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Evaluation of Three Dietary Levels of Wild Sunflower (*Tithonia diversifolia,* Hemsi A. Gray) Forage Meal on Growth and Carcass Measurement of Male Rabbits

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Abstract: Twenty-four cross bred male weaner rabbits of between 5-8 weeks, with mean weight of 804.67 g, were used in a feeding trial involving three levels 0,15 and 20% inclusion of Wild Sunflower Forage Meal (WSFM) in a complete randomized design study that lasted for 8 weeks. The rabbits were randomly divided into three dietary groups of 8 rabbits each. Each rabbit served as a replicate. The parameters measured were, feed intake, daily weight gain, feed: gain ratio, organ weights, carcass yield and tissue development. Rabbits with 20% WSFM inclusion in their diet recorded significant ($p<0.05$) lower values in daily feed intake and weight gain than both the control and 15% inclusion group. Values recorded for all the groups however did not significantly ($p>0.05$) differ in organ weights, organ yield and tissue development. It was concluded that WSFM can be included in the weaner rabbit diet up to 15% level without any deleterious effect on growth performance.

Key words: WSFM, weaner rabbits, feed intake, daily weight gain, organ weights

INTRODUCTION

Until recently in Nigeria and other developing countries when the awareness for the use of unconventional feedstuffs became real, livestock feeds production have been based on maize as the main source of energy while soybean meal, groundnut cake and fishmeal were the main conventional protein sources. Such condition had put the livestock industry in direct competition with man for these cereals [1]. The result is a situation of high prices of the conventional feedstuff to a level that their inclusion at the required and ideal level in the livestock feed would completely erode the profit of farmers. The livestock industry has not been able to meet the animal protein requirements of the Nigerian populace because it has been confronted with many obstacles, such as high cost of commercial feeds, low productivity of the indigenous breeds of animals, incidences of pest and disease, all of which constitute major factors that hinder the industry. The result is a continuous decrease in the daily protein intake of an average Nigerian. There is the need for alternative sources of animal protein that are cheap and readily available. Rabbit is affordable and requires a low cost for its management. It has a small-body size, short generation interval, rapid growth rate, high fecundity, ability to utilize forage and agricultural by-products, genetic diversity and adaptation to a wide range of ecological environment[2]. As a result of these obvious advantages rabbits can be an alternative source of animal protein[3] have put the total cost of livestock feed at about 70% of the total cost in livestock production. As a result of the dramatic change in the price structure of grains and other raw materials involved with animal feed preparation during the past years, nutritionists have been in continuous search for alternative materials to replace the usually expensive, conventional feed ingredients.

Green forages, because they have high nutritive values, have been found ideal for feeding livestock. Wild sunflower (*Tithonia diversifolia* Helms A. Gray) is a green forage plant that can be utilized as feedstuff for livestock. Some pioneering studies have been carried out on this plant[4-8]. The anti-nutritional factor contained has been reported by Sosulski[9]. Odunsi [5] and Farinu[6] reported wild sun flower to be a good alternative to maize, for inclusion in non- ruminant diets.

The present study was designed to investigate the performance of weaner rabbits fed three inclusion levels of wild flower meal and determine the better inclusion level for recommendation.

MATERIALS AND METHODS

Experimental site: The study was conducted at the Rabbitry unit of the Teaching and Research farm, Ladoke Akintola University of Technology, Ogbomoso in the derived Savannah zone of Nigeria.

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Table 1: Percentage composition of experimental diets

	Dietary levels of WSFM		
Ingredients	0	15	20
Maize	10	2.5	2.5
Maize grain	35	27.5	22.5
G.N.C	18	18	18
P.K.C	23	23	23
Fish meal	1.5	1.5	1.5
(WSFM)	-	15	20
Bone meal	3	3	3
Premix	2	2	2
Palm oil	4	4	4
Salt	0.5	0.5	0.5
Molasses	3	3	3
Total	100	100	100

WSFM-Wild sunflower forage meal Premix composition /kg Vitamin A, 4,00,00 i.u, Vitamin D3, 800,000 i.u, Vitamin E 8000 mg, Vitamin K3 8,000 mg, VitaminB1 1,200 mg, VitaminB2 2000 mg, Niacin 18,000 mg, Calcium panthothenate 4,000 mg, VitaminB6 1840 mg, VitaminB12 8 mg, Folic acid 400 mg, Biotin 20 mg, Chlorine chloride 120,000 mg, Manganese 48,000 mg, Iron 40,000 mg, Zinc 32,000 mg, Iodine 600 mg, Copper 3,400 mg, Cobalt 120 mg, Selenium 48 mg, Anti-oxidant 48,000 mg

Collection and processing of the test ingredient: The wild sunflower forage meal used for this study was prepared from leaves and succulent stalks of the naturally growing wild sunflower plant in the uncultivated plots of the Teaching and Research farm of the University. The harvested leaves and succulent stalk were air-dried on concrete slab, protected from sun and rain, until they were dry enough for easy milling.

Diet formulation: The Wild Sunflower Forage Meal (WSFM) was used with other ingredients purchased from a reputable commercial feed-mill within the locality, to formulate three experimental diets of 0, 15 and 20% levels of WSFM as shown in Table 1.

Experimental animals and management: The twenty-four male weaner rabbits used for the study were of mixed breeds and varied in age between 5-8 weeks. The rabbits were allowed an adjustment period of 1 week during which they were fed the control diet and treated against ecto and endoparasites. They were then randomly assigned to 3 dietary treatment groups of 8 rabbits, with each rabbit serving as a replicate. Rabbits in group1were fed the control diet (0%WSFM), group 2 rabbits were fed a diet containing 15%WSFM while group 3 were fed a diet containing 20%WSFM. The rabbits were housed individually in metabolic cages measuring 44x34x44 cm. The cages were kept in an open sided asbestos roofed house under natural ambient temperature. The metabolic cages were designed in such a way to allow feaces and urine collection.

After the initial weight, each rabbit was weighed at weekly interval until the end of the 8 week study to determine the weekly weight gain. Water was supplied *ad libitum*, weighed quantities of the experimental diets were served daily and the left over were collected and weighed to determine the daily feed intake.

Records of feed intake, weight changes and mortality were kept for subsequent analysis.

Laboratory analysis: The proximate composition of samples of the test ingredients as well as the experimental diets was carried out, using the method of A.O..A.C. [10].

Carcass evaluation: At the end of the experiment, the rabbits were fasted for 18 h before slaughtering. Terminal weights were taken; the rabbits were stunned and slaughtered by severing the jugular vein. They were scalded and eviscerated immediately after. The dressed weight was taken and the organs were carefully removed, weighed and expressed as a percentage of the live weight.

Statistical analysis: Data collected in the complete randomized design experiment were subjected to analysis of variance (ANOVA) procedures of Steel and Torrie[11]. Means were separated and significant differences were determined using Duncan's multiple range tests at 5% level of probability[12].

RESULTS AND DISCUSSION

Proximate composition: The proximate composition of the test material (WSFM) and the experimental diets are presented in Table 2. The values obtained for WSFM were similar to those reported in literature[5]. The values were also close to those reported for banana leaf meal, cassava leaf meal and *Tridax procumbence*[13]. The protein and fibre contents in the WSFM compared well with protein and fibre content of wheat bran, dried brewers grains and palm kernel meal[13].

The proximate composition of the experimental diets revealed that they were iso-nitrogenous and isocaloric. Although other nutrients were similar, the crude fibre increased with higher levels of WSFM.

The feed intake, final live weight, daily weight gain, feed to gain ratio and organ weights as affected by the dietary treatments are presented in Table 3.

Feed intake: Feed intake by rabbits in group 3 (59.93±5.59 g) was significantly ($p<0.05$) lower than those of groups 1 and 2 (68.23±3.32 g and 72.09±7.13 g, respectively), which did not significantly ($p>0.0.5$) differ from each other. These values were similar to those recorded by Oji and Inimgab[14[but lower than figure reported by[15]. The average daily feed intake values in this experiment were considerably lower than the range

Table 2: Proximate composition of WSFM and the experimental diets

Proximate composition	% Composition			
		WSFM	Diet1	Diet2
Diet3				
Crude protein	16.63	19.17	20.60	21.05
Crude fibre	10.00	7.92	9.58	9.72
Ether extract	7.00	6.26	5.81	6.01
Ash	13.00	4.35	5.60	6.03
NFE	53.37	46.55	50.68	49.40

WSFM-Wild sunflower forage meal

Table 3: Effect of Inclusion of WSFM on feed intake weight gain and feed to gain ratio and organ weight of rabbits

Parameters	Dietary level of WSFM		
	0	15	20
Initial weight (g)	783.85±240.89	789.18±250.51	833.14±284.14
Final live-weight (g)	1126.74±177.14^{a}	1118.81±247.85^{a}	972.15±335.25^{b}
Total weight gain (g)	342.89^{a}±53.91	329.63^{a}±51.82	139.01^{b}±21.85
Daily feed intake (g)	68.23±3.32^{a}	72.09±7.13^{a}	59.93±5.95^{b}
Daily weight gain (g)	7.72±4.41^{a}	7.64±0.97^{a}	3.31±4.08^{b}
Feed to gain ratio	8.82	9.14	18.11
Organs (% of final live weight)			
Liver	3.00±0.31	2.88±0.53	2.74±0.72
Heart	0.27±0.03	0.23±0.03	0.24±0.04
Kidney	0.46±0.05	0.65±0.16	0.67±0.09
Spleen	0.08±0.03	0.06±0.03	0.04±0.02
Lungs	0.66±0.09	0.50±0.12	0.51±0.17

^{ab}Means along the row with the different superscript are significantly different ($p<0.05$)

Table 4: Effect of WSFM on carcass yield

Parameters	Dietary inclusion of WSFM		
	0	15	20
Terminal weight (g)	1126.74±177.14	1118.81±247.85	927.15±335.25
Carcass yield	64.55±4.60	66.66±3.55	61.69±7.45
Left thigh (%)	6.67±0.58	6.98±1.07	6.69±1.10
Muscle (%)	76.60±3.24	80.97±3.97	75.53±1.44
Bone (%)	16.36±2.17	17.36±3.21	19.97±7.61
Muscle: Bone ratio	4.68	4.66	3.78

110-130g reported by Lebas[16] and Igwebuike *et al.*[17] for maize based diets and Olayeni[19] under tropical conditions. The large deviation of the values in this study from the observation of Lebas[16] could be a reflection of environmental factors and the bitter taste of WSFM[19].

Weight changes: The rabbits fed the control diet had the highest final live-weight of 1126.74±177.4 g compared to 1118.81±247.85 g and 972.15±335.25 g. The daily weight gain was 7.72±4.41 g compared to 7.64±0.97 g and 3.31±4.08 g, respectively for groups 2 and 3 rabbits. Values observed for group 1 rabbits were significantly ($p<0.05$) higher than those of group 3 on 20%WSFM but not group 2 on 15%WSFM inclusion. The final weight observed for the control and 15% WSFM group compared favourable well with the result of Oji and Inimgab[14] for rabbits fed Leucena seed meal based diet. However, the control and the experimental rabbits had lower final weights when compared with the result of Bamigbose *et al.*[20-22]. The daily weight gains obtained in the study were lower than the values obtained by the above authors and did not conform to the range of 20-25g reported by Cheeke[23]. The reason for this could be due to poor feed intake, which ultimately led to poor weight gain.

Organ weights: The relative weights of the liver, heart, kidney, spleen and lungs to final live-weights are presented in Table 3.The organs were not significantly ($p>0.05$) affected by the dietary treatments. However the weights of the liver, kidney and heart were lower than the values reported by Akinola[7] with mango seed kernel based diet in weaner rabbit diets. This observation suggested that WSFM contains no anti-nutritional factor at a level that could have affected the organs.

Carcass yield and tissue development: The relative carcass yield, the relative muscle weight and the bone to the left thigh are presented in Table 4. The non-significant ($p>0.05$) difference between diets containing 15 and 20% inclusion in carcass yield and muscle to bone ratio suggest that the inclusion of WSFM in the diets at such levels did not have any negative effect on these characteristics.

Livability: No mortality was recorded in any of the groups. This is an indication that the WSFM at these inclusion levels has no adverse effect on Liability.

CONCLUSION

The result obtained from this study showed that weaner rabbits can tolerate the inclusion of 15 % WSFM in their diet. The inclusion of 20% WSFM adversely affected the daily weight gain and ultimately the final live weight.

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