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Evaluation of Haematology and Serum Biochemistry of Weaner Rabbits Fed Diets Containing Forage Leaf Meals

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Abstract
A study was conducted to investigate the effect of varying levels of *Ficus sycomorus* and *Parkia biglobosa* leaf meals based diets on the haematology and serum biochemistry of weaner rabbits. Twenty (20) rabbits of mixed breeds and sex were allotted to four (4) treatments with each treatment consisting of five (5) rabbits. The treatments evaluated consisted of diets with zero forage (T_1; control), 5% *Ficus sycomorus* leaf meal (T_2), 5% *Parkia biglobosa* leaf meal (T_3) and 2.5% *Ficus sycomorus* + 2.5% *Parkia biglobosa* leaf meals (T_4) in a Completely Randomized Design. The diets were iso-nitrogenous and the trial lasted for eight (8) weeks. Result of the study revealed significant differences ($P<0.05$) in all parameters evaluated for haematology. The values obtained for biochemical parameters in the control and study animals also showed significant differences ($P<0.05$) except for globulin. It was concluded that inclusion of forage leaf meals in the diets of weaner rabbits had no adverse effect on the parameters evaluated since the blood profiles of rabbits in all treatment groups were within the normal range for rabbits. It was therefore recommended that *Ficus sycomorus* and *Parkia biglobosa* leaf meals could be safely incorporated into the diets of rabbits at the various inclusion levels tested as an alternative to expensive conventional protein sources.

Keywords: *Ficus sycomorus*, *Parkia biglobosa*, rabbit, haematology, serum biochemistry

Introduction

Rabbits are small herbivores that have digestive tracts that enable the efficient utilization of high levels of roughage and forage materials (Obioha, 1998) thereby reducing the pressure on cereal grains and pulse (legumes) as sources of energy and protein respectively (Alade *et al*., 2001). The heavy and increasing reliance on soybean meal, fish meal and other conventional sources of protein for animal feeding (FAO, 2004) has led to high costs of conventional feeds especially in developing countries (Alade *et al*., 2001). Numerous species of trees of protein origin are under-utilized, some of which may have promising and desirable nutritive quality for inclusion in animal diets. Among these trees are *Ficus sycomorus* and *Parkia biglobosa* which may have high potentials in rabbit feeding by providing proteins, minerals and vitamins that are lacking in grassland pastures (Bamikole *et al*., 2001). Blood is the major transport system of the body and its constituents change in relation to the physiological conditions of the animals (Ihedioha *et al*., 2004). Haematological study is a useful tool for the diagnosis of many diseases and investigation of the extent of damage to the blood (Onyeyihi *et al*., 1991). Serum biochemical analysis is used to determine the level of heart attack, liver and kidney damage (Harper *et al*., 1999).

Thus, the objective of this study was to evaluate haemotological and serum biochemical parameters of weaner rabbits fed diets containing forage leaf meals as sources of protein.

Materials and Methods

The experiment was carried out at the Livestock Teaching and Research Farm, Federal University Dutse, Nigeria. Dutse is located on longitude 9.34^{0}E and latitude 11.76^{0}N and has an elevation of 431.36 meters above sea level (Encarta, 2007). There is usually a hot diurnal temperature and comparatively cooler nights during the last 2-3 months of the dry season which is followed by a wet season between the months of June and September (Wikipedia, 2013). Fresh leaves of *Ficus sycomorus* and *Parkia biglobosa* were harvested, air dried for some days until they became crispy and milled using a hammer mill to produce *Ficus sycomorus* and *Parkia biglobosa* leaf meals. Twenty (20) rabbits between six and seven weeks of age, of mixed breed and sex, were randomly divided into four (4) experimental groups of five (5) rabbits each. The four treatment groups were assigned the four experimental diets in a Completely Randomized Design (CRD). Each rabbit received an assigned diet for 8 weeks; the animals were provided with feeders and drinkers and were quarantined for 21 days before the commencement of the experiment. Prior to the experiment, they were dewormed and given accaricides bath. Four diets were formulated with treatment one (T_1) serving as the control, thus did not contain the test ingredients. The dietary treatments contained the following inclusion levels of the forage leaf meals; 0% forage meal, 5% *Ficus sycomorus* leaf meal, 5% *Parkia biglobosa* leaf meal and 2.5% *Ficus sycomorus* + 2.5% *Parkia biglobosa* leaf meals as T_1, T_2, T_3 and T_4 respectively as presented in table 1.

Table 1: Composition of the experimental diets

	Treatments			
Ingredients	T_1	T_2	T_3	T_4
Maize	51.60	47.74	47.88	47.80
SBM	14.90	13.76	13.62	13.70
FLM	0.00	5.00	0.00	2.50
PLM	0.00	0.00	5.00	2.50
Wheat offal	30.0	30.0	30.00	30.0
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated ME (Kcal)	2692	2532	2533	2533
Calculated protein (%)	16.84	16.83	16.75	16.80

SBM=Soyabean Meal, FLM= *Ficus sycomorus* Leaf Meal, PLM = *Parkia biglobosa* Leaf Meal, ME=Metabolizable energy, CP=Crude protein, T_1=0% forage, T_2=5% FLM, T_3=5% PLM, T_4=2.5% FLM + 2.5% PLM

Blood samples (5 ml) were drawn from each animal on the last day of the study. The rabbits were bled through the ear marginal vein. 2.5 ml was collected in labeled sterile universal bottle containing 1.0 mg/ml ethyldiamine tetra acetic acid for haematological analysis and another 2.5 ml was collected in anti-coagulant free bottle for serum biochemical analysis. Serum biochemistry and haematological parameters were measured using Beckman Coulter Ac-T10 Laboratory Haematology Blood Analyzer and Bayer DCA 2000+ HbA1c analyzer, respectively. Mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentrations (MCHC) were calculated. The data generated were subjected to analysis of variance (ANOVA) using completely randomized design (CRD) of SAS (1999) Statistical Package and differences between means were separated using Least Significant Difference (LSD).

Results and Discussion

Table 2 shows the haematological response of the experimental animals fed the treatment diets. Packed cell volume was significantly ($p<0.05$) higher in T_2 (41.90%) compared to the other treatments. Significantly ($p<0.05$) higher values of haemoglobin were obtained in T_2 and T_3 while lower values were obtained in T_1 and T_4. Value obtained for red blood cell was significantly ($p<0.05$) higher in T_2 ($5.93x10^6/mm^3$) compared to other treatments while T_4 ($1.17 x10^6/mm^3$) had significantly ($p<0.05$) lower value of white blood cell. The MCV, MCH and MCHC obtained differed significantly ($p<0.05$) between the treatments with higher values obtained in T_1 (control). The PCV (31.93-41.90%) and Hb (9.50-12.10 g/dl) values obtained in this study were within the range reported by Bradley (2001) for healthy rabbits. Values obtained for red blood cells fell within the range (3.60-5.20) x $10^6/mm^3$ reported by Ogbuewu *et al*. (2010) except T_2 which was slightly higher signifying that the experimental animals were not susceptible to anaemia related diseases. The values of MCV, MCH and MCHC were in agreement with the reports of Gillet (1994).

Table 2: Haematological indices of weaner rabbits fed varying levels of *Ficus sycomorus* and *Parkia biglobosa* leaf meals

	Treatments				
Parameters	T_1	T_2	T_3	T_4	LSD
Packed Cell Volume (%)	31.93^b	41.90^a	34.30^b	32.70^b	3.89
Haemoglobin Concentration (g/dl)	9.90^b	12.10^a	10.30^a	9.50^b	11.26
Red Blood Cells (x $10^6/mm^3$)	4.13^b	5.93^a	4.45^b	4.48^b	0.66
White Blood Cells (x 10^6/ mm^3)	2.99^{bc}	5.80^a	4.39^b	1.71^c	1.71
Mean Corpuscular Volume (Fl)	77.37^a	70.67^b	72.67^{ab}	72.97^{ab}	5.82
Mean Corpuscular Haemoglobin (Pg)	23.96^a	20.46^b	21.73^b	21.40^b	1.92
Mean Corpuscular Haemoglobin Concentration (%)	30.00^a	29.00^c	29.67^b	29.33^b	4.31

$^{a, b, c}$ = Means on the same row having different superscripts differ significantly ($P< 0.05$), T_1 = 0% forage, T_2 = 5% *Ficus sycomorus* leaf meal, T_3 = 5% *Parkia biglobosa* leaf meal, T_4 = 2.5% *Ficus sycomorus* + 2.5% *Parkia biglobosa* leaf meals, LSD=Least Significant Difference

Results of Serum Biochemical Indices of weaner rabbits fed the treatment diet are presented in Table 3. Significantly ($p<0.05$) higher values of total protein (74.00 g/l) were obtained in T_1 and T_2 while lower values (68.00 g/l) were obtained in T_3 and T_4. T_1 (control) had significantly ($p<0.05$) higher value of albumin (48.33 g/l) whereas globulin did not show any significant ($p>0.05$) difference across the treatments. Glucose, urea and cholesterol had significantly ($p<0.05$) higher values in T_1 (4.57 mmol/l), T_3 (9.67 mg/dl) and T_4 (2.60 mmol/l) respectively. The values reported in the present study for total protein were within the range (54-75g/l) reported by Jenkins (2006) which suggests nutritional adequacy of dietary proteins. The range of values obtained for albumin (34.00-48.33 g/l) and globulin (25.67-34.00 g/l) were in agreement with the reports of Annon (1980) and Burke (1994) respectively. Cholesterol values obtained were within the normal physiological range for rabbits (05-4.4 mmol/l) reported by Bradley (2001). T_2 diet had the least (1.17 mmol/l) cholesterol which may suggest that the diet would assist in reducing the deposition of cholesterol in the muscle, consequently producing lean meat.

Table 3: Serum Biochemical Indices of Rabbits fed Ficus *sycomorus* and *Parkia biglobosa* Leaf Meals

	Treatments				
Parameters	T_1	T_2	T_3	T_4	LSD
Total Protein (g/l)	74.00^{a}	74.00^{a}	68.00^{b}	68.00^{b}	5.72
Albumin (g/l)	48.33^{a}	42.00^{ab}	39.00^{ab}	34.00^{b}	12.25
Globulin (g/l)	25.67	32.00	29.00	34.00	15.13
Glucose (mmol/l)	4.57^{a}	3.93^{ab}	3.70^{b}	3.67^{b}	0.74
Urea (mg/dl)	9.07^{ab}	8.73^{b}	9.67^{a}	8.77^{b}	0.65
Cholesterol (mmol/l)	1.87^{ab}	1.17^{b}	1.80^{ab}	2.60^{a}	1.12

$^{a, b}$ =Means on the same row having different superscripts differ significantly ($p<0.05$), T_1 = 0% forage, T_2=5% *Ficus sycomorus* leaf meal, T_3=5% *Parkia biglobosa* leaf meal, T_4=2.5% *Ficus sycomorus* + 2.5% *Parkia biglobosa* leaf meals, LSD=Least Significant Difference.

Conclusion and Recommendation

It was concluded that inclusion of forage leaf meals in the diets of weaner rabbits had no adverse effect on the parameters evaluated since the blood profiles of rabbits in all treatment groups were within the normal range for rabbits. It is therefore recommended that *Ficus sycomorus* and *Parkia biglobosa* leaf meals could be safely incorporated into the diets of rabbits at the various inclusion levels tested as an alternative to expensive conventional protein sources.

References

Alade, N.K., Igwebuike, J.U. and Lawan, A. (2001). Effects of varying proportion of wheat bran on the growth performance and carcass components of growing rabbits. *Journal of Sustainable Agriculture and Environment,* 4(1): 1 – 7.

Annon (1980). Guide to Care and use of experimental animal. Canadian Council of Animal Care, Ottowa, Ontario, Canada. 1: 185-190

Bamikole, M.A, Ikhatua, U.J, Babayemi, O.J, Arigbede, O.M. Tela, I.E and Osagie, P. (2001). Assessment of forage acceptability, some nutritive and anti-nutritive value components of *Ficus species* in Benin, Nigeria. *Proceedings of the 26th Annual Conference of the Nigerian Society for Animal Production,* 26: 310-313.

Bradley, T.A. (2001). What every Veterinary needs to know about Rabbit: Zoological Education Network, Lake Florida, USA (3) 1: 42-45

Encarta (2007). Encarta Encyclopedia by Microsoft Incorporations. USA.

FAO (2004). Food and Agriculture Organization. Protein Sources for the Animal Feed Industry.

Gillet, C.S. (1994). Selected drug dosages and clinical reference data. In: *The biology of laboratory rabbit*, 2nd Edition. Academic Press Limited, London. Pp: 467-472.

Harper, A.E., Rodwell and Mayes, P.A. (1999). Review of light and breeding schedule on rabbit performance *Journal of Applied Rabbit Research*, 5: 33-37.

Ihedioha J.T., Okafor, C. and Ihedioha, T.E. (2004). The haematological profile of Sprague Dawley out-bred albino rat in Nsukka. *Anim. Res. Intern*. 1: 125-132

Jenkins, J. R. (2006). Clinical pathology. In: *BSAVA, Manual of Rabbit Medicine and Surgery* 2nd Edition. Gloucester, Gl2 2AB, UK.

Ogbuewu, I.P., Uchegbu, M.C., Okoli, I.C. and Ileoje, M.U. (2010). Assessment of blood chemistry, weight gain and linear body measurements of pre-puberal buck rabbits fed different levels of Neem (*Azadirachta indica* A. Juss.) leaf meals. *Chilean Journal of Agricultural Research,* 70(3):

Onyeyihi, P.A., Egwu, G.O., Jibike, G.I., Pepple, D.J. and Gbaegbulan, J.O. (1991). Seasonal variations in haematological indices in the grey-breasted guinea fowls (*Numida meleagris* gallata, Pallas). *Nigerian Journal of Animal Production*, 18(2): 108-111