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PERFORMANCE OF FINISHER BROILERS AND COST IMPLICATION OF FEEDING PALM OIL AS ENERGY SUPPLEMENT BY

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Abstract:

This feeding trial was conducted to investigate the effect of quantitative substitution of Maize with varying levels of palm oil in broiler finisher ration on the performance and economy of producing finisher broilers. Four broiler finisher rations were formulated by substituting maize with palm oil at 0, 2, 4 and 6% levels. One hundred and forty-four day-old broiler chicks of Anak strain raised on commercial Top feed for 4 weeks were randomly allotted to four treatment diets. Each treatment group of 36 birds was replicated 3 times with 12 birds per replicate in a completely randomized design (CRD). Feed and water were provided *ad libitum*. The trial lasted for thirty-five days. Body weight gain and nutrient utilization showed significant ($P < 0.05$) increase at 4% palm oil substitution level with reduced cost per kg weight gain compared to 0, 2 and 6% levels with high cost implication. The results of this trial showed that, inclusion of palm oil at 4% can replace maize in broiler finisher ration with optimal performance.

Key words: palm oil, performance, maize, Economy of production, finisher broilers

Introduction

Cereal grains (maize, sorghum, wheat) play major role as energy sources in poultry industry in Nigeria. However, inadequate production of these cereal grains and the keen competition between man and livestock over the available grains as major energy sources coupled with high cost of imported feed ingredients have resulted to increase in the price of commercial feed by about 200% within the last decade (Esonu, 1995). As a result, most Nigerian poultry farmers have abandoned production; others have scaled down operation in order to cope with rising cost of production. This has adversely affected productivity of livestock with consequent low animal protein supply and intake. If the future of poultry industry will be adequately protected, then cheap and easily available alternative feed resources need to be sought for, where less quantity of maize (grains) will be will be used for poultry feed formulation. Palm oil is one source of energy with high caloric value, which could be incorporated at a level that will enhance the performance of the birds at least cost. Palm oil has been shown to be oil of choice particularly in poultry diet (Freeman, 1983), Panja *et al.,* 1995; Adeyemi, 1998). Utilization of oil and fats of vegetable or animal origin in poultry diet has been shown to enhance growth, feed conversion ratio, increase appetite and also alleviate the growth depression effect of heat stress (Fuller 1981). However excessive inclusion of palm oil in poultry diet may cause depression in growth, excess body fat accumulation, obesity in birds, reproductive failures and high mortality (Moran, 1986). This study was therefore undertaken to investigate the best inclusion level of palm oil in broiler diet that can replace maize and bring about an enhanced performance at least cost.

Materials and Method

Management of the Experimental birds:

Table 1: Proximate composition of palm oil and maize (% Dry matter)

	Palm oil	Maize
Moisture content	0.01	15.6
Dry matter	99.99	84.40
Crude protein	-	10.0
Crude fibre	-	2.0
Ash	-	0.10
NFE	24.99	68.30
Energy (Kcal/gm)	7.0	3.45

Table 2: Proximate composition of the commercial feed used (% Dry matter)

Crude protein (P)	23.75
Ether Extract	10.35
Crude fibre (CF)	6.52
Ash	6.00
NFE	53.38
ME Kcal/kg	2.75

One hundred and forty-four (144) day-old Anak strain broiler chicks raised on Conventional commercial broiler starter mash (Table 2) for four weeks were used for the feeding trial. At 4 weeks of age the birds were weighed and randomly distributed into four groups. Thereafter, they were fed four finisher diets formulated to contain 0, 2, 4 and 6% palm oil (Table 3) respectively for 35 days. Each treatment group was replicated 3 times consisting of 12 birds per replicate. The birds were managed in deep litter pen measuring 3.05 x 5 m in a completely randomized design (CRD). Feed and water were provided *ad libitum*. The necessary routine vaccination and veterinary attention were provided..

Table 3. Composition of the experimental diet (Broiler finisher)

Ingredients	Dietary levels of Palm oil (%)			
	0.00	2.00	4.00	6.00
Yellow maize	54.90	52.90	50.90	48.90
Palm oil	0.00	2.00	4.00	6.00
Soybean	20.00	21.00	22.00	23.00
Brewers' dried grain	17.00	16.00	15.00	14.00
Blood meal	3.00	3.00	3.00	3.00
Bone meal	2.50	2.50	2.50	2.50
Oyster shell	2.00	2.00	2.00	2.00
Common salt	0.25	0.25	0.25	0.25
*Vit/mineral premix	0.25	0.25	0.25	0.25
Methionine	0.0	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Proximate Composition (% DM)				
Crude protein	20.99	20.80	20.71	20.55
Ether extract	8.95	10.25	12.95	15.25
Crude fibre	6.80	6.60	6.20	6.10
Ash	5.25	5.25	5.84	5.65
NFE	58.01	56.60	53.30	52.45
ME Kcal/kg	2.70	2.90	3.05	3.17
Caloric: protein ratio	0.12	0.13	0.14	0.15

* Premix contained per kg ration; Vit. A. 10,000 iu; Vit. D, 15000 iu; Vit. E 3 iu; Vit K, 2 mg; Riboflavin, 3 mg, pantothenic acid, 6 mg; niacin, 5 mg; vit. B_{12}, 0.08 mg; folic acid, 4 mg; Mn, 8 mg; Zn, 0.5 mg; iodine, 0.1 mg; Cu, 10 mg; Fe, 20 mg.

Table 4: Effect of dietary palm oil on the performance of finisher broilers

Parameters	Dietary levels of Palm oil (%)				SEM
	0.00	2.00	4.00	6.00	
Initial weight (g)	785.70	778.15	765.25	786.00	40.8^{ns}
Final body weight (g)	1760.00^{b}	1800.00^{b}	2150.00^{a}	1150.00^{c}	109.88^{*}
Daily weight gain (g)	34.79^{b}	36.49^{b}	46.28^{a}	23.21^{c}	2.49*
Daily feed intake (g)	91.75^{a}	97.89^{a}	91.42^{a}	79.50^{b}	2.21*
Feed conversion ratio (FCR)	2.63^{a}	2.68^{b}	1.97^{c}	3.42^{a}	0.16*
Mortality (%)	0.00	0.00	0.00	0.00	-

Means within rows with different superscripts are significantly different (P < 0.05) *Significant. ns = non significant.

Data Collection and Analyses: Records of body weight, feed intake and conformation traits were kept while weight gain, feed conversion ratio and cost benefit analysis were calculated.

Digestibility study was carried out at the 5th week of the experiment corresponding to 9th week of age. Two birds from each replicate were randomly selected and transferred to the metabolic cage for four days adaptation period followed by three days of total collection of droppings. Bulk and representative faecal samples were weighed and oven-dried at the temperature of 60°C for 24 hours. Proximate composition of the droppings and diets were determined, according to the standard method (AOAC., 1980). An economic appraisal of the work was done. All data collected were subjected to analysis of variance (Steel and Torrie, 1980) while significant means were separated using Duncan's Multiple Range Test as outlined by Obi (1990). The cost of producing a kilogram of each diet was determined based on the prevailing market price of the feed ingredients at the period of the study.

Results and Discussion

Evaluation of the four dietary treatments based on the growth performance of the birds showed that 4% palm oil inclusion produced the best response in body weight gain, and feed conversion ratio (FCR) (Table 4) compared to those on 0, 2 and 6% levels. The response of the broiler birds to the control diet (0%) and 2$ palm oil were similar (P>0.05) but superior to 6% inclusion. This suggests that dietary palm oil inclusion at 4% improved body weight of broilers. This agrees with the findings of Nizametin (1990) who reported that dietary oil supplementation significantly (P > 0.05) increased body weight of commercial broilers. This also agrees with Whitehead (1990) who found that dietary fat inclusion improved efficiency of feed utilization in poultry and attributed such improvement to high energy concentration of fat, while Church and Pond (1980) and Fuller (1981) attributed it to improved palatability and low heat increment.

Similarly the 4% could be a level where the calorie:protein ratio (0.14) is balanced and this enhanced the performance of the birds. This is in agreement with Bartov *et al.*, (1974) who recommended 0.14 calorie:protein levels with 20% crude protein for finishing broilers.

Generally, depression in almost all the growth parameters considered in this trial by 6% palm oil inclusion, namely body weight, feed intake, feed conversion ratio as well as the high feed cost per unit weight gain and the poor gross margin from weight gain, could be traceable to high dietary fat inclusion.

Table 5. Effect o Dietary Palm oil on the Conformation traits of Finisher Broilers

Parameters	Dietary levels of palm oil (%)				SEM
	0.00	2.00	4.00	6.00	
Breast width (BW)	14.20	13.37	14.42	13.45	0.13^{ns}
Thigh circumference (TC)	9.97	9.66	10.04	9.79	0.12^{ns}
Keel length (KL)	13.31	13.27	13.72	13.03	0.13^{ns}
Body length (BL)	30.69	30.36	30.48	30.01	0.25^{ns}
Shank length (SL)	7.25	7.15	7.18	6.94	0.07^{ns}
Wing length (WL)	19.44	18.31	17.16	17.65	0.16

Means within rows with the same superscripts are not significantly different (P > 0.05). ns = not significant

Table 6. Effect of dietary palm oil on nutrient metabolizability of finisher broilers

Parameters	Dietary levels of palm oil (%)				SEM
	0.00	2.00	4.00	6.00	
Dry matter met	68.93^{b}	69.43^{b}	72.24^{a}	63.96^{a}	0.96*
Crude protein met	76.90^{a}	74.6^{a}	75.60^{a}	$70.20.20^{b}$	0.96*
Crude fibre met	83.80	82.55	83.32	80.89	0.40^{ns}
Ether extract met	79.94^{a}	72.93^{c}	80.47^{a}	79.09^{c}	0.96*
NFE met	63.05^{a}	62.28^{a}	64.36^{a}	51.90^{b}	1.57*
Dry matter intake (g)	86.97^{a}	99.74^{a}	86.67^{a}	75.17^{b}	2.11*
Daily gross energy intake (KCal/g)	4.26^{a}	4.31^{c}	4.44^{b}	4.56^{a}	0.04*
Daily metabolizable energy intake (Kcal/g)	3.05^{b}	2.98^{b}	3.74^{a}	2.97^{b}	0.04*

Means within rows with different superscripts are significantly different (P < 0.05).
* Significant, ns= not significant.

The high dietary fat increased the energy concentration in the diet and this must have produced a premature glucostatic signal leading to false satiety; thereby resulting to low intake with subsequent reduction in nutrient intake and utilization (Moran, 1986). Similarly, high ambient temperature in our tropical environment could contribute to the observed depression in intake and consequently in the growth parameters. According to Jensen *et al.* (1970), increasing dietary fat in poultry diet with constant protein level,

may lead to calorie:protein imbalance. This probably also explains the significant (P < 0.05) depression in all the growth parameters considered in this trial. This confirms the work of Scott *et al.* (1955) who showed that feeding broilers with high dietary oil resulted to progressive decline in growth

performance of the birds. Crude fibre intake (Table 6) was not significantly (P>0.05) influenced among treatment groups. Dry matter, crude protein, Nitrogen free extract (NFE) and metabolizable energy intake were lowest (P<0.05) at 6% inclusion level.

This trend could be attributed to the same reason noted above, which is high level of fat supplementation, with increasing caloric contribution of palm oil which depressed feed intake, nutrient intake and utilization. Metabolizable energy (ME) and dry matter intake were optimal at 4% inclusion. Also as noted earlier, this could perhaps be a level where the calorie:protein ratio is balanced which enhanced feed intake, nutrient intake, ME intake and proper feed utilization which led to increased weight gain.

The conformation parameters considered were not significantly (P > 0.05) influence. This agrees with the findings of Bartov and Bornestein (1977) who reported that increase in dietary oil without altering the calorie:protein ratio had no effect on growth performance of finishers broilers, especially on such parameters like keel length and wing length.

On economic consideration the prevailing market price of maize and palm oil at the period of this study were as follows: maize N18/kg and palm oil N10/kg.

The cost of producing a kilogram of each diet (Table 7) was highest at the control (0%) and lowest at 6% of palm oil. The high level of producing the control diet could be attributed to high cost of maize at the period of the study, while the production cost of the other three diets with (2, 4 and 6%) palm oil levels decreases with increasing levels of palm oil. Cost of feed consumed to make a unit weight gain (Table 7) was highest (P > 0.05) at the control and 6% palm oil levels and lowest at 4% palm oil level. The high cost of feed per unit weight gain of chicks fed 6% palm oil diet was due to poor utilization of the diet as shown in the FCR (Table 4).

Similarly, the efficiency of utilization of diets with 0 and 2% palm oil as manifested in the FCR followed the same trend as the cost of producing the feed consumed. This shows the high cost of a unit of body weight gain among the control group was not due to low efficiency of feed utilization but as a result of high cost of production. Results of the gross margin showed 6% palm oil diet to have lowest value (N26.92) while 4% treatment grups had highest gross margin

Table 7. Cost implication of dietary palm oil in production of broilers.

Parameters	Dietary levels of palm oil (%)				SEM
	0.00	2.00	4.00	6.00	
Actual feed cost (₦/kg)	25.01	22.47	20.40	18.99	-
Relative cost of feed (%)	100.00	88.56	78.83	74.85	-
Feed cost/kg weight gain (₦)	65.77^{a}	60.21^{b}	40.18^{c}	64.01^{a}	2.98*
Gross margin from weight gain (₦)	39.74^{b}	43.71^{b}	64.70^{a}	26.92^{d}	4.18*

Means within rows with different superscripts are significantly different (P < 0.05), *Significant.

Conclusion: The results of this trial showed that palm oil could be incorporated in broiler finisher diet at 4% replacing maize with improved performance at a reduced cost. This shows the high cost of a unit of body weight gain among the control group was not due to low efficiency of feed ˙˙ization but as a result of high cost of production. Results of the gross margin showed 6% palm oil diet to have the lowest value (N26.92) while 4% treatment groups had highest gross margin.

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