Journal of Agriculture and Environment Vol. 5 Nos. 1 and 2, 2009: 119-123
ISSN 1595-465X

SHORT COMMUNICATION

RESPONSE OF BROILER BIRDS TO LOCUST (*Schistocerca gregaria*) MEAL AS A REPLACEMENT FOR FISH MEAL IN THE SEMI-ARID ZONE OF NIGERIA

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Introduction

Locust (*Schistocerca gregaria*) is a common insect that belongs to the order Orthoptera. Its availability is seasonal and location-based. It is found in abundance in the savannah zone of Nigeria, especially during the rainy season. It is known to cause a lot of damages to field crops, meadows and tree stands. In areas like Sokoto, locusts are trapped in large quantities and carried to the market for sale. They are processed for consumption by roasting or frying using vegetable oils. Locust has been one of the greatest agricultural pests since the beginning of civilization. It is a voracious pest capable of eating large quantity of vegetation. Pestilences of locusts devastate crops, pastures, orchards and entire countries or even continents (Adeyemo and Longe, 2008). Despite the destruction of crops, locusts could have beneficial effects as a source of protein in animal nutrition like some other insects. Das (1954) analyzed the locust, *Schistocerca gregaria* for use both as food and fertilizer, while Barrans (2002) reported that a pound of locusts (grasshoppers) contains more than adequate amounts of all amino acids for adults' nutritional needs. This quantity of locusts also meets an adult's daily needs for phosphorus, iron, thiamin, riboflavin, niacin, and essential fatty acids. Calcium levels of locusts exceed those of beef and poultry meat. Das (1954) reported that locust contained about 62% protein and 17% fat, but Adeyemo *et al*. (2000) reported a lower protein level of 52 % and an ether extract of 12%. Fish meal is a valuable protein source that contains between 60 to 72 % crude protein with almost all essential amino and fatty acids. The ingredient is currently beyond the reach of many poultry farmers due to its high cost. To reduce feed cost attempts were made in using locusts/grasshopper, other insects and larvae of *Cirina forda* by various researchers (Teotia and Miller, 1973; Turkey and Szaboti, 1981; Adeyemo and Longe, 2000; Akinnawo and Ketiku, 2000; Hena *et al., 2008*) with some degrees of success. The successes recorded could be due to the similarity in crude protein contents of these two ingredients. The present study attempted to replace fishmeal with locust meal in the diets of broiler chickens in the semi-arid northwestern Nigeria.

Materials and Methods

The experiment was conducted at the Poultry Production and Research Unit of the Department of Animal Science, Usmanu Danfodiyo University Sokoto, located at Veterinary Clinic along Aliyu Jodi Road, Sokoto State, Nigeria. Sokoto State is located on latitude 13^0 4' N and longitude 5^0 13' E in Northwestern Nigeria (Fullard, 1973; Reuben 1981). It is situated in the savannah vegetation zone of Nigeria with a semi arid climate,

bordering Niger Republic to the North, Zamfara state to the East and Kebbi State to the Southwest, and occupying a land area of 25,973 square kilometers (Mamman *et al*., 2000). The area has two major seasons: the long dry spell, which extends from October to June and the short rainy season, which begins from May or June and lasts till September. The average annual rainfall of the State is about 550 mm with a peak in August (Mamman *et al*., 2000).

The climate of the state favous the growth of these locusts, particularly in Local Government Areas located in the northern part of the state (Goronyo, Sabon Birni, Gada, Illela, Gwadabawa, Tangaza, Binji and Gudu).

The design of the experiment was complete randomized design (CRD) following the procedure of Steel and Torrie (1980). The experiment was made up of two treatments with three replications each.

Ninety day-old broiler chicks of *Abore acre* strain were used for the trial. The chicks were divided into six groups of 15 chicks each. Three groups were randomly assigned to each dietary treatment as replicates. All routine management practices and vaccination schedules were observed as stated by Oluyemi and Roberts (2000). Records of feed intake and water intake were kept on daily basis, mortality was recorded as it occurred while body weight gain was calculated from the difference between the initial and final weights of chicks after the termination of the experiment. Two diets were formulated; diet 1 contained fish meal while diet 2 contained locust meal to replace the fish meal (Table 1). These diets were fed to the experimental birds from day old to the end of the experiment at the age eight (8) weeks.

All data collected were subjected to statistical analysis using SAS (1990) and means separation was done by Duncan's multiple range test as outlined by Steel and Torrie (1980).

Results and Discussion

Results of the experiment are presented in Table 2. All the performance indices (feed intake, weight gain, feed conversion ratio and mortality) of birds on both the control and treatment diet were not significantly affected ($P > 0.05$) by the replacement of fish meal with locust meal. Adeyemo and longe (2008) reported similar non-significant effects of replacing fish meal with locust meal. The non-significant differences in the performance characteristics might be due to high crude protein content of the locust meal. Earlier, Das (1954) reported that locust contained about 62% crude protein and 17% fat, but Adeyemo *et al*. (2008) reported a lower protein level of 52 %. The amount of crude protein contained in locust meal is much close to that of fish meal.

A low and non-significant ($P>0.05$) mortality for birds on the two treatment diets were indications that replacing fish meal with locust meal did not lead to any adverse effect or disease condition. Awoniyi (2007) reported similar finding when fish meal was replaced with maggot meal in the diets of broiler chickens. The cost of feed was however significantly ($P<0.05$) affected by the replacement of locust meal. A kilogram of fish meal cost about ₦52.00 against that of locust meal which cost only about ₦49.00.

Table 1: Gross composition of experimental diets

Ingredients (%)	Treatment diet	
	Diet 1	Diet 2
Maize	51.00	51.00
Groundnut cake	30.00	30.00
Wheat offal	7.50	7.50
Fish meal	3.00	-
Locust	0.00	3.00
Blood meal	2.00	2.00
Bone meal	3.00	3.00
Limestone	3.00	3.00
Salt	0.25	0.25
Premix	0.25	0.25
Total	100.00	100.00
Calculated analysis of the experimental diets		
ME ($mjkg^{-1}$)	12.12	12.12
Crude protein (%)	23.76	23.74
Crude fiber (%)	3.29	3.45
Ether extract (%)	4.33	4.30
Ca (%)	1.89	1.88
P (%)	0.47	0.46
Methionine (%)	0.41	0.41
Lysine (%)	0.96	0.97

Results of cost benefit analysis (Table 3) showed that it was costlier to produce chicks on fish meal than raising them on locust meal. However, the net revenue generated from the control group was better than the one from the birds fed with diet 2. Both total cost and net revenue of producing birds using both treatment diets were not significantly ($P > 0.05$) affected.

It can be concluded from the results of this study that fish meal could be replaced by the locust meal in the diet of broiler chickens without negatively affecting the performance characteristics

Table 2: Performance characteristics of broiler chickens fed experimental diets

	Diet		
Parameter	1	2	SEM±
Initial body weight (g)	49.55	49.29	3.16
Average feed intake (gb^{-1})	4123.00	4211.23	98.21
Average final body weight (gb^{-1})	2123.01	2012.34	69.23
Average body wt gain (gb^{-1})	2073.45	1963.05	45.34
Feed conversion ratio	2.00	2.14	0.71
Mortality (%)	2.50	1.50	0.41

Means in a row followed by same letter (s) are not significantly different (P>0.05)

Table 3: Cost benefit analysis

Parameter (₦ $bird^{-1}$)	Diet 1	Diet 2
Cost of feed (₦kg^{-1})	51.75[a]	48.50[b]
Cost of chicks	180.00	180.00
Cost of feed consumed/bird	213.36	204.23
Cost of feed /body wt gain	102.92	104.20
Medication	35.00	35.00
Total cost	428.36	419.5
Revenue		
Cost of live weight	400	400
Revenue from sale of birds	844.00	804.00
Net revenue	415.64	384.50

Means in a row followed by same letter (s) are not significantly different (P>0.05)

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