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EFFECTS OF SHELL ON THE NUTRITIONAL VALUE OF ROASTED GROUNDNUTS SEEDS

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ABSTRACT
Groundnut (*Arachis hypogaea*) seeds (raw, roasted with shell and roasted without shell) were analyzed for proximate composition and oil extracted from the samples was subjected to physicochemical analysis. The results obtained showed that the raw, roasted with shell and roasted without shell contained 38.44%, 43.49%, 44.34% fat, 25.88%.23.88, 23.56% crude protein, 18.95 %, 19.81%,21.37% carbohydrate, 11.76%, 7.45% 5.08% moisture, 2.73%, 5.07%3.31% crude fibre and 2.24%,2.30% 2.34% ash respectively. The ash, fiber, fat and carbohydrate contents of the samples subjected to heat treatment were higher than that of the raw sample. Moisture and crude protein of the raw sample was higher than those of the samples subjected to heat treatment. The percentage free fatty acid values were 8.92.4.22, 3.29 for the raw, roasted with shell and roasted without shellrespectively. Iodine value was 110.55, 105.69 and 103.54 for the oil extracted from. Peroxide values were 3.598, 3.195 and 2.798 meq/KOH for the oil from the raw, roasted with shell and roasted without shell respectively. Relative densities were 20.241, 20.238, 20.236, and viscosities of 286.25, 286.07, 286.0 Cs respectively. The values were highest for the oil from the raw seeds followed by those roasted with shell and lowest for those roasted without the shell. The results show that the shell has a protective effect on the nutritional value of groundnut seeds.

KEYWORDS: Groundnut seeds, shell, nutritional value, moisture, proximate, physicochemical.

INTRODUCTION
Oils are important natural products on account of their nutritional values and numerous industrial applications. Nutritionally, they contain the fat-soluble vitamins, unsaturated fatty acids, monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs, some of which are essential), minerals and some phytochemicals that function as antioxidants (Azeez, 2013). Industrially, vegetable oils are trans esterified to obtain biodiesels or blended to form bio lubricants (Bilal, 2013). Despite their usefulness, oils have major drawbacks in their utilization: they are difficult to handle and easily undergo oxidative deterioration (Canakci et al., 1999). The oxidation of oils involves a reaction between various reactive oxygen species (ROS) and the multiple bonds in the acyl chains of the triacylglycerols (TAGs) in the oils. The initial (primary) products of this reaction are hydroperoxides, which decompose to give a host of secondary products (aldehydes, ketones alcohols, hydrocarbons etc) which impart offensive odours and flavours to the oil, decrease its nutritional quality and safety (Pignitter and Somoza, 2012; Halvorsen and Blomhof, 2011). As a result, oxidation renders deteriorated oils less acceptable to consumers and its attendant economic losses. Some of these products are also implicated in the development of certain diseases when deteriorated oils are consumed (Maduelosi and Worlu, 2015).

Groundnut (*Arachis hypogaea*) is an oilseed leguminous crop cultivated widely across the world. Groundnut oil is extracted from the seeds of the groundnut plant. It is an important food oil, with a good flavor, high quality and low free fatty acid value. The fatty acid composition and physicochemical analyses of samples obtained from different varieties have been investigated (Anyasor *et al*., 2009). Due to its high content of monounsaturated fatty acids, it is considered healthier than oils with saturated fatty acids and is relatively resistant to rancidity.

This research was carried out to ascertain the effects of heat on the nutritional composition of groundnut seed roasted with and without the shell and to determine the physicochemical parameters of oil extracted from raw groundnut seeds and groundnut seeds roasted with and without the shell.

MATERIALS AND METHODS

Materials: Groundnuts seeds with shells.

Reagents: Acetic acid, chloroform, potassium iodide, sodium thiosulphate, n-hexane, carbon tetrachloride, Wij's reagent, neutral ethanol, phenolphthalein indicator, sodium hydroxide and starch indicator.

The groundnut seeds were purchased from local suppliers in Mile 3 Market, Port Harcourt, Nigeria.

Sample Preparation

The groundnut seeds were thoroughly washed, sundried, sorted and divided into three groups; A, B and C of three Kg each labelled. Group A, consisted of raw shelled seeds served as the control, Group B were roasted with the shells and group C were unshelled and roasted at 90 ^{O}C for six hours.The seeds from each group were separately ground into pastes and stored in a freezer for use.

Oil Extraction

Portions of the ground paste from each group were used for oil extraction using n-hexane. The oil samples obtained were stripped, oven dried and stored in a freezer until required for analysis.

Proximate Analysis of the various oil Samples

Each of the ground seed samples were used for proximate analysis. The following parameters were analyzed for: moisture content, ash content, fat content, protein content, crude fibre and carbohydrate.

Analysis of Physicochemical parameters of the oil Samples

The peroxide value, iodine value, percentage free fatty acid, relative density and viscosity of each oil sample were determined according to the American Oil Chemists Society (AOCS, 1999) Official procedures.

Statistical Analysis.

All the analysis were carried out in triplicate. The data obtained were subjected to analysis of variance (ANOVA). The difference between means were evaluated using Tukey's multiple comparison test and the significance accepted at $p \leq 0.05$ level. The statistical package in MINITAB 16 computer program was used.

RESULTS

The results of the analyses are displayed in Tables 1 and 2 below.

Table 1: Results of Proximate Parameters.

	RAW	ROASTED WITH SHELL	ROASTED WITHOUT SHELL
Moisture	$11.76^{a} \pm 0.50$	$7.45^{b} \pm 0.55$	$5.08^{c} \pm 0.30$
Ash	$2.24^{a} \pm 0.30$	$2.30^{a} \pm 0.08$	$2.34^{a} \pm 0.05$
Fat	$38.44^{c} \pm 0.45$	$43.49^{b} \pm 0.50$	$44.34^{a} \pm 0.35$
Crude Fibre	$2.73^{c} \pm 0.05$	$3.07^{b} \pm 0.05$	$3.31^{a} \pm 0.04$
Protein	$25.88^{a} \pm 0.15$	$23.88^{b} \pm 0.22$	$23.56^{b} \pm 0.12$
Carbohydrate	$18.95^{c} \pm 0.17$	$19.81^{b} \pm 0.31$	$21.37^{a} \pm 0.15$

Values are means ± standard deviation of triplicate samples. Mean values bearing the same superscript in the same row do not differ significantly ($p > 0.05$).

Table 2: Results of Physicochemical Parameters

COMPOSITIONS	RAW	ROASTED WITH SHELL	ROASTED WITHOUT SHELL
% FFA	$8.92^{a} \pm 0.05$	$4.22^{b} \pm 0.02$	$3.29^{c} \pm 0.01$
Iodine Value (wij's)	$107.55^{a} \pm 0.00$	$105.69^{b} \pm 0.02$	$103.54^{c} \pm 0.03$
Peroxide Value (g/mg)	$3.5978^{a} \pm 0.002$	$3.1947^{b} \pm 0.0002$	$2.7982^{c} \pm 0.002$
Relative Density	$20.241^{a} \pm 0.001$	$20.238^{ab} \pm 0.002$	$20.236^{b} \pm 0.002$
Viscosity (Cs)	$286.25^{a} \pm 0.05$	$286.00^{b} \pm 0.05$	$286.07^{b} \pm 0.002$

Values are means ± standard deviation of triplicate samples. Mean values bearing the same superscript in the same row do not differ significantly ($p > 0.05$).

DISCUSSIONS

The results of the proximate shows that moisture content was highest for the raw sample. This is attributed to the loss of moisture due to heating for the roasted samples. The percentage increases in ash, fat, crude fibre and carbohydrate contents of the roasted samples can also be attributed to the effect of heat on the roasted samples. This is in line with the observations by Ayoola and Adeyeye, 2010.On the other hand, the percentage protein content of the roasted increased which can be attributed to the denaturing of protein on heat application on the roasted samples. This observation is in accordance with the observations of Angaye, et al., (2015).

The results of the physicochemical analyses indicate that the iodine decreased in the roasted samples. This indicates a loss of unsaturation (loss of number of double bonds). Similar results were obtained by Angaye, et al.,

(2015). The peroxide values of oil extracted from the roasted samples showed a decrease compared to the oil extracted from the raw sample. Peroxide value is an indication of the extent of initial oxidation which may decompose with time. The present observation can be attributed to a breakdown of the initial oxidation products. This accounts for the lower peroxide values of oil extracted from the roasted samples.

The relative density and viscosities of oil extracted from the roasted did not show any significant changes. This can be attributed to the relatively short time of heat application that did not alter these parameters significantly.

CONCLUSION: Shell has protective effect on the nutritional value of groundnut seeds.

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