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Studies on the Chemical and Phytochemical Properties of the Seeds of *Etanda africana*

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Abstract

A study was conducted to evaluate the nutritive value and anti-nutritive factors of raw and processed *Etandaafricana* seed. Raw *Etandaafricana* seeds were collected for the study. Two different processing methods (boiling and roasting) were carried out. All the processed seeds were milled and taken to the laboratory for nutrients and anti-nutrient analyses. The processing methods had no effect ($p>0.05$) on the dry matter, ether extract and ash contents of the seed.The mean values of crude protein and crude fibre were significantly ($p<0.05$) reduced by the different processing methods. However, the nitrogen free extract (28.12 - 34.64 %) was significantly increased ($p<0.05$) by the methods. All the processing methods significantly ($p<0.05$) reduced the contents of phytochemicals; saponin was reduced from 0.21 to 0.11%, tannin, 1.81 to 0.15% and alkaloids, 0.13 to 0.02 % in the seed. It was concluded that *Etanda africana* seed should be processed through boiling and roasting to reduce anti-nutritional factors to a tolerable level before being used as animal feed.

Keywords:*Etanda africana,* nutrients, anti-nutrients, processing methods

Introduction

The *Etanda africana* is a well known leguminous tree used in traditional medicine throughout WestAfricain the treatment of many diseases such as fever, diabetes, hypertension (Occhiuto *et al*., 1999). Like other legume seeds, the nutritional value of *Etanda africana* seed is shrouded by the presence of antinutritional factors such as tannins, phytate, and trypsin inhibitors (Belewu *et al*., 2008), which would limit its use in monogastric nutrition. Therefore, there is a need to reduce these anti-nutritional factors through different processing methods. Effective utilization of this legume can be achieved by reduction or complete elimination of these antinutritional factors. Heat treatment has been employed to reduce or totally eliminate the anti-nutritional factors contained in legume seeds (Kaankuka *et al*., 2000; Tuleun and Patrick, 2007, Makinde *et al*., 2017a). Reports have shown that boiling, toasting, fermentation, sprouting, decorticating of seeds and chemical treatment, can reduce or eliminate the anti-nutritional factors in legume seeds. There is only pocket-size knowledge about the effect of these processing methods on the nutritive value of *Etanda africana* seeds.

The study is aimed atcomparing the effect of two processing methods on the nutrient and anti-nutrient compositions of *Etanda Africana* seed.

MATERIALS AND METHODS

The experiment was conducted at theDepartment of Animal Production Laboratory of the School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Niger State. Minna is located within latitudes 4°30' 09°30' and 09°45'N and longitudes 06° 30' and 06°45 'E with an altitude of 1475 m above sea level (Climatemp, 2016). The area falls within the Southern Guinea Savannah vegetation zone of Nigeria with anannual rainfall of between 1100 and 1600 mm and a mean temperature of between 21^{0}C and 36.5^{0}C (Climatemp, 2016). Minna experiences two distinct seasons; dry season (November to March) and wet or rainy season (April to October).

About 1 kg of *Etanda africana* seeds was obtained from the Teaching and Research Farm, Federal College of Wildlife Management, New Bussa, Niger State. The seeds were handpicked so as to eliminate all unwanted materials. The seeds were carefully cleaned and divided into 3 lots; raw, boiled and roasted. About 300 g seed were boiled at 100°C at a seed: water ratio of 1: 10 w/v. for 2 h in an aluminium pot on a Gallenkamp

thermostat hot plate. The water was drained and the boiled seed oven dried at 50°C. Roasting of 300 g sample of the seed was done in open pan under the controlled temperature at 100°C for 20 minutes. The seeds were continuously stirred until the seeds cracked and their endosperm turned brown with toasty sweet odour. All the processed seed samples were ground to pass through a 1 mm sieve before analysis.

Proximate and anti-nutrientcompositions of raw and processed *Etanda africana* were determined according to the procedure of AOAC (2006) while Dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), Ash,Nitrogen free extract (NFE), saponin, tannin and alkaloids were determined.

Data collected were subjected to t-test using SAS software (2015) while significant means were separated by Duncan multiple range test at 5% level of significance.

Results and Discussion

Table 1 shows the proximate composition of the raw and processed *Etanda africana* seed. There were significant differences ($p<0.05$) in crude protein, crude fibre, NFE and gross energy contents of the seeds. The dry matter, ether extract and ash contents of the seed were not significantly ($p>0.05$) influenced by the different processing methods. The dry matter value of 89.33% observed for boiled *Etanda africana* seed is similar to the value of 87.24% reported by Gidado *et al*. (2013). It was higher than the values of 80.00% reported by Belewu *et al*. (2008) for *Etanda africana* seed. The reduction in the values of crude protein from 40.18% to 33.51% for boiled seed and 37.38% for roasted seed was due to the burning off of some nitrogenous compounds during processing (Emenalom and Udedibie, 1998). Emiola *et al*. (2002) however reported anincrease in crude protein content of raw kidney beans when subjected to roasting. The observation in this work is in agreement with previous findings of Amaefule *et al*. (2003) and Emenalom and Udedibie (1998) who obtained similar results with different legumes.

Table 1: Proximate Composition of raw and processed *Entanda africana* seed

Nutrients,%	Raw	Boiled	Roasted	SEM
Dry matter	91.30	89.33	90.30	0.99
Crude Protein	40.18^{a}	33.51^{b}	37.38^{ab}	1.67
Crude fibre	13.50^{a}	11.00^{b}	12.04^{ab}	0.98
Ether extract	5.75	6.00	4.50	0.76
Ash	3.75	4.25	3.50	0.38
Nitrogen free extract	28.12^{b}	34.64^{a}	32.88^{ab}	1.19
Gross energy (Kcal/100 g)	319.95^{a}	322.32^{a}	315.70^{b}	1.65

SEM=Standard error of mean

The observed value of crude protein (33.51 - 40.18%) reported in this study was higher than 19.69% reported for *Etanda africana* seed by Gidado *et al*. (2013). The differences in these values may be attributed to variation in soil, climate, variety and processing methods. The crude fibre content of boiled *Etanda africana* seed (11.00 %) and that of roasted *Etanda africana* seed (12.04 %) was significantly reduced by the different processing methods. However, the nitrogen free extract was increased as a result of the processing methods used.

Table 2 shows the anti-nutrient composition of the raw and boiled *Etanda africana* seed. There were significant differences ($p<0.05$) in the contents of saponin, tannin and alkaloids. The antinutritional factors in *Etanda africana* seed were inherently low in raw *Etanda africana* seed and were significantly reduced by the different processing methods used. However, roasting was the most effective method for reducing these anti-nutrients as observed in this study. Although, most of these anti-nutrients are heat labile, especially tannins and saponin (Makinde *et al*., 2017b). The generally low concentration of ANF is indicative of the possibility of utilizing the seed meal as a feedstuff without affecting the health of animals consuming such feed.

Table 2: Antinutrient Composition of raw and processed *Entanda africana* seed

Anti-nutrients, %	Raw	Boiled	Roasted	SEM
Saponin	0.21^{a}	0.17^{b}	0.11^{c}	0.01
Tannin	1.81^{a}	0.54^{b}	0.15^{c}	0.02
Alkaloids	0.13^{a}	0.04^{b}	0.02^{b}	0.01

SEM=Standard error of mean

Conclusion

It is evident that *Etanda africana* seeds contain some ANFs. Despite the presence of these ANFs, full potentials of this seed can still be enhanced, since the results generally showed that it contains high CP and the anti-nutritional factors can still be subjected to some treatments, like boiling and roasting to reduce those ANFs to a tolerable level before being used as animal feed.

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