SHORT COMMUNICATION

MAIZE/SORGHUM - BASED DRIED BREWERS' GRAINS IN BROILER FINISHER DIETS

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ABSTRACT

A 40 - day feeding trial was conducted to determine the optimal substitution level of maize/sorghum-based dried brewers' grains (MSDBG) for maize in broiler finisher diets. Six experimental broiler finisher diets were formulated such that 25%, 50% and 75% of the maize in diet 1 (the control) were replaced with MSDBG in diets 2, 3, and 4, respectively while diets 5 and 6 were like 3 and 4, respectively but fortified with 4% palm oil. Each diet was fed to a group of 48 broiler chicks for 40 days (week 4 to week 10 of age). There were no significant ($P > 0.05$) differences among the groups in growth rate (43.95, 45.52, 45.11, 43.01, 45.80 and 43.92 g/day, respectively). At replacement levels of 50% and 75% with or without palm oil, the birds consumed significantly ($P < 0.05$) more feed than the group on the control diet (140.0, 151.4, 177.3, 174.6, 174.2 and 167.1 g/day, respectively).

Feed conversion ratio of the MSDBG groups was consequently significantly ($P < 0.05$) inferior to the control. Addition of palm oil did not produce any noticeable effect on the performance of the birds. Feed cost for production of a kilogram of broiler was markedly reduced at the 75% replacement level.

Key words: Maize/sorghum-based dried brewers' grains (MSDBG), maize, broiler diets.

INTRODUCTION

The growing demand for maize in the last few years for both human and livestock consumption has pushed its market price to alarming height that has directly affected the production cost of farm animals, particularly

the non-ruminants. This has invariably escalated the market prices of livestock products out of reach of the common man. There is therefore an urgent need for alternatives to maize in livestock feeds to reduce the current breaking pressure on the commodity that is also adversely affecting the good proportion of the population that depends on it as staple food.

One of the alternatives to maize that readily comes to mind is the dried brewers' grains. Brewers' grains is the extracted residue of cereal grains or grain products resulting from the manufacture of beer. Although brewers' grains is 'spent' with regard to its starch content, it contains proportionally more of valuable vitamins, minerals, fat, fibre and protein than were contained in the original cereal grains used (Kingsell *et al*, 1979). It is a rich source of essential fatty acids and vitamins, especially the B - complex vitamins for birds (Singh, 1988).

The conventional cereal grain for manufacture of beer is barley. However, with the Federal Government ban on importation of barley, all the breweries in the country have resorted to the use of maize and sorghum as their primary raw materials. Production of beer based on maize and sorghum results in production of a by-products, maize/sorghum-based dried brewers' grains (MSDBG), that is much richer in nutrients than the conventional barley-based by-product (Udedibie and Emenalom, 1993, Udedibie *et al*, 1995). This is so because the fermentation process of maize and sorghum is much less efficient. As a result, a good proportion of the unfermented carbohydrates is left in the by-product (Ejindu, 1996, personal communication). The crude fibre content of barley-based dried brewers' grains is over 20%

(Ewing, 1965; Udedibie, 1984) as against 12% for MSDBG (Udedibie and Emenalom, 1993) and this limits its use in the diets of non ruminants, particularly poultry (Ademosun, 1973; Nelson, 1984). The tolerance level of poultry for dietary MSDBG is therefore expected to be higher. This paper reports the performance of finisher broilers fed on diets in which maize had been replaced with MSDBG up to 75 percent.

MATERIALS AND METHODS

The maize/sorghum-based brewers' grains used for the study was obtained from Consolidated Breweries Plc, Awo-Omama in Imo State, the brewers of '33' Export lager beer. Maize and sorghum formed 80 - 90% of

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Two hundred and eighty-eight (288) broiler chicks at their 4th week of age and weighing on the average 386.5 gm were divided into 6 groups of 48 birds each. Each group was then randomly assigned to an experimental diet. Each group was further sub-divided into 3 replicates of 16 birds and each replicate housed in a 2m x 4m compartment. The birds

TABLE 1 INGREDIENT AND CHEMICAL COMPOSITION OF THE EXPERIMENTAL DIETS.

Ingredients	Control (0.0%)	Treatments Replacement levels (%)				
		25.0	50.0	75.0	50.0*	75.0*
Maize	55.00	41.20	27.50	13.70	27.50	13.70
Soybean Meal	18.00	18.00	18.00	18.00	18.00	18.00
Wheat Offals	10.00	10.00	10.00	10.00	6.00	6.00
Palm Oil	0.00	0.00	0.00	0.00	4.00	4.00
Premix	17.00	17.00	17.00	17.00	17.00	17.00
MSDBG	0.00	13.80	27.50	41.30	27.50	41.30
Chem. Comp. (% DM)						
Crude Protein	20.32	22.81	25.29	27.77	25.25	27.57
Crude Fibre	4.41	5.55	7.09	8.43	6.67	8.03
Ether extract	4.01	4.36	4.70	5.05	8.49	8.84
Calcium	0.68	0.74	0.76	0.79	0.75	0.77
Phosphorus	0.51	0.58	0.66	0.74	0.65	0.74
L-methionine (Cal.)	0.38	0.48	0.48	0.54	0.48	0.54
L-lysine (cal.)	1.09	1.18	1.27	1.36	1.26	1.34
ME (Cal.) (Kcal/gm)	3.00	2.92	2.82	2.71	2.91	2.88

* Contained 4% palm oil

** Contained 35.3% palmkernel cake, 23.5% blood meal, 17.6% fish meal, 14.7% bone meal, 5.9% oystershell, 1.5% common salt and 1.5% vitamin/trace mineral premix to provide the following per kg of feed: Vit. A, 10,000iu; Vit D3, 1500 iu; Vit E, 4.8 iu; Vit K, 2mg ribofl., 3mg, panthothenic acid, 6mg; niacin, 15mg; choline, 3mg; Vit B12, 0.08mg; Folic acid, 4mg; Mn 0.8mg; Zn, 0.5mg; Iodine, 1.0mg; Co, 1.2mg; Cu, 10mg; Fe, 10mg.

the mash-bill (proportions of the ingredients used). The brewers' grains was collected wet (DM, 25%) at the cost of ₦200.00 (two hundred naira) per ton at the time of the experiment (1995) and dried to 90% dry matter in the sun. It was then run through a grinding machine to break the lumps for production of a homogenous material. A sample of it was analysed for proximate composition according to AOAC (1995).

were weighed at the beginning of the experiment and weekly thereafter. Feed and water were provided on ad libitum basis and feed consumption was recorded daily.

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

RESULTS AND DISCUSSION

Nutrient Composition of MSDBG and Experimental Diets

The proximate composition of the experimental diets and MSDBG has been presented in Tables 1 and 2 respectively. The proximate composition of the MSDBG used for this study compared very favourably with earlier values reported by Udedibie and Emenalom (1993) and Udedibie *et al* (1995). The slightly higher crude fibre of 13.12% could be due to differences in mash-bill which the brewery modifies from time to time.

TABLE 2: PROXIMATE COMPOSITION OF MSDBG (g/100g DM)

Nutrients	Value
Crude Protein	28.25
Crude fibre	13.12
Ether extract	6.70
Total ash	7.36
Nitrogen-free extract	44.57
Gross energy (Kcal/gm)	4.23

in the beer production process. The energy contribution of palm oil in diets 5 and 6 did not appear to be significant. On the other hand, the calculated concentrations of the micro-nutrients, L-lysine and L-methionine, increased in the diets as the level of MSDBG increased for the reason earlier stated.

Performance of Experimental Birds

Data on the performance of the experimental birds have been presented in Table 3. The feed intake of the birds increased with increase in dietary level of MSDBG. With exception of the group on 25% replacement level, MSDBG induced significantly ($P < 0.05$) higher feed intake. A similar observation had earlier been made by Ademosun (1973) on barley-based dried brewers' grains. This could be explained in relation to the lower metabolizable energy values of the diets since birds usually eat to satisfy their energy requirement (Hill and Singh, 1988). There were, however, no significant ($P > 0.05$) differences among the groups in growth rate although groups on 25%

TABLE 3: EFFECTS OF PARTIAL REPLACEMENT OF DIETARY MAIZE WITH MSDBG ON THE PERFORMANCE OF FINISHER BROILERS

Parameters	Control (0.0%)	Replacement levels (%)					SEM
		25.0	50.0	75.0	50.0	75.0	
Av. initial body wt. (gm)	387.5	387.9	387.57	384.2	387.1	387.9	12.45
Av. final body wt. (gm)	2145.7	2207.5	2192.2	2104.8	2219.2	2045.7	43.57
Av. growth rate (gm/day)	43.95	45.52	45.11	43.01	45.80	43.92	1.32
Av. feed intake (gm/day)	140.6 ^a	151.4 ^{ab}	177.3 ^b	174.6 ^b	164.2 ^b	167.1 ^b	4.06
Feed/gain Ratio	3.20 ^a	3.33 ^{ab}	3.93 ^b	4.05 ^b	3.37 ^{ab}	4.03 ^b	0.12
Mortality (numbers)	Nil	Nil	2	3	Nil	Nil	-
Cost Analysis							
Kg feed/kg gain	3.20	3.33	3.93	4.05	3.37	4.03	-
Cost of feed (N/kg)	18.31	16.22	14.65	12.94	15.22	13.42	-
Cost of feed/kg broiler (N)	58.59	55.01	57.57	52.41	51.29	54.69	-

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

The relatively higher crude protein and fibre of the brewers' grains reflected in higher crude protein and fibre in the experimental diets as the level of the brewers' grains increased. The calculated metabolizable energy of the diets decreased in the same direction. This was understandably so since a good proportion of the fermentable carbohydrates of the grains had been removed

and 50% replacement levels maintained relatively superior growth performance. This superior performance could be related to the fact that the energy levels of these two diets were still within the adequacy zone for the broilers. The fibre contents were also within the tolerable level. In addition, the diets might contain higher concentrations of essential fatty acids and unidentified growth factors

contributed by brewers' grains (Singh, 1988). Although there were no statistical differences among the groups in growth rates ($P > 0.05$), the slight drop in performance of the groups on 75% replacement level possibly resulted from the disproportionate high crude fibre and protein to low energy levels of the diets. Addition of 4% palm oil did not make any difference in the quality of the diets. Nelson (1984) had earlier reported that 50% replacement of maize with barley based dried brewers' grains with or without 5% palm oil supplementation significantly depressed performance of broilers. The cost/benefit effects of the diets are also outlined in Table 3. At the time of the trial, the costs of the various feed ingredients put the costs of a kilogram of the experimental diets at N18.31, N16.52, N14.65, N12.94, N15.22 and N13.42 respectively. Even with higher feed intake of the groups on MSDBG diets, the feed cost of producing a kilogram of broiler with MSDBG diets was N1.02 to N7.30 cheaper than the control. In a large scale broiler enterprise, a saving of N1.00 (one naira) in feed cost of producing a kilogram of broiler is quite significant.

The results of this trial have shown that up to 75% of maize in broiler finisher diets can be replaced with MSDBG without reducing performance of the birds. This is equivalent to about 42% dietary inclusion of the by-product. It is therefore recommended that its universal use in poultry industry in the country should be maximally exploited as a way of reducing the current demand pressure on maize. If the demand on maize is reduced, its price will obviously come down.

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