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Studies on Haematological and Serum Biochemical Characteristics of Weaner Rabbits Fed Different Levels of Wild Sunflower (*Tithonia diversifolia* Hemsl A. Gray) Leaf- Blood Meal Mixture

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Abstract

A 59 day -feeding trial involving thirty-two, 5-& weeks old, weaner rabbits of mixed breeds and sex with initial weight of between 594 and 608g was conducted to examine the effect of feeding different levels of wild sunflower leaf- blood meal mixture (WSFLBM) as a iron- conventional feedstuff on the haematological and serum biochemical indices of weaner rabbits. The rabbits were allocated into 4 treatment groups of 8 rabbits per group. Each rabbit served as a replicate in a completely randomized design experiment. The four treatment groups had diets containing WSFLBld at 0,5. 10 and 20% dietary inclusion levels. All the haematological parameters evaluated: White blood cell count(WBC), Red blood cell count(RBC'), Mean corpuscular haemoglobin concentration (MCHC), Mean corpuscular haemoglobin (MCH), Mean corpuscular volume(MCV)were not significantly (P > 0.05) affected by the inclusion of WSFLBM. Significant influences were not observed for total protein, albumin, globulin and alkaline phosphatase. However, the serum biochemical indices evaluated, showed that cholesterol, SGPT and SCOT were significantly (P < 0.05) affected as the level of WSFLBM increased.
It was concluded based on data from WBC, RBC, MCV, MCH MCHC and those from serum biochemical indices evaluated that wild sunflower leaf- blood meal mixture could be incorporated up to 20% level in weaner rabbit ration.

Keywords: weaner rabbit, heamatological parameters, wild sunflower leaf-blood meal mixture.

Introduction

Majority of the ever-increasing population of Nigeria suffer from protein malnutrition because animal protein, being the best source of protein is very expensive and often not within reach of an average family (Ojewola-*et al.*, 1999). This is consequent upon the fact that the prices of conventional feedstuff are expensive leading to high cost of feed. In order to meet animal protein requirement of the people, efforts should be geared toward producing animals that are prolific, possessing short generation interval and less capital intensive as an interim measure (Obioha, 1976).

One of such species of livestock is rabbit. It has short gestation period of 28-32 days, high prolificacy, and rapid growth rate. It requires smaller initial capital outlay when compared with other non-ruminants. Rabbit meat is tasty, low in cholesterol, sodium and fat but high in protein. There is

no known religious/cultural taboo against the consumption of rabbit meat (Biobaku and Oguntona, 1997). In terms of commercial production, rabbit is close to: modern broiler chicken in growth rate, feed conversion efficiency and meat quality (Anthony *et al* 1990). Rabbits are efficient converter of feed to meat and can utilize up to 30% crude fibre as against 10% by most poultry species (Egbo *et al;* 2001).

The use of forage and agro-industrial byproducts, have become an area of interest to animal nutritionists because of the challenges posed by the high cost of the conventional feedstuff's. Akinyosoye, 1978 observed that green plants are main nutritional sources of vitamins and provides a large portion of minerals required by animals during normal growth and development. According to Onifade and Tewe (1993) blood meal and diverse forage materials such as wild sunflower can be efficiently utilized by rabbits.

In spite of the relative successes achieved with the use of various unconventional feedstuffs in term of nutrient digestibility, utilization and performance of farm animals, there is need to consider the health status of the animals to be produced. A readily available and fast means of assessing clinical and nutritional health status of animal on feeding trials may be the use of blood analysis. The reason being that ingestion of dietary components has measurable effect on blood composition

Table 1: Percentage Composition of the Experimental Diets

Ingredients	**Diets**			
	1	2	3	4
Maize	15	12	9	3
Maize bran	30	30	30	30
Groundnut cake	10	8.25	6.5	3
Palm kernel cake	31	31	31	31
Fish meal	1.5	1.25	1.0	0.5
WSFLBM	0	5	10	20
Bone meal	3	3	3	3
*Premix	2	2	2	2
Oil	4	4	4	4
Salt	0.5	0.5	0.5	*05*
Molasses	3	3	3	3
	1(30	100	100	100
Determined Analysis				
Crude Protein	16.18	17.50	19.46	19.68
Crude Fibre	7.60	7.80	8.20	8.70
Ether extract	1625	16.41	16.20	15.84
Ash	*953*	9.56	8.88	14.88
ME(kcaVkg)	3719	3720	3725	3476
NFE	50.44	48.73	47.21	40.90

*Vitamin -mineral premix contained the following (g/kg): vit A, 1500IU; vit E, 11IU; vit B,, lOmg; vit B_3,40mg; vit B 20mg; choline chloride, 400mg; Mn, 120mg; Fe. 70mg; Cu, 1 Omg; I., 2.2mg; Se, 0.2mg; Zn, 45mg; Co, 0.02mg. V

(Church *et al,* 1984;Veulterinora, 1981; Maxwell *et at*, 1990) and may be considered as appropriate measure of long term nutritional status.

This study therefore investigates the effect of feeding wild sunflower leaf-blood meal mixture on the growth performance, haematological and serum biochemical indices of weaner rabbits.

Materials and Methods.

Location of experiment

The experiment was carried out at the Rabbitary unit of the Teaching and Research farm of Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Nigeria. The area is located within the derived savanna zone of Nigeria.

Animals and their management.

Thirty-two, 5-8 weeks old weaner rabbits of mixed breeds and sex with a weight range of between 594 and 608g were randomly assigned to four dietary treatment groups of eight rabbits per group in a complete randomized experimental design. The rabbits were housed individually in all - wire metabolic cages with provision of feeding and drinking troughs. The rabbits were fed twice daily at 08.30h and 15.30H while water was provided *ad-libitun.* Feed intakes and live weights were recorded daily and weekly respectively throughout the experiment, which lasted for 59 days.

Preparation of experimental diets

Wild sunflower leaf meal was prepared by air -drying wild sunflower leaf harvested when the first inflorescence had opened in 50-80% of the plants on a concrete floor. The dried leaves were then hammer milled to produce wild sunflower leaf meal.

Blood meal used was prepared by boiling fresh blood collected from the abattoir for one hour. The coagulum was spread on a concrete floor and sun - dried for 5 days. It was then hammer milled into. blood meal.

The wild sunflower leaf meal and the blood meal were mixed together in ratio 2:1 respectively to form wild sunflower leaf -blood meal (WSFLBM) mixture. The test ingredients were mixed together with other ingredients to form four (4) experimental diets at levels of 0, 5, 10, and 20% as presented in Table 1. The proximate composition is presented in Table 2.

Blood Analysis

At the 8th week of the experiment, blood samples were collected from the marginal veins of the ears of six randomly selected rabbits per treatment. The blood samples were analyzed for some haematological and biochemical indices. All blood samples for haematological indices were collected into bottles containing EDTA, as anti - coagulant. The haematological indices determined included packed cell volume (PCV), Haeamogloblin concentration (Hb) White blood cell count (WBC), Red blood cell count (RBC), Mean corpuscular volume (MCV), Mean corpuscular haemogloblin (MCH), mean corpuscular haemogloblin concentration (MCHC) and white blood cells differential counts (i.e Neutrophils, Lymphocyte, Monocytes and Eosinophils). Packed cell volume (PCV) was determined by the micro-haematocrit method (Dacie and Lewis. 1991), the haemoglobin concentration was determined by the

colometry-cyanomethicmoglobin method, Red blood cells (RBC) counts were determined by the improved Neubauer haemocytometer method (Kelly, 1979), While mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and mean corpuscular

Table 2: Proximate Composition of Test Ingredients

Nutrients	%DM		
	WSFLBM	**Blood meal**	**WSLM**
Crude Protein	50.52	83.12	21.21
Crude Fibre	14.30	0.61	10.50
Ether extract	10.99	1.30	10.00
Ash	14.00	8.83	18.09
Nitrogen Free Extract	10.19	6.14	40.20

WSLM: Wild sunflower leaf meal
WSFLBM: Wild sunflower leaf-blood meal

Table 3: Performance and Haematological traits of rabbits-fed varying levels of WSLBM

	Diets				
Parameters	**1**	**2**	**3**	**4**	**S/L**
Initial Live weight (g)	594.6±41.3	607.3±52.3	608.6±58.7	608.1±40.5	NS
Final Live weight (g)	1220.6±43.1	1285.3±52.6	1248.0±46.1	1288.6±30.9	NS
Heamoglobin (g/dl)	7.02±1.21	7.32±1.40	9.92±0.58	7.12±0.85	NS
Packed cell volume (%)	21.0±3.53	22.17±4.25	30.0±1.84	21.5±2.59	NS
Red blood cells (x10Vmm^3)	3.53±0.57	3.73±0.07	5.05±0.31	3.6±0.44	NS
MCV(FL)	59.7±0.70	59.4±1.04	59.4±0.67	59.80.34	NS
MCH(Pg	19.7±0.40	19.7±0.03	19.7±0.20	19.8±0.24	NS
MCHC (g/dl)	33.3±0.49	33. HO. 21	33.1±0.15	33.1±0.22	NS
WBCXX10Vmm^3)	5.73±1.13	5.88±0.77	5.9±0.69	4.68±0.36	NS
Neutrophils (%)	34.5±2.16	32.17±1.82	34.5±1.80	34.33±1.43	NS
Lymphocytes (%)	59.0±2.13	52.17±1.71	59.3±1.28	59.3±1.78	NS
Monocytes (%)	0.67±0.21	1.33±0.33 .	1.17±0.31	1.50±0.34	NS
Eosinophils (%)	5.67±1.26	7.00±0.68	4.50±0.89	4.83±1.38	NS

NS=No significant difference (P>0.05)
M1′ 11C: Mean corpuscular haemoglobin concentration
MCHC: Mean corpuscular haemoglobin
MCV: Mean corpuscular volume

haemoglobin concentration (MCHC) were computed according to the method of Jain (1986). The differential white blood cell (WBC) counts were obtained by making a differential smear stained with Wright's stain and the percentage counts taken for segmented neutrophils and lymphocytes (Dacie and Lewis, 1991)

Blood samples that were meant for serum chemistry were collected into other

bottles free of any anticoagulant. It was centrifuged at 1000 r.p.m for 10 minutes and the serum was separated and analysed. Serum protein, albumin and globulin were analysed colorimetrically using diagnostic reagent kits (Renal Diagnusztikal Reagents, keszlet, Hungary) based on total protein (Wechelbaun, 1964) albumin and globulin (Doumas and Briggs, 1972) and cholesterol (Roschian *et al,* 1974) respectively. Activities of serum glutamic oxaloacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT) and alkaline phosphatase (ALP) were determined colorimetrically (Reitman and Frankel, 1957).

Chemical Analysis

The proximate components of the wild sunflower leaf—blood meal mixture and samples of the four experimental diets were determined by the method of A.O.A.C (1990).

Statistical Analysis

All data collected were subjected to one way analysis of variance using SAS, 1988 and significant means separated by Duncan multiple range tests. (Duncan 1955).

Results

Table 2 shows the proximate composition of test ingredients. The proximate components of blood meal used in this study are 83.12%, 0.61%, 1.30% and 8.83% for crude protein, crude fibre, ether extract and ash respectively while those of wild sunflower leaf meal are 21.21%, 10.50%, 10.0% and 18.09% respectively. The combination of wild sunflower and blood meal contained a higher proportion of crude protein than wild sunflower leaf meal alone. The crude protein and crude fibre content of the experimental diets increases as the inclusion levels of WSFLBM increases. However all the values fall within the range recommended by Lebas et al (1986) for growing rabbits. Table 3 shows the growth performance and the values of various haematological indices investigated. The rabbit final live weight ranges between 1220.6 and 1288.6g. There was no difference (P>0.05) among the treatments in term of final live weight.

Table 4; Serum biochemical parameters of rabbits fed varying levels of WSFLBM

	Diets				
Parameters	**1**	**2**	**3**	**4**	**S/L**
Albumin (g/dl)	2.62±0.08	2.37±0,07	2.63±0.12	2.68±0.14	NS
Globulin (g/dl)-	2.55±0.06	2.68±0.03	2.62±0.08	2.77±0.06	NS
Total protein (g/dl)	5.12±0.12	S.OSiO.10	5.25±0.19	5.45±0.17	NS
Cholesterol mg/dl)	26.8±0.75^{b}	27.7±0.92^{b}	29.33±0.80^{ab}	30.67±0.99 ^{a}	*
SGPT(U/L)	7.83±0.87^{ab}	6.17±0.87^{b}	10.0±0.89^{a}	7.5±0.85 ^{ab}	*
SGOT(U/L)	*16.0±115* ^{ab}	13.33±1.36^{b}	18.5±1.25^{a}	15.8±1.0 ^{ab}	*
ALP(U/L)	40.5±0.76	37.5±1.66	41.0±1.15	41.33±1.12	NS
Albumin Globulin	1.03±0.07	0.88±0.05	1.00±0.10	0.97±0.10	NS

^{abc}Means within a row with different superscript differ significantly (P<0.05)
NS: No significantly different (P>0.05)
* = Significantly different (P<0.05)
SGPT: Serum (glutamic Pyruvic Transaminase)
SGOT: Serum (glutamic Oxaloacetate Transaminase)
ALP: Alkaline Phosphatase

Haemoglobin values obtained are 7.02,7.32,9.92 and 7.12 g/dl for diets 1, 2, 3 and 4 respectively while those of packed cell volume are 21.0,22.17, 30.0 and 21.5 respectively. The values obtained for Red blood cell count (RBC) are 3.53, 3.73, 5.05 and 3.6 (xlOVmm^3) for diets 1, 2, 3 and 4 respectively. Haemoglobin (Hb), packed cell volume (PCV), red blood cells (RBC),. mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) were not significantly affected (P>0.05) by the dietary inclusion of WSFLBM although Hb, PCV and RBC values marginally increased from diet 1 to 3 after which the values declined. White blood cells (WBC), neutrophils, lymphocytes, monocytes and eosinophils were not significantly (P > 0.05) influenced by different inclusion levels of WSFLBM (Table 3)

The serum biochemical indices as influenced by the diets are presented in Table 4. Total protein values obtained are 5.12, 5.05,5.25 and 5.45g/dl for diets 1,2,3. and 4 respectively while albumin values are 2.62, 2.37, 2.63 and 2.68g/dl for diets 1, 2, 3, and 4 respectively. The values obtained for cholesterol in mg/dl are 26.8,27.7,29.33 and 30.67mg/dl for diets 1, 2. 3 and 4 respectively. Albumin, globulin, total protein, Alkaline Phosphatase (ALP) and albumin-globulin ratio were not significantly (P>0.05) different among the dietary treatments while cholesterol, SGPT and SCOT were significantly (P < 0.05) affected. The serum cholesterol level of rabbit significantly (p<0.05) increased as the level of WSFLBM increased. SGPT and SCOT did not follow any specific pattern.

Discussion

Although the crude protein content of the diets increased as the inclusion of WSFLBM increases, it did not significantly (P>0.05) affect the final live weight and haematological values of the rabbits in all the treatment groups. The implication is that the lowest protein level (16.1 8%) for diet 1 in this study can adequately support the growth of the rabbits.

The non-significant (P>0.05) differences in the values obtained for final live weight across the treatment groups is contrary to the reports of Iheukwuemere *et al* (2002) and Farinu *et al* (1999) when rice milling waste and mango seed kernel meal respectively were fed to weaner rabbits. This is an indication that wild sunflower leaf-blood meal mixture could be a better unconventional feedstuff than some other ones since it compared favourably with the control diet.

The similarity in the values of Hb, PCV, RBC, MCH, MCV and MCHC could be related to nutritional adequacy and safety of the test ingredients (WSFLBM). The values obtained according to Uko, et al., (1998) showed that these animals were well nourished. The test ingredients were able to provide essential amino acids and minerals that were necessary for the normal functioning of the haematopoetic tissues (Ezeagu et al, 2002). The values for all the parameters fall within the normal range values established for rabbits by Mitruka and Rawnsley (1977).

Anti-nutritional factor inherent in the leaf of wild sunflower (Dutta et al, 1986) did not seem to have any adverse effect on the above-mentioned blood parameters although this is contrary to the report obtained when wild sunflower leaf meal was used to feed broiler chickens (Gauz and Dupreez, 1975; Odunsi *et al.* 1999). The variations would be due to level of inclusion and specie differences. The comparable results obtained for the control and other treatment groups could

also be due to the positive complementary effect of the two unconventional feedstuffs used as test ingredients. Sunflower leaf is rich in calcium, Haematological and serum biochemical characteristics of rabbits magnesium and phosphorus. The crude protein also has high concentration of methionine. (Seller, 1984; BP Nutrition, 1979) while blood meal is a good source of lysine and leucine but deficient in methionine, isoleucine, calcium and potassium (Me Donald, 1981).

The non-significant effect observed in the white blood cell count and its differentials therefore remove the possible fears of imminent hazard that may be associated with the use of WSFLBM. The serum total protein and albumin of the rabbits used in this study were not affected ($P>0.05$) by the WSFLBM inclusions. This showed that the protein levels contained in the diets was enough to support normal protein reserves across the groups. The similarity in the albumin content could be attributed to the comparable protein intake across the groups. Guache *et al.* (1991) reported albumin content to be specifically influenced by protein shortage. The albumin contents and total protein observed in this study were within the normal ranges for rabbits reported by Mitruka and Rawnsley (1977). Total protein values increases slightly as the level of WSFLBM increased though not at a significant level. This observation according to Eggum (1970) suggests good quality of the test diet since the higher the value of serum total protein, the better the quality of the feed stuff. The cholesterol values obtained for all the dietary treatments fall within the normal range reported by Mitruka and Rawnsley (1977) even though there were significant ($P<0.05$) differences across the treatment groups.

The values obtained for SGPT did not follow airy specific pattern. Although there were significant ($P<0.05$) differences among treatments, the value 7.83 u/1 obtained for control is similar to that of diet containing 20% WSFLBM mixture. Similarly SCOT value of 16.0 u/1 obtained for control compared well with the value (15.8 u/1) recorded for the diet containing 20% WSFLBM mixture. SCOT and SGPT usually respond to the presence of toxic substances in the diet (Aletor, 1983; lyayi, 1994). The observed values therefore indicate the ability of the rabbit to tolerate the anti-nutritional factor *(Sesquiterpene lactone)* identified in wild sunflower leaf meal by Dutta et al. (1986). The significant effect of the diets on SGOT and SGPT agrees with the findings of Sokunbi and Egbunike (2000) in rabbits, Fasina et al. (1999) in broiler chicken but contrary to the report of Iheukwuemere, et al (2002) in broiler chickens.

Conclusion

Most of the parameters tested viz growth performance, haematological and biochemical indices showed no significant differences. It could therefore be concluded that WSFLBM mixture could be efficiently utilized and tolerated by weaner rabbits up to 20% inclusion level without any deleterious effect on growth performance and health status of growing rabbits.

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