SHORT COMMUNICATION

RESPONSE OF FINISHING BROILERS TO GRADED LEVELS OF HEAT TREATED SOLVENT EXTRACTED THEVETIA OIL

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ABSTRACT

The experiment reported herein considered the effect of using solvent extracted thevetia oil which was subjected to heat treatment at 110°C for 25 minutes. Four experimental diets consisting of a basal diet and three other diets in which 2.5, 5.0 and 10% of the control diet was replaced by the thevetia oil were formulated and fed to broilers during the finishing stage (4 - 8 weeks). Eighty broilers were individually weighed and randomly divided into four groups of 20 birds each and these were further divided into 4 replicates of 5 birds each. The four groups were then randomly allocated to the four dietary treatments. Feed Intake and Feed: Gain improved with increase in thevetia oil concentration ($P < 0.05$). However, there was no significant effect of the dietary treatment on weight gain. Increasing the concentration of thevetia oil improved the retention of both protein and fat ($P < 0.05$). It was concluded that solvent extracted thevetia oil will serve as a valuable feed ingredient for finishing broiler if a mild heat treatment is employed since some of the toxic compounds in it are probably thermolabile.

Key Words: Thevetia oil, heat processed, broiler performance

INTRODUCTION

Fats are without doubt energy booster in monogastric diet. Miller (1979) observed that there is only one method of formulating broiler diets in hot weather if maximum growth is to be obtained and this is by increasing the energy level and all other nutrients. This is normally done with use of added fat. Fuller (1981) stated that it was possible to alleviate to a great extent the growth depressing effect of

heat stress by the use of high level of dietary fat in poultry rations. Other advantages of using fat is the fact that they improve the general appearance and palatability of feed. (Dale and Fuller, 1978; Moran, 1982). Fats are also sources of essential fatty acids and are important in the metabolism of fat soluble vitamins.

Fats and oils available in Nigeria are palm oil, groundnut oil together with melon seed oil and coconut oil in rather small quantities. (Babatunde *et al.*, 1976). Atteh *et al.*, (1990) observed that recent competition between man and livestock for vegetable oils has resulted in little being available for livestock feeding, hence the need for an alternative source of oil that is not only cheaper but also not consumed by man. One such novel source is thevetia oil. Thevetia oil is obtained from *Thevetia peruviana* (Yor: Kanminko) which is a common ornamental plant which flowers and fruits all year round in Nigeria.

There is little or no information on the nutritive value of thevetia oil for livestock. However, the little information available on *Thevetia* seeds have indicated that the seeds contain glycosides which are poisonous to livestock and human (Lang *et al.*, 1963; Paul 1963). The work of Atteh *et al.*, (1990) showed that thevetia oil has an impressive unsaturated fatty acid profile, feeding trial however gave a performance far below expectation an indication that the mechanically, extracted thevetia oil may still contain some glycosides. Atteh and Adeyemi (unpublished) determined the ME value of solvent extracted thevetia oil to be 7846 kcal/kg. The workers are of the opinion that solvent extraction may reduce this problem, since thevetin a major glycoside of *Thevetia peruviana* seed (Datta and Gopa 1981) is

TABLE 1: COMPOSITION OF EXPERIMENTAL DIETS (%)

	DIETS			
	1	2	3	4
Control*	100.00	97.50	95.00	90.00
Thevetia oil		2.50	5.00	10.00
Analysed nutrient content:				
Dry matter	93.65	91.90	92.50	89.14
Crude protein	19.69	19.03	18.65	18.59
Crude fat	5.05	6.88	8.40	11.26
Crude fibre	5.92	5.11	4.99	4.32
Metabolisable Energy ¹	2958	3080.20	3202.4	3446.8

* Composed of 50.00% Maize, 30.00% soybean meal, 6.68% Brewers dried grain, 10.00% Maize bran, 1.84% Bone meal, 0.88% Oyster shell, 0.25% Salt, 0.10 DL-Methionine and 0.25% Vitamin - mineral premix (supplying the following per 1 tonne of feed 8000 iu vitamin A, 1200 iu vitamin D₃, 13 iu vitamin E, 2mg vitamin K₃, 3mg riboflavin, 10mg nicotinic acid, 7.0mg pantothenic acid, 900mg choline, 0.08mg cobalamin, 1.5mg folic acid, 0.25mg biotin, 125mg antioxidant, 25mg Fe, 80mg Mn, 50mg Zn, 2.0mg Cu, 0.2mg Co and 0.1mg Se.

¹ Calculated value

TABLE 2: INFLUENCE OF INCREASING DIETARY CONCENTRATION OF THEVETIA OIL ON THE PERFORMANCE OF FINISHING BROILERS OVER A 4 - WEEK PERIOD

		CONCENTRATION OF THEVETIA OIL			
	0	2.5	5.0	10.0	SEM
Criteria					
Av. Initial weight (g)	545.2	538.93	541.6	537.0	8.35
Av. Final weight (g)	1447.36 ^b	1518.02 ^{ab}	1537.00 ^{ab}	1603.80 ^a	50.24*
Av. Feed Intake	79.21 ^a	74.45 ^{ab}	74.44 ^{ab}	66.78 ^b	3.36
(g/bird/day)					
Weight gain	32.22	34.99	35.55	38.10	2.38
(g/bird/day)					
Feed:Gain	2.50 ^a	2.13 ^{ab}	2.10 ^{ab}	1.78 ^{ab}	0.06*

* Figure followed by different superscripts in the same row differ significantly. ($P < 0.05$).

known to be insoluble in ether (Windholz, 1983). The current study aims at studying the effect of heated solvent extracted thevetia oil on finishing broilers.

MATERIALS AND METHODS

Cracked thevetia seeds were subjected to solvent extraction (petroleum ether 60 -80°C bp). The extracted oil and ether was

separated by distillation while remaining traces of petroleum ether was removed by use of a rotary vaporiser. Before feed mixing, the oil was heated at a temperature of 110°C for 25 minutes in an oven. Eighty broiler chicks of a commercial strain, aged four weeks which had been reared on conventional starter mash were used to determine the effect of graded level of thevetia oil on finishing broiler birds. The

TABLE 3: EFFECT OF INCREASING CONCENTRATION OF THEVETIA OIL IN THE DIET ON PROTEIN AND FAT RETENTION BY FINISHING BROILERS.

Thevetia oil in diet (%)	Nutrient retention (%)	
	Protein	Fat
0	59.87 ^{ab}	63.40 ^b
2.5	53.94 ^b	70.47 ^{ab}
5.0	53.79 ^b	75.26 ^a
10.0	61.72 ^a	76.18 ^a
SEM	2.89	3.52

*Figures followed by different superscripts in the same column indicates significant difference ($P < 0.05$).

birds were individually weighed and randomly divided into four groups of 20 birds each and these were further divided into 4 replicates of 5 birds each. Replicate group were similar in weight and each replicate was housed in battery cages. The experimental diets consisted of a control diet (Table 1) and Thevetia oil based diets in which 0, 2.5, 5.0 and 10.0% respectively of the control diet was replaced by the heat treated thevetia oil. Both feed and water were supplied *ad libitum* during a four week feeding period. Birds and feed intake were weighed weekly.

A nutrient retention trial was carried out when the birds were 6 weeks old. Weighed quantity of feed were given while faecal droppings were collected over a 72 hour period using the total collection procedure as described by Cullison (1982). Collected excreta were oven dried at 60°C, weighed and ground before chemical analysis. All tests and excreta samples were subjected to proximate analysis in accordance with methods of AOAC (1984). Data collected from experiment were subjected to analysis of variance using a complete randomised design according to the procedure of Steel and Torrie (1980). Means of response variables having a significant F-test were further subjected to Duncan's multiple range test (Duncan, 1955).

RESULTS

Broiler Performance

The response of finishing broilers to dietary inclusion of thevetia oil is given in Table 2. Average daily feed intake, average weight gain and Feed:Gain ratio were significantly affected by dietary treatments. ($P < 0.05$). As the concentration of thevetia oil increased in the diet, feed intake decreased while the average weight gain increased. Thevetia oil based diets also gave a better efficiency measured in terms of Feed:Gain ratio. No mortality was recorded during the 32 days finishing period.

Nutrient Retention

A trend towards increased retention of nutrient ($P < 0.05$) with increasing thevetia oil content of diet was observed for protein and fat (Table 3).

DISCUSSION

The data generated from this study have shown that thevetia oil can be incorporated into the diets of finishing broilers. Earlier work of Atteh *et al.*, (1990) showed that thevetia oil had an impressive fatty acid profile which is higher than the figures for palm oil given by NRC (1984) thus giving the expectation that thevetia oil will support a good productive performance. The result of feeding trials of Atteh *et al.*, (1990), however was contrary to this expectation. The workers were of the opinion that mechanically extracted thevetia oil still probably contain some glycosides hence the depressed efficiency. Datta and Gopa (1991) isolated the cardiac glycoside thevetin from *Thevetia peruviana* which Windholz (1983) reported to be water soluble, hence it is thought that solvent extraction may provide a less toxic oil. Preliminary work on solvent extracted thevetia oil for starting broilers by Atteh and Adeyemi (Unpublished) gave a performance which was better than that reported by Atteh *et al.*, (1990) using mechanically extracted oil. However in the current study finisher broilers on thevetia oil based diets gave a performance that is in agreement with the report of Corino *et al.*, (1980) showing a positive relationship

between the degree of unsaturation of fatty acid and feed efficiency in broilers.

Velu and Baker (1974), showed that as dietary fat increases, there will be a decrease in feed intake, a finding to which the result of this experiment is in consonance with. It was however contrary to the report of Akinwande (1981) who reported that increasing dietary fat level significantly increased feed intake of broiler chicks resulting in higher incidences of fatty liver. The increase in average daily weight gain with increasing dietary level of thevetia oil is in agreement with earlier works of Rand *et al.*, (1958) and Griffiths *et al.*, (1977) who observed that increasing the level of fat even at constant energy levels led to increase in weight gain. Growth rate of broilers and feed efficiency were almost a direct function of the dietary fat level as shown by Waldroup *et al.*, (1976). The reason for this may not be far fetched since it has now been recognised that fats slow down the rate of food passage in the digestive tract and thus allowing enzymes to do a thorough job on digestion of carbohydrates and proteins in the diet. (Moran, 1982).

The retention of nutrients showed an increasing trend with increase in the concentration of thevetia oil in the diet, this observation is contrary to that of Atteh *et al.*, (1990) using mechanically extracted thevetia oil in broiler finisher diets. The improvement in protein retention with additional thevetia oil input is an indication that dietary fat supplementation improves retention. Rand *et al.*, (1958) reported that increasing dietary fat level resulted in an improvement in protein utilisation. Vermaersch and Vanschoubroek (1968) postulated that fat does exert a protein anabolic action while Kussaibatti *et al.*, (1983) reported higher apparent digestibility of protein when diets are rich in unsaturated lipids. The results of this study gave an indication that some of the glycosides that are present in thevetia oil are probably heat labile hence the improved performance observed here when compared to the work of Atteh *et al.*, (1990) using mechanically extracted oil and Atteh and Adeyemi (Unpublished) using

solvent extracted oil.

It is concluded that solvent extracted thevetia oil will serve as a valuable feed ingredient for finishing broilers if a mild heat treatment is employed, since some of the toxic compounds in it are probably thermolabile.

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