Synthetic alllic on digestive organs weight in broiler chickens. Artemio Vargas-García1, Raúl Argüello-García2, Arturo Pro-Martínez1, Fernando González-Cerón6, Lucia Martínez-Gómez2, Eliseo Sosa-Montes2, Analy Mata-Estrada1, Leodan Rodríguez-Ortega2, Alejandro Rodríguez-Ortega2, and Jaime Gallegos-Sánchez1, 1Colegio de Postgraduados, Campus Morelos, Estado de México, Texcoco, Mexico, 2Universidad Autónoma Chapingo, Estado de México, Tepoztlan, Mexico, 3Universidad Politécnica de Francisco I. Madero, Hidalgo, Tepatepec, Mexico, 4Centro de Investigación y Estudios Avanzados, Instituto Politécnico Nacional, Ciudad de México, Mexico.

Supplements of garlic in broiler diets have been recognized for their stimulating effect on the digestive system in birds. The current study was conducted to evaluate the effect of synthetic alllic on digestive organs weight (liver, spleen, pancreas, proventriculus, gizzard, small intestine and ceca) in broilers. Nine hundred 1-d-old mixed broiler chicks “Ross 308” were distributed among 3 treatments: 0, 1 and 2.5 mg of allicin/kg of BW (0-ALLI or control, 1-ALLI and 2.5-ALLI, respectively); 10 replicates per treatment were used. Synthetic alllic was administered by oral-esophageal via using a pediatric catheter. Treatments were randomly assigned to the experimental groups and were administered daily at the same time from d 14 to d 27. At 28, 35 and 42 d of age, 20 broilers per treatment with body weight close to the average of the pen were selected, weighed and slaughtered for evaluation of digestive organs weight. Data were analyzed as a 3 × 3 factorial arrangement (treatments and age) using the MIXED procedure of SAS. Results are reported as g/kg of BW. It was found that only liver weight was affected by treatment; broilers in the 2.5-ALLI group (22.85 ± 0.49a) showed higher (P < 0.05) liver weight than broilers in the other groups (0-ALLI: 21.80 ± 0.49b and 1-ALLI: 21.66 ± 0.49b). Relative weight of spleen increased (P < 0.05) with age (28 d: 0.86 ± 0.05b; 35 d: 1.21 ± 0.05a and 42 d: 1.31 ± 0.05a). Additionally, it was observed a reduction in proventriculus (28 d: 3.78 ± 0.09a; 35 d: 3.52 ± 0.09b and 42 d: 2.96 ± 0.09c), gizzard (28 d: 13.76 ± 0.39a; 35 d: 12.80 ± 0.39b and 42 d: 11.39 ± 0.39c), small intestine (28 d: 21.02 ± 0.47a; 35 d: 21.92 ± 0.47a and 42 d: 19.07 ± 0.47b) and ceca (28 d: 3.12 ± 0.95a; 35 d: 3.06 ± 0.95a and 42 d: 2.26 ± 0.95b) relative weight as age increased. Pancreas weight was not affected (P > 0.05) by treatment or age. In conclusion, administration of synthetic alllic increases liver weight without affect weight of rest of organs.

Key Words: allicin, digestive organs, broilers

Effects of incubator tray location and sex on broiler chicken skeletal muscle developmental characteristics and muscle stem cell heterogeneity and mitotic activity. Jessica Starkey*, Oscar Tejeda, and Kathryn Meloche, Auburn University, Auburn, Alabama, United States.

Hatching egg incubation temperature variations of as little as 0.5°F during from embryonic d 4 to 11, which encompasses both primary and secondary myogenesis, can significantly alter broiler carcass and breast meat yields. The objective was to determine if incubator tray location (LOC) and sex interact to impact broiler muscle development and growth, thus, a randomized complete block experiment with a 3 × 2 factorial treatment structure was conducted. Broiler hatching eggs were obtained from a 40-wk-old commercial broiler breeder flock and incubated in a single stage hatchery at a commercial hatchery running a temperature profile designed to generate a 0.5°F temperature differential among trays placed in the top (TOP), middle (MID), and bottom (BOT) of the racks (n = 4 trays per rack location). From d 4 to 11, average internal egg temperatures were 99.6, 99.9, and 100.1°F in the TOP, MID, and BOT trays, respectively (P > 0.05). Chicks hatched from the 3 incubator tray locations (n = 160 per LOC; 80 per sex per LOC) were reared on a common diet in raised floor pens with 1 bird per pen from d 7 to 37. On d 14, 23, 28, and 37, 1 h before pectoralis major (PM) sampling, 12 birds per treatment were injected with 5-bromo-2′-deoxyuridine (BrDU) to label mitotically active (BrDU+) cells. Cryohistology, immunofluorescence staining, and digital fluorescence microscopy was used to estimate PM fiber number and determine the density (cells per mm2), mitotic activity, and heterogeneity of expression of the myogenic regulatory factors (MRF) and muscle stem cell (MSC) markers, MyoD and Pax7. Data were analyzed using the GLIMMIX procedure of SAS (V9.4) and least squares means were separated using the PDIFF option at P ≤ 0.05. No significant LOC x sex interactions were observed. Chicks originating from warmer BOT trays had more muscle fibers than those from cooler MID trays (P = 0.0176). Not surprisingly, male (M) broilers had more fibers than females (F; 6,518,329 v. 7,326,538 ± 275,411; P = 0.037). On d 14, F broilers had more myonuclei than M (137. v. 107 ± 8; P = 0.0057). Density of MyoD+:Pax7+:BrDU+ MSC was greater in M than F on d 23 (19.6 v. 13.6 ± 1.8; P = 0.0224) and 28 (27.5 v. 17.2 ± 2.5; P = 0.0052). On d 23, 28, and 37, density of MyoD+:BrDU+ MSC was greater in M than F (P ≤ 0.0447). Chicks incubated on BOT and MID trays had greater MyoD+:Pax7+:BrDU- MSC density on d 23 (9.1 v. 8.6 v. 4.9 ± 1.3; P = 0.0445) and 28 (10.3 v. 7.5 v. 5.4 ± 1.0; P = 0.0028) compared with those from TOP trays. Combined, these data suggest that incubator tray LOC and sex both impact muscle development and aid in explaining the mechanisms behind why M and BOT tray broilers in our previous work had greater breast meat yields.

Key Words: incubation temperature, muscle development, satellite cell proliferation, myogenic regulatory factor, broiler chicken

The impact of cleaning and disinfection of poultry house on broiler performance. Agabus Patu*, Jacob Hamidu, and Maxwell Okai, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

The study evaluated the impact of broiler house degree of cleaning and disinfection on growth performance and microbial status. The degrees of cleaning included (dry cleaning only (T1), dry and wet cleaning with ordinary water (T2), dry and wet cleaning with detergent (T3), dry and wet cleaning with detergent and disinfection (T4), and dry and wet cleaning with detergent, disinfection and whitewing (T5). A total of 375 Ross 308 broiler chickens were randomly allocated to each of the treatment and reared for 8 weeks. Each treatment was replicated 3 times with 25 birds each. Data recorded included feed intake, weight gain, feed conversion ratio (FCR), liveability and microbial load. Data were analyzed as one-way ANOVA using the Proc. GLM SAS® at P ≤ 0.05. The bacterial counts were analyzed as log10 cfu and ANOVA obtained my GLM. Birds from T5 had higher feed intake than birds from T1 and T2 for the period of 1–28 d but none was different from T3 and T4 (P = 0.04). The broiler weight gain per bird tended to be different at 49 d (P = 0.07) and increased with the degree of cleaning. The FCR up to 49 was lower in T4 compared with T1 (P = 0.022). The weekly mortality reduced with increasing degree of cleaning (y = 1.24x² − 13.70x + 46.95; R² = 0.97). Similarly, bacterial load in the litter also reduced (y =
The dose-response of phytogenic feed additives (PFA) in the starter diet phase of broilers challenged with a virulent coccidia live vaccine. Francisco Díaz*,2, Stacie Appleton1, and Jan Dirk van der Klis2,1Dalacon USA, Inc., Carlisle, Pennsylvania, United States, 2Delacon Biotechnik GmbH, Steyregg, Austria.

The most common challenges affecting commercial broiler gut health are coccidiosis, necrotic enteritis, and bacterial enteritis. In the past, achieving production goals under challenge conditions relied largely on the use of antimicrobial growth promoters (AGPs). However, because of legislation against the use of antibiotics (AB) as AGPs and the increasing consumer demand for AB-free animal production, the poultry industry is seeking alternatives. The objective of this study was to evaluate the efficacy of Biostrong® Protect (BP; a mixture of essential oils from the Myrtaceae and Asteraceae plant families and saponins) supplemented to broiler feed at graded dose levels up to 28 d. This dose-response experiment was conducted at Southern Poultry Research Station in Athens, GA, USA. 1,500 one-day-old male broiler chickens (Cobb 500) were randomly distributed over 5 treatments with 12 replications of 25 birds each. All experimental chickens were vaccinated with an unattenuated live vaccine (Coccivac-B52, MSD Laboratory) with virulent oocysts of E. acervulina, E. mivati, E. maxima and E. tenella. The vaccine was used at label recommended dose at the hatchery. After arrival, birds were allotted to the experimental treatments, which enabled determination of the dose-response relationship of BP (250, 375, 500, and 1000 g/MT). Basal diets were formulated to meet the nutritional requirements of broilers from 1 to 42 d of age in ad libitum feeding program. Weight was measured at 14, 28 and 42 d of age and body weight gain (BWG) and feed conversion ratio (FCR) per period. Mortality rate was calculated over the entire experimental period. Data were analyzed using PROC GLM of SAS. In this trial, similar (P > 0.05) results of body weight gain and mortality among treatments were observed. However, from 28 d onwards, a dose level of at least 400g/MT BP significantly (P < 0.05) improved FCR over the unsupplemented control. The maximum effect was obtained at an inclusion of 550 g/MT BP, reducing FCR from 1.70 to 1.63 for the entire 42d period. Additional studies have indicated that this effect of BP was related to its anti-inflammatory effect and quorum sensing inhibition effects. It was concluded that 375 g/MT Biostrong® Protect improved production performance after a coccidiosis vaccination.

Key Words: dose response, Biostrong Protect, phytogenic, broilers, coccidia

Raising local chickens (LC) is an activity that contributes to the household livelihood security of rural families of Mexico and other developing countries. It is mainly carried out by housewives. The aim of the present study was to characterize the productive performance [hatching weight, body weight (BW) at 25 weeks of age and BW gain from 0 to 25 weeks] and compare the Logistic and Richards growth models for determining the best one that fits the data of LC. This study was conducted at the experimental chicken house of the Colegio de Postgraduados-Campus Campeche, Mexico, from April to September 2017. A total of 99 chicks (43 females and 56 males) were obtained by random mating of 24 cocks and 76 hens collected from backyards of rural communities of Campeche State. LC were raised under confined production system. Chickens were fed with a starter diet (from hatching until 3 weeks of age) containing 19.0% crude protein (CP) and 3,000 kcal of metabolizable energy (ME)/kg and a grower diet (from 4 to 25 weeks of age) containing 18.0% CP and 2,800 kcal ME/kg. All LC were weighed weekly from hatching until 25 weeks of age. Productive performance was analyzed using PROC TTEST and the growth models were fitted using the PROC NLIN of SAS software. Growth models were compared using determination coefficient (R²), Akaike information criterion (AIC) and Bayesian information criterion (BIC). The results showed that hatching weight was similar (P = 0.4466) between females and males (35.9 ± 0.6 g and 36.7 ± 0.8 g, respectively); however, BW at 25 weeks of age was different (P = 0.0001) between sexes: 1,631.1 ± 48.5 g for hens and 2,565.5 ± 53.8 g for cocks. Additionally, females showed lower (P = 0.0001) BW gain (1,595.2 ± 48.4 g) compared with males (2,328.8 ± 53.7 g). Richards (R²: 0.9382 and 0.9415; AIC: 2,226.1 and 2,426.5; BIC: 2,238.6 and 2,439.2; for females and males, respectively) was the best model that describes the growth pattern of LC. The maximum relative growth was 0.0068 g/days for females and 0.0065 g/days for males. Hens and cocks reached maximum growth at 54.4 and 66.3 d of age, respectively. The asymptotic weight was higher in males than in females (2,875 and 2,012 g, respectively). In conclusion, LC males are heavier and had higher BW gain than LC females and the best fit of the data was obtained with the Richards growth model.

Key Words: local chicken, growth curves, productive performance, body weight gain, Campeche State

Evaluation of the combined effects of moderate house relative humidity and increased air movement on litter moisture and water activity in a commercial broiler house. Iskender Yildirim1,2, Connie Mou*1, Michael Czarick1, and Brian Fairchild1,1University of Georgia, Athens, Georgia, United States, 2University of Selcuk, Konya, Turkey.

Recent studies suggest that in addition to litter moisture, water activity (A_w) can be a good if not better indicator of microbial activity in broiler litter. Previous research in this lab has found that the provision of increased air movement at floor level with the use of “high-volume” circulation fans at an average speed of 0.76 m/s while also maintaining a moderate house relative humidity (Rh) (<60%) can result with lower litter moisture content (MC %). A secondary study was conducted to whether this combination could have an effect on water activity (A_w) of litter conditions in addition to MC %. Two field studies were conducted on 2 commercial broiler farms. On each farm, 2 12 × 152 m houses were used. On Farm 1, one house had no circulation fans operating (CTL) while an adjacent house was equipped with 8-60 cm 350 W circulation fans that ran continuously (TRT). These fans were capable of circulating up to 25% of house volume each minute, providing an average air speed at floor level of 0.76 ± 0.03 m/s. On Farm 2, one house had 8-45 cm 125 W low volume circulation fans (LVCF) (0.28 ± 0.14 m/s) while...
Bacteria in a commercial broiler hatchery can be detrimental to chick City, Missouri, United States. A percent of chicks with *P* with bacteria in the yolk-sac, but a significant decrease (was seen. Chick quality data showed an increase in the percent of chicks the study, but reductions in microbial load as compared with baseline was affected by a “super clean” performed in the hatchery in wk 5 of ANOVA and Sidak’s multiple comparisons test. Microbial load testing -tests or 2-way t27 weeks for comparison. Hatchery performance data, chick quality and static air plates using tryptic soy agar (TSA). Air samples and ATP trial loads were measured by total ATP bioluminescence swab samples locations included an egg cooler, setter hall, and hatcher hall. Bacteria -treated. Treated areas included an egg cooler, setter hall, hatcher load, sanitation to reduce microbial load, which in turn improved hatchery performance and production in a commercial setting. Key Words: dry hydrogen peroxide, hatchery, hatch of fertile, microbial load, sanitation 268 Effects of using dry hydrogen peroxide in a commercial hatchery on hatchery performance. Brian Jordan*, 1, Laura Oxford1, Julia McElreath1, Nelson Cox2, Miguel Barrios1, and Jeanna Wilson1, 1The University of Georgia, Athens, Georgia, United States, 2USDA-ARS, Athens, Georgia, United States, 3Syneixis Biodefense, Kansas City, Missouri, United States. Bacteria in a commercial broiler hatchery can be detrimental to chick health and hatchery performance. Even though sanitation and disinfection occur routinely, a method of continual sanitation could be a valuable tool for commercial hatcheries. A commercially available product, gaseous dry hydrogen peroxide (DHP) from Synexis Biodefense (https://synexis.com) has been proposed for this purpose. Preliminary studies have shown that DHP is effective at reducing microbial load on hatching eggs and does not negatively impact hatchability or chick health. Therefore, the purpose of this study was to evaluate the effects of DHP on bacteria levels and hatchery performance in a commercial hatchery setting. For this trial, a hatchery with 2 identical sides was used. Half of the hatchery was treated with DHP, while the other half remained non-treated. Treated areas included an egg cooler, setter hall, hatchet hall, chick processing areas, and vaccine laboratories. The non-treated locations included an egg cooler, setter hall, and hatchet hall. Bacterial loads were measured by total ATP bioluminescence swab samples and static air plates using tryptic soy agar (TSA). Air samples and ATP swabs were collected for 2 weeks before treatment to establish baseline microbial load, then samples were taken bi-monthly, then weekly, then bi-weekly from similar locations on each side of the hatchery for 27 weeks for comparison. Hatchery performance data, chick quality evaluations, and residue breakout data were also collected. Data were analyzed using Prism statistical software with student’s t-tests or 2-way ANOVA and Sidak’s multiple comparisons test. Microbial load testing was affected by a “super clean” performed in the hatchery in wk 5 of the study, but reductions in microbial load as compared with baseline was seen. Chick quality data showed an increase in the percent of chicks with bacteria in the yolk-sac, but a significant decrease (P < 0.05) in the percent of chicks with *Aspergillus* in the lungs. Early dead, bacterially contaminated, and *Aspergillus*-contaminated embryos were numerically reduced on the treated side when compared with the non-treated side in residue breakthroughs. The percent hatch and hatch of fertile were numerically increased (90.2% non-treated vs. 90.9% treated HOF; P = 0.08) on the treated side of the hatchery as well. Three-day mortality of chicks hatched from the treated side was also numerically reduced compared with chicks hatched from the non-treated side. Taken together, this study suggests that the DHP product was beneficial as a method of continual sanitation to reduce microbial load, which in turn improved hatchery performance and production in a commercial setting. Key Words: dry hydrogen peroxide, hatchery, hatch of fertile, microbial load, sanitation 269 A phytogenic feed additive to improve male and female reproductive performance. Jan Dirk van der Klis*, 1, Stefan Hirtenlehner1, and Megan Koppen2, 1Delacon Biotechnik GmbH, Steyregg, Austria, 2Delacon USA, Inc., Carlisle, United States. Male fertility is of utmost importance for breeder flock performance as it is directly related to the number of day-old chicks per hen housed. One of the key factors for male fertility is sperm quality. Sperm quality is directly affected by the anti-oxidant system in the spermatozoa which reduces the concentration of intracellular free radicals that induce sperm DNA fragmentation and lipid peroxidation in the sperm cell membrane. Phytogenics can have direct (via polyphenols) and indirect anti-oxidant effects. The mode of action of the latter is via the Nrf2-pathway upregulating the nuclear anti-oxidant response element (ARE), which results in increased production of anti-oxidant enzymes. On top, essential oils and saponins are known to increase testosterone production. Biostrong® Libido (BSL) is a proprietary blend of essential oils, flavonoids, and quillaja saponins developed to improve male breeder fertility. This experiment was done with Hubbard breeders between 43 and 53 weeks of age, housed in cages. 54 individually housed males per treatment were fed a control diet as such or supplemented with 1.5 lb/t BSL. Males were milked for artificial insemination. Semen quality was evaluated at 43, 48 and 53 wks of age. Females (9 pens per treatment with 24 birds per pen) were inseminated with semen of the control or the BSL group. At 48 and 53 wks of age, a total of 1950 eggs per treatment were collected and set to determine fertility, hatchability and first quality day-old chicks. The number of live spermatozooids was sign. (P ≤ 0.05) increased by 7.7%. Semen concentration (spermatozooids/ml) was increased by 3.0%. Treatment effects on semen quality were not age dependent. Fertility rate was sign. (P ≤ 0.01) increased in 85.4 to 89.3% at 48-weeks of age and from 83.8 to 88.5% at 53-weeks of age. Hatchability rate (as % of fertile eggs) was increased from 93.7 to 95.5% at 53-weeks of age and first quality DOC rate (as % of hatched eggs) was increased from 91.6 to 93.6% at 48-weeks of age. Treatment effects on non-mentioned ages were not statistically significant. Per 100 eggs set, the number of DOC was increased by 5.1 at 48-wk breeders and by 5.7 at 53-wk breeders via supplementation of male breeder diets. It was concluded that dietary supplementation of male breeder diet with Biostrong® Libido improved semen quality, resulting in higher female reproductive performance. Key Words: semen quality, fertility, breeder breeder, phytogenics, antioxidant 270 Understanding how infrared beak treatment affects the beak tissue and the healing response of brown and white feather layer pullets. Sarah Struthers*, 1, Ashish Gupta2, Susanth
Poult. Sci. 98(E-Suppl. 1)

Gomis², Eugenia Herwig¹, and Karen Schween-Lardner¹, ¹University of Saskatchewan, Saskatoon, Saskatchewan, Canada, ²Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada.

Despite considerable research examining the impact of infrared beak treatment (IRBT) on the production and welfare of laying hens, it is still not fully understood how IRBT affects the beak tissue during the first few days post-treatment. The objectives of this study were to understand the histology of IRBT-treated vs. untreated beaks during early life (0 to 21 d) and to examine how IRBT affects the beak length and healing response of Lohmann Brown (LB) and Lohmann LSL (LW) pullets. The experiment, a 2x2 factorial arrangement of beak treatment and strain, was performed in a completely randomized design. Pullets (n = 100 per strain) were obtained from commercial hatcheries and 50 chicks per strain were infrared beak treated post-hatch (IR). The remaining chicks for each strain were sham treated controls (C). Chicks were housed in cages from 0 to 21 d (4 per cage; 625 cm² per chick). Feed and water (360° nipple drinkers) were provided ad libitum. Presence of beak sloughing was recorded daily from 7 to 21 d. Beak length was measured weekly. Beak samples were collected for histology from 4 pullets per treatment every 2 d starting at 1 d of age. Histology slides were analyzed for re-epithelialization and inflammation and scored on a scale of 0 to 4, with 0 showing no lesions and 4 showing severe inflammation and necrosis. Beak length data were analyzed using PROC MIXED (SAS 9.4) with Tukey’s test to separate means. Median histological scores for treated birds only were analyzed as a 1-way ANOVA using PROC NPAR1WAY (SAS 9.4). Differences were significant when P ≤ 0.05. Sloughing of the treated beak tissue began at 10 d and was complete by 20 d. Beak treatment had an effect on beak length with C pullets having shorter bottom beaks at 1 d but longer top and bottom beaks at 21 d. LB pullets had longer top and bottom beaks than LW at 1 d but shorter top beaks at 7 d. An interaction was seen between beak treatment and strain for 14 d top beak length with LB IR pullets having longer top beaks than LW IR pullets (7.36 vs. 6.47 mm). Over the 21 d period, C pullets had more beak growth compared with IR (4.38 vs. 0.63 mm for top beak; 3.88 vs. 0.76 mm for bottom beak). LB pullets had less beak growth compared with LW over the 21 d. No differences in histology scores were found between treated LB and LW beaks; however, all treated LB beaks showed complete healing by 21 d while some LW beaks still showed moderate healing and inflammation. Overall, IRBT was effective at reducing beak length and growth post-treatment. The histology results suggest that healing begins as soon as 5 d post-IRBT and that appropriate healing responses occurred in both strains as evident by re-epithelialisation and a reduction in inflammation.

Key Words: Lohmann, histology, beak length, beak treatment


An 8 week study was conducted at the teaching and research farm of Tai Solarin University of Education in Ijebu Ode Nigeria to determine the effect of 30 min stepwise increase in lighting for Isa brown point of lay pullets on egg production parameters, performance characteristics and volume of waste generated. A total of 100 Isa brown pullets of 16 weeks of age were randomly divided into 4 treatments in a completely randomized design (CRD). Each treatment was further divided into 6 replicates of 4 birds each. The 4 treatments represent the duration of exposure of the birds to light on a daily basis (12hrs, 14hrs, 16hrs and 18hrs). The birds were transferred from the floor to cage at 16 weeks of age while 2 weeks were allowed for acclimatization of the birds to the new environment. At 18 weeks of age, the birds were exposed to 30 min stepwise increase in lighting until the maximum number of hours is reached. Treatment 1 which is the control was placed under normal daylight which averaged 12 h while treatments 2, 3 and 4 received 14 h, 16 h and 18 h daily on a weekly 30 min increase. Data collected from the study were analyzed using statistical analysis software (SAS) 1999 while means were separated using the Tukey’s studentized range of the same software. Available data show that birds that were reared under 14 h daylight were the first to come into lay at 19 weeks of age. Significant differences (P < 0.05) were observed in the feed intake per bird per week across the group. In wk 1, the highest feed intake (530g) was obtained from birds exposed to 14 h of daylight. In wk 8 however, feed intake in birds that received 12 and 14 h of light were similar (844g) but significantly higher than feed intake in birds that received 16 h (776g) and 18 h (792g) respectively. The mean values of body weight, weekly egg production and egg weight were all statistically similar. In conclusion, increased daylight did not improve egg production, body weight gain and age at first egg. However, feed intake was improved by increased daylight while volume of waste generated from birds across the treatments were not affected.

Key Words: photostimulation, pullets, incremental lighting, Isa brown, acclimatization

272 A bi-phasic curve for modeling egg production in molted flocks. Anna Wolc*1,2, Jesus Arango2, Ian Rubino2, and Jack Dekkers1., 1Iowa State University, Ames, Iowa, United States, 2Hy-Line International, Dallas Center, Iowa, United States.

Egg production on a flock level can be summarized into several phases determined by biology of individual birds: rapid increase in production reflecting achieving sexual maturity, peak production related to maximum laying potential and gradual decrease in the rate of lay as the birds age. Mathematical models are useful for monitoring flock performance and predicting future records to optimize revenues. The goal of this study was to develop and test a mathematical formula that can accurately describe egg production in molted flocks. To do that the model of Yang et al. (1989) was extended into a bi-phasic form. The new model was tested on performance records of 44 molted flocks and 58 single-cycle flocks with production recorded until at least 90 weeks of age and cumulative egg number until 90 weeks within expected range. Those flocks represented a total of over 9.5mLn layers. The model was implemented using minpack.lm package in R. A very good fit to the real data was observed with average r-square of 0.97 in molted and 0.99 in single-cycle flocks. The difference between the fit of Yang at al. (1989) model and the bi-phasic model can be used to differentiate between single cycle and molted flocks. The bi-phasic model also adequately predicted future records up to 8 weeks in advance; longer periods were not tested because caution is recommended when predicting with regression models outside of the observed range. The newly developed bi-phasic model is an adequate tool for benchmarking egg production data from molted flocks.

Key Words: egg production curve, molt, laying hens

273 Effects of simulated transport on brown strain end-of-cycle hen body physiology, stress, and behavior. Kailyn Beaulac*, Trever Crowe, and Karen Schween-Lardner, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.
Transport conditions are stressful for poultry, especially for end-of-cycle hens that are already experiencing metabolic stressors. A 5x3x2 factorial arrangement consisting of 5 temperature (T) and relative humidity (RH) combinations (−10°C uncontrolled RH (−10), +21°C 30% RH (21/30), +21°C 80% RH (21/80), +30°C 30% RH (30/30), and +30°C 80% RH (30/80)), 3 durations (D) (4, 8, and 12h), and 2 feather covers (well (WF) and poor (PF)) was used for this study. Brown hens (n = 540; 90 WF and 90 PF hens from 3 commercial farms) were housed for a 3–5 d adaptation period. Before exposure, hens were feed restricted (6h) and an initial blood sample was taken. Hens were moved to environmental chambers, crated (target density 54.5 kg/m²) and exposed to the treatment combinations (tx) above. During exposure, behavior was recorded via infrared video. Post-exposure blood samples were taken (delta (Δ) calculated) and mortality was noted. Blood samples (3/tx) were analyzed for pH, partial pressure of CO₂ and O₂ (pCO₂, pO₂), oxygen saturation (SO₂), sodium (Na), glucose (G), hematocrit (Hct), hemoglobin (Hb), and heterophil/lymphocyte ratio (H/L; 5/tx). Data were analyzed as a randomized complete block design via ANOVA (Proc Mixed (SAS 9.4); significance P ≤ 0.05). Mortality occurred in −10 T/RH, with 12h resulting in higher mortality than 4h (P < 0.01). The ΔH/L increased in −10 more than 21/30 (P = 0.01). The ΔpH was higher in 30/80 than 21/80 and −10 (P = 0.01). The decrease in pCO₂ was larger in 30/80 than −10, 21/30, and 21/80 (P < 0.01) and was larger in 12h than 4h (P = 0.01). For ΔpO₂, −10 was higher than other T/RH (P < 0.01). The ΔSO₂ was higher in −10 compared with 21/30 and 21/80 (P < 0.01). The ΔNa was highest in 30/30 and 30/80 compared with −10 and 21/30 (P < 0.01) and it rose with longer D (P < 0.01). The ΔG, was lowest in −10 compared with other T/RH (P < 0.01) and decreased more in PF hens (P < 0.01). The ΔHct (P = 0.02) and ΔHb (P = 0.02) increased in 12 and decreased in 4h. Ptiloerection was higher in −10 PF 4h and −10 WF 8h (P = 0.01). WF 30/80 hens panted most, followed by 30/80 PF and 21/80 WP (P = 0.03). Hens spent more time motionless in −10, 21/30, and 21/80, followed by 30/30, then 30/80 (P < 0.01). Hens were most active in 30/80 compared with −10, 21/30, and 21/80 (P < 0.01) and in 4 compared with 8h (P = 0.02). Hens shivered more in −10 compared with other T/RH and gulped more in 30/80 compared with −10, 21/30, and 21/80. Rustling was more frequent in 30/80 and 30/30 than 21/30 (P < 0.01), in 4 than 8h (P = 0.04) and in PF than WF (P = 0.02). Cold T (−10) compromises welfare, as indicated by increased mortality. In addition, hens in extreme T for prolonged D exhibit signs of thermal stress as seen by ΔpH, pCO₂, ΔpO₂, ΔNa, and behavioral adaptations.

Key Words: feather condition, mortality, thermoregulatory behavior, thermal stress, heterophil/lymphocyte ratio

274 Upper critical ambient temperature of male growing Pekin ducks from 14 to 42 days of age. Ming Xie*, Peixin Sun, Jing Tang, and Shuisheng Hou, Institute of Animal Sciences of Chinese Academy of Agricultural Sciences, Beijing, China.

An experiment was conducted to examine the effects of ambient temperature on growth performance and carcass traits of male growing Pekin ducks from 14 to 42 d of age to establish the upper critical ambient temperature for these ducks. A total of 216 14-d-old male White Pekin ducks were divided randomly to 6 environment-controlled chambers with ambient temperature set at 20, 22, 24, 26, 28, and 30°C from 14 to 42 d of age, respectively. In each chamber, 36 ducks were assigned randomly to 6 raised wire-floor pens of 6 birds. The relative humidity of all chambers was set at 60% during this period and each chamber has similar space size and pen distribution with the same pen size. At 42 d of age, the growth performance and carcass traits of ducks from each pen were measured. Data were analyzed as a completely randomized design using the one-way ANOVA procedure of SAS software with pen as the experimental unit for analysis and means were compared by using Duncan’s multiple comparison procedure when temperature treatment was significant (P < 0.05). Broken-line regression was used to the upper critical ambient temperature and this temperature was the inflection point temperature above which the duck response started to change. As ambient temperature increased from 20 to 30°C, the body weight decreased from 3054 to 2321 g/bird, the weight gain decreased from 85.6 to 59.4 g/bird/day, and the feed intake decreased from 236.2 to 169.8 g/bird/day, respectively, but the feed/gain increased from 2.74 to 2.87 (P < 0.05). According to broken-line regression, the upper critical ambient temperature during the growing period were 27.4, 27.4, and 26.0°C when body weight, weight gain, and feed/gain were served as response criteria, respectively. On the other hand, the weight of breast meat, leg meat, and abdominal fat decreased as ambient temperature increased and they were declined to minimum when the temperature increased to 30°C (P < 0.05). The percentage of breast meat and abdominal fat also showed decreasing response to increasing temperature but leg meat percentage increased as ambient temperature increased and it reached maximum at 30°C (P < 0.05). According to broken-line regression, the upper critical ambient temperature during the growing period were 25.5 and 25.6°C when breast meat weight and percentage were served as response criteria, respectively. In conclusion, both growth performance and breast meat of growing ducks were sensitive to increasing ambient temperature and the ambient temperature during the growing period should be kept below 26°C to optimize the growth performance and carcass traits.

Key Words: ducks, temperature, growth performance, carcass trait, heat stress


Commercialization of guinea fowl in Africa is still in its rudimentary stage and there is a dearth of information on the optimal stocking density of the birds. This study was conducted to evaluate the effects of stocking density on the physiological response and performance of guinea fowl. A total of 240 indigenous guinea fowl were used for this study. The birds were weighed and assigned to different stocking densities of 14, 16, 18 and 20 birds/m² (SD1, SD2, SD3 and SD4, respectively) at wk 4 weeks of age. Feed and water were provided ad libitum. Data were collected on growth performance, hematocrit, plasma triiodothyronine and rectal temperature of the birds. Data were analyzed by ANOVA with stocking density as the independent variable in a Completely Randomized Design. The results showed that there were no significant differences in the body weight of the birds at the 5th and 6th week of growth with the stocking density. From the 7th to the 13th week, birds stocked at 14 and 16 birds/m² were significantly (P < 0.05) heavier than birds stocked at 18 and 20 birds/m², while at wk 14 and 15, body weight of the birds was in the order 14 birds/m² > 16 birds/m² > 18 birds/m² > 20 birds/m². Feed conversion ratios of the birds increased...
with stocking densities. Heterophil/lymphocyte ratio significantly increased with stocking density. At 7, 8, 11, 12, 13, 15 and 16 weeks, rectal temperature of the birds increased with stocking density. Plasma triiodothyronine of the birds was not significantly affected by stocking density. Most of the organ weights of the birds in SD 1 and SD2 were comparable but higher than those of SD3 and SD4. It was concluded that stocking density of helmeted guinea fowl higher than 16 birds/m² adversely affected growth performance and welfare of the birds.

Key Words: stocking density, haematology, performance, welfare, guinea fowl