World
Rabbit
Science
Association

PROCEEDINGS OF THE 12th WORLD RABBIT CONGRESS

Nantes (France) - November 3-5, 2021

ISSN 2308-1910

This communication was accepted by the scientific committee of the Congress

but was not presented during the Congress itself,
neither face-to-face nor remotely via Internet.

EFFECT OF FEEDING VARYING LEVELS OF WILD SUNFLOWER (*Tithonia diversifolia)* LEAF-BLOOD MEAL MIXTURE ON NUTRIENT DIGESTIBILITY AND GROWTH RESPONSE OF WEANER RABBITS

Adetola O.O.*, Odetola O. O., Saka A.A., Adetayo, T.O., Jinad, M.O.
Department of Animal Health and Production Technology, Federal College of Animal Health and Production Technology, P.M.B 5029, Moor Plantation Ibadan, Oyo State, Nigeria.
*Corresponding author: olufunmilayo.adetola@fcahptib.edu.ng

ABSTRACT

A study was conducted to evaluate effect of feeding varying levels of sunflower (*Tithonia diversifolia*) leaf-blood meal (SFLBM) mixture on nutrient digestibility and growth performance of weaned rabbits for 56 d. Thirty-six mixed breed weaned rabbits (49 d old) weighing 0.80 kg were randomly assigned into four treatment groups of 9 rabbits each replicated thrice in a completely randomised design. Four diets were formulated to contain SFLBM at a ratio of 4:1 (sunflower leaf meal: blood meal) at 0% (control), 10%, 20% and 30% as D1, D2, D3 and D4, respectively. Parameters measured were feed intake, growth rate, feed conversion ratio and the nutrient digestibility was evaluated for 7 d. Results of growth performance revealed significant ($P< 0.05$) differences in final weight, average daily weight gain and feed conversion ratio which decreased as the inclusion levels of SFLBM increased. The highest ($P<0.05$) values were in D1 and D2, followed by D3, while D4 had the worst values. Final weight and weight gain were better in rabbits fed with D2 and D3 compared with those of D4. Digestibility of dry matter, crude protein and ether extract, decreased ($P< 0.05$) from D1 and D2 to D3 while the lowest value was for D4 group. However, crude fibre showed highest ($P< 0.05$) value on D2 followed by D1while the lowest values were obtained on D3 and D4 but reverse is the result recorded for organic matter content. In conclusion, utilization of sunflower leaf-blood meal mixture up to 20% in rabbit's diet is tolerable without any deleterious effect on growth and digestibility of the diets.

Keywords: Rabbit, Sunflower leaf, Blood meal, Growth, Digestibility

INTRODUCTION

The dietary protein intake on the average Nigerian, both in terms of quantity and quality, is widely acknowledged to be inadequate. The emphasis for poultry, cattle, sheep, goat and pig to produce the much-needed animal protein for the teeming population has not yielded the expected dividends (Bukola *et al*., 2002). The shortage of animal protein therefore calls for improvement in the feeding, management and productive performance of livestock and this has resulted in an upsurge of interest in rabbit production with attendant gains in importance and popularity in the sub-humid zone of Nigeria (Asuquo, 1997). Biobaku (1998) alluded to the fact that increased rabbit production could bridge the demand to supply protein gap and it is by far the most appropriate system for sustainable meat production. They produce white meat that is palatable and nutritious, high in protein and low in calories, fat and cholesterol (Gillespie, 1998). A matter of great concern to livestock farmers is the problem of seasonal fluctuation in both quality and quantity of animal feeds, scarcity and high cost of conventional feed ingredients. Alawa *et al*, (1990) have advocated the development of alternate feeding materials that would be relatively cheap when compared with commercial feeds and conventional feedstuffs. Sunflower has high nutritional value, containing all known essential amino acids and it is also rich in minerals and vitamins especially the B-complex vitamins (Olabanji *et al*, 2007). Blood meal contains 77.3% CP, 0.53% fat, 1.46% CF, 0.3% Calcium and 0.2% phosphorus (Aduku, 1993). Thus, it could be a good protein source for livestock species such as rabbit. Blood

meal protein was better than plant protein and it is high in lysine and leucine (Olabanji *et al*, 2007) but little is known about the effect of the combination of sunflower leaf and blood meal on the

performance of rabbit. Thus, this study was conducted to investigate the effect of feeding varying levels of sunflower leaf-blood meal mixture on the performance and nutrient digestibility of weaned rabbits.

MATERIALS AND METHODS

Experimental location, Processing and preparation of diets

The experiment was carried out at the Rabbitary Unit of Teaching and Research Farm, Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan, Oyo State Nigeria.

The sunflower leaf used was harvested and processed by air-drying on a concrete floor inside a well-ventilated roofed house to preserve its nutritive value. The dried leaves were milled into sunflower leaf meal (SFLM). Blood used was prepared by boiling a freshly collected bovine blood from the abattoir for 60 minutes. The coagulum was spread on a concrete floor and covered with mosquito net to prevent contamination by flies, sun-dried until completely dried and then milled into blood meal. The processing was done as described by Olabanji *et al*., (2007). The sunflower leaf meal and blood meal were mixed in ratio 4:1 respectively to make sunflower leaf-blood meal mixture, then pelletized for easy consumption.

Animals and experimental design

Thirty-six (36) unsexed weaned (49 d of age) mixed breed of rabbit with an average weight of 820 g were used for an experimental period of 56 days. The rabbits were acclimatized for a week and housed in a wooden hutch with a wire mesh (so that faeces and urine can drop). Feed were supplied twice daily with water *ad-libitum*. The experimental animals were managed well for optimum performance.

Four diets (D1, D2, D3 and D4) were formulated to contain a mixture (4:1) of sunflower leaf-blood meal included at 0%, 10%, 20% and 30%, respectively (Table 1).

Table 1: Composition of experimental diets

Ingredients	D1 (0%)	D2 (10%)	D3 (20%)	D4 (30%)
Maize	31.5	31.5	31.5	31.5
Maize bran	30.0	30.0	30.0	30.00
Groundnut cake	30.0	20.0	10.0	0.00
SFLBM	0.0	10.0	20.0	30.0
Bone meal	3.00	3.00	3.00	3.00
Molasses	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50
*Premix	2.00	2.00	2.00	2.00

SLBM: Sunflower leaf-blood meal mixture (4:1)

*Premix per kg diet: vitamin A 10,000 I.U, vitamin D 12,000 I.U, vitamin E 20 I.U, vitamin K 2.5 mg, Thiamine 2 mg, Riboflavin 3mg, Pyridoxine 4.0mg, Niacin 20mg, Panthemic acid 5.0mg, Cobalamin 0.05mg, folic acid 0.5mg, Biotin 0.08 mg, Cu 0.006g, Mn 0.006g, Co 0.25g, I 0.0014g, Zn, 0.03g; Se 0.24g and antioxidant 0.125g

Table 2: Chemical composition of test ingredients and experimental diets (%)

Parameters	SFLM (%)	BM (%)	SFLBM (%)	D1 (0%)	D2 (10%)	D3 (20%)	D4 (30%)
Dry matter	93.1	91.8	87.5	90.2	89.2	85.6	84.7
Crude protein	23.3	87.3	37.2	17.2	19.2	17.1	19.2
Crude fibre	15.5	0.00	13.8	9.00	8.65	11.2	6.79
Ether extract	1.11	0.45	0.75	5.21	5.10	4.39	3.80
Ash	18.4	4.11	14.8	7.41	8.09	8.49	9.22
NFE	41.6	8.15	33.5	61.1	58.9	58.8	61.0

NFE: Nitrogen free extract; SFLBM: Sunflower leaf-blood meal mixture; BM: Blood meal; SFLM: Sunflower leaf meal

The rabbits were randomly allocated into dietary treatments with three replicates having 3 rabbits each. Data recorded were: initial weight, final weight, average daily weight gain, feed intake, average

daily feed intake. Feed conversion ratio was calculated, and digestibility trial was studied using a rabbit per replicate in a metabolic cage. For digestibility study, the rabbits were fed known amount of feed before faecal samples were collected for 7 days, then oven dried to attain a constant weight. The dried faeces were analysed and the results were used to determine digestibility of feed nutrients by the rabbits.

Chemical Analysis:
The proximate composition of test ingredients, experimental diets and faeces were analysed by A.O.A.C (2005).

Statistical Analysis
All data were analysed using one way analysis of variance (ANOVA) of the statistical analysis software (SAS, 2004). Significant means were separated using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Final weight, weight gain, average daily weight gain and FCR were significantly (P<0.05) affected by dietary treatments (Table 3). The highest (P<0.05) final weight were observed in D1 and D2, followed by D3, while D4 had the worst values. Similar trend was observed for average daily weight gain. This value contradicts the report of Duwa *et al.,* (2014) who recorded weight gain of (940-1019.91g) when rabbits were fed graded levels of roasted sunflower (*Helianthus annus*) seed meal. Rabbits on D4 (30% SFLBM) had lower feed intake probably due to the non-palatability of feed at higher inclusion level and this agreed with the findings of Dutta *et al*. (2003) that reported that feed intake is reduced with the presence of anti-nutrients in feed as well as the non-palatability of the feed ingredients. Feed conversion ratio had better (P<0.05) on D2 (3.62) and D1 (Control), then D3 (6.20) and the least value was on D4, which is an indication of feed efficiently utilized by rabbits on those diets

Table 3: Growth response of rabbits fed varying levels of Sunflower leaf-blood meal mixture diets

Parameters	D1 (0%)	D2 (10%)	D3 (20%)	D4 (30%)	SEM (±)
Initial weight (g)	847	849	828	841	9.92
Final weight (g)	1381^{a}	1349^{ab}	1156^{bc}	957^{c}	57.69
ADWG (g/d)	12.7^{a}	11.9^{a}	7.79^{a}	2.75^{b}	1.35
ADFI (g/d)	49.8	41.4	45.0	32.7	2.99
FCR	4.00^{b}	3.62^{b}	6.20^{ab}	12.80^{a}	1.42

^{a,b} means with different letters on the same row differs significantly (P<0.05). ADFI: Average daily feed intake; ADWG: Average daily weight gain; FCR: Feed conversion ratio; SEM: Standard Error of Mean (n=3).

The nutrient digestibility was significantly influenced by dietary treatments (Table 4). This agreed with the findings of Fakorade *et al*., (2018) when rabbits are fed with wild sunflower leaf meal (*Tithonia diversifolia).*

Table 4: Nutrient digestibility of rabbits fed varying levels of Sunflower leaf-blood meal mixture diets

Parameters (%)	D1 (0%)	D2 (10%)	D3 (20%)	D4 (30%)	SEM (±)
Dry matter	71.5^{a}	78.0^{a}	67.7^{ab}	49.1^{b}	4.10
Crude protein	79.5^{a}	82.2^{a}	66.3^{ab}	43.4^{b}	5.73
Crude fibre	57.8^{ab}	77.2^{a}	66.9^{a}	41.7^{b}	4.98
Ether extract	97.6^{a}	96.7^{a}	86.2^{ab}	81.4^{b}	2.75
Organic matter	43.1^{ab}	24.6^{b}	51.6^{a}	52.4^{a}	4.55
NFE	86.8^{a}	89.7^{a}	87.0^{a}	78.1^{b}	1.71

^{a,b} means with different letters on the same row differs significantly (P<0.05). NFE: Nitrogen free extract. SEM: Standard Error of Mean (n=1).

The dry matter digestibility ranges from (49.1 - 78.0%) with the highest (P<0.05) value on D2 (78.0%) and least on D4 (49.1%). Similar trend was observed for digestibilities of crude protein, ether extract and nitrogen free extract, respectively. The values obtained for crude protein digestibility (43.4-

82.2%) in this study was lower than those (76.3-84.4%) reported by Duwa *et al*., (2014). For crude fibre digestibility, rabbits on D2 and D3 had the highest (P<0.05) values of 77.2 and 66.9, followed by D1 (Control) while D4 had the lowest value. These values fell within the values reported by Ajayi *et al*., (2007). Jasmine (2006) reported that high crude fibre in the ration of growing rabbits did not have

any effect on the digestibility of dry matter, ether extract and crude protein. On the contrary, a decrease in dry matter digestibility was reported by Lebas (1998) with the inclusion of high levels of fibre in the diet of rabbits. However, Black (2001) reported that the digestibility of most nutrients has been shown to increase as the crude protein rises. Organic matter content recorded highest (P<0.05) values on D3 and D4 followed by D1 while the lowest value was recorded on D2. Hence, organic

CONCLUSIONS

It can be concluded that Sunflower leaf-blood meal mixture can be included in rabbit diet up to 20%, which could be efficiently utilized and tolerated without any detrimental effect on growth and digestibility. Further investigation into higher levels of inclusion will be studied for better utilization.

REFERENCES

Aduku, A.O., 1993. Tropical Feedstuff Analysis Table. *Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. Nigeria. Pp: 1-2.*

Ajayi, A. F., Farinu, G. O., Ojebiyi, O. O., and Olayeni, T. B., 2007. Performance evaluation of male rabbit fed diets containing graded levels of blood-wild sunflower leaf meal mixture. *World Journal of Agriculture Science Vol.3. No 3, Pp: 250-255.*

Alawa, J.P., Botoye, D.T.K., Ndukwe, F.O and Berepubo, N.A. 1990. Effect of varying proportions of brewer's dried grains on the growth performance of young rabbits. *J. Applied Rabbit Res., 12: 252-255.*

A.O. A. C. 2005. Association of Official Analytical Chemists. Official methods of Analysis, *15th edition. A.O.A.C. Washington D.C. Pp 69-88.*

Azuquo, B.O., 1997. Nutritional potentials of Ipomea, Centrosema, Puereria , Emilia and Tridax foragesin mixed feed for wearner rabbits. *Nig. J. Anim Prod., 24: 46-50*

Biobaku, W.O., 1998. Growth response of rabbits fed graded levels of groundnut shell; effect of organ weight and enzyme activities. Science Forum *Journal of Pure and Applied Science, 11: 176-180*

Black, J., 2001. The nutrition of commercial rabbits. Part 1. Physiology, digestibility and nutrient requirement. *Nutrition Abstract Review (Series B) 5(4): 197-225.*

Bukola, P.U.M., Allison, E.A., Berepubo, N.A and Orumari, B.M, 2002. Bioeconomic evaluation of the performance of rabbits raised under two different housing systems. Tropical Journal,20 (4) 176-180

Duncan, D.B., 1955. Multiple ranges and multiple F: tests. *Biometric 11: 1 – 42*

Dutta, A., and Dutta, S. K. (2003). Vitamin E and its role in the prevention of atherosclerosis and carcinogenesis: a review. *J. Am. Coll. Nutr; 22(4): 258-268.*

Duwa, H., Girgiri, A. Y., Dauda, A., and Igwebuike, J. U., 2014. The effect of feeding graded levels of roasted sunflower L. (*Helianthus annus*) seed meal on weaner rabbits. O*nline J. Anim. Feed Res., 4(5): 107-112.*

Fakorade, O.P and Adetutu, A.A., 201). Performance and carcass characteristics of weaner rabbits fed wild sunflower (*Tithonia diversifolia*) inclusion in their diet. *International Journal of Development and Sustainability. Volume 7 No 8: Pp 2216-2226.*

Gillespie, J.R., 1998. Animal Science. *Delmar Publishers, Washington, USA.*

Jasmine, J. C., 2006. Rabbit digestion and blood composition after fat and oil addition to the feed. *Journal of Applied Rabbit Research.38:221-229.*

Lebas, F., 1998. Reflections on rabbit nutrition with a special emphasis on feed ingredients utilization. [*http://www.northernpulse.com/uploads/resources/527*].

Olabanji, R. O., Farinu, G. O., Akinlade, J. A., and Ojebiyi, O. O., 2007. Growth performance, organ characteristics and carcass quality of weaner rabbirts fed different levels of wild sunflower (*Tithonia diversifolia*) leaf-blood meal mixture. *International Journal of Agricultural Research, 2: 1014-1021.*

SAS, 2004. Statistical Analysis System. Proprietary software release 8.1 *SAS institute Inc, Cary, North Carolina USA.*