
An 8 week feeding trial was conducted to assess the effects of substituting maize for biscuit waste on the performance and cost benefit analysis of 120 d old Anak 2000 broiler chickens. Four dietary treatments (1, 2, 3 and 4) were formulated with diet 1 containing 100% maize as control. In diets 2, 3 and 4, biscuit waste meal (BWM) replaced the percentage proportion of maize in diet 1 at concentrations of 25, 50, and 75% respectively. Results on the performance indices revealed that only the average liveweight and daily weight gain were significantly (P < 0.05) higher in birds on 50% BWM than those on other diets at the starter phase. While at the finisher phase, average liveweight, daily weight gain, feed intake, feed conversion ratio and protein efficiency ratio were significantly(P < 0.05) higher in broilers fed 50% BWM than those on other treatment diets. The cost benefit analysis indicate that cost of feed consumed/(N/bird), cost of feed per kilogram weight gain (N), total cost of production(N), decrease with increase in the inclusion levels of BWM with 50% inclusion level translating to the highest profit per bird. It therefore infers that BWM can successfully replace maize up to 50% level in broiler diets for enhanced performance and optimum profit.

Key Words: biscuit waste, broilers, economic value and growth

69  Study of egg qualities related to different lysine levels from various strains of layers. X Dong*SC, P Curtis, D Roland, and L Kerth, Auburn University, Auburn, AL.

The goal of this project was to evaluate the protein levels, which may impact the functionality of the egg white. During this study, 2016 eggs were collected from 14 strains of layers on diets containing 3 levels of lysine. Measurements included weight, pH of albumen and yolk, whipping height and angel food cake height. Results of the study indicate that the brown eggs were significantly heavier than the white eggs (P < 0.001). The weight of all egg components increased with the higher levels of lysine in diet. White eggs had significantly higher moisture contents than brown eggs (P = 0.0017). The moisture content of albumen decreased as the lysine level in the diet increased. The increasing lysine levels resulted in greater angel food cake volume, but lower whipping height. Age of the layers greatly impacted the quality of albumen. In conclusion, brown-egg layers produced bigger eggs with less moisture and better heat resistant foaming ability, but less yolk. The increasing lysine level in the diet contributed to the increase in size, heat resistant foaming ability and moisture content of eggs.

Key Words: egg, lysine, albumen, foaming ability, age

70  Effect of balanced dietary protein levels on egg production and egg quality parameters in commercial layers. P. Soddee*SC, M. Tahir1, B. Sebastian1, S. E. Aggrey1, and G. M. Pestl1, 1University of Georgia, Athens, 2Agricultural University, Peshawar, Khyber Pukhtunkhwa, Pakistan.

The effects of series of balanced dietary protein levels on egg production and egg quality in laying hens from 18 through 74 weeks of age were investigated in this experiment. One hundred and 40 pullets (Bovans) were randomly assigned to individual cages with separate feeders and were then equally assigned to 3 different protein level series with isocaloric diets. Diets were separated into 4 phases of 18–22, 23–32, 33–44 and 45–74 weeks. The protein levels of high protein (H) series were 21.62%, 19.05%, 16.32% and 16.05%, respectively. Medium protein (M) and low protein (L) series were 2% and 4% lower in balanced dietary protein. The results clearly demonstrated the balanced dietary protein level was the limiting factor for body weight, average daily feed intake (ADFI), egg weight, hen day egg production (HDEP) and feed per kilogram eggs. Feeding either the H or M series resulted in similar ADFI, HDEP (93.23% and 95.68% peak production, monthly basis), and feed per kilogram eggs whereas feeding with the L series resulted in lower ADFI and HDEP (90.33% peak production) and higher feed per kilogram eggs. Egg weight responded in a linear manner to balanced dietary protein level (58.78, 55.94 and 52.73 g for H, M and L, respectively). Feed intake of all hens, but especially those in the L series, increased considerably after wk 54 when the temperature of the house decreased due to winter conditions. Thus hens fed the L series seemed particularly dependent on house temperature to maintain body weight, ADFI and HDEP. For egg quality parameters, percent yolk, Haugh units and egg specific gravity were similar regardless of diets. Haugh units were found to be greatly affected by the variation of housing temperature. Contrary to the idea of a daily amino acid “requirement,” these results may be used to determine profit maximizing levels of balanced dietary protein (and therefore amino acids). The approximation from overall mean value (entire experimental period), adding 2% protein to the M series will increase HDEP by 2.56%, egg weight by 2.84 g and decrease feed intake per kilogram eggs by 127 g.

Key Words: laying hens, protein titration, egg production, egg quality


This study was conducted to determine the effect of 2 different levels of crude protein (16% and 18%) on egg production and quality from 18 to 24 wk of age. Three treatment diets included a 16% crude protein commercially produced diet (C16) and 2 research diets produced at the NCSU feed mill; 16% (N16) and 18% (N18) crude protein. Seventeen brown layers were placed into 12 replicate litter pens, for a total of 204 18 wk old birds. Each pen was 3.7 × 3.0 m for a density of 1 hen/66 m<sup>2</sup>. Feed was provided ad libitum, with one feed weigh back recorded per 4 wk period over the 6 wk trial. Daily records were collected on eggs production and livability. On the third week of each period a minimum of one dozen eggs was collected from each pen for egg weight and USDA grade and size distribution. The egg sample was divided into 2 groups of 6 eggs each for Haugh Units and egg shell strength. These were measured and recorded on an Egg Analyzer and Texture Expert Analyzer, respectively. Statistical analysis was done using the PROC GLM in SAS and LSMEANS with significant differences separated using PDIFFs. Hen-housed eggs and Hen-day production were affected by diet. Birds fed the N16 and N18 diets had more (P < 0.05) eggs than birds fed C16. Dietary treatment significantly affected Hen-day production; birds fed N16 had the highest mean, C16 the lowest. Egg wt and percent Extra Large were different (P < 0.05) between each treatment. Egg wt was higher for birds that received C16 and N16 compared with N18. The parameters of feed consumption, livability, and physical egg quality were not significantly affected by the diet fed. This study indicated that the birds fed the N16 had the best performance while the eggs produced from the C16 had the highest quality.

Key Words: egg, protein, layer, cage-free, diet
Effects of feeding various digestible lysine intake levels by Cobb 500 broiler breeder hens on reproductive performance. L. Mejia*SC, C. D. McDaniel, and A. Corzo, Mississippi State University, Mississippi State.

A study was conducted to examine the reproductive parameters of Cobb 500 broiler breeder hens fed different daily consumption levels of dig lysine (mg/hen/day) on the reproductive parameters of Cobb 500 broiler breeder hens. A total of 240 Cobb 500 broiler breeder pullets and 40 cockerels, 20 wk of age, were obtained from a commercial blackout rearing house and placed in individual cages. A pre-breeder diet (CP 16%, Ca 1.50%, dig lysine 0.92%) was fed from 21 to 24 wk of age, and a breeder diet (CP 16%, Ca 3.0%, dig lysine 0.65%) was fed from 25 to 34 wk of age, respectively. Experimental diets were fed from 35 to 45 wks of age. Treatment 1 and 2 diets were formulated with commercially available ingredients and resulted in daily dig lysine intakes of 1,200 (IDL) and 1,010 mg/hen/day (ID), respectively. Treatments 3 and 4 were semi-purified diets and used L-glutamic acid to maintain isonitrogenous conditions, with dig lysine levels 1,010 (SPL) and 600 mg/hen/day (SP). Hens fed the SPL and SP diets had lower hen-day egg production than hens fed the ID diet, with hens receiving the IDL diet yielding intermediate values. Hens fed the SP diet had the lowest (P < 0.05) egg weight but no differences were observed among dietary treatments for egg specific gravity. Fertility and hatch of set were lowest (P < 0.05) for hens fed the SPL dietary treatment. No differences were observed for early and middle dead, contaminated or pipped eggs. Late dead was observed to be higher (P < 0.05) in hens fed the SPL diet. A decrease in the daily intake of dig lysine from 1,010 to 600 mg/hen/day improved broiler breeder reproductive performance when hens were fed semi-purified diets, but the same did not occur when reducing dig lysine intake from 1,200 to 1,010 when using commercial-type diets.

Key Words: broiler breeder, fertility, lysine


The effect of injecting graded levels of selenium (Se) as seleno-L-methionine (Se-Met) or sodium selenite (Na2SeO3) into the yolk of incubating eggs on embryo toxicity and tissue Se concentration was studied. On Day 10 of incubation, fertile eggs were injected with 20, 40 or 60 μg of Se as Na2SeO3 or Se-Met in a volume of 0.1 mL of phosphate buffered saline (PBS). Another treatment (sham-control) consisted of injecting 0.1 mL of PBS without Se. Four replicate groups of 25 eggs were assigned to each treatment. Embryo viability values at Day 20 of incubation were 95% for the sham-control; 86, 84 and 88% for 20, 40 and 60 μg Se as Na2SeO3; and 93, 87 and 97% for 20, 40 and 60 μg Se as Se-Met, respectively. The order of Se concentrations in Day 20 embryo tissues was liver > lung > heart > breast, regardless of the Se source. Using Se-Met as the Se source resulted in higher Se concentrations in the liver, lung, heart and breast muscle, compared with Na2SeO3. Linear increases in all tissues were obtained with increasing doses of Se. However, the change in heart and breast muscle Se concentrations was not significant above the 40 μg dose when Na2SeO3 was used (P > 0.05). Regression coefficients for tissue Se concentrations vs. injected dose for all tissue were significantly greater for Se-Met than for Na2SeO3 (P < 0.01). The current study indicates that in ovo yolk sac injection of up to 60 μg of Se as either Se-Met or Na2SeO3 is not toxic to embryos and that using Se-Met results in higher tissue Se levels.

Key Words: selenium, in ovo injection, chicken embryo, sodium selenite, seleno-methionine

Resolving pellet quality issues with the manufacture of commercial turkey diet formulations. K. G. S. Lilly*SC, L. K. Shires, B. N. West, and J. S. Moritz, West Virginia University, Morgantown.

High throughput and high fat inclusion in commercial turkey diets decreases pellet quality. This necessitates feed manufacturers to address these factors to realize the potential of feeding high quality pellets. Possible solutions include the use of commercially available pellet binders or utilizing feed manufacturing techniques that maximize heat transfer for nutrient binding within the pellet, e.g., thicker pellet die. However, a thick pellet die may be detrimental to throughput and heat sensitive nutrient stability, specifically amino acids; the use of increased mixer-added fat may reduce frictional heat and alleviate these concerns. This experiment was a 3 (binder) x 2 (technique) factorial design. Commercial turkey diets incorporated either no binder, or one of 2 different commercially available binders and processed using 2 techniques: 1% mixer-added fat and 38.10mm effective die thickness or 3% mixer-added fat and 44.96mm effective die thickness. To create a complete diet, the remainder of the fat was added post-pellet, so that all diets contained 8% fat. All treatments were manufactured at West Virginia University’s pilot feed mill and steam conditioned at 82.2°C. The 6 treatments were pelleted in random order each day, for 4 d, producing 4 replications. Binder inclusion improved several feed manufacture variables such as pellet durability index, modified pellet durability index and feed-fine production, indicating the production of high quality pellets (P < 0.05). The inclusion of 3% mixer-added fat and 44.96mm die decreased pellet quality, but also decreased pellet melt relative electrical energy usage (P < 0.05). However, when binders were included, manufacturing variables were improved (P < 0.05). Neither binder nor manufacturing technique affected production rate (P > 0.05). Creating a high quality pellet is important, but creating feed that is highly digestible and readily available to the bird is imperative. Therefore, true amino acid digestibility of the diets was investigated using Single Comb White Leghorn cecotomized roosters as a model.

Key Words: feed manufacture, pellet binder, turkey diet, mixer-added fat, digestibility


There is growing interest in the use of alternatives to antibiotic feed additives for commercial turkey production. Growth performance of turkey toms fed diets supplemented with Actigen (Alltech, Inc.), a mannosic-rich oligosaccharide derived from cell wall of a specific strain of Saccharomyces cerevisiae, was compared with diets supplemented with virginiamycin, a common antibiotic feed additive. On the day of hatch 864 Hybrid Conventional turkey toms were randomly distributed among 48 floor pens in a curtain-sided facility. All the toms were naturally challenged by placing them on used litter from a previous flock. Feed and water was provided ad libitum to all birds until 20 weeks of age. The toms were randomly assigned to one of 4 dietary treatments: MC [1–12 wks diets contain monensin, 12–20 wks non-medicated]; AA [1–12 wks monensin and Actigen , 12–20 wks contain Actigen ]; MA [1–12 wks monensin, 12–20 weeks Actigen ]; MV [1–12 wks monensin, 12–20 weeks virginiamycin]. Body weights (BW) and feed consumption were determined at 3, 6, 9, 12, 14, 16, 18, and 20 weeks, and feed/gain (FCR) calculated. There was no statistically significant treatment effect on feed consumption. The treatment receiving virginiamycin had about 2 to 3% higher BW at 14, 16, 18, and 20 wks (P < 0.05) than the other treatments. For cumulative (1–20 wk) FCR, among the AA
treatment group was significantly higher than the MV, MA, and MC groups, respectively (2.53 vs 2.41, 2.44, and 2.45, *P* > 0.0002). Dietary supplementation of virginiamycin resulted in the highest 20 wk BW. In contrast, Actigen supplementation from 1 to 20 wks resulted in inferior FCR. More research is needed to confirm Actigen as an alternative to antibiotic feed additive for turkeys.

**Key Words:** turkey, antibiotics, Actigen, growth, yeast

76 Effect of MaxiChick (25-hydroxycholecalciferol and canthaxanthin) supplementation on turkey breeder performance and on the quality of the day-old-poult. C. Hamelin 1, S. Briere 2, G. Leveque 2, M. F. Soto-Salanova 1, and J. M. Hernandez 1, DSM Nutritional Products Europe, Basel, Switzerland. 2Gretry France, Saint-Laurent de la Plaine, France.

The effect of supplementing turkey breeder diets with a patent protected combination of 25-hydroxycholecalciferol and canthaxanthin (MaxiChick®,) was evaluated. 1100 BUT 10 female turkey breeders were allocated randomly to 20 pens and 2 treatments (10 replicates/treatment), with 55 females per pen. Hens were artificially inseminated once a week from 31 to 50 wk of age. All birds received the same diet, but the treated birds received 6ppm canthaxanthin, and a vitamin premix in which half of the vitamin D was replaced by 37.5 mg/kg 25-hydroxycholecalciferol (MaxiChick®). Males were monitored for body weight, sperm volume, concentration and mobility at 33, 45 and 50 weeks of age. Females were also weighed weekly, and egg production, number of hatching eggs, and culled eggs were recorded daily and monitored weekly. At 4 different ages (34, 38, 44, and 50 weeks) eggs were set in trial conditions to monitor poult quality (first grade poult, culled poult, dead embryos). At 44 wk of breeder age, blood and livers of 25 poult per treatment were collected for TBARs determination. At 34 weeks of age, breeders fed MaxiChick® showed better hatchability, more hatching eggs and more poult per hen. This difference was maintained until the end of the experiment. At the end of the trial, by 50 weeks of age, the number of settable eggs was 100.7 ± 1.2 for the control group, 101.6 ± 1.0 for the treated group. Sperm volume and sperm concentration were greater for the MaxiChick®, birds (7.39 ± 0.46 vs. 6.92±109 ± 0.16 at 33 wk). Candling at 10–14 d indicated increased fertility for the MaxiChick® group (93.81 vs. 92.95%) after 6 wks in the trial, and also a subjective evaluation indicated more first quality chicks for the treated group. Liver TBARs of chicks coming from 44-wk-old breeders fed MaxiChick® were significantly lower than those of control chicks. These results confirm the positive effect, previously reported for broiler and layer breeders, of feeding canthaxanthin and 25-hydroxycholecalciferol to turkey breeders.

**Key Words:** 25-hydroxycholecalciferol, canthaxanthin, turkey breeders, performance, liver TBARS

77 Effect of dietary supplementation of beta-mannanase (CTCzyme) on the growth performance of turkey hens. R. D. Malheiro 1, R. D. Malheiro 2, R. D. Malheiro 3, I. Barasch 1, M. J. Wineland 1, and D. Moore 2, 1Department of Poultry Science, North Carolina State University, Raleigh, 2Department of Animal Science, North Carolina State University, Raleigh.

CTCzyme (CTCBIIO, Inc., Seoul, Korea) is a heat stable β-mannanase that can reduce the anti-nutritional effects of mannanoligosaccharide, a highly viscous indigestible non-starch polysaccharide in soybean meal (SBM) and many other feedstuffs that compromises dietary energy utilization. Nine-hundred-60 6-week old Nicholas turkey hens were randomly assigned to one of 48 pens with 20 hens per pen. Four experimental diets were randomly assigned among 12 pens. Feed and water was available to the birds for ad libitum. Feed consumption, group body weights, and number of birds per pen were recorded at 8, 10, 12, 14, and 16 weeks. The experiment was designed as a 2 X 2 factorial arrangement of 2 dietary inclusion levels of CTCzyme (CTCBIIO, Inc.) (0 and 0.05%) and 2 dietary levels metabolizable energy (High and Low) that differed by 150 kcal ME/kg. The CTCzyme product contained 992 units β-mannanase/g. At 14 weeks of age, 3 mL blood samples were collected of one bird per pen for analysis turkey α1-acid glycoprotein (AGP). This experiment was analyzed as a completely randomized block factorial design. Turkeys fed the high energy feed had significantly greater BW at 8, 10, 14, and 16 weeks of age (*P* < 0.01) than those fed the low energy feeds, without affect on FCR. Dietary CTCzyme supplementation significantly increased BW and improved FCR by about 10 points (*P* < 0.05), independent of dietary energy level. Although significant enzyme X dietary energy interaction effects were not observed on growth performance of hens, the dietary supplementation of CTCzyme was marginally more effective in the high-energy, high fat diets than the low energy diets, indicating possible improvements in dietary fat utilization. Dietary CTCzyme supplementation did not affect AGP level of the hens sampled at 14 weeks of age. Dietary supplementation of CTCzyme clearly improved growth performance of turkey hens, regardless of dietary energy level.

**Key Words:** turkeys, β-mannanase, dietary energy, growth performance, α1-acid glycoprotein

78 The effect of feeding Original XPC to turkey breeder hens and progeny on the growth performance of turkey toms. P. R. Ferket 1, R. D. Malheiro 1, I. Barasch 1, M. J. Wineland 1, and D. Moore 2, 1North Carolina State University, Raleigh, 2Diamond V, Cedar Rapids, IA.

This study investigated the use of a Saccharomyces cerevisiae fermentation product, XPC, in turkey breeder diets and subsequent progeny diets. Two diets were proved to Hybrid Converter breeder hens starting at 29.5 weeks of age before the onset of lay: control diet or the control diet containing 0.075% XPC. At approximately 33.5 weeks of age, eggs were collected from both breeder flocks and transported to North Carolina State University where they were incubated. Male pouls were divided at hatch into 4 treatments with 10 pens/treatment and 15 poult/pen. The treatments were arranged as a 2X2 factorial, consisting of 2 dietary XPC levels for breeders (0 and 0.075%) and 2 dietary XPC levels for progeny (0 and 0.125%–1–6 wks and 0.0625% until 20 wks). The toms were raised in a curtain-sided, floor pen facility, and provided feed and water ad libitum. Body weights (BW) and feed consumption was determined at 3, 6, 9, 12, 14, 16, 18, and 20 wks and feed/gain (FCR) calculated. At 20 wks, 20 birds per treatments were slaughtered and carcass parts yield was determined. There were no significant (*P* > 0.05) breeder effects or breeder X progeny interaction effects on BW or FCR throughout the experiment. BW of progeny fed XPC was greater than controls at 3 wks (579 g vs 509 g, *P* < 0.0001), 6 wks (2595 g vs 2417 g, *P* < 0.0001), 9 wks (6057 g vs 5480 g, *P* < 0.0001), 12 wks (10151 g vs 10151 g, *P* < 0.0001), and 14 wks (13495 g vs 13180 g, *P* = 0.0041). However, cumulative FCR of progeny fed XPC was lower than controls from 1 to 3 wks (1.71 vs 1.59, *P* < 0.0001), and 1–14 wks (2.12 vs 2.21, *P* = 0.0130), but this advantage was lost by 20 wks. There were not significant treatment effects on carcass yield. Feeding pouls XPC to commercial toms improves growth performance through to 14 wks of age although less advantage was observed during the subsequent finishing period.

**Key Words:** turkeys, Saccharomyces cerevisiae, fermentation product, growth performance, carcass yield