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The Effect of Maize Cob Meal (MCM) on Performance and Economy of Feed Conversion of Growing Rabbits.

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Target audience: Animal Scientist, Feed Millers, Farmers

Abstract

A feeding trial was conducted with thirty (30) weaner rabbits to investigate the nutritive potentials of maize cob meal (MCM). Thirty mixed breed rabbits were used and randomly assigned to treatment T1, T2, T3, T4 and T5 in which MCM replaced maize at 0, 5, 10, 15 and 20% weight for weight respectively at the rate of six (6) rabbits per dietary treatment. Results of preliminary experiments showed that MCM contained ME of 2104kcal, CP of 3.0%, cellulose of 34%, NDF of 70.63%, C of 44%. The rabbits were fed and given drinking water ad-libitum for the twelve-week experimental duration during which their performance, carcass quality and economic analysis were evaluated. Experimental diets depressed all the growth parameters measured except feed conversions ratio when MCM exceeded 10%. Average daily feed intake was in the range of 34.84-50.01g while average final weight range was 1215.83-1625g. The diet also affected the economy of feed conversion such that feeding of dietary treatments resulted in a positive net revenue of N 398.31 to N 682.31 per rabbit. It can be concluded that maize cob meal can replace maize in growing rabbit diet up to 10% without adverse effect on the performance parameters.

Key words: Economy of feed conversion; Maize Cob Meal; Performance and Rabbit

Description of problem

The rising prices of livestock feeds especially in Nigeria and the scarcity of conventional proteins and energy concentrates for the formulation of feeds have forced the animal scientists in Nigeria to search for attractive, cheaper and readily available protein and energy sources. These efforts have produced accumulating evidence that alternatives such as palm kernel cake, Bambara groundnut meal, pigeon pea meal, mango seed kernel meal, rubber seed meal and maize cob meal, can be used for feeding livestock, especially poultry, pigs and rabbits with encouraging results (1).

Maize is a major energy feed ingredient, like other cereals, it is in short supply, leading to very high prices at certain

periods of the year (2). To reduce the cost of feeding livestock, which competes directly with human beings for the same feedstuffs, attempts have been made to use alternative sources of protein and energy. These have mostly been of agro-industrial by-product origin which is not directly utilizable by man. A possible potential benefit is dietary inclusion of maize cob meal a widely available crop residue that is abundant in the tropical areas of the world, when treated and used in rabbits feeding, it could reduce the cost of production and improve the quality of their carcasses (3). Investigating the possible utilization of fibrous foodstuff in rabbit diets is common and of particular importance in Nigeria, as many indigenous ingredients and their by-products are fibrous (4). However, in some situation where there may exist readily available high energy feed ingredients, it may be posible to replace part of the maize used in practical type rabbit diet with maize cobs meal.

Rabbit production has a considerable potential in the developing countries for the supply of the much needed animal protein due to the low capital investment and space requirements, short generation interval, rapid growth rate, high reproductive potential and ability to utilize the abundant forages and fibrous agricultural by- products (5; 6 and 7). In spite of these advantages, rabbit production has not received the desired attention in the tropics. Productivity is usually 50% or less of what is typical in the temperate countries (5). While high temperature (causing heat stress and discomfort) may have contributed to the low productivity (8), however, inadequate and high cost of feed ingredients brought about mainly by the stiff competition between people and monogastric animals such as the rabbit and poultry for grains, which is the major constraint (9).

The study was conducted, to investigate the effect of feeding graded level of maize cob meal on the performance of rabbits and to determine the cost/benefits of using maize cob meal in rabbit's diets.

Materials and Methods

Experimental site:

The experiment was carried out at the Rabbits Unit of the Livestock Teaching and Research Farm of the University of Agriculture Makurdi, Benue State, Nigeria. Makurdi lies within the Guinea Savannah region of Nigeria and located at latitude 07º 41'N, 08º 37'E Southern Guinea Savannah with a climate that has two distinct seasons. The wet season starts in April and end in October while the dry season starts from November through March. High temperature is experienced between February and April, while the harmattan with cool chilly weather is experienced from December to early February. Annual temperature ranges between 21ºC in January and 35ºC in March, with an annual rainfall of 1500mm-1800mm. Relative humidity ranges between 69% in August/ September and 39% in January (10).

Source of maize cob meal

Maize cob meal was source from the local farmers in Ikom LGA of Cross River State. The cobs were dried in the

sun for about 6 days to reduce its moisture content to about 10%. After which the cobs was ground in a heavy-duty high rotation harmer mill to obtain a suitable sieve sizes of 3mm on average particle, for chemical analysis and feed formulation.

Design and Management of experimental animals

A total of thirty (30) weaned rabbits with average weight of 355.00g of mixed breed (New Zealand and American Chinchilla) and mixed sexes were used for the experiment, they were obtained from a local farmer in Ibadan. The rabbits on arrival were allowed to acclimatize for 7 days and maintained on a similar diet. They were then weighed and randomly allocated to treatments. The rabbits were assigned to the five treatments in a Completely Randomized Design (CRD) with one rabbits per replicate. They were then fed on their various diets daily for 12 weeks. The rabbits were house individually in wire mesh cages measuring 60 x 40 x 40 cm and containing a feeder and a drinker. Each rabbit was inspected for good health. Standard health/sanitation procedures were strictly adhered to during the experiment.

Experimental diets

Five experimental diets were formulated such that maize cob meal was included at 0, 5, 10, 15, and 20% levels in the diets. The experimental Treatments were represented by T1, T2, T3, T4 and T5. Five experimental diets were formulated as shown in Table 1.

Table 1: Ingredient and Nutrient Composition of experimental diets (%)

Ingredients	T_1 (control)	T_2 (5%)	T_3 (10%)	T_4 (15%)	T_5 (20%)
Maize	43.72	38.72	33.72	28.72	23.72
Maize cob meal	0.00	5.00	10.00	15.00	20.00
Rice Offal	21.80	21.80	21.80	21.80	21.80
Full Fat Soybean	19.54	19.54	19.54	19.54	19.54
Groundnut cake	9.74	9.74	9.74	9.74	9.74
Palm Oil	2.50	2.50	2.50	2.50	2.50
Bone ash	2.00	2.00	2.00	2.00	2.00
Premix	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Analyze nutrient composition (%)					
Crude protein	17.01	16.72	16.45	16.13	15.90
Dry Matter	90.82	92.46	92.27	92.08	91.98
Crude protein	18.38	17.50	17.00	16.50	16.00
Ether Extract	11.88	7.95	7.57	6.98	7.86
Ash	8.33	7.85	8.99	8.52	8.23
Crude Fiber	9.84	10.40	11.43	11.95	12.05
NFE	44.29	49.39	47.29	47.65	48.18
ME (Kcal/kg)	2954.14	2851.16	2741.75	2763.04	2642.48

Each 1kg of vitamin/mineral premix manufactured by BEAUTS Co. Inc. Man, U.S.A., contains Vitamin A 220,000, Vitamin D 66,000, Vitamin E 44, 014; Vitamin K 88 mg; Vitamin B 12; 0.76 mg; Niacin 1 122 mg, Calcium 27%, Phosphorus 10%, Iron 0.6%, Zinc 0.35%, manganese 0.25%, Copper 0.06%; Iodine 0.002%, Cobalt 26 ppm, Selenium 4pp. ME = Metabolizable Energy, NFE = Nitrogen Free Extract

Metabolizable Energy of the maize cobs was calculated according to the formula of (30). That is ME = (37 x %CP + 81 X %EE + 35.5 X %NFE) Kcal/kg

Where ME = Metabolizable Energy, CP = Crude Protein, EE = Ether extract, NFE = Nitrogen Free Extract

Chemical analysis

The proximate analysis of maize cob meal and experimental diets was carried out according to (11). The characterization of the crude fiber of Maize cob meal was done as described by (12), while the Elemental composition was carried out with the method of CHNSO Analysis (Carbon, Hydrogen, Nitrogen, Sulphur and Oxygen) as described by (13).

Experimental Procedure/Parameters

Data were collected on the following parameters:

Average daily Feed Intake (FI)

The rabbits in each treatment were fed weighted amounts of their group diets daily and fresh water given *ad-libitum.* Feed intake was determined by obtaining the differences between the quantity of feed offered and the left over weekly. The average daily feed intake of all the rabbits was obtained by dividing the total feed intake of the rabbits during the period under study by 84 days.

Average daily Weight Gain (ADWG)

The animals were weighed at the beginning of the experiment and weekly thereafter to obtain the weekly weight in order to determine the growth rate. The average daily weight gain per rabbits was obtained by subtracting the initial weight from the final weight gain of each rabbits and dividing by 84 days.

Feed Conversion Ratio (FCR)

FCR was calculated as the ratio of average daily feed intake to average daily weight gain.

FCR = (Weight of feed intake/Weight gain)

Economy of feed conversion:

The cost per kilogram feed and the cost of processing of each experimental diet were determined based on the current prices of feed ingredients in Makurdi. The cost of feeding the rabbits on a particular diet for the period of the study was also calculated as the product of the cost per kilogram of the diet and feed intake. Feed cost/kg weight gain was also calculated by dividing the Cost of feed intake/rabbit (Ɛ) by the Average total weight Gain (kg). The net profit was computed as the selling price of table rabbit less the total cost of production. Consideration was given to cost of medication, labour and depreciation of asset (housing, feeder and drinker)

Statistical Analysis

All data obtained were subjected to Analysis of Variance (ANOVA) using (14)

Table 2: Proximate Composition of Maize Cob Meal

Constituents	Proportion (%)
Dry Matter	92.00
Crude Protein	3.00
Ether Extract	0.50
Crude Fiber	34.00
Ash	1.50
Nitrogen Free Extract	55.00

Mean values of three (3) determination

Characterization of Crude Fiber Content of Maize Cob Meal (MCM)

The characterization of crude fiber content of maize cob meal is shown on Table 3. The values obtained as cellulose 34.70%, hemicelluloses 19.05%, ADL = 16-88% was different when compared to that reported by (17) that MCM contain 45.6% cellulose 39.8% hemicelluloses and 6.7% high on dry bases but were higher to values reported by (18) who found average values of 31.367% cellulose and 14.9% lignin, on average for 35 hybrids of maize. These differences could also be attributed to varieties and location.

Table 3: Characterization of Crude Fibre Content of Maize Cob Meal

Constituents	Proportion (%)
Cellulose	34.70
Hemicelluiose	19.05
Neutral Detergent Fiber	70.63
Acid Detergent Fiber	51.58
Acid Detergent Lignin	16.88

Mean values of three (3) determination

Elemental Analysis of Maize Cob Meal (MCM)

The Mineral content of maize cob meal is shown on Table 4. The values obtained as carbon 44.0%, hydrogen 7.0%, oxygen 47.0% and nitrogen 0.4% shows a slide differences from the report of (19) who reported carbon content of 48.4%, hydrogen 5.6%, nitrogen 0.3%, and oxygen 44.3%, on a moisture free basis and (20) also reported similar values of carbon 46.58%, hydrogen 5.87 %, oxygen 45.46%, nitrogen 0.47%. These differences also may be attributed to varietal and location differences.

Table 4: Elemental Composition of Maize Cob Meal

Element	Proportion (%)
Carbon	44.00
Hydrogen	7.00
Oxygen	47.00
Nitrogen	0.40
Trace Elements	1.60

Mean values of three (3) determination

Performance of Rabbits Fed diets containing Maize Cob Meal

The data on feed intake, weight gain, feed conversion ratio and mortality are presented on Table 5. The rabbits were equalized in weight before they were assigned to the various diets. Significant difference ($p<0.05$) was observed in final body weight, daily weight gains and daily feed intake.

Results on the performance of rabbits revealed that average daily feed intake decreased with increase in level of maize cobs meal in the diets above 10%. This decrease in feed intake is probably due to high levels of fiber content in the diet which make it unpalatable when compare to the control and 5 - 10% MCM diet. These results do not agree with the finding of (21), who reported that the rabbits can tolerate a wide range of crude fiber in the diet provided energy density is adequate.

The highest daily feed intake 50.1g/day/rabbit was observed in treatment 2 with 5% MCM, while the lowest daily feed intake 34.84 g/day/rabbit was obtained in rabbit fed diet T_5 containing 20% MCM. The figures reported here (10.46 to 15.17g/day/rabbit) for average daily gain were lower than 18.20 to

19.20g/day/rabbit reported by (22) but they fall within the range of 10 to 20g/day/rabbit which (5) found to be normal for most rabbits reared in the tropical environment. The daily weight gains reported in this study (10.46g/day to 15.17g/day) are higher than the values 8.43-10.38g/d recorded by (6) for rabbit fed raw and cooked *Delonix regia* seed meals, the values were in agreement with 10.99 to 15.18g/day/rabbit (23). this difference is attributed to the high temperatures in the tropics. The feed conversion ratio (3.91 to 4.61) obtained in this study were higher than 3.08 to 3.69 reported by (24) but lower than the values 4.81 to 6.0 obtain by (23). The rabbits in T_2 and T_3 diet had a better FCR (4.00 and 3.91) respectively than the control (4.35). From these results, it can be suggested that FCR was improved by the dietary inclusion of MCM. These results agree with previous findings reporting that dietary inclusion of many agriculture byproducts including carrot-top or maize cobs, dried watermelon, wheat bran or beet pulp, pea vines hay or pea pods hulls have resulted in better FCR values as fed to rabbits (25), (26), (27) and (28).

Table 5: Performance of Rabbits Fed Diets Containing Maize Cob Meal

Parameters	T_1 (control)	T_2 (5%)	T_3 (10%)	T_4 (15%)	T_5 (20%)	SEM
Av. Initial Weight (g)	353.33	355.00	355.00	356.67	356.67	
Av. Final Weight (g)	1591.67^{ab}	1625.00^{a}	1455.00^{bc}	1355.83^{cd}	1215.83^{d}	58.06*
Av. Daily Feed Intak e (g)	44.85^{b}	50.01^{a}	41.38^{c}	38.07^{d}	34.84^{e}	1.20*
Av. Daily Weight Gain (g)	14.84^{ab}	15.17^{a}	12.90^{bc}	11.90^{cd}	10.46^{d}	0.70*
Feed conversion Ratio	4.34	4.00	3.91	4.11	4.45	0.28
Mortality	0	0	0	0	0	0

^{abcde} Mean on the same row with different superscripts are significantly different ($p<0.05$), Av. = Average, SEM = Standard Error of Mean, *= Significant difference ($p<0.05$)

Economy of feed conversion of Rabbits Fed Diet Containing Maize Cob Meal

The economy of feed conversion of rabbits fed diets containing maize cob meal is presented on Table 6. Feeding dietary treatments resulted in a positive net revenue of N 398.31 to N 682.31 per rabbit. The cost per kg of each treatment feed (N68.14 to N75.67) was lower in MCM based diets than the control diet (N78.14). This low feed cost among the MCM treatments group did not however translate to higher profit than the control after 5%MCM inclusion, while Profit (N682.31) per rabbits in 5% MCM inclusion was better than the profit (N605.41) per rabbits in the control diet. This result agreed with the findings of, (31) who found that peanut hay inclusion to replace clover hay contributed in lowering the feeding cost and increased the profit. Similarly, (28) indicated that the best profit values were for rabbits fed pea pods hulls or pea vines hay inclusion over the control diet. Economic utilization is one of the major reasons advanced by (8) for the use of alternative feeds.

Table 6: Economic Analysis of Rabbits Fed Diets Containing Maize Cob Meal

Parameters	T_1 (control)	T_2 (5%)	T_3 (10%)	T_4 (15%)	T_5 (20%)
Feed cost per Kg (Ɛ)	78.14	75.64	73.14	70.64	68.14
Average feed intake/rabbit (kg)	3.77	4.20	3.48	3.20	2.96
Cost of feed intake/rabbit (Ɛ)	294.59	317.69	254.53	226.05	201.69
Cost per young rabbit (Ɛ)	800.00	800.00	800.00	800.00	800.00
Miscellaneous/rabbit (Ɛ)	200.00	200.00	200.00	200.00	200.00
Total cost of Production (Ɛ)	1294.59	1317.69	1254.53	1226.05	1201.69
Average final weight/rabbit (kg)	1.59	1.63	1.46	1.36	1.22
Sales per mature rabbit (Ɛ)	1,900.00	2,000.00	1,800.00	1,700.00	1,600.00
Profit/rabbit (Ɛ)	605.41	682.31	545.45	473.97	398.31
Average total weight Gain (kg)	1.25	1.27	1.08	1.00	0.88
Feed cost per kg weight Gain (Ɛ)	368.23	403.47	274,89	226..05	177.49

Conclusion and applications

1. The characterization of the crude fiber content of the test ingredient revealed that MCM did not interfere with nutrients and chemicals absorption by rabbits since dietary fiber can act by changing the nature of the contents of the gastrointestinal tract and by changing how other nutrients and chemicals are absorbed.
2. The data on performance showed that the rabbits gained weight in all the treatment but was highest in T_1 and T_2 but numerically T_2 had the highest values in growth parameters.
3. The economy of feed conversion revealed that with maize cobs meal, profit is maximizing at 5% level of inclusion and also it cost less to produced 1kg live weight of rabbit above 5% level of inclusion of MCM.
4. Finally, it has been established in this study that, MCM can replace maize in rabbit diets up to 5% comfortably as revealed from the daily weight gain, feed conversion ratio, and economy of feed conversion of rabbits fed diet containing maize cob meal. It can therefore be Concluded that MCM can be included in growing rabbit diets up to 10% as a source of energy.

Applications

Based on the results obtained from the study, the following steps can be applied:

1. For optimum performance of rabbits, the replacement of maize with MCM in rabbit growing diet should not exceed 10% level of inclusion,
2. Pelletizing of MCM base diets for rabbits is also recommended for maximum utilization of MCM,
3. Further study should be carried out to know the best level of inclusion of MCM between 5% and 10%.
4. More so the use of sweeteners is recommended to improve the palatability of MCM which will

further improved feed intake in rabbit's diets.

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