Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.27, 2014

Nutritional Composition and Oil Characteristics of Golden Melon (*Cucumis melo*) Seeds

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Abstract
This study investigated the mineral and proximate composition of Golden/canary melon (*Cucumis melo*) seeds and the physiochemical properties of the seed oil. Proximate composition and physicochemical properties of oil were
performed according to AOAC procedures. Minerals were determined using the method of Novozamsky *et al.* (1983). Results show that the seeds contained high percentage of crude fibre (33.94%) and low percentage of carbohydrate (3.14%). The seeds also contain high value of iron (136.5ppm), zinc (48.35ppm), manganese (25.70ppm), copper (15.40ppm) and low value of calcium (0.023±0.001%). Hexane extracted oil had acid value (2.68mgKOH/g) peroxide value (7.42mgKOH/g), iodine value of (117.43mgKOH/g), saponification value (191.42), free fatty acid (2.34) moisture content (5.68%), and refractive index (1.62) respectively. The seeds serve as good sources of crude fiber, fat and protein. Results also showed that the golden/canary melon oil is non rancid.
Keywords: Physicochemical, Golden melon, Hexane extracted oil

1. Introduction

Cucurbitaceae (Cucurbit) is an important family comprising one of the most genetically diverse groups of food plants. Most of the plants belonging to this family are frost sensitive and drought-tolerant (Whitaker and Bohn, 1950). Some important Cucurbit family members include gourd, melon, cucumber, squash and pumpkin (Robinson and Decker-Walters, 1999). Melons are low in calories and nutrient-rich and make a healthy contribution to diet. Golden melon (*Cucumis melo*) is a large, bright-yellow melon with a pale green to white inner flesh found in Africa. Its cultivar group is indorus, melons in this group are late maturing melons called "Winter melons" including Crenshaws, casabas, honeydews, juan canary, santa claus. The fruits from *Cucurbitaceae* species are valued for nutritional and medicinal purposes (Jeffrey, 1990). The remaining portion of the Cucurbit fruits, especially the seed (often discarded as agrowaste), can be utilized for other food applications such as preservative, and also in animal feed and oil extraction, contributing to less waste disposal and value-addition. The uses of cucurbit seeds as potential sources of oils have been reviewed by (Jacks *et al.*, 1972) who reported that the dehulled seeds contain about 50% of oil. The high content of oil, showing useful characteristics such as odorlessness, good colour and appearance, make these seeds suitable for oil industrial applications (Al-Khalifa, 1996; Mariod *et al.*, 2009). However, little work has been reported on the nutritional composition of golden melon seed, and especially on physiocochemical properties of its oil. Therefore, the main objective of this study was to evaluate the nutritional composition and oil characteristics of golden melon seeds as potential source of valuable oil for commercial applications.

2. Methodology

2.1 Source of material: Golden melon fruits were obtained from Kuto market, Abeokuta, Ogun state, Nigeria. The seeds were removed from the fruits, cleaned and washed off of any adhering residue, then sundried for 72 hours.

2.2 *Proximate Analysis of Seed*

Moisture content, crude fibre and fat content were determined according to the method described by AOAC (2000) Crude proteins were calculated from the nitrogen content by Kjeldahl method using factor 6.25 as described by AOAC (2000). Ash content was determined according to the method described by AOAC (1996). The total carbohydrate content (on dry weight basis) was calculated by difference [100-(crude protein + crude fat + ash + crude fiber)].

2.3 Mineral Composition of Seed

This was determined using the method of Novozamsky *et al.* (1983)

2.4 Extraction of Seed Oil

Oil was extracted from the dry milled seeds determined by a Soxhlet extractor using hexane as a Solvent.

2.5 Physiochemical properties of the seed

Saponification value, peroxide value, iodine value, refractive index and free fatty acid value were determined by methods already described in the AOAC (1995). Moisture content of the oil was determined by AOAC (2000).

3. Result

The proximate composition of golden melon seeds is shown in Table 1. It was found that the seeds had moisture content of 7.45%, ash content 3.23%, crude protein 21.05%, crude fat 31.86%, crude fiber 33.94% and carbohydrate 3.14%. The mineral composition of golden melon seeds is shown in Table 2. it was found that the seeds had calcium content of 0.023%, magnesium 0.09%, potassium 1.04%, sodium 1.77%, copper 15.4ppm, manganese 25.7ppm, zinc 48.35ppm, iron 136.50ppm. The physiochemical properties of golden melon seed oil is shown in Table 3. The seed oil had acid value of 2.68mgKOH/g, peroxide value 7.42mgKOH/g, iodine value 117.43mgKOH/g, saponification value 191.42mgKOH/g, free fatty acid 2.34% and refractive index 1.62.

Table 1. Proximate composition of golden melon seed

PARAMETERS	VALUES (%)
Moisture	7.45 ± 0.01^{d}
Ash	3.23 ± 0.01^{e}
Crude protein	21.05 ± 0.01^{c}
Crude fat	31.86 ± 0.01^{b}
Crude fiber	33.94 ± 0.01^{a}
carbohydrate	3.14 ± 1.15^{e}

Values are mean ± SD of 3 replications

Table 2. Mineral composition of golden melon seeds

PARAMETERS	VALUES
Calcium (%)	0.023 ± 0.001^{g}
Magnesium (%)	0.09 ± 0.01^{g}
Potassium (%)	1.04 ± 0.01^{f}
Sodium (%)	1.77 ± 0.01^{e}
Copper (ppm)	15.4 ± 0.10^{d}
Manganese (ppm)	25.7 ± 0.10^{c}
Zinc (ppm)	48.35 ± 0.01^{b}
Iron (ppm)	136.5 ± 0.10^{a}

Values are mean ± SD of 3 replications

Table 3: Physiochemical properties of golden melon seed oil

PARAMETERS	VALUES
Acid (mgKOH/g)	2.68 ± 0.01^{e}
Peroxide (meq/kg)	7.42 ± 0.01^{c}
Iodine (mgKOH/g)	117.43 ± 0.01^{b}
Saponification (mgKOH/g)	191.42 ± 0.01^{a}
Free fatty acid (%)	2.34 ± 0.01^{f}
Moisture content (%)	5.68 ± 0.01^{d}
Refractive index	1.62 ± 1.00^{g}

Values are mean ± SD of 3 replications

4. Discussion

The moisture content of any food material is a measure of the life span of the food. It indicates how long a food material can be stored without becoming mouldy (Fellows, 2000). Hook *et al*. (1982) reported that the moisture level of a food influence the texture and the more ordered the endosperm structure, the lower the rate of moisture content. The result revealed that the moisture content of golden melon seed (7.45%) is higher than the values (4.33%) for *Cucumis sativus* and (7.26%) for *Cucurbita moschata* as reported by Fokou *et al*. (2004). The result showed that the samples have significant amount of ash which are important sources of minerals. Proteins are class of nitrogenous compound that consist of large molecule composed of one or more long chain of amino acid. The protein content of the seeds (21.05%) is lower compared to the values (23.70 – 30.68%) reported by Olaofe *et al.* (1994) for melon, pumpkin and gourd seeds. Crude protein in the seed compared favourably with high protein seeds and nuts like cowpea (22.7%) and soybeans (35%). This implies that the oil samples are edible to humans. The high protein content of the seed makes the seed suitable for fortification of foods while the oils can serve as a good supplement in animal feed formulation. Fat consists of wide group of compounds that are generally soluble in organic solvent and generally insoluble in water. The crude fat content of the golden melon seed(31.68%) is higher than the values (23.1%) reported by Kamel *et al.* (1985) for water melon seed oil but lower than the values (42.9%) and (57.3%) as reported by Fokou et al. (2004) for *Cucumis manni* and *Cucumis sativus* respectively. Mabaleha *et al*. (2007) also reported oil yields for seeds ranging from 24.8 – 30.0% in

Citrullus lanatus and *C. colocynth* respectively while Madaan and Lai (1984) recorded oil content values of 41.0 – 56.6% in melon seeds. The values of lipid obtained for golden melon seed is within these values. Melon seeds have high fat contents, thus the seeds are classified as excellent sources of dietary oil (Nwokolo and Sim, 1987). Crude fiber of any seed indicates the presence of reasonable quantity of trapped water (bound) held by the hydrophilic polysaccharides of the fiber (Robertson and Eastwood, 1981). The crude fiber content of golden melon seed (33.94%) is higher than values (0.90 – 1.63%) reported by Fokou et al. (2004) and (2.30 – 2.94%) reported by Madaan and Lai (1984) and Loukou *et al*. (2007) respectively. The crude fiber contains indigestible materials which can reduce constipation by increasing bowel movement. Carbohydrate content (3.14%) is lower than the values recorded by Fokou *et al* (2004) and Loukou et al. (2007) for C. lanatus (9.867%), C. manni (13.86%) and C. melo (23.18%).The variation in mineral composition could be due to the climate, species, soil type, water and the cultural practices adopted during planting (Steven *et al*., 1985).
Free Fatty Acid value of oil sample was 2.34%, FFA value is an important variable in considering the quality of oil because the lower the free fatty acid, the better the quality of the oil. Low free fatty acid indicates the stability of the oil. Acid value of the oil is lower than the codex standard value for virgin vegetable oils. These values were within the range reported for water melon (3.41mg/g) and melon seed (4.26mg/g) (Ebuehi and Avwobobe, 2006). Saponification value of the oil (191.42mgKOH/g) is higher than watermelon value (175.98mgKOH/g) and lower than that of melon seed oil (201.15mgKOH/g) as reported by Ebuehi and Avwobobe (2006). It was within the range reported for Cucurbitaceae seed oil (182.1 – 193.8mgKOH/g) by Mabaleha *et al*. (2007). Peroxide value of the oil (7.42meq/kg) is lower than (19.54mol/g) as reported for melon seed oil by Ebechi and Avwobobe (2006). The values are lower than the codex standard value (10meq/kg) for refined vegetable oil and maximum value (20meq/kg) allowed for unrefined olive oil (FAO/WHO, 1993). This implies that the golden melon seed oil has lower degree of rancidity. These findings agree with the report of Ebuehi and Avwobobe (2006). Iodine value of golden melon seed oil (117.43mgKOH/g) is higher than 124.0 in desert melon and higher than 95.8 in Tsama melon as reported by Mabaleha *et al.*(2007). The lower iodine value signifies low degree of unsaturation and the lesser the ability of the oil to become rancid by oxidation.

5. Conclusion

From the results obtained, golden melon seeds are good sources of crude fiber, protein and fat. The seeds could be used to enrich soup and fortify other products in order to improve the protein content as it was found to be edible. It is rich in mineral elements which aid digestion, formation of strong bone and teeth and haemoglobin formation. The oil is edible and non racid.

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