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Haematological and serum biochemical parameters of rabbits fed varying dietary levels of water spinach (*Ipomoea aquatic)* leaf meal

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ABSTRACT

Twenty four rabbits of mixed breeds aged between 10-12 weeks, weighing between 900 – 1000g were used in an experiment to determine the effect of feeding varying dietary levels of water spinach (Ipomoea aquatica) leaf meal on haematological and serum biochemical parameters of rabbits. The rabbits were randomly allocated into four treatments, T_1, T_2, T_3 and T_4 containing 0%, 5%, 10% and 15% of water spinach leaf meal respectively (Table 1). Feed and water were served ad libitum throughout the 8 weeks experimental period. At the end of the feeding trial 3 rabbits per treatment were sacrificed and analysis done on blood samples. The result indicated there was no significant (P> 0.05) influence of diet on all the haematological parameters studied. There was also no significant (P>0.05) effect of diet was observed on serum biochemical parameters except serum glucose that was significantly reduced in the control diet. This result shows that water spinach meal can be included up to 15% in rabbit diets without adverse effect on haematology and serum biochemistry of rabbits.

Key words: Haematology, serum biochemistry, rabbits, water spinach leaf meal

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INTRODUCTION

The domestic rabbit (*Oryctolagus cunniculus*) is an important non-ruminant herbivore for meat production. Rabbit meat is a source of healthful food as it is low in cholesterol, but high in protein, 22g/100g [1]. Rabbits can also utilize the available proteins in cellulose rich plants, where as it is not economical to feed these to chicken and turkeys, the only animals with higher energy and protein efficiency. Since there is high demand for additional source of food worldwide the exploitation of plants of low economic importance would be a step towards better resource utilization [2] which is in line with the strategy to achieve sustainable animal production systems by matching them with locally available feed resources [3].

Water spinach is an herbaceous trailing vine that dwells in muddy stream bank, fresh water ponds, and marshes. This perennial aquatic vine is confined to the tropics and sub tropics and does not grow well when temperature is below 24^{o}C. Water spinach can reproduce sexually by producing one to four seeds in fruiting capsules or vegetatively by stem fragmentation [4]. The effect of water spinach on the growth performance and carcass yield of rabbit has been reported Chat [5]. However, there is no information on the effect of water spinach on haematology and serum biochemical parameters of rabbits in the southern guinea savannah ecological zone of Nigeria. Therefore, this study was carried out to investigate the effect of feeding graded levels of water spinach on the haematological and serum biochemical parameters of rabbits in southern guinea savannah of Nigeria.

MATERIALS AND METHODS

Location-The study was conducted at the Rabbitry unit of the Livestock Research Farm, University of Agriculture Makurdi. Makurdi is located at Latitude 7^{o}14' North and Longitude 8^{o}24' East and lies within the Southern Guinea

Savannah Region of Nigeria. The annual temperature ranges from 22.43 to 33.41^{o}C. High temperature is experienced between late February and April. The annual rainfall is between 1270mm-1397mm [6].

Test ingredient-Water spinach plants were collected around the banks of river Benue in Makurdi. The plants were sun dried ground into powder and included at the levels of 0, 5, 10, and 15% in the diet labeled as T_1, T_2, T_3 and T_4 respectively (Table 1). Other ingredients used include: - soybeans, maize offal, maize, rice offal, premix, bone meal and salt. The diets were formulated to meet 16% crude protein requirement for growing rabbits.

Table 1. Composition of experimental diets

Ingredients	T_1	T_2	T_3	T_4
Maize	29.95	29.95	29.00	30.95
Full fat soya bean	28.00	27.50	26.55	26.00
Maize Bran	24.00	19.50	15.00	15.00
Rice offal	15.00	15.00	15.00	15.00
Water spinach	0.00	5.00	10.00	15.00
Premix	0.25	0.25	0.25	0.25
Salt	0.3	0.3	0.3	0.3
Total	100.00	100.00	100.00	100.00

T_1=0% water spinach meal *T_2=5% water spinach meal*
T_3=10% water spinach meal *T_4=15% water spinach meal*

Experimental animals- A total of twenty four weaned rabbits of mixed breeds, aged between 10 and 12 weeks with average weight of 995.75g were used for the study. The rabbits were randomly assigned to the four (4) treatments with six (6) rabbits per treatment. Each rabbit served as a replicate. At the end of the feeding period which lasted for 8 weeks, the animals (three per treatment) were starved of feed for 24hour and thereafter slaughtered.

Blood sample collection-Blood samples were collected into labeled Ethylene-deamine-tetra-acetic acid (EDTA) treated tubes for haematological analysis and into tubes without anticoagulant for serum biochemical evaluation. Evaluations were conducted according to the method already described [7].

Data analysis-Data obtained were subjected to analyses of variance using GenStat (Release 4.24) statistical package [8]. Significant differences between treatment means were separated using Duncan's Multiple Range Test [9].

RESULTS

The results of the proximate composition of water spinach are presented in Table 2. Water spinach was found to be high in moisture (86.62%) rich in protein (20.75%), crude fibre (10.59), fat (18.67%) and ash (10.87%).

Table 2: Proximate composition of water spinach

Measurements	%
Moisture	86.62
Crude protein (CP)	20.75
Crude Fibre	10.59
Ether Extract	18.67
Ash	10.87

Standard methods of A.O.A.C. (1990) were used to determine the proximate composition

The results on the haematology of rabbits fed water spinach meal are shown in Table 3. The packed cell volume (PCV), haemoglobin (Hb), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) mean corpuscular volume (MCV), red blood cell (RBC) count and white blood cell (WBC) count were not significantly ($p>0.05$) different among treatments. The values did not follow any specific pattern.

The results of the effect of water spinach leaf meal on the serum biochemical values of male rabbits are shown in Tables 4. Alanine aminotransferase, alkaline phosphatase total protein, albumin, total cholesterol , Creatinine, conjugated bilirubin, total bilirubin and urea were not significantly different among treatment groups ($p>0.05$). Serum glucose was significantly ($p<0.05$) influenced by dietary treatments.

Table 3: Haematological parameters of male rabbits fed varying dietary levels of water spinach

Parameters	T1	T2	T3	T4	LOS
Packed cell volume (%)	39.30±0.86	40.00±0.58	39.60±0.33	40.00±0.50	ns
Red blood cells ($x10^{12}$/l)	6.55±0.15	6.70±0.06	6.05±0.19	6.50±0.07	ns
Haemoglobin (g/dl)	12.30±0.20	12.60±0.12	12.70±0.03	12.60±0.12	ns
MCH (pg)	18.94±0.12	19.13±0.31	19.36±0.49	19.34±0.05	ns
MCHC (g/dl)	31.45±0.24	31.59±0.31	31.85±0.32	31.49±0.06	ns
MCV (fl)	31.44±0.24	31.59±0.31	31.85±0.08	31.59±0.05	ns
White blood cells ($x10^{9}$/l)	7.10±0.18	7.30±1.65	8.10±0.32	7.90±0.06	ns
Neutrophils(%)	44.60±1.45	48.30±1.20	51.00±0.58	46.60±1.86	ns
Eosinphils(%)	0.00	0.00	0.00	0.00	ns
Lymphocytes(%)	50.30±1.45	48.60±1.76	46.00±0.58	48.30±1.86	ns
Monocytes(%)	2.30±0.23	2.67±0.30	2.67±0.00	2.00±0.00	ns
Basophils (%)	2.30±0.20	1.03±0.30	0.67±0.21	1.67±0.18	ns

Los=Level of significance T_1=0% water spinach meal T_2=5% water spinach meal
ns = not significant 5% T_3=10% water spinach meal T_4=15% water spinach meal
MCV=Mean corpuscular volume MCH=Mean Corpuscular Haemoglobin MCHC=Mean Corpuscular Haemoglobin Concentration

TABLE 4. Biochemical indices of male rabbits fed varying dietary levels of water spinach

Parameters	T1	T2	T3	T4
Alanine aminotransferase(u/I)	17.33±0.33	16.33±0.88	16.00±0.58	17.33±0.88
Alkaline Phosphatase (U/I)	96.33±0.88	96.66±0.66	99±0.88	100±1.16
Total protein (g/ 100ml)	8.17±0.44	8.17±0.27	8.90±0.06	8.87±0.15
Albumin (g/ 100ml)	3.93±0.44	4.27±0.17	4.00±0.12	3.80±0.12
Glucose (mg/100ml)	93.33±1.76 [b]	99.00±1.00[a]	98.00±1.16 [a]	99.33±1.33 [a]
Total cholesterol(mg/100ml)	100.33±1.20	99.00±1.53	102.67±1.76	104.67±1.45
Creatinine (mg/100ml)	0.76±0.03	0.80±0.03	0.79±0.02	0.73±0.02
Conjugated Bilirubin (mg/100ml)	0.39±0.01	0.39±0.02	0.38±0.02	0.42±0.02
Total bilirubin (mg/100ml)	0.73±0.03	0.74±0.03	0.73±0.04	0.79±0.03
Urea (mg/100ml)	58.33±1.67	57.67±1.76	57.67±1.45	56.00±1.05

a,b means in the same row with different superscript as significantly different (p<0.05)
T1=0% water spinach meal T2=5% water spinach meal
T3=10% water spinach meal T4=15% water spinach meal

DISCUSSION

The study has shown that the value (86.62%) of the moisture content of water spinach obtained in this study agrees with an earlier finding [5] which showed that the forage contained 80% moisture content on fresh basis. This rather high moisture content of the forage implies that it will have a laxative effect if consumed in excess and animal may tend to feed less on them. Dry matter intake in animal nutrition is very important as it ensures the intake of large quantity of nutrient when compared to high moisture feeds.

The crude protein (CP) content of water spinach of 20.75% obtained in this study is similar to the value of 21.9±0.67 reported [5] and much higher compared with grasses (5.0 – 10.0%) but it falls within the range of legumes (15.00-30.00 %) which is highly relished by livestock. The crude fibre content of 10.59% is low indicating that the forage will also make good feed for monogastric herboviours such as pigs, rabbits and horses. The fat content of water spinach (18.67%) implies that it can supply some amount of energy to the animals. The percentage ash content is also high, which indicates that the forage is very rich in minerals and therefore confirmed the report [5] that the forage is a rich source of minerals.

It is well established that changes in haematological and biochemical parameters reflect the physiological status of animal [10]. Packed cell volume (PCV) values obtained in this study were not significantly ($p>0.05$) influenced by dietary treatments. The values were within the reference range of 33 to 50% reported by MediRabbit (2007). The red blood cell (RBC) range of 6.05±0.19x10^6/mm^3 to 6.53±0.19x10^6/mm^3 and haemoglobin (Hb) range of 12.30± 0.20 to 12.70±0.03 were within standard range of 3.8 to 7.9 x 10^6/mm^3 for RBC and 9.40 to 17.90g/dl for Hb respectively [11]. This result indicates that water spinach support red blood cell synthesis. The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) values obtained in this study were not affected by dietary treatments and within the normal range for healthy rabbits. The Red Blood cells indices (MCH, MCV, and MCHC) are important morphological characteristics of anaemia [12]. This is perhaps an indication that the rabbits were not anaemic.

The white blood cell (WBC) values obtained in this study which were not significant among treatments were within the normal range of 5 x 10^9 /l to 13 x 10^9 /l reported [11]. The white blood cell differentials namely lymphocytes, neutrophils, monocytes, basophils and esonophils were not significantly influenced by dietary treatments.

Significant effect of diet was not observed on all the parameters studied except serum glucose that was significantly ($p>0.05$) reduced. The reduced serum glucose value in the control was an indication that the test diets will supply more energy for the animals than the control. The non significant effect of diets on most of the biochemical parameters studied show that inclusion of water spinach leaf meal up to 15% has no adverse effect on serum biochemistry of rabbits.

CONCLUSION

The findings showed that water spinach can be fed to rabbits at 15% level of inclusion without any detrimental effect on haematology and serum biochemistry of rabbits.

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