EFFECT OF DIETARY INCLUSIONS OF PALM OIL AND SHEABUTTER FAT ON GROWTH AND SEXUAL MATURITY OF PULLETS

A.A ODUNSI and A.J. GBADAMOSI

Department of Animal Production and Health,
Ladoke Akintola University of Technology,
Ogbomoso, Nigeria.

Received 05 July 1999; Accepted 27 October 1999

ABSTRACT

A lesser known vegetable fat, sheabutter fat (SBF) was compared with palm oil (PO) as a dietary ingredient during the rearing phase of pullets. Black Harco grower-pullets (12 weeks old) were assigned to diets in which PO and SBF each quantitatively replaces maize at 2.5 and 5.0% and a fifth diet containing 2.5% each of both PO and SBF. At the 20th week, they were fed a common layer diet until sexual maturity was attained on all treatments. Results at the growing phase did not reveal any significant effects ($P>0.05$) on feed intake, weight gain, feed/gain and feed cost/weight gain. Sexual maturity was attained by 148, 149, 151, 155 and 158 days for pullets fed 5% Palm Oil, 2.5% SBF, 2.5% PO, 5% SBF and 2.5% SBF/PO diets respectively. PO and SBF at the levels studied were equally tolerated and could replace maize with no adverse effects on growth response. However, a delay in time of lay occurred when both oils were mixed in the diet.

Keywords: Palm oil, Sheabutter fat, maize, poultry, physiology, growth.

INTRODUCTION

Oils and fats of vegetable or animal origins have been employed in animal diets being a more energetically convertible ingredient with a lower heat increment (Freeman, 1983); to improve dietary utilization of nutrients (Maiorino *et al.*, 1986) and as a supplement to improve utilization of a high fibre diet (Longe and Adekoya, 1988). Additionally, they have been found to enhance growth and feed conversion efficiency, improve physical appearance of feed thus encouraging

consumption and as extra sources of essential fatty acids and vitamins. They have been used to alleviate the growth depressing effects of heat stress by incorporating in poultry diets (Fuller, 1981). Whitehead (1981) further reported a marked improvement in hen day production and egg weight when different sources of oil were included in layer diets.

In most of those studies and others (Panga *et al.*, 1995, Fajimi *et al.*, 1983), palm oil has been the oil of choice, particularly in poultry diets. However, competing demands by other sectors of the economy is making it unattractive for use in livestock feed formulations hence alternatives should be sought.

Sheabutter fat – a product from sheabutter nuts (*Butyrospermum paradoxum*) is relatively cheap and so far has not been exploited in practical animal diets. This trial was therefore embarked upon to: (i) compare sheabutter fat and palm oil as a replacement for maize, and (ii) determine the effect on pullet growth performance, feed consumption and sexual maturity.

MATERIALS AND METHODS

Sheabutter fat (SBF) and Palm oil (PO) were purchased from a vegetable oil dealer at Ilorin, Kwara State of Nigeria. The SBF was melted over an open fire before incorporation. Five diets (Table 1) were composed such that diets 1 and 2 contained PO at 2.5 and 5.0% respectively while diets 3 and 4 had SBF at 2.5 and 5.0% respectively. Diet 5 contained 2.5% each of both PO and SBF. Both oils were quantitatively used to replace maize in the diets. A common layer diet (Table 1) without

TABLE 1: COMPOSITION OF EXPERIMENTAL DIETS (%)

Ingredients	Grower diets			Layer diets		
	1	2	3	4	5	6
Maize	40.50	38.0	40.50	38.00	38.00	50.30
Palm oil	2.50	5.0	-	-	2.50	-
Sheabutter fat	-	-	2.50	5.00	2.50	-
Groundnut cake	15.30	16.00	15.30	16.00	16.00	20.00
Fish meal	-	-	-	-	-	3.00
Rice bran	8.00	7.30	8.00	7.30	7.30	-
Palm Kernel cake	20.00	20.00	20.00	20.00	20.00	14.00
Corn bran	10.00	10.00	10.00	10.00	10.00	-
Bone meal	2.50	2.50	2.50	2.50	2.50	3.00
Oyster shell	0.50	0.50	0.50	0.50	0.50	9.00
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Calculated						
Crude protein (%)	15.13	15.13	15.13	15.13	15.13	17.08
Ether extract	3.80	4.21	3.78	4.20	4.19	2.54
ME (Kcal/kg)	2.70	2.76	2.70	2.76	2.75	2.61
Feed cost (N/kg)	20.48	20.67	20.18	20.08	20.38	26.60

*Agricare premix, Pfizer Products Plc. Ikeja, Lagos contains the following vitamins A, D₃, E, B₁₂ and riboflavin, pantothenic, nicotinic and folic acids, choline chloride and Se, P, Ca, Io, Cu, Mn, Zn, Fe, Teramycin, antioxidant and anticaking agent.

oil inclusion was fed to the birds from the 20th week until maturity was reached.

One hundred Black Harco grower-pullets (12 weeks old) which had been raised on a proprietary diet were randomly allotted to the 5 dietary treatments at twenty birds each. Each treatment had 4 replicate groups of five birds. At the 19th week, the pullets were transferred to the battery cage unit. Diets and water were supplied *ad libitum*. The birds were weighed on replicate basis at the beginning of the trial and then at two weeks interval while feed intake was measured weekly. Sexual maturity (age at first egg) and weight of such eggs were noted. Weekly egg production and egg weight records were kept until sexual maturity was reached in all dietary treatments.

Results were evaluated using the analysis of variance (ANOVA) procedures (Steel and Torrie, 1980). Differences among means detected by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Dietary utilization of PO and SBF by pullets during the growing phase did not reveal any significant effects ($P>0.05$) on feed intake, weight gain, feed/gain and feed cost/weight gain (Table 2). However, the slight reduction in feed consumption by pullets fed the oils at 5% could be related to increase in energy density due to oil inclusion (Odunsi and Onifade, 1998; Adeyemi, 1998; Panja *et al.*, 1995). This effect is irrespective of whether the oil fed was palm oil or sheabutter fat.

PALM OIL VS SHEABUTTER IN GROWER-PULLET DIETS

Inclusion of oils at 5% also resulted in a slightly better feed/gain than for pullets on 2.5% thus supporting the views of Adeyemi (1998) and Freeman (1983) that oils generally improved feed conversion ratio. Surprisingly, the diet containing both oils resulted in higher feed intake, feed/gain and feed cost/weight gain but lower weight gain when compared to the other diets.

Pullet age on attaining sexual maturity is of interest. Table 3 shows that Birds fed on the diet containing 5% PO reached maturity earlier (148 days) than others, with a delay of 7 days for 5% SBF fed birds and 10 days for the diet

containing both oils. Weight of first egg was heavier with delay in maturity irrespective of type of oil fed (Carlson and Nelson, 1981; Wells, 1980) except diet 5.

The type of diet fed during the rearing phase not only influences the time at which maturity is attained but also bird performance during lay (Lee, 1987). Daily weight gain during the growing phase had a noticeable trend with early egg yield, egg weight and attainment of sexual maturity (Table 3). Pullets with the highest gain became matured faster irrespective of whether PO or SBF was

TABLE 2: EFFECT OF TWO LEVELS OF PALM OIL AND SHEABUTTER FAT ON PERFORMANCE OF GROWER PULLETS (12-20 WEEKS)

Characteristic	DIETS					SEM
	1	2	3	4	5	
Feed intake (g/day)	95.96	93.12	95.01	93.37	98.37	3.01
Initial weight (kg)	0.96	0.94	0.95	0.96	0.99	0.01
Final weight (kg)	1.47	1.48	1.45	1.46	1.43	0.02
Weight gain (g/day)	10.41	11.02	10.20	10.00	9.18	1.96
Feed/gain	9.22	8.45	9.32	9.15	10.72	0.94
Feed cost/kg gain (₦/kg)	40.10	39.37	40.55	41.20	46.56	2.75

fed. For instance, 5.0% PO fed birds had daily gain of 11.02g and matured by 148 days while 2.5% PO had 10.4g and attained maturity by 151 days. Conversely, those on 2.5% SBF and 5.0% SBF diets gained 10.2 and 10.0g daily but attained maturity by 149 and 155 days respectively. Those fed both oils had the least value of 9.2g and matured latest (158 days). This close trend between pullet weight gain and egg production bears some relevance to the report of Summers and Leeson (1994) that pullets may come into production early, often due to faster rate of growth. Furthermore, feed intake during the growing phase did not show any relationship with sexual maturity indicating that body weight actually determines sexual maturity (Wells, 1980). In this study, it appears that dietary factors apart from quantity ingested influenced maturity. Higher levels of PO promoted early attainment of sexual maturity while the reverse was the

case with SBF. An evaluation of oil compositional differences might therefore provide some information in this regard.

The growth response of pullets reveals that SBF is equally tolerated as PO even at 5%. Feed intake was not adversely influenced, preliminarily depicting absence of odour and toxic factors in SBF unlike that reported by Fajimi *et al.*, (1993) with rubber seed oil, and Adeyemi (1998) with thevetia oil.

Presently, sheabutter fat is not widely used as cooking oil and therefore, does not find its way into human diets as prominently as does PO. Hence its incorporation as a feed ingredient is novel. The findings in this trial indicated that it is well tolerated, comparable to PO and is effective in replacing maize at the levels studied. It can therefore be used as an energy booster in low caloric density diets.

TABLE 3: SEXUAL MATURITY AND WEIGHT OF FIRST EGG, EGG YIELD AND EGG WEIGHT OF PULLETS DURING THE LAST THREE WEEKS OF THE EXPERIMENT

Measurement	DIETS				
	1	2	3	4	5
Age at first egg (d)	151	148	149	155	158
Weight of first egg (g)	48.2	45.5	47.3	50.4	46.2
Average egg weight (g)					
Week 22	43.2	48.3	47.8	-	-
23	49.6	52.2	53.0	49.3	48.7
24	52.0	51.5	57.2	49.6	52.2
Average egg yield (%)					
Week 22	7.1	8.6	8.6	-	-
23	28.6	25.7	17.1	15.7	2.9
24	42.9	48.6	31.4	28.6	17.1

ACKNOWLEDGEMENT

The authors are grateful to Babajide, T.F.; Nasiru, M.O. and Adigun, N. for assistance in the management of the birds.

REFERENCES

- ADEYEMI, O.A. (1998): Response of finishing broilers to graded levels of heat treated solvent extracted Thevetia oil. *Nig. J. Anim. Prod.* 25: 134-138.
- CARLSON, C.W. and NELSON, R.A. (1981): Grower diets and their effects upon subsequent performance of layer type pullets. *Poult. Sci.* 60:1272-1281.
- DUNCAN, D.B. (1995): Multiple range and F-test. *Biometrics* 11:1-42.
- FAJIMI, A.O. BABATUNDE, G.M. OGUNLANA, F.F. and OYEJIDE, A. (1993): Comparative utilization of rubber seed oil and palm oil by broilers in a humid tropical environment. *Anim. Feed Sci. Technol.* 43:177-188.
- FREEMAN, C.P. (1983): Fat supplementation in animal production – monogastric animals. *Proc. Nutrition Society.* 42: 351-354.
- FULLER, H.L. (1981): Formulating broiler feeds for hot weather use. *Poultry Digest*, June pp. 321-323.
- LEE, K. (1987): Effect of different methods and severity of growing feed restriction on growth and laying performance of white leghorn. *Poult. Sci.* 66: 694-699.
- LONGER, O.G. and ADEKOYA, O.E. (1988): Response of laying hens to different inclusion levels of palm kernel meal and vegetable oil. *Nig. J. Anim. Prod.* 15:111-117.
- MAIORINO, R.M., HIOZAB, A.A., MITCHELL, R. and REID, B.L. (1986): Animal fat effects on nutrient utilization. *Poult. Sci.* 65:2304-2313.
- ODUNSI, A.A. and ONIFADE, A.A. (1998): Effect of Zinc Bacitracin supplementation of broiler chick diets containing a low or high vegetable oil concentration in the tropics. *Trop. Vet.* 16:51-57.
- PANJA, P. KASSIM, A. and JALALUDIN, S. (1995): Effects of palm oil and soybean oil as fat sources in isonitrogenous and isocaloric diets on the performance of broilers. *Asian – Australian Journal of Anim. Sc.* 8:223-229.
- STEEL, R.G.D. and TORRIE, J.H. (1980): Principles and procedures of statistics. A biometrical approach. 2nd edn. McGraw-Hill Book Co., New York, U.S.A.
- SUMMERS, J. D. and LEESON, S. (1994): Laying hen performance as influenced by

PALM OIL VS SHEABUTTER IN GROWER-PULLET DIETS

- dietary protein intake to sixteen weeks of age and body weight at point of lay. Poultry Sci. 73: 495-501.
- WELLS, R.C. (1980): Pullets feeding during rearing in relation to the subsequent laying performance. In: Recent advances in Animal Nutrition (Hereign, ed). Butterworth, London pp. 176-186.
- WHITEHEAD, C.C. (1981): The response of egg weight to the inclusion of different amounts of vegetable oil and linoleic acid in the diet of laying hens. Poultry. Sci. 22:525-532.