

NUTRITIVE VALUE OF MAIZE HUSK TREATED WITH TERMITE HOMOGENATE AT DIFFERENT CONCENTRATIONS AND DURATIONS

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ABSTRACT

The call for diversification of Nigerian economy has stimulated more investment in production of staple crops such as maize. The production of maize has its own challenges which include generation and management of wastes. Such wastes from maize include husk and cobs. After harvesting, most farmers leave their maize husk on the farm to decay with less being consumed by livestock. The ability of termites to digest cellulose suggests the possibility of improving the nutritive content of maize husk through fermentation with termite homogenate. The objective of this study was to assess the nutritive value of maize husk treated with termite homogenate at different concentrations and durations. Homogenate obtained from termites (*Kaloterms spp*) was used to ferment maize husk at different concentrations and durations being 0ml/kg, 100ml/kg, 300ml/kg, 500ml/kg at 8 hours, 16 hours and 24 hours respectively. The experiment was a 3x3 factorial in a completely randomized design (CRD). The proximate and fibre fractions of the resulting substrate were analyzed. Termite homogenate from *Kaloterms spp* at 100ml/kg, 300ml/kg and 500ml/kg on maize husk incubated for 8, 16 and 24 hours had varying effects on proximate composition and fibre fractions. Termite homogenate from *Kaloterms spp* at 500 ml/kg used in treating maize husk for 24 hours improved the protein content and decreased the lignin content of maize husk thereby improving its nutritive value.

Keywords: *Kaloterms*, homogenate, concentration, crude fibre, maize husk

INTRODUCTION

Increased livestock production is one way of meeting the protein requirements of the Nigerian populace and this can be sustained by utilizing feeds that have no value in human diets (Iyeghe Erakpotobor *et al.*, 2002). Maize husk is an example of non-conventional feedstuffs. It is the leafy fibrous sheath covering the corn ear which farmers remove and large quantities are left mostly on the farm after harvest to be grazed by small and large ruminants. Maize husk is usually subjected to trampling, soiling and termite damage, with less than 50% being consumed by livestock (Munthali *et al.*, 2000). Maize crop residues compared with other cereal residues produce the largest proportion of the total crop residues hence they serve as a major source of ruminant feed in Africa and Nigeria in particular (Tang *et al.*, 2006). Non-conventional feedstuffs are however bulky, low in digestible nutrients and high in fibre thereby posing a limitation to their use. McDonald *et al.* (1995) reported that the digestibility and intake of highly lignified cereal crop residues may be improved by physical and biological treatment/processing. Thus, the objective of the study was to assess the nutritive value of maize husk treated with homogenate of termites, *Kaloterms spp* at different concentrations and incubation periods.

MATERIALS AND METHODS

The experiment was conducted at Samaru College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria. Maize husks were collected from the College farm. The maize husk was washed, chopped and dried before further taken to Food and Nutrition Laboratory of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University Zaria, where it was milled and sieved with 0.1mm sieve to attain small particle size.

Source of termites and extraction of enzyme

Termites were collected from a mound located in front of the Ahmadu Bello University Gymnasium. A subsample of termite were taken for identification at Crop Protection Department, Faculty of

Agriculture, Ahmadu Bello University Zaria, where it was identified to be; Order: Isoptera, Family: Termitidae and Genera: *Kaloterms spp.* The termite mound was dug and termites were collected. Termite homogenate extraction was done following the method described by Purwadaria (2003).

Experimental design, laboratory analysis and data analysis

The experiment was conducted using 3x3 factorial in a completely randomized design (FCRD) with a control, four treatments were considered (T1, T2, T3 and Control) and each treatment has three replicates (R1, R2 and R3). Treatment 1 was fermented for 24 hours, treatment 2 was fermented for 16 hours and treatment 3 was fermented for 8 hours while control was not treated. Each of these treatments was subjected to three concentrations of termite homogenate being 100ml/kg, 300ml/kg and 500ml/kg. All the treatments were in triplicates. After treatment, subsamples of 20g were weighed from each replicate of the treatments and control and used to determine proximate composition and fibre fractions of the sample. This was also done at the Department of Animal Science, A.B.U., Zaria using the procedures described by A.O.A.C. (1995). All data obtained was managed using excel and it was further analysed using SPSS and SAS.

RESULTS AND DISCUSSION

Table 1 shows the mean effects of concentration and duration of incubation on proximate composition of maize husk fermented with tissue homogenate from *Kaloterms spp* at 0ml/kg, 100ml/kg, 300ml/kg and 500ml/kg for 0hour, 8hours, 16hours and 24hours. Treated maize husk with a significantly ($P<0.05$) higher crude protein of 3.76% was obtained with termite homogenate of 500ml/kg at 24hours, as compared to 2.31% obtained with termite homogenate of 0ml/kg at 0hour. The improved crude protein values obtained at 500ml/kg could be due to the release of more polysaccharide bound protein and this is as reported by Belewu *et al* (2003) and Akinfemi *et al.* (2009). This could also be due to the activities of micro-organisms which are known for the bioconversion of carbohydrates and lignocelluloses into protein as reported by Camire *et al.* (1997). The implication is that incorporating termite homogenate with maize husk will increase the crude protein of the maize husk for animal growth. There was a significant difference in oil and NFE of treated maize husk as compared to the control. However there was no difference between oil composition and NFE for all the treated samples at the various concentrations of termite homogenate used. There was a significant ($p<0.05$) decrease in crude fibre content of treated maize husk as the concentration of termite homogenate increased, also the CF decreased significantly ($p<0.05$) as the duration of treatment increased. This decrease in CF with increase in concentration of termite homogenate and duration of treatment is an indication of softening of the maize husk during fermentation as a result of enzymes present in the digestive tract of termites. This is in line with the hypothesis of Rouland *et al.* (1988) that digestive tracts of these insects contain endoxylanase and cellulases from two different organisms: a fungal endocellulase and a termite exocellulase produced by the salivary glands. Fibre fractions of maize husk fermented at different concentrations and durations with homogenate of *Kaloterms spp* is presented in Table 2. The observed results indicates that there were no significant ($P>0.05$) differences in all the fibre fractions of maize husk treated with up to 500 ml/kg of termite homogenate. However as regards the duration of treatment, there was no significant ($p>0.05$) difference in the ADF and cellulose of treated and untreated maize husk. The lignin of maize husk (17.09%) treated with termite homogenate for 24 hours was significantly lower than maize husk treated at lower durations.

Table 1. Mean effect of concentrations and durations of incubation on proximate composition of maize husk treated with termite homogenate obtained from *Kaloterms spp*

TREATMENTS	C.P%	C.F%	Oil%	Ash%	NFE%
Concentration (ml/kg)					
0	2.31 ^d	34.23 ^a	0.72 ^b	3.19 ^c	50.25 ^b
100	3.10 ^c	31.66 ^b	1.01 ^a	3.93 ^b	51.79 ^a
300	3.35 ^b	31.17 ^{bc}	0.96 ^a	4.07 ^a	51.75 ^a
500	3.76 ^a	30.47 ^d	1.01 ^a	4.12 ^a	51.62 ^a
SE	0.03	0.05	0.03	0.02	0.25
Duration of Incubation (Hours)					
0	2.31 ^d	34.23 ^a	0.72 ^c	3.19 ^d	50.25 ^c
8	2.92 ^c	32.85 ^b	0.85 ^b	3.74 ^c	50.46 ^c
16	3.38 ^b	31.11 ^c	0.95 ^b	3.92 ^b	51.85 ^b
24	3.90 ^a	29.35 ^d	1.18 ^a	4.46 ^a	52.86 ^a
SE	0.03	0.05	0.03	0.02	0.25

C.P = Crude protein, C.F = Crude fiber and NFE = Nitrogen free extract, SE =Standard error.

Means with same letter within a row are not significantly different (P>0.05)

Table 2 Mean effect of concentrations and durations of incubation on fibre fractions of maize husk treated with termite homogenate obtained from *Kaloterms spp*

TREATMENTS	LIG.%	ADF%	NDF%	CEL.%	HEM.%
Concentration (ml/kg)					
0	17.49 ^a	31.42 ^a	51.08 ^a	13.93 ^a	19.66 ^a
100	17.29 ^a	32.27 ^a	50.44 ^a	14.98 ^a	18.17 ^a
300	17.65 ^a	31.92 ^a	50.43 ^a	14.27 ^a	18.52 ^a
500	17.74 ^a	31.98 ^a	50.28 ^a	14.25 ^a	18.29 ^a
SE	0.24	0.28	0.22	0.47	0.44
Duration of Incubation (Hours)					
0	17.49 ^{ab}	31.42 ^a	51.08 ^a	13.93 ^a	19.66 ^a
8	17.57 ^{ab}	32.39 ^a	50.03 ^c	14.82 ^a	17.65 ^b
16	18.01 ^a	31.74 ^a	50.25 ^{bc}	13.73 ^a	18.51 ^{ab}
24	17.09 ^c	32.04 ^a	50.87 ^{ab}	14.95 ^a	18.83 ^{ab}
SE	0.24	0.28	0.22	0.47	0.44

LIG.= Lignin, ADF = Acid detergent fiber, NDF = Neutral detergent fiber, CEL. = Cellulose and HEM. = Hemicellulose, SE =Standard error

Means with same letter within a row are not significantly different (P>0.05)

CONCLUSION

Different concentrations of termite homogenate from *Kaloterms spp* at 100ml/kg, 300ml/kg and 500ml/kg on maize husk incubated for 8, 16 and 24 hours had varying effects on proximate composition and fibre fractions. Termite homogenate at 500 ml/kg used in treating maize husk for 24 hours improved the protein content and decreased the lignin content of maize husk.

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