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Effect of Decorticated Fermented Prosopis Seed Meal (*Prosopis africana*) on Growth Performance of Broiler Chicken

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Abstract: Two hundred and forty 7 days old Anak 2000 broiler chicks were used to determine the growth rate and economic of broiler fed decorticated fermented *Prosopis africana* seed meal (DFPSM). Five experimental diets containing 0, 25, 50, 75 and 100% DFPSM replacement levels for full fat soybean meal were fed to broiler for 8 weeks. The experiments were in a completely randomized design (CRD) with five treatments, each replicated four times with 48 birds per treatment and 12 birds per replicate. The average live weight of broiler ranged from 2500-2850g in each dietary group and were significantly ($P < 0.05$) affected by dietary treatment, similarly the growth rate and feed conversion ratio were also significantly affected by the dietary treatment ($P < 0.05$) .The study indicate that 20% inclusion of DFPSM with soybean meal could be used in a broiler diet.

Key words: Fermented *Prosopis africana* seed meal, broiler diet, animal protein, developing countries

INTRODUCTION

Animal protein requirement in developing countries has become critical due to rapid population growth. This creates adverse consequences on food security and has resulted in high incidence of hunger and malnutrition, consequently efforts are geared towards increasing the animal production component of agriculture, and this fact has become prominent because of the malnutrition condition that characterized developing countries (Igbedioh 1996).

In Nigeria there is a widen gap between the production and consumption of animal protein and per capital animal protein intake is already below recommended levels (Ukachukwu and Obioha, 2000). During the past two decades the cost of soyabean and ground nut cake has continued to rise and this was attributed to declining production and increasing demand by the rapidly expanding human population, (Okeodo *et al.,* 2005).

The major item of cost in poultry production is feed; one of the first manifestation of this problem for feeding animal is the competition for feedstuff that can commonly be used by human and livestock, like maize, soya, sorghum and groundnut (Iyeghe *et al.,* 1992).

The price of soyabean, which is a major source of protein in poultry diets, has continued to increase as a result of stiff competition between the industrial processors and human consumption for soyabean (Amaefule and Iroanya, 2004). Consequently there is a world wide interest in the search for new plant species capable of supplementing traditional crops and staples (Jurgen *et al.,* 1998). It is in the light of this that decorticated fermented Prosopis seed is considered as potential feedstuffs for poultry.

Prosopis africana is a leguminous tree and one of the 44 species of the genus Prosopis. It is a savannah tree found in semi-arid and arid regions of tropical Africa (Keay, 1989). The tree is of great economic value to man and animal, it fixes nitrogen to enrich the soil, generates hardy timbers, produces protein rich leaves and sugary pods used as feed stuffs for ruminants. (Annongu *et al.,* 2004). However, the disadvantage of Prosopis is the high content of anti-nutritive factor such as tannins, haemagglutinins, prosopine and toxic amino acids which are capable of inducing adverse effect on simple stomached animals when consumed without adequate processing (Cheeke and Shull, 1985). Scientific data on direct or processed use of Prosopis seeds and it nutritive value is lacking, available data or information deals meanly with the use of Prosopis pods and leaves (Lyon *et al.,* 1988). In Nigeria Prosopis seeds are used for making “local magi”, (dawa dawa) by subjecting the seeds to 24h boiling at 100^{o}C. However, Draper (1944) used Prosopis juliflora pod flour to replace maize and wheat in nutrition of pigs and chickens and reported positive results. Information on the used Prosopis seeds in nutrition of Monogastric animals is very limited. This study therefore is designed to examine the effect of feeding graded levels of decorticated fermented Prosopis seed meal on its soybean meal replacement value in feeding broiler chicken.

MATERIALS AND METHODS

Prosopis seeds were obtained from Lafia market, Nigeria. The seeds were processed by boiling for three hours and allowed to cool. The seed were decorticated by hand squeezing and washed with clean water. They

were then kept in a large polythene sacks to exclude air and fermented for two days according to the method described by Achi (1992). The fermented seeds were then sun-dried to a constant weight, milled using hammer mill to produce Prosopis seed meal. A sample of the meal was subjected to proximate analysis according to A.O.A.C. (1990) Table 1.

Based on the result of the proximate analysis, five broiler diets were formulated containing Prosopis seed meal replacing soybean meal as protein source at 25, 50, 75 and 100%, respectively. Table 2. The control diet (o) did not contain Prosopis seed meal.

Management of experimental birds: Two hundred and forty 7 days old un-sexed Anak 2000 broiler chicks purchased from ECWA Rural Development Farms Jos, Plateau State, Nigeria were used for the experiment at the livestock unit of College of Agriculture Lafia, Teaching and Research Farm. The chicks were brooded using kerosene stoves and electric bulbs as sources of heat and light in a deep litter house. The broiler chicks were divided into 5 groups of 48 birds each and randomly assigned to the five treatment diets in a completely randomized design (CRD) experiment. Each treatment group was further subdivided into 4 replicate of 12 birds per replicate. Feed and water were provided *ad-libitum*, parameters measured were feed intake, growth rate, weight gain, feed conversion ratio and feed cost. All the recommended vaccinations and preventive medication were administered accordingly; the feeding trial lasted for 8 weeks.

Statistical analysis: The data collected for each of the parameters were statistically analyzed using one-way Analysis of variance procedure outlined by Minitab Statistical Software (Minitab Statistical Software, 2004) Differences between treatment means were separated using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS

The proximate composition of raw and decorticated fermented Prosopis seed meal (DFPSM) is shown in Table 1. It shows that raw Prosopis seed contained 22.62% CP, 6.46% EE, 6.90% CF and 4.04% Ash, while the decorticated fermented Prosopis seed meal contained 42.52% CP, 7.93% EE, 4.93% CF and 8.12% Ash. The mineral contents include Calcium, Phosphorus and Potassium.

While the nutrient composition of the experimental diets are shown in Table 2. Data on performance, as well as the economic of production of broiler chickens on the various dietary levels of DFPSM replacement of soybean are presented in Tables 3 and 4.

Table 2 gives the nutrient compositions of the experimental diets, the calculated crude protein for the treatment diets ranged from 20.0-20.04%, the calculated metabolisable energy ranged from 2807.23-2903.00 Kcal/kg. Performance of chickens on the different levels of DFPSM inclusion is presented in Table 3. Among the various parameters measured. The final live weight and the average growth rate were significantly different ($P < 0.05$) among the treatments. Growth rate for the control diet was significantly better and decreases as inclusion of DFPSM increases to 100%.There was no significant difference ($p > 0.05$) between broilers fed the control diet and varied levels of inclusion of DFPSM for average feed intake and feed conversion ratio.

Appendix 1: Concentration of total Nitrogen and amino acids in Prosopis seed and Full fat Soybean (gAA/16gN)

Parameter	Raw Prosopis	Treated Prosopis	FFSB
Total nitrogen (%)Amino acid (g/16g N)	2.04	2.50	
Essential AA			
Leucine	6.69	6.89	5.07
Lysine	6.69	6.78	4.22
Methionine	0.54	0.57	6.9
Isoleucine	2.67	2.91	2.93
Cystine	2.14	2.16	1.44
Phenylalanine	2.88	3.64	3.34
Tyrosine	2.35	2.75	2.65
Theonine	2.18	2.32	2.56
Tryptoophan	0.92	0.94	10.00
Valine	5.09	5.14	3.17
Non-Essential AA			
Aspartic Acid	9.04	9.85	7.78
Glutamic Acid	20.12	20.56	12.49
Alanine	3.38	3.65	2.77
Arginine	9.15	9.88	4.99
Glycine	6.47	8.17	2.93
Histidine	1.80	1.86	1.70
Proline	3.71	4.28	4.26
Serine	3.98	4.62	3.36

Annongu and Termulen (2001). Jurgen *et al*. (1998).

Table1: Proximate composition of raw and decorticated fermented Prosopis seed meal (%DM)

Nutrients	Raw	Decorticated fermented
Dry Matter (DM)	96.08	94.25
Crude Protein	22.62	42.52
Ether Extract	6.46	7.93
Ash	4.04	8.12
Crude Fiber	6.90	4.93
Phosphorus	0.69	0.86
Calcium	1.21	1.13
Potassium	0.68	0.79

DISCUSSION

The nutrient content of the raw and processed Prosopis meals obtained in this trial was at variance with the findings of (Annongu and Ter Meulen, 2001, Jurgen *et al.,* 1998). Various factors ranging from the processing method, length of fermentation and the activities of micro-organisms could be responsible for the differences obtained. The high average feed intake in birds fed 25, 50 and 75% inclusion of DFPSM replacement of soybeans meal though not significant

Table 2: Percentage composition and calculated analysis of experimental diets

Ingredients	0	25	50	75	100
Maize	54.70	56.00	54.00	53.40	52.40
Full-fat soybeans'	31.10	23.30	16.10	10.00	0.00
Prosopis seed meal	0.00	6.50	15.70	22.40	33.40
Maize offal	10.0	10.0	10.0	10.0	10.0
Bone meal	2.50	2.50	2.50	2.50	2.50
Oyster shell	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
**premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated analysis					
Crude protein%	20.00	20.04	20.00	20.00	20.00
Crude fiber%	4.60	4.50	4.50	4.40	4.10
Ether extract%	4.10	4.20	4.50	4.60	4.80
Calcium%	1.40	1.40	1.30	1.30	1.30
Phosphorus%	0.80	0.70	0.70	0.70	0.60
ME (Kcal/kg)	2807.21	2878.68	2860.60	2888.60	2903.20

**Premix 2.5kg contains. Vit A, 15,000000iu, Vit D3, 300000iu, Vit E 30000iu, Vit K 2500iu, Thiamine B, 2000mgr, Riboflavin (B2) mgr, Pyridoxine (B6) 4000mgr, Niacine 40000mgr, Vit B12, 20mgr, Pantothemic acid 10000mgr, Folic acid, 1000mgr, Biotin, 80mgr, Choline chloride, 500mgr, Anti-oxidant, 125gr, Manganese, 96gr, Zinc, 60gr, Iron, 24gr, Copper, 6gr.

Table 3: Performance of broiler fed graded level of decorticated and fermented prosopis seed meal (DFPSM)

	%Level of inclusion					
Parameter	0	25	50	75	100	SEM
Initial lives weight , g/bird	79.20	79.3	81.7	77.9	80.8	0.66^{NS}
Final live weight g/ bird	2850^{a}	2800^{ab}	2550^{c}	2570^{bc}	2500^{c}	71.18*
Average feed intake (g/day)	119.6	123.6	123.9	123.7	122.2	0.81^{NS}
Average growth rate (g/day)	49.50^{a}	48.6^{a}	44.1^{b}	44.5^{b}	43.2^{b}	1.28*
Feed conversion ratio	2.42	2.54	2.81	2.78	2.83	0.18*
Dressing percentage	74.16	76.31	70.84	72.95	74.10	1.99^{NS}
Mortality number	1/48	2/48	3/48	2/48	2/48	-

^{abc}:Means in the same row followed different superscripts are significantly different ($P < 0.05$). SEM = standard error of means. NS = Not significant.

Table 4: Cost of feeding decorticated Prosopis seed meal (DFPSM)

Parameter	0	25	50	75	100
Total feed intake, kg	6.64	6.86	6.98	6.87	6.85
Total feed cost (N/kg)	347.9	356.7	350.9	346.7	342.9
Feed cost	52.24	51.86	50.71	50.10	49.52
Feed cost/kg weight gain N	197.1	202.1	198.1	193.1	192.1
Total weight gain	1.76	1.76	1.77	1.79	1.78

N = Nigeria's unit of currency; $1.00 = N140.00. Table 4. Outline the economics of using processed Prosopis seed meal to replace soybean meal at varied levels.

could be due to presence of the two protein sources leading to availability of balance amino acid profile and improve palatability for the birds. This was in line with the finding of Annongu and Ter Meulen (2001) on pullet fed processed and raw Prosopis seeds. The non significant difference ($p > 0.05$) in the performance of broiler fed control diet and 25% level of inclusion of DFPSM diet suggest that the replacement level is too low to cause major significant difference in growth and performance of the broilers but become significant ($p < 0.05$) from 50% inclusion and above. This similar trend was reported by Amaefule and Iroanya (2004). Also the poor growth rate recorded on 100% soybean replacement with DFPSM might be due to imbalance in amino acid profile particularly the low level of methionine associated with Prosopis seeds which play a major role in growth. However, the advantage of using any diet has to be determined by the price of the ingredients. For broilers fed the control diet, feed cost per day was not significantly different ($p > 0.05$) from that of broiler fed 25% DFPSM inclusion but higher than 100% soybean replacement with DFPSM diet, making economics of using Prosopis seed meal particularly considering the feed cost and feed cost/weight gain in favours of complete replacement of soybean with DFPSM.

Conclusion: This study have shown that the inclusion of DFPSM in a broiler diet does not add positively on performance but have economic advantage.

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