Anatoli, The State Agrarian University of Moldova, Moldova:

Some aspects of utilization of bioactive preparation from yeasts on the reproductive parameters of pigs

Vasilopoulos S., Laboratory of Nutrition, Faculty of Veterinary Medicine

Diet supplementation of encapsulated extracts of oregano, garlic, crithmum and camelina on meat composition and gene expression of certain liver enzymes

Vasilopoulos S., Laboratory of Nutrition, Faculty of Veterinary Medicine

Effect of oregano, garlic, crithmum and camelina encapsulated extracts on growth performance and some welfare traits of broilers

ORAL PRESENTATIONS

Metabolomics as a valuable tool for the evaluation of eggs after dietary supplementation with oregano, thyme, sideritis tea and chamomile on brown laying hens

Ilias Giannenas ¹ * , Katerina Grigoriadou ^{2,3} , Erasmia Sidiropoulou ¹ , Eleftherios Bonos ⁴ ,
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In the current study the effects of dietary supplementation with a mixture of dried oregano, thyme, sideritis tea and chamomile on laying hen performance, egg quality parameters, and oxidative stability in the egg yolk were monitored. Also, it was investigated whether bioactive constituents of medicinal-aromatic plants may affect the metabolic profile of the egg. In this trial 432 hens were allocated in two treatments (unsupplemented vs. supplemented with the mixture) and fed for 42 days. Eggs were collected at the end of the trial period, egg yolk was separated, extracted, and the total phenolic content (TPC) and oxidative stability was measured. Furthermore, LC-MS metabolic profile of eggs was studied and pathway analysis was elaborated in MetaboAnalyst. Egg production and feed conversion ratio were not affected by the supplementation. However, eggs from the supplemented treatment showed improved shell thickness and strength. Lipid and protein oxidation was reduced in yolk and albumen of treated eggs. Moreover, LC-MS metabolomic analysis of yolk showed significant variations and tight clustering in unsupervised principal component analysis due to different chemical profiling of egg yolk. Secondary metabolites of aromatic plants did not transfer into yolk, nevertheless the feed supplementation impacted the pathway metabolism of tyrosine, phenylalanine, propanate, and the biosynthesis of aminoacyl-tRNA, phenylalanine, tyrosine and tryptophan. In conclusion, diet supplementation of layers with a mixture of dried medicinal aromatic plants can affect shell thickness and strength, lipid and protein oxidative stability and increase tyrosine and phenylalanine content in eggs.

Keywords: diet, aromatic plants; performance parameters; egg quality; lipid antioxidant activity; protein carbonyls; egg yolk pathway analysis; LC-MS metabolomics

Acknowledgments: This research has been co-financed by Greece and the European Union (European Regional Development Fund) in context “Research – Create – Innovate” within the Operational Program (Competitiveness, Entrepreneurship and Innovation (EIIANEK) of the NSRF 2014-2020. Project Code: T1EΔK-05041. Acronym “FeedMAP”

Use of insect meals in monogastric animals' nutrition

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The constantly increasing global consumption of animal products has increased the demands and the prices of feed materials, especially those with high protein content such as soybeans and fish meals. Therefore, the exploration of alternative sustainable protein sources is imperative. The utilization of insects as animal feeds is regarded as a promising development. Insect protein can meet monogastric animal requirements for good growth and health. Insect meals from different species differ in nutritional value and amino acid composition. Moreover, they can be important sources of beneficial bioactive compounds such as antioxidant peptides, chitin and antimicrobial peptides. Some insect meals could potentially partially or totally replace soya bean meal in the diets of poultry and swine. Today, in the European union, some insect meals are today commercially utilized as aquafeeds, whereas their use is expected to expand to the other farm animals in the future. Insects such as the mealworm beetle (*Tenebrio molitor*) and the black soldier fly larvae (*Hermetia illucens*) can be used for the large-scale conversion of plant biomass into protein and they could be cost-effective and energy-efficient sources of valuable, high-quality energy, protein and fat. Currently, farming techniques and technologies are being developed to accommodate the production of edible insects and their market is expected to grow rapidly in the future.

Keywords: diet, feed materials, poultry, insect meal, protein, swine.

Acknowledgments: This research has been co-financed by Greece and the European Union (European Regional Development Fund) in context “Research–Create–Innovate” within the Operational Program (Competitiveness, Entrepreneurship and Innovation (EPAnEK) of the NSRF 2014-2020, Project Code: T2EAK-02356. Acronym: InsectFeedAroma

Growth performance of broilers as affected by black soldier fly (*Hermetia illucens*) meals in the diet and age

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The aim of the work was to assess the effect of dietary inclusion of meals derived from Black soldier fly (BSF) larvae on the growth performance in broilers. The trial was carried out with ROSS broilers divided into three groups according to the formulated diets - control (CON), receiving standard diet, FFBSFM – receiving 5% full fat BSF meal and DFBSFM – receiving 5% partially defatted BSF meal. During the first two weeks, all the birds were fed the same starter diet and from 21 to 35 days of age they received the experimental diets. The performance parameters controlled included body weight, feed intake, weight gain, feed conversion ratio, as well as the growth rate of the broilers at the age of 35 days, 42 days and 49 days. The inclusion of 5 % full fat or partially defatted BSF meal was associated with decreased feed intake at the age of 42 and 49 days but increased live weight in the birds from both groups receiving the product. Significant interaction between the diet and the age of the broilers was observed in regard to the weight gain ($P<0.001$), feed conversion ratio ($P<0.01$), as well as the growth rate ($P<0.001$) of the birds.

Keywords: Black soldier fly, poultry, nutrition, growth performance

Assesment of yeast fermented rapeseed meal capacity to modulate inflammatory and oxidative stress in piglets after weaning

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The aim of the study was to investigate the potential of rapeseed meal fermented (RSMF) with *Saccharomyces cerevisiae* as a new sustainable feed to reduce the transitory intestinal inflammation, diarrhea and oxidative stress in piglets after weaning. 16 TOPIG pigs after weaning with a initial weight of 9.04 ± 0.19 kg were randomly allocated to two dietary treatment, control and RSMF diets, (8 pigs per treatment) for 21 days. RSMF replaced soybean meal at 10%. At the end of the trial (21d) animals were slaughtered and samples of blood and intestine segments (jejunum, ileum and colon) were collected for the determination of plasma biochemical and intestinal inflammatory as well as oxidative stress parameters. Pig performance and diarrhea incidence very important during weaning crisis was also investigated. Results showed that fermented rapeseed diet had no significant influence on the piglet's performance. After 21 days of experimentally treatments the weight and the average daily weight gain of piglets receiving RSMF had similar values as piglets receiving control diet. Similarly, plasma biomarkers which reflect liver and kidney function did not show significant differences between control and fermented rapeseed diet. However, the number of piglets with diarrhea was higher in the control group than in the group receiving the fermented rapeseed diet throughout the experimental period. Also, the signs of intestinal inflammation were reduced in pigs fed the RSMF diet. A significant decrease of the most powerful pro-inflammatory cytokines TNF- α (-33.14%, $p=0.03$) and IL-1 β (-25.50%, $p<0.05$) in colon and jejunum samples derived from pigs fed the diet with fermented rapeseed meal. The concentration of IL-8 and IL-6 decreased also in ileum (-15.75%, $p=0.0009$ and -14.39%, $p=0.03$ respectively) of piglets fed FRSM which indicate the modulatory capacity of this feed in reducing the weaning associated intestinal inflammation. RSMF diet improved also the antioxidant status and reduced significantly the lipid peroxidation. TBARS concentration in plasma (-24.81%, $P=0.022$) and two intestinal segments, jejunum (-20.72%, $P=0.028$) and colon (-20.46%, $P=0.003$) suggesting the potential of fermented rapeseed meal to diminish the oxidative reaction. In conclusion, these results recommend the use of fermented rapeseed meal in pig nutrition with beneficial effect on pigs after weaning.

Keywords: pig, weaning, fermented rapeseed, inflammatory and oxidative stress parameters

Acknowledgements: This research was funded by the Romanian Ministry of Education and Research through project number PED 396/2020.

Evaluation of some purine derivatives biomarkers in cow's milk

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One of the modality to evaluate the synthesis of proteins in the rumen is to determine the purine derivatives (PD) in urine or milk, important biomarkers on the efficiency of feeding ruminants. In this regard, simultaneous quantification of allantoin, uric acid, xanthine, and hypoxanthine in cow milk by solid phase extraction (SPE) and high performance liquid chromatography-diode array detection (HPLC-DAD) method was perform.

The isolation of PD from cow milk were used Strata-SCX cartridges. The Chromatographic separation of PD was performed on ODS-2 Hypersil column with 0.05 M (NH₄)₂HPO₄ buffer solution (pH = 7.76) as mobile phase. The HPLC-DAD method was validated and showed a linearity with regression coefficients higher than 0.999. The obtained limits of detection (0.09 - 0.74 µg·mL⁻¹) and the limits of quantifications (0.27 - 2.24 µg·mL⁻¹) show a good sensitivity of method. The validated method showed good precision with a relative standard deviation below 4.48%, while the accuracy ranged from 95.34 to 104.47% for all analytes. The HPLC-DAD method was applied to quantify PD from cow's milk samples.

Keywords: purine derivatives, SPE; HPLC-DAD; method validation; cow's milk.

Implementing innovative nutritional solutions to farmers market to obtain functional foods

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Nowdays, creating new added value foods by implementing innovative nutritional solutions at farm level represents a real advantage for local farmers. It became mandatory to think integrated and to visualise the entire food chain from farm to fork taking into consideration all the aspects, the synergistic and antagonistic elements interaction. The expected impact of the Project GALIM PLUS was to obtain functional eggs to meet consumers expectation and to bring on Romanian market high quality functional foods by using local, inexpensive by-products with positive impact on environment and consumers' health. The aim of the Project was to transfer the optimum nutritional feeding solutions obtained by poultry experiments at laboratory level to small and medium enterprises so they can apply at large scale the most appropriate results. One of the Project challenges' was to achieve optimal productivity and efficiency indicators performances in a feasible manner. Developing functional food ingredients became a necessary field of research as a sustainable strategic plan for Romania to enable the implementation of the innovative feeding solutions into poultry industry to enhance the valuable nutrients content of egg matrix.

Keywords: farms, functional food, innovative, nutritional solutions, poultry

Acknowledgements: This research was funded by the Romanian Ministry of Education and Research through project Competitiveness Operational Programme (COP) – GALIM PLUS

Assessment of some bioactive compounds in fermented rapeseed fodder

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The fermented rapeseed meal has influence of on improvement production parameters and nutrient digestibility, modify the gut microbiota, stimulate metabolic processes, and above all improve animal health. The aim of this paper was to evaluated of some bioactive compounds in rapeseed fodder fermented with *Saccharomices cerevisiae* and *Saccharomices boulardii* yeasts, used in swine feed. Thus, the bioactive and nutritional compounds: carbohydrates, organic acids and some flavonoids and phenolic acids were analyzed by high performance liquid chromatography (HPLC) and by Fourier-transform infrared spectroscopy for structural characterization. The quantities of carbohydrates, phenolic compounds and organic acids (oxalic, citric, tartaric, malic) decreased in fermented rapeseed fodder under activity of the two yeasts used. Regarding the content of succinic acid, the end product of anaerobic metabolism, it increases in the range of 32.80 to 261.30 mg/100 g in all samples of fermented rapeseed fodder under the influence of both types of yeasts.

Also, the total phenolic content (TPC) and antioxidant activity by DPPH (2,2'-diphenyl-1-picrylhydrazyl radical) and ABTS [2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonate) assays were studied in the fermented rapeseed fodder. The results shows that the fermented rapeseed fodder have nutritional and antioxidant properties and can be used in swine feed.

Keywords: bioactive compounds, antioxidant activity, fermented rapeseed fodder, HPLC, carbohydrates, TPC.

Acknowledgements: This research was funded by the Romanian Ministry of Education and Research through project number PED 396/2020.

Assessment of bioactive components derived by-products on the epithelial integrity and immune markers in piglets as animal model

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Restoring of epithelial integrity and of the mucosal barrier function, together with modulation of inflammatory and innate immune markers, represent targets for alternative strategies in IBD. The aim of our study was to evaluate the effects of a diet including 8% grape seed meal (GSM), rich in bioactive compounds (polyphenols, polyunsaturated fatty acids (PUFAs), fiber) on the inflammatory mediators, markers of colonic epithelial integrity, mucosal barrier function, pro-inflammatory, and innate immunity in DSS-treated piglets used as animal models of intestinal inflammation. Our results showed that the DSS treatment induced a widespread inflammation at colon level by increasing a wide range of pro-inflammatory molecules via activation of pro-inflammatory p38/ERK/JNK MAPK signalling cascades followed by activation of NF- κ B and other nuclear receptors. Diet with 8% grape seed meal including its whole bioactive components was efficient in counteracting the inflammatory disorders by inhibiting MAPKs from the three MAPKs distinct groups (ERK1/2, p38 and JNK1/2) attenuating NF- κ B gene and protein expression and diminishing pro-inflammatory cytokines and chemokines production toward the control level. The beneficial effects of bioactive compounds from dietary GSM were exerted in the colon at three complementary levels: (a) restoration of the epithelial integrity and mucosal barrier reinforcement by modulation of claudins, Occludin (OCCL) and Zonula-1 (ZO-1) tight junction genes and proteins, myosin IXB (MYO9B) and protein tyrosine phosphatase (PTPN) tight junction regulators and mucin-2 (MUC2) gene; (b) reduction of pro-inflammatory MMP-2 (matrix metalloproteinase-2) and MMP-9 (matrix metalloproteinase-9) genes and activities; and (c) suppression of the innate immune TLR-2 (Toll-like receptor-2) and TLR-4 (Toll-like receptor-4) genes and attenuation of the expression of MyD88 (Myeloid Differentiation Primary Response 88)/MD-2 (Myeloid differentiation factor-2) signalling molecules. These beneficial effects of GSM could further attenuate the transition of chronic colitis to carcinogenesis, by modulating the in-depth signalling mediators belonging to the Wnt pathway.

Keywords: piglets, inflammation, intestinal bowel disease, grape seed meal

Acknowledgement: This work was funded by Romanian Ministry of Research, Innovation and Digitalization through the project Nucleu PN 19 09 0101.

Broiler's meat oxidative stability as influenced by dietary natural antioxidants inclusion

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The effect of cranberry leaves and walnut meal on broiler meat nutritional quality, was evaluated in a 6-week feeding trial, conducted on 240 Ross 308 broiler chicken, assigned to 4 treatments reared in semintensive system conditions on permanent shave litter (10-12 cm thick) in boxes of 3 m². Four dietary ratios which included three concentrations of cranberry leaves (0, 1%) and two concentrations of walnut meal (0 and 6%) were developed as follows: (C) a control diet (corn-soybean diet with no nutritional supplements added); one experimental diet with 1% CL and no WM added; one experimental diet supplemented with 6% WM in CL absence and one mixed diet with 6% WM and 1% CL.

The results of the study showed that among the compounds with biological value, vitamin E registered the highest increase for CL supplemented groups and lutein & zeaxanthin concentration increased for all experimental groups. The vegetal mixture supplementation lead to improved fatty acids profile in terms of long chain omega 3 concentrations (1.08 and 1.11% for experimental groups vs 0.81% for C group). The peroxidation process was delayed under nutritional supplements influence, the primary oxidation parameters being influenced by WL (peroxide value (Meq O₂/kg): 0.371 (WM 0%) vs 0.330 (WM 6%)) and the secondary oxidation parameters decreased in experimental groups supplemented with CL (TBARS value (µg/kg): 252.9 (CL 0%) vs 184.5 (CL 1%)).

Keywords: broiler, cranberry leaves, walnut meal, bioactive compounds

Acknowledgements: This research was funded by the Romanian Ministry of Agriculture and Research through project number ADER 9.1.2.

Chemical composition and biological activities of selected medicinal-aromatic plants from Greece

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Medicinal-aromatic plants (MAPs), herbal medicinal products and their preparations have been increasingly used to either treat or cure or prevent diseases of humans or animals. The flora of Greece is exceptionally rich (>6.600 taxa-species and subspecies), with high rate of uniqueness (20% endemics, 1.500 taxa), which contain plenty of significant biological active ingredients. Many contemporary studies show that these ingredients have potential health benefits as they protect and prevent the onset of serious conditions such as diabetes, cardiovascular diseases, aging, etc. Moreover, MAPs extensively used in the Mediterranean Diet as flavorings and seasonings. Furthermore, according to recent studies, their inclusion in animals diet exerts positive effects on product quality, improving oxidative stability and preservation as well as all the related traits. Some of the studied plants are: Oregano (*Origanum* spp.-Lamiaceae), Thyme (*Thymus* spp.-Lamiaceae), Mountain tea (*Sideritis* spp.-Lamiaceae), Sea fennel (*Crithmum maritimum*-Apiaceae), Achillea (*Achillea* spp.-Asteraceae), etc.

Acknowledgments: Part of this work has been co-financed by Greece and the EU (European Regional Development Fund) in context of “Research – Create – Innovate” Operational Program “Competitiveness, Entrepreneurship and Innovation (EPAnEK)”, NSRF 2014-2020. Project Code: T7ΔKI-00313 (MIS 5050735). Acronym: GreenPro.

Mycotoxin reduction in animal feed: adsorbent potential of several by-products used as feed additives

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Among the main approaches employed for the reduction of mycotoxins, growing interest has been given to practices that aim at minimizing mycotoxin adsorption along the gastrointestinal (GI) tract. To describe this biosorbent approach, this study investigated the potential of 8 biomaterials (agro-industrial by-products) to serve as mycotoxin mitigators. Rich in bioactive compounds, grape seed meal, seabuckthorn meal, white and red potatoes skins, and juicing residues of Granny apple, carrot, beetroot and celery were freeze-dried, ground into a fine powder, incubated a constant temperature in PBS containing a binary-mycotoxin solution of 5 µg/mL aflatoxin B1 (AFB1) and zearalenone (ZEA), and analyzed for the residual mycotoxin content by UHPLC-FLD, measured as percent of adsorbed mycotoxin. *In vitro* adsorption experiments were carried out in two steps: (1) preliminary screening, to determine the effect of contact time, adsorbent concentration, medium pH and temperature; (2) optimization of adsorption process using Response Surface Methodology (RSM). Our evaluation of the comparative binding efficacy revealed grape seed (GSM) and seabuckthorn (SBM) meals as the most efficient materials for the reduction of AFB1 and ZEA in aqueous medium. We observed no effect of pH and temperature, but noted significant differences for both AFB1 and ZEA sequestering potential under the influence of contact time and food residue concentration. Furthermore, by employing adsorption isotherm models (Langmuir, Freundlich, Sips), we estimated strong adsorption capacities in case of both mycotoxins, which are not significantly affected by pH changes. Specifically, GSM showed higher affinity towards binding AFB1 than SBM, whereas ZEA adsorption efficacy was greater over time in case of SBM. Optimum settings for the mycotoxin adsorption process in model solutions were predicted to be attained under physiological conditions at adsorbent concentrations between 28 mg/mL and 37.5 mg/mL. Based on our findings, the mycotoxins adsorption process is highly dependent on the biomaterial used as adsorbent. Exerting the highest sequestering potential for both AFB1 and ZEA, grape seed and seabuckthorn meals represent viable alternatives to commercial biosorbent products.

Keywords: mycotoxins; food by-products; grape seed meal; seabuckthorn meal; decontamination; adsorption.

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The effects of exposure to low dose of ochratoxin A on piglet microbiota

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Feed contamination is a major concern to the pig farming industry with a growing concern being directed towards the harmful effects that mycotoxins have on the overall health and development of pigs. Ochratoxin A (OTA) is a secondary toxic metabolite produced by various fungal species of the genus *Penicillium* and *Aspergillus*, with a marked nephrotoxic and immunotoxic effect. It is metabolized in the liver, intestines and mainly in the kidneys, the concentration of OTA from kidneys is an important sign showing general exposure of animals to this mycotoxin. The deleterious effects on the gastrointestinal microbiota have not been studied thoroughly, especially at a low concentration exposure.

The aim of the study proposed to investigate the effect of a sub-chronic concentration of OTA on some important bacterial populations colonizing the pig gut after weaning as well as assessing the impact on short chain fatty acids (SCFA) production. Healthy TOPIGS-40 hybrid piglets immediately after weaning were allocated in two groups either given a standard weaner diet or a standard weaner diet contaminated with 50 ppb OTA/kg feed (a concentration below the EU recommendation as limit for piglets). Quantitative PCR based enumerations targeting the 16s region were used successfully to estimate absolute abundances of targeted bacterial genera. Our results showed that OTA even at low concentration is able to modulate the composition of bacterial community of piglets fed OTA contaminated diet. At the genus level, *Bacteroides*, *Bifidobacter*, *Dorea*, *Escherichia*, *Enterobacter*, *Oribacterium*, *Ruminococcus* and *Syntrophococcus* were the most significantly affected genera by OTA compared to the genus *Lactobacillus* which has the strongest resistance to OTA. Concentrations of short-chain fatty acids which are important indicators of the intestine health of pigs, were decreased in the presence of OTA, the most severely affected concentration being that of butyric acid. These results showed that further studies are necessary before setting a limit for the concentration of OTA in feed for piglets after weaning.

Keywords: Ochratoxin A, SCFAs, piglet microbiota, 16s bacterial quantification, RT-PCR

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Preliminary results concerning the effect and mechanisms of action of zearalenone on intestinal epithelium

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Zearalenone (ZEA) is a mycotoxin produced by fungi of the genus *Fusarium*. Humans are exposed to ZEA on a daily basis through the consumption of cereal-based foods or products of animal origin. Farm animals are also very exposed to the mycotoxin contamination. Among farm animals, pigs are the most susceptible to ZEA intoxication due to their diet rich in cereals, but also due to their native sensitivity to mycotoxins. The main route of exposure to ZEA, both in humans and pigs, is oral, the intestine being the first defense barrier of the organism. The aim of this *in vitro* study was to investigate the effects of exposure of human colorectal cancer cell line (Caco-2) and porcine intestinal epithelial cell lines (IPEC1) to low doses of ZEA. The Caco-2 cell line was stimulated with LPS (10 µg/ml) and a cocktail of cytokines (50 ng/ml *IFN-γ*, 50 ng/ml *TNF-α*, 25 ng/ml *IL-1β*) for 2 hours; after stimulation, the cells were treated for 24 hours with ZEA (20mM). Similarly, porcine intestinal epithelial cell lines (IPEC 1) were stimulated 2 hours with LPS (10 µg/ml), and treated for another 24 hours with ZEA (10 mM). The effect of ZEA was analyzed at the level of gene expression of pro-inflammatory cytokines (e.g., *IL-1β*, *TNF-α*, *IL-6*, *IL-8*) by Real-time qPCR, but also at the level of protein concentration for *IL-6* and *IL-8* cytokines by ELISA technique. Also, gene and protein expressions of two signaling molecules involved in inflammation and oxidative stress (nuclear receptors *Nrf-2* and *NF-κB*) were evaluated by qPCR and Western blot. Our results showed that a concentration of 20 mM of ZEA decreased the gene expression for the pro-inflammatory cytokines *IL-1β*, *TNF-α*, *IL-6*, *IL-8* and the *IL-6* and *IL-8* protein concentration compared to untreated Caco-2 cells. ZEA have similar effects in pig IPEC1 cells, a concentration of 10 mM of ZEA reducing the mRNA level of *IL-1β*, *TNF-α*, *IL-8* pro-inflammatory cytokines and of *p38-α MAPK* signaling marker. Also, in both cell lines, a decrease at the mRNA level was observed for the transcription factors *NF-κB* and *Nrf-2* indicating their direct involvement in the induction of ZEA toxicity. This study demonstrates that low concentrations of ZEA had anti-inflammatory properties in both humans and swine epithelial cell lines. Also, at the intestinal level, ZEA seemed to induce these effects by modulating the *NF-κB* and *Nrf-2* nuclear receptors.

Keywords: zearalenone, inflammation, swine, intestinal epithelium

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Antimicrobial potential of agro-industrial by-products

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Weaning is one of the most stressful periods for pigs, correlated with a transient dysregulation of local (intestinal) immune response, associated with post-weaning diarrhea, mainly due to *E. coli* F4 infection. The post-weaning diarrhea is a major source of mortality and economic losses in pig sector. As the use of antibiotics as growth promoters has been banned in the E.U. in 2006, it was necessary to develop alternative feeding solutions to counteract the negative effects of weaning and to reduce mortality in piglets. The supplementation of the weaning diet with ingredients rich in bioactive compounds with antimicrobial properties was investigated during the past decade. The food industry generates a large amount of by-products with a negative impact on the environment. These by-products are source of bioactive compounds, such as polyphenols, fatty acids, fiber, thus recycling and valorisation of these wastes is a challenge for animal feeding strategies. Studies highlighted the positive role of polyphenols, which have been studied in depth for their beneficial effect on health and for their antioxidant action, but to a lesser extent, for their antimicrobial action. The aim of this study was to investigate the antimicrobial activity of polyphenols extracted from different by-products (grapeseed meal, sea buckthorn meal, rapeseed meal, and rapeseed meal fermented with *S. cerevisiae*), against pathogenic *E. coli* F4 strain. The polyphenols from by-products were extracted using 80% acetone solution, and were quantified using Folin-Ciocalteu method. To determine the growth efficiency of *E. coli* F4 in the presence of different concentrations of polyphenols, *in vitro* experiments were performed and the bacterial proliferation was measured using the spectrophotometer at different intervals for 24 hours. The results demonstrated that the polyphenols, especially those extracted from grapeseed meal and sea buckthorn, have antimicrobial effects, inhibiting the growth efficiency of *E. coli* F4 strain. Moreover, our results showed that the polyphenols extracted from rapeseed meal and fermented rapeseed meal presented noticeable differences in inhibition, in similar concentrations, suggesting that the fermentation process considerably affects the profile of rapeseed meal polyphenols. In conclusion, the agro-industrial by-products used in our study had antimicrobial potential, mainly due to their composition in polyphenols. Further studies are needed to determine the optimal use of these by-products as solution for the weaning crisis.

Keywords: weaning, antimicrobial, agro-industrial by-products, polyphenols, *E. coli*

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Review regarding the new genomic era, a fresh start up in sheep milk production for improving the selection with modern applications

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A fresh start up was initiated with Genomic era in 2009 when in domestic animal species with economic importance, the genome was determinate and appeared the opportunity to use this legacy more efficient for human kind. Multiple studies were undertaken in sheep and goat to discover the genome using a new modern technology like ovine and goat SNP chip. Countries with great tradition in small ruminant milk production adopted very soon this modern technology in Animal Genomic evaluation. Applications of genomics were implemented by Australia, New Zealand followed by France in dairy sheep and goats. Important studies were undertaken first in dairy cattle from United States of America, studies that help a lot to start the research and fill the existent gap for sheep and goat dairy breeds. Milk production implies a complex mechanism which involves a multitude of genes responsible with different roles in small ruminants' metabolism. Mammary gland is the vital organ and the center where these genes develop their expression activity in a complex manner. All these benefits furnished by genomics maximize the genetic progress helping a lot small ruminant breeders to diminish the genotyping cost by selecting the best animals for new generations to come. This millennium comes with demographic explosion and climate change, events that were exposed before their appearance in Rio de Janeiro Earth Summit, that took place in June, 1992. Agriculture and animal breeding confronted with important crises and developed strategic plans to cover the worldwide foods necessities for humans, animals and plants. A lot of help was found in research with sustainable solutions to solve these issues. One of this solution was genomic information which came with the best decision for farmers helping them to select an animal either for genetic conservation, keeping the genetic diversity, or for its best qualities in production.

Keywords: Sheep breeds; Estimated genomic breeding value; Genomic evaluation; Genomic selection

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**Estimation the genetic parameters for milk yield
in Romanian Spotted, Simmental type cattle breed**

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The aim of this study was to estimate the genetic parameters for test-day milk yield and the breeding value in Romanian Spotted, Simmental type cattle. Random regression test-day animal model was used to estimate the genetic parameters. The number of records were 2062 test-day from 302 cows. The data were obtained from Romanian Breeding Association Romanian Spotted, Simmental type. The heritability estimates values ranged between 0.377 and 0.417. The breeding value for the best ten cows for milk yield ranged from 1946.57 to 3250.38 kg. The correlations between test-day milk yields ranging from 0.28 to 1.

Keywords: heritability, correlation, cattle, test-day model

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Effect of dietary antioxidant sources on growth performance and intestinal microbiota in broiler chickens reared under normal temperature vs. constant heat stress

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The paper presents the effect of dietary antioxidant sources on growth performance and intestinal microbiota in broiler chickens raised under thermoneutral conditions (TN) and heat stress (HS). Two feeding trials were performed on 120 broilers per trial (40 chicks/group) raised in environmentally-controlled digestibility cages in HS at 32 °C and TN conditions. In each trial, the broiler chickens were divided into three homogenous groups (C, E1, E2). Both feeding trials used the same structure of diets. Compared with the control diet (C), in trial I, the experimental diet (E1) included the addition of 0.025% willow bark powder extract and the experimental diet (E2) included 0.05% willow bark powder extract; in trial II, E1 diet included 20 mg CrPic/kg premix and 25 g vit. C/kg premix and E2 diet included 20 mg CrPic/kg premix and 2.5 g Zn/kg premix. The use of willow bark extract (0.05%) significantly improved performance only under TN conditions. Dietary supplementation with CrPic+vitamin C and CrPic+Zn did not significantly influence the growth performance of chickens raised under HS or TN. Only under HS, the dietary willow bark extract reduced the number of pathogenic bacteria in the caecal content and the number of staphylococci in the intestinal contents. Under HS, both levels of inclusion of willow bark extract had a beneficial effect in the multiplication of lactobacilli, whereas under TN conditions, only the higher dose was effective in increasing their number. In both HS and TN conditions, the inclusion of CrPic+vitamin C and CrPic+Zn in the diet led to a reduction in the pathogens tested in the caecal content (*Enterobacteriaceae*, *E.coli*, staphylococci) and an increase in the number of lactobacilli in the cecal and intestinal contents.

The results obtained in the experiments highlighted the beneficial effects of including willow bark extract and vitamins and minerals (CrPic+vitamin C, CrPic+Zn) in maintaining the balance of intestinal microflora, even under heat stress conditions.

Keywords: broiler, heat stress, microflora, vitamins, minerals, willow bark extract

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Effect of herbal feed additives on broilers meat quality

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Nowadays, considerable attention has been paid to feed additives derived from plants as replacements for antibiotic growth promoters. The present study has tested the effect of dietary alfalfa meal, alone or in combination with basil, thyme and sage supplementation on the productive performances, and meat quality of broiler chickens. For that, 125 broiler chickens (10 days old) were divided into five groups of 25 animals each and were fed either a control diet (C) or an experimental diet as follow: C diet supplemented with 5% alfalfa (E1); C diet supplemented with 5% alfalfa and 1% basil (E2); C diet supplemented with 5% alfalfa and 1% thyme (E3); C diet supplemented with 5% alfalfa and 1% sage (E4) from 10 to 42 days of age. Performance data were recorded over an experimental period of 32 days (grower – finisher phases). At the end of the trial, 6 broilers/group were slaughtered, and the breast and thigh muscle meat were sampled and analysed in order to determine the meat quality. From the obtained performances, final body weight was significantly affected by the experimental diets by decreasing with 8.56% in E1, 9.52% in E2, 8.36% in E3 and 10.86% in E4 compared with C group. The polyphenol concentration was not a significant contributor in experimental samples of breast and thigh compared with control, but the antioxidant capacity was significantly ($p < 0.05$) increased, especially in E4 samples of breast and thigh. Also, E2 diet was significant contributor on decreasing cholesterol concentration in thigh meat samples among all groups, while E4 breast samples had the lowest cholesterol concentration. These findings indicated that the inclusion of alfalfa meal and herbal feed additive sources in broiler chickens' diets significantly improved meat quality, while affecting the final body weight when comparing with control group.

Keywords: alfalfa, broiler chickens, herbal plants, meat quality, performances.

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Nutritional strategies to mitigate production parameters and egg quality under heat stress conditions – a comprehensive overview

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The globally temperature is raising every year constantly due to greenhouse effect and global warming, which greatly affects poultry industry by decreasing production performances and egg quality. Therefore to minimize the negative effects of heat stress it is mandatory to find solutions by dietary interventions (vitamins, minerals, energy, protein, aminoacids) or by using local thermoregulatory plants (parsley, dill, rosemary, thyme, fennel, coriander seed, hot red pepper) altogether with inclusion of probiotics, well-known for their stress alleviation properties with positive effects at the cellular level. These mixed interventions presents numerous advantages that can be observed at gastrointestinal tract level, improved feed conversion, enhanced immunity and egg quality, assuring a productive and healthy flock with low costs. Managing heat stress in farms involves combined readjustments concerning diets and management providing for a suitable environment. All various solutions to heat stress management has to take into consideration a livestock production and performance improvement. These days, the ubiquity of using phytoadditives and probiotis as heat stress amelioration strategies is expanding, providing new perspectives to realize their full potential in animal nutrition.

Keywords: egg quality, diets, heat stress, performances, phytoadditives, poultry

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Preliminary study on performances and manure nitrous oxide level of suckling piglets fed with milk from sows fed differently

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Diverse methods of reducing the environmental impact of pig production have been studied over the last few decades. As known, nitrogen (N) is one of the most harmful nutrients for the environment. The purpose of the present study was to investigate the associative effects of the sows' milk production and their offspring N intake on litters performances, nitrogen excreta and nitrous oxide (N₂O) level predicted. A number of 20 suckling piglets from sows fed two different diets (1.6% soybean oil in C diet and 1.6% hempseed oil in E diet) received the same diet based on 2.5% hempseed oil and 2% mustard meal. All piglets were weighed the first day after farrowing (AF), 7-, 21- and 30-days AF. The average milk production calculated was 7.545 L/sow. The milk intake was calculated taking into consideration the piglets' average daily gain (ADG) integrated in regression equation. The N₂O production was calculated using literature prediction equations, which include nitrogen (N) excreta as the main parameter. The average milk intake was higher in piglets from the C diet (+3.76%; P=0.001), while feed intake was similar between diets (P>0.05). Correlated with milk production and solid feed, N intake was 17.53 g/d in C diet and 14.57 g/day in E diet. Piglets' performances [(final body weight (BW) and ADG)] were not influenced (P>0.05). The results regarding N excreta and N₂O emitted were not significantly affected (4.86 g/day vs 3.81g/day for N excreta, respectively 0.010 g/day vs 0.008 g/day for N₂O; P>0.05). A high significant positive Pearson correlation was observed between N intake (from milk and solid feed) and N₂O production and N litter output. Following these findings, we conclude that piglets fed with milk from sows feed hempseed or soybean oils, have a similar impact on N₂O production.

Keywords: Milk, piglets, nitrogen, soybean oil, hempseed oil, N₂O,

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Nitrogen balance, performance and plasma parameters of growing pigs fed a mixture of leguminous diet

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Dietary composition and the physiological status of the pigs are major contributors to the efficiency of protein utilization with impact on the animal health and environment. This paper aimed to evaluate the effects of a mix of non-conventional feed ingredients (alfalfa hay: peas powder) as partial replacement of sunflower meal (SFM) on nitrogen (N) balance, performance and plasma parameters of growing pigs. Ten male growing pigs (39.05 ± 0.76 kg) were randomly allocated in two groups given two diets: control [C, based on corn-SFM and soybean meal] and experimental (E, where the mixture of lucerne hay: peas powder (1:1) partially replace the SFM). The pigs were housed in a metabolism cage and subjected to a 7-day adaptation period followed by a 25-day faecal and urine collection period. At the end of the trial, the performances (body weight, average daily feed intake, average daily gain, feed: gain ratio), the N balance and plasma metabolic profile (lipid, protein, enzyme, mineral) were evaluated. The final body weight was 48 ± 0.76 kg. Results showed that the C diet maintains appropriate performance and plasma metabolic profile with the E diet ($P > 0.05$). Pigs fed E diet decreased N intake (7%, $P = 0.07$), urine N excretion (8%, $P < 0.05$), wet feces output, (1%, $P > 0.05$), feces N excretion, (0.2%, $P > 0.05$) and total manure N output (6%, $P = 0.06$). Plasma urea nitrogen tended to decrease by 35% ($P = 0.09$). This study demonstrates that the use of a dietary mixture of lucerne hay: peas (1:1) powder, as partial replacement of SFM in growing pigs, can reduce urine N excretion without affecting performance and health parameters.

Keywords: alfalfa hay, growing pigs, peas powder, nitrogen balance

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Effects of *Bacillus subtilis* as probiotic source in weaning piglets diet

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A total of 60 piglets, 30±3 day-old Topigs hybrid with initial body weight (BW) of 8.41±0.92 kg were used in 3 homogeneous groups: C, E1 or E2, 10 piglets/6 pens, 2 replications/group. The effect of *Bacillus subtilis* ATCC 6051a (*Bs*, 1.6 x 10⁹ CFU/mL) supplementation in piglets diet was evaluated. Different levels of *Bs*, respectively 1% in E1 diet and 3% in E2 diet, were used to investigate the growth performance, diarrhea occurrence, intestinal pH values, and microflora population from intestinal content (ileum and cecum). The feed was administered *ad libitum* in the flour form, with 2 meals/day. The addition of *Bs* did not influence ($P>0.05$) the BW or average daily gain (ADG); however, across the entire trial ADG was higher in E2 and E1 vs. C (>1.12 and 1.08 times vs. C diet). The feed intake (ADFI) was greater in C diet than diets with additive incorporated. Feed efficiency was higher in E1 and E2 than C diet. The addition of *Bs*-1% decreased ($P<0.05$) diarrhea incidence around 8% vs. C group, and 4% compared to *Bs*-3%. A total of 23.4% of piglets had soft faeces, 43.75% score 2 (mild diarrhea), and 32.81% score 3 (severe diarrhea), but no differences ($P>0.05$) were noticed between groups. The inclusion of *Bs*-1% reduced in ileum and cecum the numbers of *Coliforms* (<26.38% and <21.50%), *Clostridium* spp. (<9.83% and <7.19%), *Enterococcus* spp. (<11.13% and <8.87%), and *E. coli* biotype β-hemolytic (<26.22% and <22.09%) vs. to C group. Moreover, the ileum and cecum pH of the piglets changed markedly in *Bs* treatments. In conclusion, our results confirmed that *Bs*-1% can positively affect growth performance, moderate the diarrhea rate, endogenous microflora, and intestinal pH during the post-weaning period.

Keywords: probiotic, weaning piglets, diarrhea incidence, performance, intestinal microflora

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The effects of including brewers spent yeast in sheep diets on various milk parameters

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Sheep milk represents one of the foodstuffs that may have beneficial effects for human health due to its nutrients' supply but also its composition rich in bioactive compounds such as peptides and fatty acids. Animal nutrition is the most important strategy to modulate milk composition for obtaining nutritionally-enriched dairy products, by valorising the characteristics of various feedstuffs. In the same time, such strategies should focus on solutions that avoid competition for resources with food or other industries, such as the by-products and wastes from these industries. Brewers spent yeast is a by-product obtained in beer industry, rich in proteins and some bioactive compounds. The 5% inclusion of brewers spent yeast in the sheep diet led to a significantly increase in saturated fatty acids content ($P < 0.05$) and a significantly decrease in monounsaturated fatty acids content ($P < 0.05$) of the milk. On the other hand, it has induced a decrease of the omega 6/omega 3 ratio ($P < 0.05$). This is important for consumers, considering that a low omega 6/omega 3 ratio is known as beneficial from the point of view of cardiovascular diseases. Also, the content of milk minerals was influenced; of these, a significantly increase in milk Ca content was noticed. The total milk polyphenols content has also increased ($P > 0.05$), which is consistent with the fact that brewers spent yeast is rich in natural antioxidants. In this line, determinations of the parameters of the milk fat oxidative stability revealed a significantly decrease of conjugated dienes content. These results indicate brewers spent yeast represent an alternative feedstuff for sheep/ruminants' nutrition, which has the potential to induce changes in milk composition that are beneficial for the consumers' health.

Keywords: brewers spent yeast, dairy sheep, milk quality, milk composition.

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Evaluation of the effects of aflatoxin B1 and ochratoxin A co-contamination on protein expression and enzyme activity of some CYPs P450 enzymes in piglets' liver and kidney

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The use of some plant-derived antioxidants in feed could be a better solution to diminish the deleterious effects of mycotoxins and for maintaining the piglets' health. The purpose of this study was to evaluate the combined effects of aflatoxin B1 and ochratoxin A on protein expression and catalytic activities of CYP1A2, CYP2E1, CYP3A29 and GSTA1 in piglets' liver and kidney and the preventive effect of administration of a byproduct mixture derived from *Vitis vinifera* (grape seed) and *Hippophae rhamnoides* (sea buckthorn) oil industry against these mycotoxins' effects. Forty cross-bred TOPIGS-40 hybrid piglets after weaning were assigned to three experimental groups (E1, E2, E3) and one control group (C), and fed with experimental diets for 30 days. The basal diet was served as a control. The experimental groups were fed as follows: E1—basal diet plus a mixture (1:1) of two mixtures; E2—the basal diet experimentally contaminated with mycotoxins (479 ppb OTA and 62ppb AFB1); and E3—basal diet containing 5% of the mixture (1:1) of grapeseed and sea buckthorn meal and contaminated with the mix of OTA and AFB1. After 4 weeks, the animals were slaughtered, and tissue samples were taken in order to perform microsomal fraction isolation, followed by protein expression and enzymatic analyses. The protein expressions of CYP2E1 and CYP3A29 were up-regulated in an insignificant manner in liver, whereas in kidney, CYP1A2, CYP2E1, CYP3A29 ones were down-regulated ($p < 0.01$) in E2 group. The specific enzymatic activities of CYP1A2, CYP2E1, CYP3A29 decreased in liver ($p < 0.001$) whereas in kidney, these increased significantly ($p < 0.001$) in the same group. The co-presence of the two mycotoxins and the mixture of grape seed and sea buckthorn meal, generated a tendency to return to the control values ($p < 0.01$). These findings suggest that grapeseed and sea buckthorn meal waste represent a promising source in counteracting the harmful effect of ochratoxin A and aflatoxin B.

Keywords: piglets; mycotoxins; CYPs protein expression; CYPs enzyme activity; feed additives

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Genetics and genomic approaches for sustainable dairy cattle improvement

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In general, the FAO defined the characteristics of a sustainable development as environmentally non-degrading, economically viable, conserves genetic resources, technically appropriate and socially acceptable. Therefore the essential components of a sustainable dairy genetic improvement programme should include improvements in productivity with no adverse effect on fitness but rather improves fitness traits (reproductivity, disease resistance and robustness), improves welfare traits (body condition and sound feet) and has little or no negative impact on the environment. Over the years, to achieve sustainable dairy genetic improvements, many countries have broadened their national breeding goals to include health, welfare, and fertility traits, with the relative weights on these non-productive traits now accounting for about 30% of the overall weight in their national dairy cattle indexes. International efforts to improve sustainability include harmonization of trait definitions, establishment data collection protocol for the difficult to measure traits in order to promote international dairy genetic evaluations. International evaluations result in broader set of available top bulls for use across countries thereby maintaining genetic diversity. Given climate change, major sustainability issues in dairy cattle breeding include heat tolerance, feed resources and methane emission. Breeding for heat tolerance has been based on the rate of decline in milk yield to changes in the temperature and humidity index (THI). Since 2016, dairy sires are being selected in Australia for heat tolerance based on genetic predictions using THI. The incorporation of functional genes for heat tolerance from GWAS studies using THI, has been shown to increase accuracy of prediction for heat tolerance by up to 10%. In addition, improvement for heat tolerance has been implemented through introgression of the slick gene. The slick hair gene located on chromosome BTA20 in Senepol cattle is responsible for a smooth and short hair coat, confers thermotolerance and improved capacity for heat dissipation. Introgression of the gene into some Holstein cattle has been shown to produce animals with lower body temperatures. Livestock is deemed a major contributor to greenhouse gas produced therefore breeding for reduction in methane (CH₄) emission is important for sustainable dairy System. The accuracy of genomic selection for CH₄ reported for Danish Holstein was about 0.42. CH₄ is difficult to measure routinely in large number of animals, therefore indirect predictors have been examined. Research indicates selection for feed efficiency is a good proxy and could result in 26% reduction in methane over a 10-year period. Nordic countries and the Netherlands have implemented genomic models to improve feed requirements for maintenance.

Keywords: dairy cattle, genetic improvement, genomics, sustainability, climate change

Genomic approaches reveal pleiotropic effects for carcass and meat quality in beef

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Two important attributes for the beef industry are carcass and meat quality, because they drive profitability and consumer demand. These traits are of even greater importance in crossbred cattle used in subtropical and tropical regions for their superior adaptability because they tend to underperform compared to their purebred counterparts. Many of these traits are challenging and expensive to measure and unavailable until late in life or after the animal is harvested, hence unrealistic to improve through traditional phenotypic selection, but perfect candidates for genomic selection. Before genomic selection can be implemented in crossbred populations, it is important to explore if pleiotropic effects exist between carcass and meat quality traits. Therefore, the objective of this study was to identify genomic regions with pleiotropic effects on carcass and meat quality traits in a multibreed Angus-Brahman population that included purebred and crossbred animals. Data included phenotypes for 10 carcass and meat quality traits from 2,384 steers, of which 1,038 were genotyped with the GGP Bovine F-250. Single-trait genome-wide association studies were first used to investigate the relevance of direct additive genetic effects on each carcass, sensory and visual meat quality traits. A second analysis for each trait included all other phenotypes as covariates to correct for direct causal effects from identified genomic regions with pure direct effects on the trait under analysis. Five genomic windows on chromosomes BTA5, BTA7, BTA18 and BTA29 explained more than 1% of additive genetic variance of two or more traits. Moreover, three suggestive pleiotropic regions were identified on BTA10 and BTA19. The 317 genes uncovered in pleiotropic regions included anchoring and cytoskeletal proteins, key players in cell growth, muscle development, lipid metabolism and fat deposition, and important factors in muscle proteolysis. A functional analysis of these genes revealed GO terms directly related to carcass quality, meat quality, and tenderness in beef cattle, including calcium-related processes, cell signaling, and modulation of cell-cell adhesion. These results contribute with novel information about the complex genetic architecture and pleiotropic effects of carcass and meat quality traits in crossbred beef cattle.

Use of genomic selection in Romanian cattle genetic evaluation

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Scarce genealogical data means a low accuracy in traditional genetic evaluation methodology who use Best Linear Unbiased Prediction methods (BLUP). In the last decades, molecular biology creates a new tool: dense panels of Single Nucleotide Polymorphisms (SNP), usable in genetic evaluation of farm animals. Usually, in genomic evaluation, a training population contribute to estimation of the effect of dense SNP panel on improvable traits. Using estimated effects, further estimations are performed in the base population genotyped as well, ranking animals by Genomic Estimated Breeding Values (GEBV). The main improvements of genomic selection are increased accuracy, reduction of generation interval, all those leading to major decrease of costs with entire process of genetic selection in breeding companies.

In our study we aimed to identify the smallest genotyped sample size who offer the smallest reduction in estimative power, correlated with increased accuracy. Another topic of this paper were comparison between various breeding value estimation models, classical and genomic, and analysis of precision gain and similarity between estimates of the models under different scenarios.

Sample population consist in 200 Romanian Black Spotted, Monbeliarde and Crossbreed cows. Cows were genotyped using Axiom Bovine v3 Genotyping Array with 60k SNP panel. Statistical analysis was performed in R, package rrBLUP, was used for GWAS, and for breeding value estimation were used BLUP methodology implemented in R. Genetic evaluation was compared under four statistical methodologies: Genomic, Sire, Animal and Test-Day Models.

Based on analysis, there is no population stratification in studied data and from Q-Q plot, results that some observed SNPs effects are greater than expected, resulting that SNPs were associated with milk production at 305-days.

Regrading estimation accuracy, the model with the lowest accuracy was Sire-Model (36.6%). Adding information about female ancestry, progeny and collaterals in Animal Model increase accuracy to 49,7%. More detailed Test-Day increase estimation to 59.1% accuracy, and adding genomic information the accuracy was maximized to 69.9%.

Regarding similarity, for each lactation all the statistical models return highly correlated breeding values. The highest (97.2%) and the lowest (79.2%) rank correlation are registered between Test-Day and Animal Model for the first and second lactation most probably because that the two models use different phenotypic records.

As a conclusion, in term of workforce, logistic and material costs, accuracy, and parentage information quality, genomic evaluation can be a better alternative, at least in Romania, for classic methodology of breeding value estimation (BLUP).

Keywords: genomic selection, cattle, GWAS

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Genome-wide association study of somatic cell score in Romanian Brown cattle

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Genome-wide association studies have recently emerged as important tools for uncovering the relationships between genomic regions and phenotypes of interest. In this study, we have performed a two-step genome-wide association study on somatic cell score in the first three lactations of a population of Romanian Brown cattle. We focused on somatic cell score as this is an important economic trait for milk cattle, being used as an indirect indicator for mastitis. Quality control of genotypes was performed using the PLINK software, with the options “--geno 0.05 --mind 0.05 --maf 0.05 --hwe 1e-6”, yielding a number of 119 animals and 40305 markers. Principal component analysis plots were created using the R package *argyle* and evidence of population stratification was found to be mild. Nevertheless, the first 8 principal components were included as covariates in the study. The first stage of the genome-wide association study was to compute estimated breeding values using a random regression test-day model implemented in *Blupf90*, with herd-year-season as contemporary groups and third-order Legendre polynomials modelling both fixed and random coefficients of lactation curves. Breeding values were computed for a 305-day standard lactation length and then de-regressed using the R package *DRP*. De-regressed breeding values were used as phenotypes for the second stage of the study, where the *rrBLUP* R package was used to compute *p*-values for genomic markers at a significance threshold of 10^{-4} . In total, 26 markers were identified as significant for somatic cell score, of which a number of 10, 9 and 7 for first, second and third parity, respectively. Given that different markers were found associated with the first three parities, it was concluded that different genomic regions are influencing the corresponding lactations.

Keywords: genome-wide association study; genotyping; microarray; somatic cell score

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Progress in the genomic characterization of local sheep populations and estimation of genomic breeding values

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Genomic selection is a new tool very useful in the accurate breeding value estimation of an animal, without taking into account own, ancestors or a number of offspring phenotypic information. Breeding value is estimated using association between a very dense panel of genetic markers (SNP) and the phenotypes on a group of animals. These associations can be used further for genomic breeding value prediction (GEBV) on animals that have been genotyped on the same SNP panels, but do not offer any source of phenotypic information. Use of genomic information in breeding value estimation can reduce genetic improvement costs and in the case of the lack of the pedigree information will increase the accuracy of estimation. For those reasons, genomic selection can offer a valuable alternative from traditional breeding value estimation in Romania. Regarding the changes breeding programs and breeding value estimation methodology in Romanian sheep, SNP polymorphism characterization and associations studies are demanded. Present study aims to perform a genetic characterization and SNP association study on a Romanian sheep population, in Romanian Black Head sheep more precisely. But the acknowledge from this biggening study may be applied on other breeds too. The results will be used in improvement of local breeding programs and a further standardization of genomic evaluation at National level. Animals were genotyped using Axiom™ Ovine Genotyping Array 50K (mini-96 format) from Affymetrix. After quality control analysis was performed using PLINK software to check call rate and minor alle frequency a total of approximatively 50K SNPs meets the standards from a total of 65K SNPs. Forward studies are required for more complex quality control checks and the final and clean SNPs will be used in genomic evaluation. Also, in this first study it was found that the heterozygosity is high (over 50%) and the population is well clustered from genomic kinship point of view. In conclusion, genomic selection using high density SNPs panels have a good potential and will be very useful in genetic improvement programs of Romanian sheep breeds.

Keywords: genomic, sheep, breeding values

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**Mycotoxin occurrence in samples of cereals and feed from South Eastern Romania
between 2019-2020**

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The study on mycotoxin contamination was conducted between 2019-2020 on a number of 139 compound feeds, 45 protein-vitamin-mineral concentrates, 54 cereals and cereal by-products, 4 hay and silos, mainly from South Eastern Romania.

The concentration of mycotoxins: aflatoxins (AF), fumonisins (FB), zearalenone (ZEA), toxin T-2 (T2) ochratoxin (OTA) and deoxynivalenol (DON) from the analyzed samples was assessed by ELISA method. The vast majority of the analyzed samples were contaminated with mycotoxins in concentrations that were within the limits allowed by the regulations and regulations in force. Some analysed samples have shown a mycotoxin contamination that exceeded current regulations.

The main problem is represented by the co-contamination with more than one mycotoxin, as more than 80% of the analyzed samples were contaminated with more than one mycotoxin, with important consequences for health risk as there is converging evidence that mycotoxins could synergistically interact for animal and human toxicity

Keywords: mycotoxins, legislation, co-occurrence

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Nitrous oxide prediction in manure from pigs given mustard x grapeseed oil cakes as a replacement for sunflower meal

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During the last century, the emission of nitrous oxide (N₂O) from the livestock sector increased significantly. N₂O is a greenhouse gas with 298-fold higher global warming potential than CO₂ (CO₂ eq.). Pigs accounted for about 26% of N₂O emissions. The formation of N₂O occurs through nitrification and denitrification processes in manure. This study aimed to estimate N₂O production in the manure of growing-finishing pigs starting from our experimental data. The associative effects of dietary mustard and grapeseed oil cakes (MxG) as an alternative for sunflower meal (SFM) on performance and efficiency traits were also determined. Forty growing-finishing pigs were randomly allocated in two groups (2 replicates per group) given two diets: C diet (based on sunflower meal, 15 wt) and E diet (based on mustard and grapeseed cakes mixture, 7:8 wt:wt). Our model includes as initial input data: body weight (BW), feed intake, nitrogen intake, dietary dry matter, and fibre. Using literature prediction equations, including nitrogen excreta as the main parameter, we established N₂O production expressed as equivalent CO₂. A decline with 3% for BW (P=0.052), respectively 10.19% for average daily gain (P=0.002) in pigs given MxG was recorded. Correlated with growth parameters, efficiency traits (feed intake, feed: gain ratio, nitrogen, and fibre intake) were decreased as well (P>0.05). Dietary addition of MxG led to an 5% lower level of N₂O production in manure (expressed as CO₂ eq.). The reduction of total nitrogen output was not significant (<7.14% in E diet compared to C diet). In our trial, a relatively low nitrogen intake percentage is retained in the pigs body (35.56% in C group and 35.98% in E group, P>0.05). Based on these results, we conclude that the inclusion of 15% mustard and grapeseed oil cakes mixture in pigs diets, although reduce growth parameters, is a valuable nutritional solution by their contribution to lowering N₂O and nitrogen excretion.

Keywords: pigs, grapeseed cake, mustard cake, N₂O, nitrogen

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Preliminary research on growth performance and carcass quality of a novel crossbreed slow-growing broilers in Romania

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The study aimed to compare the growth performance, carcass traits and meat quality of fast- and slow-growing broilers. Ross 308 commercial breed was used as fast-growing genotype (FGB), while for obtaining the slow-growing genotype (SGB), the Ross 308 crossed with three varieties of the local naked neck (NN) genotype as follow: SGB1 (♀Ross 308 × ♂Red NN), SGB2 (♀Ross 308 × ♂Barred NN) and SGB3 (♀Ross 308 × ♂Black NN). A total of 660 day-old mix sexed broilers were allocated in four genotype groups: FGB (n=120), SGB1 (n=180), SGB2 (n=180), SGB3 (n=180), and reared in a semi-intensive production system. Broilers were fed with two-phase basal diet 1-28d (20% CP, 12.55 MJ/kg EM) and 29-81d (18% CP, 12.97 MJ/kg EM). Productive performance (body weight gain, BWG; feed intake; feed conversion ratio, FCR) was assessed for each phase and overall period. At 81d of age, 18 broilers per genotype (1:1 sex ratio) were slaughtered for carcass traits and meat (breast and thigh) quality evaluation [pH, color measurements: brightness (L*), redness (a*) and yellowness (b*), color difference over time (ΔE), saturation index (Chroma C), Hue angle (H)]. Results shown that performance were influenced ($p < 0.05$) by genotype, the overall BWG had a decrease trend (SGB1 < SGB2 < SGB3 vs FGB), and FCR increase (SGB2 > SGB3 vs SGB1 and FGB). Genotype affected carcass traits, all SGB groups had lower carcass weight, carcass and breast yields, while the yields of legs and wings, abdominal fat, gizzard and liver percentage were higher than FGB ($p < 0.05$). Sex significantly affected carcass weight, breast and legs yields, abdominal fat, gizzard and liver percentage ($p < 0.05$). Genotype × sex interaction was found for carcass weight, legs yields and abdominal fat ($p < 0.05$). All SGB genotypes had lowered pH_{45min} values in breast and thigh meat ($p < 0.05$), while at 24h *post-mortem*, the differences in pH_{24h} values were not significantly as those of FGB. No significant effect of sex on meat pH was found. The breast meat L*, b*, ΔE and H values were decreased in SGB, while the a* value increased as an effect of genotype ($p < 0.05$). A significant effect of sex was found for b* and H values in breast meat ($p < 0.05$). Genotype × sex interaction for all breast meat color parameters was observed. The L*, b*, ΔE and C values of thigh meat lowers and H value higher in SGB as an effect of genotype, while the b* and C values differ between sex ($p < 0.05$). The present results showed that although the FGB achieved better performance and carcass parameters vs. all SGB, these crossbred could represent an alternative for modern poultry meat consumers, but it still needed further investigation for in-depth meat quality analysis.

Keywords: genotype, slow-growing broiler, performance, carcass traits, meat quality

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Valorization of the thermo-hydric stress in the area of sandy soils by promoting in culture of some of cowpea genotypes (*Vigna unguiculata* [L] Walp)

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The research carried out at RDSPCSS Dabuleni, in the period 2020-2021, aimed at the behavior of four genotypes of cowpeas (*Vigna unguiculata* L. Walpers) in the conditions of thermo-hydric stress in the area of sandy soils in southern Oltenia. The experiment was organized by the method of randomized blocks, on a sandy soil with low natural fertility, poorly supplied with total nitrogen (0.045-0.08%), medium to normal supplied with extractable phosphorus (41-87 ppm), reduced to medium supplied in exchangeable potassium (65-97 ppm) and with a weak acid soil reaction (pH H₂O = 5.9-6.59), under irrigation conditions. The obtained results showed the drought tolerance and the defense reaction of the cowpea plant to the thermo-hydric stress, by increasing the percentage of bound water and the concentration of vacuolar juice and by reducing the stomatal conductance, which prevents water loss through perspiration. Distinctly significantly positive correlations were recorded between stomatal conductance and the processes of photosynthesis ($r = 0.9189$ **) and plant perspiration ($r = 0.794$ **). From the point of view of the correlation of the physiological indices with the productivity of the plant, the cowpea variety *Aura 26* behaved best, which at an average daily transpiration of 2.69 mmol H₂O / m² / s and a leaf index of 8.05, assimilated by photosynthesis about 11.57 μmol CO₂ / m² / s and recorded an average of 14.6 pods / plant with 8.9 grains / pod. The productivity of the cowpea plant was negatively correlated with the vegetative growth of the variety, and the results obtained showed significant increases in grain production ($p > 0.05$) in all genotypes studied, compared to the control variety (*Jiana*), which recorded a value large area of the leaf area index.

Keywords: cowpea, drought, tolerance, physiology, leaf area index, productivity

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Ranking the dietary treatments of broiler chickens

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The AHP evaluation methodology was used to rank the tested nutritional solutions and to choose the best nutritional solution in order to reduce environmental pollution with nitrogen. The evaluation methodology consisted in comparing by three evaluators the recipes based on the zootechnical performances / meat quality / environmental impact.

Thus, regarding the zootechnical performance criterion (C1), the results of the technical indicators were taken into account: the average daily increase, the total increase and the final weight. The meat quality criterion (C2) was given by the antioxidant capacity of the chicken meat.

The ecological criterion was expressed by the nitrogen digestibility coefficient.

The recipes of tested nutritional solutions were composed of either medicinal and aromatic plants (basil, thyme, sage) in a proportion of 1% (set 1), respectively essential oils (0.05%) of the same plants (set 2).

The application of the AHP methodology indicated that the best nutritional alternative was obtained for basil, either in the form of essential oil or vegetal material.

Keywords: AHP, basil, broiler chickens, nutritional solution, sage, thyme

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The effect of dietary addition of a synbiotic after long-term starvation on certain biochemical parameters and liver structure in common carp (*Cyprinus carpio* L.)

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The prolonged starvation has many effects on the physiological and morphological processes in fish and interferes them with the ability to absorb nutrients and caloric intake. The aim of present study, was to investigate the effect of long-term starvation and posterior dietary administration of commercial synbiotic consisting fructooligosaccharide (FOS) which used in combination with *Enterococcus*, *Lactobacillus*, *Bifidobacterium* and *Lactococcus* spp. for evaluation on some blood biochemical parameters and histological characteristics of common carp liver. Experimental fish after 5 months starved period was subjected to the following feeding protocols: continuous starvation until 60 day (ST), re-feeding (FS) with dry composed diet (Aqua 1032 Swim) and re-feeding with composed diet and synbiotic (FSS) for the following 60 days. Fish were fed four times daily. The blood samples were taken from the vena caudalis occurred immediately after the respective stunning procedure by electro stunning device. The collected blood (approximately 2.0 ml) has been centrifuged at 2500 rpm for 5 min at room temperature and plasma was immediately separated and stored at -20°C until analysis. Of the studied parameters, after long-term fasting and subsequent feeding with a standard diet and with added synbiotic to the feed, glucose and urea remain unchanged during the experimental period. Also, the statistically largest (P 0001) difference was observed in albumin and cholesterol values after re-feeding. Likewise, fasting and refeeding have a significant influence on another studied biochemical parameters, namely: calcium, phosphorus, aspartate-aminotransferase, alanine-aminotransferase, total protein, globulins and creatinine. Our results reveal the changes in values of biochemical parameters during long-term starvation and re-feeding with synbiotic and indicate signs of structural alterations of the liver in common carp.

Keywords: common carp, symbiotic, liver, biochemical parameters

Antiviral effect of grape seed extracts against enveloped RNA viruses

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Owing to the high content of polyphenols with potent antioxidant activity, such as ferulic and caffeoylquinic acids, catechins and resveratrol, grape seed extracts (GSE) have numerous benefits in treatment of diabetes, cardiovascular disease, inflammation and cancer.

In this study we aimed to evaluate the antiviral activity of red GSE against enveloped RNA viruses, using the bovine viral diarrhoea virus (BVDV), as a model. BVDV has a single-stranded, positive-sense RNA genome and belongs to the *Pestivirus* genus of the *Flaviviridae* family. BVDV infection induces serious diseases in cattle and other ruminants with a wide range of clinical manifestations of the respiratory, gastro-enteric and the reproductive systems, resulting in a high mortality rate in infected animals and important economic losses worldwide. Despite the importance of this pathogen, effective vaccines and selective antiviral compounds are not available yet.

Toxicity profiles of organic and water GSE extracts with known chemical composition were established in MDBK cells, the BVDV host, followed by evaluation of the antiviral effect at both entry and replication levels. Interestingly, the organic GSE extract showed a strong, dose-dependent antiviral effect, even at a high multiplicity of infection (MOI), as demonstrated by complementary, plaque forming assays and PCR. Investigation of the mechanism of GSE action revealed a significant inhibition of BVDV replication, accompanied by reduced expression of the viral proteins in infected MDBK cells. To identify the active compounds in the GSE, pure drugs from a Natural Product Library were screened for potential antiviral activity against BVDV. Of these, we identified caffeic and ferulic acids as potent BVDV inhibitors. While the antiviral activity of the caffeic acid has been reported before, to the best of our knowledge, this is the first scientific communication demonstrating the inhibitory activity of the GSE and its constituent, the ferulic acid against Pestiviruses, highlighting the potential of natural extracts in fighting infectious diseases.

Keywords: grape seed extract, RNA viruses, polyphenols

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The effects of including brewer's spent yeast in sheep diets on rumen parameters

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The effects of including brewer's spent yeast in sheep diets on several rumen parameters were studied using 45 multiparous Black Head sheep, randomly distributed in 3 groups. The three groups were fed Dactylis hay (ad libitum) and different compound feeds, containing 0% (Control group), 5% (BSY5 group) and 10% (BSY10 group) inactivated brewer's spent yeast. The experiment lasted 40 days; in the last week rumen content was collected from each animal, using a flexible esophageal tube connected to a vacuum pump. pH was determined on fresh samples, using an ion-meter, the samples for volatile fatty acids and protozoa counting were specifically treated stored until analyses. The concentration of total volatile fatty acids in the rumen fluid was similar among treatments, as well as the relative proportion of acetic acid. On the other hand, the relative proportion of propionic acid decreased ($P < 0.05$) which led to an increase of C2:C3 ratio ($P < 0.01$). In case of butyric acid, a tendency to increase ($P = 0.09$) was noticed. No noticeable effects on protozoa density were detected. However, the differences in fermentation patterns (volatile fatty acids profile) indicate potential changes of bacterial populations. These preliminary results indicate a potential of brewer's spent yeast to induce changes on rumen metabolism.

Keywords: brewer's spent yeast, sheep, rumen

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The LIFE Green Sheep project: for a low carbon and sustainable sheep farming

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The Romanian sheep production landscape is characterised by a large number of farms that are very diverse in terms of size, degree of modernisation, production level, etc. In average, Romanian sheep farms lag behind EU average in terms of yields, application of modern technologies, uptake of the research results, etc. Also, there is lag concerning the whole-farms diagnoses / assessments, from various point of views: breeding, nutrition, financial sustainability, environmental impact, etc. The later become more and more important, both for the society and the farmer, especially in the frame of the EU and national policies and targets, e.g. Green Deal.

The Life GreenSheep project (www.life-green-sheep.fr), coordinated by Institut de l'Elevage (IDELE), France and partnering several research actors, and a large number of associations, cooperatives and farmers from 5 European countries (France, Spain, Italy, Ireland, Romania) focuses on demonstration and dissemination actions to reduce the carbon footprint in European sheep farming. Its main objective, to reduce by 12% the carbon footprint of sheep milk and sheep meat while ensuring farms' sustainability is filling a gap of the Romanian sheep production sector. Currently, there's no system in place to assess and to monitor the sheep farms' evolution from the point of view of GHG (GreenHouse Gaz) emissions. The implementation of the project (2020-2025) will lead to the dissemination of mitigation measures that ensures not only a reduction of GHG emissions but also an increase of the farm efficiency (through nutrition, herd management, etc.). In the project, IBNA is responsible with the action C2 (advisers' training to assessment tools) and will rot out the project on 28 meat sheep farms and 82 milk sheep farms.

Among the tools used to achieve the project goals in Romania is CAP'2ER[®], which allows a rapid (level 1) or in depth (level 2) multi-criterial assessment of a farm. The assessment can be used as a decision support to implement actions / strategies / measures toward increasing efficiency, reducing losses toward the environment, etc. While CAP2'ER[®] is currently being adapted to the Romanian specifics, a first pilot assessment of a sheep farm was done, thus allowing the farmers to identify potential measures to reduce GHG while ensuring farm's sustainability.

Keywords: sheep, greenhouse gases, mitigation

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POSTER PRESENTATIONS

Probiotics in broiler chicks' diet fed with different sources of protein

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Probiotics have been provided to be the most preferred and effective alternative to antibiotics. The aim of this study was to evaluate the potential of *Bacillus subtilis* ATCC 6051a (Pro), as a probiotic bacterium in broiler diets based of two sources of protein [soybean meal (SBM) and cowpea (CWP; *Vigna unguiculata* [L] Walp). Growth performance (GP), carcass traits, and gut microflora population were investigated using a total of 480 one-d-old mixed sex broiler chicks (Ross 308). The SBM or CWP diets were tested in the presence or absence of Pro (1×10^{11} CFU/kg feed) in a 2×2 factorial arrangement in a completely randomized design. Chicks were randomly assigned to 4 dietary treatments (6 replicate pens with 20 chicks each). Diets of starter, grower, and finisher were formulated to be isocaloric, isonitrogenous with similar content of total lysine, TSAA, Ca and available P, and manufactured in mash form, without inclusion of growth promoters or antibiotics. The results showed that birds fed CWP had comparable GP as those fed the SBM diet. Carcass, breast and legs' yield, and digestive organs size (i.e., gizzard, heart, liver, pancreas, spleen, small intestine, and caecum) were not affected by the protein source. Inclusion of Pro in broilers' diets increased BWG during grower ($P < 0.01$), finisher ($P < 0.01$), and overall study period ($P < 0.001$), tended to increase FI ($P = 0.059$; d 0-42) and improved feed efficiency in the grower ($P = 0.047$) and finisher ($P = 0.043$) phase. The addition of Pro significantly decreased abdominal fat ($P = 0.026$), and caecum weight ($P = 0.034$) and tended to increase pancreas ($P = 0.057$), and caecum length ($P = 0.086$) while carcass as well as breast and legs' yield were similar. In addition, Pro was beneficially in modulating gut flora composition. In particular, the caecal *Bacillus* spp. (\log_{10} CFU/g digesta) and *Enterococcus* significantly increased ($P = 0.016$ and $P = 0.024$, respectively) whereas the Coliforms ($P < 0.001$) and *E. coli* count decreased ($P = 0.040$) compared with birds without Pro. It is concluded that the *B. subtilis* (ATCC 6051a) as probiotic product significantly improved the GP and beneficially affects the gut bacterial community in SBM and CWP diets.

Key words: cowpea, probiotic, broiler performance, gut microflora.

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Dynamic changes in the main class of immunoglobulin and digestive disorders in suckling piglets

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After farrowing (AF), the offspring lose their microbiological sterility by passing into a microbe-rich environment; however, they are provided with maternal immunity by colostrum. The immunoglobulins (IgA, IgG and IgM) are primary colostrum protein components. In this research, we investigated changes in the main immunoglobulin classes (IgA, IgG and IgM) in piglet plasma and their relationship with diets and composition of sow milk. Piglet performance and diarrhoea incidence were also assessed. A complete factorial test was performed on 144 piglets. Three diets were tested: i) a basal diet with soybean meal (SM group, 22%); ii) SM plus hempseed (HS group, mix 21.5% SM: 1.5% HS); iii) SM plus peas (Peas group, 16% SM:16% peas). Each diet was \pm a mixture *L. acidophilus* and *L. plantarum*. Piglets fed with HS diet had 4.6% higher growth performances compared to SM group. Milk Ig was significantly correlated with fatty acids (Σ n-3 and Σ n-6). In colostrum, the Ig level was higher than in milk. At day 5 AF, the IgG concentration was 35% lower than on the first day, and the decreasing trend continued until 21 days. A linear decreasing by 51% at day 5 than 1st day AF was observed for plasma IgA concentration. The concentration of IgG was significantly impacted by diets. The additive supplements did not modify the level of plasma Ig. The piglet's diet rich in n-3 PUFA by HS incorporated, led to a lower rate of diarrhoea. The bacterial supplement potentiated these effects.

Keywords: immunoglobulin, diarrhoea, plasma, milk, piglets

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**Some aspects of utilization of bioactive preparation from yeasts on
the reproductive parameters of pigs**

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In this paper, the results of study of the influence of the biologically active manoprotein preparation, obtained from biomass of brewer's yeast, on sows in the second gestation period, in order to improve productive characteristics and reproduction indices. Thus, the purpose of this research was to evaluate the influence of manoprotein preparation biologically active, obtained from yeast, on the productive and reproductive parameters of pregnant sows.

The results of the research showed that at birth, in the control group (LM), they were obtained in average 10.8 live piglets, and in the experimental group (LE) - 12.4, viability of piglets at 21 days in LM was 10.4 live piglets and in LE - 12.0. Thus, we can mention that the results obtained will make a real contribution to efficiency the process of reproduction and growing of pigs. Supplementation of the basic feed ration for sows 30 days before calving and 10 days after calving, with manoprotein preparation obtained from yeast biomass from beer industry waste in 10-15 ml per head / day, increases the number of live piglets in calving by 1.6 heads and reduces the number of stillborn piglets by 1.8 compared to the control group. It was established that supplementing the basic ration of sows, 30 days before and 10 days after calving, with manoprotein preparation in a volume of 10-15 ml per head / day, acts on animal metabolism, increasing the growth energy of young pigs.

Key Words: mannoproteins, bioactive preparations, pigs, reproduction, yeast extracts

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“New biologically active microbial preparations for increasing the reproductive and productive potential of animals of zootechnical interest”, financed by ANCD

Diet supplementation of encapsulated extracts of oregano, garlic, crithmum and camelina on meat composition and gene expression of certain liver enzymes

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The aim of the present study was to evaluate the effects of dietary supplementation of a mixture of extracts of aromatic and medicinal plants and their encapsulated forms in cyclodextrin on meat quality characteristics and some changes in gene expression of some liver enzymes of broilers. 120 one-day old chicks were reared for 35 days allocated in 3 groups; Control Group A (CL) was fed basal diets (based on maize and soybean meal) in mash form, without anticoccidials or antibiotics. Groups B (HERB) and C (HERB-CD) were further supplemented with 0.1% of an equal mixture of herbs in free form or in cyclodextrin, respectively. At the end of the trial, all birds were slaughtered and breast, thigh and liver samples were collected, analysed and the expression of five target genes, Methionine synthase (MTR), Tyrosine aminotransferase (TAT), Spermidine synthase (SMS), Methionine sulfoxide reductase (MSRB1) and Betaine homocysteine S-methyltransferase (BHMT) were evaluated. Inclusion of herbal extracts in cyclodextrin in diets resulted in a decrease in fat and a slight increase in protein content in both breast and thigh meat, while moisture remained unaffected. The lipid oxidation status was improved in both tissues of chickens of both groups fed the herbal supplemented diets, whereas protein oxidation improved in group C breasts and thighs. After normalization to β -actin expression, quantitative real-time PCR analysis revealed an induction ($P \leq 0.05$) in the expression of MTR, SMS and MSRB1 genes in the liver of both treated groups, with the greatest induction observed for SMS with a 2.7-fold greater gene expression levels in the group with cyclodextrin. No changes ($P \leq 0.05$) were observed for the TAT and BHMT genes in the herbal groups compared to the control. It is possible that the supplementation of broilers' diet with herbal extracts, especially in cyclodextrin encapsulation may have a positive effect on certain enzymes active in the process of methionine synthesis revealing an improved liver function.

Keywords: diet, aromatic plants; liver gene expression, broilers

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Effect of oregano, garlic, crithmum and camelina encapsulated extracts on growth performance and some welfare traits of broilers

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The utilization of herbal extracts and essential oils in animal nutrition has been regarded as one of the most promising alternative to antibiotics as feed additives development in feed production, potentially serving as a viable alternative to increasingly fluctuating traditional commodities. This trial examined the dietary use of a mixture of herbal extracts and their encapsulated forms in cyclodextrin on the growth performance and some environmental and welfare traits of broilers. In a 35 day trial, 120 one-day-old mixed broiler chicks (Ross-308) were randomly allocated to 3 groups, housed in floor pens with wheat straw litter. Commercial breeding, management and vaccination procedures were employed. The Control Group A (CL) was fed basal diets (based on maize and soybean meal) in mash form, which did not contain anticoccidials or antibiotics. The diets of Group B and Group C were further supplemented with a mixture of herbal extracts (HERB) and the same herbal extracts encapsulated in cyclodextrin (Herb-CD) respectively. Data was analysed with ANOVA using SPSS v25 software. Body weight (BW), feed intake (FI), average daily gain in body weight (ADG) and feed conversion ratio (FCR) during the period of 1-10d, 11-24d, 25-35d and 1-35d were evaluated. Litter score, dry matter in litter, pododermatitis and feather score were also assessed at the end of trial. Results showed that BW and FCR values were superior in HerbCD group compared to CL group, although FI did not differ among the groups. Litter score, dry matter in litter and feather score did not differ among the groups either, however, pododermatitis score was lower in HerbCD compared only to control group that in turn did not differ to the HERB.

Keywords: diet, aromatic plants; performance parameters; broilers

Acknowledgments: This research has been co-financed by Greece and the EU (European Regional Development Fund) in context of “Research – Create – Innovate” Operational Program “Competitiveness, Entrepreneurship and Innovation (EPAnEK)”, NSRF 2014-2020. Project Code: T7ΔKI-00313 (MIS 5050735). Acronym: GreenPro.



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