Replacement value of millet for maize as a source of energy in the diets of growing rabbits.

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Abstract: The study was conducted to determine the replacement value of millet for maize as a source of energy in the diets of growing rabbits. Forty weaned mongrel rabbits were used for the study. The rabbits were randomly assigned to five dietary treatments with eight rabbits per treatments. The rabbits were kept for eight weeks during which they were fed formulated feed in which maize was replaced with millet at 0, 25, 50, 75 and 100% levels in the diets. 1 control, 2, 3, 4, and 5 respectively replacing maize as a source of energy. The results on the performance of the rabbits fed the experimental diets for daily feed intake showed no significant ($p > 0.05$) difference in all the treatments. Daily water intake was highly significant ($P<0.001$) with the highest value recorded in T2 (211.09ml) and lower value in T1 (148.9ml). No significant ($P>0.05$) difference recorded in the initial weight, while the final weight was different ($P<0.05$) in T2, T4 and T5, but not significant ($P>0.05$) in T1 and T3. Daily weight gain showed no significant ($P>0.05$) difference among T2, T4 and T3, T5 but significantly different ($P<0.05$) in T1. Feed conversion was recorded significant ($P<0.05$) in T4, while no significant ($P>0.05$) difference in T1, T2 and T3, T5. The carcass evaluation revealed that pelt, liver and lungs were recorded highly significant ($P<0.001$) difference. Kidney and kidney fat were high in significant ($P<0.01$) difference. Dressing percentage was also significant ($P<0.05$) while live weight, carcass weight, head, tail, small intestine, large intestine, spleen, heart and stomach were all similar across the treatments. In the economic analysis, the total feed intake was observed higher in T5 (3.96kg) and least feed intake in T4 (3.81kg). T1 had the highest feed cost/kg. Total weight gain was higher in T4 and feed cost/gain was observed high in T1 with the value (N78.28).
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Key Words: millet (*Pennisetum typhoid*), Energy source, rabbit.

Introduction

Feed alone account for up to 70% of the total cost of production (Ubosi et al, 2000; Okorie, 2003). The major constraint in animal production has been the high cost of feeding which is being compounded with the present economic depression and the fact that most of the feed ingredients such as maize, sorghum and soybean's used in preparing rabbits diets face serious competition from man and other animals as food (Ijaya *et al.,* 2002).

Maize (Zea mays) is one of the most important cereal crops grown mainly for human consumption. However, maize has been the chief source of energy in monogastric animals especially poultry and rabbits feeding in Nigeria. Therefore, the demand for maize exceeds the supply as a result of its additional use as component of livestock feeds, baking, and brewing industry (Dada et al, 1998). The need to find alternative ways of providing another source of energy to rabbits is therefore long overdue.

Millet (*Pennisetum typhoid*) is commonly grown in drier areas of Nigeria and tropics. It has very small grain and like sorghum is susceptible to pests like quells birds (Uchegbu et al; 1998). Millet is the dominant food crop in the Sahel zone of Nigeria, and ranks second only to sorghum in the Sudan Savannah Zone, (Nwasike et al; 1982). Millet is superior and higher in tryptophan than maize though close to wheat. Lysine is however the most limiting amino acid of the crop (Olomu; 1995). Oyenuga (1988) reported the chemical composition of millet as follows; 88.78% dry matter, 9.02% crude protein, 4.99% ether extract, 0.66% crude fibre, 83.20% nitrogen free extract and 2.13% total ash. NRC (1996) reported that millet has no tannin, but contains 5.7% oil and is higher in protein and mineral content than maize and sorghum. This study was therefore designed to determine the replacement value of millet for maize as a source of energy in the diets of growing rabbits.

Material And Methods

Experimental Site

The experiment was conducted at the Abubakar Tafawa Balewa University Rabbits Research farm Bauchi. The University is located at Yelwa along Tafawa Balewa Road, Bauchi State Occupied a land area of about 60, 000sq km (approximately 7% of Nigerian's total land area. The state lies between latitude 9^0 30N and 12^0 30'N and longitude 8^0 42'E

and 11^0 8'E. The average rainfall ranges from 600mm in the north to 1300mm in the south west part of the state. The rainfall pattern is immoderate and the rain starts from June to September in the northern part and from April to October in the south-western part of the state, and maximum temperature of 35^0C and minim of 18^0C (B.S.A.D.P, 1999).

Experimental Animals and their Management

The rabbit house was cleaned and disinfected before the start of the experiment. Similarly, the ages, plastic feeders, and water container were thoroughly washed and disinfected. Forty mongrel rabbits were used for the experiment. The rabbits were individually housed in a long tier cages supported at base with wooden planks about 80cm from the floor level. They were netting and cages were properly five. The rabbits were fed every morning at 7.00am and residue left were collected and weighed before the next feeding.

Measurements taken

At the beginning of the experiment, rabbits were individually weighed and initial weights were taken and the individual weights were taken at weekly interval for six (6) weeks using weighing scale. The feed and water consumption was also determined by the intake and left over of feeds recorded.

Statistical Analysis

Data obtained were subjected to analysis of variance (NOVA) in a completely randomized design (Steel and Torrie; 1980). Differences between means were separated using Duncan's multiple range test (DMRT).

Experimental Diets

Five Isonitrogenous diets (16% crude protein) were formulated in which maize was replaced with millet at 0, 25, 50, 75 and 100%, such that the two ingredients collectively occupy 50% of the diets. The ingredients composition of the experimental diets is shown in Table 1. The forty weaned mongrel rabbits were randomly assigned to the five dietary treatments with eight rabbits per treatment. The experimental lasted eight weeks excluding two weeks adaptation period.

Table 1: Ingredients composition of Experimental Diets (%)

Ingredients	Treatments				
	1	2	3	4	5
Maize	50.00	37.50	25.00	12.50	0.00
Millet	0.00	12.50	25.00	37.50	50.00
Maize offal	28.20	28.20	28.20	28.20	28.20
Soya bean	18.80	18.80	18.80	18.80	18.80
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50	0.50
Calculated nutrient content:					
Crude protein %	16.00	16.00	16.00	16.00	16.00
Crude fiber %	5.80	6.35	7.10	7.85	8.60
ME (Kcal/kg)	3038.71	3010.66	2975.52	2969.13	2905.58

Table 2: Performance of rabbits fed the experimental diets

Parameters	**Treatments**					**SEM**	**LS**
	1	**2**	**3**	**4**	**5**		
Daily Feed intake (g)	91.50	91.99	93.60	90.62	94.35	1.95	NS
Daily water intake (ml)	148.04^d	153.34	165.21^c	189.58^b	211.09	2.36	***
Initial weight (g)	1215.30	1278.20	1220.30	1214.50	1254.00	139.16	NS
Final weight (g)	1883.94^c	1935.50^d	1999.82^c	2075.50^a	2027.22	294.56	*
Daily weight gain (g)	15.92^c	15.88^a	18.56^b	20.50^a	18.41^b	2.15	*
Feed conversion	5.75^a	5.88^a	5.04^b	4.42^c	5.12^b	0.87	*

a, b – Means in the same row with different superscripts are significantly different (* = P<0.05, ***=P<0.001); NS = Not Significant, SEM = standard error of mean, LS = Level of significance

Table 3: Carcass characteristics and organ quality of rabbits fed the experimental diets

	Parameters / Treatments						
	1	**2**	**3**	**4**	**5**	**SEM**	**LS**
Live weight	1073.70	1055.00	1010.80	1098.00	1174.80	144.99	NS
Carcass weight	472.75	532.00	498.25	580.50	695.00	80.18	NS
Dressing %	40.76^{c}	50.18^{ab}	48.85^{ab}	53.90^{ab}	59.28^{a}	4.50	*
Head	10.56	8.65	8.46	9.95	9.83	1.76	NS
Pelt	8.10^{d}	9.05^{c}	10.03^{c}	22.05^{a}	15.58^{b}	2.84	***
Tail	0.40	0.48	0.78	0.68	0.63	0.14	NS
Small intestine	7.40	6.75	8.45	9.53	8.38	0.93	NS
Large intestine	9.88	9.35	11.48	12.06	9.53	1.34	NS
Spleen	0.18	0.13	0.15	0.25	0.23	0.05	NS
Heart	0.23	0.23	0.23	0.23	0.33	0.05	NS
Liver	1.38^{b}	1.10^{b}	3.38^{a}	3.33^{a}	3.05^{a}	0.53	***
Lung	0.28^{c}	0.53^{ab}	0.65^{a}	0.68^{a}	0.70^{a}	0.08	***
Kidney	0.43^{b}	0.50^{b}	0.95^{ab}	1.23^{a}	1.40^{a}	0.26	**
Kidney fat	0.48^{b}	0.45^{b}	0.88^{a}	1.03^{a}	1.05^{a}	0.16	**
Stomach	5.45	4.50	5.55	6.38	6.05	0.80	NS

a, b – Means in the same row with different superscripts are significantly different (* = P<0.05, **=P<0.01, ***=P<0.001); NS = Not Significant, SEM = standard error of mean, LS = Level of significance

Table 4: Economic analysis of replacing maize with millet as source of energy in the diets of growing rabbits

Parameters	Treatments				
	1	2	3	4	5
Total feed intake (kg)	3.84	3.86	3.83	3.81	3.96
Feed cost (₦/kg)	53.40	50.90	48.40	33.80	43.40
Total feed cost (₦)	205.10	196.50	190.20	128.80	171.90
Total weight gain (kg)	2.62	.63	3.12	3.44	3.09
Feed cost (₦/kg gain)	78.28	74.71	60.96	37.44	55.63

Results

Performance of rabbits fed experimental diets.

Data on daily feed intake is presented in table 2. There were no significant (P>0.05) difference among 0,25,50,75 and100% level of replacement of the diets across all the treatments. The DFI value ranges from T1 90.62 - T5 94.35. Obtained in this study. which was higher than values 56.19-66.28g reported by Agunbiade et al. (2002); Ajayi et al. (2007). Although, it appears that the rabbits consumed more feed as the level of replacement increases. Daily water intake was highly significant (P<0.001) among the treatments means with the higher value recorded in T5 (211.09ml) and lower value in T1 (148.04ml).

No differences (P>0.05) across the treatments means in the initial weight. While there were significant (P<0.05) difference in T2, T4 and T5 in the final weight of the experimental animals but no differences (P>0.05) in T1 and T3. The highest value recorded was in T4 (2075.50 and the least in T1 (1883.94). Daily weight gain was recorded significantly (P<0.05) different in T1 and no (P>0.05) differences across the remaining treatments. The values obtained in this study 15.88-20.50g was higher than value 13.01-15.03g recorded by Jokthan et al. (2003). And 11.13-12.14g by Ajayi et al. (2007). Although, the weight gain were lower than the 25-50g/day reported for temperate rabbits. (Deblas and Garvey 1975); Reddy et al., 1977. The differences may be due to breed and environmental factors. Ekpan yong(1984) and Aduku et al.,(1988) used New Zealand white rabbits, while Mongrels rabbits were used for this study. Gillespie (1992) observed that new Zealand white rabbits have faster growth and rate of gain than most othe breeds. Cheek (1987) also reported that rabbits of temperate origin have faster rate of gain than their tropical counterparts. The feed conversion ratio was recorded the same (P>0.05) in the mean seperation in T1, T2 and T3, T5 but different (P<0.05) in T4. The values were higher than 2.63-4.00 reported by Ayers et al. (1996); Okorie, (2003). But almost similar to that of 5.32-5.63 reported by Eustace

et al. (2003). Conversely, this is prior to the value (3.6) reported by Rastogi (1989) for rabbits fed pelleted concentrates, pelleting has been recommended as a way of minimizing selective feeding and consequent wastage of feed.(Lang 1981; Cheeke, 1979).

Carcass characteristics and organ quality of the experimental animals

The results on the carcass yield and internal organ characteristics were presented in table 3. The results showed no significant (P>0.05) difference across the processing methods for live weight, carcass weight, head, tail, spleen, small intestine, large intestine and stomach. Dressing percentage was recorded significant (P<0.05) difference in T1 and T5, but not significant in the remaining treatments. The values obtained in this study were low 40.76-59.28% than the range of 55.30±0.72-67.45±0.43% reported by Idowo et al, (2006). But comparable to 42.43-47.61% reported by Abdul et al., (2012). The values range obtained for weight of the Heart are similar to the values 0.24-0.26g reported by Onifade and Tewe (1982). The weight of spleen obtained in this study was higher than 0.05-0.07g by Ozung et al.(2011). The stomach weight were comparable to the results of Maryam (2008) who recorded approximately 3.90-6.35g for stomarch. Pelt was recorded highly significant (P<0.001) with the highest value in T4 (22.05g) and least value in T1(8.10g). liver was also recorded highly significant(P<0.001) higher value in T3(3.38g) and lower value in T2(1.05). lungs was significantly higher too (P<0.001) with the highest grams recorded in T5(0.70g) and least in T1(0.28g). kidney and kidney fat were observed significantly high(P<0.01) across the treatments means.

Economic analysis of the formulated feeds

The economic analysis of replacing maize with millet as a source of energy in the diets of growing rabbits is presented in table 4. The total feed intake recorded was 3.84, 3.86, 3.83, 3.81 and 3.96 for T1,T2,T3,T4 and T5 respectively. The total feed intake 3.96kg was observed high on the rabbits fed T5 while T4 recorded the least 3.81. T1 had the highest feed cost(₦ 53.40) while T4 recorded the least(₦ 33.80) cost decreases with increase in level of replacement. And for the total feed cost, it was recorded with highest value in T1(₦ 205.10) and lowest value in T4 (₦ 128.80) this indicate that the levels at 2,3,4 and 5 are more economical in supporting growth than the 1(control). T4 had highest total weight gain(3.44kg) and T1 with the least value(2.62kg). feed cost (₦ /kg gain) was estimated high in T1(₦78.28/kg) and low in T4(₦ 37.44/kg gain).

Conclusion

The results obtained from this study showed that substituting maize for millet as source of energy in the diets of growing rabbits has the potential of improving growth performance. It could be concluded that rabbit's diet can be incorporated with millet (*Pennisetum typhoid*) at varying levels without any adverse effects on growth performance, carcass and internal organ indices of weaner rabbits. Therefore, for the economic advantage in millet as a diets for energy source farmers should be encourage to embark on the cultivation of the crop.

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