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SYNERGISTIC EFFECT OF *ASPERGILLUS NIGER* AND *PENICILLIUM CHRYSOGENUM* ON *JATROPHA CURCAS* KERNEL CAKE: INFLUENCE ON PERFORMANCE OF SHEEP

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ABSTRACT
In Performance, digestibility and haematological trials, a total of nine West African dwarf Sheep were used to evaluate the effect of fungi blend (*Aspergillus niger and Penicillium chrysogeum) on* nutrient digestibility and haematological indices when sheep were fed fungi blend treated *Jatropha curcas* kernel cake based diets. The three experimental Treatment diets were (A) Control diet with Soybean cake as the protein source, (B) 50% Soybean cake plus 50% fungi blend treated *Jatropha curcas* kernel cake and (C) 100% fungi blend treated *Jatropha curcas* kernel cake. Total average daily dry matter intake was significantly higher for the control diet (A) compared to other diets (B and C). The dry matter digestibility was higher ($p<0.05$) for sheep fed the control diet (A) (96.00%) as compared with those on diets B and C but no significant difference was observed in the digestibility of the fungi blend treated *Jatropha curcas* kernel cake based diets. The crude protein, crude fibre and the ether extract digestibility's followed similar trend. There was a significant ($p<0.05$) improvement for digestible dry matter intake of diet A (control) over the fungi blend treated *Jatropha curcas* based diets (B and C). Other digestible nutrients intake (digestible crude protein, digestible ether extract and digestible crude fibre) followed similar trend ($p>0.05$). Haematological parameters in sheep fed the fungi blend treated *Jatropha curcas* kernel cake based diet recorded no significant difference ($p>0.05$) in all the parameters (hemoglobin, white blood cell, Red blood cell, neutrophil, eosinophil, basophil and monocyte) evaluated except Packed cell volume (PCV). The highest PVC (30.50%) was noted in diet B followed closely by diet A and the least was diet C (27.50%). Conversely, Lymphocyte level was in the order of diet C > B > A. In conclusion, while diet A had a positive impact on digestible nutrient intake, fungi blend treated *Jatropha curcas* kernel cake based diets (B and C) had the capacity to significantly enhance the haematological parameters of the experimental sheep.

KEY WORDS: Sheep, *Aspergillus niger, Penicillium chrysogenum,* dry matter intake, digestibility coefficient, digestible nutrient intake, haematological indices ,Jatopha seed cake

INTRODUCTION

Nutrition is the most vital aspect of animal production hence good nutrition is a pre-requisite for good health, good reproduction, high milk yield, fast growth rate and a successful ruminant system[1]. Nutrition exerts influence on flock reproduction, milk production and growth of the animals. Additionally, it also determines the growth rate of young animal while animal fed with nutritionally deficient diet is more susceptible to disease and fails to reach its genetic potential. Feed resources and their efficient utilization are considered first limiting factor to improve animal productivity. The availability and the cost of feed is a serious problem facing animal production due to the rising competition for the available feed supply by man, industry and livestock. Feed resource with regards to availability and quality as well as their convenient physical forms for use are quite essential in animal feeding. With the increase in the need for additional livestock feed resources, researchers have embarked on different kinds of feed resources (non conventional) to serve as alternative to conventional feedstuffs. *Jatropha curcas* which is a drought perennial resistance plant has seed which after removing the oil contain seed cake . The cake contains between 57 and 64% protein content[2]. The level of essential amino acid except lysine is higher for the FAO reference protein. However, the seed contains several toxins which include lectin, saponins, phytates trypsin inhibitor and phorbolester . The feeding value of the cake could be improved by treating it biological (Biotechnological method). Therefore, the thrust of this study was to detoxify the cake using fungi and the feeding of resulting substrate to sheep.

MATERIALS & METHODS

Location of the Experiment

The experiment was conducted at the Animal pavilion of the Department of Animal Production, University of Ilorin, Nigeria. The pen was thoroughly washed with disinfectant (Morigard) and later left for a week after washing before the introduction of the animals.

Animal and Management

West African dwarf sheep (n = 9) were purchased from a local market in Ilorin, Kwara State. The animals were treated against ecto and endo parasites using IVOMEC and later randomized against the experimental diets

Materials

The Jatropha seed used in this trial was obtained from The Jatropha Plantation of the University of Ilorin, Nigeria.

The kernel was first dried, later roasted and milled through hammer mill (about 1mm sieve). The milled material was pressed using hydraulic press and the remaining oil was obtained using the chemical method (cooled extraction using petroleum ether). The soaked substrate was later decanted and the resulting material was air dried.

Fungi Used

The fungi used were obtained from the Institute of Agriculture Research and Training (IART), Ibadan, Nigeria. It includes *Aspergillus niger* and *Penicillium chrysogenum.*

Inoculation and Incubation

The fungi were sub-cultured on potato dextrose agar (PDA) and incubated for about seven days. The milled and autoclaved Jatropha seed cake was inoculated with the spore of each fungi separately (10^7 spore /ml) and later incubated for proper growth of the fungi. The fungi fully enveloped the substrate in about 7 days and the growth of the fungi was terminated by oven dried at 70^{OC}. The fungi treated Jatropha seed cake was used in formulating diets for the experimental animals (Table 1).

TABLE 1: Composition of the Experimental Diets

Ingredients (%)	A (Control)	Diet B (Penicillium chrysogenum treated Jatropha seed cake)	Diet C (*Aspergillus niger* treated Jatropha seed cake)
Cassava waste	53.00	53.00	53.00
Fungi treated *Jatropha curcas* kernel cake	0.00	5.00	5.00
Soybean cake	10.00	5.00	5.00
Cowpea husk	35.00	35.00	35.00
Vitamin/mineral premix	1.00	1.00	1.00
Salt	1.00	1.00	1.00
Total	100.00	100.00	100.00

Experimental Diets, Feeding and Digestibility Trial

The experimental diets consist of Treatment A (Control, no Jatropha seed cake inclusion), B, 50% *Penicillun chrysogenum* treated Jatropa seed cake plus 50% Soybean cake; C, 50% Aspergillus *niger* treated Jatropha seed cake plus 50% Soybean cake while other ingredients are of fixed proportions. The experimental animals are randomized against the experimental diets and fed and watered *ad-libitum* for a 56day period. The digestibility trial was conducted at the last two weeks of the experiment. Blood was collected from the jugular vein of the animals and various haematological parameters were determined.

Chemical analysis

The proximate composition of the faeces and the feed were determined using the method of A.O.AC. (3).

Statistical analysis

All data collected were subjected to analysis of variance of **a** Completely Randomised design model while significances were separated using Duncan (4) multiple range test.

RESULTS & DISCUSSION

Proximate Composition of the Experimental Diets

The dry matter content was 88.00% (A), 93.00% (B), 92.00 % (C) while the crude protein content was 25.09, 22.78, and 27.33 percents A, B and C respectively. The crude fibre and ether extract contents were 31.94, 32.40 and 30.99 percents and 17.99, 11.87 and 12.54 percents respectively. However, there was a slight reduction in the crude fibre contents of fungi treated Jatropha kernel cake (Diets B and C) compared to the Control (A). The low crude fibre recorded for diets B and C may be attributed to the degradation of the fibre content by the fungi introduced.

TABLE 2: Proximate Composition of the Experimental Diets

Parameters (%)	Diet A (Control)	Diet B (*Penicillium chrysogenum* treated Jatropha seed cake)	Diet C (*Aspergillus niger* treated Jatropha seed cake)
Dry matter	88.00	93.00	92.00
Crude Protein	25.09	22.78	27.33
Crude fibre	31.94	32.40	30.99
Ether extract	17.99	11.87	12.54
Ash	11.12	11.77	12 55

Feed intake, Body weight gain and General Performance of the animal

There was no significant difference in the dry matter intake among the animals. The crude protein intake was significantly higher for diet C followed by diet A and the least was diet B. The increased crude protein intake of diet C may be attributed to the release and addition of microbial protein into the diet and this corroborates the reports of Jacqueline et al., 1995[5] and Belewu *et al*., 2008 [6]. There was no significant difference in the crude fibre intake between diets A and C. This could be due to the solubilization and degradation of the Jatropha kernel cake.

The highest weight gain was recorded for animals on diets C, B and A in that order. The highest weight gain of

animals on the fungi treated diets could be due to the rich nutrient contents of these diets as well as the presence of un-identified growth factors (UGH) present in the biological treated diets [5, 6] .

TABLE 3: Feed intake and weight gain of the Experimental animals (g/d)

Parameters	A	B	C	±SEM
Dry matter	430.00	400.78	450.98	5.90
Crude Protein	107.89[a]	91.30[b]	123.25[c]	2.56
Crude fibre	137.34[a]	129.85[b]	139.76[a]	2.33
Ether extract	77.36[a]	47.57[b]	56.55[c]	1.76
Ash	47.82[b]	47.17[b]	56.60[c]	1.55
Weight gain (g)	4.57[a]	4.90[ab]	5.58[b]	0.56

Haematological indices

The PCV reported herein fell within the range reported elsewhere (7). However, the value was least for diet C. The haemoglobin, white blood cell, Red blood cell, neutrophil and eosin were not significantly different among the diets. These values fell within the normal range reported for sheep [8]. The lymphocyte content was similar among the diets. The basophil and monocyte recorded are similar among diets (A-C).

TABLE 4: Haematological indices of the Experimental Animals

Prarmeters	A	*B*	*C*	*±SEM*
Packed cell volume (PCV) %	39.25b	43.50ab	44.50	0.50
Haemoglobin (g/dl)	*10.75*	11.98	11.13	0.60NS
White Blood cell(WBC) X 10^9	8.85	*8.25*	*8.20*	*0.48NS*
Red Blood cell X10^{12}	12.25	12.00	9.60	0.92NS
Neutrophil (%)	37.00	36.80	54.00	6.43NS
Lymphocytes(%)	*73.00*[b]	75.50[b]	76.00[a]	4.56NS
Eosin (%)	2.75	*2.50*	*2.25*	*0.50NS*
Basophil(%)	*0.00*	*0.00*	*0.00*	*0.00*
Monocyte (%)	38.15	*38.75*	*39.00*	*4.00*

Means having similar superscripts are not significantly different from each other (p>0.05)

CONCLUSION & IMPLICATIONS

The degradation of Jatropha kernel cake by fungi (*Aspergillus niger and Penicillum chrysogenum)* reported herein are found to be effective in enhancing feed intake and weight gain of the experimental sheep. The blood parameters were comparable to the standard normal blood value of sheep. Hence, the fungi treated Jatropha kernel cake can be used as substitute of soybean cake for economic reasons as well as solve the problem of competition between man and livestock.

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