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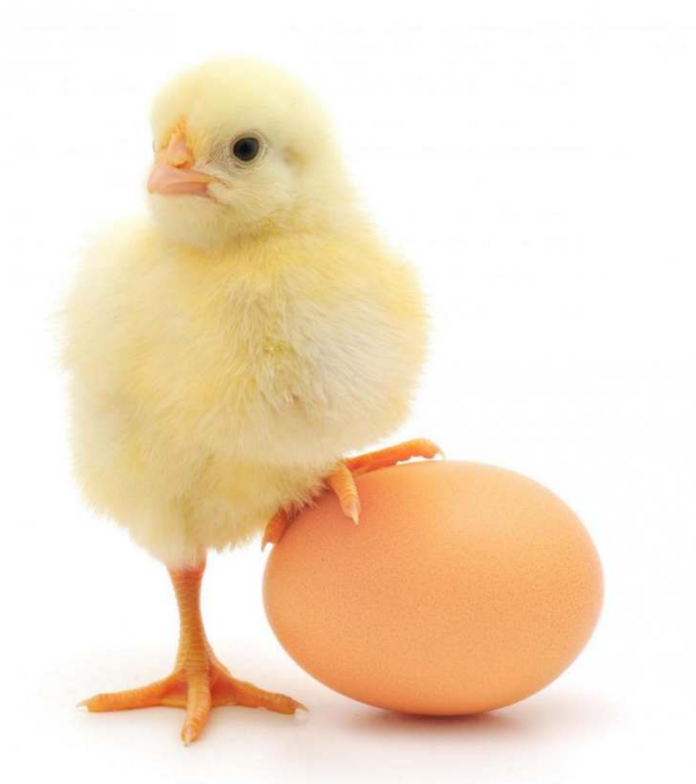

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Effect of Replacing Groundnut Cake with Maggot Meal in the Diet of Broilers

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Abstract: Two hundred and twenty five day old broilers were used to investigate the replacement value of maggot meal for groundnut cake (GNC) in the diets of broilers. Housefly maggot (*Musca domestica*) meal containing 37.2% crude protein, 35.5% crude fat, 7.15% ash, 9.05% crude fibre and 5.3kcal of energy was fed to replace dietary GNC at 0, 25, 50, 75 and 100% levels. There was no significant difference (p>0.05) in weight gain, feed intake, feed to gain ratio and nutrient retention with increasing levels of maggot meal in the diets of the broilers. The result obtained showed that maggot meal could replace up to 100% of dietary GNC level in the diets of broilers without adverse effect on performance.

Key words: Broiler, maggot meal, groundnut cake, replacement

Introduction

High cost and scarcity of feedstuffs particularly the protein sources such as soybean cake, groundnut cake and fish meal is the major factor militating against commercial poultry production. This is because poultry are monogastrics; hence they lack the complex digestive anatomy for the synthesis of protein and vitamins as it occurs in ruminants. However, many feedstuffs especially animal or abattoir by-products and agro-industrial by-products which are usually of no feeding value to humans could be alternatively fed at cheaper cost to monogastric animals (Omole and Tewe, 1985). Maggots develop from the eggs laid by housefly (*Musca domestica*) on accumulated poultry droppings. The fact that poultry droppings are organic materials make them a suitable medium for coprophagous insects like housefly to lay their eggs upon. Maggots are readily available especially on poultry farms where laying hens are reared in the cage system. Maggots are essentially a rich source of animal protein and limiting amino acids, particularly lysine, arginine and methionine (Waldroup and Harms, 1963). Calvert *et al.* (1969) and Teotia and Miller (1974), also reported that the protein quality of housefly pupae is comparable with that of meat or fish meal and superior to that of soybean meal. Maggots are produced in large quantities in existing manure wastes such as poultry manure (Calvert, 1979) and municipal organic waste (Ocio and Vinaras, 1979).

Maggots are harvested and processed into meals with no purchasing cost. This study was aimed at assessing the possibility of substituting maggot meal a waste that is readily available for groundnut cake which is a relatively expensive conventional protein concentrate in broilers feed. Maggots are animal protein that can be easily produced in large amounts and are not competed for by humans; they constitute environmental harzards which can be converted to feedstuff. Hence, this study is focused on determining the level of maggot meal that can replace Groundnut cake (GNC) in the diets of broilers.

Materials and Methods

A total of two hundred and twenty five day-old broiler chicks of mixed sex were used for this study which lasted for six weeks. The study was conducted at University of Ilorin, Ilorin, Nigeria, in year 2004. The chicks were randomly allocated to five dietary treatments. Each treatment had three replicates of fifteen chicks per replicate. The five experimental diets had maggot meal replacing GNC (22%) at 0, 25, 50, 75 and 100% levels (Table 1). The maggots used for the experiment were floated out the manure collected from a pit under the battery cages of laying hens using a 3mm sieve. The maggots collected were washed before drying in Gallenhamp drying cabinet at a temperature of 60°C for 24 hours. The maggot meal thus produced and fed to the experimental animals had a crude protein content of 37.2%, ether extract of 35.5%, crude fibre of 9.05%, 7.15% ash and 5.3kcal/g energy.

The chicks were housed in electrically heated battery brooders with feed and water supplied *ad libitum* throughout the study period. Nutrient retention trial was carried out in the fifth week of the experiment. Feacal samples were collected for 3 consecutive days adopting the total collection method. Collected excrete samples were measured, oven dried at 70°C for 72 hours, ground and stored for chemical analysis.

Proximate analyses were carried out according to the methods of A.O.A.C. (1980). Data on initial and weekly live weight and daily feed intake were collected and kept. All the data were subjected to analysis of variance using the model for completely randomized design and where significant, treatment means were compared by Duncan's multiple range test (Steel and Torrie, 1980).

Results

The growth performance characteristics of broilers fed diets with maggot meal replacing GNC are presented in Table 2. There was no significant effect (p>0.05) of treatment on observed feed intake by broiler chicks. The

Table 1: Composition of Experiment Diets (Kg/100kg)

Ingredients	1	2	3	4	5
Maize	60.25	60.25	60.25	60.25	60.25
Fish meal	3.00	3.00	3.00	3.00	3.00
Blood meal	5.00	5.00	5.00	5.00	5.00
Soyabean meal	7.00	7.00	7.00	7.00	7.00
Salt	0.25	0.25	0.25	0.25	0.25
Mineral Vit. Premix*	0.25	0.25	0.25	0.25	0.25
Bone meal	1.00	1.00	1.00	1.00	1.00
Oyster shell	1.25	1.25	1.25	1.25	1.25
Groundnut cake	22.00	16.50	11.00	5.50	0.00
Maggot meal	0.00	5.50	11.00	16.5	22.00
Total	100.00	100.00	100.00	100.00	100.00
Proximate Composition (Analysed Values)					
Dry matter (%)	95.51	9487	94.99	96.61	95.92
Crude protein (%)	21.50	21.58	21.65	21.80	21.48
Ether extract (%)	5.22	5.43	5.58	6.72	6.81
Crude fibre (%)	3.32	3.26	2.96	3.27	4.35
Ash (%)	1.82	1.77	1.61	1.97	2.20
Metabolizable energy(Kcal/Kg)	3143	3133	3220	3117	3165

•Supply per Kg Vit:-Vit A, 8000IU; Vit D_3, 1200IU, Vit E, 3IU, Vit K_3, 2mg; Vit B_2, 3mg; Vit B_3, 10mg; Vit B_5, 150mg; Manganese, 80mg; Zinc, 50mg; Copper 2mg; Iodine 1.2mg, Cobalt, 0.2mg; Selenium, 0.1mg

Table 2: Effect of replacing GNC for maggot meal on the growth performance of broilers

Replacement level of GNC (%)	Dietary level of Maggot Meal (%)	Feed Intake g/bird/day	Weight gain g/bird/day	Feed: gain ratio	Mortality (%)
0	0	27.80	15.5	1.79	12.5
25	5.5	27.70	15.7	1.75	0
50	11.0	27.90	15.4	1.81	0
75	16.5	26.20	14.6	1.81	0
100	22.0	25.70	14.2	1.81	0
S.E.M		0.5	0.3	0.01	3.13
		NS	NS	NS	NS

S.E.M = Standard error of mean, NS = No significant difference (p>0.05)

Table 3: Effect of Maggot meal replacement for GNC on nutrients retention of broilers

Replacement level of GNC (%)	Dietary level of Maggot Meal (%)	Protein (%)	Fat (%)	Crude fibre (%)	Metabolizable energy (Kcal/Kg)
0	0	68.39	82.74	46.02	3343
25	5.5	72.22	89.50	37.09	3520
50	11.0	65.79	85.61	34.81	3417
75	16.5	64.83	74.63	37.29	3389
100	22.0	64.17	74.14	39.15	3365
		NS	NS	NS	NS
S.E.M		1.77	3.26	2.43	146.40

S.E.M = Standard error of mean, NS = No significant difference (p>0.05)

feed intake values at 0, 25 and 50% maggot meal replacement for GNC where highly comparable (27.8 Vs 27.7 Vs 27.9g), while broilers on the 75 and 100% maggot meal replacement for GNC diets “tended” to have lower (p>0.05) feed intake values.

There was no significant effect (p>0.05) of the different treatments on weight gain values. There tended to be a decline in weight gain as the level of maggot meal increased in the diets. Broilers fed 0, 25 and 50% maggot replacement diets had weight gain values of 15.5, 15.7 and 15.4g respectively which compares (p>0.05) with 14.6 and 14.2g gained by broilers fed 75 and 100% maggot replacement diets.

Similarly, the feed to gain ratio was not significantly affected (p>0.05) by the treatments; although chicks on 25% replacement level “tended” to have the best feed efficiency of 1.75.

The effect of increasing levels of maggot meal to replace GNC in the diets of broiler on nutrient retention is shown in Table 3. There was no significant difference (p>0.05) in nitrogen (protein), fat and crude fibre intake with increasing level of maggot meal in the diets. However, both protein and fat retention “tended” to decrease (p>0.05) with the increasing maggot meal levels from 50% to 100% replacement level for GNC. Broilers fed the control diet appeared to have lower fat retention than those fed 25 and 50% maggot meal replacement for GNC diets (MRG), while they tended to have higher protein and fat retention values than those on the 75% and 100% MRG diet. Also, 0% MRG diet tended to have higher protein retention value than all MRG diets except for the 25% MRG that was non significantly (p>0.05) higher. 25% MRG diet gave the highest metabolizable energy value. 12.5% mortality was recorded for broilers fed 0% MRG diet while there was no mortality recorded from broilers on the other MRG diets throughout the experimental period.

Discussion

The crude protein content of the maggots used (37.2%) is in agreement with that reported by Gado *et al.* (1982) and Atteh and Ologbenla (1993); but totally at variance with those of Calvert *et al.* (1971) and Teotia and Miller (1974) who got much higher but varied results. Teotia and Miller (1974), however stated that the differences may be due to different analytical procedure employed or the use of different media for the production of housefly pupae. Thee maggots used also contained 35.5% crude fat which does not agree well with that of Calvert *et al.* (1971), Teotia and Miller (1974) and Gado *et al.* (1982) who got lower values of fat. However, the fat content obtained is supported by Chapman (1971) who stated that the major food reserves of insects are triglycerides. The gross energy of the maggots was found to be 5,249Kcal/kg. This is much higher than that reported by Teotia and Miller (1974) as 2,500 Kcal/kg. Thus the higher energy value of fat content obtained in this study since fat and energy contents of a feed material are directly correlated.

The insignificant difference in weight gains observed at different dietary levels of maggot meal is in correlation with the results of Calvert *et al.* (1969), Calvert *et al.* (1971), Teotia and Miller (1974) and Gado *et al.* (1982) who reported insignificant difference in weights gained by chicks fed different dietary levels of corn-pupae diets and corn soybean diets. According to NRC (1984), GNC contains 39.8% protein and the maggot used in this study had a close amount of 37.2% protein. Hence, maggot meal and GNC are comparable in their ability to supply needed protein for broiler chicks. Also, the lysine and methionine content of maggots are reported as 5.2 and 2.6 respectively by Calvert *et al.* (1971) while NRC (1984) reported 1.60 and 0.45 respectively for GNC. This implies that despite the slightly lower protein content, maggot meal can still favourably compete with GNC, thus leading to the insignificant difference in weight gains obtained in the study.

The slightly higher weight gained by chicks feed 25% MRG diet may be attributed to higher protein retention value recorded for this group of birds. As stated by Ichhponani and Malik (1971), that protein retention per unit of feed consumed is in correlation with growth rate as well as feed efficiency, the weight gains and feed to gain ratios obtained for the four dietary treatments followed this trend. The very low eight gains recorded for birds on 100% MRG, may also be related to less feed consumed by these birds, probably due to the dull colour or outlook of the diet as reported by Ewing (1963) that chicks are sensitive to colour. However, feed intake of chicks fed the different treatments had no significant difference (p>0.05). This implies the acceptability of both maggot meal and GNC by the chicks.

Protein retention value is related to the amount of unsaturated lipids in a diet as supported by Kussaibati, *et al.* (1983) that stated that apparent digestibility of protein is always higher when diets are rich in unsaturated lipids. Hence the protein and fat retention values obtained agreed with this phenomenon. The low and insignificant fibre retention values obtained in all the treatments may be attributed to the fact that chicks being monogastrics could not affectively make use of the fibrous materials in the diet.

Increase in Metabolizable Energy (ME) with increasing maggot level may be explained by the high fat contained in the maggots. Fat contains a lot of energy which are released when the fat is oxidized.

Zero mortality recorded in diets containing maggot meal i.e. 25-100% MRG diet implies that maggots have no pathological effect on the chicks. This is in agreement with Calvert *et al.* (1969) and Teotia and Miller (1974) who both reported that no pathological changes occurred in chicks fed maggot based diets. It is also supported by Bayadina *et al.* (1980) and Polvotova *et al.* (1980), who noted that the housefly larvae meal had no adverse effect on the health of fed pigs. All these observations point to the fact that after proper treatment, maggots may either contain a tolerable level of micro organism or none at all. As there has neither been any pathological report on chicks fed GNC diets, the mortality found in the birds fed the control diet (0% MRG) may be attributed to mechanical injury and other non-nutritional hazards.

The results of this experiment have shown that maggot meal has high potential in poultry nutrition, particularly being an animal protein source in broilers feed. In terms of the insignificant weight gain, feed to gain ratio and nutrient retention, broilers can tolerate the 100% maggot meal replacement for GNC in their diet. This implies that if much effort is put into the harvesting and processing of maggot into meals, high opportunities lies ahead in its inclusion in poultry feed to reduce cost of production. Nzamujo (1999) reported that mass production of maggot has solution to the high cost of livestock production.

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