PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 9 (9): 909-911, 2010
ISSN 1680-5194

Some Physicochemical Characteristics of Defatted Flours Derived from African Walnut (*Tetracarpidium conoforum*): An Underutilized Legume

E.C. Ndie[1], C.V. Nnamani[2] and H.O. Oselebe[3]
[1]Department of Nursing Science, [2]Department of Applied Biology,
[3]Department of Crop Production and Landscape Management,
Ebonyi State University, Abakaliki, Nigeria

Abstract: The nuts of African Walnut were processed into flour and a portion defatted and the samples were analyzed for proximate composition, water absorption capacity, solubility, bulk density and rapid visco characteristics. Results showed that the flour is rich in protein and fat (21.6 and 47.7%) respectively. The defatted samples have higher solubility, water absorption capacity, peak viscosity breakdown values, final viscosity and set back values when compared with undefatted sample. This result indicates that defatting of African Walnut flour improves the pasting characteristics of the flour whose high protein content makes a good protein supplement.

Key words: Defatted flour, undefatted flour, legumes, *Tetracarpidium conophorum*, protein deficiency

INTRODUCTION

In the developing countries legumes have high acceptability and utilization due to their importance as sources of dietary protein. African Walnut (*Tretracarpidim conoforum*) has a long history as food plant and is grown by peasant farmers across West African rain forest. The climber bears capsules which are greenish in colour when young and greenish-yellow when fully ripe. They contain four shelled seeds (Willis, 1966). The seeds take 4-6 months to mature and are found in the local markets between the months of June and September. In Nigeria, it is traditionally eaten as nut after boiling (Akpuaka and Nwankwor, 2000). African Walnut is included in the list of lesser known food stuff (Achievement, 1998), while Ogunsma and Ddeboma (1983) and Osogie *et al.* (1986) reported that it is rich in protein (22.8-23.5%) and Fat (41.5-50). In the light of the nutritional values of Africa Walnut, (*Tretracarpidium Conoforum*) the flour derived from the nut could serve as protein supplement in food formulation.

The present study aims at studying the physicochemical and pasting characteristics of defatted and undefatted flours derived from African Walnut.

MATERIALS AND METHODS

Sample preparation: Mature nuts of African Walnut were purchased from Oye Awgu market of Enugu State, Nigeria. The shells were removed and seeds milled in an attrition mill and dried in an electric oven at 40°C. One half of the sample was defatted using hexane while the other half remained undefatted.

Chemical analysis: Fat, carbohydrate, ash and moisture were determined using AOAC (1990) and protein determined using Kjeldohl Method (AOAC 1990). Solubility was determined by the method of Leach *et al.* (1959), while water absorption capacity and bulk density were determined by the method of Okaka and Porter (1977).

The pasting characteristics were determined using rapid Visco Analyzer (RVA) model RVA-3D at International Institute of Tropical Agriculture (II TA) Ibadan, Nigeria.

RESULTS AND DISCUSSION

Proximate composition: The result of proximate analysis of African Walnut (*Tetracarpidium conoforum*) is shown in Table 1. Results indicate that moisture, protein, carbohydrate, fat, fibre and ash content of *T. conoforum* are 9.5, 21.6, 16.9, 47.7, 2.9 and 2.4%, respectively. The results are within the range reported by Ogunsma and Ddeboma (1983) and Osogie *et al.* (1986). The main nutritional values of legumes lie on their supply of cheap dietary protein and calories in the developing countries of the world. Survey had shown that very few people in tropical countries suffer from simple protein deficiency. Most prevalent deficiency is protein-energy, in which an overall energy deficiency forces the metabolism to utilize the limited intake of protein as a source of energy (US NAs, 1980). In this regard, African Walnut could play a role considering the high protein content of the flour (21.6%).

The fat content of the flour of *T. conoforum* was also very high (47.7%) indicating that the seed of the plant

Corresponding Author: H.O. Oselebe, Department of Crop Production and Landscape Management, Ebonyi State University, Abakaliki, Nigeria

Table 1: Proximate composition of *Tetracarpidium conophorum* (African Walnut)

Parameter	Composition (%)
Moisture	9.5
Protein	21.6
Carbohydrate	16.9
Fat	47.7
Crude fibre	2.9
Ash	2.4

Values are means of three replicates

should be exploited as an oil seed. In this regard, it has been used for the generation of dry oil (Akpuaka and Nwankwor, 2000; Tchiegang, 2001).

Effect of defatting on some functional properties of flour derived from *Tetracarpidium conophorum* (African Walnut): The result of defatting on the solubility, water absorption capacity and bulk density of flour derived from African Walnut is shown on Table 2. The results indicated that solubility of the undefatted was 18.4±1.6%, while that of defatted flour was 25.3±1.5%. The water absorption capacity of defatted and undefeated flour was 108±40% and 103±3.4%, respectively. The bulk density of defatted and undefatted flour was 563±0.11 and 0.31±0.13 wt/vol). This results show that defatted flour had increased solubility and water absorption capacity when compared to undefatted flour. The use of any flour as food ingredients is depended on the water-flour interaction, which determines the rehydration of flour. The higher solubility percentage and water absorption capacity of defatted flour of *T. conophorum* may be attributed to the removal of the non-polar groups that interfere with the flour-water interaction (Nputong and Weldran, 2002).

Effect of defatting on the pasting characteristics of flour derived from African Walnut: Results of the Rapid Visco Analysis (RVA) indicated that defatted flour had a peak viscosity of 183±5.2, a breakdown value of 136.83±4.0 and a final viscosity of 531.25±6.4 (Fig. 1). Lower RVA values were obtained for undefatted flour, 32.25±3.5, 29.92±3.2 and 42.33±3.4, for peak viscosity, breakdown value and final viscosity, respectively (Fig. 2). The set back value, pasting time and pasting temperature for defatted and undefatted flour are shown in Table 3. Again defatted flour had higher set back value 394.42±6.1, compared to undefatted flour 12.42±3.4. The pasting time was 5.6 and 6 min, while the pasting temperature was 77.3°C and 80 °C for defatted and undefatted flour, respectively.

The pasting characteristics of flour determine their best use in food processing which in most cases are dependent on the botanic species of plants (Okoli, 1998). The viscosity of starch paste after heating and stirring at a maximum temperature for 15 min define the stability of the starch granules and the ability of the swollen starch to resist deformation and busting during constant heating and stirring (Morris, 1990). On the other

Table 2: Effect of defatting on the solubility (%), water absorption capacity (%) and bulk density (wt/vol) of flour derived from African Walnut

Flour	Water absorption capacity (%)	Solubility (%)	Bulk density
Defatted	130±3.4	25.3±1.5	0.31±0.13
Undefatted	108±4	18.4±1.6	0.56±0.15

Values are means of three replicates

Table 3: Effect of defatting on the rapid visco characteristic of flour of *Tetracorpidium conophorum* (African Walnut)

Flour	Set back value	Pasting time	Pasting temp
Defatted	394.42±6.1	5.6	77.3
Undefatted	12.42±3.4	6.0	80.0

Values are means of three replicates

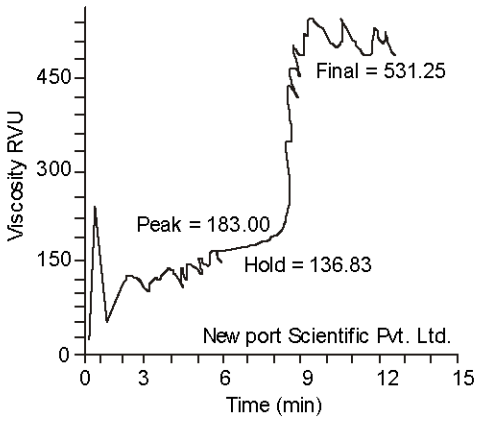

Fig. 1: Peak viscosity, breakdown value and final viscosity of defatted flour of African Walnut (*Tetracarpidium conoforum*)

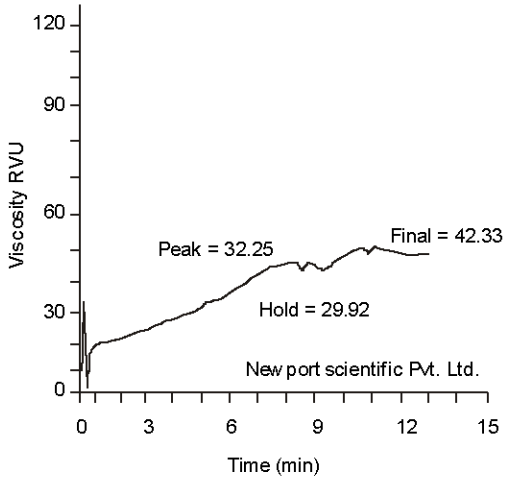

Fig. 2: Peak viscosity, breakdown value and final viscosity of undefatted flour of African Walnut (*Tetracarpidium conoforum*)

hand, the set back value is a measure of recrystalization of gelatinizing flour (retrogradation) and is a function of amylose and amylopectin configuration (Okoli, 1998). The low peak viscosity, breakdown value and set back value of the undefatted flour indicate that the flour would be more stable when compared with defatted flour. This may be due to the fact that the granules of defatted flour may have been made weaker by the removal of fat. The high set back value of defatted flour has an implication for the use of the flour in preparation of foods when a gel of high rigidity is needed as in bread making. In such instances, undefatted flour of *T. conophorum* may be preferred.

Conclusion: It may be concluded from this study that defatted flour derived from African Walnut with high protein content, high water absorption capacity, high solubility and good pasting characteristic could be used as composite flour in preparation of bread and other confectionaries. The African Walnut could also be exploited as an oil seed.

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