

Effect of Graded Levels of Sweet Potato Leaves on Haematological and Serum Biochemical Parameters of Rabbits

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Abstract

The study was conducted to evaluate the effect of graded levels of sweet potato (*Ipomoea batata*) leaves (SPL) and pelleted concentrate feed (PCF) on haematological and serum biochemical parameters of rabbits. Thirty-six weaner rabbits comprising of eighteen (18) bucks and does each were used for the experiment. The rabbits were randomly assigned to three dietary treatments in a Completely Randomized Design. Twelve (6 males and females each) rabbits were assigned to each treatment and replicated three times such that each replicate was allocated 4 (2 males and 2 females) rabbits. Rabbits in treatment 1 were fed 100 % sweet potato leaves concentrate while in treatment 2 was fed 50 % concentrate and 50 % sweet potato leaves and treatment 3 was 100 % concentrate. Haematological and serum biochemical parameters data collected were subjected to one-way analysis of variance of the SPSS statistical package. Feeding rabbits with graded level of sweet potato leaves had no significant ($p > 0.05$) effect on all the haematological and serum biochemical parameters measured. Based on the findings of this study, sweet potato leaves can be fed to rabbits without any known negative effect on the haematological and serum biochemical parameters and are recommended for feeding rabbits in the study area.

Keywords: Effect, Sweet Potato Leaves, Rabbits, Haematology, Biochemistry

1. Introduction

Haematological and serum biochemistry studies have been found useful for disease prognosis and for the therapeutic and feed stress monitoring. Haematological and serum biochemistry studies are important because the blood is the major transport system of the body, and evaluations of the haematological and serum biochemistry profile usually furnishes vital information's on the body's response to injury of all forms, including toxic injury to rabbits. Haematological and serum biochemistry studies represent a useful process in the diagnoses of many diseases as well as investigation of the extent of damage to the blood. A readily available and fast means of accessing clinical and nutritional health status of animals on feeding trials may be the use of blood analysis because ingestion of dietary components has measurable effects on blood composition and maybe considered as appropriate measures of long-term nutritional status [1-4].

In developing countries, the interest has focused on exploring protein sweeping underutilized legumes and forages due to an acute

shortage of food rich in protein, caused by population explosion and the high cost of animal protein. A lot of forages could be used in animal rations substituting a part of costly protein sources, that depending on chemical composition, low anti-nutritional factors (ANF) content, viability and palatability, thus forages' leaves and seeds are of great interest due to the high nutritional value and low cost. emphasized the need for leaf meals in animal diet particularly rabbits as a possible means of reducing cost of animal feed. Sweet potato (*Ipomoea batata*) is an herbaceous creeper plant which resists draught, has short generation interval of about four months, and can therefore be planted twice a year; hence its availability and usage as feed for rabbits throughout the year is not in doubt. The leaves of this plant have been used in the tropics as a cheap protein source in ruminant feeds probably as a result of its high protein contents and reported no significant difference in different inclusion levels of pineapple peels in live weight, carcass weight, dressing percentage, and heart, liver, kidney, lungs, stomach, intestine, abdominal fat, forelimb, loin, skin/fur, head, shank, hind limb, testis and blood weight.

The leaves of sweet potato have been used in the tropics as a cheap protein source in ruminant feeds probably as a result of its high protein contents. Therefore, the objective of the study is to evaluate the effect of graded levels of sweet potato (*Ipomoea batata*) leaves and pelletized concentrate feed (PCF) on haematological and serum biochemical parameters of rabbits [5,6].

2. The Study Area

The experiment was carried out at the Livestock Research and Demonstration Farm of the Department of Animal Science, Faculty of Agriculture Shabu-Lafia Campus, Nasarawa State University Keffi. The study area falls within the Southern Guinea Savannah zone of Nigeria. The area is located on latitude 8° 35' North and Longitude 8° 32' East, altitude 181.53m above sea level with a mean temperature of 34°C, humidity of 40-86%, average day light of 9-12 hours and a rainfall between 1500mm to 1800mm (Faculty Weather Station, 2023).

3. Experimental Design and Management of Experimental Animals

A total of thirty-six (36) weaner rabbits comprising of eighteen (18) bucks and does procured from National Veterinary Research Institute (NVRI) Vom, Jos, Plateau State, Nigeria. The rabbits were housed in a well cleaned and disinfected hutches with dimensions of 70 x 60 x 50-cm each. The experimental rabbits were housed and quarantined for two weeks for any possible diseases and for the purposes of acclimatization. During this period, the rabbits were dewormed with Ivermectin at the dose of 0.3 mg/kg subcutaneously and also treated prephilately against coccidiosis with Amp role 200® according to the manufacturer's prescription. After quarantining, the rabbits were randomly assigned to three dietary treatments in a Completely Randomized Design (CRD). Twelve rabbits (6 bucks and 6 does) were assigned to each treatment and replicated three times such that each replicate was allocated 4 (2 bucks and 2 does). Rabbits in treatment 1 were fed fully on concentrate, while treatment 2 were fed 50 % concentrate and 50 % sweet potato leaves and treatment 3 rabbits were fed 100 % sweet potato leaves. The rabbits were given water *ad-libitum*.

4. Source of Sweet Potato Leaves (SPL)

Sweet potato leaves (SPL) used in this study were sourced from established backyard farm located within Lafia. The SPL were harvested fresh daily and fed to the rabbits at the predefined ratio with the commercial pelletized concentrate feed (PCF).

5. Blood Sample Collection

At the end of the feeding trial, samples of whole blood were collected to determine the effect of sweet potatoes leaves on haematological and serum biochemistry. For the haematological parameters, blood samples were collected in a marked Ethylenediaminetetraacetic Acid (EDTA) bottle. The other blood samples were collected in EDTA free bottles for serum biochemical analysis. Both blood samples collected for haematology and serum were taken to Bafawat Laboratory, Lafia, Nasarawa State, Nigeria within one hour of collection.

6. Determination of Haematological Parameters

Blood samples were collected from 18 rabbits in all. This comprised of two rabbits per replicate and six rabbits per treatment. Haematological parameters were determined following the procedure described by. Haematological parameters measured include packed cell volume (PCV), hemoglobin concentration (Hb), white blood cell counts (WBC), red blood cell counts (RBC), neutrophil, lymphocytes, basophils, eosinophils, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), platelet count and Mean platelet count. Packed cell volume (PCV) was determined using Win Trobe's micro-haematocrit method while red blood cell (RBC) and white blood cell (WBC) were determined with an improved Neubauer hemocytometer. Hemoglobin concentration (Hb) was determined using cyano-methemoglobin method. The erythrocytic indices, mean cell volume (MCV), mean cell hemoglobin (MCH) and mean cell hemoglobin concentration (MCHC) were calculated according to the formula of [7,8].

7. Determination of Serum Chemistry

Sample of blood obtained from the collected blood samples stored in sterile sample bottles without anticoagulant to determine the biochemical components as described by. The blood samples collected into plain tubes without anticoagulant were centrifuged (Roto fix 32®-Hettich) at 3000 rpm for 10 min. The serum was collected and kept at 20°C until analysis. Total serum protein was determined using the Biuret method as described by. Albumin was determined using Bromocresol Green (BCG) method while globulin was estimated by subtracting albumin values from total protein. Serum cholesterol was determined spectrophotometrically using commercial Bio-La-Tests, and serum glucose was estimated using a commercial glucose colorimetric assay kit. Similarly, blood serum chemistry: total protein, globulin, creatinine, urea, cholesterol, Triglyceride, High density lipoprotein and Low-density lipoprotein were determined according to the procedure of [7,9].

8. Statistical Analysis

All data collected were subjected to one-way analysis of variance (ANOVA) to test the effect of sweet potato leaves on body parameters and blood chemistry of weaner rabbits. Where significant differences exist, Duncan Multiple Range Test was used to separate the means. The Animal model fitted for the experiment will be:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where;

Y_{ij} = Individual observation
 μ = Overall mean,
 T_i = Effect of i^{th} treatment
 e_{ij} = experimental error.

9. Results and Discussion

The effect of sweet potato (*Ipomoea batata*) leaves on haemato-

logical parameters of rabbits is presented in Table 1. Feeding rabbits with graded level of sweet potato leaves had no significant ($p>0.05$) effect on all the haematological parameters measured.

Haematological characteristics of animals are greatly influenced by the quantity and quality of feed consumed by animals which disagrees with the observation in the current study. The results in the present study showed no effect in all the haematological parameters and it is at variance with the report of who stated that hemoglobin (HB), packed cell volume (PCV), red blood cell (RBC) and white blood cell (WBC) concentrations showed variation between treatment groups ($p < 0.05$) of feed. The values obtained for all groups were within normal ranges as described by. The observed increments in the values of hemoglobin, packed cell volume (PCV), red blood cells (RBCs) and white blood cells (WBCs) concentrations in treatments 2 and 3 demonstrates how well tolerated the test rabbits was able to handle the sweet potatoes supplemented diets. reported that utilization of sweet potatoes leaves at concentration of 3mls and 5mls per kg body weights resulted in increased hemopoietin secretion thereby stimulating hemopoietin organs (liver and bone marrow). Also, opined that an increase in RBC profile may be connected with freedom from diseases. The results of the differential WBC count (Neutrophils and Leucocytes) which showed no significant impact indicated that the sweat potato treated groups are not battling with any toxicological or disease impact from the treatment, and is not poisonous nor contain an irritant as to initiate any negative immunological responses. White blood cells (WBC) are used to predict the immune response of an animal to stress from an irritant antigen and or poison [10-13].

Also, observed that normal WBC range indicated that the animals are healthy; a decrease in WBC below normal range is an indication of allergic conditions, anaphylactic shock and certain parasitism. Similarly, reported that reduced WBC count, reflects fall in the production of body defense system to infection. From this study, the treatment had no significant influence on the treated groups and their values were within reported normal standard suggesting that sweet potato inclusion in rabbit feed is safe for use as feed supplements [11,12].

The effect of sweet potato (*Ipomoea batata*) leaves on serum chemistry of rabbits is presented in Table 2. Feeding rabbits with graded level of sweet potato leaves had no significant effect on all the serum biochemical parameters measured.

The non-significant effect of sweet potato leave meal on serum biochemical parameters as observed in this study strongly agreed with the report of who reported that sweet potato leaves have no effect on haematological and serum biochemical parameters of rabbits. The values obtained for albumin, cholesterol, Aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP) and glucose in this study falls within normal range and strongly agreed with the report of. The values obtained for cholesterol reveals that in the diet containing sweet potato has improved the health status of the rabbit although not significant and this may be due to the high level of total soluble sugar present in the sweet potato leaves that becomes dissolved into the blood stream of the rabbits. The observed results in the present study agrees with the results of who reported that sweet potato had no significant effect on hematology and serum biochemical parameters and have no negative effects on the blood constituents [13,14].

Parameters	T ₁	T ₂	T ₃	P-Value
HB	10.26±0.41	10.21±0.91	10.08±0.26	0.931 ^{NS}
PCV	31.67±1.20	32.33±0.88	32.33±0.88	0.818 ^{NS}
RBC	5.38±0.29	5.25±0.26	5.15±0.31	0.864 ^{NS}
MCV	59.50±1.02	57.83±0.94	59.16±0.79	0.425 ^{NS}
MCH	19.33±0.33	19.50±0.50	21.00±1.61	0.856 ^{NS}
MCHC	31.83±0.65	31.83±0.40	31.50±0.34	0.548 ^{NS}
PLT	159.83±47.56	132.66±47.70	95.00±23.26	0.323 ^{NS}
N	36.00±2.46	36.00±4.69	40.66±3.16	0.577 ^{NS}
L	58.00±3.26	58.16±4.57	57.67±3.04	0.995 ^{NS}
T = treatments, T ₁ = 100% Concentrate, T ₂ = 50 % concentrate and 50% sweat potato leaves, T ₃ = 100% sweat potato leaves, NS = not significant, HB= Haemoglobin, PCV= Packed cell volume, RBC= Red blood cell, MCV= Mean corpuscular volume, MCH= Mean corpuscular haemoglobin, MCHC= Mean corpuscular haemoglobin concentration, PLT= Platelets, N= Neutrophils, L= Lymphocytes.				

Table 1: Effect of Sweet Potato (*Ipomoea Batata*) Leaves on Haematological Parameters of Rabbits

Parameters	T ₁	T ₂	T ₃	P-Value
CR	122.83±6.15	117.50±5.79	121.00±6.10	0.819 ^{NS}
Urea	7.52±1.13	6.42±0.93	6.81±0.73	0.711 ^{NS}
TB	58.16±6.52	58.33±3.98	57.67±2.23	0.994 ^{NS}
Albumin	32.00±2.206	30.50±1.89	31.00±2.30	0.882 ^{NS}
Globulin	24.33±2.47	29.00±1.86	25.66±1.89	0.297 ^{NS}
TBilirubin	19.10±3.50	19.15±2.59	16.71±1.60	0.768 ^{NS}
CBilirubin	3.56±0.99	2.20±0.36	4.70±1.12	0.283 ^{NS}
AP	350.50±48.52	487.33±85.79	473.83±51.92	0.172 ^{NS}
GOT	64.16±20.97	86.16±43.57	70.16±12.79	0.858 ^{NS}
GPT	49.66±9.77	87.00±25.57	52.16±12.10	0.264 ^{NS}
Ca ²	1.96±0.17	1.83±0.166	1.71±0.12	0.546 ^{NS}
PO ₄ ³	1.16±0.12	1.05±0.62	0.92±0.09	0.219 ^{NS}
Glucose	5.97±0.83	6.13±0.83	7.08±1.18	0.683 ^{NS}
T = treatments, T ₁ =100% Concentrate, T ₂ =50% and 50% sweet potato leaves, Concentrate, T ₃ =100% sweet potato leaves, NS = not significant, CR= Creatinine, Tbilirubin= Total bilirubin, Cbilirubin= Conjugated bilirubin, AP=, Alkaline Phosphatase, GOT= Glutamate Oxaloacetate Transaminase, Ca ² = Calcium, PO ₄ ³ =Phosphate				

Table 2: Effect of Sweet Potato (*Ipomoea Batata*) Leaves on Serum Chemistry of Rabbits

10. Conclusion

Feeding rabbits with graded levels of sweet potato leaves had no significant effect on the haematological and serum biochemical parameters measured and is therefore recommended for feeding rabbits in the study area.

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