
Effect of the level and source of crude fiber on growth performance and organ weights of 21-day-old broilers. C. Uculemana, I. Meza, and C. Vilchez

Effect of dietary incorporation of processed bambara groundnut (Vigna subterranea) on broiler performance and carcass characteristics. M. Mahmoud and A. Mohamad

Effect of the level and source of crude fiber on growth performance and organ weights of 21-day-old broilers. C. Uculemana, I. Meza, and C. Vilchez

Effect of dietary incorporation of processed bambara groundnut (Vigna subterranea) on broiler performance and carcass characteristics. M. Mahmoud and A. Mohamad
339  Effect of dietary protein source and litter condition on growth performance and meat yield of broiler chickens reared to 46 days of age. J. Starkey1, R. Shirley2, A. Welsher2, O. Tejeda1, L. Spencer1, D. Bourassa1, and C. Starkey1. 1Auburn University, Auburn, AL. 2Adisseo USA Inc., Alpharetta, GA.

The objective of this 3 × 2 factorial study was to determine whether growth and meat yield of broilers that were hatched and reared without antibiotics differed when: 1) fed different dietary protein sources, and 2) reared under different litter conditions. To investigate this, 3 dietary treatments were formulated to include either: 1) soybean meal (SBM), 2) poultry by-product meal + feather meal (PBM), or 3) mammalian meat and bone meal (MBM). All diets were formulated to meet or exceed the nutrient recommendations of the primary breeder and were both iso-caloric and iso-nitrogenous. To define the effect of litter condition upon broiler performance, floor pens were bedded with either: 1) new, pine wood shavings (NEW) or 2) built-up litter from a prior broiler grow-out, top-dressed with new, wood shavings (USED). Upon arrival, day-of-hatch, male Yields Plus × Ross 708 broiler chicks (n = 1,800) were randomly assigned to 1 of 6 treatments each represented with 12 replicate pens (25 birds per 2.3 m² pen). Within each litter treatment, broilers received 1 of 3 diets in 4 phases: starter (d 1 to 12), grower (d 13 to 27), finisher (d 28 to 38), and withdrawal (d 39 to 46). Mortality-adjusted BW, feed intake (FI), and FCR were determined for each phase. On d 47, following a 24-h static water chill, broiler carcasses were deboned and part yields were determined. Data were analyzed using the MIXED procedure of SAS with pen as the experimental unit and block as a random factor. Means were considered significantly different when P ≤ 0.05. No significant interactions between the main effects of protein source and litter condition were observed (P ≥ 0.1510). In d 12, 27, 38, and 46, birds reared on NEW litter had significantly lower BW compared with those reared on USED litter (P ≤ 0.0189). Birds reared on USED litter had greater FI during the starter, finisher, and withdrawal phases compared with those on NEW litter (P ≤ 0.0311). During the starter, grower, finisher, and withdrawal phases, FCR was lower for broilers reared on USED litter (P ≤ 0.0238). No significant differences in carcass or carcass part weights were observed among broilers reared on NEW and USED litter (P ≥ 0.3029). While d 0 to 46 broilers fed PBM tended to have lower BW gain compared with those fed MBM or SBM (P = 0.053), FCR was similar among protein sources (P = 0.437). Broilers fed MBM and SBM yielded heavier carcasses (P = 0.0149) with less abdominal fat (P = 0.0015), and had heavier breast fillets (P = 0.005) and tenders (P < 0.0001) compared with those fed PBM. Feeding either MBM or SBM resulted in improvements in growth performance and meat yield compared with PBM, and USED litter conditions improved growth performance.

Key Words: broiler chicken, protein source, litter condition, growth performance, carcass yield

340  Different nutritional proposals on laying hen diets on performance, egg quality and body composition in post-peak egg production. F. Fabbi1, M. Melarec2, M. Reis2, N. Sakomura2, A. Rech1, and L. Bittencourt1. 1DSM Nutritional Products, Sao Paulo, Brazil. 2UNESP, Jaboticabal, Brazil.

Commercial egg producers use different nutritional supplements for feeding laying hens with different vitamin and mineral recommendations and sources as well as a wide variety of nutritional additives to improve production. Therefore, the objective was to evaluate the influence of different premix concepts on egg production of hens in post-peak. One hundred 60 63-weeks-old Hy-Line W36 laying hens were randomly allocated to 2 treatments, 10 replicates of 8 birds each. All hens were fed a corn-SBM mash diets, to attend the breeder requirements. Treatments were: (T1) basal diet (BD) supplemented with a commercial premix (0.4%) vitamin levels and minerals (sulfate) an average of Latin America producers, enzymatic blend (phytase and carbohydrase) and zinc bacitracin; (T2) BD with concept premix (0.4%), with optimal vitamin nutrition (OVN), 25(OH)D3, carbo-amino-phospho-chelate trace minerals, monocomponent enzyme blends (phytase, carbohydrase, amylase and protease), probiotic, organic acids, essential oils and pigments. Vitamins and minerals levels T1/T2, kg per feed: Vit. A 8,000/12,000 IU; Vit. D3 2,000/3,000 IU; 25 (OH)D3 0/69 μg; Vit. E 10/30 mg; Vit. K1 1,600/3,000 mg; Vit. B1 1,000/3,000 mg; Vit. B2 3,000/7,000 mg; Vit. B6 2,000/5,000 mg; Vit. B12 10/25 μg; niacinamide, 18/50 mg; pantothenic acid 4/12 mg; folate 400/1,500 μg; biotin 60/150 μg; choline 260/500 mg; cooper 8/8.62 g; iron 50/43.74 g; manganese 65/56.37 g; zinc 60/43.74 g; selenium 300/340 mg. Experimental trial was 4 periods of 28 d each one, and were measured in the end of each period, productivity (feed intake, FI, egg weight, EW, lay, egg mass, EM, and feed conversion ratio, FCR), egg quality (Haugh Unit, HU, yolk color, YC, eggshell strength, ST, and thickness, ST) and body composition (fat mass, lean, bone mineral density and content, ash, fat, protein and water). Data were submitted to ANOVA and means compared by Tukey test at 5% probability. Effect of diet premix supplementation (commercial vs concept) was found (P < 0.05) for FI (102 vs 106, g); EW (67 vs 66, g), lay (84 vs 86, %) and FCR (1.65 vs 1.71, g/g). It also influenced the egg quality (P < 0.05) for YC (6 vs 11, Yolk Color Fan) and HU (85 vs 86), and body composition (P < 0.05), for fat mass (299 vs 253, g), protein (17.63 vs 18.03, %) and water (62 vs 63, %). The concept premix increased the laying with decreases in EW as expected, and improved internal egg quality. The improvements in productivity and quality in some way affect hen’s body composition, probably due to the increases on reserves mobilization in post-peak. Based on results, it was concluded that the concepts premix affected positively the hen productivity, egg quality and body composition.

Key Words: vitamins, minerals, eubiotics, enzymes, hens

341  Supplemental microalgal docosahexaenoic acid enriched the fatty acid and affected expression of genes related to lipid metabolism in tissues of broiler chickens. S. Tolba1, T. Sun1, A. Magnuson1, G. Liu1, W. Abdel-Razik3, M. El-Gamal2, and X. G. Lei1. 1Cornell University, Ithaca, NY. 2Zagazig University, Zagazig, Sharkia, Egypt.

This experiment was to study how supplemental dietary microalgal docosahexaenoic acid (DHA) affected enrichments of this n-3 fatty acid and gene expression related to lipid metabolism in tissues of broiler chickens (BR). A total of 192 (day old) Cornish male BR were allotted to 4 dietary treatments (6 cages/treatment and 8 birds/cage). The birds were fed corn-soybean meal basal diet supplemented with a DHA-rich microalgal (aurantiochytrium) biomass (Heliae, Gilbert, AZ) at 0, 1, 2 and 4% (0, 1.7, 3.4 and 6.8 g DHA/kg diet) for 6 weeks. Blood, liver, adipose and breast and thigh muscle samples (n = 6/treatment) were collected at wk 3 and 6 for analyses. Data were analyzed by one-way ANOVA and linear regression. The biomass inclusion resulted in dose-dependent (P < 0.01) enrichment of DHA in plasma (R² = 0.76–0.79), liver (R² = 0.83–0.90), and YC (R² = 0.76–0.90) and tended to improve HU (P < 0.05) and significantly improved ST (P < 0.01) and ST (%) of the egg yolk. The inclusion of DHA in feeding broilers significantly influenced the YC, ST and ST percent of the egg yolk, and significantly improved yolk color. This is probably due to the gene expression related to lipid metabolism (P < 0.05) and affected expression of genes related to lipid metabolism in tissues of broiler chickens.

Key Words: vitamins, minerals, eubiotics, enzymes, hens

Poult. Sci. 97(E-Suppl. 1)
Poult. Sci. 97(E-Suppl. 1)

= 0.70–0.75), breast (R² = 0.89–0.91), and thigh (R² = 0.91–0.93) at both wk 3 and 6. The highest DHA concentrations reached 0.82 and 0.96 g/kg in breast and thigh muscles, respectively, in chicks fed 4% of the biomass at wk 6. The biomass inclusion resulted in dose-dependent decrease (P < 0.01) of n-6 fatty acid concentrations (19–92%) and the n-6/n-3 fatty acid ratios (61–95%) in all assayed tissues, but elevated (P < 0.01) total polyunsaturated fatty acids concentrations by 66–91% in the liver at wk 3 and 6. Compared with the control, the 4% biomass decreased (P < 0.01) nonesterified fatty acid concentrations in liver and adipose tissue by 34 and 25%, respectively. Compared with the control, the DHA-rich microalgae supplementation decreased (P < 0.05) hepatic mRNA abundances of fatty acid desaturases1 (63–64%), fatty acid elongase2 (60–75%), fatty acid synthase (FAS) (45–49%), stearoyl-CoA desaturase1 (SCD1) (61–74%), sterol regulatory element binding protein1 (46–60%), carnitine palmitoyltransferase2 (17–44%), acyl-CoA synthetase (ACS) (53%), and interleukins6 (53%) and 10 (45%) at wk 3 and (or) 6. In contrast, the supplementation enhanced (P < 0.05) adipose tissue mRNA abundances of acetyl-CoA carboxylase (38–46%), FAS (33%), SCD1 (up to 2.6-fold), acyl-CoA oxidase1 (47%), acetyl-CoA acyltransferase2 (30–31%) and ACS (25–106%) at the 2 time points. In conclusion, supplementing the DHA-rich microalgae effectively enriched DHA and lowered n-6/n-3 fatty acid ratios in all assayed tissues of broiler chickens. However, the supplementation exerted differential impacts on expression of genes related to lipid metabolism between the liver and adipose tissue. Supported in part by Heliae, Gilbert, AZ; DOE (DE-EE007091); and Cornell University (Hatch grant NYC-127419).

Key Words: broiler, DHA, enrichment, fatty acid, gene


This study was planned to investigate if untoasted full-fat soybean (UFFSB) had any effect on the growth performance of finishing broilers chickens (d 21–35) when it replaced standard solvent extracted soybean meal (SBM) on protein-equivalent basis. Five iso-nitrogenous and iso-caloric (CP:21%; ME:3150 kcal/kg) diets were formulated by replacing SBM with UFFSB @ 0, 25, 50, 75 and 100% and designated as FFSB0, FFSB25, FFSB50, FFSB75 and FFSB100. One hundred and 50 (n = 150) one-day-old broiler chickens were randomly distributed under 5 dietary treatments. Each dietary treatment had 3 replicates with 10 broiler chicks/replicate. The diets were fed ad libitum for the experimental period (d 21–35). Data on feed intake and body weight of each replicate were recorded on weekly basis to calculate body weight gain and feed:gain. Feed intake by the birds during d 21–28 or 28–35 or 21–35 (overall-finishing stage) was not influenced by the dietary treatments. Body weight gain and feed:gain during d 21–28 were unaffected irrespective of the level of replacement of SBM with UFFSB. The body weight gain and feed:gain during d 28–35 and during the entire finishing stage (d 21–35) were observed to be impaired (P < 0.001) when SBM was replaced with UFFSB. Maximum drop in body weight gain (d 21–35) was observed in broiler chickens fed the FFSB100 diet followed by the FFSB75, FFSB50, FFSB25 and FFSB0 diets. Similar trend was observed in feed:gain. On d 35, one bird from each replicate selected on random basis was slaughtered to obtain data on soft organ weights. The weight of heart, liver, kidneys and immune organs (bursa, thymus and spleen), however, remained un-affected (P > 0.05) across the dietary treatments. Replacement of SBM with UFFSB had non-significant (P > 0.05) effect on hematological parameters. In conclusion, UFFSB cannot completely replace SBM in broiler chicken diets during finishing phase.

Key Words: full-fat soybean, broiler chicken, immune organ, blood chemistry, growth


Feed composition, particle size and quality of ingredients have been reported to impact nutrient digestibility and live performance. However, limited studies have compared the effects of these factors under similar conditions to determine which one has more relevance. Therefore, the objective of this study was to evaluate the impact of naturally occurring mycotoxins in moldy corn, oil rancidity, particle size of corn, inclusion of wheat and high-calcium levels on live performance, digestibility and organ development in chickens. A total of 336 d-old Ross-708 female chicks were randomly distributed in 48 pens. Eight dietary treatments were randomly distributed to have 6 replicate pens of 7 chicks each. Diets were formulated to have similar nutritional content and included: corn coarse (900 μm) and fine (400 μm) grinding, high-calcium (1.40%) with poultry fat, high Ca with soybean oil, standard Ca (1.10%) with soybean oil, mycotoxins (moldy corn stored for 2 years and naturally contaminated with aflatoxin B1 142 ppm, aflatoxin B2 19.5 ppm, aflatoxin G1 3.1 ppm, fumonisin B1 2.2 ppm, fumonisin B2 0.7 ppm, and fumonisin B3 0.2 ppm), rancid soybean oil (heated 65°C for 14 d with peroxide value of 16 mEq/kg) and wheat replacing all corn. Each diet was fed from 1 to 14 d of age and chickens had similar management and environmental conditions with mild heat stress (28–35°C) during the second wk. BW and feed intake were obtained, BW gain, FCR, European Production Efficiency Factor (EPEF) and flock uniformity calculated. Data were analyzed in a completely randomized design with diet characteristics as treatments and pen location within room as random effect using a one-way ANOVA with orthogonal contrasts. Greater BW and BW gain were found in chickens fed diets with corn coarse grinding and wheat-based diets, in contrast diets with mycotoxins had the lightest chickens. The best FCR (P < 0.05) was observed in chickens fed high-Ca-poultry fat diets, but similar to chickens fed diets with corn coarse grinding and high-Ca-soybean oil. On the other hand, diets with rancid oil and wheat inclusion had an intermediate FCR in comparison to the diet containing rancid oil and mycotoxin inclusion which had the worst FCR. There were no effects (P > 0.05) of treatments on flock uniformity. The EPEF was similar for all treatments except for the diet with mycotoxins that had an inferior index. Dry matter and crude protein digestibility results suggested that mycotoxins in feed decreased (P < 0.05) digestibility as compared with other treatments. No signs of intestinal health problems were observed. In conclusion, from all treatments, the diet containing moldy corn with mycotoxins reduced digestibility and consequently impaired live performance up to 14d.

Key Words: live performance, mycotoxin, wheat, corn, protein digestibility

344 Growth performance and carcass characteristics of broilers raised under different feeding programs that contained hominy grits. W. Cañizalde and C. Vilchez*, Universidad Nacional Agraria la Molina, Lima, Peru.
An experiment was carried out to determine the effects of different feeding programs that contained hominy grits (HG) on growth performance and carcass characteristics of broilers. 720 one-day-old Cobb 500 male chicks were used. From d 1 to d 8 all birds were fed a common pre starter diet and then a 3-phase feeding program (FP): starter (S; 9 to 21 d), grower (G; 22 to 35 d) and finisher (F; 36 to 42 d). The levels of inclusion of HG in each FP were as follow: FP1, Control group; No HG in any phase; FP2, 5% HG in S, G and F diets; FP3, 5%, 10% and 15% HG in S, G and F diet, respectively; FP4, 10%, 15% and 20% HG in S, G and F diet, respectively. Each FP consisted of 6 replications with 30 birds per replication. Feed (as mash) and fresh water were offered ad libitum. Average body weight, body weight gain, feed intake, feed conversion ratio and mortality (%) were determined weekly. On d 43, 3 birds were randomly selected from each replicate (18 birds/treatment) to evaluate for carcass characteristics (carcass yield, breast yield and abdominal fat; %). Statistical significance was evaluated using ANOVA under a Complete Randomized Design with Tukey’s test for multiple comparisons. The results showed that neither growth performance nor carcass characteristics were significantly influenced ($P > 0.05$) by any of the feeding programs considered in the present study; however, when the cost per kilogram of bird produced is taken into account, the lowest cost corresponded to the FP4 feeding program. In conclusion, hominy grits can be used in broiler feeding without affecting live performance or carcass characteristic with a greater gross margin per bird when compared with a feeding program without it.

**Key Words:** hominy grits, broiler, carcass characteristic, feeding program, performance