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Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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Vitamin Composition and Fibre Fractions of Cashew Nut Shell: Implication for Animal Nutrition

J.O. Ocheja[1], B.C. Lablabe[2], H.G.E. Oguche[3] and G.O. Usman[3]
[1]Department of Animal Production, Kogi State University, P.M.B. 1008, Anyigba, Nigeria
[2]Department of Food Nutrition and Home Science, Kogi State University, Anyigba, Nigeria
[3]Department of Animal Production and Health, Federal University, Wukari, Nigeria

Abstract: Raw cashew nut shells from both red and yellow varieties, obtained from Kogi State university campus, Anyigba, were screened for their vitamin content and fibre fraction. Vitamins A and C were found to be very high, vitamins B1 and B2 contents were found to be high, while vitamins B6 D, E and K were moderate in content vitamin B12 (cynoconalamin) was found to be completely absent in cashew nut shell. The Neutral detergent fibre (25.30%) was moderate for lignin. The crude fibre content of cashew nut shell was found to be high (23.05%) the values for cellulose lignin and Hemicellulose were 7.45, 11.5 and 7.35%, respectively. The vitamin content of cashew nut shell was found to be adequate for the difference species and classes of livestock except for vitamin B12 which is completely absent. It was recommended that the level of inclusion of cashew nut shell in diet for livestock should be very low so as to keep the overall fibre content of compounded ratio at recommended level. Cashew nut shell can also be used to jack up the fibre content of rations, where all the other ingredients are very low in fibre, it can also be used as a fibres material in livestock diets.

Key words: Raw cashew nut shells, vitamins B6 D, E and K, conventional feed ingredients

INTRODUCTION

The high cost of conventional feed ingredients has necessitated the search for alternative feed ingredients that are cheap, safe, readily available and at the same time not in direct use by humans (Ocheja *et al*., 2013a). The competition for conventional feed material for ruminants and non-ruminants has led to scarcity and rising cost of conventional feed ingredients such that feed cost accounts for about 70% of the recurrent cost of livestock production (Akinmutimi, 2004). In most cases these alternative feed stuffs are free from the pressures of competition by humans and industry (Sapoota, 1992). In this regard the use of Agro by products as feed ingredient for livestock feed is imperative and is gaining popularity. One of such agro by-products that appear to be promising in animal nutrition is cashew nut shell. It is expedient to analyze unconventional feed materials for their chemical composition with a view to determining their suitability or others wise as feed ingredients for livestock feed from points of view of nutritional value, safety and utilization by animals. Previous work had looked at the proximate composition (Ocheja *et al*., 2011; Okolo *et al*., 2012) as well as the mineral and phyto chemical composition (Ocheja *et al*., 2013) of cashew nut shell.

There is, there for the need to examine the vitamin and fibre contents of cashew nut shell with a view to elucidating their implications for animal nutrition as well as judicious use.

Vitamins have been reported to be vital for the maintenance of normal life and that deficiencies are associated with clinical symptoms that can be cured by their dietary addition they are also said to be active in the metabolism of all nutrients Toxicity due to overdose of some vitamins have also been reported (MC Donald *et al*., 2002; Aduku, 2004)

Fibre at recommended levels have been reported to have nutritional physiological and prophylactic functions in Animal (Anugwa *et al*., 1989). High levels of fibre however have been reported to be detrimental to Animals (Mc Donald *et al*., 2002).

This research work therefore is aimed at analyzing cashew nut shell for their vitamin content as well as fibre content with a view to determining their suitability as others wise as feed ingredient for livestock feed.

There is death of research data on the chemical composition and hence nutritional qualities of cashew nut shell, thus making this work expedient.

MATERIALS AND METHODS

Samples of raw cashew nuts (both red and yellow varieties) were obtained from cashew trees within Kogi State university campus Anyigba. The nuts were cleaned and the kernels carefully removed from the shells. The shells were sent to the laboratory for analysis of their vitamin content (vitamin A, B1, B2, B6, B12, C, D, E and K) and fibre fractions (Neutral Detergent fibre, (NDF) Acid detergent fibre (ADF) acid detergent lignin (ADL) cellulose and Hemicellulose).

Corresponding Author: J.O. Ocheja, Department of Animal Production, Kogi State University, P.M.B. 1008, Anyigba, Nigeria

Table 1: Vitamin composition of cashew nut shell (mg/100g)

Vitamins	A	B	B2	B6	B12	C	D	E	K
Values (mg/100 g)	8.12	4.27	7.25	0.64	Nil	46.41	0.27	0.46	0.62
%	0.00081	0.00043	0.00073	0.00064	NIL	0.0046	0.000027	0.00046	0.00062

Table 2: fibre composition of cashew nut shell (% DM)

Fibre fractions	Composition (% DM)
Crude fibre	23.05
Neutral detergent fibre (NDF)	26.30
Acid detergent fibre (ADF)	18.95
Acid detergent lignin (ADL)	7.45
Cellulose	11.50
Hemicellulose	7.35

ADL+Cellulose = ADF
ADF+Hemicellulose = NDF
NDF-ADF = Cellulose

The vitamin analysis was carried out using standard procedure (AOAC, 1980). While the fibre analysis was done according to the method of Van Soest *et al.* (1991). The percentage hemicellulose content was obtained by finding the difference between neutral detergent fibre and Acid detergent fibre values.

All the analysis were carried but in triplicates and the average values for each parameter taken result for the vitamin content were determined in mg/100 g and later converted to percentages. The fibre fraction were determined in percentages.

RESULTS AND DISCUSSION

Vitamin analysis: Values for the vitamin analysis are presented in Table 1.

Provitamin A:

- 1 mol of B-carotene = 2mol of vitamin A
- Cashew nut shell can be said to be very rich in vitamins A and C rich in vitamins B1 and B2 moderate in vitamins B6, D, E and k and has no vitamin B12 at all.

Compared with requirement of various breed and values for different species and classes of livestock reported by Aduku (2004) and MC Donald *et al.* (2002), the vitamin content of cashew nut shell can meet all the vitamin requirement of all classes of livestock, except for vitamin B12 which is completely absent in cashew nut shell. The absence of vitamin B12 (cyanocobalamin) in cashew nut shell may not be a problem in ruminant since it is synthesized by ruminants so long as cobalt is not deficient.

Fibre fractions: Values for the fibre fractions are presented in Table 2.

The crude fibre content of 23.05% was high but was lower than 25.70 and 24.20% reported by Okolo *et al.* (2012) and 20.81% reported by Ocheja *et al.* (2013). This disparity could be due to difference in varieties, soil conditions as well as methods of analysis. The moderate NDF value of 26.30% was quite lower than the safe upper limit of 60% reported by Meissner *et al.* (1981) for guaranteed feed intake by ruminants.

The cellulose and Hemicelluloses value of 11.50 and 7.35% was comparable with 11.31 and 7.31%, respectively reported by Omale (2014). But the lignin value of 7.45% was however higher than 5.56% also reported by Omale (2014). Since Hemicelluloses is nearly completely digested by colonic and rumen bacteria enzyme cellulose is 40% digested and lignin is not digested by colonic and rumen bacteria enzyme, (Anugwa *et al.*, 1989) it therefore follows that only about half the crude fibre content of cashew nut shell may be digestible. This however qualities cashew nut shell as feed stuff for ruminants because Preston (1986) reported that for a feed to be considered a ruminant feed it should have a total dry matter digestibility coefficient of 40-50%. It therefore means that the total dry matter digestibility of cashew nut shell would be higher than 50%. Bamualin *et al.* (1980) also reported that low NDF of 20-35% suggest high digestibility, but that high lignin content suggest low digestibility *Ceterus paribus*.

The crude fibre content of cashew nut shell (23.05%) is capable of depressing feed intake especially in monogastric animal since it was reported that crude fibre levels of 10-15% depressed feed intake either because of excessive bulk or reduced palatability of the feed, depending on the degree of lignifications, lignin is said to affect the bioavailability of hemicelluloses and even other nutrients (Anugwa *et al.* 1989).

The above implies that the level of inclusion of cashew nut shell in diets for livestock (more so for non ruminants) should be very low so as no to jack up the overall crude fibre content of compounded diets beyond recommended levels. Cashew nut shell can however be used to improve the fibre content of livestock rations where all the other feed ingredients are very low in fibre. Cashew nut shell can also be used as filler material when compounding diets for livestock.

Conclusion and recommendations: Cashew nut shell is very rich in vitamins C and A rich in vitamins B1 and B2, moderate in vitamins D, E, K and B6 and has no vitamin B12 at all. The crude fibre content of cashew nut shell is high and only about half of this may be digestible.

Recommendations: The level of inclusion of cashew nut shell in diets for Animal (more so for monogastric animals) should be very low so as to keep the crude fibre levels of compounded rations at recommended levels. Cashew nut shell can also be used to Jack up the fibre content of diets for livestock, especially where

the other feed ingredients are very low in fibre. Cashew nut shell can also be used as filler material when compounding livestock feeds.

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