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Effect of Some Processing Techniques on the Proximate and Antinutrients Composition of *Leucaena leucociphala* Seed

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Abstract: The effects of some processing technique on the proximate and antinutritional factors in *Leucaena leucociphala* seed were evaluated. The crude protein, ether extract, crude fibre, ash content and nitrogen free extract were estimated on raw, roasted and cooked samples of *Leucaena leucociphala* milled seed. The antinutritional factors such as phytate and tannin were also determined in the raw and processed samples of the seed. The nitrogen free extract of the raw sample was observed to be significantly lower ($p < 0.05$) compared to those of roasted and cooked samples. A significant increase ($p < 0.05$) was observed in the ether extract and crude fibre of raw sample compared with that of roasted and cooked samples. A significant reduction ($p < 0.05$) was observed in the level of phytate of roasted and cooked samples compared to the raw sample. A significant reduction ($p < 0.05$) was also observed in the level of tannin of cooked sample compared to raw and roasted. The study revealed that there was improvement in the nutritional quality of the processed seed with reduction in the antinutritional factors.

Key words: *Leucaena leucociphala*, proximate composition, antinutritional factors, cooked, roasted

INTRODUCTION

The major problem of poultry in the under developed countries today, apart from the incidence of disease is that of high cost of feed ingredient. This problem has tended to reduce the rate of expansion of the poultry industry and has added to the low level of animal protein nutrition of their citizen. Efforts to reduce the high cost of feeds and therefore the cost of products have concentrated on using alternative and unconventional feed stuffs (Adeniji and Balogun, 2002).

There is therefore the need to look for alternative protein feedstuffs which could be readily available and serve as replacement for protein source in the diets of poultry. The very good class of plant that can be exploited for this purpose is the legumes. Legumes have been reported to be an important source of proteins to man and animals in developing countries (Agbede, 2004).

Leucaena leucociphala is a tropical legume found in Central America, Yucatan Peninsula of Mexico, Philippines, northern Australia and western Nigeria. *Leucaena leucociphala* is a fast growing ubiquitous tropical legume which has found use in agroforestry, soil improvement and land reclamation, wood and forage due to its exceptional capacity to produce biomass (Danso *et al.*, 1992). They are highly nutritious for ruminants and many excellent animal productions. However, the usefulness of most legumes such as *Leucaena leucociphala* are limited by the presence of antinutrients inherent in them. The adverse effects of these antinutrients could be reduced by some processing techniques such as roasting, cooking, steaming, toasting, autoclaving. Processing techniques

are the effective way of achieving desirable changes, removal of undesirable components and effective utilization of the full potential of legumes as feed stuff (Gloria *et al.*, 1995).

The present study was therefore designed to evaluate the effect of some processing techniques on the nutritional composition and the levels of antinutritional factors in raw and processed *Leucaena leucociphala* seed samples.

MATERIALS AND METHODS

Leucaena seeds were purchased at the Leventis Foundation (Nigeria) Limited, Ilesa, Osun State, Nigeria.

Preparation of the raw *Leucaena* seed sample:

Leucaena seeds were firstly sieved to remove unwanted matter such as leaves, sands etc and then milled using a local grinder to give the smooth seed samples.

Preparation of roasted *Leucaena* seed sample:

Leucaena seeds were roasted in a dry pan using an electrical hot plate. The seed meal were continually stirred until a characteristic brownish coloured seeds were obtained (about 15-30 min depending on the quantity to area of the pan). The seeds were then milled and sieved to remove the seed coat.

Preparation of cooking *Leucaena* seed sample:

Leucaena seeds were washed, put in cooking pot and boiled for forty minutes on a Gas cooker. The seed were then dried, milled and sieved to give a smooth seed sample.

Determination of proximate composition: The crude protein, ether extract, ash and crude fibre were determined using the procedure outlined by AOAC (1990) and carbohydrate by difference.

Determination of antinutrients: Tannin content was determined according to Joslyn (1970). The level of phytate content of *Leucaena* seeds samples was determined using the method of Wheeler and Ferrel (1971).

Statistics analysis: All data were subjected to analysis of variance (Steel and Torrie, 1960). Significant differences between the treatment means were determined at 5% confidence level using the Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Figure 1 shows the proximate composition of raw and processed *Leucaena leucociphala* seed. The nitrogen free extract of the raw sample was observed to be significantly lower ($p < 0.05$) compared to those of roasted and cooked samples. The carbohydrate content of the processed sample compared well with that reported by Ahmed and Abdelati (2008). A significant reduction ($p < 0.05$) was observed in the ether extract. This could be as a result of leaching during processing. It might also be as a result of denaturation of the lipid. Processing techniques such as boiling has been reported to bring about denaturation of lipid fraction in processed samples (Elegbede, 1998). Legumes generally contain low fat contents in the range of 1-2% with exceptions such as chickpea-6.7% (Costa *et al.*, 2006); soybean- 21% and peanut-49% (Augustine and Klein, 1989). Crude fibre of raw sample was significantly higher ($p < 0.05$) compared with that of roasted and cooked samples. This shows that there will likely be bioavailability of the amino acids in the processed samples than the raw sample. High level of crude fibre causes decrease in availability of amino acid in monogastric animals (Ranhotra *et al.*, 1971). Although no significant difference ($p > 0.05$) was observed in the levels of crude protein of the raw sample compared with the roasted and cooked samples, the protein levels of the processed samples still fall within the range reported for other legumes (Elegbede, 1998).

The levels of some antinutrients in the raw and processed *Leucaena* seed samples are shown in Fig. 2. A significant reduction ($p < 0.05$) was observed in the level of phytate of roasted and cooked samples compared to the raw sample. This observation is in accordance with earlier findings by Vaishale *et al.* (1998), who reported that roasting of legumes apparently reduced phytic acid. The reduction in the antinutrients by roasting was observed to be as a result of heat hydrolysis (Ologhobo, 1989). This might be true

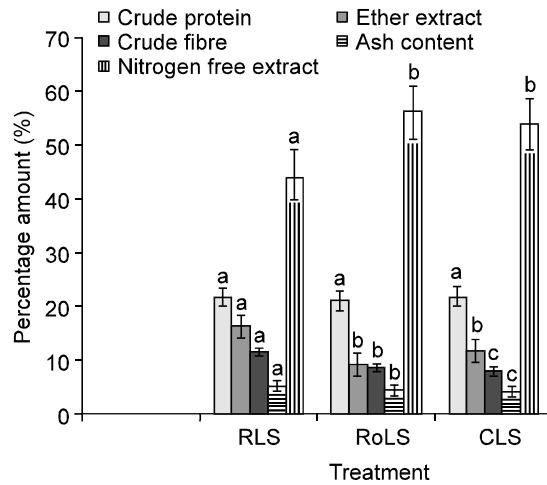


Fig. 1: The percentage proximate composition of raw and processed *Leucaena leucociphala* seed samples. Determination was done on dry matter bases. Values are means of 3 replicates per treatment (\pm SD). Means with different superscripts in the same row were significantly different ($p < 0.05$). RLS - Raw *Leucaena* Seed sample; RoLS - Roasted *Leucaena* Seed sample; CLS - Cooked *Leucaena* Seed sample

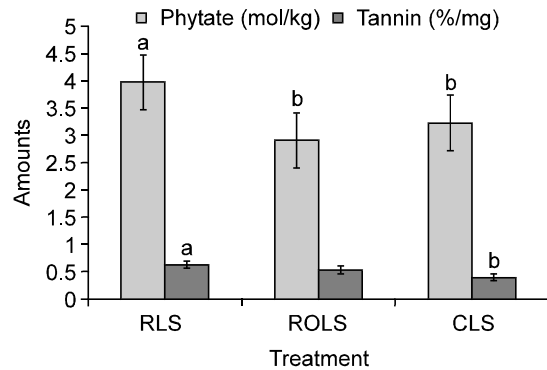


Fig. 2: Levels of some antinutritional factors in raw and processed *Leucaena leucociphala* seed samples. Values are means of 3 replicates per treatment (\pm SD). Means with different superscripts in the same row are significantly different ($p < 0.05$). RLS - Raw *Leucaena* seed sample; RoLS - Roasted *Leucaena* seed sample; CLS - Cooked *Leucaena* seed sample

in the case of *Leucaena leucociphala* seed as observed in this study. A significant reduction ($p < 0.05$) in the level of tannin was observed in the cooked sample compared with raw *Leucaena* sample. This might be due to heat hydrolysis. Loss of tannin molecules as a result of roasting or steaming through heat degradation has been reported by Ogum *et al.* (1989). This suggests that

cooking could reduce the level of tannin in the *Leucaena* seed sample. Tannins have the capability of decreasing the digestibility and palatability of proteins because they form insoluble complexes with them (Osagie *et al.*, 1996). This study shows that processing of *Leucaena leucociphala* seed could improve the bioavailability of its nutrient and reduce the antinutritional factors present. However, further research is suggested on the effect of other processing techniques on the nutritional quality of *Leucaena leucociphala* seed.

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