EFFECT OF DIFFERENT ANIMAL PROTEIN SOURCES ON PERFORMANCE OF BROILER CHICKENS

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ABSTRACT This experiment was carried out to determine the effect of different protein sources (maggot, termite, grasshopper and lizard meal) on performance of broiler chickens. A total of one hundred and fifty (150) day old broiler chicks of Marshall Breed were used for the experiment. An eight week study was conducted to evaluate the performance of broiler chicken fed four different sources of animal protein. Diet I contained 5% fish meal while Diets 2, 3, 4 and 5 contained 5% maggots meal, termites meal, grasshopper meal and lizard meal respectively at the starter phase. The finisher phase contained 2.5kg each of the protein sources respectively. The chicks were allotted to five dietary treatments each replicated thrice with ten birds per replicate in a completely randomized design (CRD). Data collected were subjected to one-way analysis of variance and significant means were separated using Duncan Multiple Range Test (DMRT). The feed intake value observed in birds fed Diet 1 was significantly ($P<0.05$) higher than others statistically. Birds fed Diet 2 showed significant ($P< 0.05$) showed higher weight gain than others. Birds fed Diet 2 (maggot meal) performed better than others in absolute weight gain (2287g) which is very close to those fed fish meal (Diet 1). In conclusion, maggot meal in this study enhanced performance and is thus recommended as a replacement for fish meal. **Keywords**: broiler chickens; performance; animal protein sources

INTRODUCTION

Poultry has become the fastest means of bridging the gap in animal protein intake in Nigeria, due to its short production period and quick return on investment. However, this potential is currently being undermined by escalating costs of feedstuffs, and poor funding of the industry (Nworgu, 2007). The search for the least cost feed component has brought about the replacement of some conventional feedstuffs with cheap and locally available alternatives in the formulation of poultry feeds. The high cost of fish meal for example, has led to exploring alternatives such as termite, grasshopper and maggot meal sources of feed ingredients. Atteh and Ologbenla (1993) reported that any alternatives to be used should have comparative nutritive value, be cheaper than the conventional protein sources and be available in larger quantities. It is from the above that this study focused on the use of maggot, termite, grasshopper and lizard meals as alternative protein sources to fish meal in broiler diets.

MATERIALS AND METHODS

The experimental site

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Ibrahim Badamasi Babangida University, Lapai Niger State. The area is located in the Vegetative Zone of Guinea Savannah, Middle Belt of Nigeria. It lies on longitude 9.02°N and latitude 6.3°E of the equator with an average temperature range of 21°C – 36.5°C and a rainfall range of 1100-1600mm (Usman, 2013).

Source and preparation of test ingredients

The maggots used in the experiment were bred from layers droppings. They were obtained by culturing housefly larvae (*Musca domestica*) on the droppings. The droppings were spread on a wet platform to attract

houseflies which introduced the larvae on the dropping. After seven days, they were ready for harvesting, as they migrate to the surface of the substrate. The harvested maggots were oven-dried at 75°C for three hours in order to reduce its moisture content for proper storage. Termites were caught by simple light traps after night rainfall. Flying termites were attracted by the light and were caught inside a yellow basin containing water. They were hand-picked, de-winged, oven dried to a constant weight and then ground into powdery form. Mature male and female *Agama agama* lizards were caught by hunting with catapults, stones and traps. The lizards were slaughtered and visceral removed. Lizard carcass was sundried for 12 days to appreciable moisture content in the month of December. Dried grasshoppers were purchased from Lapai local market. The carcass of *Agama agama* lizard, termite and grasshopper were later ground into meal using hammer mill into separate bags.

Experimental diets

The experimental starter diets (Table 1) composed of 5% fish meal as source of animal protein in diet 1 (control), 5% of maggot meal (MGM), termite meal (TMM), grasshopper meal (GHM), and lizard meal (LDM) in diets 2, 3, 4 and 5 respectively. At the finisher phase, 2.5% of each test ingredient replaced fish meal in diets 2, 3, 4 and 5 respectively (Table 2).

Experimental birds and management

The pens were cleaned and then disinfected using Izal before the arrival of the chicks. A total of one hundred and fifty (150) day-old broiler chicks of Marshal Breed were used for the study. They were allotted into five treatments of 30 chicks in a completely randomized design (CRD). Each treatment was replicated thrice with 10 birds each. The birds on arrival were placed on the experimental diets. The chicks were brooded on deep litter using charcoal pot as source of heat. Anti-stress (Vitalyte®) was administered to the chicks on arrival and routine management practices were adopted as recommended by Oluyemi and Roberts (2000). Experimental broiler starter feed was fed in the first four (4) weeks while the broiler finisher was fed in the last four (4) weeks. Feeds and water were supplied *ad-libtum*. The birds were vaccinated against gumboro disease at the end of weeks one and three, using Infectious Bursal Disease vaccine (IBDV) and Newcastle disease Vaccine (Lasota) at the end of 2nd and 4th weeks. Amprollium was administered to the birds against coccidiosis at week 5.

Data collection and statistical analysis

Data on body weight gain and feed intake were collected on weekly basis and they were used to determine feed conversion ratio. Feed intake was monitored by calculating the difference between the feed served and left over. The mean value of these parameters were obtained and recorded. Mortality was recorded as it occurred throughout the period of the experiment. Data collected were subjected to analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980). The significant means were separated using Duncan's Multiple Range Test (DMRT) (Duncan, 1955) at 5% probability level.

RESULTS AND DISCUSSION

The performance of broiler birds fed diets containing different animal protein sources is shown in Table 3. The mean final weight recorded were 2400, 2367, 2167, 2167 and 1930g for treatment 1, 2, 3, 4 and 5 respectively. Absolute weight gains in grams were 2324, 3387, 2091, 2097 and 1857 for treatment 1, 2, 3, 4 and 5 respectively. Feed intake ranged from 4289.89g in birds fed lizard meal to 4700.16g in birds fed control diet, while average daily feed intake ranged from 76.60g in birds fed lizard meal to 83.93g in birds fed control diet. Feed conversion ratio was at the best (2.02) in birds fed with control diet, followed by those fed maggot meal (2.04), and the worst (2.31) from those fed lizard meal. Mortality increased from the control group and across other treatments and was obtained as 6.67, 13.33, 20.00, 23.33 and 33.33 for treatments 1, 2, 3, 4, and 5 respectively.

There were significant ($P<0.05$) differences among the treatments mean of feed intake. Treatment 1 (control) had the highest value (4700.16) followed by treatment 2 (4661.31) which was not significantly

(P>0.05) different statistically from birds fed fish meal. This was similar to the report of Egbewande *et al.* (2017), who obtained no significant (P>0.05) effect when maggot meal was used to replace fish meal in diets of broiler birds. The lowest final weight (1930g), feed intake (4289.89g), absolute weight gain (1857g), and the highest mortality rate (33.33%) obtained in birds fed lizard meal might be as a result of the anti-nutritional factors in raw lizard as reported by Abulude *et al*. (2007). They added that *Agama agama* lizard contained tannin, oxalate and phytate. The final weight gain obtained from birds fed lizard meal in this study is however, higher than 1526g reported by Olabode *et al.* (2017). Feed conversion ratio for birds on treatment 1 and 2 were superior (2.02) and (2.04) respectively, compared with the rest of other treatment groups.

CONCLUSION

This study revealed that maggot meal can completely replace fish meal at 100% inclusion rate in broiler chicken diet without any significant effects on weight gain, feed intake and feed conversion ratio. The performance data in this study point to the potential of maggot meal as an alternative animal protein source to fish meal. Since growth is of paramount concern to poultry farmers, the performance of birds fed Diet 2 (maggot meal) seemed to indicate better nutrient adequacy than diets 3, 4 and 5 and is therefore, recommended.

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Table 1: Composition of experimental starter diets

Ingredient (%)	Treatment				
	Control	MGM	TMM	GHM	LDM
Fish meal	5.00	-	-	-	-
Maggot meal	-	05.00	-	-	-
Termite meal			05.00	-	-
Grasshopper meal				05.00	-
Lizard meal					05.00

Other feedstuffs had same value (%) across treatment group: maize – 50.00; groundnut cake – 10.88; soyabean – 19.42; wheat

offal – 10.00; bone meal – 3.00; limestone – 0.80; starter premix – 0.25; salt – 0.25; lysine – 0.20; methionine – 0.20. Calculated Crude protein (%) and Metabolizable energy (kcal/kg): control = 23.24 and 2896; MGM = 23.97 and 2898.89; TMM = 23.85 and 2876.14; GHM = 23.63 and 2862.64; LDM = 23.13 and 2859.72
Key: MGM = Maggots meal; TMM = Termites meal; GHM = Grasshopper meal; LDM = Lizard meal

Table 2: Composition of experimental finisher diets

Ingredient (%)	Treatment				
	Control	MGM	TMM	GHM	LDM
Fish meal	02.50	-	-	-	-
Maggot meal	-	02.50	-	-	-
Termite meal	-	-	02.50	-	-
Grasshopper meal	-	-	-	02.50	-
Lizard meal	-	-	-	-	02.50

Other feedstuffs had same value (%) across treatment group: maize – 50.00; groundnut cake – 9.45; soyabean – 18.30; wheat offal – 15.00; bone meal – 3.50; finisher premix – 0.25; salt – 0.25; lysine – 0.30; methionine – 0.20. Calculated Crude protein (%) and Metabolizable energy (kcal/kg): control = 20.61 and 2913.73; MGM = 20.72 and 2954.85; TMM = 20.33 and 2913.73; GHM = 20.21 and 2916.73; LDM = 20.12 and 2911.73
Key: MGM = Maggots meal; TMM = Termites meal; GHM = Grasshopper meal; LDM = Lizard meal

Table 3: Performance of broiler chickens fed diets containing different protein sources

Parameter (g)	Treatment							
	Control	MGM	TMM	GHM	LDM	SEM	LSD	
Initial weight	76.00	80.00	76.00	70.00	73.00	00.13		NS
Final weight	2400.00^{a}	2367.00^{b}	2167.00^{c}	2167.00^{c}	1930.00^{d}	00.40		*
AWG	2324.00	2287.00	2091.00	2097.00	1857.00	00.52		NS
ADWG	41.50	40.75	37.33	37.44	33.16	00.02		NS
Feed intake	4700.16^{a}	4661.31^{a}	4350.06^{b}	4439.55^{b}	4289.89^{c}	00.08		*
ADFI	83.93	83.23	77.67	79.27	76.60	00.21		NS
FCR	02.02	02.04	02.08	02.12	02.31	00.09		NS
Mortality (%)	06.67	13.33	20.00	23.33	33.33	-	-	

Key: SEM: Standard error of mean; LSD: Level of significant difference; FCR: Feed conversion ratio, AWG: Absolute weight gain, ADWG: Average daily weight gain, ADFI: Average daily feed intake NS = Not significant, * = Signicant

^{abcd} Means within the same row with different superscripts differs significantly (P< 0.05)