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Study on Some Hematological Parameters of Goats Fed *Aspergillus* Treated and Untreated Shea-Butter Cake

M.A. Belewu, A.A. Yahaya and A.O. Adeyina
Microbial Biotechnology and Dairy Science Laboratory,
Department of Animal Production, University of Ilorin, Nigeria

Abstract: Red Sokoto goats (n = 20) were fed fungus (*Aspergillus niger*) treated and untreated Shea-butter cake in a completely randomized design model for a 56 day period. Evaluation of some of the haematological parameters showed that haematocrit (PCV), Red Blood Cell (RBC) count, White Blood Cell (WBC) count, haemoglobin (Hb) concentration and lymphocytes decreased significantly ($p<0.05$) in diets B, C and E, while an increase was observed in diet D for parameters studied. The similarity in the creatinine content of the blood showed that the kidney was functioning normally and no act of illness observed. The derived parameters (MCHC, MCV and MCH) followed this profile. In conclusion the dietary feeding of *Aspergillus* treated Shea-butter cake holds a good promise as it has no detrimental effect on the health status of Red Sokoto goats.

Key words: Red Sokoto goats, haematological indices, shea-butter cake, *Aspergillus niger*

INTRODUCTION

The problem encountered during the dry season in developing countries necessitated for an aggressive search for novel and unconventional feedstuff, without compromising the quality of various ingredients to be supplied. Shea-butter cake is a by-product of Shea-butter industry and the product is abound in the tropics and sub-tropics constituting nuisance (Belewu and Belewu, 2004).

Shea-butter cake has crude protein content of between 15 and 20% but with some anti-nutritional factors (tannin, saponin, hydrocyanide etc). Some of the anti-nutritional factors can be reduced to a very large extent by various processing methods (physical, chemical and mechanical). Annongu (1996) reported on the use of chemical treatment with encouraging result. It was noted that the use of chemical treatment apart from been expensive could have some negative effect like sodium load in animal (Adebowale, 1987).

This research was design to evaluate the effect of fungus treated and untreated shea-butter cake on some haematological parameters of Red Sokoto goats bearing in mind that haematology can be used to evaluate the health condition of goat (Haper *et al*., 1979).

MATERIALS AND METHODS

The Shea-butter cake used for this study was collected from Apa-ola in Kwara State, Nigeria. The cake was autoclaved at 121°C for 15 min so as to get rid of any microbes. The content was cooled and later inoculated with the spores of *Aspergillus niger* ($10^6 \times 10^7$). The inoculated substrate was incubated at 37°C until the fungus enveloped the substrate within 7 days. The fungus treated sample was oven dried at 70°C so as to terminate the fungus growth and later used in the formulation of diets (Table 1). Diet A (control) was a Soybeans based diet while diets B, C, D and E are shea-butter cake based diets. The fungus treated shea-butter cake was included at 15% (diet B) and 7.5% (diet D) while diets C and E have untreated shea-butter cake inclusion at 15 and 7.5%, respectively (Table 1 and 2). Animals were fed and watered *ad-libitum* for a 56 day period.

Blood sample was collected from the jugular vein of the experimental animals' fortnightly into sample bottles

Corresponding Author: M.A. Belewu, Microbial Biotechnology and Dairy Science Laboratory, Department of Animal Production, University of Ilorin, Nigeria

Table 1: Composition of the experimental diets

Ingredients (%)	Diet A(0% shea butter cake)	Diet B fungus treated (15% shea butter cake)	Diet C (15%) untreated shea butter cake	Diet D (7.5% treated shea butter cake)	Diet E (7.5% untreated shea butter cake)
Corn bran	50.00	50.00	50.00	50.00	50.00
Brewer's dried grain	33.00	33.00	33.00	33.00	33.00
Shea-butter cake	0.00	15.00	15.00	7.50	7.50
Soybean cake	15.00	0.00	0.00	7.50	7.50
Bone meal	1.00	1.00	1.00	1.00	1.00
Vitamin-mineral premix	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50

Table 2: Proximate composition of the experimental diets (%)

Parameters	Diet A (0%)SBC	Diet B (15% fungus treated SBC)	Diet C (15%) untreated SBC)	Diet D (7.5%) fungus treated SBC)	Diet E (7.5% untreated SBC)
Dry matter	93.24	93.05	94.75	95.10	95.20
Crude protein	16.32	17.54	17.37	16.43	15.62
Ether extract	7.92	8.84	9.23	8.27	7.18
Crude fibre	18.60	12.74	13.35	12.41	13.32
Ash	15.75	20.56	20.32	32.90	38.69
Acid detergent fibre	44.94	44.85	40.45	47.55	36.74
Neutral detergent fibre	74.13	60.29	64.90	64.19	71.11
Lignin	21.15	19.60	22.20	19.80	20.10
Cellulose	8.57	8.46	9.66	7.98	8.28
Hemicellulose	35.24	27.17	38.08	38.04	44.94

until the conclusion of the trial. Haemctocrit (PVC) was determined with a microhaematocrit centrifuge, RBC and WBC counts were determined with a haemocytometer. Haemoglobin concentration estimate was determined by Wedemeyer and Yasutake (1977) while differential Zleucocyte counts were determined by counting stained (Leishmans) blood smear with a light microscope.

Statistical analysis: All data collected were subjected to analysis of variance of a completely randomized design while treatment means were separated using Duncan (1955) multiple range test.

RESULTS AND DISCUSSION

The PVC, red blood cell white blood cell counts and haemoglobin concentration decreased significantly ($p<0.05$) in diets B, C and E compared with diet D such that animal fed diet D had the highest value that was significantly different from other (Table 3). However, the result fell within the value reported by Kaneko (1989) for goat. The value also agreed with the report of Calhoun and Brown (1975) and Belewu and Jimoh (2005). The lower value of RBC reported for diet E could be due to the presence of anti-nutritional factors (tannin, saponin and hydrocyanide). Additionally, the low RBC of this diet could be linked to the presence of cyanide ions which are capable of coordinating with the iron in haemoglobin hence locking the uptake of oxygen (John, 2000). Shea-butter cake has been shown to contain some anti-nutritional factors (Belewu and Belewu, 2004). The inclusion of fungus treated shea-butter cake in the diet could probably have caused superior haematological parameters compared with the untreated shea-butter cake (C and E) (Table 3). Saponin and tannin found in shea-butter cake are known to cause erythrocyte haemolysis, reduction of blood and poor feed intake (Cheeke, 1971).

Improvement was observed in the haematological indices of goats fed fungus treated based diet relative to those fed untreated shea-butter cake based diets. (Table 3). This result was in accordance with the report of Sahastrabudie *et al*. (1986) and Belewu and Morakinyo (2007) that *Aspergillus niger* reduced the level of anti-nutritional factors. However, the improvement arising from the 7.5% dietary inclusion of fungus treated shea-butter cake was encouraging. There was no significant difference in the level of lymphocytes. But the level of leucocytes (WBC) is influence by the diet, age, stress, digestion and parasites. The value of neutrophil reported herein was higher than the result of Belewu and Jimoh (2005). The differences could be due to its chief function as phagocytes and the ability of lymphocytes to re-circulate which is vital to the immune system.

There was similarity in the value of creatinine obtained and this shows that the kidney is functioning properly (Guyton and Hall, 2000). The alkaline phosphate was higher in diet A but no act of illness was observed in all the animals. This was in agreement with the report of Kaplan (1992). Inspite of the negative arising from the dietary inclusion of untreated shea-butter cake, the values of haematological indices noted in the study were still within the normal range for goats.

Table 3: Effects of fungus treated and untreated shea butter cake on the haematology indices of red sokoto goats

Blood parameters	Diet A 0% SBC	Diet B 15% fungus treated SBC	Diet C 15% untreated SBC	Diet D 7.5% fungus treated SBC	Diet E 7.5% untreated SBC	±SEM
Hb (g dL^{-1})	8.30^{a}	7.00^{a}	6.80^{a}	11.30^{b}	6.60^{a}	0.87^{*}
PCV (%)	21.00^{a}	16.70^{b}	19.3^{c}	30.03^{d}	19.70^{c}	4.88^{*}
RBC $\times 10^{12}$ L^{-1}	2.10^{a}	1.70^{a}	2.10^{a}	3.60^{b}	2.10^{a}	0.61^{*}
WBC $\times 10^{9}$ L^{-1}	15.00^{a}	14.30a	15.20^{a}	19.40^{b}	16.20^{a}	5.41^{*}
MCV (g dL^{-1})	10.30^{a}	9.70^{a}	9.10^{a}	11.50^{b}	18.30^{c}	10.35^{*}
MCH (g dL^{-1})	4.00^{a}	4.10^{a}	4.10^{a}	3.20^{b}	8.00^{c}	0.77^{*}
Neutrophil (%)	31.66^{a}	29.30^{b}	27.70^{c}	34.30^{C}	29.00^{d}	8.45^{*}
Lymph (%)	69.30	70.70	72.30	64.70	65.00	13.46^{NS}
Creatinine mmol L^{-1}	64.60^{a}	67.60^{a}	63.60^{a}	53.60^{b}	78.60^{c}	12.23^{*}
Alkaline phosphates mmol L^{-1}	67.60^{a}	46.30^{b}	46.60^{b}	55.30^{c}	46.30^{b}	9.12^{*}

Means in the same row having similar superscripts are not significantly different ($p>0.05$)

CONCLUSION

The result of this study revealed that feeding of *Aspergillus* treated Shea-butter cake to Red Sokoto goats had no detrimental effect on the health status of the animals. Such feed could be used to solve shortage of feed during the dry season.

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