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Journal of Food Composition and Analysis 18 (2005) 89–103

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JOURNAL OF  
FOOD COMPOSITION  
AND ANALYSIS

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Original Article

Studies of the chemical composition and protein quality evaluation of differently processed *Canavalia ensiformis* and *Mucuna pruriens* seed flours

Johnson O. Agbede\*, Valentine A. Aletor

Division of Nutritional Biochemistry, Department of Animal Production and Health, Federal University of Technology, Akure, Nigeria

Received 23 December 2002; received in revised form 9 October 2003; accepted 9 October 2003

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**Abstract**

Differently processed seed flours of *Canavalia ensiformis* and *Mucuna pruriens* were characterized with respect to their proximate composition, gross energy, mineral and amino acid contents. The anti-nutrients typified by phytin, lectin, trypsin inhibitor activity (TIA), tannin and cyanide were also quantified and this was followed by protein quality evaluation with the rat. The result showed that *C. ensiformis* contained on the average: crude protein  $24.2 \pm 2.2$ , ash  $3.1 \pm 0.6$  and ether extract  $11.1 \pm 0.9$  g/100 g DM while *M. pruriens* contained on the average: CP  $25.7 \pm 1.4$ , ash  $4.1 \pm 1.4$  and EE  $9.6 \pm 2.8$  g/100 g DM. The gross energy varied from 1.65 to 2.07 MJ/100 g for *C. ensiformis* with a coefficient of variation (CV) of 6.74% while it varied from 1.66 to 2.07 MJ/100 g with a CV of 6.19% for *M. pruriens* due to processing. The seed flours contained a good array of amino acids but were low in cystine and methionine. Also the two flours contained appreciable levels of Na, K, Ca, Mg and P as well as some minor minerals such as Zn, Mn, Fe and Cu. The levels of these minerals were higher in the raw flours and tended to be low, in most cases, in dehulled flours. Processing significantly reduced and in some cases eliminated the anti-nutrients quantified. The protein quality evaluation of the legume seeds clearly indicated their unsuitability even in the processed forms, as sole sources of dietary protein in human nutrition. However, given their high yield potentials these seeds could play valuable roles as supplemental nutrient sources to some farm products used in food formulation for man in most developing countries where hunger is endemic.

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**Keywords:** Processing; Nutrient; Anti-nutrients; *Canavalia Ensiformis*; *Mucuna pruriens*

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\*Corresponding author.

E-mail address: joagbede@yahoo.com (J.O. Agbede).

## 1. Introduction

The role of seed legumes in the diets of animal and man in developing countries is well-documented (Oke et al., 1995; Agbede, 2000). They are rich in nutrients such as digestible protein with good array of amino acids and minerals (Ologhobo, 1980). The percent crude proteins of most legumes vary from 20 to 50 (Apata, 1990; Igene, 1999) and have been judged a good source of minerals (Oke et al., 1995). Leguminous seed have been reported to be excellent sources of energy (Del Rosario et al., 1981; Oke et al., 1995) in animal and human diets. This explains why considerable research has been directed to harnessing the potential of these seeds in animal or human diets.

*Canavalia ensiformis*, commonly known as jack bean, is usually used in Nigeria as an ornamental plant, grown near houses and allowed to trail on walls and trees (Udedibie, 1990). It is the most common tree in the North Coast of Columbia (Sanchez and Moreno, 1992). In fact, a record yield of up to 3.08 ton per hectare in an experimental trial has been reported (Addison, 1957). Jack bean has potential as feeding resource that could be exploited for its forage and seeds. Also *Mucuna pruriens* commonly known as devil beans or ‘Werepe’ in South West of Nigeria or “Adua apee” in Ghana, is a weak stemmed, hairy annual climber growing up to about 8 m long, with trifoliolate leaves, dark purple flowers and pods with irritant hairs. *M. pruriens* belongs to the family Papilionaceae of the order leguminosae. As a cover crop, it is capable of effectively controlling spear grass and produces thick mulch that is essential for soil and water conservation (Osei-Bonsu et al., 1994). The pods are straight or S-shaped and have bristle hairs when ripe. These hairs are easily dislodged and cause intense skin irritation. The pod contains between 5 and 6 seeds, and a crude protein, crude fibre and carbohydrate content of 25%, 4.5% and 53%, respectively (Ahenkora et al., 1994).

As with a number of other tropical legumes, both the foliage and seed of these legumes possess several toxic or anti-nutritional constituents. For example, while jack bean contains concanavalin A (Hague, 1975; Jaffe, 1980), saponin, cyanogenic glycosides, terpenoids and only traces of alkaloids (Udedibie, 1990), hemagglutinin, trypsin inhibitor and canavanine (Ologhobo et al., 1993), *M. pruriens* has been reported to contain phytin and tannin (Ravindran and Ravindran, 1988) that can produce some adverse effects in non-ruminant animals if fed continuously over a long time (Lord and Robertus, 1994).

While a lot of information on the nutritive potentials of these seeds is available (Ravindran and Ravindran, 1988; Udedibie, 1990; Esonu et al., 1997; Ogunsipe, 2000), information about the processing effects on the composition and nutritive quality is scanty. This study was therefore designed primarily to provide analytical data on the variation that accompanied different processing techniques of these seeds with particular reference to the proximate chemical composition, minerals, gross energy, amino acids, some anti-nutrients and protein quality using rats as animal model.

## 2. Materials and methods

### 2.1. Sample collection

The two (2) legume seeds used for these studies, *C. ensiformis* and *M. pruriens*, were harvested on the campus of the Federal University of Technology, Akure, Nigeria. While *C. ensiformis* was

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