



ASSESSMENT OF HAEMATOLOGICAL CHARACTERISTICS OF UDA RAMS FED GRADED LEVELS OF AFRICAN LOCUST BEAN (*PARKIA BIGLOBOSA*) YELLOW FRUIT PULP IN DRY SUB-HUMID ZONE OF NIGERIA

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ABSTRACT

An experiment was conducted to evaluate the effect of varying levels of *Parkia biglobosa* yellow pulp on the performance of Uda rams. The animals were fed diets containing 0, 10, 20 and 30% inclusion levels of *P. biglobosa* yellow pulp in a completely randomised experimental design replicated four times. Blood sample was collected and evaluated at the end of the experiment. Results indicated a significantly higher haemoglobin, PCV, RBC and platelets for animals fed diets containing higher levels of *P. biglobosa*. There were no significant difference in monocytes, neutrophils and lymphocytes composition of the animals ($P>0.05$). It was concluded that the yellow pulp of *Parkia biglobosa* could be incorporated up to a level of 30% in the diet of sheep without deleterious effect to the productive functions of the animals. Further studies should be carried out with other breeds of sheep to evaluate the effect of the test ingredient on lactation and other physiological functions of the animals.

KEY WORDS: Haematological Characteristics, Uda Rams, *Parkia biglobosa*, yellow fruit pulp

Introduction

Small ruminants have the ability to feed, digest and metabolize grasses, legumes, forages, farm wastes and crop residues that are unsuitable for direct human consumption (Fajemisin et al., 2010). They are therefore, able to convert different quality feeds into food of high biological value for human beings. This is because they are adapted to utilize plant cell walls as major component of nourishment (McDonald et al., 2002). Sheep husbandry have developed in response to the climate and other environmental factors (Gatenby, 2002). The semi-arid zone is the most important ecological region in the livestock industry of Nigeria (Mallami et al., 1998) and 70% of the small ruminants in the zone belong to the agro-pastoral system (FAO, 1991). Kyiogwom et al. (1994) reported that sheep rearing has been recognized as an integral part of the socio-cultural life of many Nigerians and hence production systems have remained largely traditional.

Haematology refers to the study of the numbers and morphology of the cellular elements of the blood, the red cells (erythrocytes), white cells (leucocytes), and the platelets (thrombocytes) and the use of these results in the diagnosis and monitoring of disease (Khan and Scott, 2012). Haematological studies are of ecological and physiological importance in helping to understand the relationship between blood characteristics and the environment (Ovuru and Ekweozor, 2004) and in the selection of animals that are genetically resistant to certain diseases and environmental conditions (Issac et al., 2013). Haematological parameters are good indicators of physiological status of animals (Khan et al. 2010). And those parameters that are related to the blood and blood forming organs (Bamishiye et al., 2009; Waugh et al., 2001). As reported, animals with normal blood composition are likely to show good performance (Issac et al., 2013). The examination of blood gives the opportunity to investigate the presence of several metabolites and other constituents in the body of animals and it plays a vital role in the physiological, nutrition and pathological status of an animal (Doyle, 2006). According to Olafedehan et al., (2010) examining blood for their constituents can provide important information for the diagnosis and prognosis of diseases in animals. Blood constituents change in relation to the physiological conditions of the animal (Wickler and Aderson, 2000). These changes are of value in assessing response of animals to various physiological situations (S. Khan et al., 2010). According to Aengwanich et al. (2009) changes in haematological parameters are often used to determine various status of the body and to determine stresses due to environmental, nutritional and pathological factors.

Materials and Methods

Experimental Site

The study was conducted at the Usmanu Danfodiyo University Livestock Teaching and Research Farm. The farm is located within

the main campus of the University at about 10km North of Sokoto Metropolis in Wamakko Local Government Area of Sokoto State. Sokoto is located in the Sudano-Sahelian zone in extreme North-Western part of Nigeria. It lies between longitudes 4°8'E and 6° 54'E and latitudes 12°0'N and 13°58'N and at altitude of 350m above sea level (Mamman et al., 2000). The average annual environmental temperature is 28.3°C (82.9° F). However, the maximum daytime temperature are most of the year generally under 40°C (104.0°F). The low humidity of Sokoto state makes the heat bearable. Heat is more severe in the state in March and April. But the weather in the state is always cold in the mornings and hot in the afternoons except during the hamattan period (SSMIYSC, 2010). The warmest months are February to April, where daytime temperature exceed 42°C (107.6°F) (SSMIYSC, 2010). The rainy season is from late May to October. Rainfall starts late and ends early with annual rainfall ranging between 500mm to 700mm. There are two major seasons in the state namely: wet and dry seasons. The dry season starts from October and last up to April, in some parts of the state may extend to May or June. The wet season on the other hand begins in most part of the state in May and last up to September or October (SSMIYSC, 2010). The hamattan, a dry, cold and fairly dusty wind is experienced in state between November and February of each year. Due to low humidity, Sokoto is more suitable for livestock production than for any other agricultural activity.

Sources and Processing of Experimental Feeds

The locust bean powder used in this experiment was purchased from Achida market in the outskirts of the metropolis. The remaining feed ingredients that included maize, rice offal, cowpea husk, premix, bone meal, salt, cowpea haulms, cotton seed cake and salt were purchased from Sokoto Kara market within the metropolis. Maize, cotton seed cake and cowpea hay are crushed to reduce their particle size.

Experimental Design and Diet Formulation

A completely randomized experimental design (CRD) was used in this experiment with number of animals representing replication and graded levels of *P. biglobosa* fruit pulp representing treatments. Five animals were allocated to each treatment each animal serving as replicate. The weight of the animals was balanced between treatments. Each animal was housed in a pen measuring 2m 1m, which was previously disinfected. Four complete experimental diets were formulated with graded levels of locust bean fruit pulp at 0, 10, 20, and 30% inclusion levels. The four experimental diets are used to feed the animals. The diets were designated as treatments 1, 2, 3 and 4 in the experiments. Each group was assigned to one of the experimental diets and fed *ad libitum* in the morning for 12 weeks. Water was offered *ad libitum*. The gross compositions of the experimental diets are shown in Table 1. The diets were isonitrogenous and isocaloric.

Table 1: Gross composition of the experimental diets

Ingredients	Diet 1	Diet 2	Diet 3	Diet 4
Locust bean	0	10	20	30
Maize	17.00	10.00	4.25	0.80
Cowpea husk	7.60	9.60	9.70	9.90
Cowpea haulms	17.20	17.70	17.70	7.50
Rice offal	12.45	5.45	0.15	3.30
Cotton seed cake	42.25	43.75	44.70	45.00
Salt	0.5	0.5	0.5	0.5
Premix	0.5	0.5	0.5	0.5
Bone meal	2.5	2.5	2.5	2.5
Total	100	100	100	100



Fig.1 Yellow Powder of *Parkia biglobosa* (African Locust bean) from a ruptured pulp



Fig.2. Display of Yellow Powder of *Parkia biglobosa* (African Locust bean) from a ruptured pulp

Experimental animals and their management

The apparently healthy rams were after purchase stationed at the Livestock Teaching and Research Farm Usmanu Danfodiyo University Sokoto, for 7 days for adaptation and for Quarantine. The animals were dewormed using Albendazole^R based on the manufacturer's recommendation; the animals received oxytetracycline injection for possible bacterial infection. The feeding pens were cleaned regularly and disinfected prior to the commencement of the experiment. Faeces and urine of the animals were removed every day from the feeding pens to ensure adequate hygiene, prevent ammonia accumulation and minimum discomfort of the experimental animals. Feed and water troughs were cleaned every morning before feeding.

Blood Sample Collection

Blood samples were collected once from all the animals at the end of the experiment. The blood samples were aseptically collected via jugular vein using separate sterilized disposable 5ml syringe and 23 gauge needle. The samples from each replicate was collected in plain tubes, tubes coated with ethylene diaminetetraacetic acid (EDTA), and tubes coated with fluoride oxide. The samples in the EDTA bottles was analysed for haematological parameters. The samples in fluoride oxide bottles was used for glucose level analysis, while the samples in the plain tubes is centrifuged for five minutes to separate the serum from the blood at room temperature. The serum was used for Serum Biochemical analysis.

Haematological Indices Determination

The haematological parameters analysed included packed cell volume (PCV), red blood cells (RBC) count, total white blood cells (WBC) count, leucocytes differential count and haemoglobin concentration (Hb) in accordance with the methods outlined by Bush (1991).

Erythrocyte indices which included the mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) are computed in accordance with the standard formula indicated by Jain(1993) and Schalm et al(1975).

Statistical Analysis

All the data collected are subjected to Analysis of variance using completely randomized design (Steel and Torrie, 1980). Least significant difference (LSD) was used to separate the means. Correlation analysis procedure was used to assess the relationship between the measured variables. Statview statistical package (SAS, 2002) was used in data analysis.

Result and Discussion

Proximate and fibre components of the Experimental Diets

Proximate composition of the experimental diets showed that crude fibre are higher for treatment 1 and 2. The dry matter composition of the diets decreases with increased in level of *P. biglobosa*. NDF, ADF, hemi-cellulose and lignin are higher in treatment 1 compared to the other treatments. The values for energy and crude protein were comparable between the treatments.

Table 2: Proximate and Fibre components of the experimental Diets

Parameter	Treatments			
	1	2	3	4
Dry matter (%)	94.68	94.4	94.41	93.50
Moisture (%)	5.32	5.60	5.59	6.50
Crude Protein (%)	14.27	14.10	14.19	14.25
Crude fibre (%)	21.84	21.93	21.20	19.82
Ether extract (%)	4.42	5.43	4.38	5.63
Ash (%)	11.37	8.29	10.80	9.58
NDF	45.18	44.33	42.03	37.90
ADF	29.60	29.32	29.81	29.09
Cellulose	21.18	21.59	22.11	22.01
Hemicellulose	15.58	14.93	12.22	8.81
Lignin	6.71	6.40	6.47	5.58
Energy (Kcal ME/Kg)	2530	2529	2522	2538

ADF- Acid detergent fibre, NDF- Neutral detergent Fibre

Haematological profile of Uda rams fed graded levels of *P. biglobosa* yellow fruit pulp

Result indicated a significantly higher Haemoglobin (g/dl), PCV (%), RBC (%) and platelets for animals fed diet containing higher levels of *P. biglobosa* fruit pulp (Treatment 4) (P<0.05). There were no significant differences (P>0.05) between treatments 1, 2 and 3 in haemoglobin concentration (g/dl), PCV (%) and RBC (%). Monocytes, lymphocytes and neutrophils composition are not significant across the treatments (P>0.05) (Table 3).

Table 3: Haematological Profile of Uda fed graded levels of *P. biglobosa* fruit pulp

Parameter	Treatments				SEM
	1	2	3	4	
Haemoglobin (g/dl)	8.65 ^b	8.30 ^b	8.45 ^b	9.65 ^a	0.17
PCV (%)	26.50 ^b	25.00 ^b	25.00 ^b	29.00 ^a	0.60
RBC	2.67 ^b	2.82 ^b	2.75 ^b	3.19 ^a	0.06
MCH	32.7 ^a	28.0 ^c	30.4 ^b	32.65 ^a	0.41
MCV	98.00 ^a	88.00 ^b	93.00 ^{ab}	90.50 ^b	1.43
MCHC	33.00	33.20	33.15	32.48	0.233
WBC (x 10 ⁹ /L)	8.05 ^b	6.85 ^b	11.65 ^a	7.63 ^b	0.83
Monocytes (%)	9.00	10.00	8.50	10.00	0.58
Neutrophils (%)	48.50	43.50	45.00	43.00	2.70
Lymphocytes (%)	43.00	44.50	42.50	45.00	1.85
Platelets (x 10 ⁹ /L)	435.5 ^b	262.0 ^d	354.0 ^c	532.5 ^a	16.11

a,b,c means in the same row with different superscripts are significantly different (P<0.05)

PCV- Packed cell volume, RBC- Red blood cells, MCV- Mean corpuscular volume, MCH- mean corpuscular haemoglobin, MCHC- mean corpuscular haemoglobin concentration, WBC- white blood cells

Proximate and fibre constituent of diets fed Uda rams

The crude protein content of the diets is within the recommended values to support the optimum microbial need in the rumen. The values are above the 10-12% crude protein requirement for growth of sheep outlined by Gatenby (2002). The energy and protein was similar across the treatments because the experimental diets were formulated to be iso-nitrogenous and iso-calorie. Crude fibre fraction crude fibre, NDF, ADF, Hemicellulose and lignin tends to decrease with increase in the level of *P. Biglobosa* fruit pulp, due to the less fibre component of *Parkia* fruit pulp as observed by Gernah et al. (2007). It could also be attributed to decreased level of cowpea hay with increase in the level of *P. biglobosa* fruit pulp from treatment 1 to 4.

Haematological profile of Uda rams fed graded levels of *P. biglobosa* yellow fruit pulp

The MCH, WBC, neutrophils, lymphocytes and platelets obtained in the present study were within the normal reference values reported by Duncan et al. (1994). The haemoglobin and PCV also were within the normal reference value reported by RAR, (2009), while the haemoglobin and PCV for animals placed on treatments 1, 2 and 3 falls slightly below the range indicated by Duncan et al. (1994) and Khan and Scott, (2012). The RBC values of all the treatments were below the normal reference value while the MCV and MCH were above the normal reference value as reported by Duncan et al. (1994) and Khan and Scott (2012). Lower values in RBC indicate the presence of anaemic condition (Gernsten, 2009). The haematological profile of the animals indicates the diets are not deleterious to the animals because their WBC and MCHC are within the normal reference range. The monocytes being above the normal reference value is an indication that the animal are recovering from certain infection, more so the lymphocytes being within the normal reference value is suggestion of better immune system.

Conclusion

The haematological profile of the animals indicates that the test ingredients may not be deleterious to the animals because their WBC and MCHC are within the normal reference range. The monocytes being above the normal reference value is an indication that the animal are recovering from certain infection, more so the lymphocytes being within the normal reference value is suggestion of better immune system.

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