Proximate composition, energy content and physiochemical properties of *Afzelia africana* and *Brachystegia eurycoma* seeds

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**Abstract.** The proximate composition, energy content and physiochemical properties of *Afzelia africana* and *Brachystegia eurycoma* seeds were determined. The bulk density, reconstitutability, foam properties and emulsification properties of flour samples in water, 1% saline and 1% alkali were studied. There were no significant differences (\(p \geq 0.05\)) in the proximate composition of seeds from different agroclimatic zones. The energy content of seeds were comparable to that of other legume seeds (5.7 kcal/g for *A. africana* and 4.5 kcal/g for *B. eurycoma* seeds). Foam properties of *B. eurycoma* seeds were found to be better than that of *A. africana* seeds in terms of foam volume and stability. Emulsification properties of *B. eurycoma* seeds were also found to be better than *A. africana* seeds suggesting that *B. eurycoma* seeds would be more efficient in food systems requiring the formation of stable foams and emulsions. Protein solubility in alkali was found to be better than in water and in 1% saline. The bulk densities and reconstitution indices of flour samples from the two seeds were found to be similar.

**Introduction**

*Afzelia africana* (akpalata) and *Brachystegia eurycoma* (achi) are legume tree plants that belong to the family Caesalpinaceae. The seed descriptions have been given by Keay et al. [1]. Various vernacular names of the seeds have also been given by Ene-Obong and Carnovale [2]. The cotyledons of these seeds are commonly used as thickening agents in soups and sauces, particularly in southern parts of Nigeria but little is known about the composition and physiochemical properties of these seeds. Recently Ene-Obong and Carnovale [2] reviewed the traditional processing methods for these seeds and highlighted their contribution to dietary fibre. The present study aims at evaluating the physiochemical properties that will highlight potential uses of *A. africana* and *B. eurycoma* seeds in food systems.
Materials and methods

Sample preparations. *Afzelia africana* (akpalata) and *Brachystegia eurycoma* (achi) seeds were procured from two different agroclimatic zones in Nigeria (Ishiagu in Abia State and Abakiliki in Enugu State, Nigeria). This was to enable a comparative evaluation of the proximate composition of seeds from the different locations. The seeds were decorticated manually, ground in a Wiley Mill (Cyclotex 1053, Tecator instruments) to pass through 1 mm sieve. The flour samples produced were stored in air tight plastic containers prior to use.

Chemical analyses and determination of energy content of samples. Decorticated ground seeds samples were analysed for moisture content, crude protein (N × 6.25), fat, crude fibre and ash according to standard AOAC procedures [3]. Crude protein content of decorticated seeds were compared to that of defatted and whole seed samples. Analysis of calcium content was done after ashing, using an atomic absorption spectrophotometer (AAS, Perkin-Elmer, 372, Perkin, Elmer Ltd, Beaconsfield, Buckinghamshire, UK). Phosphorus was determined by the Vanadomolybdate colorimetric method [3]. All determinations were carried out in duplicates. Determination of the energy content of foods was carried out with the Bomb calorimeter according to the method of Hugh and Hollingsworth [4].

Physicochemical properties. The bulk density was estimated by the method described by Wang and Kinsella [5]. Foam properties (foam capacity and foam stability) were evaluated by the method described by Ihekoronye [6]. Emulsification capacity of decorticated ground seed samples was estimated by the method of Sathe and Salunkhe [7]. The water absorption capacity was determined by the method described by Sosulski [8].

Results and discussion

The proximate composition of *Afzelia africana* and *Brachystegia eurycoma* seeds are shown in Table 1. The crude protein content of defatted *A. africana* seeds (25% on the average) is comparable to that of other legumes and falls within Boulter’s [9] definition of protein plants. Defatted *B. eurycoma* seeds have a relatively low protein content (15%) that is only comparable to that of commonly used cereals. The fat content of *A. africana* seeds (38.6%) is higher than that of soybean (20.4%) and cotton seed (20–26.1%) [10]. The energy content of *A. africana* seeds (5.7 kcal/g) compares favourably with that of soybean (5.5 kcal/g) while that of *B. eurycoma* seeds (4.3 kcal/g) compares favourably with that of ground nut seeds (4.6 kcal/g) and unshelled Lima beans (4.1 kcal/g) [11, 12]. There were no significant differences (p ≥ 0.05) in the proximate composition of seeds from different locations.