SUBSTITUTION VALUE OF A MIXTURE OF RICE MILLING BY-PRODUCTS FOR MAIZE IN DIETS OF WEANER RABBITS.

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ABSTRACT

A 12 - week feeding trial involving 64 weaner rabbits in a completely randomized design was carried out to determine the substitution value of a mixture of rice milling by-products (in the ratio of 1:1:1:2 respectively for straw, husk, hull, and bran) for maize in the diets of New Zealand white type weaner rabbits at four substitution levels: 0%, 50%, 75% and 100%. Rabbits on the experimental diets recorded higher feed intake of 68.83, 68.11 and 66.97gm respectively for 50%, 75% and 100% as against 52.71gm for 0%. The difference in feed intake between the group on 0% and the group on experimental diets became significant ($P < 0.05$) at 50% dietary substitution level, but there was no significant ($P > 0.05$) difference among the group on the experimental diets. Rabbits on 50% substitution level recorded the highest feed intake (68.83gm) while the group on 100% recorded the highest feed conversion ratio (15.72). Body weight gain of the groups showed significant difference ($P < 0.05$). The mixture of rice milling by-products used for this study contained 9.10% crude protein, 30.4% crude fibre, 0.29% calcium, 0.19% phosphorus and 2.01 kcal/kg metabolizable energy levels. The results of this trial suggest that a mixture of rice milling by-products could substitute maize in weaner rabbits diets up to 50% with good results.

Keywords: rice, by-products, maize substitute, weaners, Rabbits.

INTRODUCTION

Mixture of rice milling by-products comprised a ratio of 1:1:1:2 of rice straw, hull, husk and bran mixed together. Until recently, little was heard about this mixture (Ekpenyong, 1986). Most researchers have

dealt extensively on the bran (Gillespie, 1981; Briggs, 1978; McDonald *et al*, 1981) while the husk and straw have been used mainly in providing litter materials for livestock (Reddish *et al*, 1986). The recent trend in the price of conventional feedstuffs and the non-availability of such feedstuffs have aggravated the problems facing the animal production sector in bridging the yawning protein gap in developing countries. Moreso, maize and other feed grains remain staple food for most developing countries resulting in keen competition between man and livestock (Onwudike and Omole, 1994; Ngodigha, 1993; Esonu *et al*, 1994, 1996). There is therefore urgent need for a substitute for maize that is locally available, cheap, attracting no competition with man and requires no or minimal, processing cost to make it utilizable.

A mixture of rice milling by-products at the ratio of 1:1:1:2 of rice straw, hull, husk and bran mixed together is locally available in large quantities, cheap and utilizable without much processing (Oyenuga, 1968; Jackson, 1978; Aduku *et al*, 1986, Ekpenyong, 1986). The aim of this study is therefore to evaluate the substitution value of a mixture of rice milling by-products for maize in weaner rabbit diets.

MATERIALS AND METHODS

The mixture of rice milling by-products used for this study was obtained from Ikpe Rice Mill Processing Unit located at Ini local government area of Akwa Ibom State of Nigeria. The milling process consisted of the removal of the straw, husk, hull and bran by a mechanical separator. These by-products were mixed together in the ratio of 1:1:1:2 of straw, husk, hull and bran and ground in a hammer mill, producing a finely ground mixture of rice mill by-products. Molasses was used as a binder to pellet both the rice mill

TABLE 1: CHEMICAL COMPOSITION OF A MIXTURE OF RICE MILLING BY- PRODUCTS AND MAIZE (Dry Matter basis)

Parameters	Mixture of Rice mill by-products	Maize
Dry matter (%)	91.00	89.00
Crude protein (%)	9.10	8.80
Crude fibre (%)	30.40	2.20
Crude fat (%)	1.90	4.60
Calcium (%)	0.29	0.28
Phosphorus (%)	0.19	0.17
*Lysine (%)	0.50	0.24
*Methionine + Cystine (%)	0.17	0.21
*Metabolizable energy (kcal/gm)	2.01	3.33

*Calculated.

assigned to the four treatment diets at 16 rabbits per treatment. Each treatment was further replicated four times and each replicate group of 4 rabbits housed in a hutch of 180 x 60cm. Dry matter of the mixture of rice by-products and the diets was determined by oven drying and crude protein by the macro Kelahl procedure (AOAC, 1980). Mineral analysis was made by methods of Grueling (1966). Metabolizable Energy (ME) was calculated based on documented ME values of materials used.

Data collected were subjected to analysis of variance as outlined by Snedecor and Cochran (1974). When analysis of variance indicated a significance for treatment effects, specific differences between means were detected using the modified Duncan New multiple

TABLE 2: COMPOSITION OF THE TREATMENT DIETS FED TO RABBITS

Ingredients	Substitution level of the mixture (%)			
	0	50	75	100
Maize	60.00	30.00	15.00	0.00
Mixture of rice milling by-products	0.00	30.00	45.00	60.00
Soya bean meal	31.00	31.00	31.00	31.00
Fish meal	4.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50
Blood meal	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25
Pfizer vit/Tm premix*	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

*To provide the following per kg of feed:

Vitamin A - 10,000,000 I.U. D3-2,000.00 I.U.; B1 - 0.75g; B12 - 5g; Nicotinic acid - 25g; Calcium panthotenate - 12.5g B12-0.015g; K3-2.5g; E-25g; Biotin 0.05g; Folic acid - 1g; Cholic chloride 250g; Cobalt - 0.40g; Copper 8g; Manganese - 64g; Iron - 32g; Zinc-40g; Iodine - 0.8g; Flavomycin - 100g; Spiramycin-5g; 3-Nitro-5g; D1-Methionine 50g; Selenium 0.16; L-Lysine 120g; BHT - 5g.

by-products-based diets and the maize-based diet (equal quantity of molasses was used (5 litres) per 25kg.

Samples of the mixture and maize were analysed for proximate chemical composition (AOAC, 1980), Table 1.]. Based on the result of the chemical analysis, four weaner rabbit experimental diets were formulated such that the mixture of rice mill by-products substituted maize at 0%, 50%, 75% and 100% levels (Table 2).

Sixty-four, five-week-old weaner rabbits of New Zealand white type were randomly

range (1955) as outlined by Obi (1990). The experiment lasted for 12 weeks.

RESULTS AND DISCUSSION

The chemical composition of the treatment diets is presented in Table 3. The mixture and maize appeared comparable in most of the nutrients (Table 1) and substitution was done on weight for weight basis. The only major observable differences among the treatment diets were the decrease in metabolizable energy of the diets as the level of the mixture of rice milling by-product increased and the

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TABLE 3: CHEMICAL COMPOSITION OF THE TREATMENT DIETS FED TO THE WEANER RABBITS.

Parameters	Substitution		Levels	(%)
	0	50		
Crude protein	21.6	22.00	22.15	22.40
Ether extract	4.09	3.00	2.50	2.03
Crude fibre	3.37	9.37	12.87	17.37
Available calcium	0.34	0.36	0.38	0.39
Phosphorus	0.26	0.28	0.29	0.29
*Lysine	1.22	1.20	1.19	1.14
*Methionine + cystine	0.64	0.66	0.69	0.71
*Metabolizable energy (Kcal/kg)	2230.0	2160.0	2094.0	1990.5
Calorie/protein ratio	0.11	0.10	0.10	0.10

*Calculated.

TABLE 4: THE EFFECT OF MIXTURE OF RICE MILLING BY-PRODUCTS ON THE PERFORMANCE OF WEANER RABBITS.

Parameters	Substitution levels (%)				SEM
	0	50	75	100	
Initial body weight (g)	659.25	659.25	659.35	659.25	0.002
Final body weight (g)	985.25b	1066.25a	1001.25b	957.25b	2.34
Body weight changes (g)	326.00b	407.00a	342.00b	298.00b	4.48
Daily feed intake (g)	52.71a	68.83b	68.11b	66.97b	0.23
Daily body weight gain (g)	4.66b	5.81	4.89b	4.26b	1.25
Feed conversion ratio (kg feed/kg gain)	11.31a	11.84a	13.92b	15.72b	4.05
Feed cost (N/kg)	15.5	14.0	13.0	12.6	
N/kg meat produced	62.21	47.36	41.7	40.87	
Mortality	0	0	0	0	

a,b - means within rows with different superscripts are statistically different ($P < 0.05$).

increase in the crude fibre contents of the diets as the dietary level of the mixture of rice milling by-product increased. This was understandably so because of the low energy value and the high crude fibre contents of the mixture of rice milling by-products.

Data on feed intake, body weight changes and feed conversion ratio are presented in Table 4. There was significant ($P < 0.05$) difference in feed intake between the 0% and experimental diets. The mixture of rice milling by-products at 50% substitution level significantly ($P < 0.05$) improved the growth rate of the rabbits, an indication of higher

efficiency of feed conversion. Rabbits on 50% mixture of rice mill by-products substitution level generally performed better than those on 0% level. ($P > 0.05$). The poor performance of rabbits on 75% and 100% could be probably due to the low energy content of these diets and the high dietary level of the mixture which may have affected nutrient digestibility and utilization (Onwudike and Omole, 1994). Based on the results of the chemical analyses (Table 1), the mixture of rice milling by-products contained the necessary nutrients at comparatively high levels despite the fact that it was low in methionine.

It is interesting to note that with the unique caecotrophic habit of the rabbit which places the animal at advantage in the utilization of

high fibre diets, it could not effectively utilize the mixture at 75% and 100% substitution levels. This confirms the report of Cheeke *et al* (1986), that caecotrophy (coprophagy) in rabbits appears to be particularly important in the digestion of the protein fraction of forages and less important in fibre utilization, as would be expected because of the selective retention on non-fibre compounds in the caecum. The substitution of maize with the mixture of rice milling by-products reduced the production cost of one kilogram of feed as compared to the production of one kilogram of the diet. In otherwords, at 50% substitution level, feed

cost could be reduced by as much as 9.7%.

In conclusion, the result of this trial showed that the mixture of rice mill by-product at a ratio of 1:1:1:2 of rice straw, husk and bran could be substituted for maize at 50% level in weaner rabbit diets with improved performance.

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