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Research Article

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Proximate and Physicochemical Properties of Flour and Oil Extracted from Raw and Boil Locust Bean (*Parkia biglobosa*)

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Abstract Proximate composition of flour from raw and Boil (defatted) samples of locust bean as well as its physicochemical composition of the oil extracted from the two samples were determined to know their potentials for industrial and human consumption without due fermentation method normally adopted for its consumption. The results revealed that the moisture content for raw and Boil (defatted) samples (11.21±0.51, 7.25±0.01) respectively. Crude protein (25.52±0.31, 28.00±0.32), crude fibre (8.40±0.21, 8.41±0.22), Ash content (5.45±0.25, 5.44±0.26), crude fat (20.65±0.71, 10.55±0.01) while carbohydrate is (28.77±0.25, 38.35±0.33) respectively. The oil samples were investigated for their physicochemical parameters. The result investigated for physical properties for both raw and boiled sample oil showed no significant difference for refractive index (1.45±0.02, 1.46±0.01), specific gravity (0.84±0.01, 0.86±0.01), smoke point (185.00±0.01, 160.00±0.01), flash point (225.00±0.02, 220.00±0.01 and fire point (235.00±0.01, 230.00±0.02) °C, but differ for pH (3.80±0.00, 4.60±0.00) and % oil yield (25.50±0.02, 35.05±0.02) respectively. The result of the chemical parameters of raw and boiled locust bean seed oil (*Parkia biglobosa*) revealed that Acid value (1.80±0.02, 1.32±0.01) mg/g, free fatty acid (8.45±0.03, 7.48±0.02) oleic, saponification value (320.05±0.02, 230.06±0.01)mg/g, iodine value (120.42±0.01, 125.01±0.03)mg/g, while peroxide value (5.50±0.03, 3.45±0.05) meq/kg for raw and boiled locust bean seed oil respectively. The yield indicates that both oil samples are good source of oil. But the assessment of both indicated that flour and oil from the boil sample had good domestic, industrial and commercial application for human consumption.

Keyword: Chemical, Physicochemical, Proximate, Locust Bean Seed, Oil.

Introduction

Vegetable oils are essential in meeting global nutritional demands and are realised for many foods and other industrial purposes [1]. Despite the broad range of sources for vegetable oils, the world consumption is dominated by soyabean, palm, rapeseed and sunflower oils with million tons consumed per year [2]. These conventional source of vegetable oil no longer meet the ever increasing demand of domestic and industrial sectors [1]. Therefore, the need exists to look for other sources to supplement the supplies, from this point of view, non-conventional oil seeds are of much concern to cope this challenge [3]. The Africa Locust Beans (*Parkia biglobosa*) popularly known as “Iru” in Yoruba and “Dawadawa” in Ghana is found growing in the savannah and parts of the transitional zones of the country [2]. It is regarded as an economic tree and is protected by traditional norms and customs. The seed is usually extracted from the pulp boiled fermented and used as condiment either at home or sold for cash [4]. The seed which is valued is sometimes extracted by pounding the whole fruits in a mortar and winnowing out the pulp together with the current research trends towards the use of unconventional oil seeds for commercial vegetable oil production, it would be considered worthwhile to examine the physiochemical characterization of oil from boiled and raw seed of locust beans that at present, exist as uncultivated type in order to explore their wider exploitation. The present study would evaluate the quality of solvent extracted oil from boiled and raw locust beans. It is expected that this give more insight into their full utilization and commercialization.

Materials and Methods

The locust beans seed used in the study was purchased from Owo main market (Oja Oba) in Ondo State, Nigeria.

Preparation of the Samples

The raw seeds were dehulled without following general processing method of boiling before dehulling and fermentation into condiments. The dehulled sample was divided into two equal parts, one part was boiled for 24 hours, both raw and boiled samples were sundried and ground to fine particle size (≤250Nm) using a ball mill. The boiled and dried sample was defatted using normal hexane. The two powder samples were then kept in air tight containers at 4 °C until use.

Analysis Procedures

The recommended methods of the Association of Official Analytical Chemists [5] was used to determine the chemical composition of the locust bean seeds (Raw and Boil) including moisture content by drying the sample in an oven at 110°C for 24 hours, ash, crude protein by Nitrogen content was estimated by the micro-kjeihdhal method and crude protein was calculated (N×6.25)., crude fat, crude fibre and carbohydrate was obtained by percentage difference [6].

Physico-Chemical Analysis

Oil was extracted from the raw and boiled samples of locust bean seeds using soxhlet apparatus with n-hexane as the extracting solvent, after extraction, the solvent was removed *in vacuo* and the extracted oil was used for analysis. The percentage oil content of each seed was determined by gravimetrically quantifying the oil residue after exhaustive extraction and reclaiming of the solvent *via* vaccum distillation. The refractive index, specific gravity, melting point, smoking point, flash point and fire point of the oil were determined using AOAC [7]. The method of chemical analysis (determination of iodine value, acid value, saponification value, peroxide value and free fatty acid) followed the standard procedure of Association of Official Analytical Chemist [7]. Data were analysed using the statistical analysis system SPSS and analysis of variance and mean separation were calculated by the general linear model procedure

Results and Discussion

Table 1: Proximate Composition of Raw and Boil (defatted) African Locust Bean Seed flour (*Parkia biglobosa*)

Parameter (%)	Sample A	Sample B
Moisture content	11.21±0.51	7.25±0.01
Crude protein	25.52±0.312	8.00±0.32
Crude Fibre	8.40±0.21	8.41±0.22
Ash	5.45±0.25	5.44±0.26
Crude Fat	20.65±0.71	10.55±0.01
Carbohydrate	28.77±0.25	38.35±0.03

Mean ± deviation of triplicate determination.

Note: A= Raw sample, B= Boil(defatted) sample

Table 1 shows the proximate composition of African locust bean seed (Raw and Boil (defatted) sample) (*Parkia biglobosa*). The results of the assessment were as follows: moisture content for raw and Boil (defatted) sample samples (11.21±0.51, 7.25±0.01), crude protein (25.52±0.31, 28.00±0.32), crude fibre (8.40±0.21, 8.41±0.22), ash (5.45±0.25, 5.44±0.26), crude fat (20.65±0.71), and 10.55±0.01), while carbohydrate is (28.77±0.71, 38.35±0.03). The moisture content of raw sample is higher than that of Boil (defatted) sample, which indicates that the Boil(defatted) sample is safe for long period without spoilage, generally seeds having this low moisture content are not highly susceptible to microorganisms attack [8]. The protein content of Boil (defatted) sample is higher than that of raw but both was in agreement with those indicated by Al-Khalifa [9]. The protein content of both sample suggest that it can contribute to the daily need of 23.6g/100g for adults as recommended by some authorities [8]. The crude fibre content of both samples was quite significant and comparably higher than pumpkin seed of 2.5±0.1 and was low compared to 12.1%. *C. Pepo and C. Maxima* [10] and 9.3% for *T. occidentalis* [3]. Fibre is regarded as essential, as it absorbs water and provide roughages for the bowels, assisting intestinal transit, very low fibre in food is however helpful to digestive process but it lowers the vitamins and enzymes content of the food materials [11]. Lipids are mainly structural components of the body and are of limited nutritional importance. Lipids/fat however contribute to the palatability of the food [12]. The fat content of raw is higher than that of Boil (defatted) sample because of the extraction of oil from the sample. Also, the lipids/fat contents of both samples in the present study was found to exceed, or be comparable to that of the common edible lipids such as cotton seed (22-24%), sunflower (30-35%), soya bean (18-22%) and olive (12-50%) [13]. Therefore both samples can be considered as a potential source of vegetable oil for domestic and industrial purposes. The ash content of both samples was quite significant and it shows no difference in determination as ash content determination is important because it is an index of the quality of feeding materials used by animal feed producer for poultry and cattle feeding [3].

Table 2: Physical Parameters of Oil from Raw and Boil African Locust Bean Seed (*Paria biglobosa*)

Parameters	**Sample A**	**Sample B**
Refractive Index	1.45±0.02	1.46±0.01
Specific Gravity	0.84±0.01	0.86±0.01
Colour (Unit)	Greenish Yellow	Yellowish Brown
Moisture (%)	NIL	NIL
Smoke Point (°C)	185.00±0.01	160.00±0.01
Flash Point (°C)	225±0.02	220.00±0.01
Fire Point (°C)	235.00±0.01	230.00±0.02
pH	3.800±0.00	4.60±0.00
Oil Yield (%)	25.50±0.02	35.05±0.02

Mean± Standard Deviation of Triplicate Determination

Note: A=Oil from Raw sample, B= Oil from Boil sample

Table 3: Chemical Parameter of Oil from Raw and Boil African Locust Bean Seed (Parkia *biglobosa*)

Parameters	**Sample A**	**Sample B**
Acid Value (mg/g)	1.80±0.02	1.32±0.01
Free Fatty Acid (% oleic)	8.45±0.03	7.48±0.02
Saponification Value (mg/g)	320.05±0.02	230.06±0.01
Iodine Value (mg/g)	120.42±0.07	125.01±0.03
Peroxide Value (meg/kg)	5.50±0.03	3.45±0.05

Mean± Standard Deviation of Triplicate Determination

Note: A=Oil from Raw sample, B= Oil from Boil sample

Table 2 presents the result of the yield and physical parameters of sample A and B oils. The yield was found to be 25.50% and 35.05% for A and B oil respectively. The value of the product makes the industrial practice of the oil recovery a profitable venture and will reduce the level of waste that is obtained from the industries [14]. The pH of the oil samples were determined to be 3.80 and 4.60 for sample A and B respectively. The low P^H level is indicative of the presence of a reasonable amount of fatty acid in the oils which is a good indicator of the advantageous utilization of the oil as a result of the presence of fatty acids [15]. The value for smoke, flash and fire point for sample A and B are 185 °C, 225 °C, 235 °C, 160 °C, 220 °C and 230 °C respectively. The smoke, flash and fire points of oil has a linear relationship with the content of free fatty acids present [7]. This is an indication that the oil samples will be good for human consumption [16]. Refractive index is used by most processors to measure the change in in saturation as the fat or oil is hydrogenated, it also depend on their molecular weight, fatty acid, chain length, degree of saturation and degree of conjugation [13]. The sample A and B seed oils showed a refractive index reported of 1.45±0.02 and 1.46±0.01 which was similar to those reported by Lazos [10] for pumpkin (1.4616) and melon (1.462) seed oil. The sample A and B seed oil was greenish yellow and yellowish brown colour with nut-like taste. It was liquid at room temperature and even in refrigerator. Specific gravity of 0.84±0.01 and 0.86±0.01 of the oil fell in the reported range of 0.9159 [17] for *C. pepo.* Table 3 shows the chemical analysis carried out on these two oil sample of A and B reveal that free fatty acid 8.45±0.03 and 7.48±0.02 respectively. The value from the two sample are higher than the value reported by Adebayo *et al* [18] of 4.50 and 2.25mg/g oleic for African star apple. The result shows that the two oil with high level of free fatty acid could be more predisposed to spoilage by hydrolytic rancidity, however it is expected that refining the oils could reduce free fatty acids content to acceptable level [19]. This is acid value of the two samples were within the range commonly reported for most vegetable oils from what was obtained in the present study. The higher acid value of 1.80±0.02 and 1.32±0.01 for sample A and B respectively could be attributed to high lipolytic activity of the native lipase [19]. This is an indicative of the high state of rancidity of the oil which could be attributed to poor handling, improper storage as well as height of time between harvesting and oil extraction [20]. A previous study of Enujiugha [21] has already revealed that the activity of seed lipase could predisposed these oil to faster deterioration during storage. The saponification value of the two oils sample A and B were found to be 320.05±0.02 and 230.06±0.01 respectively. The value are in line with 310 and 250mg/g KOH reported by [16]. The values project that both oil are good in soap making and in the detection of adultration of the oil [14]. The iodine value of an oil is the weight of iodine absorbed by 100g of the oil sample. This is related to its unsaturation, the higher the iodine value, the greater the degree of unsaturation and greater the liquidity [22]. The iodine value of sample A and B oils were 120.42±0.01 and 125.01±0.03 respectively, which is almost the same value for sweet orange seed and grape seed oil of 130.60wij and 115.13wij reported by Abitogun and Jide Alfred [14]. The values are indication that the oil samples are high in unsaturated fatty acid and therefore liquid at room temperature. The peroxide value of the two samples were 5.50±0.03 and 3.45±0.05 respectively. These values are higher than the values reported by Adebayo *et al* [18] for 1.51 mol/kg for raw oil from apple star endosperm. This is an index of rancidity, if it is higher in the oil sample [23].

Conclusion

Considering the result of the investigation carried out on raw and boil(defatted) flour sample, It can be concluded that boil (defatted) sample had nutritional benefits than raw sample. The shelf life of the boiled (defatted) sample is an indication for its availability throughout the season to check its unavailability throughout the year. Oil sample A (raw locust bean seed oil) and Oil sample B (boiled locust bean seed oil) can be recommended for industrial application. Commercialization of the seed oil from the fruit for processing into edible vegetable oil and industrial manufacturing processes in such areas as resin and pharmaceutical will require the applicability of oil from boil due to high percentage yield and saponification value.

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