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GROWTH PERFORMANCE OF RABBITS FED SWEET POTATO VINE-BASED DIETS SUPPLEMENTED WITH METHIONINE AND LYSINE

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ABSTRACT

In a ten week feeding trial, seventy-two (72) weaned mixed breed rabbits aged six to seven weeks old, with initial live weight ranging from 600g to 1130g, were randomly allocated to twelve treatment diets in a 3 x 2 x 2 factorial experiment in a completely randomized design. The factors were: (1) Sweet potato vine at levels of 0, 15 and 30%, (2) methionine at low (0.07 kg) and high (0.10 kg) supplementary levels and (3) lysine at low (0.12 kg) and high (0.15 kg) supplementary levels. Results obtained showed that sweet potato levels gave similar final weight, weight gain, average daily gain and feed conversion efficiency.15% sweet potato vine gave the least feed cost, while 30% sweet potato vine gave the least feed cost kg^{-1} gain. Final weight, weight gain, average daily weight gain, feed conversion efficiency, feed cost and feed cost kg^{-1} gain were not affected by methionine or lysine levels. Low lysine encouraged higher daily feed intake than high lysine supplementation. There was no interaction between sweet potato vine level and methionine supplementation on growth parameters except daily feed intake and feed cost.Control (0%) and 15% sweet potato vine at both low and high methionine levels encouraged higher daily feed intake, while levels of sweet potato vine at high lysine supplementation encouraged only daily feed intake. There was no interaction between methionine and lysine supplementation level on final weight, weight gain, average daily weight gain, daily feed intake, feed conversion efficiency, feed cost and feed cost kg^{-1} gain.Feed cost was affected by the interaction between sweet potato vine and methionine and, between sweet potato vine and lysine.Feed cost was highest for rabbits on 0% sweet potato vine at high lysine supplementation while rabbits on 15% sweet potato vine at low lysine supplementation level had the lowest feed cost. Feed cost kg^{-1} gain was also lower on 15 and 30% sweet potato vine meal than 0% sweet potato vine meal diet at low methionine,low lysine; high methionine, low lysine; and high methionine,high lysine supplementation levels. It is therefore recommended that 30% sweet potato vine could be fed to rabbits while for supplementation, 15% sweet potato vine mealsupplemented with high methionine, low lysine;or low methionine, high lysine would enhance profitability for the farmer.

Keywords: Forage meal, sweet potato vine, lysine, methionine, growth, rabbits

INTRODUCTION

Feeding rabbits diets with high forage content as fresh or dry is a long term practice.This is done either to increase fibre intake in order to keep the gut in good working order or to utilize the vast forage resources available to good advantage.Fresh foliage used to replace 10% of the cereal concentrate in the diet gave satisfactory performance in terms of weight gain, feed conversion and also with regard to mortality and herd culling (Mora *et al*., 1991). The feeding of sweet potato forage to animals is widely practiced by farmers and researchers alike. Feed intake and feed conversion ratio tended to increase with increase in sweet potato vine;

indicating that sweet potato vines are palatable for pigs (Duyet *et al*., 2003) However, feed intake of rats was depressed when the diets included sweet potato vine silage (Bui NhuHuyPhuc, 2000). Elamin *et al*. (2011) obtained better feed conversion ratio by feeding sweet potato to rabbits than the other rations. Problems which preclude the use of some plants as protein sources for monogastric animals are their limited palatability and high levels of fibre, which may limit feed intake and availability of nutrients (Rosales *et al.*, 1993; Bui NhuHuyPhuc, 2000).

In poultry, however, dried sweet potato vines included at up to 16% in broiler diets were shown to be as efficient as alfalfa meal for growth rate, feed intake or feed efficiency (Farrell *et al*., 2000). Thirty percent (30%) inclusion rate of ensiled sweet potato foliage did not significantly affect growth performance in growing pigs (Le Van An *et al*., 2005). Higher inclusion rates of sweet potato at 40 and 60% DM reduced growth by 16 and 30%, respectively (Hoang Huong Giang *et al*., 2004). The inclusion of high level of sweet potato vines in the diet reduced feed intake (Domínguez and Ly, 1998; Phuc *et al*., 2001). Foliage dry matter intake was higher when sweet potato vines were all or part of the foliage supplement in the diet of pigs (Chhay Ty *et al.*, (2007). Groundnut haulms and soybean foragewere more cost effective than sweet potato forage for feeding rabbits though weight gain was higher on sweet potato vines (Iyeghe-Erakpotobor, 2007). In the diets for growing pigs, sweet potato vines can replace 13% of protein from fish meal and soybean meal without affecting performance and digestibility of pigs (Manh *et al*., 2007).

Martina and Damianan (1983) fed rabbits with decreasing crude protein levels of 18.08, 16.32, 14.22 and 12.50%, and reported that crude protein could be reduced to 16.32% with lysine and methionine supplementation without affecting weight gain and feed efficiency. Zajkowska *et al*. (1980) reported thatrabbits fed diets supplemented with methionine or lysine or both improved feed conversion. Lysine is the first limiting amino acid, and a lack of lysine in diets results in decreased feed intake (Tamminga and Jansman, 1993). Feed intake increased with increasing concentration of digestible methionine (Mulyantini *et al*., 2006). Morris and Abebe (1990) also indicated the importance of lysine and methionine on the growth of pullet and broiler chicks. The aim of this study was to determine growth performance of rabbits fed graded levels of sweet potato vines supplemented with methionine and lysine.

MATERIALS AND METHODS

Study Area

This study was carried out at Bayero University, Kano Animal Science Farm Research Unit. It is located at the new site of the University, about 5Km West of Kano City in Ungogo Local Government Area of Kano State. Kano is located within the general area demarcated by the lines of longitude 8°E and 9°E and latitude 12°N and 13°N in the Northern Guinea Savannah Zone of Nigeria. The area has two seasons, the wet (May-September) and dry seasons (October-April). The annual temperature and rainfall ranges between 21°C and 39°C and 787mm to 960mm respectively (KNARDA, 2001).

Experimental Design

A 3 x 2 x 2 factorial arrangement in a Completely Randomized Design was used for this study. The factors were sweet potato vine at 0, 15 and 30% level, methionine at low (0.07kg) and high (0.10kg) levels, and lysine at low (0.12kg) and high (0.15kg) levels. The treatments were allocated to the experimental units completely at random.

Response of a parameter to the treatment is given by the model below
$y_{ijkl} = \mu + \alpha_i + \beta_j + \gamma_k + (\alpha\beta)_{ij} + (\alpha\gamma)_{ik} + (\beta\gamma)_{jk} + (\alpha\beta\gamma)_{ijk} + e_{ijkl}$.
Where;
y_{ijkl} = observation of factor 1 level i, factor 2 level j and factor 3 level k for the l^{th} unit
μ = population mean of y
α_i = effect of factor 1 (sweet potato vine level)
β_j= effect of factor 2 (methionine level)
γ_k= effect of factor 3 (lysine level)
$(\alpha\beta)_{ij}$= interaction of factor 1 and factor 2
$(\alpha\gamma)_{ik}$= interaction of factor 1and factor 3
$(\beta\gamma)_{jk}$= interaction of factor 2 and factor 3
$(\alpha\beta\gamma)_{ijk}$= interaction of factor 1, factor 2 and factor 3
e_{ijkl} = random variation of the observation

Experimental Animals and their Management

A total of 72 weaned rabbits used in this study were obtained from a local farmer. The rabbits were mainly of heterogeneous population, between six to seven weeks old with initial live weight ranging from 600g to 1130g.Six rabbits were allocated to each treatment, with three replicates of two rabbits per treatment. The study was conducted for 70 days (ten weeks). The animals were dewormed with WormazineHydrosolubleAntihelmintic at a dosage of 1g/litre of drinking water, Keproceryl WSP (Hydro soluble mix of antibiotics and vitamins) at a dosage of 0.5g/litre of drinking water was administered for 5 days and AnupcoVitalyte at dosage of 10g to 20 litres of drinking water as an anti-stress factor. The rabbits were weighed before the feeding trial and the treatment diets (Table 1) were gradually given to the rabbits to replace the feed they were used to for a week in order to allow the rabbits adjust to the experimental diets.

The rabbit house and cages were thoroughly cleaned and disinfected before placing the rabbits in the cages with dimensions of 0.5m x 0.5m x 0.5m ($0.125m^3$). The house and cages were cleaned daily. Aluminum feeders with dimensions of 0.25m x 0.10m x 0.8m were used as feed troughsfor feeding the rabbits. The feeding was done at 08.00hoursof the morning. Clean water was supplied to the rabbits *ad libitum*in aluminum drinkers with dimensions of 0.20m x 0.10m x 0.8m. Feed not eaten was collected in the morning, weighed as leftover feed and used to determine feed intake. The feeders and drinkers were washed with clean water daily before new feed and water were offered. The sweet potato foliage was sun-dried and milled to obtain the sweet potato vine meal which was used in diet formulation. Table 1 shows the composition of treatment diets fed to the rabbits.

The rabbits were weighed weekly during the study period. The weekly weights taken were determined and used to determine the growth performance such as, average daily weight gain and final weights.The leftover and spilled feed was collected and weighed daily in the morning to calculate the daily feed intake.The data generated were used to compute feed conversion efficiency. Cost of feeding each rabbit was obtained and used to calculate feed cost day^1 and feed cost/kg^1 gain.

Table 1: Composition of experimental diets fed to the rabbit

Sweet potato vine (%)	0				15				30			
Methionine level	Low		High		Low		High		Low		High	
Lysine level	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Ingredients												
Maize	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97
Maize offal	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31
Wheat offal	14.66	14.66	14.66	14.66	12.46	12.46	12.46	12.46	10.26	10.46	10.26	10.26
Sweet potato vine	0.00	0.00	0.00	0.00	2.20	2.20	2.20	2.20	4.40	4.40	4.40	4.40
Rice bran	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31
Groundnut cake	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Palm oil	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.07	0.07	0.10	0.10	0.07	0.07	0.10	0.10	0.07	0.07	0.10	0.10
Lysine	0.12	0.15	0.12	0.15	0.12	0.15	0.12	0.15	0.12	0.15	0.12	0.15
Calculated value												
Crude protein	17.60	17.61	17.63	17.50	17.50	17.48	17.51	17.59	18.02	18.03	18.06	18.09
Crude fibre	20.4.5	20.45	20.45	20.44	20.96	21.40	21.81	21.79	23.08	22.87	23.02	23.07
ME (Kcal/Kg)	2602.10	253120	2531.20	2548.10	2548.10	2547.30	2549.00	2548.10	2564.10	2564.30	2565.10	2566.00

Roche VM502 premix supplied per Kg diet; Vitamin A: 12000 I.U; Vitamin D_3: 12000 I.U; Vitamin E: 3.6 I.U; Vitamin K: 1.8 mg Vitamin B_2: 3.6 mg; Nicotinate: 18 mg; Calcium-d-Pantothenate: 9.6 mg; Biotin: 0.36 mg; Vitamin B_{12}: 0.12 mg; Choline chloride: 120 mg; Chloteteracycline: 4.8 mg; Manganese: 24 mg; iron: 48 mg; zinc: 96 mg; Copper: 60 mg; Iodine: 1.8 mg; Cobalt: 48 mg ;
ME = Metabolizable energy

Statistical Analysis

Data collected were subjected to analysis of variance using the General Linear Model Procedure, for factorial experiment in a complete randomized design. The initial weights ranged from 650 g to 1130 g and therefore, initial weight was used as covariate in the analysis of covariance to adjust the values of final weights, weight gain, feed intake and feed conversion efficiency. Pair-wise Difference was used to separate significant treatment effects (SAS, 1987)

RESULTS AND DISCUSSION

Varying levels of sweet potato vines had no significant (P>0.05) effect on growth performance of rabbits (Table 2). Sweet potato vine at 15% gave the least feed cost, while 30% sweet potato vine gave the least feed cost kg^{-1} gain. Edache *et al*. (2009) did not observe differences in weight gain and feed conversion ratio of quails fed graded levels of sweet potato meal diets.Similar final weight, weight gain, average daily weight gain and feed conversion efficiency of rabbits on graded levels of sweet potato vine was probably due to the adequate balance of nutrients for rabbit growth in the treatments. Nguyen and Ogale, (2004) reported that non-significant effect of green feeds on growth rate, feed conversion and meat quality was observed when the basal diet is well balanced in major nutrients.

Table 2: Effect of sweet potato vine on performance of rabbits

Parameters	Sweet potato vine level (%)				
	0	15	30	SE	LOS
Final weight (g)	1195.00	1210.66	1208.01	0.02	0.71
Average daily weight gain (g)	4.95	5.21	5.23	0.29	0.65
Daily feed intake (g)	74.25	75.54	73.51	0.58	0.18
Feed conversion efficiency	0.07	0.07	0.07	0.01	0.57
Feed cost (₦ day^{-1})	1.83	1.47	1.53	0.18	0.34
Feed cost/kg gain (₦)	340.54	452.16	312.39	46.48	0.10

LOS = Level of significant, SE = Standard Error, ₦ Naira

Le Van An *et al*. (2005) also did not observe significant effect of 30% inclusion of ensiled sweet potato foliage on growth performance of growing pigs.The non-significant effect of levels of sweet potato vine diets on weight gain of rabbits observed in this study agrees with the report of Iyeghe-Erakpotobor *et al*. (2002) who fed varying levels (100, 75, 50 and 25%) of concentrate and forage (groundnut haulms, lablab and mucuna) to grower rabbits. Final weight and average daily weight gain obtained in this study were lower compared with the values reported by Ajayi *et al*. (2007).Garcia *et al.* (1999) evaluated effects of inclusion of four levels of dehydrated sweet potato foliage and roots on the performance of growing pigs and concluded that the feed consumption declined as dehydrated sweet potato foliage increased from 15% to 45% in the diet. Feed conversion efficiency obtained from this study was low and could be attributed to high fibre content of the treatment combinations, which is also in agreement with the work of Iyeghe-Erakpotobor *et al*. (2004).

Weight gain and feed conversion efficiency are determined not only by the nutrient content but also by availability of nutrients in the forage. Iyeghe-Erakpotobor and Nwagu (2014) reported

that rabbitsutilized about one and half more ingested protein for maintenance than for protein synthesis at all levels of groundnut forage meal diets, while on lablab forage meal diets, rabbits utilized almost equal amounts of digestible crude protein for maintenance and protein synthesis on all lablab forage meal levels.

The effect of methionine in Table 3 revealed that at both high and low level of supplementation, final weight, weight gain, average daily weight gain, daily feed intake, feed conversion efficiency, feed cost and feed cost kg^{-1} gain were not affected.

Table 3: Effect of methionine and lysine on performance of rabbit

	Methionine level				Lysine level			
Parameter	**Low**	**High**	**SE**	**LOS**	**Low**	**High**	**SE**	**LOS**
Final weight (g)	1206.29	1202.60	0.02	0.80	200.98	120.79.	0.02	0.90
Average daily weight gain (g)	5.15	5.11	0.22	0.71	5.08	5.18	0.27	0.92
Daily feed intake (g)	74.64	74.22	0.45	0.66	75.34[a]	73.52[b]	0.55	0.04
Feed conversion efficiency	0.07	0.07	0.22	0.83	0.07	0.07	0.220.	0.92
Feed cost (₦ day^{-1})	1.53	1.69	0.15	0.13	1.55	1.68	15	0.54
Feed costKg^{-1} gain (₦)	325.93	410.80	37.95	0.45	384.54	352.19	37.95	0.55

[ab]Means with the same superscript within row are similar, LOS = Level of Significant, SE = Standard Error, ₦ =Naira

Final weight, weight gain, average daily weight gain, feed conversion efficiency, feed cost and feed cost kg^{-1} gain were also, not affected ($P>0.05$) by lysine supplementation except daily feed intake where rabbits on low lysine level had higher feed intake than those on high lysine level (Table 3). Daily feed intake decreased significantly ($P<0.05$) on high lysine level than low lysine level. It shows that low lysine supplementation encouraged higher daily feed intake than high lysine supplementation level. This observation does not agree with the report of NRC (1977) that the efficiency of feed utilization for monogastric animals is influenced by the levels of lysine and methionine in the diet.The daily feed intake values (71.86 – 76.72 g) obtained in this study was higher than those (61.49 – 66.28g) reported by Ajayi *et al*. (2007). Mulyantini *et al*. (2006) reported that feed intake increased with increasing concentration of digestible methionine up to 4.7 g/kg diet.Similar feed intakes on both low and high methionine supplementation levels observed in this study could be because lower levels of methionine were used.

There was no interaction between sweet potato vine level and methionine supplementation on growth parameters except daily feed intakeand feed cost (Table 4). Daily feed intake on 0 and 30% sweet potato vine mealat low and high methionine supplementation was similarbut lower than on 15% sweet potato vine at low and high methionine supplementation. Feed cost decreased on 0% sweet potato vine with high methionine supplementation and increased on 15% sweet potato vine with high methionine supplementation, but was similar on 30% sweet potato vine with low and high methionine supplementation.

Table 4: Interaction between sweet potato vine level and methionine supplementation on growth performance of rabbits

Sweet potato vine level (%)	0		15		30		SE	LOS
Methionine level	Low	High	Low	High	Low	High		
Parameter								
Final weight (g)	1205.70	1183.63	1222.16	1223.8(	1215.71	1200.31	0.03	0.77
Average daily weight gain (g	5.11	4.80	5.38	5.41	5.34	5.12	0.41	0.92
Daily feed intake (g)	74.22^{b}	74.27^{b}	76.24^{a}	74.84^{a}	73.46^{b}	73.56^{b}	0.81	0.04
Feed conversion efficiency	0.07	0.07	0.07	0.07	0.07	0.07	0.01	0.66
Feed cost (₦ day^{-1})	2.11^{ab}	1.55^{b}	1.12^{c}	1.96^{b}	1.49^{c}	1.57^{b}	0.25	0.02
Feed cost Kg^{-1} gain (₦)	355.09	326.00	432.48	539.52	357.90	366.88	65.73	0.30

^{ab}Means with the same superscript within row are similar, LOS = Level of significant, SE = Standard Error, ₦ = Naira

Feed cost was higher (P<0.05) for rabbits on 0% sweet potato vine at low methionine supplementation level than on 15 and 30% sweet potato vine at low methionine supplementation level.

There was interaction between sweet potato vine and lysine supplementation level on daily feed intake and feed cost as shown in Table 5. Daily feed intake increased on 0% sweet potato vine with high lysine supplementation and remained similar on 15 and 30% sweet potato vine for low and high lysine supplementation levels. Rabbits on 15% sweet potato vine at high lysine supplementation had the highest daily feed intake and rabbits on 0% sweet potato vine at low lysine supplementation had the lowest daily feed intake.

Table 5: Interaction between sweet potato vine level and lysine supplementation on growth performance of rabbits

Sweet potato vine level (%)	0		15		30			
Lysine level	Low	High	Low	High	Low	High	SE	LOS
Parameter								
Final weight (g)	1182.99	1206.39	1222.16	1199.16	1197.74	1218.25	0.03	0.65
Average daily weight gain (g)	4.79	5.11	5.38	5.03	5.06	5.39	0.41	0.62
Daily feed intake (g)	72.31^{b}	75.18^{a}	75.42^{a}	75.65^{a}	72.59^{b}	74.43^{a}	0.81	0.04
Feed conversion efficiency	0.07	0.07	0.07	0.07	0.07	0.08	0.01	0.42
Feed cost (₦ day^{-1})	1.42^{b}	2.24^{a}	1.12^{c}	1.23^{c}	1.50^{b}	1.56^{b}	0.25	0.02
Feed cost Kg^{-1} gain (₦)	330.61	350.48	432.48	471.84	390.53	234.24	65.73	0.30

^{ab}Means with the same superscript within row are similar, LOS = Level of Significant, SE = Standard Error and ₦ = Naira

Feed cost increased at 0% sweet potato vine with high lysine supplementation but was similar at 15 and 30% sweet potato vine for low and high lysine supplementation levels. Feed cost was highest for rabbits on 0% sweet potato vine at high lysine supplementation level and rabbits on 15% sweet potato vine at low lysine supplementation level had the lowest feed cost.0 and 15% sweet potato vine at both low and high methionine levels encouraged high feed intake, while levels of sweet potato vine only at high lysine level encouraged high feed intake. It would appear that the high feed intakes observed would increase intake of methionine and lysine which are essential amino acids therefore increase weight gain, however this was not the case in

this study.High supplementation of sweet potato vine diets with methionine or lysine did not did not appear to reduce cost of feeding rabbits.

There was no interaction between methionine and lysine supplementation level on final weight, weight gain, average daily weight gain, daily feed intake, feed conversion efficiency, feed cost and feed cost kg^{-1} gain (Table 6).

Table 6: Interaction between methionine and lysine supplementation on growth performance of rabbits

Methionine level	**Low**		**High**			
Lysine level	**Low**	**High**	**Low**	**High**	**SE**	**LOS**
Final weight (g)	1210.43	1202.15	1191.52	1213.68	0.02	0.42
Average daily weight gain (g)	5.20	5.11	4.96	5.25	0.32	0.46
Daily feed intake (g)	75.84	73.44	74.85	73.59	0.82	0.45
Feed conversion efficiency	0.07	0.07	0.07	0.07	0.01	0.72
Feed cost (₦day^{-1})	1.52	1.55	1.58	1.80	0.21	0.64
Feed costKg^{-1} gain (₦)	318.62	333.24	450.46	371.14	53.67	0.39

LOS = Level of Significant, SE = Standard Error, and ₦ = Naira

However, increases in methionine and lysine supplementation led to an increase in feed cost but decreased feed cost kg^{-1} gain.The interaction between sweet potato vine, methionine and lysine supplementation is shown in figures 1 to 5. Final weight (Figure 1) and weight gain (Figure 2) were higher on 0 and 30% sweet potato vine meal at high methionine, low lysine supplementation; On 15% sweet potato vine diet, it was higher at low methionine,low lysine and at high methionine, high lysine supplementation than other supplementation levels.

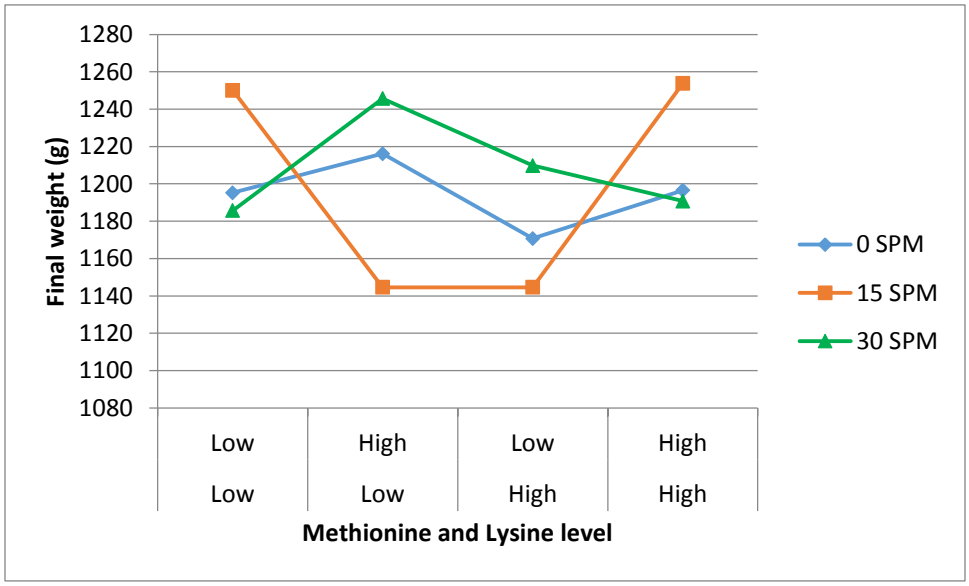


Figure 1: Final weight of rabbits fed sweet potato vines meal supplemented with methionine and lysine. SPM – sweet potato vine meal.

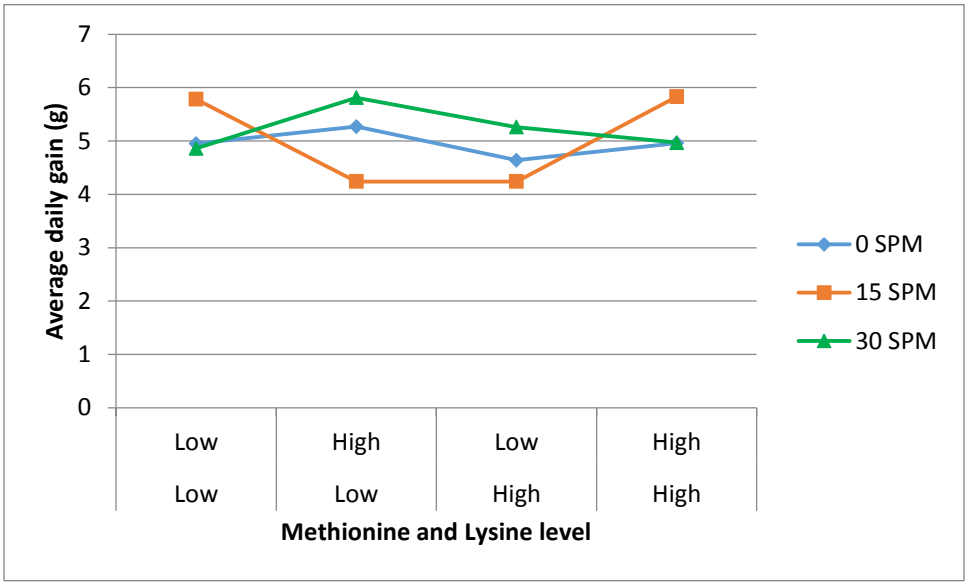


Figure 2: Weight gain of rabbits fed sweet potato vines meal supplemented with methionine and lysine. SPM – sweet potato vine meal.

Feed intake was higher on 0 and 15% sweet potato vine diets at low methionine, low lysine supplementation (Figure 3) while it was higher at low methionine, high lysine supplementation in 30% sweet potato vine meal diet. Feed conversion efficiency was better for 0 and 30% sweet potato vine meal diet at high methionine, low lysine supplementation while on 15% sweet potato vine meal diet, it was better at low methionine, low lysine supplementation than other levels of supplementation (Figure 4). Feed cost kg^{-1} gainwas lower at 15 and 30% sweet potato vine meal than 0% sweet potato vine meal diet at low methionine,low lysine; high methionine, low lysine; and high methionine,high lysine supplementation levels (Figure 5).

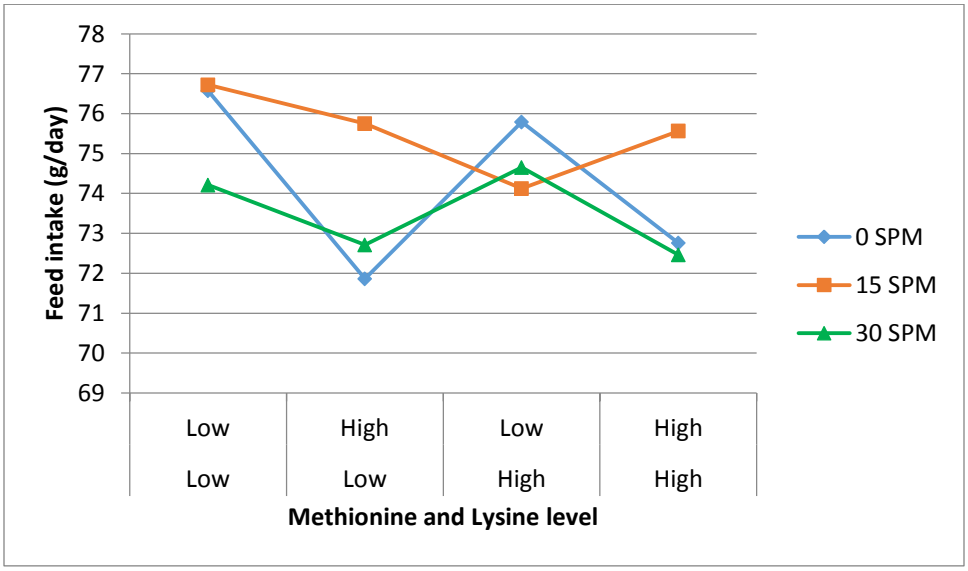


Figure 3: Feed intake of rabbits fed sweet potato vines meal supplemented with methionine and lysine. SPM – sweet potato vine meal.

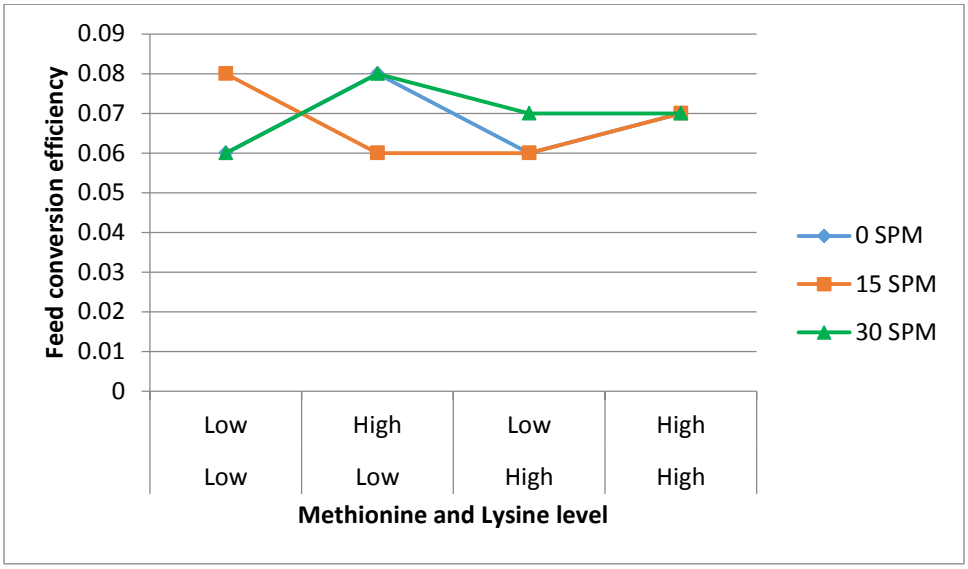


Figure 4: Feed conversion efficiency of rabbits fed sweet potato vines meal supplemented with methionine and lysine. SPM – sweet potato vine meal.

Similarity in final weight, weight gain, average daily weight gain and feed conversion efficiency in rabbits in this study could be probably indicate that the diets were balanced and supplied adequate balance of nutrients for rabbit growth, however, the low growth rates obtained could be as a result of the high ambient temperatures of 39°C to 40°C that characterised the environment under which the rabbits were raised especially in the afternoons. Rezaei *et al*. (2004) reported that increasing lysine level in the diet increased weight gain and gain to feed ratio in grower pigs. This effect was not observed in this study. Addition of 40% more lysine and methionine than NRC requirement tended to significantly decrease body weight gain and improve feed conversion ratios (Bouveh and Gevorgyan, 2011).

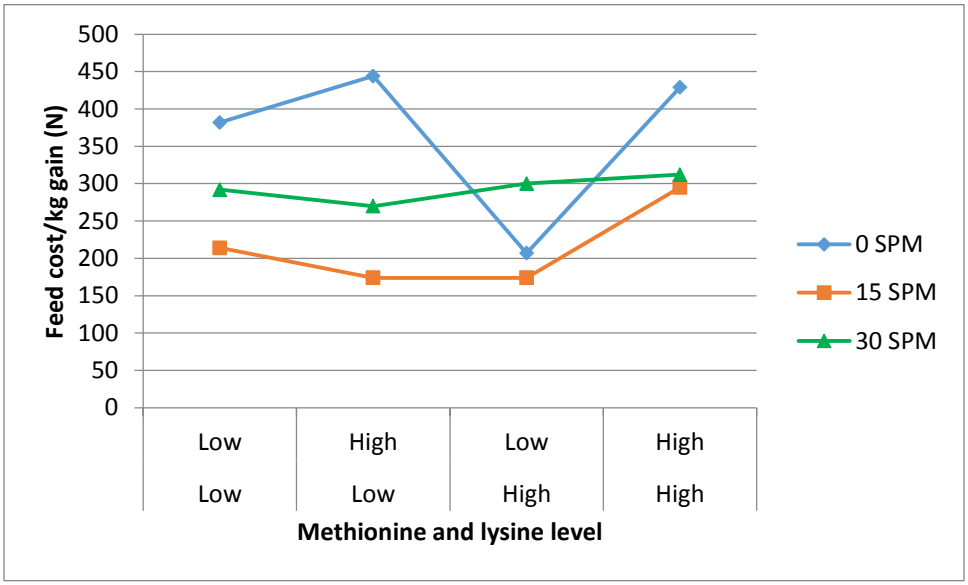


Figure 5: Feed cost per kg gain of rabbits fed sweet potato vines meal supplemented with methionine and lysine. SPM – sweet potato vine meal.

Supplementation of lysine and methionine in diets that were suboptimal in terms of protein and essential amino acids improved performance and reduced feed costs of birds (Minh and Ogle, 2005). Generally, weight gains obtained in this study are low but comparable with what many researchers obtained in the tropics but lower than what are reported in many sub-tropical and temperate regions. This might have to do with the fact that rabbits used in this study, have over the decades from the process of adaptation to the prevalent high ambient temperatures, reduced their rate of gain and in consequence body size. Iyeghe-Erakpotobor and Nwagu (2014) reported that rabbits in the tropics are raised at temperatures ranging between 27-44^{o}C, outside their comfort zone of around 21^{o}C, therefore exposing them to moderate to severe heat stress, which results in some inefficiency in energy and protein utilization and retention.Feed cost kg^{1} gain obtained in this study are higher than that reported by Nworgu *et al.* (1999). This could be because of the relative cost of the sweet potato vine and other feed ingredients used in this study which changes depending on where and when they are obtained.

Based on results obtained, it is concluded that 15% sweet potato vine gave the least feed cost, while 30% sweet potato vine gave the least feed cost kg^{-1} gain;low lysine supplementation encouraged higher daily feed intake than high lysine supplementation. 0 and 15% sweet potato vine at both low and high level of methionine encouraged higher daily feed intake, while levels of sweet potato vine at high lysine combination encouraged higher daily feed intake. Feed cost was affected by the interaction between sweet potato vine and methionine and between sweet potato vine and lysine.Feed cost kg^{-1} gain was lower on 15 and 30% sweet potato vine meal than 0% sweet potato vine meal diet at low methionine,low lysine; high methionine, low lysine; and high methionine, high lysine supplementation levels. It is therefore recommended that 30% sweet potato vine could be fed to rabbits while for supplementation, 15% sweet potato vine mealsupplemented with high methionine, low lysine;or low methionine,high lysine would enhance profitability for the farmer.

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