# WORLD'S POULTRY SCIENCE JOURNAL

# education organization research





**Conference on a Cruise** 

The 5<sup>th</sup> Mediterranean Poultry Summit Of the WPSA

Oct. 20-25, 2016 Italy - Spain - France

PROGRAM

5<sup>th</sup> Mediterranean Poultry Summit Of the Mediterranean Poultry Network of the WPSA Italy – Spain - France October 20 – 25, 2016

# **Book of abstracts**

Supplement of the World's Poultry Science Journal

Editors N. Daghir, H. Khouri and G. Sayegh

# Hosted by: French Branch of the World's Poultry Science Association Italian Branch of the World's Poultry Science Association and

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#### Welcome to the 5<sup>th</sup> MPS

As president of the Mediterranean Poultry Network, I would like to extend to all of you our heartiest welcome to the 5th MPS "The Conference on a Cruise" sailing from Italy to Spain and then to France and back to Italy. I hope that you will enjoy this unique summit on board ship cruising through the Mediterranean and that you will benefit from the various sessions that we have organized for you in the scientific program. We have received for this conference a total of 120 abstracts and the reviewers were very impressed with the quality of the work submitted. Only six abstracts were rejected and the remaining 114 were divided into three parts; the first being the 14 invited papers to be presented by international speakers from eleven different countries. The second part of the program consists of 44 oral presentations of 15 minutes each and the remaining 54 papers will be poster presentations. These will be digital posters which is something new for our MPS. All these papers address various topics of importance to the Mediterranean region and the poultry industry at-large. We are also pleased that six graduate students, two from each of the Mediterranean countries; Spain, Italy and Lebanon have submitted papers and will be included in the program. We hope that in future conferences we can enlarge this involvement of graduate students because these men and women are going to be the poultry scientists of the future.

I want to take this opportunity to thank all the speakers and poster presenters who are joining us from 33 countries and from all five continents. I also want to thank the reviewers for the 120 abstracts received, the members of the scientific committee and the members of the organizing committee for the many hours and days of hard work to make this meeting a success.

Our sincere thanks to all sponsors for their support because they made this conference possible and for all participants for joining us on this new venture. We wish you all a very fruitful meeting and a most enjoyable cruise.

Nuhad J. Daghir, President

Nutrat. Doplin

MPN of WPSA & Chair of Scientific Committee

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## **Program Outlook**

Thursday, Oct. 20	Port of Savona
16h00	Departure From Savona Heading to Civitavecchia
	(Rome)
	The Captain's Welcome Cocktail
19h30	Dinner and Show

Friday,	October 21	Port of Civitavecchia (Rome)
09:00		Registration
09:00	17:00	Day Off (Rome visit)
17:00	17:30	Opening Ceremony
17:30	18:15	K1- Plenary Session 1 (Economics Studies on the Poultry
		Industry in the Med Regions)
18:15	19:30	O1- Oral Session 1 (Nutrition 1)
19h30		Dinner and Show (Sponsored by Novus International)

Saturday,	Oct. 22	Cruising between Italy and Spain
09:00	09:45	K2 - Plenary Session 2 (Nutrition II)
09:45	10:45	O2 - Oral Presentations (Nutrition II)
10:45	11:00	15 Minutes Coffee Break
11:00	12:00	K3 - Plenary Session (Nutrition III)
12:00	13:00	O3 – Oral Session (Nutrition III)
13:00	14:00	Lunch Break
14:00	15:00	K4 – Plenary Session IV (PreBiotics - Probiotics / Gut Health)
15:00	16:00	O4 - Oral Session IV (PreBiotics - Probiotics / Gut Health)
16:00	16:30	Coffee Break
16:30	17:15	K5 – Plenary Session V (Interactions of Environment and Genetics.)
17:15	18:30	O5 - Oral Session V (Interactions of Environment and Genetics.)
18:30	19:00	P1 - Digital Poster Session I (Economics / Miscellaneous)
19:30	24:00	Dinner and show (Sponsored by Novus International)

Sunday,	Oct. 23	Port of Barcelona
08:30	08:50	K6 – Plenary Session VI (Poultry Housing)
08:50	09:50	O6 - Oral Session VI (Poultry Housing)
09:50	10:10	15 Minutes Coffee Break
10:10	10:30	K7 – Plenary Session VII (Poultry Health)
10:30	12:00	O7 – Oral Session VII (Poultry Health)
12:00	13:00	Lunch Break
13:00	18:00	Half Day OFF (Barcelona)
18:00	19:30	P2 - Digital Poster Session II (Poultry Nutrition)
19:00		Departure from Barcelona to Marseille
19:30	24:00	Dinner and Show

Monday, Oct. 24		Port of Marseille
08:30	10:30	O8 – Oral Session VIII (Miscellaneous)
09:00		Arrival to Marseille
10:15	10:30	15 Minutes Coffee Break
10:30	12:00	O9 - Session IX (Poultry Health 2)
12:00	12:30	Diamond Sponsor Presentation
12:30	13:00	Lunch Break
13:00	18:30	Half Day Off (Marseille Visit)
18:30	19:00	Digital Poster Session III (Poultry Health)
19:00		Departure From Marseille Back to Savona
19:00	19:30	Closing Ceremony
19:30	24:00	Gala Dinner and show
Tuesday	y, Oct. 25	Port of Savona

Tucsuay,	U
9:00	

Arrival and disembarking

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5<sup>th</sup> Mediterranean Poultry Sunnit of the WPSA Italy, Spain and France.

20 – 25 October 2016

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5<sup>th</sup> Mediterranean Poultry Summit of the WPSA Italy, Spain and France.

20 – 25 October 2016

Plenary Sessions (Keynote Speakers) [KI-01]: Economic Studies on the Poultry Industry in the Med Region (ID: 110136) [Netherlands]

#### Perspective for the Poultry Sector in Mediterranean Region

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The Mediterranean countries in North Africa are among the leading poultry meat producers in Africa. After South Africa, Egypt is the second largest producer with 834,000 tonnes in 2013. Morocco, Algeria, Tunisia and Libya follow ranking number 3, 4, 6 and 7 with respectively 599,000, 261,000, 139,000 and 125,000 tonnes. Between 2000 and 2013 annual growth rate in production was between 4% (Egypt) and 7% (Morocco). Export of poultry meat of all mentioned countries is negligible. The situation on imports of poultry meat differs. Egypt had a substantial import of 110,000 tonnes and Morocco, Algeria and Tunisia just had minor imports in 2013. Demand for poultry in North Africa will continue to grow as a result of population increase and higher consumption per person driven by higher income and further urbanization. These changes offer opportunities for local poultry producers. Countries in North Africa with a large population are Egypt (92 million), Algeria (40 million) and Morocco (34 million). For average consumption per person there are wide differences between the countries. In Algeria the consumption is low (7.4 kg), moderate in Egypt (11.6 kg) and Tunisia (14 kg), and relatively high in Morocco and Libya (both around 20 kg per person). In general there is an upward trend in consumption per person. The poultry sector in Turkey showed extraordinary growth in recent years. In 2013 poultry meat production was almost 1.8 million tonnes. The fast increase led to a considerable growth of the exports (395,000 tonnes in 2013), mainly to countries in Africa, West and Central Asia. Also the demand in the domestic market did grow rapidly. Consumption in 2013 was 20.5 kg, compared to 16.9 kg per person in 2008.

Keywords: Economics, Libya, Algeria, North Africa, Tunisia, Morocco, perspectives

[K1-02]: Economic Studies on the Poultry Industry in the Med Region (ID: 110134) [United States]

#### Future of Turkey Industry in the Mediterranean Region

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Turkey meat consumption is increasing in the Middle East / Mediterranean region due to its lean protein content, versatility to blend nicely with many regional spices, availability via import of the meat, and lack of religious barriers. Millions of pounds of turkey meat are imported to the Mediterranean region from Europe, North and South America and sold as tray pack products or further processed and sold as value added and prepared products. According to Orrani Consulting Group 2015 Survey, United Arab Emirates (UAE) turkey meat consumption is increasing approximately 10% per year. The consumption of turkey meat in UAE is about 60% whole body, 12% thigh meat, 10% breast meat, 13% processed products such as ham and smoked breast and 3% as ground turkey meat. Demand for fresh and locally produced turkey meat is high and increasing but local production is limited. There is a perception that producing turkey meat locally in the Mediterranean region is not economical. This perception could be related to many factors such as: turkeys are harder to grow than chickens, require special housing and management, disease sensitive and limited government support. Perception and reality are off because in North Africa (Algeria, Morocco, and Tunisia) turkey production in the last 10 years more than doubled and currently about 40 million turkeys are raised in these countries collectively. Government support in the early stages of the turkey industry development in these countries was critical but currently the industry is self-sustained and very progressive. Production of turkey meat is also common in Israel and Turkey and in its early stages in Iran. The production cost of a pound of live turkey meat in North Africa is about 67 cents while in the US it is about 52 cents. It is not surprising that production cost of turkey meat is higher in North Africa versus the US. Feed and poult make about 81% of the total cost in North Africa versus 73% of the total cost in the US. In the US toms are raised to 45 pounds or more while in North Africa the average market weight is about 40 lbs. The difference in market weight further lowers the cost of production in the US versus North Africa. The potential to produce turkey meat in the Mediterranean region is very attractive as the cost of production declines due to the genetic improvement for weight, yield and feed conversion. Every year there is a savings of two days to reach the same weight with an improvement of 0.3% in breast meat yield and 4 points in feed conversion. Turkey meat production will likely increase in the Mediterranean region to meet the demand of those looking for a healthier diet. A 3-ounce serving of boneless skinless turkey breast contains 26 grams of protein, one gram of fat and Zero grams of saturated fat. That's 8 percent more protein than the same size of serving of boneless skinless chicken breast or trimmed top loin beefsteak.

Keywords: Low cost protein, Good Quality Protein, Turkey Genetics, Middle East Region

[K2-01]: Poultry Nutrition 2 (ID: 110056) [Lebanon]

# Availability, Quality and Utilization of Oil Seed Meals produced in the MENA Region

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The population of the MENA region was 432 million in 2007 and it is estimated that in 2050 this figure will rise to 692 million inhabitants. The poultry industry in the MENA region depends heavily on imported soybeans and soybean meals. About six million metric tons of soybean meal are needed for the production of poultry meat and eggs every year, based on the production of about 8.0 million tons of poultry meat and 3.6 million tons of eggs. Poultry feed prices are consistently increasing because of their dependence on imported soybean meal. In order to decrease dependency of the feed sector on soybean meal, it is essential to find sustainable alternative protein sources. Several countries in the region produce sizeable amounts of oil seed meals that can partially or fully replace soybean meal in poultry rations. Nearly 5 million tons of cottonseed meal, peanut meal, sesame meal, sunflower meal and rapeseed meal are produced yearly in this region. The neighbouring countries of India, Pakistan and Sudan produce over 30 million tons of these meals. This study focused on these five meals in relation to amounts produced, quality and possible levels of use in various poultry rations. Data will be presented on availability, constraints of these meals as replacements for SBM, economic feasibility, and methods of improvement for possible utilization at higher levels. Oil seed meal digestibility, quality, naturally occurring toxins, antimetabolites, mycotoxins, nutrient imbalances, and last but not least prices play a major part in determining the use of these meals for the production of poultry meat and eggs. This paper will also include a review of findings on the nutritive value of these five protein supplements produced in the region.

Keywords: MENA region, Protein sources, oil seed meals, Broilers, Layers

[K2-02]: Poultry Nutrition 2 (ID: 110084) [Lebanon]

#### Recent Research on Selected Middle East Feedstuffs for Poultry

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Climate change and increasing human population in developing countries is causing a great rise in the demand for poultry production in hot climates. Countries located in hot climates including Lebanon are net importers of poultry feed ingredients namely soybean meal and yellow corn. Moreover, high feedstuff price volatility is adding up to the challenge of sustaining the economic profitability of poultry production in hot climates since feed constitutes up to 70% of poultry production cost. This presentation will pinpoint the vital role that locally produced crops in arid and semi-arid climates can play by partially or fully replacing imported feedstuff. Four crops namely Safflower, Faba Bean, Common Vetch and Ervil will be assessed as potential sustainable alternatives feed stuffs to incorporate in poultry feeds. Research data will be presented on recommended processing procedures, inclusion rates, considerations and limitations when using these alternative meals or grains in both broiler and layer diets.

Keywords: Safflower, faba beans, common vetch, ervil, poultry rations

[K3-01]: Poultry Nutrition 3 (ID: 110127) [France]

#### Adapting Trace Element's Nutrition of Birds for Optimizing Environment and Poultry Product Quality

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Trace elements have been poorly considered by poultry nutritionists in the past as shown by the available literature in this area because of the large margin between their requirements and supplementation in poultry and because of the low cost of these essential minerals in the diet (<01%). New environmental considerations and regulations limiting the trace element supply, improvement in analytical methods revealing putative contaminants in mineral sources, new knowledge of trace element roles in bone metabolism, anti-oxidant status, homeostatic regulation, product quality, immunology and availability of novel sources have all renewed interest in this field during the past 15 years and increased studies for optimizing trace element's nutrition especially when considering other parameters than the bird's performance. This review will analyze the interest and the role of some essential trace elements in broilers and hen nutrition, focusing mainly on Zn and Cu and, considering particular functions on I, Se and Mn. Its aim is to underline the main functions of trace elements in growth, bone metabolism, bird immunity, shell quality and the particular requirements for insuring these functions which will determine the current recommendation in poultry nutrition. The impact of trace elements on the environment (plant phytotoxicity) will be considered and means to reduce risk of environmental contamination will be explored by considering the adjustment of mineral dietary supply to bird requirements, phase feeding, the source's availability, gastro-intestinal physiology and interactions of trace elements with other dietary components (phytate, phytase, viscosity). Finally the possibility of poultry product's enrichment in some trace elements for the benefit of human health will be explored.

Keywords: Trace element, Zn, Cu, plant phytotoxicity

[K3-02]: Poultry Nutrition 3 (ID: 110118) [Italy]

#### **Phosphorus Nutrition in Poultry: Past Present and Future**

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Phosphorus is a very important nutrient in poultry nutrition at large, and has always been an important parameter in feed formulation. In fact, since the '40s, the availability of low cost P from mineral and animal sources has been the major limitation for the development of better methods to establish birds P requirements and to evaluate the biological value of P in the ingredients. After the year 2000, three factors contributed to a renewed interest in P: 1) An increasing P pollution problem; 2) BSE crisis and the subsequent ban of TAPs; 3). The increase in price of the P rich minerals from which the current P supplements are produced. With the ban on Transformed Animal Proteins due to the BSE epidemics, the sources of P have been restricted to the mineral phosphates and the P present in vegetable ingredients, scarcely available. On one side, this has forced feed manufacturers into an extensive use of phytase enzymes, on the other it has clearly shown the limits in the general definition of P requirements for the various poultry species. The last one was particularly evident around 2006, when a drought in Australia pushed wheat prices up causing a massive increase in wheat planted surface worldwide in the following year. This in turn created a surge in the demand for P fertilizers and the result was an 8-fold increase in the price of phosphate rocks from 2006 to 2008. A decline followed but phosphate rocks prices never came back to the original prices. The limits to the amounts of phosphate rocks exploitable for the production of P fertilizers and P feed supplements have become more and more evident, and available reserves are not enough to meet the consumption projected for the next century, leaving no more space for the waste of resources. The limits of the most widely used system for the evaluation of P biological value in poultry became apparent: the industry had been working with P levels that had been much larger than the requirements of the animals, at least in most of the productive periods and species. There was a definite need for a shared approach to a more realistic P requirement definition and raw material P value in practical poultry nutrition. The WG2 of the EF (WPSA) decided to appoint an "ad hoc" panel, called "P Panel" to deal with the problem. All WG2 members were invited to be part of it, and the invitation was extended to all the companies/organizations that showed interest. If the P Panel were to agree on a position, the WG2 would have made this public for the interest of everyone. The WG2 published in the 2013 September issue of World's Poultry Science Journal, a recommendation about the "Determination of P Availability in Poultry" that we hope will be helpful in the creation of a "P system" that will allow practical poultry nutritionists worldwide to produce less expensive and more effective diets for their animals, with the best possible use of the available P resources.

Keywords: Phosphorus, Pollution, Phytase, P, Work group 2, WG2

[K3-03]: Poultry Nutrition 3 (ID: 110121) [Switzerland]

#### **Optimum Vitamin Nutrition for Better Health and Performance of Poultry** Gilbert Weber

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Vitamins are essential micronutrients, required for optimum health and normal physiological functions such as growth, development, maintenance or reproduction. Vitamins are divided into two groups: the fat-soluble group includes the vitamins A, D3, E and K, while the vitamins of the B-complex (B1, B2, B6, B12, niacin, pantothenic acid, folic acid and biotin) as well as vitamin C are classified as water-soluble. As most vitamins cannot be synthesized by poultry, they must be obtained from the feed. Fat-soluble vitamins may be deposited in the animal body, while water-soluble vitamins are not stored and excesses are rapidly excreted. Vitamin requirements of poultry are dynamic and may change with further genetic developments of high performing breeds, modifications in nutrition or adaptations in production systems. The vitamin levels, recommended by reputable organizations such as NRC are certainly sufficient to prevent clinical deficiencies, but do not support optimum health, performance and welfare of modern hybrid lines. It is well established that several vitamins modulate the activity of the immune response, which represents the first line of defense against infectious diseases. Other vitamins are regulating the homeostasis of minerals and thus support the development of optimum bone strength and skeletal frame. Some antioxidant vitamins reduce the negative impact of stresses of various origin and ultimately improve performance and welfare of poultry under challenging production conditions. In addition most dietary vitamins can be deposited in meat and eggs of supplemented poultry and thereby improve the nutritional value of the end products. In order to entirely exploit the genetic potential of recent genotypes, to strengthen the disease resistance and to improve welfare as well as to optimize meat and egg quality, the vitamin nutrition of poultry must be regularly reviewed. The Optimum Vitamin Nutrition (OVN) concept provides practical recommendations for feeding poultry high quality vitamins in the right amounts and ratios, appropriate to their life stage and growing conditions. Supplementing feed with vitamins in accordance to OVN is the safest and most economical way to maintain a high level of welfare and health as well as to achieve good performance and high product quality in poultry production.

Keywords: vitamins, performance, health, welfare, poultry

[K4-01]: PreBiotics - Probiotics / Gut Health (ID: 110119) [United States] I Feed Additives and Their Impact on Gut Health

#### Interactions of Nutrients and Feed Additives and Their Impact on Gut Health M. Sifri

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The term; "unidentified growth factor" does not have the same acceptance as it had 25 years ago or beyond. Until today, feed additives are still primarily referred to as antibiotic growth promotants (AGP) in some parts of the world. Currently, feed additives are being defined more precisely in terms of their composition and function Their influence may involve a modification of the profile of the gut microflora, gut immunity, gut physiology, nutrient digestibility or interaction at a multitude of areas. Such additives may include probiotics, prebiotics, enzymes, acidifiers, complex minerals, vitamin derivatives, amino acid derivatives, antibodies, short and medium chain fatty acids, plant extracts and others. Additives are being developed to provide a quantitative contribution in performance. It is rewarding that there are tremendous tools and techniques to help define the chemical composition, structure and mode of action of feed additives. Such advancements continue to help quantify the relative value of modifiers and determine their fit as critical components of nutrition and gut health.

Keywords: Gut health, additives, nutrients, interactions

[K4-02]: PreBiotics - Probiotics / Gut Health (ID: 110129)

[Brazil]

#### New Advances on Feed Additives (Probiotics and Prebiotics) to Replace Antibiotics as Growth Promoters

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For many decades, Antibiotic Growth Promoters (AGP) have been traditionally used worldwide in sub-therapeutic levels to counter microbial infections in poultry and improve their performance. But due to public health concern on the overall increase in antimicrobial resistance, the use of AGP is either restricted or out rightly banned in several countries. Thus, alternatives to AGP have been searched and developed. Among the candidates for replacement, Probiotics and Prebiotics have the most widespread acceptance at this time. Probiotics are mono or mixed cultures of live microorganisms, which include beneficial effect on the host by improving the properties of the indigenous microflora in the gut. Killed bacteria cultures as well as bacterial metabolites have been included in the definition. Prebiotics are generally defined as non-digestible polysaccharides and oligosaccharides that can positively affect the animal organism by stimulating the activity and growth of beneficial native bacteria in the gastrointestinal tract and eliminate the pathogenic ones. Thus, serve as substrate for beneficial bacteria. Lactose. mannanoligosaccharide (MOS). fructooligosaccharides (FOS), galactooligosaccharides (GOS), yeast cell wall parts are the most recognized Prebiotics for poultry. Their beneficial effects are enhanced when Prebiotics are used simultaneously with Probiotics in the form of Symbiotics. Significant variability still exists in their effectiveness. This presentation will review the use of Probiotics and Prebiotics as AGP alternatives, the potential mechanism of their action, and discuss some recent data on the effects of these supplements in poultry nutrition.

Keywords: Probiotics, Prebiotics, Antibiotics, Growth Promoters, Gut Health

[K4-03]: PreBiotics - Probiotics / Gut Health (ID: 110132) [Spain]

# Effects of Supplemental Sources of Fiber on the Development of the Gastrointestinal Tract and Growth in Broilers

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Traditionally, dietary fiber was considered an anti-nutritional factor in poultry diets, because of its negative impact on nutrient digestibility and feed intake. Consequently, most nutritionists restricted the amount of fiber in diets for young broilers to less than 3.0 to 3.5%. Recent research, however, has shown that this might not be the case under all circumstances, and that the inclusion of moderate amounts of fiber might improve growth and feed efficiency in broilers. The benefits of additional fiber in the diet were more evident when insoluble sources, such as oat hulls and sunflower hulls, rather than soluble sources, such as sugar beet pulp are used. Moreover, the benefits were more pronounced when the original diet had a low fiber content, as is often the case in pre-starter diets for broilers. The inclusion of insoluble fiber sources into low fiber diets improved the development of the organs of the gastrointestinal tract (GIT), especially that of the gizzard, and increased enzyme production and nutrient digestibility with effects more pronounced in broilers than in pullets, and in young than in adult birds. In addition, insoluble fiber improves the anti-peristaltic movements of the GIT, facilitating the mixing between nutrients and enzymes and reduces gizzard pH which in turn favors pepsin activity and reduces the multiplication of pathogens along the intestines. As a result, the quality of the excreta and the health status of the birds improve, with a reduction in the incidence of wet litter problems and carcass condemnations. In summary, nutritionists should be aware of the importance of formulating diets for broilers taking into account neutral detergent fiber content of the ingredients. Broiler formulas should not have an excess of fiber because of its negative impact on palatability and feed intake but should also avoid low levels of fiber because of its negative effect on GIT function and animal health.

Keywords: Fiber, Gastrointestinal Tract, Growth, Broilers

[K5-01]: Environment / Genetics interaction (ID: 110126) [Israel]

#### Genotype-by-Environment Interaction: Adaptation of Broilers to Hot Climate Avigdor Cahaner

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Modern 'industrial' broilers are characterized by rapid growth to high marketing body weights, high rate of feed intake and metabolism, and elevated internal heat production. These are internal stressors enhancing the effects of external heat stress. Hot conditions in broiler houses, common in the Mediterranean region, hinder the dissipation of excessive internal heat, leading to elevated body temperatures and depressed appetite. Lower feed intake reduce growth, especially of the breast muscles, leading to lower yield and poorer quality meat. Lower growth rate also results in poorer feed conversion ratio (FCR). Additionally, hot conditions often lead to higher rates of morbidity and mortality. These negative effects of hot climate are partially alleviated by management practices associated with higher costs or lower efficiency: climate-controlled housing increase costs per square meter, and low stocking density requires more or larger facilities. In these approaches, the fast-growing broilers adapt to the hot climate by changing their environment. Alternatively, because broilers suffer from heat stress only when reaching body weight of about 1.5kg, the stress can be avoided by marketing at lower body weight. However, this approach increases the relative costs of day-old chicks and of processing. Because heat susceptibility is higher in broilers with rapid growth and high body weight, genetically slow-growing and smallbody broilers are better adapted to hot conditions. However, their adaptation comes with extra costs due to the need for more facilities, poorer FCR, and lower meat yield. Another genetic approach to mitigate heat stress is based on enhancing the dissipation of excessive internal heat by genes that reduced or eliminate feather coverage. Naked neck broilers exhibit partial heat tolerance, and full heat tolerance was exhibited by featherless broilers. Under hot conditions, even at high stocking-density, featherless broilers eat and grow normally, with good FCR and high meat yield.

Keywords: Genotype, Environment, Adaptation, Hot Climate, heat tolerance

[K5-02]: Environment / Genetics interaction (ID: 110053) [Turkey]

#### Acclimatization to High and Low Temperatures

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It is very well known that ambient temperature has a major impact on poultry production. Heat and cold stress can occur at temperatures above and beneath the upper and lower critical temperatures, respectively. In case of heat exposure, growth rate and feed consumption decrease in broilers and it has a highly detrimental effect on egg production and egg shell quality in laying hens. Exposure to low temperatures results in increased feed consumption, but it also results in decreased performance in broilers and laying hens. Thus, both may lead to economic losses and alter animal welfare. Different strategies have been studied in order to reduce the detrimental effects of heat and cold stress. Temperature acclimation during embryogenesis has recently received experimental attention as an effective way. This phenomenon refers to chickens subjected to higher or lower incubation temperatures that may acquire tolerance to higher or lower temperatures during postnatal life, respectively. This hypothesis is based on the facts that: 1. Temperature experienced during embryonic development may influence physiological responses to the environment and 2. It may have positive effects by improving thermotolerance. Previous studies showed that temperature during critical developmental phases that affect gene expression has persistent effects on thermal acclimation of chickens. This critical period is linked to the development and maturation of the hypothalamus-pituitary-thyroid axis and hypothalamus-pituitary-adrenal axis. The mechanisms involved in thermotolerance acquisition include changes in pathways regulating energy metabolism resulting in a change in heat production, modifications in stress markers, changes in anti-oxidant pathways and membrane alterations. The aim of this paper is therefore to review 1. Whether and how temperature experienced during embryogenesis affects temperature tolerance of broilers and laying hens and 2. The physiological mechanisms underlying adaptive temperature response.

Keywords: Broilers, layers, acclimation, temperature
[K6-01]: Poultry Housing (ID: 110062) [Lebanon]

### Advancement of Biosecurity with Appropriate Poultry House Structure and Innovative Ventilation

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While Biosecurity measures were hardly known or implemented in almost all countries of the world prior to the onset of the twenty first century, the emergence of pathogenic diseases such as avian influenza and virulent Newcastle has necessitated the revision and upgrading of the Biosecurity measures in all types of poultry farming. Measures that necessitated the upgrading include minimum distances between farms depending on the type, improved house structures that prevent rodent and wild bird entrance, tight fencing of each farm, all-in-allout with one type and one age of birds at any time, appropriate attendant housing on the premises with minimal vacations, imposed showering and change of clothes for all staff etc. This paper will concentrate on appropriate poultry house structures and staff accommodation as well as on an implementation of positive pressure forced ventilation systems through specialized filters that would trap bacteria and viruses thus reducing to a minimum possible introduction of disease agents to the poultry population within the house. The positive pressure ventilation system has been already implemented on a commercial scale by the Agricultural Development Co. Tanmia in Lebanon for the first time in the world. It has so far shown excellent results in mortality, feed conversion, EEF as compared to the negative pressure ventilated broiler houses, in light of the predominant exposure to H9N1 and virulent ND in the country.

[K7-01]: Poultry Health 1 (ID: 110128) [Germany]

#### Avian Influenza in Poultry: A Never Ending Problem?

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Avian influenza (AI) is a highly contagious disease of many kinds of poultry, wild and cage birds and associated with severe economic losses. In addition, the infection causes periodically epidemics in humans, horses, pigs, seals, whales, and a variety of birds. AI viruses are divided into subtypes on the basis of the antigenic relationships of the surface glycoproteins, haemagglutinin (HA) and neuraminidase (NA). To date, 18 H and 11 N subtypes of avian influenza viruses (AIV) have been detected. AI viruses are divided into low pathogenic (LPAIV) and highly pathogenic (HPAIV) causing up to 100% morbidity and mortality. "Antigenic drift" (antigenic shift or re-assortment) of AI occurs by exchange genes from different subtypes. This is commonly regarded to be the driving mechanism for AI epidemics from one year to the next and may result in severe pandemics. Clinical signs may include high mortality, ruffled feathers, depression, diarrhoea, sudden drop in egg production, cyanosis of comb and wattles, oedema and swelling of head, blood-tinged discharge from nostrils, respiratory distress, incoordination and pin-point haemorrhages mostly seen on the feet and shanks. The control is based mostly on enforcement of biosecurity measures, surveillance, movement restriction and stamping out of infected flocks. The efficacy of vaccine is very much dependent on the quality of the product, antigen concentration as well as the correct application. A universal solution for prevention and control of avian influenza does not exist. Generally, applying of most of above mentioned measures alone is of little value, unless they are accompanied by improvements in all aspects of management and bio-security. Several challenges and problems facing the control of AI in poultry will be discussed.

Keywords: Avian influenza, AI, Viruses



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[O1-01]: Poultry Nutrition 1 (ID: 110138) [Spain]

### Effect of Adding a Protease in Broiler Diets with 500 or 1000 FTUs of Phytase and a NSP's blend; or in Diets with a Mannanase Added to Basal Diets Containing 1000 FTUs of Phytase

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Two trials tested the effect of a protease (Cibenza DP100®; PR) fed to broilers in combination with other feed enzymes. Unsexed Cobb500 1d-old chicks were fed Corn/SBM/MBM or Corn/SBM/DDGS/wheat bran mash basal diets in trial 1 (E1) and 2 (E2) for 42d. E1 was a 2x3 factorial composed of 6 Trt of 7 pens of 45 birds each, with 2 dietary levels of Phytaverse® (Phy), 500 or 1000 FTUs. The former level was formulated at 0.15% of Av.P. and Ca, and AA and ME as suggested by Novus, and the latter at 30% higher values than 500 FTUs across nutrients. All E1 diets had a blend of carbohydrates (Cibenza CSM®). E2 had 6 trt of 6 reps of 45 birds each in a 2x3 factorial with a mannanase (Cibenza DE200®; Man) fed at 0 or 800 units/g, in basal diets with 1000 FTUs of Phy formulated as in E1. Each Phy or Man level (E1 or E2, respectively) was fed on 3 types of diets: 1) positive controls (+Ctrl), 2) negative controls with less AA and ME than +CTRL(-Ctrl), and 3) -CTRL plus 500g/MT of PR. AA and ME differences between +CTRL and -CTRL corresponded to the PR matrix values suggested by Novus. Carcass traits (from 5 birds/pen) and performance (pen averages) were analyzed by ANOVA and Tukey Test. Interactions between either Phy or Man vs. PR were tested as a 2x2 factorial without +CTRL. In E1 at 42d, no Phy x PR interaction was seen for performance (<0.05). Adding PR improved BWG & FCR at levels similar to +CTRL, and greater than -CTRL (P<0.05). Feed intake was unaffected by Trt (P<0.05). Carcass and breast weight improved with PR the former being greater in diets with 1000 FTUs (P<0.05). Trt did not affect carcass yield, and breast yield was greater in diets with PR and 500 FTUs (P<0.05). In E2 at 42d, there was no PR x Man interaction for performance (P>0.05). Adding PR showed better BWG and FCR vs -CTRL, and +CTRL showed intermediate values irrespective of Man use (P<0.05). Similar carcass weight and breast yield and weight were seen between +CTRL and PR irrespective of Man use, and unexpectedly -CTRL had the highest carcass yield in diets with Man (P<0.05). These results suggest that Protease can be used in broiler diets with either 500 or 1000 FTUs Phy and a blend of NSP's, or 1000 FTUs with Man.

Keywords: phytase, protease, mannanase, broilers, enzyme blends

[01-02]: Poultry Nutrition 1 (ID: 110112) [Germany]

### Effect of Soybean Processing Conditions and Enzyme Supplementation on Growth Performance of Broilers Fed Corn/Soy-Based Diets

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The aim of the present experiment was to examine the effect of soybean processing conditions and a combination of dietary exogenous xylanase, amylase and protease (XAP) on the performance and carcass characteristics of broilers fed corn/soybean meal-based diets. The experimental design was a 3 x 2 factorial arrangement of treatments evaluating 3 soybean processing conditions (normal cook (SBM1), extended cook time (SBM2) and shortened cook time (SBM3)) and two levels of enzyme supplementation (without or with XAP, to provide 2000 U of X, 200 U of A, and 4000 U of P/kg diet). Single source of soybean was used to produce the 3 tested soybean meals (SBM). Each diet was fed ad libitum to 8 pens of 40 male broilers, each from day 1 to 49. Data were subjected to two-way ANOVA and means were separated by Student's t-test. Processing conditions resulted in 3 levels of trypsin inhibitor and protein dispersibility index (5200, 3700 and 8000 TIU/g; 22.6, 19.9 and 24.1% for SBM1, SBM2 and SBM3, respectively). No interactions (P>0.05) were observed for any of the measured parameters at any period. Soybean processing condition and enzyme supplementation had no effect (P>0.05) on weight gain, feed intake and carcass characteristics. Enzyme supplementation improved (P<0.05) feed conversion ratio compared to unsupplemented diets (1.931 vs 1.952) over the entire period (1-49d). In conclusion, under the conditions of this study, SBM processing duration had no effect on broiler performance and carcass characteristics. Dietary supplementation of the combination of xylanase, amylase and protease improved broiler feed conversion ratio regardless of the soybean processing conditions tested in this study.

Keywords: Soybean processing, enzymes, broilers, performance

[01-03]: Poultry Nutrition 1 (ID: 110042) [Iran (Islamic Republic of)]

#### Effect of Acidifiers and Saturated Fat Sources on Performance, Carcass Characteristic and Nutrient Digestibility of Broiler Chickens

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The aim of this study was to evaluate the effect of acidifiers and saturated fat sources on performance, carcass characteristic and nutrient digestibility of broiler chickens. In a complete randomized design, 480 day-old Ross broiler chickens were randomly divided into 12 treatment groups, each in four replicates of 10 chicks per replicate. Two fat sources (Animal fat as tallow, T and vegetable fat powder as ERP10TM, E) at a level of 5% each and two acidifiers in powder form (a brand name of mixture of tri, di, and mono butyrine, C4 and citric acid, CA) at 0.15 and 0.30% of C4 and 0.5 and 1% of CA were used to replace fat sources to make 8 rations. The other 4 diets were prepared using a mixture of 2.5% T and 2.5% E blended with either C4 or CA at the above mentioned fat replacement levels of each acidifier. Results showed that average live body weight numerically was higher in chickens fed diet containing mixture of two fat sources, T+E and 1.0% CA. Supplementation of 0.3 % C4 to the diet containing E decreased feed intake (P < 0.05). The lowest feed to gain ratio was obtained when two fat sources used with C4 or CA at 15-21 days of age (P < 0.05). Nutrient digestibility improved when the two fat sources were mixed together and 0.3% C4 and 1.0% CA partly replaced these fat sources. In conclusion, the mixture of T+E along with 0.3% C4 or 1.0% CA manifested synergistic effects and improved broiler performance and nutrient digestibility.

Keywords: Fat sources, acidifiers, performance, digestibility, broilers

[01-05]: Poultry Nutrition 1 (ID: 110023) [Iran (Islamic Republic of)] ivalency of Bacillus Subtilis Spore for

# Estimation of Metabolisable Energy Equivalency of Bacillus Subtilis Spore for Male Broiler Chicks

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Feed charges have a considerable percentage of costs in livestock production, especially up to 75-80% for poultry. Therefore, feed additives were investigated in the last years to increase feed efficiency. Probiotics are one of the most common feed additives in poultry nutrition. There are many studies about the effects of probiotics on performance of broiler chickens, but none has evaluated nutrients equivalency values of probiotics. Therefore, the aim of this study was to evaluate the metabolizable energy (ME) equivalency value of Bacillus Subtilis spore (GalliPro) by using regression response equations and its potential for decreasing dietary ME content and feed cost. One hundred seventy six day old male chicks (Ross 308) were used. Graded levels of ME and GalliPro were used to derive the regression equation in this experiment. Dietary treatments contain a basal diet (2800 kcal/kg), graded levels of ME (2850, 2900, 2950, 3000 and 3050 kcal/kg) and graded levels of GalliPro (Bacillus Subtilis  $4 \times 109$  CFU/g DSM 17299) added to basal diet (0.05, 0.1, 0.15, 0.2 and 0.25 g/kg). Completely randomized design, with 11 treatments was used. Each dietary treatment had 4 replicates with 4 chickens per cage. Linear equations were generated for GalliPro and ME. The derived regression equations of body weight and FCR for ME were set to be equal to those obtained for Gallipro. GalliPro equivalence value for ME was calculated by subtracting the obtained value from ME content of basal diet. The results indicated that ME value of Gallipro decreased by age. In comparison to basal diet, added GalliPro significantly improved body weight and feed conversion ratio. Metabolizable energy equivalency of GalliPro for FCR and body weight at 42 days of age was 360366 and 485823 kcal/kg respectively.

Keywords: Broiler chickens, Bacillus Subtilis (GalliPro), Metabolisable energy equivalency

[O2-01]: Poultry Nutrition 2 (ID: 110137) [Brazil]

#### Dose Response of Organic Zn Chelated with 2-hydroxy-4-methylthio Butanoic Acid (HMTBA) on Performance, Carcass Quality, Gut Health, and Immunology of Male Broilers

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An experiment was conducted to evaluate the effect of increasing levels of Zn-HMTBA chelate (Novus International Inc.) on performance, carcass, and meat quality traits, gut health, and immune response in broilers. A total of 2,960 Cobb 500 male chicks randomly allocated to 7 treatments and 10 replicates were used. A density of 12.2 birds/m2, reused litter, vaccination (IBD at d 1), and commercial-like feeder space were imposed. Broilers were fed an isonutritional corn-soy diet across treatments except for Zn, using a 3 feeding phases program: Starter (1 to 14 d), Grower (15 to 28 d), and Finisher (29 to 38 d). Seven levels of Zn-HMTBA chelate were fed from 0 to 96 ppm in grades of 16 ppm, and methionine levels were adjusted to account for the HMTBA content of Zn-HMTBA. Carcass and meat quality were evaluated at 38 d in 4 birds randomly selected per pen. The ileal index on histological changes of intestinal villi (ISI) was obtained from 1 bird/pen as an indicator of gut health. Cell mediated and humoral immune responses were tested by blood flux cytometry and IBD titres, respectively. ANOVA and regression analyses were performed. Qualitative parameters and incidence of lesions were analyzed by the Kruskal-Wallis test. Production efficiency, BWG, and livability were improved linearly with Zn-HMTBA addition in all feeding phases (P < 0.05). The FCR decreased linearly at 14 and 28 d (P < 0.01). Cooking loss, carcass and thighs yields (%) also improved linearly. Breast weight and yield increased with Zn-HMTBA addition (P < 0.05) while breast pH, footpad lesions, white striping, and wooden breast score and occurrence were not affected. Skin scratches size reduced linearly in more than 5 cm with an increased Zn-HMTBA level. The incidence of meat bruises dropped vs Control by 73% and 67% with 48 ppm and 80 ppm Zn-HMTBA, respectively. Zn-HMTBA improved (P < 0.0001) gut health and functionality (ISI) at 38 d. Three populations of lymphocytes increased linearly (P < 0.05). In conclusion, Zn-HMTBA chelate can improve performance, carcass yield, meat quality, gut health, and immune responses of broilers.

Keywords: Chelated Zinc, Gut Health, immune response, Broiler

[O2-02]: Poultry Nutrition 2 (ID: 110100) [Spain]

#### Effects of Source and Level of Copper on the Performance and Organs Copper Stores in Broiler Chickens

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Prophylactic concentrations (125 to 250 ppm) of dietary Copper improve broilers performance, mainly through antibacterial or bacteriostatic properties. Higher amounts may interact with phytate and limit the ability of phytase to hydrolyze phytic phosphorus (PP). Nevertheless, these effects could depend on the nature of the Cu source. The present study was designed to compare the effect of two sources of Cu, copper sulphate (CuSO4) and dicopper oxide (Cu2O, CoRouge®) at 3 levels of Cu (15, 150, 300 ppm) in the diets. For this purpose 576 one-day male broiler chicks were divided into 48 groups each of 12 chicks (6 trt x 8 replicates). Body weight (BW) and feed intake were recorded weekly up to d 35. One bird per replicate was euthanized on d 35 post hatch, skin fat and breast muscle were sampled, and liver and kidney were collected and weighted for Cu determination. Copper sources were evaluated in vitro to measure solubility, PP hydrolysis by phytase at pH 2.5, 4.5 and 6.5. Feed conversion ratio was increased (P < 0.001) for chickens supplemented with 300 ppm from CuSO4 in comparison to those with 300 ppm from Cu2O (2.19 vs. 1.84, respectively). The use of 300 ppm from CuSO4 reduced (P = 0.001) BW on d 14, 28 and 35 and increased (P =0.04) liver Cu content in comparison with 300 ppm from Cu2O. The use of 300 ppm, either from Cu2O or CuSO4, increased (P < 0.001) Cu accumulated in kidney and breast muscle in comparison to 15 and 150 ppm. Including a level of 300 ppm from CuSO4 reduced PP solubility (68.66%) in comparison to Cu2O (97.41%). Increasing the levels of Cu from both sources reduced PP hydrolysis by phytase at pH=4.5 and 6.5. In comparison to CuSO4 dietary levels of 150 and 300 ppm Cu from Cu2O are adequate to ensure broiler growth performance with minimum accumulation in some organs.

Keywords: Broiler, Copper sulphate, Dicopper oxide, Phytate

[02-03]: Poultry Nutrition 2 (ID: 110047) [New Zealand]

#### Separate Calcium Feeding and its Interaction with Phytase in Broilers

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The interaction between separate calcium feeding and phytase on the performance, ileal digestibility (CAID) of nitrogen (N), starch, fat and, total tract retention (TTR) of calcium (Ca) and phosphorus (P) in broilers was investigated. Five dietary Ca concentrations (1.3, 4.3, 7.3, 10.3 and 13.3 g/kg) and two inclusion levels of phytase (0 or 1000 units [FYT/kg] of feed) were evaluated in a  $5 \times 2$  factorial arrangement of treatments. All diets were formulated to be equivalent with respect to total and non-phytate P contents. One-day-old male broilers (Ross 308) were allocated to 48 cages (8 birds/cage), and cages were randomly assigned to 10 dietary treatments. Birds were also provided with a source of Ca in a separate feed trough. Increasing dietary Ca concentration decreased (P < 0.05) weight gain and feed intake in diets without phytase with a marked reduction in the diet with 13.3 g Ca/kg, whereas in the phytase-supplemented diets, the reduction in both weight gain and feed intake was gradual up to 13.3 g Ca/kg. Addition of phytase lowered (P < 0.01) feed per unit gain of birds at all dietary Ca concentrations. Over the 21 d trial period, consumption of the separate Ca source was reduced (P < 0.001) by increasing dietary Ca concentration. Increasing dietary Ca above 4.3 g/kg decreased (P < 0.05) the total Ca intake (Ca from separate source plus Ca from feed) in diets without phytase, but the total Ca intake in phytase-supplemented diets were similar (P > 0.05). Birds fed 1.3 g Ca/kg diet showed the lowest (P < 0.05) N digestibility, but similar (P > 0.05) to the diets with 4.3 g Ca/kg. Phytase addition enhanced CAID of N (P < 0.05), fat and gross energy. Increasing dietary Ca to 10.3 and 13.3 reduced TTR of P in diets without phytase, while all the phytase supplemented diets showed similar (P > 0.05) retention. The previously reported Ca-specific appetite in modern broilers and the 'phosphoric' and 'extra-phosphoric' effects of phytase were confirmed in this study. The current work also highlighted the additive outcome of separate Ca feeding and phytase addition.

Keywords: Broilers; Nutrient digestibility; Performance; Phytase; Specific appetite

[02-04]: Poultry Nutrition 2 (ID: 110067) [Iran (Islamic Republic of)] ase on Zinc Requirment of Obese Broiler

# Effect of E. coli-derived 6-Phytase on Zinc Requirment of Obese Broiler Breeders

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One hundred and twenty eight Cobb 500 broiler breeder hens (>4.9 Kg) were weighed at 58 weeks of age. In order to deplete the birds from zinc reserve, hens were fed a semi purified zinc deficient (9.5 mg/kg) diet and consumed water contained 35µgzinc/l. After 2 weeks of depletion period, hens were randomly allocated to 8 dietary treatments in a factorial arrangement of phytase (0, 300 U/Kg) and dietary zinc (30, 60, 90, 120 mg/kg) with 4 replicates per treatment. Body weight gain, egg production, egg weight and egg quality were measured during 5 weeks of the experiment. At 65 weeks of age, two hens per replicate were slaughtered and carcass characteristics and ovarian morphology were measured. Added zinc, increased egg weight (P<0.05) and zinc content of both plasma (P<0.0001) and egg yolk (P<0.05). The phytase and zinc which were added to aged broiler breeder hen's diet increased egg weight and decreased the production by affecting the number of attetic follicles (P<0.05). In conclusion increasing the levels of zinc and phytase in the diet of aged broiler breeder hen had negative effect on egg production but resulted in positive effect on both internal and external egg quality. Finally, the zinc requirement which was estimated by different models proposed that the addition of exogenous phytase to diet of aged broiler breeder hens could decrease zinc requirement by releasing 19.2% bounded zinc to phytate. Zinc requirement of aged broiler breeder hens, was estimated at 83.3 mg/kg but with the addition of the mentioned dietary phytase it became 67.3 mg/kg.

Keywords: Zinc Requirement, Obese Broiler Breeder, E. coli-derived 6-Phytase, Late Production

[O3-01]: Poultry Nutrition 3 (ID: 110120) [Italy]

#### Apparent Metabolizable Energy Evaluation of Insect Meals for Poultry Diets

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Insects, due to their high nutritive value are considered very promising in poultry diets. When a new ingredient has to be used, it is of crucial importance for nutritionists and feed companies to know their metabolizable energy to formulate balanced diets. The aim of this study was to determine the apparent metabolizable energy (AME) and the N-corrected apparent metabolizable energy (AMEn) of a partially and a totally defatted Hermetia illucens (HI) larvae meal (HIP and HIT, respectively) for broiler chickens using total excreta collection. Two experimental diets were obtained by substituting 25% (w/w) of a basal diet with HIP (crude protein (CP): 53.04% dry matter (DM); ether extract (EE): 21.81% DM) or HIT (CP: 65.46% DM; EE: 4.59% DM). One-d-old male broiler chickens (Ross 308) were raised on floor pens and fed a commercial broiler diet until 19 d of age. At d 19, sixty birds of uniform body weight were randomly assigned to 15 cages (four birds/cage) and fed the same commercial diet until day 25. From day 26 the birds were fed the experimental diets (five replicate cages/treatment) and feces were collected for 4 consecutive days (31 to 34 d). The AME and AMEn of HIP and HIT meals were assessed. Data were analyzed using Student's t-tests for independent samples, with cage as the experimental unit. Significance was declared at P<0.05. The AME value was higher (P<0.05) in HIP (14.40 MJ/kg DM) than HIT (11.45 MJ/kg DM. The same trend was observed for AMEn (14.18 and 11.17 MJ/kg DM, respectively; p<0.05). The obtained results for AME and AMEn are lower than those reported by De Marco et al. (2015) for full-fat HI (17.38 and 16.60 MJ/kg DM), and full-fat Tenebrio molitor (16.86 and 16.02 MJ/kg DM) meals. These differences may be explained by the different amount of residual ether extract. Both HIP and HIT represent a valuable poultry feed ingredient, with AME values highest or in the same range as those of the main feed ingredient used in poultry nutrition i.e. soybean (9.5 MJ/kg DM) and corn meals (13.5MJ/kg DM).

Keywords: Poultry, Digestibility, AME, insect, Hermethia illucens

[O3-02]: Poultry Nutrition 3 (ID: 110099) [Bangladesh]

### Effects of Dietary Grape Pomaces (Vitisvinifera) Supplementation on the Performance, Total Tract Nutrient Utilization, Blood Profile and Meat Quality of Broilers

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This experiment was conducted to explore the efficacy of grape pomaces (Vitisvinifera) on growth performance, total tract nutrient utilization, blood profile and meat quality in commercial broilers. Four hundred and twenty five Ross broiler chicks (3-d old) were randomly allocated to four dietary treatments for four weeks. Each treatment had five replicates with 20 birds each, except the control which had 25 birds per replicate. The dietary treatments were (1) control (2) 0.5% grape pomace (GP), (3) 0.75% GP, and (4) 1.0% GP supplemented in diet after drying. Supplementation of GP improved (p<0.05) weight gain during 1st and 2nd week only showing quadratic effect but weight gain, feed intake and FCR remained unaffected during 4th week and overall period. The nutrient utilization studies conducted at the end of the feeding trial did not show any effect due to GP supplementation. Plasma levels of glucose, triglyceride, and HDL-cholesterol was not affected, however, total cholesterol was decreased in GP supplemented groups showing quadratic effect as compared to control. Also, plasma immunoglobulins (IgG) levels were higher in GP fed groups showing quadratic trend. Overall, it could be concluded that GP supplementation did not affect performance but was effective in reducing plasma cholesterol and improving meat quality parameters in broilers.

Keywords: Grape pomaces, growth performance, meat quality, TBARS, broilers

[O3-03]: Poultry Nutrition 3 (ID: 110122) [Italy]

#### Growth and Slaughter Performance of Broiler Chickens Fed Diets Formulated with Increasing Inclusion Level of Tenebrio Molitor Meal

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Insects are currently considered as a novel protein source for animals as they provide a high quality and quantity protein. The larvae of Tenebrio molitor (TM) have been considered a promising protein source for broiler chickens. Aim of this study was to evaluate the effects of increasing inclusion of TM meal in broiler diets. A total of 160 male and 160 female oneday-old broiler chicks (Ross 708) were randomly allocated to 4 dietary treatments (5 replicates, 8 birds/replicate). Isonitrogenous and isocaloric diets were formulated by including 0, 5, 10, 15 % TM meal (TM0, TM5, TM10, TM15, respectively). Diets were split into three phases: starter (1-12d), grower (12-25d) and finisher (25d to slaughter). Birds were fed ad libitum. Feed consumption (FC), body weight (BW), daily weight gain (DWG), feed conversion ratio (FCR) and carcass yield were evaluated. At day 40 (for females) and 53 (for males), 10 broilers (2 birds/replicate) from each treatment were slaughtered. Data were analyzed by one-way ANOVA, followed by Duncan's post-hoc test. For females, TM5 displayed the highest final BW (P<0.01). Females fed TM5 had higher (P<0.05) DWG than other groups for both 26-40 and 1-40 days periods. All TM-supplemented diets resulted in higher FC (P<0.05) than TM0 for both 1-12 and 12-25 days periods while cumulative FCR was not influenced by the treatments. In male chickens, TM5 showed the highest final BW (P<0.05) while TM supplementation, regardless of level, improved (P<0.05) FC for 1-12 days, 12-25 days and 1-53 days periods. For males, TM15 diet resulted in lowest (P<0.05) FCR for both 25-53 and 1-53 periods. Carcass yields, for both sexes, were not influenced by TM dietary inclusion. As a conclusion, 5% of TM seems to be a suitable dietary inclusion level by improving, or at least not altering broiler growth and slaughter performance but with a superior impact on females. Consequently, TM supplementation in broiler diets proved to be a good potential novel protein source.

Keywords: Insect meal; Meal worm; Broiler chicken; Performances

[O3-04]: Poultry Nutrition 3 (ID: 110064) [Turkey]

#### The Effect of Dietary Supplementation of Vitex agnus-castus and Vitamin Combinations on Performance and Carcass Traits in Heat Stressed Broilers

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The aim of this study was to investigate the effect of dietary supplementation of Vitex agnuscastus essential oil (VEO) and different vitamin combinations (vitamin A, C and E) on performance and carcass traits of heat stressed broilers. A total of 300 broiler chicks (Ross-308), 21 days old, were divided into 6 groups with 5 replicates. The chicks were exposed to heat stress for 9 hours a day (HS, 34 oC ambient temperature from 08:00 to 17:00) then thermo-neutral condition for 15 hours a day (TN, 22 oC ambient temperature from 17:00 to 08:00). The experiment started when chicks were 21 days old and continued to 41 days old. The treatment groups were as follows; 1: thermo-neutral positive control (TNC, 24h, 22 oC), 2: heat stressed group (negative control, HS, no supplementation), 3: HS + VEO (300 mg/kg), 4: HS + VEO (300 mg/kg) + vit-C (250 mg/kg), 5: HS + VEO + vit-E (250 mg/kg) and 6: HS + VEO (300 mg/kg) + vit-A (15000 IU/kg) supplementation. As a result, there were no significant differences among the groups in terms of final body weight and total body weight gain (P>0.05). However feed consumption (P<0.001) and feed conversion ratio (P<0.05) were significantly affected by treatments. Carcass traits (except breast, %) were not influenced by treatments. In conclusion, heat stress has reduced the feed consumption of treatments compared to control. Although other vitamins (vit C and E) had positive impact on feed conversion ratio, the combination of vitamin A with Vitex agnus-castus essential oil provide the best results.

Keywords: broiler, heat stress, Vitex agnus-castus, performance, vitamin

[O4-01]: PreBiotics - Probiotics / Gut Health (ID: 110098) [South Africa]

# Improving Gut Health and Performance of Broilers by Adding Bacillus subtilis to the Diet of Broilers

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This study evaluated the effect of a direct-fed microbial (DFM) product (Enviva Pro 201 GT, DuPont Danisco, Marlborough, UK), a blend of three Bacillus subtilis strains, on the performance of broilers fed a maize-soya based diet with and without inclusion of an antibiotic growth promoter (AGP; zinc bacitracin 15%). Six treatments, with 10 pen replicates per treatment and 60 Ross 308 broilers of the same sex per pen, were included: Negative Control (basal diet without additives), Positive Control (basal diet with AGP) and four groups fed diets containing DFM at either 250g/ton or 500g/ton and without or with AGP included. The body weight (BW), feed intake (FI) and feed conversion ratio (FCR) were evaluated over a 35 day rearing period. Birds that received AGP had a higher body weight (BW) and lower feed conversion ratio (FCR) at 35 days compared to birds that did not receive AGP. Dose of inclusion of DFM (250g/ton vs. 500 g/ton) with and without AGP did not affect BW, FI or FCR. The lower dose of DFM (250g/ton) in the diets of broilers resulted in a significantly lower FCR compared to the diet containing no additives as well as those diets that contained DFM in combination with AGP. DFM inclusion at 250 g/ton of feed also resulted in a FCR no different from when broilers received AGP (without DFM) in their feed. However, when combining a DFM with AGP in the diet, FI and FCR of broilers increased. DFM added at 500g/ton feed together with AGP reduced BW and increased FCR significantly at 35 days compared to broilers receiving a diet containing AGP alone. In conclusion, DFM at 250 g/ton had a similar favourable effect on FCR of broilers than AGP. but when combining a DFM with AGP, the feed intake and FCR increased significantly.

Keywords: Bacillus subtilis, Direct Fed Microbials, Broilers, Performance

[04-02]: PreBiotics - Probiotics / Gut Health (ID: 110079) [Pakistan]

### Effect of Dietary Supplementation of Kefir on Body Measurements, Giblet Weight and Gut Morphology in Geese.

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Provision of safe food is always a primary concern for biological researchers. Along-with many other feed additives, the antibiotics retained their complementary position as as growth promoters in livestock feeding for decades. Besides the many beneficial effects associated with antibiotic inclusion in poultry feed, the drug resistance has become a challenging issue for humans because of significant drug residues in food. Probiotics are considered to be the possible solution in order to substitute the antibiotics safely from poultry feed without hampering their growth. Probiotics are not only destined to replace antibiotics but also have a beneficial effect to enhance organism's gut health and its immunity. Kefir refers to the product produced after fermentation of milk along-with Kefir grains, which is thought to have potential effect on the growth and other parameters in poultry feed. Regarding its potentials, the present study was designed to evaluate the effect of kefir administration in geese through drinking water on their performance, body measurements, giblet weight and gut morphological patterns. A total of 45 birds were divided into 3 groups having 15 birds in each. Group A served as control while B and C were offered kefir treated drinking water @ 2.5% and 7% respectively. Results revealed non-significant effect of kefir supplementation on growth performance, feed intake, FCR, body measurements, giblet weights and gut morphology at both levels of supplementation as compared to control group. It can be concluded that Kefir can be used in poultry feed with an inclusion rate of 7% for its various other known beneficial effects without imposing any adverse effect on the performance parameters, body structures and gut morphology.

Keywords: Kefir, Probiotic, Geese, Gut Morphology

[04-03]: PreBiotics - Probiotics / Gut Health (ID: 110074) [Pakistan]

# Efficacy of a Local Sodium Bentonite Enriched Clay as Mycotoxin Binder in Laying Birds

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Mycotoxin is still a major threat to the poultry industry of Pakistan compromising the performance of laving birds at all different ages. Poultry farmers are mostly reluctant to use expensive toxin binders therefore it is imperative to find locally available cheaper source that could effectively replace expensive toxin binders. Present study examined the impact of a local clay (LC) as toxin binder on the production performance and egg quality of laying birds fed toxin contaminated diet. This study was conducted at the University of Agriculture, Peshawar, Pakistan with the approval of animal ethic committee for involving live birds handling and welfare standards. A total of forty-five layers (34 weeks age) were grouped (n=5) and kept in cages (n=15; 3birds/cage) fulfilling all the requirements including feeding, drinking and environmental conditions. Birds in LC-1 group (positive control) received standard diet (as per NRC, 1994), LC-2 (95ppb aflatoxin contaminated), LC-3, LC-4 and LC-5, contaminated (95ppb aflatoxin) with 1, 1.5 and 2% of local clay (LC). Experiment lasted four weeks during which eggs were collected from cages, feed intake and FCR and egg quality was determined. From the present findings it was revealed that birds in group LC-2 showed a significant decrease in cumulative feed intake and poor FCR compared to all other groups. Difference among other groups was however insignificant. Egg production was drastically reduced to 48 % in negative control group (LC-1) compared to positive control and other treated groups that showed more than 60% egg production on average. Birds in LC-1 produced more deformed (6%), poor shell thickness, lower egg weight (58.2 g) compared to all other counterpart groups. It was concluded that local clay is an effective source to ameliorate the toxic effect of toxin in feed with reduced cost of addition in poultry diet.

Keywords: Keyword: Local clay, egg production, feed intake, FCR, laying birds

[04-04]: PreBiotics - Probiotics / Gut Health (ID: 110076) [Iran (Islamic Republic of)]

#### The Use of Different Pellet Binders to Improve Physical Pellet Quality, Performance and Total Tract Apparent Nutrient Retention in Broiler Starters Soudabeh Moradi (1), Arash Moradi (2) and Reza Abdollahi (3)

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An experiment was conducted to investigate the effects of pellet binder inclusion on growth performance and nutrient utilization in broiler chickens form 1 to 42 days of age. A total of 504 male Ross 308 broilers were randomly allocated to 7 dietary treatments, each replicated 4 times with 18 chicks per replicate during starter period (pellet diameter: 2.5mm) and finisher period (pellet diameter: 4mm). Dietary treatments were as follow: control group (without adding pellet binder), sodium bentonite (10 and 20 g/kg), wheat gluten (10 and 20 g/kg) and wheat (100 and 200 g/kg). Nutrient analysis of all diets were the same. All pellet binders significantly improved (P≤0.05) pellet durability index (PDI) compared with control diet with wheat gluten and wheat addition were more efficient than sodium bentonite in improving pellet hardness. At 21 d, body weight and body weight gain significantly improved by inclusion of 10 g/kg wheat gluten and 200 g/kg wheat, but over the entire trial period, chickens fed diets containing 10 g/kg wheat gluten and 100 and 200 g/kg wheat gained significantly more ( $P \le 0.05$ ) weight than control. Birds fed the diet containing 200 g/kg wheat consumed more ( $P \le 0.05$ ) feed than those fed control diet during the starter period (1 to 21 d). Inclusion of wheat gluten (10 and 20 g/kg) and wheat (100 and 200 g/kg) improved fat apparent retention compared to control ( $P \le 0.05$ ). Fiber and phosphorus apparent retention increased by 20 g/kg wheat gluten inclusion, while calcium apparent retention improved by wheat gluten inclusion at both 10 and 20 g/kg levels compared to control ( $P \le 0.05$ ). In conclusion: including 10 g/kg wheat gluten, and 100 and 200 g/kg of wheat improved pellet quality, growth performance and the apparent retention of some nutrients from total tract of broiler chickens fed pellet diet.

Keywords: PDI, pellet hardness, sodium bentonite, wheat gluten, wheat, total tract apparent retention

[05-01]: Environment / Genetics interaction (ID: 110078) [Italy]

#### Assessing Genetic Variability of Some Mediterranean Local Chicken Breeds Martino Cassandro (1) and Demir Özdemir (2)

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Aim of this study was to assess intra and inter genetic variability and population structure of two chicken populations reared in Turkey (Denizli and Gerze) and six from Italy (Ermallinata di Rovigo, Padovana, Pèpoi, Polverara, Robusta Maculata and Robusta Lionata) using nineteen microsatellite markers. A total of 171 alleles were found across 19 microsatellite loci with a mean number of 9 alleles per locus. The breeds were highly differentiated with an average FST of 0.328. Global FIS values (0.277) indicated that non-random mating occurred in both Turkish and Italian chicken breeds. The mean number of alleles across breeds was 4.11. Observed heterozigosity was lower than HE for all breeds and it was in the range of 0.235 (Pèpoi) to 0.421 (Ermellinata di Rovigo). Genetic distance (DC) between pairs of breeds ranged from 0.307 (Padovana and Polverara) to 0.716 (Gerze and Ermellinata di Rovigo), with average DC across breeds ranging from 0.451 (Padovana) to 0.687 (Gerze). According to STRUCTURE analysis. The most probable structure clustering of the eight chicken populations was at K=10. While Turkish breeds showed no substructures within breeds and were observed to be distinct homogenous genetic populations, subgroups were observed mainly in Italian chicken breeds corresponding to the different ecotypes present in these breeds. Results arising from this study provide evidence regarding the genetic structure and variability of 8 mediterranean chicken populations, and the implications of their actual management, which indicates the need for a conservation strategy to develop sustainable genetic conservation programs for the Turkish and Italian chicken populations considered.

Keywords: Turkish chicken, Italian chicken, Microsatellite, Population structure, Genetic diversity

[O5-02]: Environment / Genetics interaction (ID: 110052) [Kuwait]

#### Status of Indigenous Chickens in Kuwait, Saudi Arabia, and Egypt

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The poultry industry has two important types of production. These are: a commercial sector, characterized by its use of highly intensive units; and the indigenous unconventional system which has been growing very slowly, especially in the Middle East area. Development and conservation of native indigenous chickens and non-chicken species, such as quails, ducks, houbara and ostriches, are of great importance to enhance biodiversity and enrich the genetic pool of poultry worldwide. It contributes to food security and income generation in rural areas. Historically, these species also serve some social and religious functions, as they are required for special festivals and are essential for many traditional ceremonies. More effort and time should be spent on the development of local pure breeds and on conducting research studies on all aspects of scientific fields related to these poultry species. The current paper sheds light on the importance and the status of these unconventional poultry species in Kuwait, Saudi Arabia, and Egypt.

Keywords: breeds, food security, poultry

[05-03]: Environment / Genetics interaction (ID: 110055) [Turkey]

### The Effect of Lighted Incubation on Body Temperature, Tonic Immobility Duration, and Growth of Broiler Chicks Reared at Continuous or 16L:8D Posthatch Lighting

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Previous studies reported that a 16L:8D photoperiod during incubation (Lighted incubation) can modify the chick's post-hatch stress response and may improve growth and welfare of broilers as comparing to dark incubation. These effects are thought to be partly related to early entrainment of circadian physiology in embryos. This study aimed to investigate the effects of lighted- incubation on daily rhythm of early post-hatch body temperature (rectal temperature, RT) and tonic immobility duration (TI) and body weight of broilers. Ross 308 boiler eggs were incubated either in 16L:8D photoperiod with white fluorescent (300 lux) or in darkness. At post-hatch, 128 chicks per treatment were housed in 4 brooding cages for 6 d under either 16L:8D or 24 h light (24L). Rectal temperature of 20 caged chicks from each incubation/post-hatch lighting group was measured on d1, 2, 3, and 5 at the last h of the light and dark periods within a day. Corresponded measurements were made in the 24L post-hatch lighting group at the same time periods. Tonic immobility duration was measured on d 7. A total of 320 chicks were also kept at floor pens (20 chicks/pen) with 4 replicates either under 16L:8D or 24L for 38d. Data was subjected to ANOVA, statistical significance based on P ≤0.05. Incubation lighting didn't affect RT. However, it interacted with post-hatch lighting, age, and measurement time. Post-hatch lighting significantly affected RT with higher values in 24L than16L:8D. Rectal temperatures measured at light period were higher than the dark period. Interaction effects revealed that chicks from lighted incubation had significantly higher RT than those dark-incubated ones under 16L:8D. It might be related to the early entrainment of chicks to diurnal changes in lighting environment. Post-hatch lighting, but not lighting during incubation, affected TI with lower durations under 16L:8D than 24L. Chicks from lighted- incubation had higher BW at d 7 under post-hatch 16L:8D than those under 24L. There was no difference in body weight of broilers at slaughter age. It seemed to be that post-hatch lighting had more prominent effect on RT and TI duration than incubation lighting.

Keywords: Broiler, lighted incubation, post-hatch lighting, body temperature, tonic immobility

[05-04]: Environment / Genetics interaction (ID: 110108) [Turkey]

### Effects of In-ovo Injection of Propolis Ethanol Extract to the Hatching Eggs and its Addition to Offspring Diets at Post-Hatching Period on the Immune System, Intestinal Microflora and Fattening Performance

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This work was conducted to determine the effects of in-ovo feeding or feeding propolis extract containing diets on fattening performance, vaccine-antibody relationship, gut microflora, some blood parameters and parent mediated immune system in broiler breeder hens. A total of 288 Ross308 breeder hens aged 38-39 weeks were used. There were 6 groups: CC (Parent-Control and Offspring-Control, CP (Parent-Control and Offspring-propolis extract, CiP (Parent-Control and Offspring-in-ovo propolis extract), CiS (Parent-Control and Chickens-in-ovo saline), PeC (Parent-propolis extract and Offspring-Control), PeP (Parent-Propolis extract and Offspring-Propolis extract). Each group consisted of 10 replicates with 10 broiler offspring and the experiment lasted for 6 weeks with ethanol-extracted propolis concentration of 400 ppm/kg diet. While the highest feed consumptions at 0-21 days and 0-42 days were found in PeC, the best feed conversion ratio at 0-42 days was found in CP group. The live weight gains were found not to be different among the groups. The highest alanine aminotransferase activities were found in CC and CP and aspartate aminotransferase activities in PeP and PeC groups. The highest triglyceride and total antioxidant levels were found in CC with the highest total oxidant level in CiP group. IgA level in hatched eggs and IgM value after slaughtering were highest in CiP group. The best immune response for Newcastle Disease vaccine was obtained at day 21 in CC and CiS groups and at the 28th day for Infectious Bursal Disease vaccine in CP group. The highest total aerobic microorganism and the lowest total fungi count were found in PeP group. In conclusion, in-ovo propolis ethanol extract (CiP) had no consistent effects on blood biochemical parameters except for triglyceride level. However, it increased the maternal antibody levels, decreased the E. coli counts and provided strong immune response against Infectious Bursal Disease.

Keywords: Poultry, in-ovo feeding, bee propolis, immune parameters, maternal antibody

[05-05]: Environment / Genetics interaction (ID: 110030)

[Sudan]

# Effect of Using Different Pre-storage Warming Times on Hatchability of White Hisex Breeders' Eggs

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It is well known that commercial hatcheries set their eggs after days of storage which increases the incubation duration, decreases hatchability, chick quality and growth performance. The objective of this experiment was to study the effect of different pre-storage warming (PRESW) times on hatchability, embryonic mortality and chick grades of White Hisex layer breeders' eggs. A total of 1200 eggs were collected from a flock at 67 weeks of age. Eggs were divided into four groups of 300 eggs each according to their warming time (0 hour as control, 2 hours, 4 hours and 6 hours, respectively). These groups were further subdivided into four replicates. of 75 eggs each and were assigned to the completely randomized design (CRD). Eggs were incubated at 37.5°C. All eggs after warming were stored for two days in a cooler at 18°C and a relative humidity of 75%, they were then incubated in (Pas Reform) setter for 18 days and hatcher for three days. At the end of the hatching process hatched chicks were graded (1st and 2nd grade chick); pipped - hatched eggs were then removed and counted. The remaining unhatched eggs were broken to determine fertility and embryonic mortality. Results indicated that pre-storage warming of hatching eggs at 37.5oC for 4 hours significantly ( $P \le 0.01$ ) reduced early dead embryos and total unhatched eggs. The first grade chicks were significantly ( $P \le 0.01$ ) higher in pre-storage warming eggs. It is concluded that 4 hours PRESW improved hatchability percentage as it decreased embryonic mortality percentage. It also increased the number of saleable first grade chicks which by far increases profits.

Keywords: Breeder eggs; Fertility; Hatchability; Egg Storage; unhatched chick quality

[O5-06]: Environment / Genetics interaction (ID: 110011)

[Iraq]

#### Fertility Criteria in Female Ostriches (Struthio camelus) after Artificial Insemination by Using Three Methods of Semen Collection Hazim Al-Daraii

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This study was conducted to investigate the effect of semen collection method on fertility and hatchability rates and sperm penetration holes of ostrich. A total of 9 males and 27 females, 3-7 years old were randomly assigned to three treatment groups with 3 males and 9 females for each treatment. Three semen-collecting methods were tested: (1) manual massage method; (2) dummy method; and (3) teaser female method. In all collecting methods fertility and hatchability rates and sperm penetration holes were assayed for three consecutive months. Results revealed that the use of teaser female or dummy methods for collecting the semen from male ostrich resulted in a significant increase ( $p \le 0.05$ ) with respect to fertility (%), hatchability from fertile eggs (%), hatchability from set eggs (%), and sperm penetration holes and a significant decrease ( $p \le 0.05$ ) in embryonic mortality (%) in comparison to manual massage method during the three months of the experiment. Development of the animal friendly methods (teaser female and dummy methods) for collecting semen from ostriches has advanced considerably in recent years. Normal ejaculates can be collected regularly but the males need to be trained. The importance of human-bird interaction in stimulating birds to perform sexual behavior needs to be recognized and taken advantage of in training. Semen collected by the teaser or dummy method is of good quality and quantity and is suitable for storage and gave very good results in relation to fertility and hatchability rates and sperm penetration holes. The ostrich industry appears to be in a good position for development of the artificial insemination technology, although adoption of the artificial insemination technology in ostrich breeding will produce substantial changes in the current industry.

Keywords: Fertility, hatchability, semen collection, ostrich

[06-01]: Helder Maertens (ID: 110054) [Belgium]

### Analysis of the Hygienogram Information and Hygienogram Scores Obtained after Cleaning and Disinfection of Poultry Houses in Flanders during the Period 2007 to 2014

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Cleaning and disinfection (C&D) of poultry houses is essential to manage farm hygiene. Adequate performance of the different steps in cleaning and disinfection and the use of suitable products are keys to prevent and control zoonoses and animal diseases. Hygiene monitoring on total aerobic flora using agar contact plates at different locations of the poultry house is used to evaluate the proper execution of C&D and results in hygienogram scores between 0 and 5 (ranging from very good to very bad respectively). Scores and information of the so-called hygienograms of each poultry farm were recorded (n = 20422 - 2007 to 2014) and analyzed. The outcome variables were: year, season, husbandry system (floor, barn and aviary, battery and furnished cage), production type (breeding, rearing, production poultry), use of cleaning product, disinfectant and its active components, disinfection time and temperature and disinfection responsible. Descriptive analysis showed a decreasing trend for the average hygienogram score over the years 2007 to 2014. Remarkable differences were found between the different husbandry systems; with barn/aviary system and floor housing having a better score compared to furnished cage and battery (0.62 and 0.85 versus 0.88 and 0.99, respectively). Scores of production housings were worse compared to pedigree breeding, breeding and rearing houses. Cleaning protocols using a cleaning product, gave better scores than cleaning protocols without a product. Differences in scores between groups of disinfectants (with certain active components) were found. Disinfection protocols using formaldehyde gave the best scores. In addition, disinfection protocols using 2 different disinfectants showed improved results compared to the use of 1 single disinfectant. Finally disinfection carried out by an external firm resulted in a better score (0.72) compared to disinfection done by the farmer (0.85).

Keywords: Poultry farm, cleaning, disinfection, hygienogram score

[O6-02]: Poultry Housing (ID: 110096) [Belgium]

# What is the potential of an Integrated Poultry Red Mite treatment of predatory mites and locally used acaricides in practice?

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Poultry red mite (PRM) remains an important cause of animal welfare problems and economical losses in layers. Previous research showed promising results for the combination of predatory mites and locally used acaricides (milbemectine and amitraz). In this project the applicability in practice of such integrated pest management is investigated. The layer house of the Experimental Poultry Centre contains 12 climate independent compartments (enriched cages and aviaries) housing 31000 hens. Different treatments were tested in each housing system: predatory mites, locally used milbemectine, locally used amitraz, the combination of predatory mites and milbemectine, the combination of predatory mites and amitraz. Predatory mites are released in the compartments in cultivating bottles, replacing half of them every month. The acaricides are applied locally by filling PVC pipes with impregnated cardboard. On a weekly base, both a visual score (Mite Monitoring System) and a counting of PRM in cardboard traps are performed to maintain an overview of the PRM population. In addition, the predatory mite population is monitored weekly. After 3 months, only the enriched cages suffered from PRM. However, it was clear that the compartments with only predatory mites and only acaricides scored very high counts of PRM. It was also in these compartments where the PRM infestation started. Dimming the lights to prevent feather pecking, resulted in an increase of PRM in all compartments. However, the increase in PRM was lower in the compartments with the combination treatments. The combination of predatory mites and milbemectine showed better preliminary results in controlling the PRM infestation compared to the combination predatory mites and amitraz. In conclusion, an integrated pest management of predatory mites and locally used acaricides showed promising results when applied under practical conditions. However, these results need to be confirmed in spring and summer conditions and the practical application needs refinement.

Keywords: red mite, integrated pest management

[06-03]: Poultry Housing (ID: 110107) [Turkey]

### Effects of Propolis and Thyme Essential Oil as a Bio-Fumigants on Microbiological Load of Hatching Eggs and Incubation Performance Parameters

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This study was planned to determine the effects of natural bee product Propolis and Thyme essential oil which are known for their antibacterial and antifungal properties on microbiological load of hatching eggs and incubation performance parameters. Two thousand and one hundred sixty hatching eggs from 39 wk aged Ross 308 breeders were divided into seven treatment groups, disinfected by dipping method with 2 doses (10% and 20%) of Propolis (P1-P2), 2 doses (8 and 16 ml/L) of Thyme essential oil (O.onites, T1-T2) , ethyl and isopropyl alcohol (Negative Control), Formaldehyde (Positive Control) and untreated group (Control). Total Mesophilic microorganism, Coliform, Escherichia coli, Staphylococcus aureus, Pseudomonas, Salmonella, mold and yeast loads were calculated by FDA method from control and treated groups at day 1 and 18 of incubation after treatment. As a result, total mesophilic microorganism load was found to be: 6.59 log CFU/ml for untreated group, 3.88 log CFU/ml for T1 and 4.40 log CFU/ml for P1. Most effective result (3.00 log CFU/ml) was with formaldehyde treatment. Dipping eggs inside the P1 and P2 significantly decreased egg weight loss percentage during the setting phase. Hatchability of setting egg percentages were significantly decreased for both T2 and P2 concentration. Highest significant percentages of embryonic mortalities during the whole incubation period were observed for eggs disinfected with T1, P2 and Formaldehyde fumigation groups, whereas the lowest ones were detected for eggs disinfected with concentrations of T1, Ethyl and Isopropyl alcohol (P<0.05). This research indicates that 8ml/L of Thyme essential oil (O.onites) and 10% concentration of Propolis could be used as alternatives to current disinfection methods to eliminate/reduce microorganisms on hatching eggs.

Keywords: microbiological load , bio-fumigants, propolis, thyme oil, chick weight, hatchability

[O6-04]: Poultry Housing (ID: 110051) [Greece]

# Current Practices in Greek Broiler Farms as Related to the Technical Status of the Establishments and Equipment

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The aim of this study was to describe breeding and managerial practices performed in two main categories of broiler farms as related to their technical status i.e. years of functioning, facilities, equipment, etc. One hundred thirty two farms, randomly selected, sited in regions which represent more than 70% of the Greek broiler production were examined. A structured questionnaire was used to collect data by personal interviews with the farm managers including biosecurity measures, harvesting system, feeding and watering method, staff, microclimate in broiler house, antimicrobial therapy and information about the establishment and equipment of the farm as well as the genotype, age and population of the flock. First results indicate that biosecurity measures in farms in good technical status perceive more importance (presence of anteroom and foot bath,  $P \le 0.05$ ) than farms in bad status. Moreover, 93.3% of the farms in bad technical status use straw as bedding material in contrast with the 28.2 % of the farms in good status where rice hulls is used ( $P \le 0.05$ ). Both categories of farms rear Ross genotype while Cobb genotype is only reared in farms in good technical status (P $\leq$ 0.05). Finally, water equipment differs significantly (P $\leq$ 0.05) between the two farm categories. Nipple drinkers without a tray is used by 40.4% of the farms in good technical status while 58.3% the farms in low level of hygiene have water equipment with nipple drinkers with tray. This study presents preliminary results of a PhD thesis in progress aiming to investigate the prevalence of resistant strains of Escherichia Coli producing B-lactamases in poultry farms.

Keywords: broiler, farms, technical, status, biosecurity

[07-01]: Poultry Health 1 (ID: 110024) [United Arab Emirates] ence in the Middle East and North

# Survey of Mycoplasma synoviae Prevalence in the Middle East and North Africa Area

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The bacteria M. synoviae (MS) is a member of the mycoplasma genus. It causes disease in the joints, bones, respiratory tract and oviduct of birds. A MS infection can result in big economic losses due to a drop in egg production and eggshell quality. During the last few years, it was noticed that some layer and breeder flocks faced a drop in egg production of  $\sim 10\%$ , some after the peak, while others before reaching the peak of production, along with poor eggshell quality. Therefore, it was believed that it was valuable to investigate the prevalence of MS in the regions. Blood samples have been collected from the Middle East and North African area from flocks suffering from egg production drops, respiratory signs, and poor eggshell quality. Also, samples were taken from broilers showing respiratory problems. Serum samples were analyzed using ELISA technique to detect antibodies against MS. presence. Ten % of the blood samples collected from layers and breeders at an age < 16weeks were found to be positive; while 45 % of those collected from flocks at an age > 16weeks were found positive. Moreover, 4% of broiler samples were found to be positive . Consequently, it was concluded that field challenge with MS was found during rearing and production in layers and breeders, in addition to its presence in broilers. The flocks were treated, but the treatments were not sufficient to control the disease.

Keywords: M. synoviae, prevalence, Middle East, North Africa, production drop, eggshell quality

[07-02]: Poultry Health 1 (ID: 110033) [Greece]

#### **Risk Factors for Campylobacter spp. Contamination in Greek Broiler Flocks: Preliminary Results**

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So far no quantitative epidemiological investigations to identify the risk factors for Campylobacter contamination in Greek farms have been published. The aim of this study was to assess the association of farm characteristics and managerial practices with the prevalence of Campylobacter spp. contamination of the broiler flocks in Greece. Eighty-six farms (in which 116 houses) sited in regions which represent more than 70% of the Greek broiler production were examined. A structured questionnaire was presented to the farm managers and samples of fresh droppings were taken to assess the Campylobacter status of the broiler flocks. About 85.21% of the flocks were positive for Campylobacter spp. More specifically, C.coli was isolated in 59% of the samples analyzed, C. Jejuni in 39% and C. upsaliensis in 2%. The risk of contamination of the broiler flocks by Campylobacter was significantly ( $P \le 0.05$ ) increased in summer, in 'old' farms -functioning over 10 years-, in bad hygiene and biosecurity status, where disinfections and deworming are made by farm untrained staff, with round drinkers and when thinning frequency is more than 3 times. Logistic regression results concluded that the probability of negative flocks is 57.68% less  $(P \le 0.05)$  in winter time compared to summer time. Moreover, the probability of negative flocks is 94% less (P $\leq$ 0.05) when the disinfection is performed by the farm staff without (with or without?) training. First results of this study indicate that management factors influence the on-farm prevalence of Campylobacter spp. This knowledge can be used to develop new strategies at the primary production level.

Keywords: campylobacter, broiler farms, risk factors

[07-03]: Poultry Health 1 (ID: 110094) [Algeria]

### Morpho-histological Study of the Bursa of Fabricius of Broiler Chickens throughout Gumboro Disease

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The study of the impact of Gumboro disease for lymphoid organs in chicken was performed in a chicken coop located in the commune of RAHBET (Batna). One hundred twenty chicks from two barns are used in this experiment. Sixty chicks clinically healthy are taken from the first henhouse and 60 chickens showing pathognomonic lesions of Gumboro disease are removed from the second chicken coop on the 3rd day after the onset of clinical signs of infection (at 24 days). Ten birds from each coop were sacrificed on days 24,d 25, d 26, d 27, d 28, d 29. Bursa of Fabricius tissues obtained from chickens were fixed in a formalin (10%), in order to avoid post-mortem changes, and sent for histological study in an Agroveterinary institute of Souk Ahras (Algeria). Throughout Gumboro disease the bursa of Fabricius is the most affected; it begins to increase in size and weight due to edema and hyperemia then returns to normal size later, followed by atrophy and weigh only a third of their initial weight on the eighth day post-infection. The macroscopic appearance of the an inflammatory cell infiltration, degenerative lesions, and organs show necrosis. Appearance of interfollicular edema, hemorrhage in the medulla area of follicles.

Keywords: Histopathology, bursa of Fabricius, Broiler chicken, Gumboro disease.

[07-04]: Poultry Health 1 (ID: 110017) [Egypt]

#### Causes of Vaccination Failure in Poultry in Egypt

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Poultry vaccines are widely applied to prevent or reduce problems that can occur, when a poultry flock is exposed to field infection with infectious agents. Their use in poultry production is aimed at avoiding or minimizing the emergence of clinical disease and mortalities at farm level, thus increasing production. The causes of vaccination programs failure vary depending on one or several factors such as: 1- Status of maternal immunity of chicks, 2- Stress may reduce the chicks' ability to immune response such asA- environmental extremes (Very high or low temperature, Relative humidity, high concentration of ammonia in the house, and high stocking density as well as other stress factors), B- Poor nutrition and C-Parasitism and other diseases. Also 3-Immune suppression due to infection with immunosuppressive agents such as IBDV or Chicken Anemia Virus, medication program and mycotoxins drugs. In addition 4-Improper vaccination, such as the use of expired vaccine and presence of variant viruses, poor antigenicity of vaccines in field and improper storage, vaccines administration mistakes, poor water quality and biosecurity failure in the poultry farm.

Keywords: Poultry, Vaccination programs, Maternal immunity, Immune response, Immune suppression.

[07-05]: Poultry Health 1 (ID: 110049) [Kuwait]

# Effect of Polyunsaturated Fatty Acids on Mitogen-Mediated Cell Proliferation in Chickens

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This study investigated the effects of n-3 PUFA on the mitogen-mediated cell proliferation in broiler chickens. Five hundred one day old Cobb 500 male broilers were fed on one of four sources of n-3 Polyunsaturated Fatty Acids (PUFA): linseed oil-, echium oil-, fish oil (FO)or algal biomass-enriched diets until slaughter. At slaughter, samples of blood, spleen and thymus were collected from each bird. The source of n-3 PUFA had a strong influence on fatty acid composition across all tissues. The proliferative response of lymphocytes from algal biomass-fed chickens tended to be the highest, followed by those fed linseed oil in most cases. Lymphocytes from chickens fed fish oil tended to exhibit the lowest proliferative response. These results suggest that algal product may enrich chicken meat with the beneficial fatty acids without significant detrimental effects on chicken immunity.

Keywords: broilers, n-3 fatty acids, cell proliferation

[07-06]: Poultry Health 1 (ID: 110026) [Greece]

### The Use of Whey in Broiler Industry: a 'Natural' Way to Prevent Campylobacteriosis and Improve Performance?

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Whey is the liquid remaining after milk has been curdled and strained. It is a co-product of the manufacture of cheese or casein and has several commercial uses. Low quantities of whey can be added in broiler diets and can significantly affect its intestinal ecosystem and meat quality. However, the use of whey for the prevention of campylobacteriosis has not been studied before. The aim of this study was to investigate the effect of the whey on broiler chicks' performance and ceacal Campylobacter counts. The experimental design included the addition of 1% whey to broiler diets and an oral inoculation with 106-108 cfu Campylobacter jejuni on the 17th day of age. One hundred and twenty day-old Ross 308 broiler chicks were randomly allocated to four treatment groups, as described below: group A, served as negative control, group B, where birds consumed whey, group C, where birds were challenged with Campylobacter jejuni and group D, where birds were both challenged and consumed whey. The body weight was measured on the 1st, 12th, 24th and 37th day of age, while the feed conversion ratio and mortality were calculated for the periods of the 12th-24th day and the 24th-37th day, as well as cumulatively. One caecum from each bird was used for microbiological analysis on the 24th and 37th day of age. The evaluation of the experimental data revealed that the addition of whey in broiler diets, as well as the challenge did not affect significantly ( $p \le 0.05$ ) the performance. Campylobacter jejunal ceacal counts were significantly higher ( $p \le 0.05$ ) in challenged birds, whereas the addition of whey in poultry diets had no significant effect on Campylobacter counts ( $p \le 0.05$ ). It can be concluded that whey has no effect on performance as well as on Campylobacter count although it may constitute a valuable ingredient of poultry diet improving meat quality and gut health of chicks. This research project was funded under the Action 'Research & Technology Development Innovation Projects'-AgroETAK, MIS453350, in the framework of the Operational Program 'Human Resources Development'. It is co-funded by the European Social Fund through the National Strategic Reference Framework (Research Funding Program 2007-2013) coordinated by the Hellenic Agricultural Organization-DEMETER.

Keywords: whey, broiler chicks, campylobacter, performance

[08-01]: Miscellaneous (ID: 110044) [Greece]

#### How Can We Improve birds' Welfare During Transport?

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Council Regulation (EC) No. 1/2005 on the protection of animals during transport and related operations sets out minimum standards for welfare of animals. These standards are not always clearly described, and more practical information is needed. This paper aims to summarize opinions given by experts when asked about 'good and best practices' to be implemented in order to further improve the welfare status of birds during transport. Delphi methodology was applied by two Expert Groups (around 10 experts each), in Greece and in France, representing different categories of animal transport stakeholders. The experts scored the hazards on a scale from 1 to 100 (most critical=100) and reached consensus about the best practices to address. First results derived from the 1st Delphi round demonstrated that the main hazards for broilers (score>30%) is associated with the loading phase (catching, harvesting) since it takes considerable time and is often carried out by untrained staff. Unloading, loading and transport are the main hazards in day old chicks' transport (scores  $\geq 30\%$ , 25% and 20% respectively) and is related to cage design and micro-climate of the trucks. This study is funded by Directorate-General for Health and Food Safety (DG SANTE) through the pilot project 'Animal Transport Guides' (SANCO/2015/G3/SI2.701422).

Keywords: poultry transport, welfare
[O8-02]: Miscellaneous (ID: 110018) [Norway]

### Do DOA-Broilers Exhibit the Same Post Mortem Findings as Same Aged Broilers Dead on Farm?

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At the end of production cycles, mortality on farm or during transport to abattoirs (dead-onarrival/DOA) evokes concern about compromised welfare and associated economic losses in the broiler industry. A case study was designed to characterize pathological lesions associated with death of broilers on the farm, close to the day of slaughter, and in DOA broilers from the same flocks. The aim was to investigate whether diseases at the end of the growth period may predispose for DOA. This was achieved by describing and comparing pathological findings in broilers dead-on farm (DOF) and broilers DOA from the same flocks. Gross post mortem examinations were performed on 607 broilers from 32 flocks, either DOF (371) or DOA (236). In DOF broilers, the most common pathological lesions were lung congestion (37.7%), endocarditis (29.4%), and ascites (24.0%), whereas the most common findings in broilers DOA were lung congestion (57.2%) and trauma (24.6%). Lung congestion was the lesion reported most in both groups; however, lung congestion was more prevalent among DOA compared to DOF (P> 0.001). A possible explanation for the pathological lesions associated with lung congestion, may be sudden death syndrome (SDS) which may be stress induced. The results indicate that steps in the catching and transport chain per se, contribute to lung congestion cases and traumatic injuries which eventually leads to DOA. Pre-existing diseases such as ascites and osteomyelitis may also predispose for DOA, but to a smaller extent. Thus, factors relating to on-farm health, catching, and transportation are all areas of future investigation in order to reduce transport mortalities and to enhance welfare in broilers.

Keywords: broiler, dead-on-arrival, mortality, post-mortem examination, welfare

[O8-03]: Miscellaneous (ID: 110041) [France]

### A Multidisciplinary Risk Management in French Poultry Slaughterhouses: What Organization in Practice?

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Health surveillance systems are increasingly managed in a multidisciplinary way, involving several stakeholders sharing detection, recording and corrective tasks. In France, poultry slaughterhouse staff – specially trained – is allowed to participate in product inspection tasks under the supervision and the responsibility of Official Veterinary Services (OVS) and on the basis of a risk analysis. To organize well the interaction between stakeholders in this multidisciplinary risk management, a control system based on alerts from Food Business Operators (FBO) to OVS is implemented. If regulation sets indicators to be monitored as well as warning values, various modus operandi between FBO and OVS can be observed in practice. In this context, a field study was conducted in order to describe the alert ways used on the ground and to identify the impact of this innovative method on the work organization. Thirty poultry slaughterhouses were surveyed through semi-directive interviews led with both the official veterinarian/auxiliary and/or the quality manager/assistant, separately. The interviews were recorded and computationally transcribed; data were qualitatively analyzed. Several modus operandi were observed. Regarding inspection task division: in some slaughterhouses, several inspection tasks were performed both by the FBO and the OVS whereas, in other situations, inspection tasks were performed by OVS only in case of alert by the FBO. Communication tools were various: from emails to direct conversations, depending on the alert severity or on the quality of relations between stakeholders. According to the interviewees, this surveillance system working as an alert system is relevant if the work organization is clearly described: organization of positions, definition of missions and roles, implementation of specific procedures on information exchange and training programs. In conclusion, the alert system appears to function correctly thanks to (i) adapted alert criteria; (ii) the system preparation and formalization; (iii) the cooperation, discussion and communication between the stakeholders.

Keywords: Poultry, slaughterhouse, work organization, alert

[08-04]: Miscellaneous (ID: 110125) [Croatia (Hrvatska)]

## Effect of High Hydrostatic Pressure Freezing and Vacuum Freezing on the Sensory Characteristics of Chicken Meat

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The objective of this study was to determine the effect of high hydrostatic pressure freezing and vacuum freezing on the sensory characteristics of chicken meat. Fresh fillets of chicken breasts were frozen with high hydrostatic pressure (150 MPa/30 min and 250 MPa/60 min) at -20°C and vacuum frozen. Drip loss and colour were measured as well as sensory analysis of treated samples. The results showed that both methods of freezing caused drip loss. Higher pressure increases L\* and b\* values, while a\* values are not affected. The colour of vacuum frozen chicken breast meat was darker and had higher a\* and b\* values compared to the samples treated by conventional freezing. The treatment with high hydrostatic pressure of 150 MPa and vacuum freezing had no significant effect on sensory characteristics of chicken breast meat, while samples treated with pressure of 250 MPa showed a statistically significant difference in overall satisfaction, tenderness and acceptability.

Keywords: high hydrostatic pressure, vacuum freezing, chicken breasts, weight loss, sensory characteristics

[O8-05]: Miscellaneous (ID: 110086) [Algeria]

# Normal Morphohistological Studies of the Lymphoid Organs (Bursa of Fabricius, Thymus, Spleen) of Broiler Chickens during Post Hatching Age.

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The study of morphometric and histologic evolutions of lymphoid organs (bursa of Fabricius, Thymus) during 28 weeks of post haching age, has been realized on 86 broiler chickens. The changes in the morpho-histological aspects with age were recorded showing the size and the weight of these lymphoid organs. Bursa of Fabricius reached its maximum size between the 10th and the 11th weeks of age, thymus reached its maximum at the 2nd week of age , but the spleen remained unchanged. These variations are in close relationship with sexual maturity as we have in other species. These observations can be used in the diagnosis of avian viral diseases such as Gumboro disease, Newcastle disease...

Keywords: Morphohistological study, Bursa of Fabricius, thymus, spleen

[08-06]: Miscellaneous (ID: 110046) [Iran (Islamic Republic of)]

## Effects of Feed Form and Cage Density on Performance and Welfare of Laying Hens

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A total of 384 Shaver laying hens were used to assess the effects of different feed forms and cage densities on their performance, welfare and stress status. Experiment began at 50 wk and lasted till 60 wk of age. Experiment was carried out using a complete block design with a factorial arrangement of treatments  $(2\times3)$ . Factors consisted of feed form (pellet and mash) and cage density (320, 400 and 533 cm2 per bird corresponding to five, four and three hens per cage). Hen day egg production, feed consumption and egg weight were measured and egg mass and feed conversion ratio were calculated. Furthermore, blood samples were taken to determine plasma glucose and corticosterone and also heterophil/lymphocyte (H/L). Hens fed on pelleted feed had significantly lower (P<0.0001) feed intake and numerically produced less eggs in comparison to their mash fed counterparts. Increase of cage density from three to five hens per cage significantly (P < 0.05) reduced mean egg production from 92.9 to 89.2%. Feed consumption also decreased linearly as number of hens per cage increased from three to five. Significant interactions (feed form× cage density) were found in feed consumption, while in mash form, feed consumption significantly decreased as numbers of hen per cage increased. The same reduction was not found with pelleted feed form. Our results indicated no significant effect of either feed form or cage density on H/L ratio, plasma glucose and corticosterone concentrations. In summary, based on results obtained in the current study, it could be concluded that decreased egg production associated with higher cage densities and pellet feeding may be compensated by high density pelleted feed.

Keywords: laying hen, cage density, pellet, welfare

[O8-07]: Miscellaneous (ID: 110090) [Pakistan]

### Efficacy of Protein and Probiotics Supplementation on Dynamics of Endocrine Markers in Serum and Pituitary Gonadotrophs of Molted Layers.

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Serum hormones, liver enzymes and dynamics of pituitary gonadotrophs were studied to seek the health status in relation to production efficiency in molted layers. There were four equal groups as control (CONT: CP16% diet, no other supplement), high protein (HP; CP18% diet, No other supplement), symbiotic (SYM; CP16% diet, Symbiotic at the dose rate of 85mg/L in drinking water) and probiotic (PRO; CP16% diet, Probiotic at a dose level of 85mg/L in drinking water). Fifteen birds were sacrificed at 5%, peak and end of post molt production period in each group to collect blood and pituitary gland. Serum hormones and liver enzymes were estimated via competitive ELISA method and commercially available kits while gonadotrophs of pituitary gland were studied by immunocytochemistry. SPSS software was used to detect significance of differences among groups at various sampling stages. Triiodothyronine (T3; ng/ml) concentration in HP, SYM, PRO; HDL-Cholesterol (HDL-C; mg/dl) in HP and AST (U/L) concentration in PRO increased significantly ( $P \le 0.05$ ) as compared to CONT. The LDL cholesterol (LDL-C; mg/dl) and cortisol (µg/dl) concentration in HP, SYM and PRO and thyroxin (T4;  $\mu$ g/dl) in SYM and PRO decreased (P $\leq$ 0.01) as compared to CONT. The decrease(P≤0.01) in LDL-C, cortisol level and increase in HDL-C is depicting the relieving aspect of these supplementations on oxidative stress and increase in T3 in supplemented birds (HP and PRO) is responsible for the improved egg production in HP by 16%, and 10% in SYM and PRO. In HP and SYM significantly ( $P \le 0.01$ ) increased cell (µm) and nucleus area (µm2) of FSH gonadotrophs and cell area of LH gonadotrophs of pituitary as compared to CONT also attributes to the improved egg production in these groups. The supplementation especially with additional protein could further enhance the production capacity of molted layers due to their stress relieving potential and increased gonadotropin producing potential of pituitary.

Keywords: Protein, Probiotic, Hormones, Enzymes, Gonadotrophs

[09-01]: Poultry Health 2 (ID: 110065) [Pakistan]

#### Molecular Detection of Viral co-Infections in Broiler Chicken

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Low pathogenic Avian Influenza virus (LPAIV). New castle disease virus (NDV) and Infectious bronchitis virus (IBV) are the most common reported causes of respiratory diseases in poultry worldwide. Diseases differential diagnosis is now more complex and difficult with mixed infections due to similar clinical and pathobiological lesions. This experimental study was carried out to induce co infection of AIV, NDV and IBV in healthy broilers. One hundred twenty day old chicks were divided equally into six groups. At day 21, group A, B and C were inoculated with AIV, NDV and IBV respectively. Group D and E were inoculated with all the three viruses on same day and different days. Group F remained uninfected as control group. The results showed that the experimental co infection increased the severity of clinical signs, gross lesions, and histopathological lesions. Lungs and tracheal samples were collected and preserved from the co infected groups and Multiplex RT-PCR was developed and standardized for the detection of all the three viruses in samples. Specific oligonucleotide primers were selected for each virus. The mRT- PCR DNA products were visualized by agarose gel electrophoresis and consisted of DNA fragments of 890 bp for AIV, 500 bp for IBV and 723 bp for NDV. In this present study a mRT-PCR has been developed to simultaneously detect and differentiate three of the most important pathogens of poultry achieving rapid diagnosis of each one of them. Such accurate detection method will be very helpful in controlling disease transmission and reducing morbidity and mortality in farms and definitely reducing economic losses in poultry operations.

Keywords: Avian Influenza virus, New castle disease, Infectious bronchitis, Multiplex RT-PCR

[09-02]: Poultry Health 2 (ID: 110071) [Spain]

## The Catalan Slaughterhouse Support Network (SESC): innovative Tool to Help Diagnosing Poultry Lesions at the Slaughterhouse

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Meat inspection aims to assess whether or not the meat and offal obtained from carcasses of slaughtered animals are adequate for human consumption. In 2008, the Catalan Public Health Protection Agency (Generalitat de Catalunya) created the Slaughterhouse Support Network (SESC) with the aims of: i) providing its meat inspectors with a diagnostic support structure and ii) offering them continuing education in their ability to diagnose lesions. A web-based application was created (www.cresa.cat/blogs/sesc) which allows meat inspectors to submit their inquiries along with images of lesions and, when needed, samples to conduct laboratory analysis. Responses are based on the opinion of a number of veterinary pathologists and other animal health and welfare professionals of CReSA and, when performed, on the obtained laboratory results. SESC offers its service to the 254 slaughterhouses that are currently active in Catalonia. Between 2008 and 2013, a total of 975 cases were submitted to SESC, being 133 enquiries (13%) from poultry species. During this period, 1.246.955.000 chickens were sacrificed in Catalonia, and 0.94% (11.733.729 carcasses) suffered total carcass condemnation and 6.15% partial condemnation (76.767.728 carcasses). Most inquiries originating from poultry slaughterhouses were of lesions compatible with Marek's disease (MD). During the study period, 85 cases of MD were histopathologically confirmed mostly in organic or slow-growing chickens. The emergence of the organic food market has broadened the range of lesions observed at slaughter. For instance, diseases such as visceral gout and fungal or viral dermatitis were found, which are rarely seen in intensively reared chickens. SESC is a pioneering system that provides meat inspectors with continuing education tools to enhance and complement their diagnostic skills. The system establishes collaboration between academia, administration and industry. In addition, the system allows collection of useful information on animal health and welfare, which has relevance for research and complements the established surveillance programs.

Keywords: Poultry, slaughterhouse, lesions, carcasses, post-mortem inspection

[09-03]: Poultry Health 2 (ID: 110072) [Spain]

# Assessment of Innate Immune Response in the Respiratory Tract of Quails Experimentally Infected with Different Strains of Avian Influenza Virus.

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Avian Influenza Virus (AIV) affects several species of food producing avian birds worldwide. Several strains of AIV have been isolated in poultry causing from little or no clinical signs to high mortality. Because of that, AIV is classified as low pathogenic (LPAIV) and high pathogenic (HPAIV). It is becoming clear that host factors such as the immune response against the viral agent also contribute to the pathogenesis seen in AIV infections. Innate immune response after AIV inoculation has been broadly studied in chicken and duck, but to a lesser extent in minor gallinaceous species such as quail. Quail has emerged as one important avian species in the epidemiology of avian influenza virus because it has been recently shown that they can harbor viral receptors in the respiratory and intestinal tract for mammalian- and avian-origin influenza viruses. In this study, we determined the cytokine expression pattern in nasal cavity and lung of quails that had been experimentally inoculated with LPAIV (H5N2 and H7N9) or HPAIV (H5N1, H7N1) strains by means of qRT-PCR techniques. The quails inoculated with the H5N2/LP strain showed a strong expression of IFN $\alpha$  in nasal cavity. Contrarily, H7N9/LP-inoculated quails presented an early up-regulation of TLR7 in the nasal cavity, in correspondence with the high detection of Influenza A antigen. Lastly, the expression levels of IFN $\alpha$ , IL6 and TLR7 in lung were highly up-regulated in the quails inoculated with the HPAIV strains, in concordance with the presence of viral RNA. These results suggest that cytokine and PRRs expression may influence viral replication and associated lesions in the respiratory tract of quails and therefore support the current idea that host factors may contribute to the pathobiology of the influenza virus infection in birds.

Keywords: Avian Influenza, Quail, Innate immune response.

[09-04]: Poultry Health 2 (ID: 110075) [Lebanon]

## Evaluation of an Autogenous Vaccine and a Blend of Essential Oils in Control of Velogenic NewCastle Disease Challenge in Broilers

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NewCastle Disease Virus (NDV) is a major economic disease circulating in the MENA region, including Lebanon. Unfortunately, the majority of the used commercial vaccines are offering unacceptable protection against local velogenic NDV strains. A controlled challenge trial was performed at the American University of Beirut to assess the protection level of an Autogenous vaccine that was developed from a predominant field strain containing the fusion sequence of Neurotropic Velogenic NDV genotype VII. Fifty day old broilers were divided equally into 5 groups with 10 birds per group. Group 1 was deprived of vaccination and essential oil blend administration. Groups 2, 3, 4 and 5 were administered the autogenous NDV vaccination at day 1 (priming) and day 14 (boosting). Group 2 received an essential oil blend while group 3 received a modified essential oil blend via drinking water. Birds of groups 1, 2 and 3 were challenged intramuscularly at 28 days with 104 EID50 of homologous strain of v-NDV, while birds in groups 4 and 5 were deprived of any v-NDV challenge. Results show that the autogenous v-NDV vaccination along with essential oil administration offered chicken 100% protection against homologous strain challenge of v-NDV while the non-vaccinated birds of group 1 had 70% mortality at 35 days of age, 5 days post challenge. Vaccinated and challenged groups 2 and 3 showed significant seroconversion and higher NDV HI titers at day 35 in comparison to the unchallenged groups 4 and 5 and the nonvaccinated group 1. Moreover, groups 2 and 3, that were administered the essential oils had better FCR and % weight gain when compared to the challenged non-vaccinated group 1. As a conclusion, Homologous vaccine against v-NDV accompanied by an essential oil blend was highly protective against v-NDV challenge in addition to enhancing seroconversion and performance of birds up until market age.

Keywords: NDV, Autogenous Vaccine, Essential oils, Seroconversion, Performance

[09-05]: Poultry Health 2 (ID: 110045) [Pakistan]

### Pathogenicity and Immunosuppressive Effect of Different Vaccinal Srains of Infectious Bursal Disease Virus on Lymphoid Organs

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The current experiment was conducted to compare the efficacy of different strains of Infectious Bursal Disease (IBD) vaccines against field virus. A total of two hundred, one day old broiler chickens were divided into four groups (50 birds each group). Group A was subcutaneously vaccinated with immune complex vaccine at 1st day of age. The group B & C were vaccinated with conventional IBD vaccines D78 and 228E at 20th and 16th day of age according to Deventer formula. The blood samples were taken randomly from five birds of each group at day 7, 14, 21, 28 and 35 to evaluate ELISA antibody titer and to determine the bursa to body weight ratio. In addition, gross and histopathological bursa lesions were scored. Ten birds from each group were challenged with virulent field IBDV on day 28. On day 35 significantly (P<0.05) higher ELISA antibody titers were observed in group A vaccinated with immune complex vaccine. Bursa to body weight ratio of group A was significantly higher (P<0.05) as compared to other vaccinated groups B and C. Mild to moderate histopathological lesions lymphocytic depletion, epithelial necrosis and mononuclear cells infiltration, fibrous tissue proliferation and edematous fluid were observed in vaccinated groups. High mortality and morbidity were observed in control group D within one week post-challenge. In conclusion: Deventer formula can be helpful to vaccinate birds at optimal times but conventional vaccines damage more bursal follicles as compared to immune complex vaccine.

Keywords: Infectious Bursal Disease (IBD), Vaccines, ELISA, Bursa to body weight ratio

[09-06]: Poultry Health 2 (ID: 110021) [Pakistan]

### In-vitro Antibacterial and Cytotoxic Evaluation of Sequential Soxhlet Extracts of Calotropis Procera Leaves Against Common Poultry Pathogens.

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The present study was designed to determine the antimicrobial activity of hexane, chloroform, ethanol and aqueous extracts of Calotropis procera leaves against common poultry pathogens. Cytotoxicity of the extracts was also determined to evaluate the safety profile of extracts. Sequential extraction was carried out to obtain extracts having successive polarity. Antibacterial activity was determined qualitatively by well-diffusion method and quantitatively by micro-broth dilution method against two gram positive pathogens Staphylococcus aureus and Clostridium perfringens type A, three gram negative pathogens Escherichia coli, Salmonella enterica and Haemophilus spp. Cytotoxic studies were carried out using MTT assay. In vitro MTT (3-(4,5)-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) colorimetric assay on Vero cell line in 96 well plate. Hexane extract showed maximum inhibitory zone against E. coli and S. enterica. Chloroform extract exhibited maximum zone of inhibition against C. perfringens and S. enterica. Ethanol extract gave maximum inhibitory zone against S. enterica and S. aureus. Aqueous extract gave best inhibitory zones against C. perfringens. In case of minimum inhibitory concentration, hexane extract gave lowest MIC value against S. enterica (972.2µg/ml). while chloroform extract showed lowest MIC value against S. aureus, C. perfringens and S. enterica (416.6µg/ml). Ethanol extract exhibited lowest MIC values against S. enterica (416.6µg/ml), The aqueous extract showed lowest MIC value against E. coli (2916µg/ml). Regarding the cytotoxicity, the cell survival percentage revealed that except ethanol, all extract are safe at all concentrations for Vero cell line. The results showed the antibacterial activity of C. procera leaves against common poultry pathogens which indicate the usefulness of C. procera in clinical practice against bacterial infection.

Keywords: Calotropis procera, Antibacterial, Minimum Inhibitory Concentration, MTT assay



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[P1-01]: Economics / Miscellaneous (ID: 110016) [Turkey]

### Determination of Alterations in Carcass and Breast Meat Yield of Male and Female Broilers in Various Slaughter Weight Categories

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The aim of this study was to determine carcass and breast meat yield of male and female broilers in various slaughter weight categories under field conditions. A total of 400 broilers (200 males/200 females) were used. At slaughter age (42 d), broilers were individually weighed to determine slaughter weight and classified with a 100 g difference between 2200 and 3000 g for female and 2400 and 3400 g for male broilers. Broilers were slaughtered after stunning process, the carcass yield was calculated as a percentage of slaughter weight, breast meat percentage was calculated as a percentage of carcass weight. As expected, slaughter weight affected carcass weight and yield but in different pattern in male and female broilers. The highest carcass yield was observed between 2501 and 2700 g slaughter weight for females (72.84 vs 72.75%), and between 2801 and 3000 g slaughter weight for males (73.70 vs 73.88%). On the other hand, the highest breast meat yield was observed between 2701 and 2800 g slaughter weight in females (47.61%), and between 2801 and 3100 g slaughter weight in males (47.17 vs 47.37%). Carcass yield is a very important parameter in broiler production but the most important parameter for the consumer remains as breast meat. The results suggested that increments in slaughter weights would not have a positive effect on breast meat yield if the demand is an increment in breast yield.

Keywords: broiler, breast yield, slaughter weight, sex, carcass yield

[P1-02]: Economics / Miscellaneous (ID: 110025) [Iran (Islamic Republic of)]

#### **Creatine Precursor Can Improve Sperm Quality in Rooster**

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The aim of this study was to assess the influence of dietary guanidinoacetic acid (GAA), a creatine precursor, on semen quality for decreasing age-related fertility in commercial male broiler breeders. Twenty-nine weeks old Ross 308 breeder roosters (n=20; 5 birds/treatment) were randomly distributed into four treatments receiving 0, 600, 1200 and 1800 mg GAA per kg of diet, respectively for 26 consecutive weeks. Semen was weekly collected by abdominal massage and seminal volume, semen concentration, sperm forward motility, sperm plasma membrane integrity and functionality, and abnormal forms were evaluated. Data were analyzed by MIXED procedure of SAS 9.1 and rooster body weight was included as a covariate for total sperm production. Comparison of means were evaluated by Tukey's test. Significant differences were reported at  $P \le 0.05$ . Semen concentration and total number of ejaculated sperms were significantly increased ( $P \le 0.05$ ) with 1200 mg/kg dietary GAA. Diet  $\times$  week interaction showed a decreasing trend for all diets except that the trend was increasing for the 1200mg GAA/kg-fed roosters from week 9 of the experimental period and onward (P  $\leq$  0.05). Supplemented roosters with GAA at all levels significantly (P  $\leq$  0.05) improved sperm forward motility until 12 weeks of the experiment after which only the 1200 mg GAA/kg group kept this trend while the other GAA levels started to decrease. Although semen volume, sperm plasma membrane integrity and functionality, and abnormal forms count were not significantly affected by treatments, higher numerical values of these parameters were observed in GAA- receiving roosters ( $P \ge 0.05$ ). Improved rooster semen quality with GAA dietary supplementation suggests that it has a potential to be used in reduced age-related fertility in commercial broiler breeder roosters.

Keywords: creatine, guanidinoacetic acid, semen quality, fertility

[P1-03]: Economics / Miscellaneous (ID: 110027) [Turkey]

### Utilization of Yolk Sac during Holding Time and First Week Broiler Performance in Newly-Hatched Chick with and without Access to Feed

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This study was carried out to determine the changes in yolk sac utilization during holding time and first week broiler performance in newly-hatched chicks with and without access to feed. Ideal incubation period was accepted as 506 h and samplings were performed according to this period. The percentage of chicks hatched at 486 h was found to be 18% of the total hatched chicks. At 486 h of incubation, a total of 10 chicks were killed by cervical dislocation to determine the volk sac utilization during holding time in hatcher. In the experiment, two treatment groups (total 240 chicks) were created for the hatched chicks at 486 h with access to feed or without access to feed. Half of the chicks hatched at 486 h stayed in the hatcher. until completing the hatching process and the other half were placed into pens. At the end of the hatching, yolk sac utilization was determined in chicks hatched at 486 h that stayed in the hatcher. The body weight gain was monitored at the end of the first week; feed conversion ratios were calculated using the body weight gains and feed consumption values. Yolk sac consumption value and rate were found to be higher in chicks hatched at 486 h without access to feed (15.77 g and 83.33%) than chicks hatched at 486 h with access to feed (11.06 g and 58.48%). At 1 week of age, the body weights and weight gains were 179.3 g and 158.4 g, and 133.3 g and 102.2 g in chicks with and without access to feed, respectively. Feed conversion rate and mortality were similar between groups. In conclusion, holding time in the hatcher affected yolk sac consumption and chick weight. Furthermore, accessing feed immediately hatching caused an increment live weight and weight gain during the first week.

Keywords: broiler, hatching time, yolk utilization, chick weight

[P1-04]: Economics / Miscellaneous (ID: 110058)

[Iran (Islamic Republic of)]

## Effects of a Native Bacillus Based Probiotic on Intestinal pH and Cecal Microbial Population

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Four hundred 1-d-old Hubbard broilers were allocated in 4 experimental treatments for 6 wk. The experimental treatments received a corn-soybean basal diet (control) and control plus 0.01, 0.02 or 0.2% commercial probiotic (Bactogen JQ ®, TakgenZist Co) that contained 4×109 cfu/g of Bacillus subtilis JQ61816. Each treatment had 4 replicates of 25 broilers. At 42 d, 8 broilers per treatment were killed, carcasses were subsequently opened. Immediately, the gizzard and middle section of the jejunum content were removed intact and the pH was recorded. Samples of the cecal contents were used to assay lactic acid bacteria (LAB) and Escherichia coli and were enumerated using MRS and MacConkey agar, respectively. Using 0.02% probiotic significantly reduced jejunum (P < 0.05) pH compared with 0.01% fed birds, while, no significant difference was observed among treatments for gizzard pH. Birds fed different concentrations of probiotic had greater populations of LAB in the ceca than those fed control diet, whereas addition of 0.02% of Bacillus subtilis had highest LAB count. Reduction in cecal Escherichia coli content was observed for broilers fed probiotic supplemented diets compared to control-fed birds (P<0.0001). It is concluded that the native Bacillus subtilis JO61816 probiotic was effective at decreasing the number of E. coli of cecum and pH value of jejunum and increasing cecal population of LAB.

Keywords: Broiler, Bacillus subtilis, cecal microflora, gatrointestinal pH

[P1-05]: Economics / Miscellaneous (ID: 110135)

[Lebanon]

# Comparison of Husbandry and Egg Quality of Conventional and Free Range Commercial Layers

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The objective of this study was to present the degree of compliance of Lebanese intensive system (IS) and free range chicken layers (FRCL) farms to the EU standards, targeting the welfare of chicken and the improvement in its egg quality. A questionnaire was implemented to uncover the adopted husbandry system on IS and FRCL. The improvement in egg quality included also an experiment that was conducted to asses quality parameters, and heavy metal content of eggs produced by IS versus FRCL. Five IS and five FRCL farms were selected and 5 eggs were randomly collected from each farm. The percentage of compliance of farms in both systems with EU regulations ranged between 0 and 66.7 % namely, for the parameters of housing management, feeding, watering, vaccines, medication, packaging and egg quality. The egg quality parameters were not significantly different between the two systems, in relation to egg weight, porosity, shell thickness, density, yolk %, albumen %, shell % and percentage of eggs with AA quality. However, the IS eggs had significantly higher Haugh unit scores and yolk color index compared to the FRCL as compared to that of the IS eggs.

Keywords: layers; intensive system; free range; compliance; EU Standards

[P1-06]: Economics / Miscellaneous (ID: 110088) [Algeria]

#### **Breeding Charecterization of Local Poultry in the Region of Aures**

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In general way, animal genetic resources go through a continuous erosion which is the consequence of the presence of a large number of species which nowadays are described as in endangered and threatened extinction. The traditional chicken (G.gallus domesticus) is a well-known example throughout the world and among which the variability and the performances have created a big benefit. This study concerns the genetic variability of breeding system for hens egg production and hen performance and was realized on the populations of the species Gallus gallus in Aurès region (Algeria). The aim was to estimate the genetic variability of the poultry populations in this region and to identify the reach of the visible Allelic forms, also to specifically analyze its potentiality for eggs production. The results show that the poultry population in the studied region contains an important genetic variability; we noticed good phenotypic characteristics, and an acceptable production of eggs, compared to the international standards. The multivariate statistical analysis (ACP, AAH) show the structure of the populations and the physical distance between those areas. The canonical analysis allowed highlighting the relation between the physical measurements and the performances of eggs.

Keywords: species G. gallus, genetic variability, performance, morphological characterization

[P1-07]: Economics / Miscellaneous (ID: 110116) [Turkey]

#### **Poultry Production in Turkey**

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The present study will cover information on the poultry production sector in Turkey. Poultry farms were small with limited production capacity in the 1970's. The sector started to move to some integrated projects after the 1980's with contracted production models. At the end of 1990's, big investors and some organizations entered the sector because of the increase in demand for cheap protein sources such as poultry meat and eggs. This led to improved infrastructure and more technologies used in commercial poultry production. Currently, the poultry industry in Turkey with respect to infrastructure, technologies and production levels is in a better situation than many developing countries. Furthermore, some poultry products and technologies are exported to various countries. According to the data of 2015, there are 312.256.000 chickens, 2.828.000 turkeys, 851.000 geese and 398.000 ducks in Turkey. Broilers and laying hens are produced in commercial enterprises, while turkeys, geese and ducks are produced in small family farms. 1.982.000 tons of chicken meat, 55.500 tons of turkey meat and 77.100 tons of other poultry meats and 16.726.332.000 eggs were produced in Turkey in 2015. Poultry meat consumption was 22.83 kg and egg consumption 200 eggs per capita in 2015. It is expected that, poultry product consumption will improve in the future in line with the preferences of consumers who will become more aware of healthy and cheap poultry products compared to other sources of animal protein.

Keywords: Turkey poultry, broiler, lying hen, poultry meat, egg

[P1-08]: Economics / Miscellaneous (ID: 110117) [Turkey]

#### **Broiler Carcass Quality in Free-range System**

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Increase in world population and demand for the chicken meat, forced the researchers to conduct mostly to improve performance in the poultry industry. Some problems such as deformations of the skeletal system, increasing foot and leg problems, occurrence of sudden death, ascites, excess fat in the carcass, behavioral and welfare problems, have emerged depending on the rapid development, increased body weight and intensive production conditions in commercial broilers production. Animal welfare-related issues and consumer awareness have been raised recently. Thus, this increased number of the studies on improving the quality of the meat and animal welfare. Nowadays, alternative poultry production techniques (free-range, organic poultry etc.) are used to improve product quality, animal health and welfare. Free-range broilers have better meat quality compared to conventional intensive broiler production and they have more yellow carcass and more red and delicious muscle in leg. Free-range broiler meat has lower pH, good texture, better water-holding capacity and less cooking loss than conventional ones. Additionally, free-range broiler carcass has higher protein, less abdominal fat and toxins compared to intensively produced broiler. Main advantages of free-range system are better bone growth due to high activity and proper animal welfare due to exposure to direct sun light, eating liberty of green forage and insect on land. It will be achieved through the use of free-range systems cultivating more healthy chickens and production of higher quality products. This review focus on the quality of broiler meat and bone issues in free-range chicken. The results demonstrated that free range system can improve meat quality traits (more yellow carcass, more red muscle, more water-holding capacity, more carcass protein, better bone growth, better texture, less pH, less cooking loss, less abdominal fat, less toxin).

Keywords: Free-range, meat quality, bone quality

[P1-09]: Economics / Miscellaneous (ID: 110131) [Pakistan]

## Determination of Quality Changes during Multiple Freeze Thaw Cycles in Chicken Breast Muscle

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This study determined the effects of multiple freeze-thaw cycles (0, 1, 2, 3, 4, 5 and 6) on physico-chemical changes in chicken meat. After slaughtering, skinless chicken breast was taken, cut into pieces  $(230 \pm 5 \text{ g})$ , and packed in low density polyethylene bags, vacuum sealed and stored at -20 °C. The frozen samples were subjected to either 0 (fresh meat, control), 1, 2, 3, 4, 5 and 6 freeze-thaw cycles. The objective of this study was to determine the effects of repeated freeze-thaw cycles (0 to 6) on the quality of chicken breast. The results showed that meat color, a\* (redness) and b\* (vellowness) values decreased while L\* values (lightness) increased with increasing cycle numbers. The pH was significantly reduced after the 6th cycle as compared to fresh meat. The drip loss and thawing loss showed an increasing trend with increasing in freeze-thaw cycles (p < 0.05). Water-holding capacity decreased as the number of freeze-thaw cycles increased (p < 0.05). NMR relaxometry profile showed freeze-thaw cycles alter the water distribution in meat subjected to number of multiple freeze-thaw cycles. Furthermore, T21 values indicated a significant decrease of myowater in the myofibriller matrix. The results regarding Warner-Bratzler shear force (WBSF) indicated a significantly decreasing trend after freeze-thawing in cycle dependent manner, compared to that of control. Differential scanning calorimetry profile indicated slight denaturation of myosin and actin with repeated freeze-thaw cycles. In conclusion, multiple freeze-thaw cycles lead to loss of muscle water together with protein denaturation, ultimately leading to decreases in the color stability of broiler chicken breast.

Keywords: Quality Changes, Freeze Thaw, Breast, Muscle Quality

[P1-10]: Economics / Miscellaneous (ID: 110060)

[Egypt]

## Genetic Evaluation of Monthly Egg Production Traits in Japanese Quail Using Random Regression Models

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Data of 1200 females of Japanese quail for the first five months of egg production were retrieved and analyzed from four consecutive generations of an egg line selected for egg production in the first thirty days (EP30). Comparison of eight random regression models with different orders of Legendre polynomials was applied to use the proper model for analysis. The most adequate model included second order Legendre polynomials for fixed and additive genetic effects, and third order for permanent environmental effects depending on Akaike Information Criterion. Estimates of heritability were relatively low to moderate (0.09 to 0.17) showed a descending pattern of amount from the first to sixth month of production. Similar pattern was observed for permanent environmental effects with greater estimates in the first (0.36) and second (0.23) months of production than heritability estimates. Except for the correlations between the first month production and the later months which were mostly low, the correlations between separate production months through the second to the sixth months were high. Significant (P < 0.05) estimates of covariate effect (age at sexual maturity) showed a decreased pattern with greater impact on egg production in earlier ages (first and second months) than later ones. Estimates of genetic correlations were mostly higher (0.17 to 0.95) than phenotypic correlations (0.14 to 0.81). Methodology based on random regression animal models can be recommended for genetic evaluation of egg production in Japanese quail.

Keywords: Japanese quail, egg production, random regression

[P1-11]: Economics / Miscellaneous (ID: 110115)

[Iraq]

## Effects of Different Sounds on Feeding Behavior and Physiological Traits in Broiler Chickens

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This study was conducted at the experimental field of the Department of Animal Resources, College of Agriculture, Sulaymaniyah University, Iraq, from 24/08/2015 to 04/10/2015. The chicks were brought from hatchery Kasha in the area Taslojh. we used the following three sounds: Movement of Chicken Feet (1), Regular Soft Timid Hens (2), Chicks Care (3) and Control (T4 without sound). Hatched, straight run chicks (n = 160), were randomly distributed among 4 treatments, with four replica (2 male -2 female) per treatment and 40 chicks per replica (10 chicks/treatment), Blood was collecting in 14, 42 days and analyzed for concentration of total protein, glucose, uric acid and cholesterol. The plasma was tested for prolactin hormone concentration in ELISA. The data was collected 1- 30 minutes before exposure to sound 2- directly after exposure for 30 minutes. The data were reported as means  $\pm$  SEM and subjected to two-way, using a GLM model in the SAS system (SAS, 9.2) (SAS, 2004), followed by Duncan's multiple-range tests to analyze the differences among all treatments when the F-value was statistically significant (P < 0.05). The results show: Significant improvement (P<0.05) in glucose and total protein, significant decrease (P<0.05) in concentration of uric acid and cholesterol ratio for the Movement of Chicken Feet (1) and Chicks Care (3) treatments at the age of 14 and 42 days. Significant improvement (P<0.05) in Prolactin concentration for treatments: Movement of Chicken Feet (1), Regular Soft Timid Hens (2), Chicks Care (3). in the period before exposure to sound 30 minutes before exposure directly after exposure directly after exposure for 30 minutes at the age of 14 days (the end of the exposure to the sound of period).

Keywords: Broiler Chickens, Sound Stimuli, Feeding Behavior, Physiological Traits.

[P2-01]: Poultry Nutrition (ID: 110014) [Kuwait]

### The Effect of Temperature on the Response of Laying Hens and Growing Broiler Chickens to Varying Dietary Levels of Tryptophan

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Two separate feeding trials were conducted on laying hens and growing broilers to study the effects of varying ambient temperature and dietary tryptophan levels on performance. In the first trial 1,440 brown strain laying hens were used and randomly distributed into 2 rooms, with 144 cage per room and 5 birds per cage. The 2 rooms had different temperatures (16 vs 26°C) and birds, in each room, were fed diets varying in Trp concentration (5.9, 10.6, 15, and 20 g/kg CP). In the second trial 20d old Ross I female growing broilers were subjected to different temperatures (20 vs 30°C) and fed diets varying in their protein (150, 180, or 210 g/kg CP) and Trp concentration (6.5, 9.5, 12.5, and 15.5 g/kg CP). There were 4 rooms per temperature and 8 cages (2 birds/cage) were allocated to each diet. Laying output and growth rate were the measured parameters in the first and second trial, respectively. The results of the first trial indicated a curvilinear response to Trp concentration (P<.001). Broiler growth rate, in the second trial, was linearly increased (P<.001) with increasing dietary crude protein concentration. In both trials, no significant (P>0.05) dietary Trp concentration x temperature interactions were observed on the studied bird's performance.

Keywords: Layer, broiler, temperature, tryptophan

[P2-02]: Poultry Nutrition (ID: 110022) [United Kingdom]

## The Effect of Exogenous Phytase on Dietary Energy and Nutrient Availability when Fed to Laying Hens

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There is far less data available describing the effects of microbial phytases in the diets of laying hens compared with broilers. An experiment was designed to investigate the effects of an evolved E.coli derived phytase (Finase EC, ABVista Feed Ingredients) on dietary apparent metabolisable energy (AME), total tract dry matter retention (DMR), nitrogen retention (NR) and phytate P digestibility when fed to laying hens for four consecutive weeks. Some laying hen performance variables, including feed intake, weight gain, egg numbers and egg mass output were also measured as a normality check. A total of sixty ISA Brown laying hens were fed one of two mash maize-soybean meal-based diets containing 150 g protein, 11.72 MJ AME, and 2.2 g/kg available P (negative control, NC), supplemented with 0 or 500 FTU (phytase units/kg feed). The diets were supplemented with titanium dioxide as indigestible marker. The birds received the experimental diets from 35 to 39 weeks of age, and each diet was replicated ten times in a randomised block design (3 birds per cage). During the last three days of the study the excreta were collected and prepared for further analysis. The phytase supplemented diet had higher (P<0.05) AME (13.33 vs 12.83 MJ/kg DM) and DMR (0.745 vs 0.720) and tended (P=0.067) to have higher NR (0.482 vs 0.421) compared to the control diet. Feeding phytase improved (P<0.001) the dietary phytate P digestibility coefficient by 34% (0.642 vs 0.479). The observed performance variables were in the expected range and no abnormalities were detected. The results from this study demonstrated that dietary phytase improves the nutritional value of maize-soybean meal-based diets when given to ISA Brown laying hens between 35 to 39 weeks of age. The improved dietary phytate P utilisation suggests that the use of dietary phytase may be an efficient way to reduce pollution from animal production.

Keywords: phytase, layers, phytate P, AME

[P2-03]: Poultry Nutrition (ID: 110031) [United Kingdom]

### Mixture of Exogenous Enzymes Enhances Dietary Energy and Nutrient Availability in Wheat Based Diets for Broilers

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The aim of the study was to evaluate the effect of three dietary treatments when fed to broiler chickens from 8 to 21 days of age on N-corrected dietary apparent metabolisable energy (AMEn), total tract nitrogen (NR) and dry matter (DMR) retention coefficients. Three wheatbased diets, including a control without enzyme supplementation (diet 1), and two more diets based on the control containing 700 units of xylanase kg/diet (Bioxylanase V, Kerry Ingredients and Flavours, Ireland) (diet 2), and 700 units of xylanase kg/diet+50 units of  $\alpha$ -D-galactosidase kg/diet+350 units of 1,4-β-glucanase kg/diet (AGal-Pro BL, Kerry Ingredients and Flavours, Ireland) (diet 3) were formulated and used in this study. Sixty male Ross 308 broiler chickens were randomly allocated to 30 small pens, giving two birds per pen. Each diet was replicated 10 times in a randomised block design. Diets were fed as mash from 8 to 21 days of age, period in which feed and water were offered ad libitum. During the last four days excreta samples were totally collected and analysed for the determination of dietary AMEn and nutrient retention coefficients. Growth performance of birds, including daily feed intake, growth and feed efficiency, was also determined. Data were compared statistically by ANOVA. The enzyme supplemented diets had higher (P<0.001) AMEn (12.40, 12.90 and 13.10 MJ/kg for diets 1, 2 and 3, respectively; SEM=0.101). Diet 1 had lowest (0.719), and diet 3 the highest (0.767) DMR coefficient (P < 0.001; 0.749 for diet 2; SEM=0.0051). Diet 3 had higher NR coefficient compared to the other two diets (0.630, 0.648 and 0.677, respectively; SEM=0.0088). There were no differences (P>0.05) in bird growth performance. The results demonstrated that a mixture of dietary enzymes improve the nutritional value of wheat-based diets for broilers. The improved dietary N utilisation suggests that the use of a mixture of enzymes may be an efficient way to reduce pollution from animal production.

Keywords: xylanase, galactosidase, β-glucanase, broilers, AMEn, N

[P2-04]: Poultry Nutrition (ID: 110036) [Iran (Islamic Republic of)]

### Efficacy of an Oregano-based feed supplement on Performance and Intestinal Morphology of Broiler Chicks

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In order to investigate the effects of Ropadiar® as an oregano-based feed supplement containing mainly carvacrol and thymol on intestinal morphology and performance of broiler chicks, a total of 496 one-day-old Ross 308 broiler chicks from two different parent stocks were allocated into two dietary groups. Chicks were assigned to 2 broiler houses with 4 replicates in each using completely randomized design according to a 2×2 factorial (2 Ropadiar® levels and 2 flocks) for 42 d. Body weight and feed intake of birds were recorded on a weekly basis. Four birds per treatment on day 42 were randomly selected for intestinal morphology measurement. The result of this study shows that there was no significant association between added dietary Ropadiar® and weight gain and feed conversion ratio. There was a significant increase, however, in epithelium thickness and villus width in duodenum and jejunum, along with an increase in villus surface area in duodenum, and increase in cell area of goblet in duodenum, jejunum and ileum (P<0.05). It could be concluded that the key point of using Ropadiar® as an oregano essential oil is in maintaining gastrointestinal health and resistance to pathogens and preventing digestive disorders that may occur.

Keywords: Oregano, Carvacrol, Thymol, Intestinal morphology, Broiler chicks

[P2-05]: Poultry Nutrition (ID: 110037) [Iran (Islamic Republic of)]

### Investigation on the Partial Replacement of Arginine by Guanidinoacetic Acid in Turkey Diets

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In this experiment 480 male BUT6 poults were assigned to 8 treatments ( $4\times 2$  factorial arrangement) with 6 replicate per treatment and 10 birds in each replicate in a completely randomized design. Treatments were different Ideal ratios of digestible Arg/Lys (85, 95, 105, and 115) and two levels of CreAmino (0 and 0.06%) as a guanidine acetic acid (GAA) source. Weight gain (WG), feed intake (FI) and feed conversion ratio (FCR) were measured for starter (1-21d) and grower (22-49d) phases. At the end of the experiment, two birds per replicate were slaughtered and carcass traits were measured. Results showed that main effects of Arg/Lys on WG was significant (P<0.05) and birds receiving diets with Arg/Lys ratio of 85% had lower WG than those with higher ratio during starter period. Interaction between Arg/Lys and GAA supplementation for WG was significant (P<0.05) during starter period, whereas birds fed diets with 105 and 115 Arg/ Lys ratio without GAA had significantly (P<0.05) higher WG compared to those with 85% ratio. Supplementation with GAA improved WG in birds fed diets with 85 Arg/Lys ratio group while it reduced FI during growing and overall period (P<0.05). Birds fed diets with 85 % Arg/Lys ratio had significantly (P<0.05) higher FCR compared to 95, 105 and 115%. Dietary supplementation with GAA improved FCR during all periods of the experiment. Interaction between Arg/Lys and GAA supplementation for FCR was significant (P<0.05) during starter period. Carcass traits were not affected by Arg/Lys ratio. Carcass, breast and wing as live weight percentage were increased (P<0.05) by GAA addition. Based on the results of current experiment, GAA seems to have a potential to spare Arg effects and improve turkeys performance.

Keywords: turkey, guanidine acetic, arginine, performance, carcass

[P2-06]: Poultry Nutrition (ID: 110040) [Iran (Islamic Republic of)]

### The Effect of Steam or Dry Conditioning and Sodium Bentonite Levels on Pellet Quality, Performance and Digestive Tract Development of Growing Broilers Fed Corn-based Diet

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The effect of steam or dry conditioning and different levels of sodium bentonite (SB) on pellet quality, performance and digestive tract development of growing broilers (11-24 d) fed corn-based diet was studied. In a  $3 \times 3$  factorial arrangement of treatments, three sodium bentonite levels (0.00, 0.75 and 1.50 %) and three conditioning times (0, 2 and 4 minutes) along with or without steam conditioning (0.0 minute as dry-conditioning), 2 and 4 minutes (70°C- steam conditioning) were evaluated. Steam conditioning in 2 and 4 minutes increased (P < 0.05) the weight gain of the chickens when compared with those of birds in dry conditioning group. Birds fed diets conditioned in 2 and 4 minutes had similar (P > 0.05) weight gains. Addition of different levels of SB had no significant effect on weight gain. Steam and dry conditioning with or without SB had no significant effect on feed intake (P> 0.05). Birds fed the conditioned diet in 2 minutes had lower (P < 0.05) feed to gain ratio than those of birds fed dry conditioned diet but similar (P > 0.05) to those fed the diet conditioned in 4 minutes. The addition of SB improved feed to gain ratio and the best feed per unit of gain was obtained by 1.5% SB (P< 0.05). No significant differences in relative weights of duodenum, jejunum and ileum among treatments were observed. The main effect of conditioning (dry/steam) time was significant (P < 0.05) for relative length of jejunum, ileum and small intestine. However, birds fed pelleted steam conditioning in 2 minutes had shorter jejunum and small intestine than those of birds fed the pellet conditioning in 4 minutes and dry conditioning. Addition of SB (0.75, 1.5%) decreased relative length of ileum (P< 0.05). Pellet durability index and hardness of the diets conditioned in 2 minutes with 1.5% SB were higher than those of other dietary treatments (P < 0.05). Under the condition of this study, it was suggested that steam conditioning improves weight gain and feed to gain ratio. Steam conditioning and SB improve pellet durability index and hardness.

Keywords: conditioning, sodium bentonite, pellet quality, performance, broiler

[P2-07]: Poultry Nutrition (ID: 110043) [Iran (Islamic Republic of)]

### Effect of Emulsifiers and Saturated Fats on Growth Performance, Carcass Characteristic and Nutrient Digestibility of Broiler Chickens

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An experiment was concluded to study the effect of emulsifiers and saturated fatty acids on growth performance, carcass characteristic and nutrient digestibility of broiler chickens. In a complete randomized design, 480 day-old Ross broiler chickens were randomly divided into 12 treatment groups, each in four replicates of 10 chicks per replicate. In this experiment, two fat sources (Animal fat as tallow, T and vegetable fat powder as ERP10TM, E) at a level of 5% each and two emulsifiers (Lecithin, L and Propylene glycol, PG) at 2 or 4 % dietary fat replacement were added to make 8 rations. Also, a mixture of 2.5% T and 2.5% E was blended with either L or PG at 2 or 4% dietary fat replacement to make 4 additional treatments. At the end of 3 and 6 weeks of the trial, carcass characteristics were measured. Chromic oxide was used for nutrient digestibility measurement. At week 2-3, L or PG increased feed intake (FI) when added to either T or E. FI decreased when the combination of T+E used with PG or L (P< 0.05). The same trend was seen at other periods. Diet with 2.5% T + 2.5% E + 4% replaced L with T or E had the highest body weight and the lowest FI and feed conversion ratio. At week 3, fat digestibility was affected by experimental diets (P < 0.05). At week 6, the highest nutrient digestibility observed in the diet with 2.5% T + 2.5% E + 4% L replaced with fat sources. Mixture of the two fat sources showed better effect on broiler performance. In conclusion, supplementation of the diets with 4% L was more effective than that of PG along with the mixture of two fat sources, T and E.

Keywords: Lecithin, Propylene glycol, "Tallow, Digestibility, Boiler chickens

[P2-08]: Poultry Nutrition (ID: 110048) [Yugoslavia]

### Synergistic Effects of Dietary Supplementation of a Garlic, Black Pepper and Hot Red Pepper Mixture on Broiler Performance, Blood Lipid Profile and Carcass Quality

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An experiment was conducted to investigate the synergistic effects of a spice herb mixture containing garlic, black pepper and hot red pepper on productive performances, blood lipid profile and carcass quality (dressing percentages; commercial cuts percentages such as breast, drumstick, thighs, wings, head and legs; percentage of abdominal fat). A total of 300 day old broiler Hubbard chicks were randomly distributed into two dietary treatments having 150 chicks each divided into four replicates with 37 to 38 chicks per replicate. Feeding trial was conducted until 42 days of age. The two dietary treatments were a commercial ration without (Control, CON) or with the addition of a herb mixture containing garlic, black pepper and hot red pepper (1:1:1) (SpMx) at an inclusion rate of 0.5%. Birds fed the SpMx diet achieved significantly (P<0.05) improved final body mass (2297.8 g/b) and feed conversion. The European broiler index (EBI) was significantly (P<0.05) lower in CON-fed birds (220.4) as compared to SpMx-fed birds (279.6) with zero mortality rate. The concentrations of triglycerides, total cholesterol, low density lipoprotein (LDL) and non-high density lipoprotein (non HDL) were significantly (P<0.05) reduced in the blood of chickens fed the SpMx diet as compared to control birds. Carcass quality of chickens was significantly (P<0.05) improved with dietary spice herbs addition. It can be concluded that chickens supplemented with these spice herbs mixture had an enhanced feed utilization and efficiency, better lipid profile and improved carcass quality.

Keywords: spice, nutrition, chickens, cholesterol, carcass

[P2-09]: Poultry Nutrition (ID: 110050) [Iran (Islamic Republic of)]

### The Effect of Dry or Steam Conditioning and Activated Sodium Bentonite on Pellet Quality Indices and Relative Electrical Energy Usage in Broiler Wheatsoy Based Diets

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At a local poultry feed plant, a study was conducted to evaluate the effect of dry or steam conditioning in different times and levels of activated sodium bentonite (ASB) on the physical pellet quality indices and pelleting energy usage of wheat-based diets. In a  $3\times3$ factorial arrangement of treatments, three ASB levels (0.00, 0.75 and 1.50%) and three conditioning time (0, 2 and 4 minutes) along with or without steam conditioning (0.0 time as dry-conditioning), 2 and 4 minutes (70°C- steam conditioning) were evaluated. Physical Pellet quality indices, including pellet durability index (PDI) and pellet hardness were determined in a Holmen Pellet Tester (NHP100) in four different times (30, 60, 90 and 120 seconds) and Kahel pellet Hardness tester, respectively. Electrical energy consumed for pelleting was calculated as relative electrical energy usage (Kwh/ton of finished feed). Steam conditioning (70°C) significantly improved PDI and pellet hardness when compared with that of dry conditioning group (P < 0.05). ASB addition increased the PDI in comparison with that of no ASB addition into the diets (P < 0.05). PDI at 2 minutes steam conditioning, and at 60, 90, and 120 seconds were higher than that of 4 minutes steam conditioning diets (P< 0.05). The diets conditioned for 2 minutes containing 1.5% ASB had the highest PDI (P< (0.05). Pellet hardness was not affected by this procedure. Relative electrical energy usage was decreased significantly at 4 minutes feed conditioning time than those of dry and 2 minutes conditioning (P < 0.05). Therefore, steam and feed retention time in conditioner chamber can positively affect pellet quality and relative electrical energy usage.

Keywords: steam conditioning, sodium bentonite, PDI, hardness

[P2-10]: Poultry Nutrition (ID: 110057) [Yugoslavia]

### Evaluation of the Quality of a Grape Seeds Extract Used as Antioxidant in Layer Feeds Enriched in Omega 3 Polyunsaturated Fatty Acids

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A feeding trial on 120 layers has been conducted for 4 weeks which aimed to make use of winery by-products as antioxidants in layer diets enriched in polyunsaturated fatty acids. The layers, were assigned to two groups (C and E). The layers from group C received a compound feed based on corn (50.18 %), soybean meal (19.38 %) and sunflower meal (15 %), with 11.37 MJ/kg and 18.33 % crude protein. The compound feed for group E included flax meal (3%), camelina meal (2%) and grape seeds oil (2%) with 11,41 MJ /kg and 18,24% crude protein. The concentration of  $\Omega$ 3 polyunsaturated fatty acids (6.61g % fat) in group E was 726.25 % higher than in the compound feed for group C. The concentration of polyphenols in the compound feed for group E was higher than for group C. The concentration of alpha linolenic acid (C 18:3n3) in the yolk of the eggs from group E was 513.64% higher than in the yolk of the eggs from group E was 219 % higher than in the yolk of the eggs from group C. The values of the Haugh unit, corroborated with egg freshness data showed that the grape seeds oil acted as antioxidant, which maintained the nutritional quality of the eggs from group E.

Keywords: layers, eggs, omega 3 fatty acids, grape seeds oil, antioxidants

[P2-11]: Poultry Nutrition (ID: 110059) [Iran (Islamic Republic of)]

## Investigation of Feed Form and Maize Particle Size Interaction on Mineral Digestibility and Intestinal Morphometry in Broilers

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The influence of feed form and maize particle size on coefficient of apparent ileal digestibility (CAID) of minerals and intestinal morphology in broiler starters was examined in this study. Two feed forms (mash and pellet) and three maize particle sizes (fine, medium and coarse) were evaluated in a  $2 \times 3$  factorial arrangement of treatments. Whole maize was ground in a hammer mill to pass through screen sizes of 2.0, 5.0 and 8.0 mm for fine, medium and coarse grade, respectively. Feed form and particle size combinations failed (P > 0.05) to show any interaction effect for the CAID of all determined minerals indicating that the effect of particle size was similar in both diet forms. Feeding pelleted diets reduced (P < 0.05) the CAID of calcium and phosphorus, but increased (P < 0.05) that of sodium. Medium and coarse grindings resulted in higher (P < 0.05) calcium digestibility than fine grinding. Gizzard pH was not influenced (P > 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine grinding increased (P < 0.05) by particle size in mash diets, but fine g 0.05) gizzard pH compared to medium and coarse grinding in pelleted diets. Feeding pelleted diets reduced (P < 0.05 to 0.001) the relative length of all small intestinal segments and the relative weight of pancreas, proventriculus, and gizzard. Medium and coarse grinding increased (P < 0.05) the gizzard weight compared to fine grinding. In both the duodenum and jejunum, birds fed pelleted diets had greater (P < 0.05) villus height than those fed mash diets. Goblet cell number in duodenum was higher (P < 0.05) in birds fed diets containing fine particles compared to those fed medium and coarse particle sizes. The crypt depth in jejunum was greater (P < 0.05) in birds fed pelleted diets. Overall, the present data showed that when pelleted maize-based diets are fed to broilers, the use of coarse particles could possibly optimise intestinal development and function. Increased gizzard weight with medium and coarse grinding of maize had a positive effect on the gizzard pH in pelleted diets, and enhanced calcium digestibility regardless of feed form.

Keywords: Feed form; Particle size; Broilers; Minerals; Intestinal morphology

[P2-12]: Poultry Nutrition (ID: 110077) [Iran (Islamic Republic of)]

### Influence of Physical Form of Prestarter Diet on Performance and Digestive Enzyme Activity in Broiler Chicken During First Week

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The aim of this study was to evaluate the effect of physical form of feed in the first week of life on growth performance and digestive enzyme activity in broiler chickens. 208 one-day old male broiler chickens were distributed in a completely randomized design to 4 experimental treatments with 4 replicates per treatment. Experimental treatments were: Prestarter feed for the first week of broiler life with 4 different physical forms including: pellet (diameter: 2 mm), crumble, fine (sieve: 2mm) and coarse mash (sieve: 4mm). The prestarter diets were based on corn and soybean meal and fed ad libitum from 1 to 7 days of age, then all birds fed same diets from 8 to 42 d. Highest body weight gain (BWG) was observed at 7 days in birds fed pellet and crumble feed, while inclusion of coarse mash in the first week significantly decreased BWG in 42 days of age ( $P \le 0.05$ ). Diet form did not affect volk sac relative weight at any ages. Feeding prestarter diet in pellet and crumble form significantly increased feed intake and improved FCR at 7 days of age (P<0.05). Physical form of prestarter diet did not influence the activity of aminopeptidase at different parts of the intestine and pancreas at all ages. Feeding prestarter diet as pellet form increased pancreatic enzyme activity at d 4 compared to mash diets ( $P \le 0.05$ ), also amylase activity in the jejunum was higher at fine mash group than those fed crumble and coarse mash during 7 days of age ( $P \le 0.05$ ). It is concluded that physical form of feed in the first week of life influenced performance and activity of amylase during fist week, but had a slight effect on final body weight in broiler chickens.

Keywords: Broiler chickens, prestarter, physical form, performance
[P2-13]: Poultry Nutrition (ID: 110080) [South Africa]

# The Evaluation of Lupins (Lupinus angustifolius) as Alternative Protein Source in Ostrich Diets

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Nutrition contributes 70-80% of the total input costs of an intensive ostrich production unit. An increase in the price of traditional protein sources, such as soybean oilcake meal, necessitates producers to find cheaper alternatives to ensure the cost efficient production of slaughter ostriches. This study was performed to determine to what levels soybean oilcake meal may be replaced by locally produced sweet lupins in the diets of slaughter ostriches (Struthio camelus var. domesticus) and to evaluate the effect of increasing lupin inclusion levels on the end weight, feed intake (DMI), average daily gain (ADG) and feed conversion ratio (FCR) of the birds. In the trial, 141 chicks (84 days of age and ca. 14 kg) were randomly divided into five dietary treatments with three replications each. Two iso-nutrient diets were formulated for each production stage (starter, grower and finisher) to contain either soybean oilcake meal (control diet) or lupins. Soybean oilcake as protein source was gradually (0%, 25%, 50%, 75%, 100% lupins) replaced by lupins. Feed and water were supplied ad libitum. Bi-weekly feed intake, as well as the weights of the birds was measured until they were slaughtered at approximately 10.5 months of age. The average initial body weight of the birds was  $13.8 \pm 0.6$  kg. At the end of the trial, no differences (P=0.39) were found for the end weight of the birds between the treatments. The end weights of the birds were  $87.5 \pm 3.0$  kg.  $92.3 \pm 3.0$  kg,  $94.6 \pm 3.0$  kg,  $95.2 \pm 3.4$  kg and  $88.9 \pm 3.1$  kg, respectively. For the different diets DMI, ADG and FCR did not differ (P=0.51, 0.21, 0.96, respectively) between the five treatments. A mean DMI and ADG of 2020.5  $\pm$  61.9 and 351.5  $\pm$  8.3 g/bird/day were observed with a mean FCR of  $5.7 \pm 0.1$  kg feed/kg weight gain. Over the told experimental period regression analysis of the data revealed that ADG showed a quadratic function (R2=42% and P=10%) between the diets, with a tendency for a higher growth rate with the intermediate diets. The study revealed that soybean oilcake meal can be replaced in the diets of slaughter ostriches with lupin up to 30% without any significant detrimental effect on production. The hind-gut fermentation ability of ostriches probably enables them to utilise lupins with their higher fibre content than soybean oilcake meal, efficiently. The results of this research will eventually contribute to the currently limited knowledge on the diet formulations of ostriches as well as the optimal inclusion level of lupins in ostrich diets. The findings of the study may also assist to create a potential market for locally produced protein sources such as lupins and broaden our knowledge with regards to the potential of this source as feed ingredient for animals.

Keywords: ostriches nutrition lupins

[P2-14]: Poultry Nutrition (ID: 110081) [South Africa]

## Effect of Varying Levels of Protein and Amino Acid Concentrations on the Production Parameters of Growing Ostriches

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An estimated 70 to 80% of the input costs of an ostrich farming enterprise are solely attributed to the feeding of the birds. Protein, along with energy, is a macronutrient and both comprise the bulk of the digestible matter contained in animal diets. The aim of this study was to investigate the effects of five different levels of protein with corresponding amino acid profiles in the diets of slaughter ostriches (Struthio camelus var. domesticus) on the feed intake, average daily gain (ADG) and feed conversion ratio (FCR). The trial, with five treatments and three replications per treatment, was structured into 15 camps containing 20 young chicks each. The middle of the five diets was formulated according to the standard diet commonly used in industry, and served the purpose of the control for this study. The inclusion levels of diets one through five were thus 11.8%, 12.2%, 12.6%, 13.0% and 13.4% crude protein, with corresponding amino acid profiles, respectively. The ostriches had access to fresh clean water and fed their respective diets ad libitum. Weekly feed intake was measured, as well as weekly weighing of the birds was done until they were slaughtered at 13.5 months of age. Any differences were significant at a level of P = 0.05. Results for feed intake had differences (P =0.002) between the treatments and a linear function was applied to best fit the data. An incremental increase in diet would result in a subsequent increase in intake by 63 g/bird/day. Diets 3, 4 and 5 had higher intakes than diets 1 and 2. Diet 5 had the highest feed intake of 1684 g/bird/day, whilst Diet 1 the lowest of 1432 g/bird/day. Differences (P = 0.0001) were found between treatments for the ADG, with the trend across the five treatments best fitted by a quadratic function. Diets 3, 4 and 5 did not differ between themselves, with diet 4 (347 g/bird/day) marginally higher than the other two. Diets 1 and 2 had significantly lower ADG's, 259 g/bird/day and 299 g/bird/day respectively, than the other three diets. In terms of FCR, a quadratic function was fitted to the trends, with diet 1 differing (P = 0.0002) from the rest of the treatments. Diet 1 had a FCR of 4.4 while diet 4 had a FCR of 3.8, the best, though not significantly different from diets 2, 3 and 5. Overall, although diets 4 and 5 consistently performed the best across the production parameters; there were no significant differences among diets 3, 4 and 5 in terms of these parameters. Therefore, conclusively it can be stated that these diets consistently performed above diets 1 and 2. Increased protein concentrations in the diet above the norms used in industry did not result in significant increases in performance levels of slaughter ostriches.

Keywords: Growing ostriches, nutrition, amino acid requirements

[P2-15]: Poultry Nutrition (ID: 110082) [South Africa]

#### Determination of Energy, Protein and Amino acid Requirement for Maintenance and Egg Production of Breeding Ostriches

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Great success has been achieved with modelling the nutrient requirements of poultry, but modelling has been used only in a few previous studies with ostriches. Results obtained from previous studies were used to determine the energy, protein and amino acid requirement for egg production and maintenance of breeding ostriches. Two methods were used to determine the energy requirement for egg production of ostrich breeders. Metabolisable energy requirement for egg production (MEe) and efficiency of ME utilization for energy deposition in egg (ko) was calculated as 12.2 MJ/egg and 0.8 respectively. Effective energy requirement for egg production (EEe) and maintenance (EEm) was calculated as 8.0 MJ/bird/day and 17.1 MJ/bird/day respectively. Average total daily protein requirement (TPt) was calculated as 117.2g/day. The effective energy system is probably a superior system over the ME system and EEe can therefore be regarded as a more accurate estimation of the energy requirement for egg production.

Keywords: Breeding ostriches, energy requirements, amino acid requirements

[P2-16]: Poultry Nutrition (ID: 110087) [Iran (Islamic Republic of)]

## Effect of Feeding Guanidinoacetic Acid and L-arginine on Immune Response in Aged Broiler Breeder Hens

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Two experiments were conducted to evaluate the effects of feeding guanidinoacetic acid (GAA) and L- arginine (L-Arg) on immune response of aged broiler breeder hens. In the first experiment; a total of 200 broiler breeder hens (Ross 308), from 53 to 62 weeks (wks) of age were used, and randomly distributed into four dietary treatments (0, 0.6, 1.2 and 1.8 g GAA/kg) each in five replicates. In the second experiment; 320 broiler breeder hens (Ross 308) in a  $2 \times 4$  factorial arrangement (0 or 1.2 g GAA /kg and 0, 3, 6, and 9 g added Arg/kg diet) were used from 53 to 62 wks of age. Hens received a diet that contained 2800 kcal ME/kg and 14% CP. Indices of humoral immunity [anti-sheep red blood cell (SRBC) titer, IgG, and IgM at 61wk of age] as well as differential leukocyte numbers (62 wk of age) were measured. Supplementary L-Arg increased total anti-SRBC titer ( $P \le 0.048$ ). However, the effect of supplementary L-Arg on IgM, IgG level, and differential leukocyte numbers was not significant. In the first experiment, dietary GAA increased IgM level ( $P \le 0.029$ ). The lowest IgM was recorded at 0 g GAA/kg as compared to other treatment groups. The effect of the GAA (in two experiments) on the total anti-SRBC titer, IgG level and differential leukocyte numbers was not significant. The interactive effects of L-Arg and GAA on the total anti-SRBC titer, IgM, IgG and differential leukocyte numbers were not significant. In conclusion, it seems that L-Arg and GAA supplemented diet can improve humoral immunity of broiler breeder hens.

Keywords: arginine, broiler breeder, guanidinoacetic acid, immunity, leukocyte

[P2-17]: Poultry Nutrition (ID: 110097) [Iran (Islamic Republic of)]

# **Evaluation of Metabolizable Energy Content of Processed Soybean Meal for Broiler Chickens**

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In most countries, soybean meal (SBM) is the main source of protein in poultry feed. However, SBM contains anti nutritional substances the negative effects of which are reduced following processing. The objective of the current study was to evaluate the metabolizable energy (ME) content of a processed soybean meal (Digesta<sup>TM</sup>) which was reported, in previous studies, to be of about 640 (kcal/kg) more than that of SBM. One hundred and twelve day old male chickens (Ross 308) were used in a completely randomized design with four treatments, seven replicates and four birds in each, for 42 days. In the present experiment we assumed that, the energy level of Digesta was 0 (D2230), 320(D2550) or 640 (D2870) kcal more than that of SBM while the fourth treatment (S2230) contained SBM. Based On SBM energy content, the energy equivalent of Digesta for formulation of the first, second and third dietary treatments were 2230 kcal/kg, 2550 and 2870 kcal/kg, respectively. All diets were similar for all nutrients. According to kjeldahl analysis, crude protein specification of Digesta and SBM in the nutrient matrix of software changed to 51 and 44% respectively. Average body weight of chicks receiving D2550 and D2870 diets had no significant difference with S2230 at 24 day (P<0.01) while they were heavier than D2230 (P<0.01). The trend for body weight gain during 25 to 42 days was the same as the previous period (P<0.09). Feeding Digesta instead of a regular SBM improved feed conversion ratio at 24 day (P<0.01), increased carcass yield by around 3.9% and decreased abdominal fat by about 34.8% (P<0.01). In conclusion, a properly processed dietary SBM (such as Digesta in this study) improved nutrients utilization by broilers and is likely to result in feed cost reduction. Consequently Digesta is definitely higher in ME content than regular SBM.

Keywords: Broiler chicken, Digesta<sup>TM</sup>, Soybean meal, Metabolizable energy

[P2-18]: Poultry Nutrition (ID: 110113) [Turkey]

#### Effects of Raw Bee Propolis and Water or Ethanol Extract of Propolis on Performance, Immun System and Some Blood Parameters on Broiler Bredeers Hasan Alp Sahin (1) and Ergin Ozturk (2)

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In this study it was aimed to determine the effects of raw bee propolis (RP) and water (WEP) or ethanol (EEP) extract of propolis on growth performance, some blood parameters and immunoglobulins in 15-20 weeks old Ross-308 broiler breeders. The birds in control group were fed diet without propolis whereas the birds in RP, WEP and EEP groups were fed diets with raw, water extract and ether extract propolis at the level of 1200, 400 and 400 ppm, respectively. Raw and extract propolis did not affect live weight gain, feed consumption, feed conversion ratio and some blood parameters such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), total antioxidant status (TAS), trigliceride and phosphorus (P). While EEP group had lower IgA value than RP and control group had higher IgM than only EEP group (P<0.05). The highest IgY value was determined for EEP and WEP had higher IgY values than control and RP groups. While the WEP group had lower TOS value than control group, EEP and WEP groups had higher plasma total protein and calcium (Ca) contents compared to control group (P < 0.05). The WEP had higher plasma albumin content than only RP group (P<0.05). The results of present study indicate that propolis extract, especially ethanol extract, addition in diet improves immunity, antioxidant acitivity and enhances Ca absorption. \*The authors are grateful to the Scientific Research Office of Ondokuz Mayis University (Project number: 1901.15.004).

Keywords: Poultry breeders, bee product, antioxidant, immun parameter, growth performance, blood chemistry

[P2-19]: Poultry Nutrition (ID: 110123) [Italy]

## Effect of Dietary Flaxseed Supplementation on Productive Performance and Egg Characteristics of Laying Hens

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Flaxseed is a rich source of phytoestrogens, mainly lignans (secoisolariciresinol diglucoside-SDG) and isoflavones (daidzein and genistein), whose metabolites (equol, enterolactone -ENL and enterodiol - END) possess a function similar to mammalian estrogen  $17\beta$ -estradiol. The present study evaluated the influence of dietary flaxseed supplementation on reproductive performance and egg characteristics (cholesterol, lignan and isoflavones) of 20 Hy-line hens (10/group) fed for 150 days a standard diet (C) or the same diet supplemented with 10 % of extruded flaxseed (F). When compared with a conventional diet, hens fed flaxseed showed a similar egg-laying efficiency (72.0 % vs 73.9 %) and egg yield. Furthermore, there were no effects of flaxseed on egg weight and chemical composition of yolk. The concentration of cholesterol in plasma and eggs was similar between two groups (70.0 vs 67.9 mg/dl and 180 vs 195 mg/egg, respectively). The plasma lignans, END and ENL was higher in F hens, while equol was lower (50.2 vs 71.0 ng/mL). The estradiol concentration in the plasma of hens feeding flaxseed was lower than control (P>0.05), probably due to the inhibition of the aromatase activity, an enzyme involved in the production of estrogens, by enterolactone and enterodiol. Indeed, the phytoestrogens act as potent antagonist in the hormonal response mediated by estrogen receptors (ERs). The secoisolariciresinol (SECO) was the main lignan in eggs of F group and its concentration was three times higher compared to the C one, as well as isosecolaricerisinol (192.7 vs 54.2 ng/g yolk and 152.9 vs 40.5 ng/g yolk, respectively). END and ENL were also higher in eggs of F group than C (P<0.05), whereas the equol was lower (198 vs 142 ng/g yolk). These findings indicate that dietary supplementation with flaxseed, do not affect the volk cholesterol concentration, whereas the lignans content of eggs was improved. However, the lower amount of equol suggests a probable competition for tissue uptake when lignans and isoflavones are administered simultaneously and this should be further investigated.

Keywords: flaxseed, lignans, equol, cholesterol, egg quality.

[P2-20]: Poultry Nutrition (ID: 110124) [Italy]

# Effect of Maternal Dietary N-3 Fatty Acids Supplementation on Fatty Acid Composition and $\Delta 6$ -Desaturase Activity of Chicks Liver

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The lipid composition of animal body tissues largely depends on the feeding plan used. There has been an increased interest in dietary fat sources (vegetable or fish oils) in animal nutrition that increase the n-3 fatty acid content in animal products. Furthermore, dietary fatty acids have a key role in controlling the gene expression of several enzyme pathways (e.g.  $\Delta 6$ desaturase) involved in long chain polyunsaturated fatty acids (PUFA) metabolism. The aim of this study was to check the influence of maternal dietary supplementation of linseed (rich in -linolenic acid, ALA) or fish oil (rich in eicosapentaenoic, EPA and docosahexaenoic, DHA acids) on the lipid metabolism of the chicken. A total of 60 laying hens belonging to two genetic lines (Slow-Growing -SG and Fast Growing - FG) fed 3 experimental diets were studied: control, LNA (10% linseed) and LCP (3% fish oil) group. The liver was collected in hatched chicks to assess the fatty acid composition and the activity of  $\Delta 6$ -desaturase enzyme. The linoleic (LA) as well as the arachidonic acid (AA) of liver were highest in the control followed by LNA and LCP groups independently on strains. The supplementation of extruded linseed increased the ALA content (9.10 and 8.80 % in SG and FG, respectively). Likewise, the amount of EPA and DHA was higher in the liver of LCP chicks. As a result, the total PUFA n-3 was about the same in both n-3 groups with an n-6/n-3 ratio lower than control. The activity of  $\Delta 6$ -desaturase was differently affected by genetic strain and feeding plan. The enzyme activity was very high in the SG fed control diet and decreased with the n-3 dietary enrichment. The same result appeared in FG but with a lower trend. In the ALA and LCP groups the  $\Delta 6$ -desaturase enzyme showed lower activity than in the control one, probably due to the choice of LA as biochemical substrate for the evaluation of desaturase activity. Data reported suggested that the dietary effect of PUFA on  $\Delta 6$ -desaturase activity and fatty acid profile was strongly affected by the genotype.

Keywords: Chicken, liver, a-linolenic acid, LCPUFA, Δ6-desaturase

[P2-21]: Poultry Nutrition (ID: 110133) [Algeria]

## Effect of Dietary Inclusion of "Phytase" on the performance of Broiler Chickens.

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Due to the advances in animal nutrition and biotechnology, many additives have been included in the feed formulation (enzymes, probiotics, prebiotics, essential oils and plant extracts, etc...) in order to optimize the profitability of the poultry industry. Phytase, a microbial enzyme, through the hydrolysis of the anti-nutritional factor phytate, improves nutrients' utilization such as phosphorus, calcium and proteins by poultry, thereby improving feed efficiency. The aim of this work is to test the efficacy of phytase on the performance of broiler chickens, in the Algerian production conditions. 300 Hubbard ISA-commercial strain of broiler chicks were divided into four treatment groups: control group (C) fed a conventional basal diet, and groups (P0) (P500), (P750) receiving the basal diet with a reduced inclusion rate of the di-calcium phosphate by (0.5%) and supplemented with phytase at doses: 0, 500 and 750 FTU/kg feed, respectively. Animal performance (feed intake, weight gain and feed conversion ratio) were measured through a 49-days cycle. The addition of phytase significantly improved (p < 0.05) weight gain during the growing phase for P500 by (14.92%), and P750 (13.87%) compared to C. In particular, Phytase significantly improved (p < 0.05) feed conversion ratio during the growing phase: (1.98) for P750 compared to C (2.05) and gave significantly (P<0.001) comparable ratios to the control for the whole production cycle: (2.02), (2.05) and (2.16) for P500, P750 and C, respectively. The performance of P0 were significantly lower (P<0.05) than C, P500 and P750 during the whole cycle. The improved growth performance was significantly (P<0.05) similar for both doses of phytase: 500 and 750 FTU/kg feed. In conclusion, the reduction of di-calcium phosphate by 0.5% accompanied by the addition of phytase in the diet of broilers improved animal performance which was comparable to that of the conventional diet. The promising economical results obtained with the 500 FTU phytase/kg feed in comparison with that of the 750 dose should encourage the feed manufacturing units in both private and state sectors to generalize the use of phytase in broiler feed formulation.

Keywords: Phytase, phytate, feed performance, broiler chickens.

[P2-22]: Poultry Nutrition (ID: 110070) [Brazil]

## Velocity of L-Methionine Incorporation into the Liver of Broiler Chickens at the First Week of Age

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The application of stable isotope technique using enriched compounds has helped our understanding of metabolic studies. These enriched compounds are introduced to trace the element fates in the organism and delineate functional pathways. The aim of the study was to assess the rate of labeled methionine incorporation into the liver of broilers aged 1-7 dold. A total of 51 one-d-old male Cobb broiler chickens, with an initial BW of  $45 \pm 1.13$  g, were housed (12 birds/m2 density) after selection by weight. The diet was formulated based on corn and soybean meal. A dosage of 29 µmol of L-[13C1]methionine/kg BW/h was used, administered orally within 6 h (99 atom% 13C, Cambridge Isotope Laboratories, Inc.) to promote tissue enrichment. At 0 (control), 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 16, 20, 24, 48, 72 and 96 h after initial dosing. 3 birds were slaughtered per time-point, and liver samples were collected. The liver samples have undergone lyophilization, defatting, and milling. Carbon isotopic analysis was obtained using a mass spectrometer. Second-order polynomial fit was used to determine the maximum incorporation point, and analyzed by first-order exponential equation  $[\delta_{13}C(t)=\delta_{13}C(t)+[\delta_{13}C(t)-\delta_{13}C(t)]e-kt]$ , obtained using the statistic software Minitab® 16. Maximum enrichment occurred 8.1 h after oral administration of enriched solution, and resulted in the equation:  $\delta 13C = -12.71 - 6.33e - 0.1422t$  (r2=0.94), with half-life (T=ln2/k) of 4.9 h, representing the velocity of Methionine incorporation into embedded tissue. Thus, the time required for 50% of orally-administered labeled Methionine to be metabolized is approximately 4.9 h at this dose and age of bird.

Keywords: Enriched amino acids, methyl-13C, turnover

[P2-23]: Poultry Nutrition (ID: 110009) [Iran (Islamic Republic of)]

#### Effect of Dietary Omega-3 to Omega-6 Ratio on Performance, Immune Response and Meat Fatty Acids Profile of Broiler Chickens

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An experiment was carried out to evaluate the effects of omega-3 and omega-6 fatty acids (FA) and their different ratio on performance, blood parameters, immune response and breast and thigh FA composition in male broiler chicken. One hundred and fifty 21-d-old broilers were assigned to 1 of 5 dietary groups. Treatment groups were respectively; basal diet plus 2000 mg omega-6/kg (T1) and basal diet plus 1400, 1800, 2200 and 2800 mg omega-3/kg (T2, T3, T4 and T5, respectively) using varying levels of fish oil. A completely randomized design (CRD) was used and data were analyzed by GLM procedure. Experimental treatments had no significant effect (P>0.05) on performance, blood parameters such as cholesterol, triglycerides, glucose, LDL and HDL, and omega-6 and PUFA concentration in breast muscle. Breast and thigh fatty acids profiles were significantly (P<0.05) affected by the various dietary FA supplementation with T1 having the lowest level of saturated FA and T4 the highest one. Breast and thigh omega-3 level as well as their DHA and EPA concentration increased with increasing dietary omega-3 supplementation while the SFA: PUFA and the omega-6: omega-3 ratios significantly (P<0.05) decreased with T5 having the lowest ratios. No significant difference (P>0.05) was observed in the omega-6 concentration and SFA: PUFA ratio in thigh muscle.Omega3 FA efficiency was not affected with dietary treatments. Immune assays indicated no significant effect of dietary treatments on IgG concentration although T4 group had the highest concentration of IgM. The highest antibody titer against SRBC was observed in T4 and T3 and the lowest in T1 group. In conclusion, the use of different dietary levels of fish oil had no negative effect on performance and carcass characteristics. The fatty acids composition, especially omega 3 and PUFA of breast and thigh muscle, and immune parameters were improved by dietary fish oil supplementation.

Keywords: fish oil, fatty acid composition, performance, male broiler

[P2-24]: Poultry Nutrition (ID: 110092) [Sudan]

# Effect of Fish Oil Supplementation on the Performance and Lipids Profile of Broiler Chicks

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A total of 90 one day old broiler chicks (Hubbard 15), were utilized in this experiment. Three experimental isocaloric-isonitrogenous diets were formulated to meet the requirements of broiler chicks (NRC,1994). The experimental diets contained graded levels (0, 4 and 6%) of fish oil. Nilotic silver cat fish (Bagrus domac), known in Sudan as Kabaroos, was used to produce the fish oil. Production of the fish oil was carried out using soxhlet apparatus and n-Hexane as the solvent for extraction. The extraction was carried out at the boiling point of the solvent. The effect of fish oil supplementation on broiler performance feed intake (g/ bird), weight gain (g/ bird) and feed conversion ratio (g feed / g gain ) and lipids profile was investigated . A significant (P < 0.05) improvement in total weight gain and feed conversion ratio of 6 weeks old broiler chicks was observed for birds fed 4 or 6 % fish oil as compared to those birds fed 4 or 6 % fish oil had a significantly (P< 0.05) lower cholesterol (CH, mg/dl), low density cholesterol (LDL, mg/dl) and total triglycerides (TG, mg/dl ) as compared to those birds fed the control diet . Fish oil supplementation did not significantly change the high density cholesterol (HDL, mg/dl).

Keywords: fish oil, performance, lipids profile, broiler, omega3

[P2-25]: Poultry Nutrition (ID: 110095) [Nigeria]

## Nutritive Value of Pigeon Pea (Cajanus cajan) Seeds Soaked in Wood Ash Extract in Broilers diet.

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An eight (8) weeks feeding trial was conducted to assess the effect of feeding graded levels of soaked pigeon pea meal (SPPM) in wood ash extract or solution on the growth performance, haematological and serum biochemical indices of broiler chickens. A total of 144 day-old chicks (Anak 2000) were randomly allotted to four (4) treatment diets (1, 2, 3 and 4) in a complete randomized design (CRD). Each treatment group was replicated three (3) times with twelve (12) birds per replicate, thus, having thirty-six (36) chicks per treatment group. Diet 1 contained 0% pigeon pea meal soaked in wood ash extract for 72hours as the control diet, while diets 2, 3and 4 were formulated to contain 25, 50 and 75% levels of inclusion of SPPM in place of soybean meal. Data on growth performance showed that the average live weight, daily weight gain and feed intake as well as protein efficiency ratio were significantly (P<0.05) influenced by dietary treatments at the finisher phase. Broiler chickens fed 25% SPPM based diet had a higher (P < 0.05) and comparable value of live weight, weight gain and protein efficiency ratio to that recorded in the control diet at the finisher phase. The haematological and serum biochemical indices revealed that albumin and total cholesterol were significantly (P<0.05) influenced by the treatment diets. The albumin value (2.2g/dl) was highest in birds fed 50% (SPPM) whereas, the cholesterol value decreased (P<0.05) with increasing levels of inclusion of SPPM from 0 to 75%. It therefore implies that soaked pigeon pea meal can be partially included in broiler diets up to 25% level with optimum growth performance and without any detrimental effect on the blood profile of broiler chickens.

Keywords: Broilers, growth, haematology, serum chemistry

[P2-26]: Poultry Nutrition (ID: 110104) [Turkey]

#### Tomato Powder Supplementation Prevents Muscle Lipid Peroxidation in Quails Fed a Diet Enriched with Polyunsaturated Fatty Acids

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This experiment was conducted to investigate the effects of tomato powder (TP) supplementation to Japanese quails fed a diet containing high polyunsaturated fatty acids (PUFA) on antioxidant status, muscle FA profile, and lipid peroxidation. A total of 180 chicks (1-d old) were assigned randomly to 1 of 6 diets containing 2 PUFA (15 or 45 g/100 g fat) and 3 TP (0, 2.5, or 5%) levels. The diets were replicated in 10 cages, each containing 3 birds and the experiment lasted for 42 d. Data were analyzed using 2-way ANOVA. The treatments did not affect performance parameters; cumulative feed intake, weight gain, and feed conversion efficiency averaged  $660 \pm 9$  g,  $180 \pm 9$  g, and  $3.72 \pm 0.16$ , respectively ( $\pm$ SEM). The high-PUFA diet decreased serum lycopene (P < 0.0001) and muscle  $\alpha$ -tocopherol (P < 0.0002) concentrations by 42.8 and 45.9%, respectively, and increased serum (P < 0.01)and muscle malondialdehyde (MDA, P < 0.0001) concentrations by 23.76 and 55.2% as compared with the low-PUFA diet. There were linear increases in concentrations of serum lycopene (from 0.0001 to 0.68  $\mu$ g/ml, P < 0.0001) and muscle lycopene (from 0.0001 to 4.69  $\mu g/g$ , P < 0.0001), linear decreases in concentrations of serum (from 0.77 to 0.48  $\mu g/ml$ , P < 0.003) and muscle MDA (from 0.39 to 0.25  $\mu$ g/g, P < 0.0001) concentrations, no changes in concentrations of muscle  $\alpha$ -tocopherol and retinol as supplemental TP level increased. There were significant effects of the PUFA by TP interaction on serum lycopene (P < 0.01) and MDA (P < 0.001) and muscle MDA (P < 0.09) concentrations. In conclusion, prevention of lipid peroxidation through increasing serum and muscle lycopene concentrations by TP supplementation is possible when meat is enriched with PUFA by increasing dietary PUFA level.

Keywords: tomato powder, polyunsaturated fatty acids, lipid peroxidation, antioxidant status

[P2-27]: Poultry Nutrition (ID: 110010) [Egypt]

#### Some Physiological Studies in Broiler Chicks as Affected by Using Dried Distillers Grains with Solubles and Avizyme 1500 in their Diets

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This experiment was conducted to evaluate some blood parameters of broiler chicks as affected by using distillers dried grains with solubles (DDGS) at different levels (0, 5, 10, and 15%) treated with or without enzyme (Avizyme 1500) at 0 and 1gm / kg. In a factorial arrangement (2 X 4), a total number of 256 unsexed, one day old Arbor Acres broiler chicks were distributed into 8 dietary treatments with 4 replicates each and 8 birds per replicate. Broilers were housed in battery cages inside a conventional house. The experimental period lasted for 6 weeks during which diets and water were supplied ad-libitum. At 3rd and 6th week of age, blood samples were collected from wing vein of four chicks from each dietary group to determine the RBC's, PCV, Hb, and WBC's along with some serum biochemical parameters. In general, the results obtained indicated that, in spite of adding enzyme there were significant differences among DDGS levels in RBC's, PCV and Hb. Birds fed dietary 15% DDGS recorded the highest ( $P \le 0.01$ ) values of RBC's, PCV% and Hb % as compared with other treatments. Birds fed dietary DDGS at all levels recorded significant ( $P \le 0.05$ ) difference in globulin and highly significant ( $P \le 0.01$ ) differences in total protein, albumin and glucose at the end of the experiment. During 21 days of age adding Avizyme 1500 to broiler diets, irrespective of DDGS level, significantly ( $P \le 0.01$ ) increased serum total protein, albumin, globulin and glucose. Total protein and albumin levels, however, were significantly reduced as a result of enzyme addition at the end of the trial. The interaction term between DDGS and enzyme was significant and consequently, birds fed dietary 5 and 15% DDGS without enzyme and 10 % with enzyme recorded the greatest significant (P $\leq$ 0.01) values of GOT and GPT in comparison with other groups. While, birds fed the control diet recorded the lowest value of GPT as compared to the other treatments at the end of experiment. It could be concluded that, adding DDGS up to 15% in broiler diet had no adverse effect on the blood biochemical parameters determined in this study. Moreover, adding Avizyme 1500 to 10 % DDGS containing diet improved liver enzymes of broilers.

Keywords: DDGS, enzyme, blood parameter, chicks

[P2-28]: Poultry Nutrition (ID: 110103) [Turkey]

#### Effect of Form of Supplemental Chromium on Glucose Transporters and NFkB Pathway in Broilers

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This study was conducted to investigate the effects of dietary addition of chromium (Cr) and its form on performance and oxidative stress status in heat-stressed broiler. A total of 1200 ten-day-old broiler chicks (Ross 308) were randomly assigned to one of  $2\times 3$  factorially arranged treatments: two housing temperatures (22°C for 24 h/d; thermoneutral, TN or 34°C for 8 h/d, 08:00 to 17:00 h, followed by 22°C for 16; heat stress, HS groups) and three supplemental Cr levels (birds were fed a basal diet or the basal diet supplemented with 1.600 mg of chromium picolinate (CrPic) (12.43% Cr) or 0.788 mg of chromium histidinate (CrHis) (25.22% Cr) per kg of diet. Each treatment consisted of five replicates of 40 birds each. Birds were reared to 42 d of age. Duration of experiment was 32 days. HS decreased tissue Cr concentration (P < 0.0001) and suppressed GLUT4 expressions in breast muscle and GLUT-2 expression in liver and activated NF- $\kappa\beta$  expression in breast muscle (P < 0.001). Both Cr sources increased Cr retention in breast muscle and liver, at a similar level, without affecting liver enzyme activities. Under HS condition, both Cr sources improved GLUT4 expressions in breast muscle and GLUT-2 expression in liver, and suppressed NF- $\kappa\beta$  expression in breast muscle (P < 0.0001), at a higher extent for CrHis than CrPic. In conclusion, Cr supplementation partially alleviates adverse effect of HS through altering expression of heatstress related transcription factors. The positive effect of CrHis was superior to that of CrPic.

Keywords: Chromium histidinate, chromium picolinate, broiler, heat stress.

[P2-29]: Poultry Nutrition (ID: 110111) [Pakistan]

#### Arsenic and Copper Sulfate in Combination Causes Testicular and Serum Biochemical Changes in Adult Male Birds

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The aim of the present experimental study was to investigate the testicular and serum biochemical changes induced by concurrent oral administration of arsenic and copper sulfate in adult male birds. After seven days of acclimatization, 28 adult male birds were randomly divided and kept into seven (each having four birds) equal groups for 30 days. The absolute weight of testes, liver, kidneys, spleen, lungs heart and thymus was significantly decreased in birds. Grossly, different visceral tissues were smaller in size as compared to control birds. Histologically, liver in exposed birds exhibited vacuolar degeneration, congestion and biliary hyperplasia. Kidneys exhibited renal tubular necrosis, hypertrophy of glomeruli along with loss of circular shape and congestion. The testis in treated birds showed necrotic nuclei of spermatids, the admixture of necrotic spermatids seminiferous tubules and arrest of spermatogenesis. Significantly reduced values of plasma proteins, serum total proteins, serum globulin and albumins were determined in treated birds. Serum urea, creatinine, alkaline phosphatase and malondialdehyde concentrations were significantly increased in birds as compared to control birds. The results indicated that values of liver and cardiac biomarkers such as aspartate aminotransferase, isoenzyme CK-MB, triglyceride and cholesterol were significantly higher when compared to control group. From the findings of the present study, it can be concluded that arsenic and copper sulfate alone at higher levels and in combination at lower levels induce serious tissue changes in birds.

Keywords: Birds, Copper sulfate, Arsenic, Histopathology, Serum Biochemistry

[P2-30]: Poultry Nutrition (ID: 110102) [Turkey]

#### Inhibition of NF-kB by Dietary Phytochemicals in Poultry

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High ambient temperature leads oxidative stress associated with a reduced antioxidant status in humans and animals as reflected by lowered plasma concentrations of antioxidants. Nuclear Factor- $\kappa$ B (NF- $\kappa$ B) is a ubiquitously expressed proinflammatory transcription factor that regulates the expression of over 500 genes involved in cellular transformation, survival, proliferation, and inflammation. Activation of NF- $\kappa$ B has been significantly correlated with heat stress. This transcription factor when activated can regulate antioxidant and antiinflammatory cellular responses leading to the expression of detoxifying enzymes. In our studies we have shown that NF- $\kappa$ B expression can be modulated by phytochemicals such as lycopene and curcumin. In this review, we describe small molecules (lycopene, curcumin) that suppress NF- $\kappa$ B activation, and the mechanism by which they block this pathway.

Keywords: NF-kB, phytochemical, poultry

[P2-31]: Poultry Nutrition (ID: 110008) [Iran (Islamic Republic of)]

# The Impact of Methionine, Lysine and Threonine Levels on Performance and Carcass Characteristics of Male Broilers in Starter Period.

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This research evaluates Standard Ileal Digestibility (SID) of Lysine (Lys), Methionine (Met) and Threonine (Thr) density in starter phase (1-10 d) of male broilers. At day one - 480 Ross 308 male chicks were placed in 24 floor pens, to better understand the impact of a simultaneous increase in SID Lys, Met and Thr density on growth performance, carcass traits, visceral organs and protein efficiency ratio. Four dietary treatments (6 replicates per treatment) were formulated to have different levels of SID Lys, Met and Thr density recommended by NRC: Standard (100% NRC), Medium (115% NRC), High (130% NRC), and Very High (145% NRC) levels were used in a complete randomized experimental design. Broilers fed with the High (130% NRC) diet had the body, carcass, breast and thigh weights at 10 d increased by 34.1 g (13.78%), 22.9 g (12.1%), 11.6 g (24.3%) and 5.4 g (9%), respectively, compared with the standard group (P < 0.05). Intestine absolute weight and percentage decreased when the diet was supplemented with Lys, Met and Thr at 10 d (P <0.05). Protein efficiency ratio was significantly the lowest in standard diet after 10 days of the trial as compared to other diets. The results of this study suggest that additional Lys, Met and Thr at the level of 130% of NRC (SID Lys, 14.25g/kg; Met, 6.48g/kg; Thr, 10.4g/kg) significantly optimized broiler performance (body weight, feed intake, feed efficiency) carcass, breast and thigh weight and protein efficiency ratio whereas intestine and proventriculus weights were significantly lowest compared with other diets at ten days of age.

Keywords: Broiler, Lysine, Methionine, Threonine, Efficiency

[P2-32]: Nutrition (ID: 110110) [Pakistan]

## Oxidative Damage Caused by Inorganic Arsenic and its Amelioration with Vitamin E and Bentonite in Broiler Chicks

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The present study was executed to investigate adverse effects of inorganic arsenic (i-As) in broilers and to ascertain the role of vitamin E and bentonite in alleviating its harmful effects. For this purpose, the experiment was conducted on 140 one-day-old broiler chickens. Birds of groups 2, 5, 6 and 7 were administered i-As @ (50 mg.kg-1 BW) through the feed. Groups 3, 5 and 7 received vitamin E (150 mg.kg-1 BW) and groups 4, 6 and 7 received bentonite (5 mg.kg-1 BW), respectively. Group 1 was kept as control. All the birds treated with i-As (group 2) showed a significant decrease in haematological parameters at day 21 and 42. Biochemical parameters i.e. total protein, albumin and globulin were decreased while ALT, AST, urea and creatinine were increased at day 21 and 42. Total antioxidant capacity and catalase were decreased while MDA and total oxidant status levels were increased in i-As treated group (group 2) at day 21 and 42. Co-administration of bentonite along with i-As resulted in partial amelioration (group 6) as compared to group 5 and 7 administered i-As+vitamin E and i-As+vitamin E+bentonite, respectively. It was concluded that i-As causes damage not only to haematobiochemical parameters but also to oxidative parameters in broilers and it can be ameliorated with vitamin E administration while partial amelioration occurs with bentonite. The combination of vitamin E and bentonite is the best in combating i-As toxic effects.

Keywords: Inorganic arsenic, broiler chicks, oxidative stress, vitamin E, bentonite

[P2-33]: Poultry Nutrition (ID: 110114) [Saudi Arabia]

#### Use of Citrullus colocynthis Fruit Powder in Replacement to Antibiotic Growth Promoter in Broiler Diets

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Citrullus colocynthis is a medicinal plant abundantly found in sandy lands of Pakistan. Citrullus colocynthis fruit is an excellent source of dietary essential minerals, vitamins, and antioxidants. Considering its nutritional benefits, Citrullus colocynthis can be used in broilers diets as a replacement to antibiotic growth promoters. The present study was conducted to evaluate the effect of Citrullus colocynthis fruit powder (CCFP), in replacement to antibiotic growth promoter, on the production performance of broilers. The Hubbard Classic birds (n=840) were fed on diets having gradual replacement of antibiotic growth promoter with Citrullus colocynthis fruit powder for a period of 35 days. Six experimental diets viz; A (0 g lincomycin 4.4% + 0 g CCFP per kg of diet), B (0.4 g lincomycin 4.4% + 0 g CCFP per kg of diet), C (0.3 g lincomycin 4.4% + 0.5 g CCFP per kg of diet), D (0.2 g lincomycin 4.4% + 1 g CCFP per kg of diet), E (0.1 g lincomycin 4.4% + 1.5 g CCFP per kg of diet) and F (0 g lincomycin 4.4% + 2 g CCFP per kg of diet) were formulated. Each diet was fed to 7 replicates (20 birds per replicate) from day 4 to 38th day of the age. The birds were kept on a commercial diet for an adaptation period of 3 days before the start of experimental diets. The results of the present study showed that the birds fed on diets with gradual replacement of antibiotic growth promoter with CCFP performed similarly (P>0.05) in terms of feed intake, weight gain and feed conversion ratio. The dressing percentage, visceral organ weight, intestinal length, cecal length and spleen weight also were not affected by the dietary treatments. It was concluded that CCFP can be used in broilers diets in replacement of antibiotic growth promoters.

Keywords: Broiler, growth, Citrullus colocynthis, antibiotic, performance

[P3-01]: Poultry Health (ID: 110130) [Italy]

### Efficacy in the Control of Eimeria tenella Infection in Broilers

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Consumer pressure to reduce antibiotic use in feeding has resulted in the development of nutraceutics to promote good health in the modern breeding farm. This research aims to prove the efficacy of water supplementation with Ent-Oil (EO), a commercial blend of Essential Oils, SCFA, MCFA and Acidifiers, to control E. tenella in poultry. Two hundred 1-day-old Ross 308 non vaccinated females for coccidiosis were divided into 4 groups of 50 each placed in 4 buildings (5 b/m2). Birds received diets without coccidiostat. At 29 days of age subjects were infected with 10,000 sporulate oocysts of E. tenella. Treatments were: G1 (Control=untreated); G2=treated with EO twice (3 days at infection date and 6 days at onset of the clinical signs) (0.4 l/t of drinking water); G3=treated with EO for 6 days at onset of signs; G4=treated with Amprolium 25% (2 kg/t of water) at onset of signs, for 7 days. At 43 days of age samples of gut mucosa were analyzed to detect lesions and presence of schizonts/oocysts. Litter samples were analyzed to count the oocysts at 2 different times: at the onset of signs (L1) and at the end of trial (L2). The results showed a significant (P<0.01) decrease in mortality in G2 vs. G1 (10% vs. 46%) and not significant vs. G3 (18%) and G4 (18%). Lesion score of G2 was significantly (P<0.01) lower than G1 (1.63 vs. 3.20) and vs. G3 and G4 (2.36 and 2.27) (P<0.05). Oocyst count score of G2 was significantly (P<0.01) lower than G1(1.50 vs. 3.10) and not significant vs. G3 and G4 (1.70 and 1.64). Similarly, the oocyst counts of the L1 litter showed a significantly lower (P<0.01) value in G2 (3000/g) compared to G1 (6300/g), G3 (6500/g) and G4 (6000/g), while L2 counts of G2 (1400/g), G3 (1100/g) and G4 (800/g) were all significantly lower (P<0.01) than G1 (30000/g). In conclusion, drinking water supplementation with this product confirms its efficacy against E. tenella infection, mainly when administered as a preventative measure to control coccidiosis.

Keywords: broiler; essential oils; coccidiosis; oocysts, lesions

[P3-02]: Poultry Health (ID: 110013) [Algeria]

#### First Case of Hepatic Lipidosis Observed in Broiler Turkey Flocks in Algeria

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During 2013, a disease had suddenly occurred in commercial fattening turkey flocks in Algeria. It was characterized by a moderate mortality (5%) and hepatic disorders. This pathology had been recorded in three female broiler turkey flocks (of 1000 birds each) by the end of the raising period (about ten weeks of age). Clinical and laboratory investigations had been conducted and they identified it as the turkey hepatic lipidosis. Principal observed symptoms were prostration and moderate diarrhea from time to time. Careful examination of dead birds revealed enlarged livers with pale yellowish spotting. Histopathological findings showed a fatty degeneration of hepatocytes in association with necrosis and hemorrhages. Most autopsied turkeys had hepatitis with intranuclear inclusion bodies. The cause of this disorder is still uncertain although several aetiologies are suspected such as nutritional and metabolic factors but also infections especially with some viruses.

Keywords: Algeria, broiler turkeys, hepatic lipidosis, clinic, histopathology.

[P3-03]: Poultry Health (ID: 110019) [Algeria]

#### Prevalence and Characterization of Clostridium Perfringens Isolated from Broiler Chickens in Western Algeria

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Clostridium perfringens (Cl.perfringens) is a gram positive bacteria that plays an important role in the etiology of necrotic enteritis (NE) disease which is the cause of most economic losses in poultry. The present study was carried out to investigate the prevalence of Cl.perfringens in broiler chickens at different locations in Tiaret province, western Algeria, and characterization of Cl.perfringnes isolates for the presence of cpa, cpb.etx, iA and NetB gene. A total of 125 samples representing intestinal contents of broiler chickens showing clinical signs and lesions suspected to be NE were analyzed by conventional methods and PCR. Cl.perfringens was isolated at the rate of 22.4% (28/125) confirmed by cultural and biochemical characters, out of 28 Cl.perfringens isolates, 78,57 % (22/28) isolates were toxigenic and 21.43% (06/28) were non toxigenic. Multiplex polymerase chain reaction (mPCR) was performed for toxinotyping of the 22 toxigenic isolates, all isolates were positives for the gene coding for the alpha toxin (cpa) and negatives for the beta toxin (cpb), epsilon toxin (etx) and iota toxin (iA), indicating that all the toxigenic isolates were Cl.perfringens type A 100% (22/22). As some recent studies have highlighted the involvement of NetB toxin in the pathogenesis of the disease, therefore, PCR was carried out to find the presence of this toxin. None of the 22 type A isolates were found positives for the gene coding for the NetB toxin (NetB). This result indicates that the Cl.perfringens causative agent of NE are prevalent in broiler chickens in Tiaret province and only type A was isolated without carrying the NetB gene. Further investigations are required to understand the exact role of NetB toxin in the pathogenesis of NE disease.

Keywords: Clostridium perfringens, necrotic enteritis, broiler, Toxinotyping, NetB

[P3-04]: Poultry Health (ID: 110038) [Egypt]

#### Effect of Exoskeleton of Crustacea Extracts and Zinc-Methionine Complex on Performance, Some Hematological, Biochemical, Immunological Parameters and Histopathological Changes in Broiler Chickens

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One day old, 105 broiler chicks (Avian 48) were divided into 5 groups with 3 replicates and 21 broiler chicks (BC) in each group. All groups (GPs) were fed starter diet and given water ad Libidum during 40 days (the duration of the experiment). Gp1 control negative (NC) no treatment. in Gp 2 Chitonal, exoskeleton of crustacea extracts, (CH) was used in drinking water (DW) 1 ml/l for 24 hours per day and Chitozinc, a zinc-methionine complex, (CZ) in feed at 200 g/ton . Gp 2 was treated with CH drinking water between 1-5, 20-25, 35-40 day old broiler chicks (DOBC). Gp3 between 11-13, 15-16, 24-26 and 28-29 DOBC, and Gp4 between 21-31 DOBC. Gp 5 was supplemented in feed with CZ from 0 to 40 DOBC. Five birds from each group were weighed weekly, to estimate feed conversion ratio and body weight gains. Two blood samples from 3 birds in each group were collected at 21 and 40 days. We measured total RBC, WBC, HP, phagocytic activity (PA), phagocyte index (PI) and lymphocyte transformation (LT) as well as total albumin, globulin, ratio of A/G, triglyceride, cholesterol, high density lipoprotein (HDL), and low density lipoprotein (LDL). Three birds from each group were sacrificed at 21 and 40 d to collect bursa of Fabricuse (BF), thymus (T), spleen (S) liver (L), kidney (K) and intestine (I). BF, T, and S were sent for histopathological examination. Results revealed, the effect of Chitonal and Chitozinc was better in Gp3 and 5. The level AB of IB and IBD vaccine was higher in Gp3 and 5 at 40 DOBC. All treated birds showed a significant increase in weight of BF, S and T. The serum analysis total protein and globulin showed no significant changes in Gps (3and5) at 21 and 40 DOBC. But A/G ratio decreased in Gp5 at 21 DOC and and albumin decreased in Gp3 at 40 DOBC. Cholesterol level showed significant decrease in Gp4 at 21 DOBC. In Gp5, HDL was high at 21 DOBC and LDL was low at 40 DOBC. There were no significant changes in triglyceride at 21 and 40 DOBC. Creatinine level decreased in Gps (2, 3 and 4) at 21 day and in Gp2 at 40 DOBC. No significant changes in uric acid, PA and LTT. We noticed some moderate histopathological changes in Gps (3 and 5) in L, K, BF, I.

Keywords: Avian 48 ,Broiler, Chitonal, Chitozinc, Phogpocyte

[P3-05]: Poultry Health (ID: 110061) [Spain]

#### Jejunal Histomorphological Changes According to Dietary Fat Consumption in Broiler Chickens

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The aim of this study was to determine the influence of saturation degree of dietary fat on the morphometric characteristics of jejunum in broiler chickens at 14d and its relation to fat digestibility. 160 one-day-old broilers were randomly distributed in 2 treatments (8 replicates / treatment). A basal diet was supplemented with 6% of palm oil (P, saturated) or soybean oil (S, unsaturated). A digestibility balance was carried out between 11-14d. At 14d of age, excreta samples were obtained for the analysis of lipid class composition (triglycerides, diglycerides, monoglycerides, and free fatty acids, FFA) and fatty acids (FA). Samples of the proximal portion of the jejunum of 8 chickens / treatment were also obtained, fixed in 10% buffered formalin solution and embedded in paraffin. Sections were stained with haematoxylin and eosin for morphological observations. The height of intact villi and the depth of crypts of Lieberkühn were measured. Data was analysed by ANOVA. Differences were observed in the apparent digestibility of total FA at 14d (P: 61.7% and S: 81.9%; P<0.001). The % of FFA in excreta was higher for P than for S (P: 69.52% and S: 53.25%). Differences in the morphology of jejunum were observed. Saturation degree of dietary fat had an effect in the villi height of the proximal part of jejunum, being higher the villi in P treatment. The difference observed in the digestibility and the % of FFA can be related with the differences observed in the morphometric parameters of jejunum.

Keywords: fat, jejunal histology, digestibility, lipid classes, broiler chickens

[P3-06]: Poultry Health (ID: 110106)

[Kuwait]

## The Use of Probiotic Suspensions for the Control of Salmonella in Chicken Carcass

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The poultry industry in Kuwait is one of the leading food industries in the country. Chilled locally produced broilers are preferred by Kuwaiti consumers as they are considered fresh. Processed chicken carcasses have been identified as one of the most important food vehicles for Salmonella. In this study, the prevalence of salmonella in supermarket chilled chicken was detected. The ability of different dilutions of lactic acid bacteria (LAB) supernatants and cultures to reduce salmonella in chickens was tested. In addition, different incubation periods of the effective concentration of the LAB suspension was evaluated. Seventy percent of chilled chickens were positive for Salmonella. Undiluted lactic acid bacteria supernatants and vacuum packing showed to highly decrease salmonella in chickens with no signs of spoilage. The LAB supernatants showed to be effective when incubated for 5 days. Salmonella enteritidis optical density was decreased when incubated in cell-free LAB supernatants

Keywords: Salmonella, Chilled chicken, Lactic acid bacteria

[P3-07]: Poultry Health (ID: 110028) [Egypt]

#### Efficacy of a Live Escherichia coli Vaccine for Protection of Turkeys Against Homologous and Heterologous Field Strains Infection

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This work aimed to evaluate the efficacy of a commercial live attenuated E. coli vaccine (Poulvac E. COLI) in turkeys against experimental homologous and heterologous colibacillosis infection. Sixty one-day old turkeys were vaccinated twice (at day old and 3 weeks old) by aerosol spray. Another thirty turkeys were kept as non-vaccinated control. Birds were challenged against homologous O78 and heterologous O1 and O2 pathogenic field strains of E. coli using 107 CFU/0.2 ml/ turkey. All birds were inoculated into the airsac with the virulent strains for the challenge test. On 8th day post challenge, mortality was recorded and surviving turkeys were euthanized, necrosized and examined for the recovery of E. coli organism from heart blood, liver, spleen and bone marrow samples. Antibody response in sera of vaccinated and non-vaccinated turkeys was assessed by Microagglutination test. The protection rate of vaccinated turkeys post challenge with homologous O78 was 96.7%, while birds were unable to withstand the heterologous challenge. E. coli was recovered from vaccinated challenged turkeys at ratio ranged from 13.3 to 20% from the bone marrow, liver, spleen and heart blood post homologous challenge while these ratios were ranged from 53.3 to -66.7% post heterologous challenge. There was a marked increase in antibody titers against strain O78 in vaccinated birds in comparison with the unvaccinated ones. So, the vaccination studies performed here showed that live-attenuated E. coli vaccine was protective against homologous challenge with O78 strain but could not protect turkeys against heterologous challenge.

Keywords: Turkey, E. coli, Vaccine.

[P3-08]: Poultry Health (ID: 110029) [Egypt]

#### Current Study on Avian Influenza in Egypt

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Highly pathogenic Avian Influenza virus H5N1 (HPAI-H5N1) has been emerged in domestic poultry in Egypt since early 2006. Continuous viral genome sequence comparisons and phylogenetic analysis of the circulating AIVs are necessary to recognize newly emergent influenza variant, and to monitor global spread of these viruses. Continuous evolution with evolving of different H5N1 sublineages in Egypt put an urgent need for understanding the evolutionary dynamic of H5N1 AIVs which will help for improving the control measures. Egypt was officially endemic with H5N1 AIVs since 2008. In the present study, twenty-four tracheal samples were collected from clinically infected vaccinated flocks including broiler and layer flocks suspected to be infected with H5N1 from different Egyptian Governorates during 2014 for antigenic and genetic characterization. There are two genetic subclades of H5N1 AIV have been circulated in the Egyptian poultry sectors which were belonging to clade 2.2.1. Continuous circulation of classical group 2.2.1/C of avian influenza viruses in the Egyptian poultry sectors will reported in this study. However, this study reports the infection of poultry flock with the classical group in spite of different vaccination regimes using H5N1, H5N2 or H5N3vaccines, based on RT-PCR, sequencing and phylogenetic analysis for partial HA gene. More studies and surveillance are needed for better understanding mechanisms of H5N1 AI transmission and reducing the risks of possible future influenza pandemic beside other control measures.

Keywords: Avian influenza, Vaccine, Poultry

[P3-09]: Poultry Health (ID: 110105) [Algeria]

## Footpad Dermatitis in Broilers in Algeria: Current Situation and Future Challenges

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High stocking density in meat poultry houses leads to a fast deterioration of the litter as well as high relative emission of ammoniac and high humidity that result in many health disorders. Footpad dermatitis has been extensively studied and many scores have been proposed. Footpad dermatitis has direct relationship to the poultry house conditions like litter quality, humidity, stocking density, genetic line of the birds and even feed. This study was carried on broiler chickens in Batna in the East of Algeria. This study started with periodic visits and careful examination followed by classification of macroscopic lesions observed at the level of footpads in the poultry flocks with a proposed score lesions. Humidity, density as well as the litter quality of poultry houses were recorded. This study revealed high proportion and high prevalence of footpad dermatitis in our poultry flocks; the footpad dermatitis ranged from mild and slight skin inflammation to severe ulcers of the footpad that approximates 50% of its surface. Our work revealed a correlation between the genetic strain of broilers and appearance of footpad dermatitis. This later is in close relationship with the weight and the age of broilers. Footpad dermatitis is used, nowadays, as potential parameter for measurement of the animal welfare. The high prevalence of footpad dermatitis observed in this study required drastic measures to improve the animal welfare in these poultry houses through acting on minimizing the deterioration of the litter quality and respect of good practices and using adapted poultry housing systems.

Keywords: Footpad dermatitis broilers welfare

[P3-10]: Poultry Health (ID: 110109) [Algeria]

#### **Chicken Infectious Bronchitis in Algeria**

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Intensive poultry production has been exponentially developed during the last two decades in Algeria. Intensive poultry production requires experience and more facilities and respect of good hygienic practices. The non-respect of good poultry production practice leads to the emergence of respiratory diseases due mainly to a very high density of chickens and to the inexperience of the farmers and their looking for easy gain. The actual study was realized on broiler and laying poultry houses. Clinical visits and meticulous examination revealed the classical signs of poultry infectious bronchitis like coughing, rales, sneezing and nasal discharge, while in laying hens a drop in egg production and deformation of egg shell were frequently observed. Furthermore, autopsy of affected subjects showed a marked tracheal inflammatory process going from exudative to serofibrinous with renal hypertrophy and discoloration of renal parenchyma. Infection bronchitis was also observed in some vaccinated poultry flocks, and needs careful attention and explains that we are in front of a new variant viruses or serotypes of infectious bronchitis or a vaccine failure. Thus further deep studies are needed and must be realized in a very wide scale to identify the new serotypes of the virus and installing more effective and better adapted preventive measures.

Keywords: infectious, bronchitis, chicken, Algeria

[P3-11]: Poultry Health (ID: 110007)

[Pakistan]

#### Antiparasitic Effect of Mananoligosacharide against Experimentally Induced Coccidiosis in Broiler

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The aim of this study was to find the effect of Mananoligosacharide in comparison with amprolium hydrochloride in experimentally induced coccidiosis in broiler. A total of 120, day old male broiler chickens (Ross 308) was purchased and randomly allocated to four treatments. Each group was further divided into 3 replicates of 10 birds each. Group A was kept as a negative control, group B was contaminated with E. tenella (positive control) while, groups C and D were infected with E. tenella and treated with MOS (0.8 g/kg feed) and anticoccidial drug, amprolium hydrochloride (12 g/100 L water), respectively. The results showed that weight gain, feed intake and feed conversion ratio (FCR) were significantly higher (P<0.05) in infected +MOS treated group compared to the other groups. The result of oocyte per gram (OPG) was significantly higher (P<0.05) in the group infected with coccidiosis at 5, 7, 10 and 12 day post infection. Furthermore, the OPG was significantly lower (P<0.05) in infected groups treated with MOS and amprolium at the studied periods (5, 7, 10 dpi). At 12 dpi, the infected group treated with MOS showed significantly low OPG compared to other groups suggesting the effectiveness of MOS in comparison to Amprolium. The result of pinpoint hemorrhages, thickness of cecal wall, bloody fecal contents and mucoid contents in the cecum were significant highly (P<0.05) in birds fed with infected larvae. It was also noted that the differences were not significant in these parameters between amprolium and MOS treated birds showing the effectiveness of the prebiotic agent.

Keywords: Coccidiosis, birds, monoligosacheride, feed efficiency, lesions





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