NIGER AGRIC. J. 34 (2003): 138-142

BIOLOGIC AND ECONOMIC EFFECTS OF INCLUDING DIFFERENT AGRO-INDUSTRIAL BY-PRODUCTS IN TURKEY POULT DIETS

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ABSTRACT

The biologic and economic effects of including three agro-industrial by-products as ingredients in turkey poult diets were investigated using 48 turkey poults in a completely randomised design experiment. Diets were formulated to contain the three by-products – wheat offal, rice husk and palm kernel meal, each at 20% level of inclusion and designated Treatment 2, 3 and 4, respectively. These were compared with a control diet (Treatment 1) that did not contain any of these by-products. Treatment 4 encouraged better performance ($P<0.05$) of the birds in terms of their final body weight (3175g), growth rate (42.83g/d), and feed conversion ratio (1.03) than the other two experimental and control diets. Performance of birds on Treatment 3 was statistically the same ($P>0.05$) as for birds on control treatment in all the three biologic parameters investigated. These results were better than performance of birds on Treatment 2. The economic parameters (cost per kg feed, cost per kg weight gain and gross margin) followed similar pattern as the growth parameters above. The poults on Treatment 2 had higher ($P<0.05$) cost (₦) per kg weight gain than poults on diets 1 and 3 whose values were similar but significantly ($P<0.05$) higher than that of birds on Treatment 4 which encouraged the best biological performance and the least cost per kg weight gain.

INTRODUCTION

Recent difficulties associated with the procurement of inputs for poultry production in Nigeria and the high cost of feed ingredients in particular have brought about the need to look inwards for alternatives to the conventional feed resources. It has thus become necessary to explore other feed materials that are locally available and relatively cheaper than the conventional ones (Mustapha *et al.*, 1990). The limited supply of raw materials for the poultry feed industry has resulted in a continuous increase in the cost of production, causing a phenomenal rise in the unit cost of products. Thus these products have become too expensive for the majority of the population (Hahn, 1988). For example, the increase in the cost of maize in Nigeria has been related to its scarcity as a result of the competing demand for the crop.

However, the use of grains as source of poultry feed when human needs have not been met introduces questions of economic and moral justification. Hence, it seems a prerequisite for a profitable poultry enterprise to have a local surplus production of grains, groundnut cake and other feed items. To depend on alternative sources of ingredients, especially when it encourages a shift to ingredients for which there is less competition, may help if the latter is sufficiently available (Oluyemi *et al.*, 1979).

Studies in the utilization of agro-industrial by-products in animal feeds has increased in the past two decades because of the clear necessity to conserve grains for human feeding especially in the less developed countries. There is also an increasing knowledge of the composition and potential nutritive values of a majority of industrial by-products and agricultural wastes.

The rational use of these nutritive diets for poultry production can reduce the high price of feedstuffs. A wide array of industrial by-products and agricultural wastes exist, among which are wheat offal, rice husk, palm kernel meal, cowpea hull, maize offal and sorghum wastes. Therefore, a rational use of these diets that meet nutrient specifications for efficient egg and meat production could be expected to result in considerable reduction in the current high price of livestock feed. Furthermore, there is also a need to shift emphasis from chicken to other poultry species such as ducks, turkey, guinea fowl, etc. in order to explore their relative position and various contributions to the overall development of the poultry industry. Agro-industrial by-products contain some fibre. Chicken is known for its inability to digest fibre (Alawa and Umunna, 1993). Turkey being bigger poultry species therefore may be able to utilize better these fibre sources for meat production.

A statement on food consumed and product obtained should provide basic data in evaluating ration for farm animals (Maynard *et al.*, 1979; Ukachukwu and Anugwa, 1995). Feed conversion ratio (FCR) is an important performance index in animal production. Feed conversion ratio is the expression of the quantity of feed consumed to obtain a unit of product. Changes in feed cost parallel the changes in feed conversion ratio (Sonaiya *et al.*, 1986; Ukachukwu and Anugwa, 1995). Feeds and feeding constitute about 70 – 80% of production cost in poultry. The cost of feed consumed to obtain a unit of products should therefore form a basis for recommending feed to farmers (Ukachukwu and Anugwa, 1995).

In the present study, the economic and biological effects of feeding rations containing maize, wheat offal, rice husk and palm kernel meal to turkey poults from 4 – 14 weeks were investigated.

MATERIALS AND METHODS

Sixty (60) local turkey poults, bought from Owerri, Imo State, Nigeria were brooded for 4 weeks. During this period they were fed a proprietary commercial broiler mash (23%CP and 2800kcal ME/kg). Thereafter, 48 poults were selected and randomly allocated to 4 treatment diets at 12poults per treatment. Each treatment was replicated into two at 6 poults per replicate. The dietary treatment were as follows:

Maize – soyabean diet: the control diet designated as Diet1 and

Maize – soyabean type diets but with 20% of maize replaced by either wheat offal, rice husk or palm kernel meal and designated Diet2, Diet 3 or Diet 4 respectively (Table1).

Feed and water were supplied *ad libitum* on deep litter. Feed consumption was recorded daily while chicks were weighed weekly. Feed samples were assayed for proximate components by the method of A.O.A.C. (1990). Data obtained were subjected to analysis of variance (Snedecor and Cochran, 1980) and Duncan's multiple range test was applied to partition means, where necessary (Duncan, 1955). The cost per weight gained as a result of the diets was obtained by using: Cost/kg wt. gain (₦) = Unit (kg) cost of feed multiplied by weight of feed required for 1kg body weight gain (i.e. cost of feed/kg x FCR). Since every factor or cost input involved in the management of groups was constant cost of feed, gross margin was determined based on cost of feed only.

RESULTS AND DISCUSSION

Table 2 shows the effects of different sources of fibre on performance of local turkey poultry from 4 – 14 weeks of age.

The mean daily feed intake was not significant ($P>0.05$) for all the four experimental diets. This means that any difference in the performance of the experimental birds is not as result of differences in the quantity of feed consumed. The mean daily feed intakes ranged from 44.02g in the PKM diet (Diet 4) to 58.83g in treatment 2 (Diet containing wheat offal). The consumption ($P>0.05$) of the diet containing wheat offal could be due to high fibre content of the by - products (Esmail, 1997). Non-significant ($P>0.05$) differences among treatment growth were observed in the initial body weight of experimental poults. This removes any bias that could occur due to initial weight advantages of any of the treatment groups.

Table 1: Percentage Composition of Experimental Diets Containing Different Agro–industrial By-Products

INGREDIENTS	DIET 1	DIET 2	DIET 3	DIET 4
Maize	50.00	30.00	30.00	30.00
Wheat offal	20.00			
Rice Husk	20.00			
Palm Kernel Meal	20.00			
Full Fat Soyabean	34.10	34.10	34.10	34.10
Blood Meal	5.00	5.00	5.00	5.00
Fish Meal 5.00	5.00	5.00	5.00	
Bone Meal	3.00	3.00	3.00	3.00
Oyster Shell	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25
Vit./Min Premix	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Determined Analysis For Feed Sample				
Crude	23.50 26.31	20.25	21.75	
Crude fibre	3.50	5.31	7.99	5.00
Ether Extract	7.17	7.48	5.22	8.19
Ash	10.10	10.88	14.18	18.16
Nitrogen Free Extract	55.73	49.98	52.36	46.90

*Composition Per 2.5kg (Bio mix) premix: Vit A 4,000,000 IU; vit D 800,000 IU; vit E 1,500mg: Niacin 10,000mg: Panthotenic acid 3,500mg; Biotin 15mg; vit B 10mg; Folic acid 200mg; Choline Chloride 120,000 mg; Manganese 60,000 mg; Iron 15,000mg; Zinc 15,000mg; Copper 800mg; Iodine 400mg; Cobalt 80 mg; Selenium 400mg; Antioxidant 40,000mg.

There were significant (P<0.05) differences in mean daily weight gain with treatment 4 having the highest value (42.82g) and treatment 2 having the lowest value (31.86g). The conversion ratio shows significant (P<0.05) differences among treatment means and varies from 1.85 – 1.03 with treatment 2 having the poorest value (1.85) and treatment 4 having the best value (1.03). Treatment 3 encouraged a conversion ratio (1.46) that is better (P<0.05) than that of treatment 2 (1.85). The general high performance shown by the birds fed with palm kernel meal (treatment 4) diet may be as a result of high amount of protein contained in the PKM as well as the better amino acid profile of the palm kernel meal protein (Onwudike, 1986) than the protein of rice husk and wheat offal which are cereals. Generally cereals are poor sources of lysine, and the importance of lysine in the diet of birds cannot be overemphasized. The lipid content of palm kernel meal, which resulted to high yield of energy, may have also contributed to the better performance of treatment 4 (Alawa *et al;* 1993).

Table 3 shows the effect of agro–industrial by–products on the economics of production.

The cost (₦) per kg feed for treatments 1, 2, 3 and 4 were 34.49, 32.49, 30.39 and 31.49 respectively. It was found that the diet containing rice husk (treatment 3) had the lowest cost per kg feed while treatment 1 had the highest cost per kg feed. Relative to each other, the cost per unit (kg) of treatment 2 (containing wheat offal) is 94.20% of cost per unit (kg) of control diet. Treatment 3 (containing rice husk) and treatment 4 (containing palm kernel meal) were 89.56% and 91.88% respectively of cost of the control diet. The poults on treatment 2 had higher (P< 0.05) cost (₦) per kg weight gain than poults on diets 1 and 3 whose values were similar but significantly (P< 0.05) higher than that of birds on treatment 4. The pattern of the cost returns is a reflection of the biological effects observed earlier. Treatment 4 which encouraged the best biological performance

also gave the least cost per kg weight gain. The same diet eventually resulted to the highest ($P< 0.05$) gross margin from the sales of the poults. Treatments 1 and 3, which had similar ($P> 0.05$) growth rate and feed conversion ratio (FCR), also had similar cost per kg weight gain and gross margin. These were better than cost per kg weight gain and gross margin of poults on treatment 2 (wheat offal). Generally the palm kernel meal (Diet 4) was better when both economic and biological performances of turkey poults were considered.

In other words, inclusion of palm kernel meal at 20% level in turkey diet is therefore a cheap source of nutrients for raising turkeys.

TABLE 2: Effects of Agro–Industrial By–Products on performance of Turkey poults (4 – 14 weeks)

PARAMETERS	Treatment1	Treatment 2	Treatment 3	Treatment 4	SEM
Mean initial Weight (g)	204.0	194.5	176.0	175.0	19.96
Mean Final Weight (g)	27.75^{b}	24.25^{c}	26.25^{b}	31.75^{a}	
Mean daily Weight gain (g)	36.73^{b}	31.86^{c}	34.99^{b}	42.82^{a}	0.45 *
Mean daily feed Intake (g)	50.64	58.83	50.92	44.02	3.96
Feed/ Gain ratio (g)	1.38^{b}	1.85^{c}	1.46^{b}	1.03^{a}	0.09 *

abc: Treatments along the same row with different superscripts are significantly different ($P<0.05$).

TABLE 3: Effects of Agro–Industrial By–Products on Economics of Production

PARAMETERS	Treatment 1	Treatment 2	Treatment 3	Treatment 4	SEM
Mean Weight (g)	2.571^{ab}	2.230^{a}	2.449^{ab}	3.00^{c} 0.03*	Weight (g)
Feed/ Grain ratio	1.380	1.845	1.455	1.030	0.09
Cost/kg Feed (₦)	34.49	32.49	30.39	31.49	Feed (₦)
Relative Cost (%) 100	94.20	89.56	91.88	Relative Cost (%) 100	94.20
Cost /kg Weight Gain (₦)	47.60^{b}	60.43^{a}	44.94^{b}	32.65^{c}	2.97*
Cost of Weight Gain (₦)	122.31^{c}	134.81	110.10	97.90	8.70
Revenue from Weight Gain (₦)	822.7^{b}	713.8^{c}	783.7^{bc}	956.0^{a} 10.4*	
Gross Margin (₦)	700.4^{b}	579.0^{c}	673.6^{bc}	858.1^{a}	14.75*

abc: Treatments along the same row with different superscripts are significantly different ($P<0.05$).

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