PERFORMANCE OF BROILERS GIVEN DIFFERENT DIETARY LEVELS OF ACACIA SIEBERIANA DC. VAR. SIEBERIANA SEEDS

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ABSTRACT

The study was aimed at evaluating the seeds of a leguminous plant, *Acacia sieberiana* DC as an alternative source of dietary plant protein for broilers. Five experimental diets containing 0 (control), 5, 10, 15 and 20% *Acacia sieberiana* seeds (ASS) were formulated and fed to 5 groups of birds during starter (0 - 4 weeks), grower (5 - 8 weeks) and finisher (9 - 12 weeks) periods respectively. There were 3 replicates per treatment, with 10 birds per replicate. At the end of the experiment, average weekly liveweight gains of 128.90 ± 24.17 , 122.68 ± 25.09 , 112.79 ± 22.83 , 96.40 ± 21.53 and 99.56 ± 21.53 g were obtained for the birds on 0, 5, 10 and 20% ASS inclusion respectively. The average weekly feed consumption values were 413.47 ± 63.63 , 408.59 ± 63.82 , 304.60 ± 61.70 , 347.96 ± 58.0 and 352.83 ± 59.76 g for the birds on 0, 5, 10, 15 and 20% ASS respectively. The feed efficiencies were 0.289 ± 0.03 , 0.272 ± 0.03 , 0.264 ± 0.03 , 0.248 ± 0.03 and 0.253 ± 0.03 for the birds on 0, 5, 10, 15 and 20% ASS respectively. The data revealed that in general, the birds on 0, 5 and 10% ASS inclusion performed better ($P < .05$) than birds on 15 or 20% ASS. Results of carcass evaluation show that the gizzard, lungs and heads of the control birds had significantly ($P < .05$) higher weights than those of birds on 15 and 20% ASS. From these results it can be concluded that up to 10% ASS could be incorporated into poultry diet without deleterious effect on broilers.

Key words: broilers, acacia seeds, performance, carcass evaluation.

INTRODUCTION

Recent difficulties with poultry production inputs in Nigeria and the high cost of feed ingredients in particular have brought about the need to look inwards for raw materials sourcing. It has thus become necessary to explore other feed materials that are locally available, relatively cheaper than fishmeal, groundnut cake or soya bean as protein source and preferably not important as an item of human food. The seeds of *Acacia sieberiana* DC Var. *sieberiana* appear to be a good example of such material. There are few published data on the various species of *Acacia* and even less seems to be known about *Acacia sieberiana* in particular.

Acacia belongs to leguminous plant family Mimosaceae. Over 1000 species of *Acacia* are known (Brown, Cherrikoff and Robert, 1987). The arid area of Africa and Australia constitute important centres of diversity (Smith, 1976).

Acacia species have been put to many uses notably for dye, soap, perfume, timber, forage and soil conditioning (Brown *et al.*, 1987). The foliage and pods of some species are also valuable supplement of livestock feed (New, 1984; Cribb and Cribb, 1975). The few reports available also reveal that both *Acacia* leaves (Takada, Nakozota, Ono, Honda and Yamene, 1980) and seedmeal (Reddy, Mathur and Roto, 1981) have been tried as poultry feeds. These studies showed in general, that both leafmeal and seedmeal could be incorporated into poultry diet from between 5 to 90% without reduction in poultry performance. Although data exist on the composition of *Acacia sieberiana* pods or leaves (FAO, 1978) as well as on the cyanogenic glucoside component of the plant (David *et al.*, 1975) no such data have been found on the feeding value of ASS for poultry in Nigeria. This study was therefore aimed at evaluating the seeds of this leguminous plant, *Acacia sieberiana* as an alternative source of dietary protein for broilers.

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Table 1: COMPOSITION AND CALCULATED ANALYSIS OF STARTER GROWER AND FINISHER DIETS

INGREDIENTS	STARTER DIETS				GROWER DIETS				FINISHER DIETS						
	0%	5%	10%	15%	20%	0%	5%	10%	15%	20%	0%	5%	10%	15%	20%
MAIZE	64.50	60.50	55.60	55.50	54.70.	63.70	59.50	57.50	54.40	54.40	66.24	63.50	61.00	58.10	53.90
G/NUT CAKE	22.30	20.30	18.30	8.50	2.00	23.30	21.30	16.30	9.30	2.00	21.50	18.00	14.00	11.00	7.00
A. Sieberiana	0.00	5.00	10.00	15.00	20.00	0.00	5.00	10.00	15.00	20.00	0.00	5.00	10.00	15.00	20.00
FISH MEAL	7.00	6.00	6.00	11.50	13.10	5.00	5.00	6.00	8.00	12.30	3.00	3.00	4.00	4.00	5.00
BONE MEAL	2.00	2.00	2.00	0.90	0.60	2.50	2.00	1.70	1.00	0.70	3.00	2.50	2.00	2.00	1.70
OIL	2.00	4.00	5.90	6.40	7.40	3.30	5.00	6.30	7.10	8.40	4.06	5.40	6.80	7.70	10.20
NaCl	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
PREMIX ¹	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CAL. ANALYSIS															
ME (MJ/KG)	13.19	13.18	13.19	13.20	13.17	13.39	13.41	13.40	13.39	13.38	13.60	13.59	13.59	13.61	13.61
CRUDE PRO.%	21.03	20.50	20.69	21.35	20.88	20.08	20.28	19.98	19.92	20.33	1 8.25	17.95	18.00	17.86	17.79
LYSINE %	0.85	0.76	0.70	0.81	0.77	0.77	0.78	0.69	0.66	0.73	0.60	0.59	0.57	0.52	0.50
METH + CYST%	0.36	0.33	0.31	0.35	0.35	0.33	0.31	0.30	0.29	0.34	0.29	0.24	0.26	0.24	0.23
CRUDE FAT %	6.33	8.16	9.99	10.40	11.30	7.46	9.12	10.35	11.06	11.85	11.11	9.42	10.76	11.61	13.63
CRUDE FIBRE %	2.47	2.97	3.39	3.90	4.35	2.45	2.92	3.59	3.94	4.31	2.48	2.96	3.54	4.00	4.48
CALCIUM %	1.21	1.30	1.35	1.37	1.45	1.28	1.19	1.24	1.19	1.37	1.34	1.26	1.22	1.32	1.36
PHOSPHORUS %	0.60	0.58	0.58	0.58	0.58	0.63	0.55	0.54	0.49	0.57	0.64	0.57	0.52	0.52	0.51

¹Premix: as recommended by NRC (1975)

MATERIALS AND METHODS

One hundred and fifty Anak day old broiler chicks were used for the experiment. The chicks were obtained from Nigerfirst Integrated Farm, Kaduna.

Acacia sieberiana pods were collected from Gambole and at the Forestry Resource Development Centre, Maiduguri. The pods were pounded in a wooden mortar and winnowed to obtain the seeds. These seeds were then used to formulate five diets containing 0, 5, 10, 15 and 20% ASS for starter, grower and finisher broiler rations respectively. The composition of the experimental diets are shown in Table 1.

The 150 day old broiler chicks were randomly assigned to 5 groups with 30 birds per group. Each group had 3 replicates of 10 birds per replicate pen to provide floor space of 0.07sq.m. The birds were subjected to standard broiler management procedure.

From day-old to 4 weeks of age starter ration containing the different levels of Acacia seeds were fed to the different groups. While from 5 to 8 weeks of age similar feeding was continued with grower ration and finally changed over to finisher ration as from 9 to 12 weeks of age. The supply of feed and water was *ad libitum* throughout the experiment. Feed intake as well as live weights were recorded weekly for each replicate. The feed efficiency was then calculated from these data. Daily mortality was also recorded.

At the end of 12 weeks, 5 birds were randomly picked per treatment group for carcass evaluation. The birds were deprived of feed but not water for a period of 20 hours. At the end of the 20 hours the fasted body weight of the birds were recorded before slaughter which was by severing of the carotid arteries and jugular veins. The birds were defeathered manually after immersing in hot water. Each bird was then eviscerated and various organs weighed.

Data obtained for weight gain, feed intake and feed efficiency as well as the carcass were subjected to analysis of variance of a randomised complete block design (Steel and Torrie, 1960). Significant differences between treatment means were compared by Duncan's multiple range test (Duncan, 1955).

RESULTS

Data on liveweight gain, feed consumption feed efficiency and mortality are presented in Table 2. At the end of the starter period (0 - 4

weeks) the birds on the control had significantly higher ($PC < .05$) liveweight than those on 15 and 20% ASS. There were no significant differences ($PC > 0.05$) between the birds on the control and those on 5 and 10% ASS. There were also no significant differences ($P < 128 > 0.05$) between the birds on 15 and 20% ASS diets. At end of the grower period (5 - 8 weeks) weight gains were similar for the birds on 0, 5 and 10% ASS but significantly higher ($PC < 0.05$) than those on either 15 and 20% ASS. However, at the end of finisher period (9-12 weeks) there were no significant differences in live weight gain between the various treatment groups.

Average weekly feed consumption at the end of the starter period for the birds on 0(control), 5 and 10% were similar but significantly higher than for those on 15 and 20% ASS. Similar results were also obtained at the end of both grower and finisher periods.

There were no significant differences in feed efficiency between the various treatment group at starter, grower and finisher periods. However, the analysis of the cumulative data (0 - 12 weeks) shows that the birds on control (0% ASS) had feed efficiency significantly higher ($PC < 0.05$) than those on 15% ASS.

The data on carcass evaluation are presented in Table 3. The gizzard, lungs and heads of the control birds (0% ASS) were significantly ($PC < 0.05$) heavier than for those on 15 and 20%. The weight of gizzard, head and legs of the birds on 10% ASS were not significantly ($P < 128 > 0.05$) different from control, but significantly higher than for those on 20% ASS.

DISCUSSION

Growth data indicate that at no time during the experimental period was growth performance of birds given diets with 5 or 10% ASS inclusion lower than those on the control. The data also show growth inhibitory effects at ASS levels of 15 and 20% especially at earlier ages. The improvement in live weight of these birds especially those on 20% during the finisher period (9-12 weeks) suggest a gradual adaptation by the birds to high intake of ASS. There is scarcity of information with which to compare the result of this study.

The reduced body gain observed with birds given high levels of ASS, no doubt, was a result of reduced feed intake. Diets containing ASS at over 10% seem to have high tannin content and

TABLE 2: LIVEWEIGHT GAIN (G), FEED CONSUMPTION (G), FEED EFFICIENCY AND MORTALITY (%) (MEAN $\pm$ S.E.)

		0%	5%	10%	15%	20%
LIVEWEIGHT GAIN (G)	STARTER	39.58 $\pm$ 12.77a	36.47 $\pm$ 10.00a	33.67 $\pm$ 9.46ab	20.45 $\pm$ 5.99c	20.19 $\pm$ 5.48cb
	GROWER	142.00 $\pm$ 33.69a	134.50 $\pm$ 36.30a	130.62 $\pm$ 31.35a	107.43 $\pm$ 28.20b	111.86 $\pm$ 32.21b
	FINISHER	193.82 $\pm$ 8.13a	197.04 $\pm$ 34.35a	174.08 $\pm$ 36.57a	160.79 $\pm$ 29.40a	164.73 $\pm$ 23.45a
	OVERALL	128.90 $\pm$ 24.17a	122.68 $\pm$ 25.09a	112.79 $\pm$ 22.83ab	96.31 $\pm$ 21.14bc	99.46 $\pm$ 21.53c
FEED CONSUMPTION (G)	STARTER	194.99 $\pm$ 28.31a	190.66 $\pm$ 32.05a	188.82 $\pm$ 19.28a	137.51 $\pm$ 25.86b	138.43 $\pm$ 22.60b
	GROWER	383.88 $\pm$ 66.39a	378.61 $\pm$ 46.82a	370.02 $\pm$ 41.04a	336.19 $\pm$ 45.19a	338.85 $\pm$ 50.78b
	FINISHER	661.53 $\pm$ 55.95a	656.51 $\pm$ 51.91a	643.93 $\pm$ 46.60a	570.18 $\pm$ 31.69b	581.19 $\pm$ 34.79b
	OVERALL	413.47 $\pm$ 63.63a	408.59 $\pm$ 63.82a	394.60 $\pm$ 61.70a	347.96 $\pm$ 58.07b	352.83 $\pm$ 59.76b
FEED EFFICIENCY	STARTER	0.193 $\pm$ 0.042	0.183 $\pm$ 0.027	0.175 $\pm$ 0.035	0.151 $\pm$ 0.028	0.156 $\pm$ 0.021
	GROWER	0.366 $\pm$ 0.028	0.331 $\pm$ 0.056	0.346 $\pm$ 0.056	0.315 $\pm$ 0.040	0.316 $\pm$ 0.040
	FINISHER	0.310 $\pm$ 0.069	0.301 $\pm$ 0.056	0.271 $\pm$ 0.049	0.278 $\pm$ 0.042	0.285 $\pm$ 0.042
	OVERALL	0.289 $\pm$ 0.026a	0.272 $\pm$ 0.028ab	0.264 $\pm$ 0.035ab	0.248 $\pm$ 0.028b	0.253 $\pm$ 0.028ab
MORTALITY %		8.00	6.00	6.66	6.66	6.66
(1-12 WEEKS)						

a, b, c; Means $\pm$ S.E. in the same row with the same superscript are significantly different ($P < 0.05$).

TABLE 3. CARCASS EVALUATION RESULTS

	T R E A T M E N T S						± SEM
	0%	5%	10%	15%	20%		
1. LIVEWEIGHT (LW)g	2180.00	2160.00	1940.00	1760.00	1600.00		201.59
2. PLUCKED WT (g)	1980.00	1960.00	1780.00	1580.00	1420.00		121.33
LW %	90.82	90.74	91.75	89.77	58.75		
3. DRESSED WT (g)	1380.40	1423.40	1310.33	1261.18	964.07		94.06
LW %	63.30	65.69	67.52	71.66	60.25		
4. ABDOMINAL FAT (g)	51.22	58.89	54.88	57.76	50.13		15.85
LW %	2.35	2.73	2.83	3.23	3.13		
5. GIZZARD WT (g)	68.08 ^a	55.59 ^a	60.26 ^{ab}	52.21 ^{bc}	44.37 ^c		4.23
LW %	3.12	2.57	3.11	2.96	2.77		
6. HEART WT (g)	34.28	15.04	12.22	9.05	10.35		10.34
LW %	1.57	0.69	0.63	0.51	0.65		
7. INTESTINE WT (g)	268.08	96.36	95.56	93.31	76.77		75.53
LW %	1.23	4.46	4.93	5.30	4.80		
8. LIVER WT (g)	33.86	41.78	33.65	33.84	35.19		5.58
LW %	1.55	1.93	1.73	1.92	2.19		
9. LUNGS WT (g)	32.25 ^a	12.71 ^b	13.07 ^b	10.79 ^b	9.30 ^b		3.90
LW %	1.48	0.58	0.67	0.61	0.58		
10. REPRO ORG. WT (g)	4.56	5.12	4.68	4.28	4.28		0.74
LW %	0.21	0.24	0.24	0.24	2.27		
11. KIDNEY WT (g)	3.04	2.66	3.12	2.87	2.40		0.37
LW %	0.14	0.12	0.16	0.16	0.15		
12. LEGS WT (g)	80.32 ^a	85.90 ^{ab}	70.61 ^{abc}	63.49 ^{abc}	52.96		7.90
LW %	3.68	3.97	3.64	3.61	3.31		
13. HEAFD WT (g)	59.95 ^a	61.56 ^a	50.73 ^{abc}	47.31 ^{bc}	43.78 ^c		4.69
LW %	2.75	2.85	2.61	2.68	2.77		

a, b, c: Mean in the same row with the same superscript are not significantly different (P < 0.05)

SEM = Standard Error or Means.

less palatable to broilers than that of control. Nohra, Kpatzer and Josly (1966) reported that 0.5% tannic acid in diets reduced feed intake of chicken.

The lower body weight gain and reduced feed intake at higher ASS inclusion, as could be expected, had consequences on feed efficiency.

Carcass analysis data appears to support the view that inclusion of ASS above 10% has some deleterious effect on carcass yield. The higher weights recorded for the gizzard of the control birds over those of 15 or 20% ASS might be due to the presence of tannin in the *Acacia sieberiana* seeds. This effect was not observed in 5 or 10% ASS inclusion diet apparently due to the low total tannin content of the diet at these inclusion levels. Another reason for lower gizzard weight recorded at 15 or 20% inclusion might be that some quantitative changes occurred in the gizzard. This quantitative changes might be the antibacterial effect of *Acacia sieberiana* on the number of microbes present in the gizzard. The antibacterial effect of *Acacia sieberiana* has been demonstrated (Watt and Bandwijk, 1962) and antibiotic-mediated changes in the lining of digestive tract of animals have also been documented (Clegg, 1962).

Lower lung weights associated with ASS diets might be simply explained by the basic function of the lungs i.e. respiration. Thus, the lungs of birds on ASS diet might have performed some additional function in the metabolism of tannin. This metabolism or oxidation of tannin may also not be unconnected with lower mortality recorded at high ASS inclusion diets. Schanderl (1970) described tannin as a powerful reducing agent which exhibit a marked tendency to absorb oxygen.

Mortality recorded ranges from a minimum of 6% for the birds on 5% ASS diet to a maximum of 8% for the birds on the control. This level of mortality is within the range normally experienced in the broiler industry (Neshiem *et al.*, 1969).

On the basis of results obtained in the present study therefore it appears that up to 10% ASS can be incorporated into broiler diets without deleterious effect on performance. Higher levels of ASS inclusion appear to depress growth up to 12 weeks in these birds.

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