EFFECT OF *LEUCAENA LEUCOCEPHALA* SEEDMEAL ON THE PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FROM FIVE TO TWELVE WEEKS OF AGE.

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ABSTRACT

One hundred and twenty 5-week old Shaver Cross broiler chickens were randomly distributed to four dietary treatments in which *Leucaena leucocephala* seedmeal (LSM) replaced groundnut cake at levels of 0, 5, 10 and 20% for an eight week period. Control and 20% LSM diets significantly ($p < 0.05$) increased mean feed intake during the finisher phase. Feed conversion ratio (FCR) of birds on 20% LSM was significantly ($p < 0.05$) lower than FCR of those on the rest of the treatments during the grower phase, while in the finisher period, broilers on 0 and 20% LSM had significantly ($p < 0.05$) lower FCR than birds on 5 and 10% LSM; the 10% LSM, however, induced significantly ($p < 0.05$) higher FCR than 5% LSM during the same period. Average weight gains and mortality showed no significant treatment effects throughout the period of study. There were significant ($p < 0.05$) differences between treatments means for dressed carcass percentage, liver, kidney, intestine and gizzard weights as percentage liveweight. Based on the data obtained in this study, LSM should not be included in broilers' diets at levels more than 10% of the groundnut cake.

KEY WORDS: Leucaena seedmeal, broiler diets, groundnut cake, replacement.

INTRODUCTION

The importance of identifying and utilizing locally available Nigerian feedstuffs in formulating livestock and poultry diets has been emphasized time and again, especially with respect to poultry. Successful local feeds which are to replace such expensive ingredients like maize, groundnut cake and wheat offals (are also used for human consumption) must not be staple items of human food and should be readily available year round and inexpensive to procure and process.

Leucaena leucocephala has been shown to be rich in crude protein and other nutrients (Adeneye, 1979; Okonkwo and Adikpe, 1988), and parts of this leguminous plant have been successfully fed to livestock (Mateo *et al.*, 1970; Alpuche and Preston, 1978; D'Mello and Taplin, 1978; Hulman *et al.*, 1978; Jones *et al.*, 1979) and to laying hens (Okonkwo and Adikpe, 1988; Okonkwo and Iji, 1989). Because livestock are highly susceptible to mimosine, a toxic amino acid present in Leucaena, at dietary levels of 40% and above (Hegarty *et al.*, 1964; Blood *et al.*, 1979; Liener, 1980), the poultry industry will use more Leucaena in its ration formulation than the livestock sector. This is because poultry has been shown to possess a high tolerance level for mimosine (Springhall and Ross, 1965 b; D'Mello and Taplin, 1978). This notwithstanding, very few workers have used Leucaena seedmeal in poultry diets (Bice, 1942, 1943; McDowell, 1972). However, Okonkwo and Iji (1989) fed Leucaena leafmeal to laying hens while the seedmeal has been reported to greatly enhance egg production (Okonkwo and Adikpe, 1988). The present study was conducted to investigate the effects of Leucaena seedmeal on the live performance and carcass characteristics of broiler chickens from five weeks of age to twelve weeks.

MATERIALS AND METHODS

A total of one hundred and twenty (120) five-week old Shaver Cross broiler chickens were individually weighed and distributed

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randomly to four treatments. Each treatment consisted of 30 chickens which were subdivided into three replicates of 10 each. Each replicate group was housed in a single pen, thus giving a total of twelve pens. *Leucaena leucocephala* seedmeal (LSM) was used to replace groundnut cake at 0,5,10 and 20% levels in both growers' and finishers' diets; the 0% in each case was the normal mash serving as the control. Growers' diets were fed from the fifth to the eigth week, while the finishers diets were consumed from the ninth to the twelfth week. Feed and clean drinking water were provided *ad libitum*. Parameters studied were final live weight, weight gain, feed intake, feed conversion ratio, mortality, etc

At twelve weeks, three birds per replicate (i.e. 9 birds per treatment), were fasted for 18 hours, slaughtered and dressed. Weights of hot and dressed carcass, liver, kidney, intestines and gizzard were recorded and expressed as percent of final liveweight.

Data obtained were subjected to a one-way analysis of variance; significant differences between treatment means were determined using Fisher's least significant difference test (Snedecor and Cochran, 1967).

RESULTS AND DISCUSSION

Results of chemical analysis of the *Leucaena leucocephala* seedmeal (LSM) used in this investigation had been reported earlier (Okonkwo and Adikpe, 1988), and showed it to contain 34.20% crude protein, a value in agreement with that obtained by Adeneye (1979). Means of live performance data are presented in Table 1. Average liveweights increased progressively from initial weights across treatments throughout the eight weeks (grower and finisher phases). Compared with birds on other treatments, those on treatment 4 recorded relatively lower body weights most probably because their initial liveweights were lower than the others during both phases; however there were no significant ($P<0.05$) treatment differences in average final liveweights in both phases. Although these weights increased progressively, they did so at a decreasing rate during the finisher phase; birds on treatment 4, however, maintained relatively lower body weights than others. Liveweights of birds on treatment 3 in both phases, were slightly higher than weights of birds on the rest of the treatments. During the ninth week ambient temperature peaked at 42^0c resulting characteristically in a drop in feed intake and consequent depressed body weight; however, as the temperature steadily dropped these weights gradually increased. Therefore the poor weight gains cannot be attributed to mimosine toxicity because in addition to the temperature-related weight loss, poultry has been shown by Springhall and Ross (1965a, 1965b) and D'Mello and Taplin (1978) to tolerate high levels of mimosine (over 50% LSM), and the highest level in this study was only 20% of groundnut cake.

With respect to the average weekly feed intake, there was no significant ($P>0.05$) variation between treatments during the grower period. However, there was a steady increase in feed intake as the dietary LSM level increased probably because the chicks tended to consume more feed in an attempt to meet their protein requirement as a result of the lower % CP in LSM than groundnut cake. As would be expected, mean weekly feed intake increased during the finisher period when compared to the grower phase. Values for diets 1 and 4 were significantly ($P<0.05$) higher than those for diets 2 and 3, and between these pairs there were no significant ($P>0.05$) treatment differences. Feed conversion ratio (FCR) of birds on 20% LSM diet was significantly ($p<0.05$) lower (1.34 ± 0.06) than FCR values of birds on 0, 5 and 10% LSM (1.73 ± 0.11, 1.69 ± 0.08 and 1.69 ± 0.08 respectively) during the grower period; these later FCR values however did not differ significantly ($p>0.05$). In the finisher phase, however, broilers on 0 and 20% LSM had significantly ($p<0.05$) lower feed conversion ratio (2.05 ± 0.18 and 2.07 ± 0.06 respectively) than those on 5 and 10% LSM (2.56 ± 0.24 and 2.88 ± 0.24 respectively) while the 10% LSM induced significantly ($p<0.05$) higher conversion ratio than the 5% LSM.

TABLE 1: EFFECTS OF DIETARY LEVELS OF LEUCAENA SEEDMEAL (LSM) ON THE LIVE PERFORMANCE OF BROILER CHICKENS (5-12 Weeks)

	GROWER PHASE				FINISHER PHASE			
	0% LSM	5%LSM	10% LSM	20%LSM	0%LSM	5%LSM	10% LSM	20% LSM
Mean initial liveweight (kg)	0.40 ±0.034	0.40 ±0.026	0.44 ±0.028	0.33 ±0.032	1.27 ±0.10	1.34 ±0.14	1.38 ±0.49	1.22 ±0.29
Mean final liveweight (kg)	1.27 ±0.10	1.34 ±0.14	1.38 ±0.49	1.22 ±0.29	1.90 ±0.091	1.88 ±0.024	2.08 ±0.12	1.85 ±0.011
Mean live weight gain (g/bird/week	870.98 ±45.99	936.59 ±45.99	940.48 ±45.99	890.44 ±45.99	627.74 ±76.48	547.52 ±76.48	701.23 ±76.48	627.62 ±76.48
Mean feed intake (g/bird/week)	556.25 ±78.18	576.25 ±77.75	593.50 ±80.57	630.75 ±79.78	731.67[a] ±43.50	657.66[b] ±38.67	633.33[b] ±29.35	773.67[a] ±29 97
Feed Conversion Ratio (gain/feed)	1.73[a] ±0.11	1.69[a] ±0.08	1.69[a] ±0.08	1.34[b] ±0.06	2.05[a] ±0.18	2.56[b] ±0.24	2.88[c] ±0.24	2.07[a] ±0.06
Mortality (%)	3.33 ±0.27	6.72 ±0.18	6.72 ±0.18	3.33 ±0.28	6.72 ±0.18	3.33 ±0.27	3.33 ±0.28	3.33 ±0 28

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

TABLE 2: EFFECTS OF DIETARY LEVELS OF LEUCAENA SEEDMEAL (LSM) ON SOME CARCASS CHARACTERISTICS OF BROILER CHICKENS (5 - 12 WEEKS).

	0% LSM	5% LSM	10% LSM	20%LSM
Hot carcass weight (% liveweight)	96.53 ±0.44	96.40 ±0.23	96.27 ±0.26	96.21 ±0.70
Dressed carcass weight (% liveweight)	81.58[a] ±7.35	81.15[a] ±5.26	82.21[a] ±7.46	62.87[b] ±8.84
Liver weight (% liveweight)	1.36[a] ±0.17	1.31[a] ±0.16	1.52[b] ±0.07	1.65[b] ±0.18
Kidney weight (%liveweight)	0.25[a] ±0.06	0.26[a] ±0.06	0.28[a] ±0.10	0.39[b] ±0.03
Intestines and Gizzard weights (% liveweight)	5.71a ±1.57	6.91b ±1.86	7.45b ±1.32	7.67b ±1.02

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

Though the depression of FCR by 5 and 10% LSM over control was not evident in the grower phase, these LSM levels showed much better feed conversion than control in the finisher period. Mortality data indicated that for both phases of the study there were significant effects ($P<0.05$) of treatments.

Data on carcass characteristics, expressed as percent of liveweights, are shown in table 2. Hot carcass weights showed no significant ($P>0.05$) differences due to treatments. With respect to dressed carcass weight, the 20% LSM diet produced significantly ($P<0.05$) lower dressing percentage (62.87±84) than the rest of the diets (81.58±7.35, 81.15±5.26 and 82.21±7.46, for O, 5 and 10% LSM diets respectively) which however showed no significant ($P>0.05$) differences between diets. These values are slightly lower than dressing percentages reported by Essary *et al.* (1981) and are probably caused by breed differences as indicated earlier by Renard (1979). However dressed carcass values for 0, and 10% LSM diets compare favourably with the result obtained by Dyer (1987). Liver weights of broilers on 10% and 20% LSM were significantly ($P<0.05$) higher (1.52±0.07 and 1.65 ±0.18% respectively) than those of birds which consumed the control and 5% LSM diets (1.36±0.17 and 1.31±0.16%). Because of the low levels of LSM used in this study, plus the high tolerance developed by poultry to mimosine (Springhall and Ross, 1965a, 1965b; D'Mello and Taplin, 1978) this increase in liver weight cannot be attributed to an attempt by that organ to detoxify mimosine.

There were no significant ($P>0.05$) treatment differences between kidney weights of birds on 0,5 and 10% LSM diets (0.25±0.06, 0.26±0.06 and 0.28±0.10% respectively) whereas 20% LSM produced kidney weight value significantly ($P<0.05$) higher (0.39±0.18%) than the rest. The reason for this is not clear. Intestine and gizzard weights as percent of liveweight indicated that the control was significantly ($P<0.05$) lower than the LSM treated diets. Although there were no significant treatment differences in kidney weights of birds on the LSM diets, there was a numerical increase from control with increase in LSM levels. This may be due probably to the adjustment of the intestines and gizzards to the presence and digestion of a 'new' feedstuff, since all the LSM diets caused significant ($P<0.05$) increases over control, of weights of the intestines and gizzard.

CONCLUSION

Since the aim of the broiler industry is to produce birds with high carcass yield, then the value of any "new" feed ingredient would be measured by its ability to enhance or depress feed conversion efficiency and dressed carcass yield. Results of this investigation have shown that feed conversion efficiency and carcass yield of broilers on 5 and 10% LSM were similar to those control birds. In addition, no harmful effects arising from *Leucaena leucocephala* seedmeal were observed; the seemingly subnormal performance of birds on 20% LSM was most probably due to their low initial liveweights. The depressed feed intake of broilers on 5 and 10% LSM observed during the finisher phase did not seem to affect their dressed carcass percentage. More studies with higher levels of LSM to broilers should be done since, as of now, LSM can be obtained everywhere in the country, and hence can only reduce the cost of producing dressed broiler carcass. LSM is also available in the sub-sahelian region all year round. However, until such studies are carried out, the level of inclusion of LSM in broiler rations should not exceed 10%.

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