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Growth Performance, Nutrient Utilization and Carcass Characteristics of Rabbits Fed Malted Sorghum Sprout (MSP) Based Diets

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Abstract: Twenty four hybrid weaner rabbits of both sexes were used to evaluate the usefulness of malted sorghum sprout. The rabbits were randomly allotted to four dietary groups of 6 rabbits and three replicates of 2 rabbits each. The MSP was incorporated into the diet at 0, 10, 20 and 30% levels. The experiment lasted for 56 days. Feed and water were supplied *ad libitum*. The performance characteristics, nutrient utilization, carcass characteristics and economics of production were measures of response. The result showed that, the final live weight and daily weight gain of rabbits on 0 and 20% MSP diets were highest ($p<0.05$). The daily feed intake of rabbits on MSP diets were significantly ($p<0.05$) lower than those on 0% MSP. The dry matter, crude protein and crude fibre digestibility significantly declined ($p<0.05$) as the level of MSP inclusion increases. Energy intake and energy retained followed a similar trend. Carcass weight, liver, kidney and heart weights were significantly ($p<0.05$) influenced by the dietary treatment. Less cost was incurred in producing a kilogram of rabbit when fed 20 and 30% MSP levels. 20% level of inclusion in rabbit diet could be of benefit in terms cost reduction and better growth.

Key words: Growth performance, nutrient carcass, malted sorghum spread

INTRODUCTION

The extremely high cost of feed presently being experienced by livestock industry in Nigeria has increased the feeding cost to about 70-75% of the total cost of production particularly poultry and rabbits. This development arises from explosion of population growth, which resulted in competition for available feed ingredient by man and animal. The interest of animal nutritionist in recent years has been to search for the cheaper, locally available and nutritionally viable alternatives. Such alternatives were found in agro-industrial by products and farm wastes among which is Malted Sorghum Sprout (MSP).

Malted Sorghum Sprout (MSP) is a by-product of malt processing companies. It is the dried roots and shoots of sorghum[1]. It is being turned out in large quantity in breweries and food confectioneries during malting. MSP has a lot of prospect as a feedstuff. It was reported to be rich in organic nitrogen and amino acids[1] though having low level of methionine and lysine. These amino acids are translocated from the grain to the roots and shoots during germination[2].

Malted Sorghum Sprout (MSP) has received little or no attention in terms of its use by rabbits. There are information on its utilization by growing and laying birds[3], rat[4,5]. This study therefore, seeks to explore the usefulness of malted sorghum sprouts and its effect on the growth and nutrient utilization of weaners rabbits.

MATERIALS AND METHODS

Malted Sorghum Sprouts (MSP) used in this study was obtained from a malt processing company in Agbara, Ogun State, Nigeria. Four Isocaloric and Isonitrogenous diets were formulated such that the first diet had 0% MSP (control) while the three others had 10, 20 and 30% MSP inclusion levels. The gross composition of the experimental diet is shown in the Table 1.

A total of twenty-four (24) six-week hybrid weaner rabbits of both sexes were used in this study. The rabbits were randomly allotted to four treatment groups (on weight equalization basis). Each treatment group was replicated three times with two rabbits per replicate. The rabbit were randomly allotted to the dietary treatment in a Completely Randomised Design (CRD). The experiment lasted for 56 days. Feed and water were given *ad libitum*.

The chemical composition of the test ingredient, test diets and gross energy were determined according to AOAC[6] methods. The energy content of the diets was

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Table 1: Gross composition of experimental diets (g kg^{-1})

	Diets			
Ingredients	0% MSP	10% MSP	20% MSP	30% MSP
Maize	480.00	475.00	450.00	410.00
Soybean meal	185.00	165.00	140.00	110.00
Wheat offal	300.00	225.00	170.50	140.50
MSP	0.00	100.00	200.00	300.00
Bone meal	20.00	20.00	20.00	20.00
Oyster shell	10.00	10.00	10.00	10.00
Salt	2.50	2.50	2.50	2.50
Premix	2.50	2.50	2.50	2.50
Total	1000.00	1000.00	1000.00	1000.00
Determined Analysis				
Crude protein	178.5	180.3	182.0	185.8
ME kcal/g	32.0	32.3	30.9	31.6
Crude fibre	78.7	72.1	93.2	97.9
Ash	102.1	107.6	108.9	112.4
Ether Extract	37.4	41.3	42.8	43.4

2.5 kg per tonne (Godomix): Vit. A. 10,000,000I.U, Vit D3. 2000,000I.U, Vit. E 2,000I.U, Vit. K 2250 mg, Vit. B1 1,750 mg, Riboflavin B2 1,800 mg, Pyridoxine B6 6.27 mg, Niacin 27500 mg, Vit. B12 15 mg, Pantothenic acid 7500 mg, Folic acid 7500 mg, Biotin 50 mg, Choline chloride 400 g, Manganese 80 g, Zinc 50 g, Iron 20 g, copper 5 g, Iodine 1.2 g, Selenium 200 mg, cobalt 200 mg, Antioxidant 125 g

determined using bomb calorimeter. Feed intake, live body weight, body weight gain and feed-to-gain ratio were determined weekly.

At the expiration of eight weeks, three rabbits per treatment were randomly selected and housed individually for one week metabolic study. Three days acclimatization period was allowed for the rabbits to adjust to the cage. A known weight of feed was given to the rabbits and the faeces voided were collected over a period of 4 day and weighed during the period. The faeces were oven dried at 105°C for 24 h. Total urine was collected in a bottle containing 0.01*M*HCL. Both faeces and urine samples were analysed for proximate composition and energy content according to AOAC[6]. At the end of the experiment, a rabbit per replicate was randomly selected and slaughtered. Carcass weight, dressing percentage and relative organ weights were determined.

The cost per kg feed and cost per kg weight gain were determined. Data collected were subjected to complete randomized design of analysis of variance[7]. Significant means were separated using Duncan's Multiple Range Test[8].

RESULTS AND DISCUSSION

The result of the proximate composition of MSP showed that it contained 248.5 g kg^{-1} Crude Protein (CP), 127.9 g kg^{-1} Crude Fibre (CF), 72.4 g kg^{-1} ash, 25.6 g kg^{-1} Ether Extract (EE) and 438.9 g kg^{-1} Nitrogen Free Extract (NFE), 51.3 mg kg^{-1} cyanide and 7.0 mg kg^{-1} tannin. The crude protein value obtained in this study is similar to 242.7 g kg^{-1} reported by [9]but lower than 350 g kg^{-1} reported by[1]. The difference in CP could be due to varietal differences in sorghum used. The CF obtained in this study was higher than the value (80g kg^{-1}) reported by oduguwa[5]. This may have resulted from a longer time of germination of sorghum prior malting. The roots and shoots may have undergone structural hardening.

Table 2: Performance characteristic of weaner rabbits fed MSP based diets

	Treatment				
Parameters	0%MSP	10%MSP	20%MSP	30%MSP	SEM
Initial body weight (g)	687.50	681.15	670.00	681.80	7.19
Final body weight (g)	1657.30^{a}	1543.80^{b}	1556.00^{ab}	1481.30^{c}	35.80
Total weight gain (g)	956.50^{a}	862.50^{b}	886.30^{b}	799.90^{c}	33.1
Daily feed intake (g)	58.50^{a}	51.50^{b}	52.26^{b}	50.12^{b}	4.01
Daily weight gain (g)	17.08^{a}	15.40^{ab}	15.83^{b}	14.38^{c}	0.60
Daily Protein intake (g)	10.45^{a}	9.25^{c}	9.51^{b}	9.21^{c}	0.32
Feed conversion ratio	3.43^{b}	3.34^{c}	3.30^{c}	3.49^{a}	0.26
Protein efficiency ratio	1.63	1.67	1.46	1.56	0.04

^{abc} mean on the same row having different superscript are significantly different

Table 3: Nutrient utilization of weaner rabbits fed MSP based diets

	Treatments				
Parameters	0%	10%	20%	30%	SEM
Feed intake (g)	83.52	83.21	83.44	79.61	1.01
Dry matter dig %	85.98^{a}	83.04^{b}	83.86^{b}	76.85^{c}	1.09
Ether extract dig. %	95.68^{a}	94.49^{b}	92.24^{c}	94.29^{b}	0.38
Crude protein dig. %	79.95^{a}	68.20^{b}	67.52^{b}	58.85^{c}	1.90
Crude fibre dig %	83.36^{a}	81.93^{c}	80.48^{d}	79.11^{b}	1.36
Ash dig %	89.24^{a}	86.26^{c}	82.48^{d}	88.04^{b}	0.86
NFE dig %	82.87^{a}	80.15^{b}	71.60^{c}	79.92^{b}	1.35
Energy retained (g)	245.68^{a}	245.49^{a}	229.77^{b}	229.44^{b}	2.93
Energy intake (g)	266.91^{a}	268.93^{a}	257.66^{b}	251.30^{c}	2.64
App. Energy dig %	92.05^{a}	96.28^{b}	91.8^{b}	89.18^{c}	0.38

^{abc} mean on the same row having different superscript are significantly different

Table 2 shows the growth performance of rabbits fed MSP based diets. The daily feed intake, daily weight gain, daily protein intake and feed conversion ratio were significantly ($p<0.05$) influenced by the dietary treatment. Their value reduces as the levels of MSP increases. The lower weight gain of rabbits on MSP diets may be due to the effect of cyanide (51.3 mg kg^{-1}) and tannin (7.0 mg kg^{-1}) in MSP and deficiency of some essential amino acids particularly methionine and lysine[10]. Chronic cyanide consumption depressed net protein utilization and hence, animal performance[11,4]. The low intake of MSP diets suggests that MSP is not palatable. The presence of tannin presents a somewhat bitter taste, thereby affecting acceptability and palability of feedstuff[12]. The trend for protein efficiency ratio and protein intake was largely similar which were in consonance with the observed trend for the performance parameters earlier discussed.

Table 3 shows the effect of MSP based diets on the nutrient digestibility by weaner rabbits. Crude protein digestibility significantly ($P<0.05$) decreases as the level of MSP increases in the diet. Tannin, known to confer astringency to foodstuff and complex proteins, affects food digestibility and decreases nitrogen utilization by the animals[12]. This may be responsible for the observation above. Crude fibre and ash digestibility follow a similar

Table 4: Carcass characteristics of weaner rabbits fed MSP based diets

	Treatments				
Parameters	0%MSP	10%MSP	20%MSP	30%MSP	SEM
Live weight (g)	1557.30	1533.43	1547.63	1480.30	32.30
Carcass weight (g)	979.31[a]	932.84[ab]	958.13[a]	886.47[c]	30.10
Dressing %	62.88	60.83	61.91	59.89	11.30
Liver (%LW)	3.50[c]	3.73[b]	3.80[a]	3.86[a]	0.13
Kidney	1.72[a]	1.61[b]	1.52[b]	1.55[b]	0.08
Heart	0.82	0.76	0.78	0.72	0.07

[abc] mean on the same row having different superscript are significantly different

Table 5: Cost evaluation of weaner rabbits fed MSP based diets (N)

Parameters	0%	10%	20%	30%	SEM
Cost /kg weight gain	237.01	227.84	208.80	197.11	5.23
Cost of feed intake /day	3.98[a]	3.51[b]	3.29[bc]	2.83[c]	0.12
Cost/kg of feed	34.60	34.21	31.52	28.28	

[abc] mean on the same row having different superscript are significantly different

trend as CP digestibility. Energy intake and energy retained of rabbits fed 0 and 10% MSP diets are similar ($p>0.05$) but significantly higher than those on higher levels of MSP.

Table 4 shows the carcass characteristics of rabbits fed experimental diets. The carcass weight, Liver, kidney and heart were significantly influenced by the dietary treatment. The similarity ($p>0.05$) in carcass weight value recorded for rabbits fed 0, 10 and 20% MSP diets is an index of superiority of these diets. Carcass weight could be said to be of much importance to consumer than the live weight, since the fur are so removed and this will determine the amount of weight required by the consumer. Liver weight (expressed as % live weight) was significantly ($p<0.05$) higher in rabbits fed higher (20 and 30%) levels of MSP. This may be due to the reaction of liver to the handling of tannin and cyanide content MSP. The diets significantly ($p<0.05$) differ across the treatment in feed cost per kg weight gain. (Table 5). Less cost was incurred in producing a kilogram of rabbit when fed 20 and 30% MSP levels to rabbits. Cost of feed intake per day was significantly ($p<0.05$) reduced with the increasing levels of MSP. The highest feed cost as a result of feeding 0% MSP is the consequence of the high level of maize and soybean all of which are costly as against MSP which is relatively cheap.

CONCLUSION

In conclusion, 20% level of MSP inclusion in rabbit diet could be of benefit in terms of reduction in cost of production and better growth.

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