



EFFECT OF BOILING ON PROXIMATE COMPOSITION, MINERAL AND ANTI-NUTRITIONAL FACTORS OF *CASSIA TORA* SEEDS FOR POULTRY FEED PRODUCTION

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Abstract

Effect of boiling for different time durations on the proximate composition, mineral and anti-nutritional factors of raw *Cassia tora* seeds was investigated. Boiling lasted for three different time durations of 30, 60 and 90 minutes. The proximate composition, mineral and anti-nutritional factors of the seeds of the raw and boiled were determined. Results showed that the dry matter increased above 30 minutes of boiling. Crude protein was increased by boiling. Fibre, ash, ether extract, nitrogen free extract and gross energy were reduced ($P < 0.05$). There was non-significant reduction in the mineral content. Boiling in general reduced ($P < 0.05$) the anti-nutritional factors which recorded 15.21 – 68.62% reductions in tannins, HCN, saponins and phytate at the different boiling times. It was concluded that raw *Cassia tora* seed should be boiled at least for 30 minutes to reduce the anti-nutritional factors and improve its nutritive value especially the crude protein.

Keywords: *cassia tora*, proximate, mineral and anti-nutritional factors.

Introduction

Feeding constitutes an important part of animal, especially poultry production. Ukachukwu (2015) observed that developing countries have feed deficits, which is made complex and complicated by competition among human, the industry and farm animals for the same food items as either food for man, feed for animals or raw materials for the industry. The author however observed that one of the ways of getting round this problem is by looking for alternative feedstuffs, which have little or no dietary value for man and industry. There is however some unconventional legume seeds that are still under-utilized, which little are known about their chemical composition and nutritional values, like sickle pod (*Cassia tora*) seeds, hence, the need for this research. The objective of the study was to determine effect of boiling durations on the nutritive value and anti-nutrients of *Cassia tora* seed

Materials and Discussion

Experimental Site

The chemical analyses were carried out at the Department of Animal Science Laboratory, University of Nigeria, Nsukka.

Processing of Test Ingredient

Mature dried pods of *Cassia tora* were obtained from Bauchi State, Nigeria and were dehulled to release the seeds. The seeds were processed according to procedures of Ukachukwu and Obioha (2000). Boiling lasted for three different time durations of 30, 60 and 90 minutes. In each case, water was brought to boil



at 100°C. Thereafter, the seeds were poured in and allowed to stay for the respective time durations, starting from the time the seeds were poured in. At the end of the boiling, water was drained off. Thereafter, the boiled seeds were dried in forced draught oven at 60°C for 12 hours and ground for analyses.

Proximate Analysis

The raw seeds and differently processed seeds were analyzed for proximate composition using the A.O.A.C. (1990) procedures. The gross energy was determined using adiabatic oxygen bomb calorimetric technique.

Anti-Nutritional Factors

Some of the anti-nutritional factors common with other legume species were investigated. Tannin and phytate in the samples were determined according to the method of Maga (1982). Knowles and Montgomery (1990) method was used to determine the hydrocyanic acid while the method of Obadoni and Ochuko (2001) was used in determining saponin content of the processed seeds.

Results and Discussion

Effect of boiling for different time durations on the proximate composition, mineral contents and anti-nutritional factors of *Cassia tora* seeds are shown in Table 1. For proximate composition it was observed that dry matter, ash, fibre, crude protein, nitrogen free extract and gross energy were significantly ($P<0.05$) influenced by boiling at different durations. Boiling at 60 and 90 minutes increased the dry matter, while at all the boiling durations ash, fibre, ether extract, nitrogen extract and gross energy were reduced significantly ($P<0.05$). Boiling for 90 minutes reduced fibre content more. There were no significant differences ($P<0.05$) among the boiling durations in ether extract, crude protein, nitrogen free extract and gross energy.

Table 1: Effect of boiling for different time durations on the proximate composition, mineral content and anti-nutritional factors of *Cassia tora* seeds

Parameters	Raw	boiling durations (minutes)			SEM
		30	60	90	
Proximate (%)					
Dry matter	88.50 ^b	88.00 ^b	91.50 ^a	90.00 ^a	0.51
Ash	5.00 ^a	4.00 ^b	4.00 ^b	4.00 ^b	0.16
Fibre	10.00 ^a	9.50 ^b	9.00 ^b	8.63 ^c	0.19
Ether extract	2.00 ^a	1.50 ^b	1.30 ^b	1.40 ^b	0.10
Crude protein	9.63 ^b	13.13 ^a	14.01 ^a	13.57 ^a	0.65
Nitrogen free extract	73.37 ^a	68.37 ^b	69.99 ^b	69.43 ^b	0.70
Gross energy (Kcal/g)	3.594 ^a	3.013 ^b	3.018 ^b	3.055 ^b	0.09
Mineral content (%)					
Calcium	0.58	0.58	0.56	0.50	0.03
Magnesium	0.72	0.68	0.66	0.62	0.06
Sodium	0.50	0.33	0.38	0.41	0.04
Potassium	0.27	0.23	0.16	0.23	0.02
Phosphorus	0.60	0.57	0.55	0.59	0.01
Anti-nutritional content					
Tannins (%)	0.087 ^a	0.044 ^b (49.42)*	0.049 ^b (43.67)	0.031 ^c (64.36)	0.01
HCN (Mg/g)	0.883 ^a	0.356 ^b (59.68)	0.277 ^c (68.62)	0.344 ^b (61.04)	0.09
Saponins (Mg/g)	0.994 ^a	0.548 ^c (44.86)	0.769 ^b (22.63)	0.608 ^c (38.83)	0.65
Phytate (%)	0.046 ^a	0.039 ^b (15.21)	0.034 ^b (26.08)	0.037 ^b (19.56)	0.01

^{a,b,c} Means with different superscripts in the same row are significantly different ($P<0.05$).

*Figures in parenthesis are % reduction as compared to values of raw seeds.



The increase in the crude protein of the boiled seeds could be that the decanted water contained testa of seeds, which softened and got detached during cooking and in the course of decanting water and drying, they were lost. The crude protein values for the boiled seeds however compared with 13.79% by Adamu *et al.* (2013). This present result confirmed the result of Ukachukwu (2000) who subjected *Mucuna cochinchinensis* to different boiling durations and observed higher CP compared to raw seeds. The result of crude fibre showed significant difference ($P<0.05$) between the raw and those boiled for different time durations. This could be as a result of loss of testa of the seeds in the course of cooking and decanting of water. The high percentage reduction in crude fibre observed in boiled *Cassia tora* seeds is in agreement with Akinmutimi (2004), who reported 50% reduction of CF in sword bean when subjected to cooking. Emiola *et al.* (2002) reported highest percentage reduction in crude fibre when kidney bean was subjected to cooking. The result of CF aligned with Ukachukwu (2000), who reported that after 30 minutes boiling, crude fibre of *M. cochinchinensis* seeds were significantly ($P<0.05$) reduced. The value of CF observed in the boiled seeds was similar to 9.20% by Okoye *et al.* (1980) for raw baobab seeds. The reduction effect of boiling on ether extract agreed with Ukachukwu (2000), that dehulling effect of boiling of *M. cochinchinensis* must have pre-disposed the seeds to some kind of solubilization and leaching out of its fats and oils.

There were no significant differences ($P<0.05$) in all the minerals detected in the *C. tora*. The non-significant effect of boiling on mineral content was in variance with Haytowitz and Matthews (1983) who reported that cooking caused great mineral losses with 30% of potassium lost, Copper 17% and iron 10%. Also Longe (1983) reported losses of 30% copper and 23% magnesium from mature cowpeas when cooked. The result showed that apart from potassium and calcium, the values of other macro minerals were higher than 0.07% sodium, 0.27% for magnesium and phosphorus reported for boiled *M. sloanei* seed meal, 0.06% for sodium, 0.20% for magnesium and 0.22% for phosphorus for *M. sloanei* seeds boiled with sodium sesquioxide (locally called potash or 'akanwu') (Ewa, 2015).

It was further observed that boiling *Cassia tora* for 30, 60 and 90 minutes resulted in significant reductions ($P<0.05$) in tannins, saponins, hydrogen cyanide and phytate contents of the boiled seeds. It was observed that boiling the seeds for 90 minutes resulted in drastic reduction ($P<0.05$) effect in anti-nutritional factors. It recorded 64.36%, 68.62%, 44.86% and 19.56% reductions in tannins, HCN, saponins and phytate respectively. The reduction of HCN in the processed seeds, according to Oke *et al.* (1996) can be attributed to its volatile nature and its low melting point. This agreed with Udedibie and Nkwocha (1990) that when cooking time was increased to 90 minutes, a higher degree of improvement in the nutritive value of jack bean was observed. This result also agreed with Ukachukwu (2000) that boiling seeds of *M. cochinchinensis* for 90 minute gave the best result in terms of proximate composition and anti-nutritional factors, resulting in 45%, 21% and 48% reduction in trypsin inhibitor, tannin and cyanide levels over the raw seeds.

CONCLUSION

The proximate composition of raw seeds of *Cassia tora* showed promising results. Processing the raw seeds by boiling improved the nutritive value and reduced the anti-nutritional factors. Therefore it is recommended to boil the raw seeds before use for feed production.

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