Vol. 1 No.1, July 2021

FUAM Journal of Pure and Applied Science

Available online at
www.fuamjpas.org.ng

An official Publication of
College of Science
Joseph Sarwuan Tarka University,
Makurdi.

FUAM Journal of Pure and Applied Science
© College of Science, Joseph Sarwuan Tarka University, Makurdi
https://fuamjpas.org.ng/
Vol.1. No. 1. July, 2021

Effects of Graded Levels of Sesame Seed Cake Diets on the Growth and Reproductive Parameters of Rabbits

[1]*W. Abdulsalam, [1]M.A. Mahmud, [2]I.C. Alemede and [2]J.Y. Adama

[1]Department of Animal Health and Production Technology, Niger State College of Agriculture, Mokwa, Nigeria.
[2]Department of Animal Production, Federal University of Technology, Minna, Niger State, Nigeria.
*Correspondence E-mail: wosilatnike@gmail.com

Received: 19/04/2021 **Accepted**: 14/07/2021 **Published online**: 30/07/2021

Abstract

In a twenty-four week feeding experiment, 45 weaner rabbits (*Oryctolaguscuniculus)* of mixed breeds with an average weight of 722-750 g were used to evaluate the inclusion of different dietary levels of sesame seed cake diets on growth performance, fertility and post-partum performance of growing rabbits. The rabbits were randomly assigned to the dietary treatments in a completely randomized design with nine rabbits per treatment at three rabbits per replicate and fed with diets containing 0, 25, 50, 75 and 100 % sesame seed cake in diets designated as T1 (control), T2, T3, T4 and T5, respectively. Proximate analysis of the sesame seed cake (SSC) on dry matter basis indicated that it contained 4.80 % moisture, 25.50 % crude protein, 29.33 % ether extract, 4.50 % crude fibre, 5.25 % ash, 30.62 % nitrogen free extract. After a two-week stabilization period, data on body weight and feed intake were collected from the experimental animals on weekly basis. Does were mated for fertility and post-partum parameter evaluation to conclude the second phase of the experiment respectively. Results obtained in growth performance indicated that feed intake was significantly higher ($p<0.05$) for rabbits on treatment with 50 % SSC and lowest in treatment with 0 % SSC. There was increasing trend of body weight gain from control to higher level of sesame seed cake supplementation i.e. T1 (380.52 g), T2 (450.00 g), T3 (480.56 g), T4 (450.00 g) and T5 (530.55 g). The control treatment had higher feed conversion ratio than the supplemented treatments, 100 % SSC has the lowest FCR. There was no significant ($p>0.05$) difference in all the reproductive parameters tested.There was significant ($p<0.05$) difference in gestation length and milk yield across treatment groups. The study revealed that sesame seed cake is rich in protein and could be used as a partial or total replacement as protein source without any adverse effect on the productive performance and it also support normal body functions and reproduction in weaner rabbits fed sesame seed cake.

Keywords: Fertility, Gestation, Post-Partum, Replacement, Sesame

Introduction

The demand for protein of animal origin in Nigeria is greater than the quantity that is been supplied [1]. This acute shortage of animal protein in the diet of many Nigerians has resulted in efforts been directed towards livestock that are prolific and have short gestation interval such as rabbit. An increase in rabbit production can go a long way towards bridging the demand supply gap of protein in the country [16,14]). This, according to [7], is due largely to the rabbit's high rate of prolificacy, early maturity, rapid growth rate, efficient feed utilization and the high nutritive value of its meat.According to [10], the increased demand for food and feed in developing countries, demand that alternative feed resources must be identified and evaluated as substitute for the conventional feed source. One of such feed is sesame seed which is rich in protein, carbohydrates, fibre and some minerals and has amino acid profile with good nutritional value similar to soybean [12], the nutritive value of sesame seed can also be comparable with that of groundnut cake if the anti-nutritional factors are reduced or eliminated by heat treatment.

Sesame *(Sesamumindicum L.*), also known as benniseed, belongs to the family Pedaliaceae, and reputed to be one

of the most ancient oil seeds crop known since historic times and plays an important role in human nutrition.

Materials and Methods

Experimental site and location

The experiment was conducted at the Rabbitary unit of the Livestock Farm of Niger State College of Agriculture Mokwa. Mokwa is located on latitude 9° 17'41-35^{0}N and longitude 5°13'14-83^{0}E, Mokwa is located in a fairly highland relative to the immediate environment. The altitude is 116 m above sea level [17].

Source of feed ingredients and preparation

White variety of sesame seed was obtained from Mokwa central market in Mokwa Local Government Area of Niger state. Other ingredients used for formulating the experimental diets which includes groundnut cake, fish meal, maize, groundnut haulms, maize bran, rice offal, bone meal, salt and vitamin premix, were also obtained from the same market. The experimental animals were sourced from the Rabbit Multiplication Centre, Ministry of Livestock and Fisheries Resources, Bosso, Minna, Niger State.

Processing of sesame seed meal

Seeds were thoroughly cleaned to remove extraneous materials like pebbles, dead leaves. The sesame seeds were roasted using the local coal pot for about 5 minutes at 180 –210°C and then milled, [8]. Oil was pressed out by adding ordinary water to the milled sesame seed and mixed vigorously and thoroughly. The oil floats to the surface from where it was removed by decanting and the process was repeated until negligible oil is formed. After extracting the oil, the residue was dried in the sun and then milled to obtain the sesame seed cake.

Experimental design

A complete randomized design (CRD) was used for the experiment. The rabbits were randomly allotted to five (5) dietary treatments comprising three replicates per treatment at three rabbits per replicate. The diets were formulated to include the control diet (T1) with 0 % sesame seed cake(0 %SSC)while other diets contain(T2) 25 % sesame seedcake(25 %SSC), (T3) 50 %sesame seedcake(50 %SSC), (T4) 75 % sesame seed(75 %SSC)and (T5) 100 % sesame seed cake(100 %SSC) respectively (Table 1)

Proximate analysis of raw sesame seed and processed sesame seed meal

Proximate analysis and anti-nutritional factor analysis were determined for both raw and processed sesame seed meal. The proximate compositions of the experimental diets were determined by the [2] method where feed samples were analyzed for Crude Protein (CP), Crude Fibre (CF), Ash, Fat (Ether Extract) and the Nitrogen Free Extract (NFE) was calculated, while anti-nutritional factor analysis was done at National Cereal Research Institute, Baddegi, Niger state.

Statistical analysis

The data collected during the experimental trials were subjected to analysis of variance (ANOVA) of Statistical Analysis Software for windows [15]. Significant differences ($P<0.05$) among treatment means were determined using Duncan's Multiple Range Test, Duncan, [5].

Results and Discussion

Table 2shows the proximate composition of both the raw sesame seed and the sesame seed cake. The crude protein is seen to be higher in the sesame seed cake (25.50) than in the raw sesame seed (19.86). The level of crude protein found in raw sesame seed can qualify it as a good source of protein.

Table 3 shows the anti-nutritional contents of both raw sesame seed and sesame seed cake.All the anti-nutritional factors were reduced in the sesame seed cake with an increase in the flavonoid content. There was no side effect on the health of the animal or interference with normal feed utilization.

The performance characteristics of weaner rabbits fed varying levels of sesame seed cake is as shown in Table 4.The study produced daily feed intake values between 44.89- 55.36 g (Table 4),The values reported in this study however, were fairly higher than the 24.02 – 60.54 g reported by [6] in the tropics.

The feed conversion ratio values of 6.60, 6.45, 6.12, 5.97 and 5.36 (Table 4) obtained in this study were higher than the 2.63- 4.00 reported by earlier researchers in the tropics ([3] and [11]. Lowest final weight and weight gain was recorded for 0 % SSC and it also has the worst feed to gain ratio. The superior feed conversion ratios for the sesame seed cake diets might have also contributed to the superior growth rate and weight gain by the rabbits on graded levels of sesame seed cake diets as compared to the 0 % SSC diet. The higher weight gains in the rabbits fed the SSC diets may, therefore, be partly due to a better protein quality, possibly arising from a higher methionine and lysine supply [4].

Reproductive performance (Table 5) shows no significant difference in the mating weights (initial doe weight) of the animals, ranging between 1108.33 and 1263.89 g. Average gestation length for all the animals also falls within 29-31days with no significant difference across the treatments. Does in 50 % SSC recorded the highest litter size at birth of 4.50 (though not significantly different), Does on 100 % SSC had the lowest litter size at birth (2.50). These values of litter size are in agreement with the report of [9].

Litter weight at birth (which was not significantly different among groups) was highest for 50 % SSC and 100 % SSC at 225.00 g for both treatments respectively. Treatment 0 % SSC recorded the lowest litter weight at birth (175.00 g). The litter size and weight at 21 days was highest in 50 % SSCat 3.00 and 725 g respectively while the remaining treatments ranged between 2.00 - 2.50 and 300 – 550 g respectively. The survival rate in this study (50 to 100 %) is comparable to 63.3 to 76.1% reported by [13]. The average daily weight gains of the kids were T4 (5.72 g/day), T1 (6.19 g/day), T5 (7.74 g/day), T2 (9.13 g/day) and T3 (11.43 g/day) for all the treatments over twenty-onedays post-partum period, respectively (Table 4). These values were higher than the weight gains (3.0 - 6.5 g/day) reported by [13], respectively. Kids of does on 50 % SSC, and 25 % SSC had higher growth rate than those on the remaining treatments. All the diets with sesame seed cake inclusions had significantly higher milk yield than the diet without at ($p<0.05$) significant level.

Table 1. Composition of Experimental Diets

Ingredients	T1	T2	T3	T4	T5
Maize	44.95	44.95	44.95	44.95	44.95
Rice offal	20.00	20.00	20.00	20.00	20.00
Maize bran	10.00	10.00	10.00	10.00	10.00
Groundnut cake	18.00	13.50	9.00	4.50	0.00
Sesame seed cake	0.00	4.50	9.00	13.50	18.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Vitamin Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30	0.30
TOTAL	100	100	100	100	100
Calculated nutrient composition					
ME (kcal/kg)	2594.60	2599.60	2604.50	2609.50	2614.40
Crude protein	18.28	18.26	18.01	17.88	17.74
Crude fibre	10.09	10.27	10.21	10.15	10.32

Composition of premix (Bio-mix) supply the following per kg diet: Vitamin A 500,000 I.U. Vitamin D, 800,00IU, Vitamin E, 12,000mg Vitamin K, 5000mg, Biotin 10,000mg, Vitamin B, Biotin 10,000mg, Vitamin B2 200mg, Vitamin B6 15000mg, Niacin, 12,000mg, Pantothenic Acid, 20,000mg, Biotin 10m000mg, Vitamin B12, 30,000mg, Folic Acid, 150,000mg, Chloride, 60,000mg, Manganese 10,000mg, Iron 15,000mg, Zinc 80,000mg Copper 400mg, Iodine 80,000mg Selenium 8,000mg.T1 = 0 % Sesame seed cake (SSC);T2 = 25 % Sesame seed cake (SSC);T3 = 50 % Sesame seed cake (SSC);T4 = 75 % Sesame seed cake (SSC);T5 = 100 % Sesame seed cake (SSC)

Table 2.Proximate Composition of Raw Sesame Seed, Sesame Seed Cake and Groundnut cake

Parameters (%)	**Raw sesame seed**	**Sesame seed cake**	**Groundnut cake**
Moisture Content	4.80	3.60	_
Crude Protein	19.86	25.50	45.00
Crude Fibre	5.71	4.50	3.81
Ether Extract	51.67	29.33	9.16
Ash	4.22	5.25	5.51
N- Free Extract	14.94	30.62	_

Table 3. Anti-Nutritional Substances in both Raw Sesame Seed and Sesame Seed Cake

Parameters	Raw sesame seed	Sesame seed cake	% Reduction	% Increase	RSL
Tannin (%)	1.11	0.61	45.05	_	31.20
Phytate (%)	1.67	0.50	70.06	_	23.40
Oxalate (mg/g)	3.53	1.69	52.12	_	0.54
HCN (%)	0.012	0.011	8.33	_	0.15
Alkaloid (%)	5.34	1.40	73.78	_	0.80
Saponin (%)	2.52	0.85	66.27	_	7.02
Flavonoid (%)	3.34	5.93	_	43.68	22.00

Recommended Safe Levels (RSL)

Table 4. Growth Performance of Rabbits Fed Graded Levels of Sesame Seed Cake Diets

Parameter	T1	T2	T3	T4	T5	SEM	LS
Initial Weight (g)	727.81	727.70	733.33	722.22	733.33	3.12	NS
Final Weight (g)	1108.33	1177.78	1213.89	1172.22	1263.89	3.44	NS
Total Weight Gain (g)	380.52	450.00	480.56	450.00	530.55	3.87	NS
Daily Weight Gain (g)	6.80	8.04	8.58	8.04	9.47	0.52	NS
Daily Feed Intake (g)	44.89^{b}	47.97^{b}	55.36^{a}	49.21^{ab}	50.79^{ab}	0.66	*
FCR	6.60	5.97	6.45	6.12	5.36	1.03	NS
Mortality (Number)	1	1	1	0	1	0.34	NS

^{abc}Means in the same row with different superscripts differ significantly ($p<0.05$).

LS= Level of significance; NS= Not significant; SEM= Standard Error of Means; * = Significant

Table 5. Reproductive Parameters of Does Fed Graded Levels of Sesame Seed Cake Diets.

Parameters	(0 % SSC)	(55 % SSC)	(50 % SSC)	(75 % SSC)	(100% SSC)	SEM	LS
Weight of Doe (g)	1108.33	1177.78	1213.89	1172.22	1263.89	3.44	NS
Gestation length(days)	30.50^{a}	29.50^{ab}	30.00^{ab}	28.50^{b}	30.50^{a}	0.29	*
Litter size at birth	3.50	3.00	4.50	3.50	2.50	0.45	NS
Total Litter wt/ kit at birth (g)	175.00	200.00	225.00	200.00	225.00	3.31	NS
Litter size at 21 days	2.00	3.00	2.50	2.50	2.00	0.58	NS
Total Litter wt at 1-21 days (g)	435.00	725.00	425.00	300.00	550.00	6.76	NS
Average daily wt gain /kit (g)	6.19	9.13	11.43	5.72	7.74	0.87	NS
Survival Rate (%)	55.00	100.00	50.00	50.00	75.00	2.52	NS
Total Milk Yield (g)	306.80^{b}	619.50^{ab}	708.00^{a}	354.00^{ab}	383.50^{ab}	3.70	*

Means in the same row with different superscripts differ significantly ($p<0.05$)

Conclusion

The experiment showed that up to 100 % dietary levels of sesame seed cake diet could be included in the diet of rabbits. This is based on the findings that performance in body growth, and reproduction were comparable to those rabbits on control diet (0 % SSC).

Declaration of conflicting interests

The authors declared no potential conflicts of interest

References

[1] Akinmutimi, A.H. and Onwukwe, C.C. 2002. Effect of cooking with various concentrations of potash on Nutrient composition of lima beans. *Journal of Agricultural Biotechnology* 1: 1 – 3.

[2] AOAC. 1990. Association of Official Analytical Chemists, Official methods of Analysis. 15th edition, Washington, D. C.

[3] Ayers, A.C., Barrett, R.P. and Cheeke, P.R. 1996. Feeding value of tree leaves (Hybrid Poplar and black locust) evaluated with sheep, goats and rabbits. *Animal Feed Science Technology*, 57: 51-52

[4] Booth, F.E.M. and Wickens, G.E. 1988. Non-timber uses of selected arid zone trees and shrubs in Africa. FAO conservation guide, Rome, p92-101.

[5] Duncan, D. B. 1955. Multiple range and multiple F test. *Biometrics*, 11: 1 – 42.

[6] Eshiet, N.O., Omole, T.A. and Ademosun, A.M. 1979. The effect of feeding cassava root meal on the performance of fryer rabbits. *Ife Journal of Agriculture*, 2:2-6.

[7] Ghosh, S.K., Das, A., Bujarbaruah, K.M., Das, A., Dhiman, K.R. and Singh, N.P. 2008. Effect of breed and season on rabbit production under subtropical climate. *World Rabbit Science*. 16: 29-33

[8] NAERLS. 2010. Beniseed Production and Utilisation in Nigeria. Extension Bulletin No 154, Horticulture Series No 5. 17/07/11. Available at www.naerls.gov.ng/extmat/bulletins/Beniseed .pdf

[9] Odubote, I.K., and Akinokun, J.O. 1991. Evaluation of the reproductive and body weight performance of the New Zealand white rabbit. *Nigerian Journal of Animal Production*, 18, 61-65.

[10] Odunsi, A.A. 2003. Assessment of Lablab (*Lablab purpureus*) leaf meal as a feed ingredient and yolk colouring agent in the diet of layers. *International Journal of Poultry Science,* 2(1): 7174.

[11] Okorie, K.C. 2003. The Effect of palmiticacidfortified maize wet milling by-product on the performance of weaner rabbits. Czech. *Journal of Animal Science*, 48(9): 365-370

[12] Omar, R. E. M., Mahmoud, E. A., Karousa, M. M. and Randa, S. A. 2002. Effects of additives *propolis*and*Nigella* sativa seed oil on some behavioral patterns, performance products and blood parameters in Sasso chickens. Egypt. *Poultry Science*, 21:140-151.

[13] Roy, J., Sultana, N., Khondokker, Z., Reza, A., and Hossain, S.M.J. 2002). Effect of different Sources of Protein on Growth and reproductive Performances of Rabbits. *Pakistan Journal of Nutrition,* 1 (6), 279-281.

[14] Sarikhan, M., Shahryar, H.A., Gholizadeh, B., Hosseinzadeh, M.H., Beheshti, B., and Mahmoodnejad, A. 2010. Effects of Insoluble Fiber on Growth Performance, Carcass Traits and Ileum Morphological Parameters on Broiler Chick Males.*International Journal of Agricultural Biology,* 12: 531–536.

[15] SAS 2006. Statistical Analytical System Institute Inc. Users guide statistic version 8.2edition Cary North Carolina, USA.

[16] Shahrbabak, M.S., Rozbahan, Y., Shahrbabak, M.M. and Shahrbabak, H.M. 2009. Influence of Different Levels of Digestible Degradable Protein on the Carcass Characteristic of KermaniMale Lambs in Iran.*International Journal of Agricultural Biology*, 11: 643–646

[17] Usman, M.N. 1998. Mokwa: A Growing City. Famous Graphics, Minna. Pp. 2-4.

Cite this article

Abdulsalam W., Mahmud M.A., Alemede I.C. and Adama J.Y. (2021). Effects of Graded Levels of Sesame Seed Cake Diets on the Growth and Reproductive Parameters of Rabbits. *FUAM Journal of Pure and Applied Science*,**1**(**1**): 27-31

© 2021 by the authors. Licensee **College of Science, Joseph Sarwuan Tarka University, Makurdi**. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC) license.