Asian Journal of Advances in Agricultural Research

1(1): 1-7, 2017; Article no.AJAAR.33691

Response of Weaner Rabbits Fed Toasted Sickle Pod (*Senna occidentilis*) Seed Meal

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Authors' contributions

This work was carried out in collaboration between all authors. Authors LIT and HBY designed the study, wrote the protocol, wrote the first draft of the manuscript and managed the literature searches. Author RJW coordinated the collection of data and managed the analyses of the study. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAAR/2017/33691
Editor(s):
(1) Oguz Dolgun, Plant and Animal Production Department, Adnan Menderes University, Sultanhisar Vocational College, Turkey.
Reviewers:
(1) Abdul-Rahaman Saibu Salifu, Bolgatanga Polytechnic, Ghana.
(2) Arnolfo M. Monleon, Marinduque State College, Philippines.
Complete Peer review History: http://prh.sdiarticle3.com/review-history/19123

Original Research Article

Received 26th April 2017
Accepted 11th May 2017
Published 18th May 2017

ABSTRACT

This study was conducted to determine the effect of toasted sickle pod seed meal (TSSM) on the growth performance and carcass characteristics of weaner rabbits. Forty weaner rabbits were allotted to the five dietary treatments of eight rabbits per treatment and replicated four times with 2 rabbits per replicate in a completely randomized design (CRD). Five experimental diets were compounded using TSSM at 0%, 2.5%, 5% 7.5% and 10% inclusion levels designated as treatments 1, 2, 3, 4 and 5, respectively. Results showed that all the growth parameters measured were not significant (P>0.05) across the dietary treatments as the level TSSM increased in the diets. Total Feed intake (TFI) ranged from 3201.20 to 3235.40g/rabbit while the total weight gain (TWG) varied from 930.00 g in T3 to 936.67g in T4. Better feed conversion ratio was observed in the rabbit fed experimental diets There was no significant difference (P>0.05) in carcass

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characteristics and internal weight organs evaluated. It was concluded that toasted sickle pod seed meal (TSSM) can be included in rabbit diet up 10% without negative effect on growth performance and carcass characteristics.

Keywords: Rabbit; sickle pod seed; processing; carcass.

1. INTRODUCTION

There is global awareness on the shortage of animal protein supply in most developing countries [1]. Long production intervals, feed shortage, poor genetic make-up and disease incidence among other factors affecting livestock production in the tropics [2]. There is therefore an urgent need to search for fast maturing animal such as rabbit. Rabbit has immense potentials and good attributes which include high growth rate, high efficiency in converting feeds to meat, short gestation period, high prolificacy and relatively low cost of production. Its production is becoming more popular in most developing countries [3]. However, high cost of feedstuffs most especially the conventional protein ingredients like soybean meal and groundnut cake are among other factors affecting rabbit production in the tropics [4]. A possible solution to this problem is to explore alternative protein sources, which are cheap and locally available. One of the alternative sources considered in this study is sickle pod (*Senna occidentalis*) seed.

Senna occidentalis belong to the *leguminosae* family, and it is distributed throughout the tropical and subtropical regions of the world [5]. It is mostly found in an open pasture and in fields cultivated with cereals such as soybean, corn, sorghum among crops [6]. The nutrient composition showed that the seed has crude protein of 18.64% and 29.54% reported by [7] and [8] respectively which showed it has potential as a protein source in livestock feedstuffs. Studies conducted on the use of raw and soaked sickle pod seed resulted in decrease in feed intake, total weight gain and impaired nutrient utilization in rabbits and broiler chicken. There is scanty information on the use of toasted sickle pod seed meal in rabbit production. Therefore, this study was carried out to determine the effects of toasting sickle pods seed on the performance of weaner.

2. MATERIALS AND METHODS

2.1 Study Location

The study was conducted at the Rabbit Research Unit of the Department of Animal Production and Technology, College of Agriculture, Ganye Local Government Area, Adamawa State. The study area lies between Latitude 8.26' and 11.98' North of the Equator and Longitude 12°3' East of the Greenwich Meridian. The area falls within the Northern Guinea Savannah Zone and has a tropical wet and dry climate [9].

2.2 Collection and Processing of Sickle Pod Meal

Sickle pod seeds were sourced within the study area, cleaned and subjected to toasting. Toasting was achieved by constant stirring the seed for 30minutes in a metallic frying pan to maintain uniform heating until the seed turns to light brown. The seeds were allowed to cool then mill and tagged as toasted sickle pod seed meal (TSSM).

2.3 Experimental Animals, Design and Management

Forty weaner rabbits with an initial average weight of 709±1.89 g between 6-7 weeks old procured within Yola metropolis, Adamawa State Nigeria. The weaner rabbits were allotted to five dietary treatments. Each treatment was replicated four times with two rabbits per replicate in completely randomized design. One week before commencement of the experiment, rabbit house was fumigated; cages, feeders and drinkers were thoroughly washed, disinfected and were tightly fitted to the cages to prevent spillage and feed wastage. The experimental animals were treated against ecto parasites and endo parasites using Ivomectin.

2.4 Experimental Diets and Treatments

The milled TSSM was used to compound five diets. Diet1 served as control with 0% TSSM while diets, 2, 3, 4 and 5 contains 0%, 2.5%, 5% 7.5% and 10% designated T1, T2, T3, T4 and T5 respectively. The ingredient composition of the experimental diets is shown in Table 1.

2.5 Collection of Data

The experiment lasted for 56 days during which the weaner rabbits were offered experimental

Table 1. Ingredient composition of experimental diets fed weaner rabbits

	Inclusion levels of toasted sickle seed meal				
Ingredient	**0**	**2.5**	**5.0**	**7.5**	**10**
Maize	41.00	41.00	41.00	41.00.	41.00
Soybean meal	20.00	19.16	18.00	17.45	16.60
TSSM	0.00	2.50	5.00	7.50	10.00
Cowpea Husk	10.00	10.00	10.00	10.00	10.00
Maize offal	23.00	21.34	20.00	18.05	17.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50	0.50
Premix*	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
Determined analysis					
Dry matter	90.95	90.92	90.90	91.00	90.95
Crude protein	18.77	18.52	18.33	18.90	18.20
Crude fibre	8.02	8.24	8.60	8.53	8.78
Ether extracts	7.86	7.17	7.65	7.01	7.50
Ash	7.91	7.23	7.76	7.41	7.88
NFE	57.44	58.84	57.66	58.15	57.64
*ME(Kcal/Kg)	3370.27	3410.72	3344.79	3293.63	3327.12

*Vitamin-mineral premix provider per kg the following: Vit. A 1500 IU; Vit.D_3 3000 IU; Vit.E 30 IU; Vit.K 2.5 mg; Thiamine B_1 3 mg; Riboflavin B_2 6 mg; Pyrodoxine B_6 4 mg; Niacin 40 mg; Vit. B_{12} 0.02 mg; Pantothenic acid 10 mg; Folic acid 1 mg; Biotin 0.08 mg; Chloride 0.125 mg; Mn 0.0956 g; Antioxidant 0.125 g; Fe 0.024 g; Cu 0.006 g; 10.0014 g; Se 0.24 g; Co 0.240 g, *Metabolizable Energy = ME (kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE. Calculated according to the formula of [13]*

diets and water *ad libitum*. The rabbits were weighed at the beginning of the experiment and subsequently on a weekly basis. Parameters measured include total weight gain, total feed intake, feed conversion ratio (FCR) and mortality.

2.6 Carcass and Organs Evaluation

A total of 4 rabbits from each treatment (one per replicate) were randomly selected, weighed, starved overnight to clear the gut and then slaughtered. After slaughtering, external offal such as the pelt head and feet were removed and weighed. During evisceration, the internal organs and other gut contents were carefully removed and weighed. Carcass was weighed; organ weights were expressed as percentage live weight. Dressing percentage was calculated thus:

Dressing percentage (D %) $\frac{dressedweight}{Live\ weight}\ x\ 100$

2.7 Laboratory Analysis

The proximate composition of the raw and toasted sickle pod seed meals, experimental diets and anti-nutritional factors were determined using the standard procedure of analysis described by [10].

2.8 Statistical Analysis

Data collected were subjected to one way analysis of variance using completely randomized design [11] and means were separated using Duncan's multiple range test at the $p<0.05$ level [12].

3. RESULTS AND DISCUSSION

3.1 Proximate and Anti-nutritional Factors of Raw and Toasted Sickle Seed Meal

The proximate composition of the raw and toasted sickle pod seed are presented in Table 2. The results showed higher Crude Protein (CP), Crude Fibre (CF), ether Extract (EE) and ash values for toasted sickle pod seeds meal while nitrogen free extracts (NFE) and metabolisable energy were not improved by toasting. This indicates that the nutrient of sickle pod seed is affected by heat treatment. The CP values of both raw and toasted sickle pod seed however differs from the value of 18.46% reported by [7] and 29.54% reported by [8]. The crude fibre (CF) and ether extracts(EE) values ranged from

10.18-17.10% and 7.50-8.00% respectively. The higher Crude Protein (CP) level of the toasted sickle seed may be attributed to the processing methods employed. The values of CF and ash are higher than 2.45% and 9.00% reported by [7,14]. Nitrogen free extract for raw and toasted sickle seed meal were 46.77% and 33.25% respectively. Differences in the nutrient composition could be as a result of laboratory analysis, processing methods, edaphic factors and climatic factors. All the values for anti-nutritional factors (ANFs) determined decreased as a result of the toasting. This agreed with the findings of [15,16] who reported reduction in anti-nutritional factors when they subjected sorrel seed to toasting. Reduction in the contents of the anti-nutritional factors suggests the ability of toasting as an effective method of detoxification sickle pod seed.

3.2 Growth Performance of Weaner Rabbit fed Toasted Sickle Seed Meal (TSSM)

The growth performance parameters of weaner rabbits fed graded levels of toasted sickle seed meal are presented in Table 3. Result showed that total feed intake (TFI) of rabbits on T1 diet was not significantly (P>0.05) different from those on T2, T3, T4 and T5 diets. The TFI values ranged from 3201.20 g for rabbits on T3 diet to 3235.40 g for those on T2 diet. There was no significant (p>0.05) difference in the total weight gain (TWG) of rabbits. The TWG varied from 930.00 g for rabbits fed T1 and T3 diets to 936.67 g for those on T4 diet. However, final weights and Feed conversion ratio (FCR) were not influenced by dietary inclusion of toasted sickle seed meals. Final weights were within the range of 1649.00 – 1650.00g, while FCR ranged of 3.43 in rabbits fed T2 and T4 to 3.47 in rabbits fed T1 diet.

The result is in consonant with that of [17,18], who fed roasted pigeon pea meal to broilers and reported no significant difference on the broilers performance. [19] also made similar observation when he fed graded levels of toasted pigeon pea meal to weaner rabbits. However, the result negates the finding of [20,21] who reported significant decreased in growth performance of broiler chicken and rabbits fed up to 10% inclusion of cassia *obtusifolia* seed Meal. Variation in the result could be attributed to the differences in species of animal used in the two studies and processing methods. The result of average daily weight gain (ADWG) of weaner rabbits fed graded levels of TSPM was higher the range of 12.27 to 15.70 g as reported by [19] and that of the range of 13.49−15.44 g reported by [22]. The non-significant difference of parameter measured the result obtained for final weight, total weight gain, feed conversion ratio and total feed intake agreed with the findings of [23] who reported rabbits fed diets containing heat processed seed meal were not significantly different from the control diet.

Table 2. Proximate and anti-nutritional composition sickle seed meal (%DM)

Parameters	Raw sickle pod seed meal	Toasted sickle pod meal
Dry matter	94.80	90.80
Crude protein	21.45	30.15
Crude fibre	10.18	17.10
Ether extracts	7.50	8.00
Ash	4.16	11.00
Nitrogen free extracts	46.77	33.25
MEkcal/kg*	3071.41	2988.94
Anti-nutritional factors mg/100 g		
Saponin	185.00	40.12
Phenols	137.85	46.35
Tannins	191.14	43.45
Oxalates	83.00	21.64
Phytate	240.00	26.97
Cyanides	6.98	0.63

**Metabolizable Energy = ME (kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE, Calculated according to the formula of [13]*

Table 3. Growth performance of weaner rabbit fed toasted sickle seed meal (TSSM)

Inclusion levels of toasted sickle seed meal						
Parameter	**0**	**2.5**	**5.0**	**7.5**	**10**	**SEM**
Initial weight (g)	710.67	708.00	710.00	708.33	709.67	7.09^{ns}
Final weight (g)	1646.70	1650.00	1640.00	1645.00	1642.30	12.30^{ns}
Total weight gain (g)	930.03	942.00	930.00	936.67	932.63	6.32^{ns}
Average daily weight gain (g)	16.60	16.82	16.60	16.72	16.65	8.21^{ns}
Total feed intake (g)	3228.10	3235.40	3201.20	3213.70	3219.70	10.12^{ns}
Average daily feed intake (g)	57.67	57.78	57.16	57.38	57.49	5.12^{ns}
Feed conversion ratio	3.47	3.43	3.44	3.43	3.45	1.32^{ns}

NS= not significantly different (P<0.05), SEM = Standard error mean

Table 4. Carcass characteristics and organ weights of weaner rabbits fed toasted sickle seed meal (TSSM)

Inclusion levels of toasted sickle seed meal						
	0	**2.5**	**5.0**	**7.5**	**10**	**SEM**
Live weight (g)	1619.38	1621.00	1619.21	1605.00	1603.00	16.13^{ns}
Slaughter weight	1600.00	15900.00	1603.30	1525.00	1545.00	18.86^{ns}
dressed weight (g)	841.08	860.99	835.34	823.53	812.20	8.36^{ns}
Dressing (%)	51.93	53.11	51.58	51.30	51.29	0.51^{ns}
Small intestine length (cm)	213.33	212.00	216.67	212.33	210.00	2.12^{ns}
Large intestine length (cm)	101.67	106.70	103.87	106.88	106.77	4.40^{ns}
Internal organs (% live weight)						
Small intestine weight (g)	3.25	3.24	3.25	3.38	3.92	0.03^{ns}
L intestine weight (g)	1.09	1.22	1.46	1.63	1.67	0.22^{ns}
Caecal	6.62	6.15	6.12	6.21	6.53	0.06^{ns}
Liver	2.81	2.50	2.75	2.78	2.83	0.03^{ns}
Heart	0.20	0.19	0.20	0.20	0.22	0.02^{ns}
Lungs	0.77	0.76	0.77	0.81	0.90	0.01^{ns}
Kidney	0.56	0.61	0.68	0.72	0.79	0.40^{ns}
Stomach	3.32	3.03	3.32	3.59	3.57	0.18^{ns}

NS= not significantly different (P<0.05), SEM = Standard error mean

3.3 Carcass Characteristics and Organ Weights of Weaner Rabbits Fed Toasted Sickle Seed Meal (TSSM)

The result of carcass characteristics and internal weight organs of weaner rabbits are presented on Table 4 above. The result showed non-Significant differences (P> 0.05) on the live weight, dressed weight and dressing percentage among the dietary treatment groups. The live weight values obtained in this study are within the range 985.08-1960.08 recorded by [24]. The dressed weight value range of 550 -820 g obtained in the present study are lower than the value 499.0- 592.00 g recorded by [3]. The dressing percentage varied from 51.29 – 53.11%

The result of internal organ weights were not significant (P>0.05) influenced by inclusion levels of TSSM in the diets. It is evident therefore, feeding weaner rabbit with vary levels of TSSM did not illicit any toxic response as internal organs such as liver and kidney are the major organs of detoxification did not undergo any hypertrophy [25,26].

4. CONCLUSION

From the results of this study it can be concluded that inclusion of toasted sickle pod seed meal (TSSM) up 10% in the diet of weaner rabbits did not affect growth performance and carcass characteristics. Therefore, TSSM can be included up to 10% in rabbits' diets

ETHICAL CONSIDERATION

The study was conducted with permission from the animal welfare and ethics committee of Department of Animal Health & Production Technology, Adamawa State College of Agriculture, Ganye, Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://prh.sdiarticle3.com/review-history/19123