DIFFERENTLY PROCESSED BAMBARA GROUNDNUT (*Vigna subterrenean*) SEED MEAL COULD INFLUENCE THE HAEMATOLOGICAL PROFILE OF GROWER RABBITS

ABSTRACT

This study was carried out to evaluate how differently processed Bambara nut (*Vigna subterrenean*) *seed meal could influence the haematological characteristics of grower rabbits for a period of eight weeks. Twenty grower rabbits aged 10 to 12 weeks were used for this study. The rabbits were raised intensively and were provided with feed and clean drinking water. Four experimental diets were formulated to contain 25% RBSM, SBSM, CBSM and TBSM and coded as T1, T2, T3 and T4 respectively. The four treatment groups were assigned to the four experimental diets in a Completely Randomized Design (CRD). Each treatment was replicated five times with one (1) rabbit per replicate. Blood samples were collected from each replicate for haematological analysis. The experimental data were subjected to analysis of variance (ANOVA) in a completely randomized design, using Statistical Package for Social science (SPSS) version 16. There were (P<0.05) significant differences among treatment groups for all the haernatological parameters evaluated. RBC results obtained were 45.55%, 32.28%, 47.58% and 33.59% for T1, T2, T3 and T4 respectively. WBC were* 8.73×10^9, 4.65×10^9, 7.90×10^9, *and* 7.11×10^9**/l** *for* T_1, T_2, T_3 *and* T_4 *diets respectively. From the findings of this study, soaked Bambara nut seed meal at 25% is non-toxic and can support and maintain a good health status of grower rabbits.*

Keyword: Rabbits, bambara groundnut, haematology, processing methods, antinurients, raw or processed

INTRODUCTION

Bambara groundnut (*Vigna subterrenean)* is a tropical pulse (with underground pods), and one of the legumes of papillionaceae sub family. It is a small trifoliate leave herb that is palatable to domestic animals. The crop is indigenous to tropical Africa (Olapade and Adetuyi, 2007), and originated in the Sahelian region of present-day West Africa, from the Bambara tribe near Timbuktu, who now live mainly in central Mali (Nwanna *et al.,* 2005), hence its name Bambara groundnut.

According to Omoikhoje (2008), Bambara nut is the third most eaten legume after groundnut (*Arachis hypogea*) and cowpea (*Vigna unguiculata*) in Africa. It serves as an important source of protein in the diets of a large percentage of the population, particularly to the poorer people, who cannot afford expensive animal protein (Bamshaiye *et al.* 2011). Bambara groundnut makes a balanced food, as it contains sufficient quantities of carbohydrates (65%), protein (16.25%) and fats (6.3%), with relatively high proportions of lysine and methionine (Omoikhoje, 2008 and Brough *et al.,* 1993).

However, the use of Bambara nut in the feeding of monogastric animals is limited by

the presence of antinutrients such as protease inhibitors, haemaglutinins, tannins, cyanogenic glycosides and flatulence factors in the raw bean (Ensminger *et al.*, 1996). Anti – nutrients are substances in diets that interfere with the normal digestion, absorption and utilization of the diet. A number of these substances occur naturally especially in plant materials, mostly in legumes. Low levels of trypsin inhibitor and phenolic compounds have also been reported by Brough *et al.* (1993) in Bambara nut seed.

Haematological studies are important because the blood is the major transport system of the body. An evaluation of the haematological profile provides vital information on the nutrients contained in the diets fed to animals (Ihedioha *et al.*, 2004). Hence, provides the opportunity to clinically investigate the presence of several metabolites and other constituents in the body and it plays a vital role in the physiological, nutritional and pathological status of the animal (Aderemi, 2004 and Doyle, 2006). It also helps to distinguish normal state from state of stress which can be nutritional (Aderemi, 2004).

The objective of this study is to evaluate the effect of raw or processed Bambara nut seed meal on haematological indices of grower rabbits.

MATERIALS AND METHODS

The study was carried out at the Rabbitry unit of Teaching and Research Farm, Taraba State University, Jalingo. Jalingo is located between north 8.53^0 and 11.22^0 east on latitude 11,3667 of the equator and possesses a tropical climate. This area is characterized by high temperature throughout the year, because of high radiation income which is relatively evenly distributed throughout the year. Maximum temperature of about 40^0C has been observed while minimum temperature can be as low as 18^0C between December and January. Mean annual temperature ranges between 26.9 and 27.8^0C (Antyev *et al*., 2013).

Experimental animals and management

Twenty grower rabbits of mixed sexes were bought from the Rabbitry section of Destiny Success Academy, ATC, Kofai, Jalingo, Taraba state. The rabbits were weighed and randomly assigned to the four experimental diets with five rabbits per treatment. The animals were housed in a standard hutch of 0.6m × 0.6m × 0.5m and raised 0.3m from the ground in a single-tier hutch system. The animals were provided with feeders and drinkers. The floor was swept daily; clean drinking water and a determined quantity of fresh feed were provided daily. The remnant feed was collected and weighed daily to determine the daily feed intake.

Before the commencement of the experiment, the animals were given antibiotics according to body weight and were dewormed using albendazole tablet.

Processing of Bambara Seeds

Bambara nut seeds *(Vigna subterranean)* were purchased from Jalingo main market. The Bambara seeds were divided into four lots and subsequently processed as follows:

Unprocessed: The first lot of raw Bambara nut seeds were subjected to milling without

any form of processing and was referred to as raw Bambara nut seed meal (RBSM).

Boiling: The second lot was subjected to boiling at 100 ^{0}C for 60 min. The boiled seeds were sun-dried for three days to reduce moisture content before being milled and used as boiled Bambara nut seed meal (BBSM).

Toasting: The third lot of the raw Bambara nut seeds were subjected to toasting for 20 minutes at high temperature (110^{0}C). The resultant product was cooled, milled and was called toasted Bambara seed meal (TBSM).

Soaking: The fourth lot of raw Bambara nut seeds were soaked in a container containing clean water for 24 hours. After 24 hours, the water was decanted and the soaked seeds were sun-dried for three days to reduce the moisture content. The seeds were milled and referred to as soaked Bambara nut seed meal (SBSM).

Experimental Diets

Four diets, T1 (control), T2 (soaked)), T3 (cooked) and T4 (toasted) were formulated to contain 25% RSBM, SBSM, CSBM and TBSM, respectively Bambara nut seed meals, respectively.

Experimental Design

The four treatment groups were assigned to the four experimental diets in a Completely Randomized Design (CRD). Each treatment was replicated five times with one (1) rabbit per replicate. Each replicate received an assigned diet for eight (8) weeks.

Data Collection`

Haematological Indices

At the end of the eight weeks experiment, blood samples were collected from each replicate for haematological analysis through the external ear vein using a sterilized disposable syringe and needle between 7 and 8.30 am. Blood samples were collected into labeled sterile universal bottles containing Ethylene- Diamine-Tetra-Acetic acid (EDTA) as anticoagulant. The blood samples were subjected to laboratory examinations using blood Auto Analyser, Sysmex kx-21n.

Haematological parameters determined in this study were; packed cell volume (PCV), red blood cells (RBC), white blood cells (WBC), hemoglobin (HB), mean corpuscular hemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular volume (MCV).

Proximate Composition of Raw and Processed Bambara nut seed meal

Proximate analysis of the experimental diets was carried out to determine the dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract (NFE) content.

Table 1: Composition of Experimental Diets

Ingredients	T1 (Control)	T2 (Soaked)	T3 (Cooked)	T4 (Toasted)
Maize	50.50	50.50	50.50	50.50

Soybean meal	10.00	10.00	10.00	10.00
Groundnut cake	10.00	10.00	10.00	10.00
Rice bran	3.00	3.00	3.00	3.00
Bambara nut meal	25.00	25.00	25.00	25.00
Bone meal	1.00	1.00	1.00	1.00S
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**
Proximate Analysis				
ME (Kcal/kg)	2700	2700	2700	2700
Crude Protein (%)	18.02	18.02	18.02	18.02

Statistical Analysis

The experimental data were subjected to analysis of variance (ANOVA) procedure in a completely randomized design, using Statistical Package for Social science (SPSS) version 16. Differences between treatments means were separated using Duncan multiple Range Test of the same software.

RESULTS AND DISCUSSION

The results of the haernatological indices of the grower rabbits fed diets containing differently processed Bambara groundnut is presented in Table 3. From the result, there were ($P<0.05$) significant differences among treatment groups for all the haernatological parameters. The PCV range of values (37.40 to 47.90%) were within the range of 33 to 50% reported by Merck (2009), for growing rabbits. The values obtained for all the treatment groups indicate nutritional adequacy of all diets since values did not indicate mal-or-undernutrition (Church *et al*., 1984). Aster (2004), reported that low PCV values implies anaemic condition while high PCV values suggest dehydration. Rastogi (2009) also reported that low PCV indicates conditions such as anaemia or overhydration while high vales denote conditions such as polycythemia or dehydration.

There were significant differences ($p<0.05$) in RBC among the different treatment groups. The RBC values obtained in the study were within the range of 3.80 to 7.90 $x10^6/mm^3$ reported by Burk (1994). The values obtained for rabbits on diets containing toasted and soaked meals however, were below the recommended

Table 2: Effect of the Differently Processed Bambara nut Seed Meal on Haematological Characteristics of Grower Rabbits.

Parameters	**T1 25% RBSM**	**T2 25% SBSM**	**T3 25% CBSM**	**T4 25% TSBSM**	**SEM**
Packed Cell Volume (%)	45.55^b	33.28^d	47.58^a	33.59	0.03**

Red Blood Cells (10^{12}/l)	6.70^{a}	4.44^{c}	6.35^{b}	4.45^{c}	0.02**
White Blood Cells (10^{9}/l)	8.73^{a}	4.65^{d}	7.90^{b}	7.11^{c}	0.01**
Hb (g/dl)	11.60^{b}	9.10^{c}	12.20^{a}	9.00^{d}	0.01**
MCV(fl)	68.00^{b}	75.00^{a}	75.00^{a}	75.00^{a}	0.11**
MCH (pg)	17.30^{d}	20.60^{a}	19.10^{c}	20.10^{b}	0.02**
MCHC (g/dl)	25.50^{c}	27.50^{a}	25.50^{c}	26.70^{b}	0.03**

a,b,c,d = means on the same row not followed by the same letter are significantly different (*p<0.05*). ** = Highly significant at (p<0.05) SEM=Standard error of mean. Hb= Haemoglobin, MCV= Mean Cell Volume, MCH = Mean Cell Haemoglogin, MCHC= Mean Cell Haemoglobin Concentration

standard by Merck (2009). This could be a result of the different quantities of the anti-nutritional factors in them. Mungole and Chaturvedi (2011), attributed elevation in RBC to the stimulation of the bone marrow and lymphoid organs by compounds such as alkaloids, flavonoids, polyphenolics, ascorbic acid and other vitamins which may have been negatively affected in this study.

The WBC also recorded a significant difference (p<0.05) among treatment groups. The WBC of the different treatment groups were within ranges from 6.40 to 12.90 $x10^{3}$ mm^{3} reported by Hillyer (1994), for healthy young rabbits except for rabbits on diet containing soaked meal (4.65×10^{9}) which were similar to value range of 5 to 13 $\times10^{9}$ reported by Burke (1994). The WBC of the grower rabbits fed diets containing differently processed Bambara groundnut seed meals were 8.73×10^{9}, 4.65×10^{9}, 7.90×10^{9}, and 7.11×10^{9}**/l** for T_1, T_2, T_3 and T_4 diets respectively. This shows that the animals were healthy because decrease in number of WBC below the normal range is an indication of allergic conditions, anaphylactic shock and certain parasitism, while elevated values (leucocytosis) indicate the existence of a recent infection, usually with bacteria (Ahamefule *et al.,* 2008).

The Haemoglobin (Hb) of the grower rabbits fed the diets containing the differently processed Bambara nut seed meals also differed significantly (p<0.05) among treatment groups. The values were 11.60 g/dl, 9.10 g/dl, 12.20 g/dl and 9.00 g/dl which agree with the range of 9.0-17.4 g/dl reported by Njidda *et al.* (2006). Haemoglobin is responsible for the red colour of the blood and helps transport oxygen and carbon dioxide (Flanders, 2012; Akers and Denbow (2013) and Moyes and Schulte 2014). High values of haemoglobin depend on the number of RBCs and amount of Hb in each molecule (Rastogi, 2009) while a low level of Hb indicates anaemia, a reduction in the concentration of functional RBCs in the blood (Frandson *et al.,* 2009). This implies that the rabbits did not suffer anaemia in the course of the study.

The values for MCV were 68.00, 75.00, 75.00, and 75.00 fl/mm^{3} for T_1, T_2, T_3 and T_4 diets respectively. This parameter shows a significant difference (p<0.05) among treatment groups and are within the normal range of 50.00 to 75.00 fl/mm^{3} reported by Burk, 1994). The mean corpuscular

hemoglobin (MCH) of the grower rabbits fed the experimental diets were within the range OF 14 to 24 reported by Burke (1994). The MCH for the different treatment groups were 17.30, 20.60, 19.10 and 20.10 for T_1, T_2, T_3 and T_4 diets and also differed significantly ($p<0.05$). The MCH was highest in T_2 and lowest in T_1. MCHC were higher in diets containing T_2 (27.50) and T_4 (26.70) and lower in T_1 (25.50) and T_3 (25.50). The mean corpuscular hemoglobin concentration (MCHC) of the grower rabbits in the different treatment groups recorded a significant difference but were below the range values of 27 to 34 reported by Burke (1994) and 29 to 37 by Merck (2009) except for T_2 (27.50). This may be due to the negative interaction between protein and energy levels in the diets.

CONCLUSION

Results from this study showed that soaked bambara groundnut seed meal at 25% inclusion in rabbits' diet can support growth and maintain good health status of grower rabbits.

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