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EFFECT OF DIFFERENT PROCESSING METHODS ON CHEMICAL COMPOSITION AND ANTI-NUTRITIONAL FACTORS OF KENAF SEED MEAL (*HIBISCUS CANNABINUS*)

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Abstract

The exploitation of conventional protein-rich plant resources such as soybean and groundnut cake for humans and livestock consumption has necessitated a search for other suitable and under-utilized alternative such as kenaf seed (*Hibiscus cannabinus*). This study was conducted to investigate the effect of different processing methods on the proximate composition and anti-nutritional factors of kenaf seed meal. The processing methods employed were; - raw boiling and fermentation, roasting and boiling. Designated as treatments A (control), B, C and D respectively. Significant ($P<0.05$) variation existed in the nutrient's levels among the treatments. A significant ($P<0.05$) increase was observed in Crude protein, Crude fibre and Dry matter in treatments B (Boiled and fermented), C (Roasted), and D (Boiled). Carbohydrate was significantly higher in treatment A (Raw). The processing methods significantly ($P<0.05$) reduced flavonoid, oxalate and tannin. Reduction in all the anti-nutritional factors measured was observed in treatment B except for saponin. It was concluded that processing improved the nutritional value of kenaf seed meal.

K**eywords**: *Kenaf seed meal, Boiling and Fermentation, Boiling, Roasting, Nutrients Composition.*

INTRODUCTION

Poultry production is the fastest means of improving animal protein in the diets of Nigerian populace especially the broiler chickens which have fast growth rate. High cost of feed ingredients is the major limiting factor in poultry production accounting for about 70-75% of total cost of production (12). Conventional feed ingredients such as groundnut cake, soybeans, fish meal and maize are scarce and costly which has led to a renewed interest in the use of non-conventional cheap and easily available ingredients in livestock feeding. Kenaf seed has been reported as a suitable source of protein for livestock and horse feeding due to its high content of protein (1). Kenaf seed has a crude protein content of 30.88%, organic matter content of 95.15% and ether extract content of 18.55% on a dry matter basis. The fatty acid content on dry matter basis includes palmitic acid (33.21%), stearic acid (50.02%), oleic acid (31.26%) and linoleic acid (30.51%) (11). Kenaf seed meal (KSM) has been reported by (5) to contain anti-nutritional factors such as saponin, oxalate, polyphenolic compound, gossypol and protease inhibitors. However, remarkable improvement in nutritive value and quality has been achieved through various processing methods. (8). Therefore, this study is designed to investigate the nutritive value of KSM using different processing methods as a source of feed ingredients for broiler chickens

Materials and methods

The experimental site

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Bayero University Kano. Bayero University falls at 11.97643^{0}N, 008.42995^{0}E, (10).

Source of feed ingredients

Raw Kenaf seed was obtained from Dawanau market in Ungoggo Local Government Area of,- Kano State. The seeds were cleaned by hand picking and winnowing to remove all the foreign materials. After cleaning, the seeds were processed using the following three methods.

Roasting

Three hundred gram of clean Kenaf seed as recommended by (4) was roasted for about 15 minutes in a flat open pan over an open fire by a constant stirring, until golden brownish colour was obtained. It was then allowed to cool. The roasted kenaf seed was milled and then bagged and labelled 'RTKSM'.

Boiling

Three hundred gram of clean Kenaf seed as recommended by (4) was boiled at 100^{0c} for 30 minutes, sun-dried for 3days, milled and labeled BKSM

Boiling and fermentation

The seed was boiled at 100^{0}c for 30 minutes washed and kept in an air-tight container to ferment for 3 days. The fermented seeds were sun-dried, for 3 days, milled, bagged and labelled 'BFKSM'

Experimental design

There were 4 treatments, Raw kenaf seed meal (RKSM), Boiled and Fermented seed meal (BFKSM), Roasted kenaf seed meal (RTKSM), and Boiled kenaf seed meal (BKSM) designated as A, B, C and D respectively. Treatment A served as the control.

Laboratory analysis

Determination of Nutrient Composition and anti-nutritional factors

Nutrient composition and the anti- nutritional factors of differently processed (KSM) was carried out according to the methods of AOAC (2012). The parameters determined were; Crude protein, Ether extract, Crude fibre, Ash and Carbohydrate for proximate composition. While,- Tannins, saponins, phytic acid, oxalate and flavonoids for anti-nutritional factors.

Statistical analysis

The data obtained were analyzed using ONE-WAY ANOVA of Minitab version 17 statistical software. The mean separation was carried out using Turkey's test.

RESULTS AND DISCUSSION

Proximate analysis

The result of the proximate analysis (Table 1). Revealed significant (P<0.05) differences in all the parameters determined. There was an increase in the crude protein content across the treatments except for treatment B which was statistically similar to treatment A which ranged from 28.96-37.77%. These values were higher than the values (24.16 – 25.13%) reported by (9). A significant increase (P<0.05) was also observed in the crude fibre content across the treatments compared to the control, this may be due to formation of protein-fibre complex as reported by (7). There was a significant decreased (P<0.05) in ether extract in treatments C and D while treatment B was statistically similar to treatment A (control). This agrees with the findings of (9) when kenaf seed was subjected to boiling and roasting. A significant difference (P<0.05) was observed in ash content ranging from 3.75-5.89% this is lower than the values (7.23-10.22%) reported by (8). The lower values recorded in treatments B and D could be due to leaching of the mineral into the water used for the wet-heat processing as reported by (6). The carbohydrate content decreases in B, C and D this may be due to leaching simple sugars into the cooking water (3). The dry matter contents were significantly (P<0.05) higher in treatment B, C and D. The dry matter is an indicator of the amount of nutrients that are available to the animal in a particular feed (7) this implies that the processing methods improved the nutrient contents.

Anti-nutritional factors

The result of anti -nutritional factors is presented in Table 2. Significant differences (P<0.05) were observed in all the parameters determined. There was a significant (P<0.05) reduction in flavonoid and oxalate in treatment B, C and D. This agrees with the findings of (6). The tannin content was significantly reduced in treatments B and D. A significant (P<0.05) increase was observed in phytic acid content in treatments B, C and D. A reduction in all the anti-nutritional factors measured was observed in treatment B as reported by (7).

Table 1. Proximate composition of differently processed kenaf seed meal

	Treatments				
Nutrients (%)	A	B	C	D	SEM
Crude protein	31.06^{c}	28.96^{c}	37.77^{a}	34.86^{b}	1.51
Ether extract	21.80^{ab}	22.57^{a}	17.49^{c}	21.15^{b}	0.61
Crude fibre	7.93^{c}	14.12^{a}	14.47^{a}	11.32^{b}	1.13
Ash	5.37^{b}	3.75^{d}	5.89^{a}	4.82^{c}	0.21
Dry matter	93.60^{d}	95.85^{b}	99.07^{a}	94.06^{c}	0.13
CHO	27.45^{a}	26.45^{a}	23.46^{b}	21.92^{b}	1.57

Table 2. Anti-nutritional factors of differently processed kenaf seed meal

	Treatments (on dry matter basis)				
Parameters(mg/g)	A	B	C	D	SEM
Tannins	14.64^{b}	8.39^{c}	24.02^{a}	14.52^{b}	1.36
Saponins	13.28^{a}	13.57^{a}	9.79^{b}	13.51^{a}	1.21

Flavonoids	8.50[a]	6.71[b]	7.37[ab]	8.35[ab]	1.17
Oxalate	12.93[a]	6.82[c]	9.13[b]	7.48[bc]	1.52
Phytic acid	9.56[c]	10.39[bc]	14.03[ab]	15.67[a]	2.70

A= Raw *B=Boiled and Fermented* *C=Roasted* *D= Boiled*

Conclusion

It was concluded from the study that the processing methods employed in this study improved the proximate composition and reduced Anti- nutritional content of kenaf seed meal.

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