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PERFORMANCE OF MALE AND FEMALE WEANED RABBITS FED *XYLOPIA AETHIOPICA* AND *MONODORA MYRISTICA* SEED POWDER AS FEED ADDITIVES

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Abstract
A feeding trial was conducted to evaluate the performance of thirty-two (32) weaned rabbits fed diets containing *Xylopia aethiopica* seed meal (XSM) and *Monodora myristica* seed meal (MSM). Four experimental diets (T_1, T_2, T_3 and T_4) were formulated such that Treatment 1 being the control group received diet containing neither MSM nor XSM. Treatment 2 and 3 received diets containing 1% each of XSM and MSM while treatment 4 received mixture of both XSM and MSM at 0.5% each. The treatments were replicated four times with two rabbits per replicate and a total of eight rabbits (4 males &4 females) per treatment in a randomized complete block design. The trial lasted for 12 weeks. Result showed no significant differences ($P>0.05$) in final weights and total weight gain of the rabbits across the treatments although T_3 recorded the highest statistical value. Significant ($P<0.05$) increase in feed intake was obtained in T3. Slight improvements in feed conversion ratio values were also observed in T3 and T4. Sex effect indicates reduction in feed intake and weight gain for male rabbit on diet 2. No mortality was recorded in the course of the experiment. It is therefore recommended that 1% of *Monodora myristica* can be used as additive in rabbit diet to improve feed intake and weight gain or its combination with *Xylopia aethiopica* to maintain weight gain specially for the rabbit bucks.
Keywords: Performance, weaned Rabbits, *Xylopia aethiopica*, *Monodora myristica*

Introduction
Domestic rabbit being a nutritional food plays a vital role as a source of animal protein in the human diet, especially in developing countries (Hassan, 2012). They are good converters of feed to meat and can efficiently utilize up to 30% crude fibre in the diet compared to poultry with 10% (Hassan, 2012). The alteration of gut microbiota, drug resistance and residual effect on meat product are some of the critical factors that prohibit the usage of synthetic additives. Hence, the use of phytogenics as a replacement for synthetic antibiotics suffices as a better option in improving livestock performance as well as meat quality and safety for humans (Martin *et al*., 2001). The use of *Xylopia aethiopica* and *Monodora myristica* as feed additive in rabbit feed becomes imperative because of their beneficial health and preservative importance (Martin *et al*., 2001). This study was conducted to investigate the effect of *Xylopia aethiopica* and *Monodora myristica* on the performance of growing rabbits.

Materials and methods
Experimental Location
The study was conducted for a period of 84days at the Department of Animal Science Teaching and Research Farm, Akwa Ibom State University, Obio Akpa Campus. The area is situated between latitude 4°30'N and longitude 7°30'E (SLUK-AK, 1989).

Experimental sample preparation
Monodora myristica (MSM) and *Xylopia aethiopica* (XSM) seeds were purchased from Abak market in Akwa Ibom State. They were washed thoroughly and sundried. The dried *Xylopia aethiopica* was ground into powder while the *Monodora myristica* seed were toasted before being ground into powder. The ground materials were stored in polythene bags under room temperature till usage (Coleman *et al*., 2017). Four isocaloric and isonitrogenous experimental diets (T_1, T_2, T_3 and T_4) were formulated such that Treatment1 (control) contained neither MSM nor XSM. Diets 2 and 3 contained 1% each of XSM and MSM while diet 4 was the mixture of both XSM and MSM at 0.5% each in a randomized complete block design.

Experimental animals/design

A total of 32 (16 males & 16 females) mixed breed weaned rabbits aged 7 weeks were purchased from a private research farm in Uyo, Akwa Ibom State. They were weighed and randomly distributed into four treatment groups of 8 rabbits (4 males and 4 females) each in a randomized complete block design. The treatments were replicated four times with two rabbit s per replicate. Each sex group in a replicate was housed separately in a 3-tier hutch. The animals were kept for 2weeks to adapt to the experimental environment. Feed and drinking water were offered *ad libitum* to the experimental animals. The trial lasted for 12 weeks.

Table 1: Ingredients and nutrients composition of the experimental diet for rabbits

Ingredients	T_1 (control)	T_2 (XSM 1%)	T_3 (MSM 1%)	T_4 MSM+XSM (0.5%+ 0.5%)
Maize	50.000	50.00	50.00	50.00
Soybean meal	18.50	18.50	18.50	18.50
Fish meal	1.50	1.50	1.50	1.50
Wheat offals	27.00	27.00	27.00	27.00
Bone meal	2.00	2.00	2.00	2.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vit/min Premix**	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Crude protein (%)	18.21	18.21	18.21	18.21
M.E (Kcal/kg)	2978.34	2978.34	2978.34	2978.34

*Vitamin-mineral premix provided per kg the following: Vit. A 1500 IU; Vit.D3 3000 IU; Vit.E 30 IU; Vit.K 2.5mg; Thiamine B1 3mg; Riboflavin B2¬ 6 mg; Pyrodoxine B6 4 mg; Niacin 40 mg; Vit. B12 0.0 mg; Pantothenic acid 10 mg;

Data collection and statistical analysis

Initial body weights of the rabbits were taken at the commencement of the experiment using an electronic scale. Weekly body weights of each rabbit were taken and recorded. The live weight gain was calculated as the difference between previous weight and weights recorded in the following week. The feed intake per rabbit per day was calculated as the difference between feed offered and spilled/left over feed (after 24hours of feeding). The feed conversion ratio was calculated as ratio of feed taken to weight gained after a week of feeding, using the formula:Feed conversion ratio = feed intake/weight taken(Nuamah *et al*. 2019). Data collected were subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980) and mean separation were indicated using Duncan's Multiple Range test (Duncan, 1995).

Results and discussion

Table 2 presents data on the effect of *Xylopia aethiopica*, *Monodora myristica* seed powder and sex on performance of rabbits. The final weights and total weight gain of the rabbits at the end of the experiment showed no significant ($P>0.05$) differences across the treatments. T_3 recorded the highest statistical value while T_2recorded the lowest statistical value. The reduction in weights of animals fed T_2 based diets agrees with Chike and Adidenbo (2011) who reported a reduction in body weight and growth rate of guinea pigs fed aqueous solution of *Xylopia aethiopica*. The reduction in body weight can be attributed to the active ingredients such as xylopic acid in the test material (Chike and Adienbo, 2011). A reduction in feed intake may also be a contributing factor leading to a reduced body weight in T_2. This agrees with Adefegha and Oboh (2012). Significant ($P<0.05$) differences were also recorded across treatment groups with regards to feed intake. Animals placed on T_3 based diet recorded highest feed intake values while to lowest was observed for animals placed on T_2 based diet. This agrees with Ukoha (2016) who fed 1% of *Monodora myristica* to broiler birds. The high feed intake may be attributed to the increased flavonoids from the essential oil component thereby increasing taste and appetite in the animals (Wenk, 2002). Feed conversion ratio shows a reduction from 4.51 (T_2) to 3.79 (T_3), indicating slight

improvement though not significant (P>0.05). This could support the report that phyto-additives increase feed efficiency of pigs and poultry (Igweye *et al*., 2021).

Sex effect of diet showed no significant (P>0.05) difference in final weight. This implies that the additives included in the diet did not have effect on final weight in both sexes of the rabbits. This result is in line with the reports of Okanlawon *et al*. (2020) who fed rabbits with diets supplemented with turmeric powder. Significant (P<0.05) differences were also observed for feed intake between the male and female rabbits. This implies that the additives included in the diet had an effect on appetite in both sexes. This result is in agreement with Tumova *et al*. (2019) for male and female broiler chickens but disagrees with Okanlawon *et al*. (2020) who fed diets supplemented with turmeric powder to male and female rabbits. The feed conversion ratio indicated no sex effect (P>0.05). This implies that the additives included in the diet did not impair nutrient utilization in either the male or female rabbits. This result is in tandem with Bello *et al.* (2015) who reported no significant difference (P>0.05) in feed conversion ratio of rabbits raised under different frequency of litter change. No mortality was recorded in the course of the experiment. This is attributed to the antimicrobial, antibacterial and antifungal properties of both *Xylopia aethiopica* and *Monodora myristica*. This corroborates the reports of Egbewande *et al*. (2021) that spices lower mortality.

Table 2: Performance of growing rabbits fed XSM and MSM as additive

Parameters	Sex	T_1	T_2	T_3	T_4
Initial bodyweight	**M**	722.75±135.33	768.25±135.33	739.00±135.33	747.50±135.33
	F	780.25±97.81	747.75±97.81	768.50±97.81	768.75±97.81
	Means	751.50±78.90	758.00±78.90	753.75±78.90	758.13±78.90
Final bodyweight	**M**	1680.50±141.39	1428.75±141.39	1728.25±141.39	1674.00±141.39
	F	1672.25±95.76	1730.25±95.76	1712.25±95.76	1668.75±95.76
	Means	1676.38±84.54	1579.50±84.54	1718.25±84.54	1671.38±84.54
Total body weight gain	**M**	932.75±94.65	576.00±94.65	889.50±94.65	876.50±94.65
	F	892.00±90.83	967.50±90.83	955.00±90.83	900.00±90.83
	Means	912.38±69.68	771.75±69.68	922.25±69.68	888.25±69.68
Average daily weight gain	**M**	84.80±8.14^{a}	53.07±8.14^{b}	93.05±8.14^{a}	81.96±8.14^{a}
	F	81.09±8.31	87.93±8.31	85.80±8.31	81.82±8.31
	Means	82.94±9.75	70.50±9.75	89.94±9.75	81.89±9.75
Total feed intake	**M**	3588.66±2.00^{b}	33.08±2.00^{c}	3742.97±2.00^{a}	3582.22±2.00^{b}
	F	3552.47±3.81^{b}	3412.20±3.81^{d}	3750.14±3.81^{a}	3535.44±3.81^{c}
	Means	3570.57±34.31^{b}	3360.31±34.31^{c}	3746.56±34.31^{a}	3558.83±34.31^{a}
Average daily feed intake	**M**	326.24±3.81^{ab}	316.65±3.81^{b}	340.27±3.81^{a}	325.75±3.81^{ab}
	F	322.95±1.58^{b}	319.37±1.58^{b}	340.92±1.58^{a}	321.40±1.58^{b}
	Means	324.60±1.66^{b}	318.01±1.66^{b}	340.60±1.66^{a}	323.58±1.66^{b}
Feed conversion ratio	**M**	3.85±0.71	5.97±0.71	3.66±0.71	3.97±0.71
	F	3.98±0.71	3.63±0.71	3.97±0.71	3.93±0.71
	Means	3.91±0.62	4.51±0.62	3.79±0.62	3.95±0.62
Mortality %	**M**	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
	F	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00

^{abc}Means in the same row not sharing common superscript are significantly different (P<0.05)

Conclusion and recommendation

Based on results obtained in this trial, it is concluded that supplementing rabbit diets with *Xylopia aethiopica*, *Monodora myristica*, or their combination caused no impairment on the feed conversion ratio and weight gain(except for male rabbit on diet 2) but improved feed intake significantly in both male and female rabbit on

Monodora myristica based diet. It is therefore recommended that 1% of *Monodora myristica* be used as additive in rabbit diet to improve feed intake and weight gain or its combination with *Xylopia aethiopica* to maintain weight gain especially for the rabbit bucks. However, further research work at higher levels of inclusion for both *Xylopia aethiopica* and *Monodora myristica* is recommended.

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