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The Short-term Response of Layers on Commercial Layers Mash and Dietary Fishmeal Supplement in Adamawa State, Nigeria

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Sixty Harco layers in their 12th weeks of lay were randomly allocated to six treatments, *ie* T1 (100% layers mash), T2 (layers mash + 1% fishmeal), T3 (layers mash + 2% fishmeal), T4 (layers mash + 3% fishmeal), T5 (layers mash + 4% fishmeal) and T 6 (layers mash + 5% fishmeal). The hens were given the experimental diets and water *adlibitum* for 8 weeks after a two-weeks adaptation period. The mean day and night temperatures were 39.7 and 35.2°C respectively, and relative humidity was 26.5% during the trial. There was a gradual decrease in the feed intake as the temperature increased towards the end of the study (between 6th to 8th weeks) in all the groups. Slightly higher mean values for egg weight and eggs shell thickness were obtained in T5. The present results showed that the replacement of fishmeal to layer mash at 4 to 5% resulted in significantly increased feed intake and no mortality under heat stress usually experienced during the hot period (February-April) in Adamawa state, and thereby increasing total profit. However, there are no significant effects of the replacement of fishmeal on the egg weight and egg physical characteristics.

Key words : short term response, layers, layers mash, dietary fishmeal

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Introduction

Poultry production is an important segment of the world food industries providing protein for human population in form of eggs and meat. In tropical Africa, however, production has been in practice for many years under the traditional husbandry system. In the Sudano-sahelian zone of Nigeria, layers (commercial) consume diets that are formulated for all the seasons of the year (Ubosi and Azubogu, 1989). The highest cost and scarcity of poultry feeds and harsh weather have occupied the most limiting factor facing commercial egg producers and consumers in Nigeria. Because of harsh weather, chickens voluntarily reduce their feed intake during the hot season in Sudano-Sahelian zone of Nigeria resulting in a decreased egg weight and percent hen-day

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production (Kingsley *et al.* 1992). Egg size in the poultry business determines to a large extent the market price. It is essential to supplement poultry feed with antibiotic and vitamin sources in order to ameliorate the effect of heat-stress (Freeman, 1971). The use of fishmeal to serve as an anti-stress feed supplement with respect to egg production and physical characteristics of eggs in Adamawa State has not been extensively studied.

Therefore, physical characteristics in terms of egg weight, egg size, quality and total egg yield are important indices that can not be ignored by hatcheries and consumers. The aim of this study was to evaluate the performance of layers fed commercial layer mash in combination with dietary fishmeal supplement and determine the physical characteristics of eggs.

Materials and methods

Study Area

The study was carried out in the Federal University of Technology, Teaching and Research Farm, located in Yola Adamawa State, Nigeria. It lies within the guinea savannah zone of Nigeria of latitude 9° 11″ North and longitude 12° 28″E. It has a tropical climate marked by the dry season and rainy season. The rainy season commences in April and ends some time in late October, while the dry season starts in October and ends in April. It has an annual rainfall of about 750 to 1,050 mm and an average minimum temperature of 15℃ and maximum temperature of 32℃.

Breed of layers used and experimental design

Sixty Harco breed layers (One of the breeds of poultry in Nigeria) between the age of 19th weeks olds were used for this study. Ten layers of similar weight were randomly allocated to each of the six treatments feed in a completely randomized design. The treatment feeds are shown in Table 1. The commercial layer mash was purchased from the Evangelical church of Christ in West Africa (ECWA) Yola branch. Fishes were obtained locally from fish markets as a material for fishmeal, and sun-cured and milled for mixing with layer mash as shown in Table 1.

Table 1. The composition (%) of the experimental diet fed to layers (Air dry matter basis)

Ingredients (%)	Diets					
	T1	T2	T3	T4	T5	T6
Commercial-Layers Mash[a]	100.0	99.0	98.0	97.0	96.0	95.0
Fish meal	0.0	1.0	2.0	3.0	4.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

[a] Composition of commercial layers mash : DM 86.91% ; CP 19.28% ; CF 39.8% ; ash 2.1% ; EE 1.8% ; GE (MJ/kgDM) 22.0 and Mineral-Vitamin premix = Vitamin 549000 IU ; 1149IU ; vitamin D_3 ; Calcium 28.0 g ; Copper 20.6 g and Iron 43.0 g

Housing and feeding trial

Each hen was placed in a battery cage cell measuring 30×35×45 cm throughout the 8 weeks experimental period. Hens were inoculated against Newcastle, Pollorum and Fawl typhoid, while Coccidiostats were also administered in water as part of the prophylactic treatment. The roofing material of the shade was covered with grass mat to reduce the rate of heat transmission to the hens. The trial lasted for 8 weeks, after a two-week adaptation period. Each hen was given the treatment feed and water *adlibitum*. From the 12 weeks point of lay, each treatment feed was weighed and fed to the hens twice daily at 7 : 30 and 17 : 30 hours after the leftover from previous day were weighed. Egg collection was done twice daily at 7 : 30 and 17 : 30 hours and the total egg produced per hen was recorded weekly.

Measurements

Live-weights of layers were recorded weekly to determine weight gain or loss of each hen and their body weight at their point of lay. At the end of each week, ten eggs from each group were randomly picked and weighed using a balance. The egg shell thickness was measured using a micrometer screw gauge. Similarly albumen height and width were measured using spectrometers and a Metric (Vanier) caliper, respectively. The albumen index was calculated by dividing the albumen height by the albumen width. Finally the mean day and night average temperature was recorded throughout the study periods.

Proximate analysis

The treatment diets were analyzed to determine the contents of dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract, total ash, calcium (Ca) and phosphorus (p) (A.O.A.C., 1990). Neutral detergent fiber (NDF) was determined by the Van Soest (1970) method as modified by Van Soest *et al.* (1991). Table 2 shows the chemical composition of the treatment diets.

Table 2. The proximate composition (%) of the treatment feed

Component	T1	T2	T3	T4	T5	T6
Dry matter	79.43	79.70	79.55	78.85	78.32	76.99
Crude protein[1]	21.48	21.70	22.05	22.45	22.78	23.56
NDF	49.36	46.86	46.83	46.73	42.50	46.72
Ether extract	3.00	3.05	3.25	3.61	3.82	4.04
Ash	8.40	6.41	6.84	7.42	6.20	7.91
Ca	3.59	3.61	3.92	4.02	4.36	4.52
P	0.39	0.48	0.52	0.72	0.92	1.95

[1] 100% Dry matter basis

T=Treatments

T1=0% Fish supplement T2=1% Fish supplement T3=2% Fish supplement

T4=3% Fish supplement T5=4% Fish supplement T6=5% Fish supplement

Table 3. Feed intake, body weight gain and egg physical characteristic of layers from 21 to 28 weeks of lay

Components	T1	T2	T3	T4	T5	T6	SEM
Feed intake (g/h)	75.66[c]	78.01[c]	80.38[c]	81.27[c]	89.17[a]	84.10[a]	2.38
Feed efficiency (kgfeed/dozen egg)	1.22	4.75	4.77	5.07	5.37	4.85	0.77
Body weight gain (kg/h)	1.60	1.52	1.56	1.64	1.74	1.68	0.04
Egg weight (gm)	54.13	54.25	54.40	54.91	56.60	54.90	0.46
Shell thickness (mm)	0.32	0.34	0.33	0.35	0.36	0.35	0.01
Albumen index	0.12	0.09	0.10	0.08	0.09	0.10	0.01
Haugh unit	82.42	83.74	84.66	81.91	82.73	83.79	0.51

[a,b,c] Means in the same row with different superscripts are significantly different ($P < 0.05$)

SEM = Standard error of mean

Statistical analysis

Data collected on feed intake, body weight gain, egg weight, and egg shell thickness and haugh unit were subjected to analysis of variance of a completely randomized block design. Where applicable, significance of differences between mean was evaluated by use of Duncans multiple range test (Duncan, 1955).

Results

Table 3 shows the body weight gain, feed consumption, and physical characteristics of egg in layers treated with commercial layer mash and dietary fishmeal. Relatively higher feed intake were obtained in T5 (89.17 g/h) and T6 (84.20 g/h). The lowest feed intake value of 75.66 gh^{-1} was obtained in T1 (control). The highest mean value for body weight gain (1.74 kg/h) was observed in T5 layers offered 4% fishmeal supplement. The average minimum and maximum temperature increased from 6th to

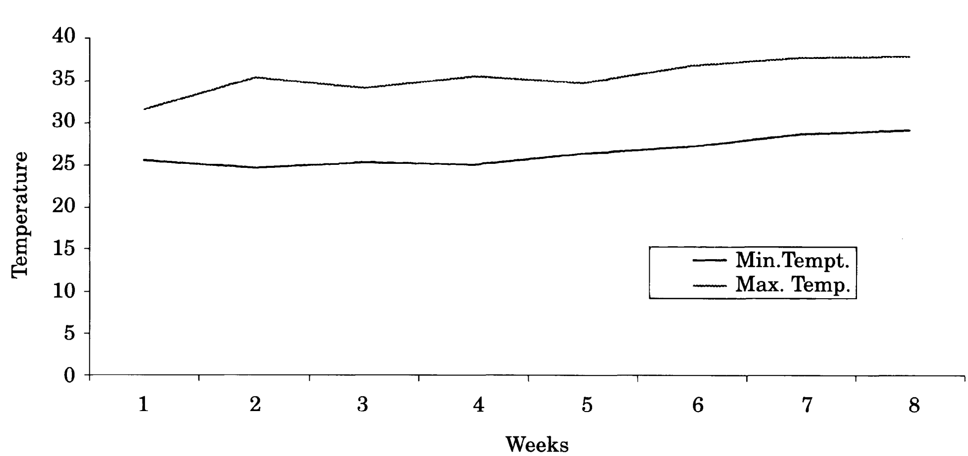

Fig. 1. Maximum and minimum Temperature during the experimental period

8th weeks periods of the study (Figure 1). The mean day and night average temperature was 39.7 and 35.2℃ respectively, and the relative humidity was 26.5% during the trial.

Egg weight and egg physical characteristics

There are no significant differences in egg weight and egg physical characteristics ($P > 0.05$). However, egg weight (56.6 g) in the layers fed the treatment T5 with 4% fishmeal supplement was slightly higher than that in control layer. Those on control diet (T1) without supplement had the lowest egg shells thickness of 0.32 mm and 54.13 g egg weight. The result of this study on eggs shell thickness was similar to the range of 0.35–0.39 mm obtained by Ubosi and Azubogu, (1989) but different from that of 0.33 mm reported by Cambell and Lasley (1985). The albumen index and haugh unit appeared slightly higher in the control group (T1) with smallest eggs produced during the entire periods of the trial.

The albumen index and haugh unit ranged from 0.12 and 82.42 in T1 layers to 0.09 and 82.73% in T5 layers, respectively. The result of the present study agreed to the works of Kiri *et al.* (1977) and Kingsley *et al.* (1992). There was no mortality observed throughout the study period.

Discussion

There was a significant difference among the treatment groups for feed intake. The body weight gain tended to be higher in treatment T5. The feed intake gradually increased with the increasing amount of dietary fishmeal supplement and was highest ($P < 0.05$) in the treatment T5 layers reflecting it higher CP, ether extract and Ca contents (Table 3). Similarly the enhancing effect of the fishmeal supplement on feed intake is clearly shown in layers on T6. In spite of the higher dietary contents of NDF, total ash, and lower CP in treatment T6 compared to treatment T5, their total feed intake appeared the same. This indicated that the supplementation of layers with 5% fishmeal supplement (T6) improved the feed intake and reduced the effect of heat stress which was associated with reducing feed consumption and feed conversion efficiency (Ubosi and Azubogu, 1989). The body weight gain followed the same trend with the feed intake, with treatment T5 having the highest mean value for body weight gain of 1.74 kg. However, in all the treatment groups, a gradual decrease in the feed intake was observed as the average day and night poultry temperature increased from 6th to 8 th weeks of the study. Figure 1 shows the average maximum and minimum temperature during the experimental period. The mean day and night average temperature was 39.7 and 35.2℃ respectively, and the relative humidity was 26.5% during the trial. Although no motility observed in the present study, Conner *et al.* (1977) reported that during high temperature, birds experience excessive heat stress resulting in the retardation of growth and loss of weight and some time high motility. This period is considered to be a very critical time for farmers (Conner *et al.* 1977).

Egg weight and egg physical characteristics

There was no significant difference in the egg shell thickness produced by layers among the treatments, even though birds on 4% fish meal supplement (T5) had the highest egg shell thickness and egg weight. The egg shells thickness in the control group (T1) without the supplement of fishmeal was slightly lowest among the treatments. This trend of increasing egg hell thickness followed the same trend of increasing feed intake across the treatments studied as a result of the increased in the supplementation of fishmeal among the groups (Ubosi and Yusuf, 1989). It is also possible that the time an egg spent in the shell gland (Ubosi and Azubogu, 1989) as well as the amount and type of feed consumed could have some influence on the percentage of shell deposited.

This study revealed that the use of 5% fishmeal in combination with layer mash resulted in increased feed intake, and slight increase of body weight in Guinea savannah zone of Adamawa state, and thereby combating the heat stress and reducing mortality experienced during hotter period in Adamawa State, Nigeria. This information could be useful in developing tropical countries and in areas with erratic high temperature changes.

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