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Response of Growing Rabbits to Graded Levels of Sickle pod (*Senna obtusifolia*) Seed Meal and its Economic Benefits as Feedstuff for Rabbits

Sanjo, H.A[1] Igwebuike, J.U.[2], Augustine, C[1]., Moses J.D[3] and Midiga, R[1].
[1]Department of Animal Production, Adamawa State University, Mubi, Nigeria
[2]Department of Animal Science, University of Maiduguri, Borno State, Nigeria
[3]Department of Agricultural Economics and Extension, Adamawa State University, Mubi, Nigeria
Corresponding author: *audaggai@gmail.com* GSM: 08072376124

Abstract
Scarcity and high cost of conventional feed resources are among the major constraints of rabbit production in Nigeria. In view of the above, it has become imperative to exploit the utilization of seeds from wild legumes such as *Senna obtusifolia*. This study was conducted to assess the performance of growing rabbits fed graded levels of *Senna obtusifolia* seed meal (SOSM). Four experimental diets were compounded to contain 0, 5, 10 and 15% SOSM. Diet one (D1) 0% inclusion level served as the control. Forty eight (48) rabbits of mixed sexes and breeds were randomly allotted to the four dietary treatments in a randomized complete block design. The experimental diets and clean drinking water were supplied *ad libitum* throughout the experimental period of eight weeks (56 days). Parameters measured include feed intake, weight gain and feed conversion ratio. Cost benefit was also evaluated. The result indicated that group of rabbits fed 15% SOSM significantly ($P<0.05$) recorded inferior feed intake (32.52 g), feed conversion ratio (4.48) and weight gain (406.59 g). The cost benefit analysis indicated that feed cost per kilogram which directly influenced other economic parameters reduced as the level of SOSM increases. However, feed cost per kilogram weight gain was comparatively higher (₦235.47) in the group of rabbits fed 15% SOSM. Based on the findings of this study, SOSM can be included up to 10% with little or no deleterious effects on the performance of rabbits. Study should be conducted on the best processing method that will enhance optimal utilization of SOSM in the diets of rabbits.

Keywords: Response, under-utilized, legume, economic benefit, feedstuff

Introduction

Sustainable livestock production in developing Countries can be achieved through the utilization of feed resources that are under-utilized and are less competed for as food for humans. The use of non-conventional feedstuffs that are not demanded by man for food is one of the approaches to reducing the high cost incurred in livestock feeding (Oyewole *et al*., 2011). In view of the above, it has become imperative to search for cheaper alternative feed resources that could substitute or replace the costly conventional feedstuffs such as soya bean and groundnut cake. *Senna obtusifolia* seeds have been recently used to feed poultry (Augustine, 2016) and can similarly be use to feed rabbits. At the moment, information on the performance of rabbits fed *Senna obtusifolia* seed meal seems to be meager hence the need to bridge such information gap. This study was designed to evaluate the performance of growing rabbits fed graded levels of *Senna obtusifolia* seed meal.

Materials and Methods

Location of the study area

The experiment was conducted at the Rabbitry Unit of Adamawa State University Livestock Teaching and Research Farm. The area is located between latitudes 9°30' and 11° North of the equator and longitudes 13° and 13° 45' East of the Greenwich meridian. The temperature regime in Mubi region is warm to hot throughout the year. However, there is usually a slight cold period between November and February. There is a gradual increase in temperature from January to April. The minimum and maximum temperatures of the area are 18.1°C and 32.8 °C and the mean annual rainfall ranges from 900-1050 mm (Adebayo, 2004).

Collection and processing of Senna obtusifolia seeds

The pods containing the seeds were harvested from matured stands in uncultivated fields in Mubi area of Adamawa State. The pods were threshed and the seeds obtained were soaked for 12 hours and boiled for one hour. The seeds were properly dried and milled.

Parameters measured

Daily feed intake was measured by subtracting the left over feed from the initial feed offered. The rabbits were weighed at the commencement of the experiment and at weekly intervals, to determine the weekly weight gain and subsequently the daily gain. At the end of the experiment, the rabbits were weighed and the difference between the initial and final weight was obtained to determine overall weight gain. Feed conversion ratio (FCR) was calculated using the formula:

Experimental diets and treatments

Five experimental diets were compounded to contain *Senna obtusifolia* seed meal at inclusion levels of 0, 5, 10, and 15% designated D1, D2, D3 and D4 respectively. Diet 1(D1, 0%) served as the control. The composition of the experimental diets is presented in Table 1.

Experimental animals and their management

Forty eight (48) growing rabbits were used for the study. The rabbits were housed in individual constructed metal cages. The rabbits were dewormed before the commencement of the experiment and were acclimatized for a period of one week. Water and known quantity of the experimental feeds were supply *ad libitum*.

Experimental design

Forty eight (48) growing rabbits of mixed sexes and breeds were randomly allotted to the four (4) dietary treatments in a randomized complete block design with three replicates of three (3) rabbits each

$$\text{FCR} = \frac{\text{feed intake}}{\text{weight gain}}$$

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) of the randomized complete block design using Statistix 9.0. Least significant difference (LSD) was used to separate the means where significant differences occur. Significant differences were considered at 95% level of confidence.

Table 1: Composition of Experimental Rabbit Diets

Ingredients	Inclusion levels of *Senna obtusifolia* seed meal			
	D1(0% SOSM)	**D2(5% SOSM)**	**D3(10 SOSM)**	**D4(15% SOSM)**
Maize	38.00	39.00	40.00	39.00
Maize offal	14.00	14.00	10.00	9.55
Soybean	29.00	28.00	27.00	26.00
Cowpea husk	15.55	10.35	9.55	7.00
SOSM	**0.00**	**5.00**	**10.00**	**15.00**
Salt	0.50	0.50	0.50	0.50
Bone meal	2.50	2.50	2.50	2.50
Premix	0.15	0.15	0.15	0.15
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis				
**M.E (kcal/kg)	2771.16	2878.48	2890.48	2899.32
Crude protein (%)	17.69	18.19	18.28	18.62
Crude fiber (%)	9.17	9.41	9.62	9.81
Calcium (%)	1.02	1.32	1.40	1.46
Phosphorus (%)	1.32	1.60	1.67	1.71

SOSM = Senna obtusifolia seed meal,
***Metabolizable energy (ME) calculated according to the formula of Pauzenga, (1985)*
ME= 37 × %CP + 81 × % EE + 35.5 × % NFE (Pauzenga, 1985)

Results and Discussion

The results of the performance of the rabbits fed graded levels of SOSM are presented in Table 2. The results of feed intake weight gain and feed conversion ratio showed a reducing trend as the level of SOSM increases in the diets with the group of rabbits fed 15% SOSM indicating the most depressive performance. This may be attributed to the adverse effect of residual anti-nutritional factors such as tannins which has the tendency to reduce feed intake consequently affecting the performance of the rabbits. This concurred with the findings of Emiola *et al.* (2013) who pointed out that processed feedstuffs may have some levels of residual anti-nutritional factors and this may adversely affect the performance of animal. Hathcook and Rader (1994) and Shahidi (1997) similarly reported that anti-nutritional factors such as protease inhibitor, goitrogen, alkaloids oxalate and phytate can impair the availability of nutrients, depress feed intake and reduce growth in animals that consume them. Therefore, if such toxic factors are eliminated or reduced it may improve feed intake and animal performance.

The mean final weight and weight gain showed significant variation ($P<0.05$) among the different treatments. Rabbits fed diet one (0% SOSM) significantly ($P<0.05$) recorded the highest final body weight and weight gain followed by rabbits fed diet two (5% SOSM). A general trend revealed that the mean final weight and weight gain reduced as the dietary inclusion levels of processed SOSM increases. This therefore suggested that, there might be an increase in the level of residual anti-nutritional factors as the level of SOSM increases. The presence of residual anti-nutritional factors may be due to the resistance of some of the anti-nutritional factors to the

processing methods used (soaking and boiling). This was buttressed by Vidal-valverde *et al*. (1997) and Ukachukwu and Obioha (1997) who explained that single method of processing and different heat treatment only resulted in partial detoxification. Similar observation was made by Augustine *et al*. (2016) who similarly fed broiler chickens with processed *Senna obtusifolia* seed meal. The 0% mortality recorded indicated that rabbits can tolerate up to 15% SOSM in their diets.

Table 2: Performance of Growing Rabbits fed Graded Levels of SOSM

Variables	**D1 (0%SOSM)**	**D2 (5%SOSM)**	**D3 (10% SOSM)**	**D4 (15%SOSM)**	**SEM**
Initial weight (g)	566.67	576.67	583.30	566.69	5.23^{NS}
Final body weight (g)	1256.03	1221.23	1204.37	973.15	2.21^{*}
Overall wt. gain (g)	689.36^{a}	644.56^{ab}	621.04^{b}	406.59^{c}	9.04*
Daily feed intake (g)	46.77^{ab}	47.98^{a}	46.14^{ab}	32.52^{c}	3.85*
Total feed intake (g)	2612.67^{a}	2681.36^{a}	2583.53^{b}	1821.52^{c}	8.22*
FCR	3.79^{b}	4.15^{a}	4.16^{a}	4.48^{a}	0.57*
Mortality (%)	0.00	0.00	0.00	0.00	-

SOSM = Senna obtusifolia seed meal; FCR = Feed conversion ratio

The result of cost benefit analysis (Table 3) showed that cost per kilogram of feed were ₦58.77, ₦54.68, ₦53.04, and ₦52.56 respectively. This revealed that feed cost per kilogram decreased as the level of SOSM increases in the diets. Feed cost decreased from ₦58.77 per kilogram feed in diet 1(0% SOSM) to ₦52.56 in diet 4 (15% SOSM) a difference of (₦6.21). However, feed cost per kilogram weight gain was comparatively higher (₦235.47) in the group of rabbits fed 15% SOSM. The result of cost benefit analysis on a general trend revealed that the use of SOSM as feedstuff beyond 10% for rabbits is not cost effective.

Table 3: Economic Analysis of Growing Rabbits Fed Graded Levels of SOSM**.

Economic variables	**D1 (0%SOSM)**	**D2 (5%SOSM)**	**D3 (10%SOSM)**	**D4 (15%SOSM)**
Total feed intake (g)	2612.67^{a}	2681.36^{a}	2583.53^{b}	1821.52^{c}
Feed cost per kg (₦/kg)	58.77	54.68	53.04	52.56
COTFI (₦)	1535.46	1466.17	1370.30	957.37
Feed cost/ kg gain (₦)	177.25	227.49	220.64	235.47

SOSM = Senna obtusifolia seed meal; COTFI = cost of total feed intake

***This was based on market prices of ingredients in Nigerian markets as of the time of study July, 2011.*

Conclusion and Recommendation

It can be concluded that inclusion of *Senna obtusifolia* seed meal beyond 10% in the diets of rabbits had adverse effects on their productive performance. On economic ground, the use of SOSM as

feedstuff beyond 10% is not cost effective. More studies should be conducted to evaluate the best processing method(s) that will enhance optimal utilization of the seed meal in the diets of rabbits.

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