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METHIONINE SUPPLEMENTATION IN THE PRODUCTIVE EFFICIENCY, CARCASS CHARACTERISTICS AND ECONOMICS OF GROWING INDIGENOUS TURKEY

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Target Audience: Animal nutritionists, feedmillers, processors, turkey farmers.

ABSTRACT

The effect of dietary methionine supplementation at varying levels on the productive efficiency, carcass characteristics and economics of growing indigenous turkey was investigated. Four Isocaloric and Isonitrogenous diets were formulated. The diets were supplemented with 0.00%, 0.05%, 0.10%, and 0.15% respectively. Eighty (80) turkey poults and aged 12 weeks, were randomly allotted to the four dietary treatments at 20 birds each, and subdivided into 2 replicates having 10 poults each in a completely Randomized design experiment. The trial lasted 8 weeks. The feed-to-gain ratio showed no significant (P>0.05) difference, though diet 2 proved to be the best. Birds fed diet 2 also had a higher body weight than the others. The values of parameters such as dressed weight (g), carcass yield (%BW), meat (PDW) Bone (PDW), abdominal fat and meat-to-bone ratio did not differ significantly (P>0.05). However, birds fed diet 2 gave the highest meat (PDW) and meat-to-bone ratio. The overall relative cost per kg gain that is most beneficial was obtained by feeding dict 2. The results indicate that supplementing growing turkey feed- containing 18%CP and 2800 Keal / kg ME with 0.05% methionine enhances productive performances, good carcass yield and production cost.

Key words: Methionine, supplementation, turkey, carcass, economics

DESCRIPTION OF PROBLEM

Indigenous turkey (Meleagridis gallapavo) in Nigeria is one class of poultry that has ben neglected and the production hitherto left in the hands of subsistence poultry farmers. Unlike the broiler chickens whose nutrients requirements had been well documented (1; 2; 3; 4; 5), there's a dearth of information on the requirement of our indigenous turkey poults. The broiler industry had suffered terrible decline in recent years, rather than having new poultry projects what we see in the large- scale abandonment of farms by their owners, thus rendering the huge investments in them unprofitable. It should be clear to every one now that reducing poultry industry to

rearing of broiler and laying chickens alone is incapable of meeting the national demand for meat. In a developing nation like Nigeria, where protein malnutrition due to serious shortfalls in meat and other animal product supplies have constituted a serious treat to human health and existence, the development of a viable turkey industry will be an appropiate idea. Efforts must be geared toward the tapping of resource pool that is readily available in turkey, guinea fowl, ducks, geese, etc. The recent mass importation of frozen turkey into the country has capture the taste of the Nigerian populace and it's also an indication that marketing would not constitute any problem. It is also one class of poultry that is generally cherished as good gift during festive periods like Christmas, Easter, Salah etc. The prospects for increase paticipation in turkey production is also brightened by the involvement of some commercial breeders (6). The bird's large size, fast rate of growth, high fecundit and excellent meat quality (7) provide unassailable reasons why turkey industry must be seriously encouraged. The population of turkey in Nigeria as reported (8) was about 1 million. This grew to 1.5-2.0 million ten year later (9). A large number of these were homestead birds, reared extensively by rural farmers. Where, they are reared commercially, it is a common knowlege to see turkey producers feeding broiler started or finisher ration to the poults. This practice may not give room for optimal performance of the poults. Every animal is endowed at birth with certain capacity for growth and production, but these inherited characteristics can be exploited to the full only when the methods of management and nutrition of the animals are appropriate to its needs (10). According to (5), the requirement for any nutrient must be capable of meeting the requirements for maintenance including endogenous losses in addition to meeting the requirements for optimum growth; the desired productive and reproduction potential of the animal and to meet the needs for the stresses of daily existence. The (11) recommended 28% CP and 2800keal /kg energy for 0-8, 8-16 and 16-24 weeks of age respectively. The level of dietary methionine recommended range between 0.65 and 0.35 for the same period. They also stated that protein and amino acids requirements of turkey are also higher than those of chickens. Therefore, growth bird, according to (12) should receive sufficient amino acids and non- essential nitrogen for optimum synthesis and deposition of tissue proteins. Supplementing turkey diet with Essential Amino Acids (EAA) is not new (13). According to (14) adding pure forms of essential Amino Acids to the diet allows a reduction in the dietary crude protein content while concomitantly meeting the requirements for all EAA. This reduction allows excesses of EAA to minimise with a corresponding better EAA balance. Methionine improves the effieciency

of feed utilization and carcass quality; it reduces mortality, cannibalism, improves egg size and prevents the accumulation of excess fat in layers. To exploit the benefits to our advantage, there is therefore a need for supplementation of cereals which are universally acknowledged to be deficient in several of the essential amino acids- with protein-rich ingredients well endowed with the deficient amino acids, but this procure still often necessitates the use of crystalline amino acids to ensure adequacy (15). Thus, methionine is routinely employed as a supplement in poultry feeds, this being the first limiting amino acid for this species. Despite the various recommendations made so far and the fact that they are mere guideline (5) and that circumstance on individual farms may also require adjustments, it is therefore imperative to establish amino acid requirement that will suit our tropical conditions and adequately take care of the differences in the nutrient composition of our feedstuffs and the types of turkey strain in our environments. This study is therefore carried out to determine the methionine supplementation for optimal productive performance of our indigenous turkey poults and qualityof their carcass.

MATERIALS AND METHODS

Composition of diets and experimental design.

A total of four isocaloric and isonitrogenous diets containing 18.4%CP and 2800Kcal/kg ME were formulated. Each of these diets (1-4) were supplemented with varying levels of methionine (0.00%, 0.05%, 0.10%, 0.15%) respectively; with diet 1 serving as the control, in a completely randomised design (CRD) experiment. The composition of the diet is shown in Table 1.

Birds and their Management

One hundred and twenty (120) indigenous poults were brooded and fed on 23% CP and 12.10MJME/kg diet for a period of 12 weeks. Out of which eighty (80) poults were randomly selected and alloted to each of the four experimental groups at 20 birds each. Each treatment was sub-divided into 2 replicates having 10 poults each. All the poults were fed *ad-libitum* and allowed free access to water throughtout the duration of the experiment. Every other routine management pratices such as vaccination/ drug administration and maintenance of cleanliness in and out of the poultry house were observed.

Method of Data Collection

The mean weekly liveweight and mean weekly feed intake were recorded, while the mean daily weight gain and feed conversion ratio were calculated from the data. The experiment lasted for 8 weeks.

Table 1: Percentage composition of the experimental diets and fed to growing indigenous Turkey from 12-20 weeks of age.

INGREDIENT (%)	DIET 1	DIET 2	DIET 3	DIET 4
Yellow maize	52.30	52.25	52.20	52.15
Fish meal	2.10	2.10	2.10	2.10
Full-fat soyabean meal	20.00	20.00	20.00	20.00
Palm kernel cake	20.00	20.00	20.00	20.00
Bone meal	5.00	5.00	5.00	5.00
Vit. Mineral premix 1	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.00	0.05	0.10	0.15
Total (%)	100.00	100.00	100.00	100.00
CALCULATED ANALYSIS:				
Crude protein (%)	18.40	18.40	18.40	18.40
Lysine (%)	1.01	1.01	1.01	1.01
Methionine (%)	0.67	0.72	0.77	0.82
M.E (kcal/kg)	2800.20	2800.20	2800.20	2800.20

Vit. mineral premix

Composition per 2.5kg (Biomix premix): Vit. A, I. U. 4,000,000; Vit. D3 I. U. 800,000; Vit. E. mg 10,000; Vit. Kmg 1,200; Vit. B2 mg 1500; Vit. B mg 1,500; Niacin mg 10,000; Pantholic acid mg 3,500; Biotin mg 15; Vit. B12 mg 10; Folic acid, mg 200; Cholin chloride mg 120,000; Manganese mg 60,000; Iron, mg. 15,000; Zinc mg; 15,000; Copper mg 800; Iodine, mg. 400; Cobalt mg. 80; Selenium mg. 400; Antioxidant, mg. 40,000.

Carcass Evaluation

At 20 weeks of age, 2 birds closest to the mean weight of birds in each of the replicates were randomly selected, starved for 24 hours, weighed and slaughtered by severing the jugular vein. Birds were bled, dipped in water and defeathered. Head neck, feet and viscera were separated. The wings were removed by cutting anteriorly, severing at the humeo-scapular joint, the cut being made close to the body line. Lateral cuts were made through the rib-heads to the shoulder girdle and the breast was removed intact by pulling anteriorly. Thighs, drums and backs were also dissected from each carcass and weighed seperately. Meat from the yield was seperated from the bone to obtain meat bone ratio. (16). The liver, heart, kidney and emptied gizzard were also seperated and weighed.

Chemical Analysis

Proximate analysis of the experimental diets and feacal samples were carried out according to the (17) method.

Economic Analysis

The cost dietary ingredients (#kg) were noted. Feed intake per poult for the period was used to multiply the cost/kilogramme. Weight gain was calculated according to the procedure (18, 19) which invoves taking the product of cost/kg feed and FCR of birds consuming such diet.

(i) Cost/kg weight gain and Mean weight gain = Cost of production

(ii) Price #kg Mean x Mean weight gain =Revenue

(iii) Gross margin (N) = (Revenue - Cost of production)

Statistical Analysis

All data were subjected to analysis of variance according to procedures described (20). Duncan (21) multiple range test was employed to compare treatment means found to be statistically significant.

RESULTS AND DISCUSSION

The performance characteristics for the different treatments are given in Table 2. Birds consuming diet 4 had significantly ($p<0.05$) higher feed intake than the birds fed diet 1, 2 and 3. Birds on diet 2 had a higher weight gain which was closely followed by birds on diets 4, 3 and 1. The feed to gain ratio, did not differ significantly ($P>0.05$) among treatments.

Table 2: Effects of dietary methionine supplementation on the performance of growing indigenous Turkey.

PARAMETER	DIET 1	DIET 2	DIET 3	DIET 4	SEM
Mean Daily feed intake (g)	156.70b	155.81b	155.36b	173.22a	*1.49
Mean total feed intake (g)	8775.0b	8725.0b	87000.0b	9700.0a	*83.54
Mean initial weight (g)	1533.0	1597.5	1542.5	1517.5	31.11NS
Mean final weight (g)	3090.0	3355.0	3135.0	3255.0	78.38 NS
Mean final weight gain (g)	1557.0	1757.5	1592.5	1737.5	94.78NS
Mean daily weight gain (g)	27.83	31.39	28.44	31.03	1.69NS
Feed-to-gain ratio	5.64	4.96	5.46	5.58	0.16NS

a, b, values with different superscripts on same row are significantly different ($P<0.05$).

Diet 4 gave the poorest feed - to- gain ratio while improvement was noticed as the percent dietary methionine supplementation was reduced from 0.10 to 0.05 (Diets 3and 2). In other words, diet 2 gave the best feed-to-gain ratio (4.96). The control diet (1) which was not supplemented with methionine also gave a poor feed-to-gain ratio of 5.64. The performance of birds fed the control diet (1) shows that methionine supplementation is a neccessity thus lending support as reported (22). On the other hand the poor performance exhibited by birds fed diets 4 and 3 may also not be

unconnected with the consistent establishment of methionine as one of the most toxic amino acids (22) when added to diets in excess of what is required by the birds. (22) also observed that, once the amount of protein needed for maximum growth is met, any further dietary addition negatively affect the efficiency of protein utilization. (23) said that it constitutes metabolic stress. This result is at variance with reports of (1) who obtained best efficiency at a greater methionine level than was required for maximal body weight gain. The discrepancy may be in the class of poultry used for the trial. (25) observed that a deficient and or excessive dietary methionine levels, made body weight gain and efficiency of feed utilization poorer than those observed within the methionine requirement range. When methionine was deficient or inadequate, amino acid imbalance was evident in the elevation of daily feed consumption with consequent adverse effects on both the rate of body weight gain and efficiency of feed conversion. When the diets contained excess total methionine there was also a manifestation of amino acid imbalance (26, 27). The performance of birds fed diet 2 was therefore, a pointer to the fact that indigenous growing turkey poults would thrive well on diet with 18.4%CP and 2800Kcal/kg ME, supplemented with 0.05% methionine in a tropical environment.

Carcass characteristics for the different treatments are given in Table 3. The value of parameters such as dressed weight (g), carcass yield (%BW), meat (PDW), bone (PDW), abdominal fat and meat-to-bone ratio did not differ significantly ($P>0.05$). The values of the percent cut-parts (PDW) such as drumstick, breast, thigh, back, and wings showed no significant difference ($P>0.05$) from one another, neither did they follow any specific pattern. Carcass composition relates to the relative proportions of lean, fat and bone. Proportion of high quality is in most cases regarded as one with a large amount of muscle and small amounts of bone and fat (28, 29) and (30) observed that dietary protein had little effect on yields of eviscerated carcass whether yields were expressed as weights per carcass or as percentages of eviscersted carcass. This seems to be in agreement with what was observed in this trial. Birds fed diet 2 gave the highest quantity of meat (PDW) and meat-to-bone ratio. An indication that an appropriate level of methionine supplementation vis-a-vis percent dietary crude protein and metabolisable energy in turkey diets enhances meat deposition. It was also noted that the abdominal fat deposition increased as the dietary level of methionine supplementation increased from 0.00 to 0.15% this is in agreement with the findings of (31) that imbalance created either by deficient and or excess dietary methionine causes less efficient conversion of feed which in-turn leads to fat deposition in the animal body.

Table 3: Effects of Dietary Methionine supplementation on the Carcass characteristics of growing indigenous Turkey.

PARAMETER	DIET 1	DIET 2	DIET 3	DIET 4	SEM
Live weight (g)	3090.0	3355.0	3135.0	3255	78.38NS
Dressed weight (g)	1729.6	2074.2	2119.1	1950.9	78.9NS
Carcass yield (expressed as % live weight)	75.2	75.4	73.9	75.7	0.38NS
Meat (P.D.W.)	70.56	75.65	73.76	71.70	1.33NS
Bone (P.D.W.)	24.00	23.48	29.63	25.77	1.92NS
Abdominal fat (%)	1.14	1.21	1.37	1.91	0.19NS
Meat-to-bone ratio	2.94	3.08	1.92	2.74	0.15NS
CUT-PART (P.D.W.)					
Drumstick (%)	17.09	17.18	17.35	15.15	0.52NS
Breast (%)	27.89ab	28.99a	26.71b	26.90ab	0.51NS
Thigh (%)	15.08	14.89	16.56	15.30	0.87NS
Back (%)	17.49	17.73	16.38	16.90	0.52NS
Wings (%)	15.28	14.42	16.47	15.29	1.02NS

a, b, values with different superscripts on the same row are significantly different (P<0.05).

The internal organs data for the dietary treatments are shown in Table 4. Of the various parameters (liver, kidney, gizzard and heart) considered in this trial, only the kidney had value that differs significantly (P<0.05) from one another. Apart from the control (Diet1) the percent kidney increased as the percent dietary methionine increased from 0.05 to 0.15%. The liver also exhibited the same pattern while the percent heart decreased with increased percent dietary methionine. It is on record (23) that excess amino acid forces poults to eliminate nitrogen through the kidneys. This could be responisible for the enlargement of kidneys, so as to accommodate the increased activities that is being carried out within the kidney.

Table 4: Effects of dietary Methionine supplementation on the internal organs of growing indigenous turkey

PARAMETER	DIET 1	DIET 2	DIET 3	DIET 4	SEM
Liver	2.01	2.01	2.07	2.11	0.13
Gizzard	4.67	4.04	5.26	3.89	0.26NS
Kidney	0.17b	0.16b	0.19b	0.39b	*0.02
Heart	0.84	0.75	0.75	0.73	0.07NS

a, b, values with different superscripts on same row are significantly different (P<0.05).

Data on the economies of production for the dietary treatments are shown in Table 5. The economics analysis excluded the cost of labour and

medication, since they are common to all treatments. The data show that birds fed diet 4 significantly ($P<0.05$) consumed more feed than the others (Diet 1-3). The cost of experimental diets and the costs of total feed consumed per bird (N) increased as the percent methionine supplementation increased from 0.00 to 0.15% (Diet 1-4). The lowest cost per kg weight gain (#) was obtained from diet 2 followed by diets 3,1 and 4 respectively. The gross margin (#) that is most beneficial was obtained by feeding diet 2 followed closely by diets 4, 3,and 1 respectively. Since the desire of every investor is to make good profit, productivity at the least cost therefore should be his pre-occupation. The result obtained in this trial lend support to (32, 33, 14) who advanced the need for methionine supplementation but with a moderate drop in the dietary crude protein fed so as to avoid heat stress (especially in a tropical condition) and to cut-down cost. Feeding diet 2 to growing indigenous growing turkey is therefore, the only alternative left for producer to cut down-cost of production and reduce metabolic stress in the growing turkeys.

Table 5: Economics of suplementing growing turkey ration with varying levels of Methionine

PARAMETER	DIET 1	DIET 2	DIET 3	DIET 4	SEM
Total feed consumed (g)	8775	8725	8700	9700	0.07*
Cost / kg feed (N)	21.80	22.09	22.39	22.68	0.05*
Cost of total feed consumed / bird (N)	191.30	192.35	194.79	219.99	1.68*
Mean weight gain (g)	1557	1758	1593	1738	0.12NS
Cost / kg weight gain (N)	122.95	109.57	122.25	126.55	2.21NS
Gross margin (N)	524.79	616.06	538.04	579.54	8.84NS

CONCLUSION AND RECOMMENDATION

Indigenous turkey production constitutes a resource pool that could be tapped alongside other poultry to enable one to confront the protein malnutrition in Nigeria due to serious shortfalls in meat and other animal product supplies. The market is already there; feedmillers, poultry producers and processors should therefore take advantage of the research efforts. Diet 2, which contain 18.4%CP, 2800 cal/kgME, and supplemented with 0.05% methionine, enhances growth, feed efficiency, quality carcass yield and economy of production of growing indigenous turkey.

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