

PRELIMINARY OBSERVATIONS ON THE USE OF MAIZE/ SORGHUM BASED DRIED BREWER'S GRAINS FORTIFIED WITH PALM OIL FOR FINISHING BROILERS

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Received 25 January, 1993 Accepted 24 September, 1993

ABSTRACT

Production of beer based on maize and sorghum gives rise to a byproduct (brewer's grains) which appears less fibrous and more nutritious than the conventional barley-based by-product. Studies were conducted to determine its proximate composition and effect as broiler finisher diet when fortified with 8% palm oil, 3% bone meal and 0.25% of lysine, methionine, salt and trace mineral/vitamin premix, respectively. The maize/sorghum based dried brewer's grains so treated was compared with a conventional commercial broiler finisher diet in a 4-week feeding trial involving 6-week old broiler chicks of Anak breed.

The maize/sorghum based dried brewers' grains contained 28.64%, 6.5%, 7.27%, 12.42% and 45.17% crude protein, fat, total ash, fibre and NFE, respectively. Fortified maize/sorghum based brewers' grains supported weight gain for finisher broilers comparable to the control, the commercial finisher diet.

Keywords: unconventional brewers' grains, palm oil, broiler finishers.

INTRODUCTION

The competition between man and his livestock, particularly monogastric ones, over available food grains has continued to be a problem in developing countries. This is mostly due to under-production that has typified the economy of many of the

developing countries. The current high prices of these cereal grains stemming from their high demand as staple human foods in many areas of the developing world also creates problem of rising feed costs. Attempts should therefore be made to look for alternative sources of feedstuffs for livestock on which competition between man and livestock will be minimal.

A group of these alternative sources of feeds is the brewers' grains. Brewers' grains is the extracted residue of barley malt alone or in mixture with other cereal grains or grain products resulting from the manufacture of wort or beer and contains pulverized spent hops in an amount not exceeding 3 percent.

Although brewers' dried grains are 'spent' with regard to their starch content, they actually contain proportionally more of valuable vitamins, minerals, fat, fibre and protein than were contained in the original cereal grains used (Kingsell *et al.* 1979). They are rich sources of essential fatty acids and vitamins, especially the B-complex vitamins for birds (Singh, 1988), and being a by-product of fermentation, must contain unidentified growth factors.

The crude fibre content of barley-based dried brewers' grains is over 20% (Ewing, 1965) and this limits its use in the diet of monogastric animals, particularly poultry (Ademosun, 1973; Nelson, 1984; Schiabile, 1981; Beryl, 1980; Wells, 1980). It is, however, a valuable feedstuff for ruminants (Conrad and Proter, 1976; Preston *et al.* 1973; Adeyanju and Ilori, 1976; Umanna *et al.* 1980; Babatunde *et al.* 1975; Adebowale and Ademosun, 1981; Umoh

et al. 1982; Udedibie, 1984).

The ban on barley in Nigeria has forced breweries in the country to resort to the use of maize, sorghum and other related cereal grains for producing beer. Production of beer based on maize and sorghum results in production of a by-product which looks less fibrous and more nutritious than the conventional barley-based by-product. With increased number of breweries in the country, a large quantity of this by-product is now available for use in livestock feeds. Its use in this regard, however, demands a knowledge of its composition and nutritive value, particularly for monogastric animals.

The studies herein reported were therefore designed to determine the proximate composition of the maize/sorghum based brewers' grains and then evaluate its value for finishing broilers if fortified with palm oil, minerals, vitamins and the essential amino acids, lysine and methionine.

MATERIALS AND METHODS

The maize/sorghum based dried brewers' grains used for this study was obtained from Eastern Breweries (Nig.) PLC, Awo-Omama, in Imo State of Nigeria, brewers of '33' Export lager beer and sun-dried for 2-3 days. The commercial broiler finisher diet was bought from a commercial feed seller in Owerri. The dried brewers' grains was run through hammer mill to break up its lumps before use in the ration formulation. The diet was mixed such that it contained 88% brewers' grains, 8% palm oil, 3% bone meal, and 0.25% of salt, synthetic lysine, methionine and vitamin/trace mineral premix, respectively (Table 1).

One hundred young broiler chicks of Anak breed raised on conventional commercial broiler starter diet for six weeks were used. At 6 weeks of age, the chicks were weighed individually and based on weight and sex, they were divided into 2 groups of 50 birds each. The two groups were randomly assigned to the two treatment diets, the commercial broiler

finisher diet (the control) and the maize/sorghum based brewers' grains diet. Each group was further subdivided into two replicates of 25 birds. The birds were managed on a deep litter system. Feed and water were provided *ad libitum*.

The birds were weighed at the beginning of the experiment and weekly thereafter. Feed consumption was recorded daily. The feeding trial lasted for 4 weeks.

During the last 4 days of the feeding trial, four birds were randomly selected from each replicate and transferred to metabolism cages where faecal collection was done for determination of apparent digestibility of nutrients of the diets by the two groups. Nutrient contents of feed and faeces were analysed according to standard methods (A.O.A.C. 1975). The gross energy was determined with a Gallenkamp oxygen ballistic bomb calorimeter.

Data collected were subjected to analysis of variance and significance of differences assessed by applying standard error of means (Steel and Torrie 1960) at the 5% level of probability.

RESULTS AND DISCUSSION

Nutrient Contents of Diets and DBG

The nutrient contents of the 2 experimental diets and the maize/sorghum based dried brewers' grains are shown in table 2. The striking features of the maize/sorghum based dried brewers' grains are its relatively low fibre content (12.42%) and high crude protein content. Its fibre content significantly deviates from the crude fibre content of the conventional barley-based brewers' grains which exceeds 20% (Ewing, 1965). Its crude protein content (28.64%) compares favourably with reported values for barley-based dried brewers' grains which range from 24% to 32% (Brooks, 1971; NRC, 1978; Chase, *et al.* 1981). Even though the diets were kept for 4 weeks, there was no case of rancidity.

TABLE 1. INGREDIENT COMPOSITION OF THE BREWERS' GRAINS DIET (%)

<u>Ingredients</u>	<u>% of Diet</u>
Brewers' grains,	88.00
Palm Oil,	8.00
Bone meal,	3.00
L-lysine,	0.25
L-methionine,	0.25
Salt,	0.25
Vitamin/TM premix*,	0.25

* Chemical Composition as specified by the Manufacturer: CP, 9%; Salt, 3%; P, 5%; Methionine, 0.9%; Lysine, 1.1%. Also to provide the following per kg feed: Vit. A, 10,000 i.u.; Vit.D₃, 1500 i.u.; Vit.E, 3 i.u.; Vit.K, 2mg; Riboflavin, 3mg; Panthothenic acid, 6mg; Niacin, 15mg; Choline, 3mg; Vit.B₁₂, 0.08 mg; Folic acid, 4mg; Mn, 0.8mg; Zn, 0.5 mg; Iodine, 1.0 mg; Co, 1.2 mg; Cu, 10 mg; Fe, 10 mg.

TABLE 2. PROXIMATE COMPOSITION OF THE TREATMENT DIETS AND THE MAIZE/SORGHUM BASED BREWERS' GRAINS

<u>Nutrients (%)*</u>	<u>Commercial Diet</u>	<u>DBG Diet</u>	<u>DBG</u>
Crude protein	17.06	24.60	28.64
Ether extract	10.82	15.84	6.50
Ash	6.52	8.22	7.27
Crude fibre	6.00	7.89	12.42
N F E	59.62	43.45	45.17
Calcium	0.79	0.91	0.31
Phosphorus	0.63	0.82	0.56
Gross energy Kcal/gm	4.40	5.33	4.28

* Percent of dry matter.

Performance of Treatment Birds

The performance of the treatment birds are shown in table 3. There were no significant ($P > 0.05$) differences between the 2 groups in total weight gain and growth rate. Although the birds on the maize/sorghum based brewers' grains diet consumed significantly ($P < 0.05$) less feed, there were no significant ($P > 0.05$) differences between the 2 groups in feed conversion ratio.

Apparent digestibilities of nutrients of the 2 treatment diets (Table 4) were similar although the maize/sorghum based brewers' grain diet contained relatively more apparent metabolizable energy (AME). This probably explains the reduced feed intake of the group on the brewers' grains diet, since energy content of feeds affect feed intake of birds.

At the prevailing prices of feeds and feed ingredients used for this study, economic analysis of the 2 diets (Table 5) indicated a significant ($P < 0.05$) reduction in the cost of production of broilers by using the maize/sorghum based brewers' grains fortified with palm oil and the micro-nutrients.

A major limitation in the use of barley-based brewers' grains in poultry diets is its high fibre content (Ademosun, 1973). Earlier reports have shown that replacement of maize with barley-based brewers' grains depressed growth even at a lower level of 20% and complete replacement of maize by such brewers' grains in broiler starter diets resulted in very high mortality (Nelson, 1984). The similarity in nutrient digestibility of the 2 treatment diets could therefore be due to their similarity in fibre contents. A study by Kondra *et al* (1974) on the influence of dietary fibre on growth, feed efficiency and digestibility of nutrients showed that digestibility of nutrients decreased as dietary fibre increased. Barley and rice hulls are also very high in silica (Van Soest, 1982) which is negatively related to digestibility. The high nutrient content and quality of maize/sorghum brewers' grains stem mostly from their thin seed testa which results in very low extraction rate during the filtering process of beer production (Ejindu, Personal Communication 1992).

Table 3. COMPARATIVE EFFECT OF COMMERCIAL BROILER FINISHER (CBF) AND MAIZE/SORGHUM BASED BREWERS' GRAINS (DBG) DIETS ON THE PERFORMANCE OF FINISHER BROILERS

<u>Parameters</u>	<u>CBF Diet</u>	<u>DBG Diet</u>	<u>SEM</u>
Average initial body wt. (g)	1015.00	1030.00	26.10
Average final "	2205.00	2035.00	19.64
Average weight gain (g)	1190.00	1005.00	18.89
Average growth rate (g/day)	42.50	35.58	2.89
Average feed intake (g/day)	167.35 ^a	149.26 ^b	3.47
Feed conversion ratio (g feed/g wt gain)	3.80	4.10	0.53

ab Means within a row with different superscripts are significantly ($P < 0.05$) different.

Table 4. APPARENT NUTRIENT DIGESTIBILITY OF TREATMENT DIETS (%)

<u>Nutrients</u>	<u>CBF Diet</u>	<u>DBG Diet</u>	<u>SEM</u>
Dry matter	87.96	86.34	3.36
Crude protein	82.44	80.72	3.54
Ether extract	92.12	93.26	2.33
Crude fibre	54.64	49.41	4.02
Ash	72.14	72.32	2.13
Apparent Metabolizable Energy (AME) (kcal/g)	2.94	3.22	0.82

TABLE 5. FEED COSTS AND ECONOMIC DATA FOR MEAT PRODUCTION

	<u>CBF Diet</u>	<u>DBG Diet</u>	<u>SEM</u>
Feed Consumption (kg/bird)	4.52	4.03	0.32
Feed Cost (₦/kg)*	3.32	2.00	-
Feed Cost (₦/bird)	14.99	8.06	0.24
Cost of producing kg meat	12.50 ^a	8.16 ^b	0.98

* At the time of this study, feed-costs were as follows: Broiler finisher mash, ₦3,320.00/ton; DBG, ₦1,400.00/ton; palm oil, ₦5.00/L; Lysine, Methionine and premix, ₦1,600.00/25kg.

ab Means within rows with different superscripts are significantly ($P < 0.05$) different.

The results of this study have shown that in the situations of acute shortage of feed grains, maize/sorghum based dried brewers' grains could be fortified with palm oil (to boost its energy value) and other trace nutrients and used for finishing broilers. These are, however, only preliminary observations and there is need therefore for further studies to determine, particularly, the optimal level(s) of palm oil to be used.

ACKNOWLEDGEMENT

The authors are grateful to the Management of Eastern Breweries (Nig.) PLC, Awo-Omama, Imo State, for providing the brewers' grains used for this study. We are particularly grateful to the Production Manager of the Brewery, Mr. B.M. Ejindu, for providing the necessary information about the by-product.

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