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Full Length Research Paper

Haematological and serum indices of goat fed fungi treated *Jatropha curcas* kernel cake in a mixed ration

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The study evaluates the efficacy of fungi (*Aspergillus niger* and *Trichoderma longibrachitum*) treated *Jatropha curcas* kernel cake in a mixed ration on percentage packed cell volume, red blood cell, white blood cell, haemoglobin, lymphocyte, monocyte, eosinophil, basophil, neutrophil, urea, creatinine, aspertate amino transferase, alanine phosphateses and alanine transference of goat. The West African dwarf goat (n = 15) were randomized against the experimental diets {(Diet A, control; B (50% soybean cake +50% *A. niger* treated *Jatropha* kernel cake); C (100% *A. niger* treated *J. curcas* kernel cake); D (50% soybean cake + 50% *T. longibrachiyum* treated J. curcas kernel cake) and E (100% *T. longibrachiyum* treated *J. curcas* kernel cake)} in a completely randomized design model for a 70 day period. Feeding and watering were given freely throughout the study. Blood was collected from the goats every fortnightly at the jugular vein. The results revealed an increase in the creatinine content of the animals fed diets B and E compared to other diets. The urea content of the blood followed similar trend. Contrarily, the red blood cell was higher in control diet A and diet D. The packed cell volume ranged between 20 and 29%. Neutrophyl was significantly higher in diets B, C and D compared to diets A and E which are similar (p > 0.05). The positive presentations show that the fungi treated *J. curcas* kernel cake could have reduced most of the anti-nutrients, revealing that the biological processing of the cake is very promising.

Key words: *Aspergillus niger, Trichoderma longibrachitum*, *Jatropha curcas* kernel cake, blood parameters.

INTRODUCTION

Due to competition between man and livestock in most of the conventional feedstuffs, scientists have been focusing on some lesser known feedstuffs without compromising the quality of such ingredients. *Jatropha curcas* L. which belongs to the family euphorbiaceae is one of such feedstuffs which contain higher nutrient content and which if properly processed could be used as a substitute for some ingredients like soybean cake or groundnut cake. *J. curcas* plant which is used as hedge plant in Nigeria is still at its seedling stage as an alternative ingredient in livestock diet. Belewu (2008) reported on the utilization of fungus treated *J. curcas* seed meal in the diet of rat with not encouraging results. The negative results could be due to the feeding of full fat with *Jatropha* seed meal. Evidence abounds in literature on the utilization of chemicals in detoxifying *J. curcas* cake with no encouraging results due probably to the presence of phorbolester (Makkar and Becker, 1997; Martinez-Herrera et al., 2006). While other anti-nutrients (Lectin, saponin, phytate and others) can be detoxified by physical (heat) and chemical methods, phorbolester could not and it causes severe toxicity in livestock. Aregheore (2003) and Gubitz et al. (1997) reported that the higher the phorbolester in the diet the lower the acceptance of the seed meal. It was noted that immature seed has higher phorbolester level than mature seeds. Aregheore et al. (2003) noted that chemical treatment could remove all traces of lectin but the concentration of phorbolester did not change even when the meal was subjected to heat at 121°C for 30 min. Contrarily, heat treatment and washing four times with 92% methanol seems a better means of detoxifying and reducing the phorblester content in *J. curcas* meal but the complicated nature of the method will prevent its use for small scale and local use which characterized developing economies of the tropics. Therefore, this study evaluates the efficacy

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Table 1. Composition of the experimental diet.

Ingredients (%)	Diet A (control)	Diet B	Diet C	Diet D	Diet E
Cassava waste	63.00	63.00	63.00	63.00	63.00
Rice husk	31.00	31.00	31.00	31.00	31.00
Soybean cake	4.00	2.00	-	2.00	--
Fungi treated Jatropha curcas Kernel cake	-	2.00[a]	4.00[a]	2.00[b]	4.00[b]
Salt	1.00	1.00	1.00	1.00	1.00
Vitamin-mineral mixture	1.00	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00	100.00

a = *A. niger* treated *J. curcas* kernel cake. b = *T. longibrachitum* treated *J. curcas* kernel cake.

of dietary fungi treated (*A. niger, T. longibrachitum*) *J.* indices of West African dwarf goat.

MATERIALS AND METHODS

Fungi used

The fungi used (*A. niger and T. longbrachiatum*) were collected from International Institute of Tropical Agriculture (IITA) Ibadan and maintained on potato dextrose agar (PDA) containing in petri dishes and in about 7days each of the dishes was enveloped with individual inoculated fungus.

Preparation of the substrate

The substrate (*J. curcas* kernel cake) which was prepared by collecting the seeds around the University of Ilorin main campus as well as Ilorin metropolis. The collected seeds were cracked to remove the kernel which was later milled and pressed using hydraulic press to get rid of the oil. The defatted cake was later autoclaved at 121°C, 15 kg psi for 30 min.

Inoculation and incubation of the *Jatropha* kernel cake

The autoclaved *Jatropha* kernel cake was allowed to be cooled before inoculating with the fungi. The cake was then inoculated with the spores of *A. niger* and *T. longibrachitum* (10^7 - 10^8 spore/ml). The inoculated substrate was incubated at room temperature and about two weeks the fungi colonized each of the substrate. The growth of the fungi was terminated by oven drying the substrate at 70°C. The spent substrate was later used in the formulation of the experimental diets.

Experimental diets

Five experimental diets were formulated in which diet A was the control (without *J. curcas* kernel cake) while diets B and C had 50 and 100% *A. niger* treated *J. curcas* kernel cake respectively to replace soybean cake. Diets D and E had 50 and 100 % *T. longbrachitum* treated *J. curcas* kernel cake respectively to replace soybean cake. Other ingredients were of fixed proportions (Table 1).

Animal and management

Fifteen West African dwarf goats (mixed sexes) used for this experiment were bought from a local market in Ilorin, Nigeria. The animals were treated against ecto and endo parasites using Ivomec. The animals were later randomized against the experimental diets with three animals per treatment in a completely randomized design model for a 70 day period. Feeding and watering were done *ad libitum*. Blood samples were collected every fortnightly from the jugular vein of the animals and subjected to haematological and serum analyses.

Analyses

Various haematological and serum analyses were done using the method of Jain (1986). All data collected was subjected to ANOVA of a completely randomized design model and means separated using Duncan (1955) multiple range test (Table 2).

RESULTS

Haematological and serum parameters are shown in Table 2. The alanine amino transference, alkaline phosphate and aspartate amino transference and fractions of the white blood cells (lymphocyte, monocyte, eosinophil, basophil and neutrophil) were similar in al the diets. However, creatinine was highest for diets B, D and E and the least was diet A (control). Similarly, the urea content of the blood was 1.34, 1.63, 1.31, 1.74 and 1.91 for diets A, B, C, D and E respectively.

The packed cell volume reported herein fell within the normal range of West African dwarf goat. However, the packed cell volume was significantly highest in diets A, B and E followed closely by diets D and C in that order.

There were significant differences in the red blood cell, white blood cell and the haemoglobin contents among all the diets.

DISCUSSION

The values of alkaline phosphate, aspartate amino transference and alanine amino transference fell within the values reported by Tambuwal et al. (2002). The function of alkaline phosphatase is unknown but it is probably vital for calcification of bone (Phillip, 1995). The highest serum urea and creatinine values recorded for

Table 2. Haematological and serum indices of the experimental animals.

Parameters	Diet A (control	Diet B (+)	Diet C (++)	Diet D (^)	Diet E (^^)	±SEM
Alanine amino transferase(iu/L)	26.60	26.00	30.50	28.40	27.50	2.01 NS
Alkaline phosphatase(iu/L)	63.33	67.53	71.53	61.80	70.88	4.68 NS
Aspartate amino tranferase(iu/L)	17.46	15.26	17.57	15.83	20.56	2.86 NS
Creatinine mMol/L	65.66^{c}	100.66^{a}	76.77^{b}	91.00^{a}	107.33^{a}	4.83*
Urea mMol/L	1.34	1.63	1.31	1.74	1.91	0.17*
Packed cell volume (%)	28.66^{a}	27.33^{a}	20.33^{b}	25.66^{a}	27.00^{a}	1.33*
Red Blood cell ($\times 10^{9}$L)	2.22^{a}	1.88^{a}	1.49^{b}	2.17^{a}	1.21^{c}	0.11*
White blood cell($\times 10^{9}$L)	6.87^{b}	6.90^{b}	9.30^{a}	7.96^{b}	8.00^{a}	0.52*
Haemoglobin (g/dl)	6.65^{a}	5.87^{b}	5.14^{b}	6.30^{a}	5.00^{b}	0.23*
Lymphocyte (%)	29.30	30.33	27.00	29.00	29.00	1.65 NS
Monocyte (%)	0.00	1.00	0.33	0.00	0.66	0.81 NS
Eosinophil (%)	0.60	1.00	1.66	0.60	1.33	0.90 NS
Basophil (%)	0.00	1.00	0.00	0.00	1.00	0.21 NS
Neutrophil (%)	69.30^{c}	73.33^{a}	77.66^{a}	71.00^{b}	69.33^{c}	1.53*

(+) = 50% *A. niger* treated *J. curcsa* kernel cake inclusion.
(++) = 100% *A. niger* treated *J. curcsa* kernel cake inclusion.
(^) = 50% *T. longibrachitum* treated *J. curcsa* kernel cake inclusion.
(^^) = 100% *T. longibrachitum* treated *J. curcsa* kernel cake inclusion.
Means along the same row with similar superscript are not significantly different from each other ($p > 0.05$).

diet E could be due probably to the high work rate of the liver and the kidney in detoxifying the toxin content of the *Trichoderma* treated *J. curcas* based diet. This supported the assertion that serum creatinine helps in evaluating the liver function and diseases while serum urea evaluates renal function and it may also indicate dehydration. However, dehydration and death were recorded in animals fed diets D and E and this supported the work of Chivandi et al. (2006). The significantly higher values of white blood cell recorded for diets C, D and E could be as a result of the animal possessing a protective system suggestive of a well adapted immune system (Tambuwal et al., 2002). The high red blood cell noted for animals on diets A and D showed that the goat are not anemic. The haemoglobin content followed similar trend. The values of red blood cell and haemoglobin reported herein could be due probably to the age of the animals used in this experiment. Tambuwal et al. (2002) reported that age has a significant effect on haemoglobin and red blood cell (that is, the oxygen carrying capacity of blood is higher in adult goats). All the values reported for urea and creatinine in this study agreed with the values reported by Tambuwal et al. (2002). The PCV noted for all diets (especially diets D and E) could be due to the compensatory accelerated production (CAP) of packed cell volume (PVC) which returns the PVC levels to normal level (Ganong, 2001; Tambuwal et al., 2002). The high content of neutrophil recorded for diets B and C showed that the cellular digestion of offending agents like bacteria was more compared to other diets. It could be concluded from this study that inclusion of 50% *A. niger* treated *J. curcas* kernel cake +50% soybean cake in the experimental diet gave the best results of parameters evaluated. This indicates that *A. niger* is effective in detoxifying the toxic content of *J. curcas* to a level that do not elicit any toxic nor death responses in goat fed the diet.

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