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Effect of Replacing Maize with Maize Milling Waste on the Performance of Rabbits, Organ Weights, and Enzyme Activities

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Target Audience: Animal nutritionists, Livestock farmers and research scientists

Abstract

The potential of maize milling waste as feed supplement in rabbit diets and the effect on organ weights, plasma glucose, serum transaminases and alkaline phosphatase were studied Twenty four, six weeks old male and female exotic New Zealand white rabbits weighing 560-620g were fed three diets containing 0%(control), 50%,and 100% maize milling waste, in an eight week feeding trial.The experiment al design was completely randomized. The maize milling waste was found to be high in nitrogen free extract (76.56%), low in crude protein (7.62%) and fibre , (2.00%) respectively.

At 50%level of inclusion in the diet, maize milling waste gave significantly (P<0.05) better weight gains than the control and 100% level of inclusion..Protein efficiency ratio was also significantly (P<0.05) better at 50% inclusion, when compared with the diets containing the 0% (control) and 100% levels of inclusion. Blood enzymes from rabbits fed the trial diets did not differ significantly (P> 0.05) The alkaline phosphatase levels were similar. (P>0.05) The results suggest that the diets met the calcium requirements of rabbits for bone mineralization, because high level of alkaline phosphatase is generally associated with subnormal calcium status. There was no incidence of enteritis or mortality among the treatment groups.

Key Words: Rabbits, Maize milling waste, Performance, Relative Organ weights, Enzymes

Descriptions of Problems

The low intake of animal protein in Africa Countries is as a result of low production and low productivity of animals such as cattle which has long production cycle in relation to rapidly increasing human population and requirement. This low production results in high price of animal products, most of the time beyond the reach of the masses. However, this problem may be reduced by the production of animals with short production cycle such as rabbits, poultry and pigs (1). Nevertheless, poultry and pigs require feed resources, which are in serious competition with man (1).

However rabbit appears to be the best of all animals with the short production cycle and also in terms of capital input and space. It is more prolific, producing relatively larger amount of meat compared to other animals.

Provision of concentrates for animals, immensely increase animal productivity. However, in developing nations like Nigeria, it results to extensive use of food grains.Hence, it is becoming increasingly difficult to raise livestock on conventional feed ingredients such as maize,

sorghum,soyabean,wheat,and groundnut cake (2)

Despite the efficient utilization of forages by rabbits, it is not available all the year round, therefore there is need for the use of unconventional feed resources, most of which are agro-industrial byproducts like palm kernel cake (pkc), maize-offal, wheat-offal, rice-hulls, maize milling waste, among others. Many low cost feed formulation which can be alternatively fed at cheaper cost to the monogastric livestock are based on the use of agro-industrial byproducts, which are of no feed value to human (3), (4) reported that tropical agricultural extraction industries turn out large number of by-products whose feeding value are yet to be harnessed .Longe (5) observed that the nutritional potential of agro-industrial by-products were based on their low content of proximate nutrients, and high fibre content.

The objective of this study is to evaluate the effect of feeding maize milling waste at different levels on the performance of growing rabbits, relative organ weights and blood enzymes activities.

Materials and Methods

The maize milling waste was collected from S and D Farms Limited, Abeokuta, Ogun State. Three diets containing 0% (control) 50%, and 100% maize milling waste were formulated as shown in Table 1. The diets were all pelleted and were formulated to contain between 17-19% crude protein, and molasses was used as a binding agent.

Twenty four, six-week old New –Zealand white, male and female rabbits weighing between 560-620g were obtained from University Teaching and Research Farm. The animals were randomly divided into three groups of eight each, (4males and 4 females) with an average weight of 580g for each group. Each group was further sub-divided into two, such that duplicate groups of four rabbits were obtained for each sub-group with two rabbits per cage. The rabbits were fed the pelleted feed daily at 8.30am with water *ad libitum.*

Records of weekly body weight gain and feed intake were taken for eight weeks, and from thesefeed efficiency, and protein ratio were calculated.

Two rabbits (one female and male) from each diet group were selected at random, for heamatologicaly study, blood was obtained from the right ear with fine capillary tubes and emptied in to test tubes kept in an inclined position for about 6 hours. The serum was separated by centrifugation at 700 rpm x 10 min and stored in a deep freezer prior to chemical analysis

Plasma glucose was measured by the method of (6), alkaline phosphatase and glutamic-oxaloacetic transaminase (GOT) by the method of (7) and glutamic-pyruvic transaminase (GPT) by the method of (8).

Two rabbits were randomly taken from each treatment group and slaughtered and the liver, kidneys and ceaca were removed, blotted on filter paper and then weighted. Total protein contents of the organs were determined by the method of Biuret (9). The mineral components of the maize milling waste and the experimental diets were determined using flame test method.

Statistical Analysis

Performance records of the animals were subjected to one way analysis of variance by method of (10). Duncan (11) multiple range test method was used to determine significant differences between treatment means.

Table 1. Percentage Composition of Experimental Diets

	Dietary level of maize milling waste		
Components (%)	0%	50%	100%
Maize	48.03	19.02	-
Soybean meal	14.38	14.38	14.38
Maize Milling Waste	—	24.01	48.03
Molasses	—	5.0	5.0
Blood meal	3.69	3.69	3.69
Wheatoffal	30.00	30.00	30.00
Oystershell	2.00	2.00	2.00
Bone meal	1.00	1.00	1.00
DL-methionie	0.40	0.40	0.40
Vit/Min Premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Calculated Composition			
Crude Protein (%)	18.17	18.26	19.36
Energy ME (KJ/g)	11.17	11.36	11.78
Crude Fibre (%)	16.64	17.84	20.78
Methionin (%)	0.38	0.38	0.38
Lysine (%)	0.30	0.28	0.32

Table 2. Proximate Composition of Maize Milling Waste and the Experimental Diets on dry matter basis

Chemical Composition (%)	Maize milling waste (Mmw)	Dietary level of maize milling waste 0%	50%	100%
Moisture	5.78	6.64	5.42	5.48
Crude Protein	7.62	16.32	17.40	17.42
Ether Extract	3.96	8.32	9.64	9.98
Crude fibre	2.00	17.85	18.64	20.32
Ash	3.64	4.24	4.26	4.26
Nitrogen free Extract	76.56	44.96	42.66	40.48
Minerals				
Potassium (%)	0.04	0.24	0.26	0.28
Sodium (%)	0.07	0.08	0.08	0.10
Phosphorus (%)	0.35	0.40	0.42	0.42
Magnesium (%)	0.13	0.32	0.38	0.40
Calcium (%)	0.02	0.63	0.84	0.88
Zink (ppm)	200	100	120	126
Manganese (ppm)	200	54	65	72
Iron (ppm)	146	85	92	100

Table 3 Effect of diets on performance of rabbits

Parameters	Dietary level of maize milling waste* 0%	50%	100%	SEM**
Number of rabbits	8	8	8	
Initial Body Weight (g)	580	580	580	6.42
Final Body Weight(g)	1486.26	1664.14	1574.26	26.40
Daily Weight gain (g/day)	16.18	19.36	17.75	1.72
Daily Feed intake (g/day)	126.42	138.72	132.46	6.42
Feed efficiency ratio	0.13	0.14	0.13	0.02
Protein efficiency ratio	2.40	3.88	3.12	0.12
Mortality	0	0	0	

*Means along the same row with different superscripts are significantly different ($P<0.05$)
**Standard error of means, Values are the means of eight animals

Table 4. Organ weight and protein content of organs of rabbits fed Different levels of maize milling waste

Organs	Dietary level of maize milling waste 0%	50%	100%
Liver			
Wet weight (g)	3.42	4.24	3.86
Dry weight (%0f body weight)	1.42	1.82	1.62
Protein (%of dry weight)	53.64	64.20	55.24
Kidney			
Wet weight (g)	0.64	0.68	0.66
Dry weight (% of body weight)	0.16	0.24	0.20
Protein (%of dry weight)	42.40	50.48	48.24
Caecum			
Wet weight (g)	1.00	1.32	1.14
Dry weight (%of body weight)	0.42	0.62	0.50
Protein (% of dry weight)	56.46	68.42	60.44

Table 5. Serum enzymes and plasma glucose of rabbits fed experimental Diets

	Dietary level of maize milling waste 0%	50%	100%
Plasma Glucose (mg/100ml)	108.04±4.84	116.42±3.30	112.62±2.32
SerumAlkaline Phosphatase (W/L) at 25°C	80.32±6.32	92.46±6.84	84.32±3.36
Serum G O T. (u/l) at 25°C	16.46±2.46	16.54±2.04	16.48±2.34
Serum G.P.T. (u/l) at 25°C	19.32±3.32	19.98±3.40	19.62±32.

Values expressed are the means of 8 analysis ± S.E.M.

G.O.T : Glutamic- Oxaloacetatic Transaminase
G.P.T : Glutamic- Pyruvic Transaminase

Results And Discussion

The chemical composition of the trial diets showed that the three diets were similar in terms of dry matter, and crude protein The levels of crude fibre were17.85%,18.64%,and 20.32% for the 0%,50%,and100% maize milling waste diets respectively.

The effect of the experimental diets on growth and feed efficiency is shown in Table 3 Average daily weight gain increased with increase in percentage maize milling waste in the diet and the differences between groups were highly significant, with the highest level of gain achieved at 50% maize milling waste inclusion . Higher level of growth with high protein level in diet was in agreement with the findings of (3)and (12)

The significantly ($P<0.05$) higher growth rate observed in the rabbits fed 50% maize milling waste diet with a high fibre content was expected and is in agreement with the findings of Biobaku (1998) However, feed efficiency ratios were not significantly ($P<0.05$) affected by maize milling waste levels and this agrees with the findings of (13),and (12)

The protein efficiency ratio of rabbits fed with 50% maize milling waste diet was significantly ($P<0.05$) higher than those of rabbits fed with the control (0%) and 100% maize milling waste diets respectively.The present results showing a decrease in body weight gain and feed intake as the percentage maize milling waste inclusion increased above 50% may be due to increase in the level of fibre in the diet and agrees with the findings of (14) who reported that a fibre level above 20% did not result in ceacal impaction in rabbits but may reduce body weight gain and feed intake.

The dry weights of the various organs and their protein levels are shown in Table 4 .The liver weight as a percentage of body weight of the rabbits fed 50% maize milling waste diet was higher (1.82%) than those rabbits fed 100% maize milling waste diet and the control diet (1.62% and 1.42%) respectively This result was not found to be related with any degree of liver damage. However the percentage of protein in the liver of rabbits fed 50% maize milling waste diet was ($P0<0.5$) significantly higher than those rabbits fed the control and 100% maize milling waste diets

There was no significant difference in the weight of both the kidneys and ceaca of rabbits fed the different diets. However there was a significantly higher protein in kidneys and ceaca of rabbits fed the 50% maize milling waste diet. Table 5 shows the level of some serum enzymes The plasma glucose in rabbits fed 50% maize milling waste diet was higher than those rabbits fed the control ands 100% maize milling waste diets by 7.2% and 3.26% respectively, but the differences were not statistically significant.The other enzymes had similar values with no significant differences among the treatments.

The alkaline phosphatase level generally increases when calcium status is subnormal because there is tendency for bone demineralization to occur, (14)

The same can be said of serum GOT and serum GPT, which are normally low in the blood but becomes high when the plane of nutrition is low or when there is an occurrence of liver damage.(14).

Conclusion And Application

1. The results from this study on utilization of maize milling waste by rabbits, suggest that rabbit performances can be substantially promoted , using different levels of maize milling waste to replace maize, with optimum growth level obtained at 50% inclusion
2. The lack of any significant difference in blood constituents suggests that the maize milling waste used at 50% and 100%levels of inclusion met the nutrient requirements of the rabbits especially the calcium and phosphorus need of the rabbits.
3. The results suggest that maize milling waste could be used to replace maize in the diet of rabbits at up to 100%inclusion with no apparent adverse effects.

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