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Physico-chemical properties of fluted pumpkin (telfiariaoccidentalis hook f) seeds

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----------ABSTRACT----------
The physical and chemical properties of oil extracted with n-hexane and petroleum ether from fluted pumpkin seeds were determined. Extraction with n-hexane gave 46.20% oil yield, while petroleum ether had 44.67%. The saponification value was higher in pumpkin oil extracted with petroleum ether (154.4±0.08mgKOH/g) when compared to n-hexane extract (147.2±0.05). The iodine value of the oils from petroleum ether and n-hexane were (104.7±0.07mgI_2/g) and (104.7±0.07 mgI_2/g) respectively. The refractive indices of the oils were 1.4348 and 1.4349 for n-hexane and petroleum ether oil extracts respectively. Peroxide value was not significantly different ($p>0.05$) for the petroleum ether extract (0.22 ± 0.00), when compared with n-hexane (0.20±0.01).

Keywords: *Saponification, refractive indices and peroxide*.

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I. INTRODUCTION

Fluted pumkin (*Telfairiaoccidentalis)* is a tropical plant grown in West Africa as a leaf vegetable and for its edible seeds. Common names for the plant include Fluted gourd, Fluted pumpkin, it is also known as Ugu, among the Ibos in Nigeria and *edikangikong* in Efik language Calabar Nigeria. The Housa call the vegetable ugwu, while it is known among the Yoruba people as efuru. The plant is a drought-tolerant, dioeciousperennial that is usually grown as trellised (Agatemor, 2005) figure 1. The young shoots and leaves of the female plant are the main ingredients of a Nigerian soup. The seeds are used for propagation, extraction of oil and as soup condiment in thickening fluid soup. It said to have contained 93% essential amino acids, 53% crude fat and 27% crude protein (Agatemor, 2005).

Seeds form an important part of human diets and are usually regarded as good source of energy (Giamis and Barber, 2004). The significance of seeds, especially in the diet of Nigerians is on the increase. First, seeds have nutritive and calorific values, which make them important in the diet. They are also good sources of edible oil and fats. The amount of energy provided with 1 g of fat and oil when fully digested is more than twice the energy provided by carbohydrates and protein (Fagbemi,*et al* 2004). As a result, seeds can be described as good source of "famine food". Seeds are also potential raw materials for local industries, especially in the oleochemical industry. Fluted pumpkin (*Telfariaoccidentalis* Hook F.) is a tropical crop that belongs to the Cucurbitaceae family (Egbekun,*et al*,1998). It is reported to be indigenous to the West tropical rain forest areas of Nigeria (Giamis and Barber,2004). The seeds of fluted pumpkin are widely consumed in Nigeria, especially in the southern part of Nigeria where it is used as soup condiment. The fermented seeds are also used in formulation of marmalade and cookies (Fagbemi*et al*, 2005). The seed is also a good source of edible oil. The crude protein and fat content of the seed, as well as the vitamin A and C and the mineral composition have been reported (Okoli, and Nyanayo1988, Smith, *et al* 2006). Literature review have shown that fluted pumpkin seed oil (*Talfairiaoccidentalis* Hook F), contain high percentage of oil. In view of these, some properties of the oil were undertaken to find out how it could be utilized for industrial application.

II. METHODOLOGY

Plants materials

Fluted Pumpkin seeds: The fluted pumpkin (*Telfairiaoccidentalis* Hook F) seed used for this research were purchase from Nsukka area of Enugu State, Nigeria, and identified by Mr O. U.Ozioko of Bioresource Development and Conservation Programme (BDCP) Resource Centre, Nsukka.

Chemicals

All chemicals used were of analytical grade and were products of British Drug House (BDH) Chemical limited, Poole England.

Statistical analysis

All investigations were carried out in triplicate and data obtained were presented as mean ± standard deviation using descriptive statistics. Student T – test was used to compare mean variance. Significance was accepted at $p<0.05$ level using SPSS v16.

III. RESULTS

The percentage yield of the extracted oil

Results of the percentage oil yield of the fluted pumpkin seed extracted with n-hexane and petroleum ether are shown in Table1. From the result n-hexane extracted more oil than petroleum ether.

Table 1 Percentage yield of the oil (volume/weight)

Oil samples	Percentage oil yield (%)
Oil extracted with n-hexane	46.20
Oil extracted with petroleum ether	44.67

Physical properties of fluted pumpkin seed oil

Result of the physical properties of the fluted pumpkin seed oil extracted with n-hexane and petroleum ether respectively are shown in Table 2. Result Show that n-hexane oil extract had a higher relative density than petroleum ether oil extract. Their viscosity also differed, as well as their refractive indeces, but not significant at 95% confidence interval.

Table2. Physical properties of fluted pumpkin seed oil

Oil samples	Density($kg/m^{3)}$	Viscosity (v)	Refractive index
Oil extracted with n-hexane	0.93431	1.90	1.4235
Oil extracted with petroleum ether	0.93208	1.89	1.4324

Chemical properties of fluted pumpkin seed oil

Table 3 shows the result of the chemical properties of the fluted pumpkin seed oil extracted with n-hexane and petroleum ether. Result Show that the acid values, peroxide values, and iodine values of both oil extracts were not significantly different. Their saponification values however differed with petroleum ether oil extract being higher than the n-hexane oil.

Table 3 Chemical properties of fluted pumpkin seed oil

Properties	Oil extracted with n-hexane	Oil extracted with petroleum ether
Acid value (mgKOH/g)	0.43±0.03	0.43±0.15
Peroxide value (Meq/g)	0.20±0.01	0.22±0.00
Iodine value (mgI_2/g)	104.7±0.07	104±7±0.07
Saponification value (mgKOH/g)	147.2±0.05	154.4±0.08

All results are mean ± SD for 3 determinations

IV. DISCUSSION

Oil was extracted from fluted pumpkin *(Telfiariaoccidentalis* Hook F) seeds, using two different solvents system, n-hexane and petroleum ether. The result obtained showed that n-hexane extracted more oil than petroleum ether. The physicochemical properties of the oil extracts revealed that the colour of the oil was yellow and was similar to other conventional vegetable oils, such as melon, and groundnut oil (Christain, 2006). The relative density of the oils showed that the n-hexane extracts was denser and this suggests that n-hexane extracted total lipid components from the seeds than petroleum ether. There was no significant difference in the values of the refractive index of the oils. The chemical characterization of the oils extracted showed acid values of n-hexane extract (0.43±0.03 mgKOH/g) and petroleum ether (0.43±0.15 mgKOH/g) respectively. The iodine values of the oil extracts were almost the same, they ranged from104.7±0.05 to 104.7±0.07 respectively. The high iodine value obtained indicates that the oil is unsaturated and explains the degree of flow. The saponification value of oil extracted with petroleum ether had 154.4± 0.08mgKOH/g, which was significantly higher ($p<0.05$) when compared to oil extracted with n-hexane which had 147.2 ± 0.05mgKOH/g. The evaluation of saponification values of the oil extracts indicates the molecular weight of the oil suggesting that the n-hexane oil extracts has shorter chain fatty acids components (Jordanov *et al* 2007); the extract with lower saponification value have higher molecular weight. The high saponification value may be connected to the

nature of the oils and the metallic ion present among other factors (Gray, 1978; Magnus, 1992; Nkafamiya*et al*, 2007a), Esuoso *et al* (1998). The peroxide value of oil extracted with n-hexane 0.20±0.01mEq/kg was low compared to the peroxide value of oil extracted with petroleum ether 0.22±0.15mEq/kg and this was not significant ($p<0.05$). This low peroxide values were observed to be non-significant at 95% confidence interval and suggest little or no peroxidative rancidity of the oils, probably because the seeds were fresh and proper handling of the oil during extraction. The result of the peroxide values this result may also be due to absolute removal of moisture from the seeds since high peroxide value is associated with moisture, atmospheric oxygen, and light on the oils leading to progressive increase in peroxide value.

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