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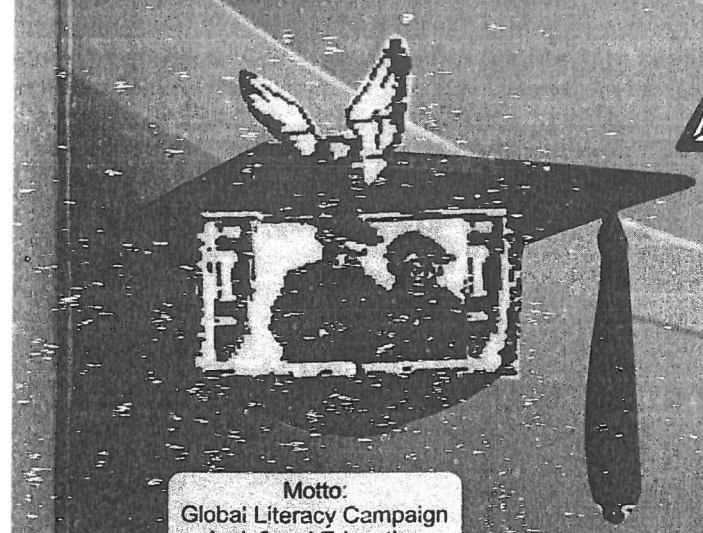

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Book of Abstract and Proceedings of the Eight International Conferences of the Society for Common Wealth Scholars in Research and Sustainable Development (SCWSRSD) Vol. 8 | 2014

PHYSIOCHEMICAL PROPERTIES AND ORGANOLEPTIC QUALITY OF *M. OLEIFERA* SEED OIL

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ABSTRACT

The studies were undertaken in order to determine the physico-chemical properties and sensory attribute of oils extracted from the seeds of Moringa oleifera The oils were extracted from the seeds and analyzed for moisture content, specific gravity, saponification value, refractive index, peroxide value, acid number, iodine value and sensory quality. The fresh oil was also characterize for their sensory attribute using three different foods. The seed oil have the following physical and chemical parameters. The colour (yellow), moisture content (2.0%), specific gravity 1.0598 kg/ dm[3]), refractive index (1.465 ± 0.04), acid values (0.67mg/ KOH/ g), iodine value (110g/ 100g), peroxide value (7.0meq/ kg), saponification value (178.10 mg/ KOHg), Melting point (36.7), Flash point(0c) (162) and Rancidity (14.0). Organoleptic scoring show that yam fried with Moringa seed oil had more taste, colour, aroma than yam fried with vegetable oil while chicken and egg fried with vegetable oil had higher taste, colour aroma a and overall acceptance scoring than chicken and egg fried with Moringa seed oil The study showed that Moringa seed oil can be used nutritional oil, industrial raw material and nutraceuticals. The oil is a good source of edible oil.

Keywords: *Moringa oleifera seed oil; physicochemical parameters; organoleptic assesment; oil extractionand characterization*

INTRODUCTION

Fats and oil whether the source of animal or vegetable in origin represent the highest source of energy per unit weight that man can consume. Apart from being a source of reserved energy, fats deposits insulate the body against loss of heat and protect the vital organs against mechanical injury. They are an important food source for man, and are also extensively used for nutritional, cosmetic and industrial purposes. They are used for supplying essential fatty acids such as linolenic and arachidonic acids. Fats and oils are also used for producing drug dispersants in therapeutics (Ranften et al., 2003)

The high world demands for oils and fats to meet the multiplex human consumption and the multitudinous industrial needs are the reasons for the increase in the importance of oil seeds and make them play an important role in the national economy of the producing countries. (Charley, 2002).

Nigeria has over 150 million people and estimated to be 170,123,740 as at July 2012 which are particularly used to palm oil, ground nut oil and soya beans oil as edible oil (Ottong, 2013). To ensure the increase of oils and fats, it is necessary to continue not only with the development of new varieties with improved oil yields, but also to search for new sources of oil. (Fadlalla, 2000). In identifying new source of edible oil, there is need to carry out the physicochemical parameters of the oil so as to determine its edibility in terms of properties and composition

Moringa oleifera Lam. (Moringaceae) is one of the 14 species of family Moringaceae, native to India, Africa, Arabia, Southeast Asia, South America, and the Pacific and Caribbean Islands (Iqbal *et al*, 2006). Because *M. oleifera* has been naturalized in many tropic and sub-tropic regions worldwide, the plant is referred to by a number of names such as horseradish tree, drumstick tree, ben oil tree, miracle tree, and "Mother's Best Friend"

The Moringa plant has been consumed by humans throughout the century in diverse culinary ways (Iqbal *et al*, 2006). Almost all parts of the plant are used culturally for its nutritional value, purported medicinal properties and for taste and flavor as a vegetable and seed. The leaves of *Moringa oleifera* can be eaten fresh, cooked, or stored as a dried powder for many months reportedly without any major loss of its nutritional value (Arabshahi *et al*, 2007). Epidemiological studies have indicated that *M. oleifera* leaves are a good source of nutrition and exhibit anti-tumor, anti-inflammatory, anti-ulcer, anti-atherosclerotic, anti-convulsant activities (Dahiru *et al*, 2006) and antianaemic effect (Hisham *et al.*, 2012). Seeds of *M. oleifera* are also known as a great source of vitamins and minerals including calcium, copper, sulphur, vitamin A and B-vitamins (Lowell, 2002). In this study, attempt was made to evaluate the physiochemical properties and organoleptic quality of *M. oleifera* seed oil.

MATERIAL AND METHOD

Plant collection

Moringa oleifera seeds, were collected from Baddegi, Niger State Nigeria. Taxonomic identification of the plant was conducted by a Botanist in the Department of Biological Science, Federal University of Technology Minna, Niger State. The seeds were then dried to constant weight in an oven at 60°C for 24 hours to remove moisture content and then ground using mechanical grinder, put in air tight container and stored in a desiccators for further analysis (Ekpa, 1989).

Oil extraction

Oil from the moringa seeds was extracted by continuous extraction in soxhlet apparatus for six hours using petroleum ether (40-60oC) as solvent according to the method described (A.O.A.C., 1990). At the end of the extraction, the extraction solvent was evaporated in a rotary evaporator. The extracted oil was assayed using standard methods.

Physicochemical Characterization

Standard procedures of American Oil Chemists Society were used for indices values (A.O.A.C, 1990). The procedures were also applied for acid value, iodine value, peroxide value and saponification value. Refractive index, color, melting point and specific gravity were determined using the recommended methods [5]. Refractometer and tintometer were used to determine refractive index and color, respectively. The saponifiable matter in the oil was determined using standard methods (A.O.A.C, 1990), while the ester value was obtained by subtracting the acid value from the saponification value.

Organoleptic evaluation

The *Moringa oleifera* seed oil were use to fried 3 different food (yam ,egg and chicken). The foods were evaluated for organoleptic properties (in comparison with the same kind of food fried with vegetable oil) according to the method as described by Stone (1985). The Organoleptic evaluations of were carried out by 8 judges. All the judges formed the panel were conversant with the factor governing the quality of the sample. The fried food was evaluated organoleptically for color, taste, aroma and overall acceptability. The taste panelists were asked to rate the samples for color, taste, aroma and overall acceptability on 1-7 point hedonic scale,

where, 7=like extremely; 6=like well; 5=like

4=neither like nor dislike; 3=dislike

2=dislike well; 1=dislike extremely.

RESULTS

Physicochemical parameters

The results of the physicochemical parameters of *Moringa oleifera* seed oil is presented in table 1: the seed oil have the following physical and chemical parameters. The colour (yellow), moisture content (2.0%), specific gravity 1.0598 kg/dm^3), refractive index (1.465 ± 0.04), acid values (0.67mg/KOH/g), iodine value (110g/100g), peroxide value (7.0meq/kg), saponification value (178.10 mg/KOHg), Melting point (36.7), Flash point(0c) (162) and Rancidity (14.0)

Table 1: physicochemical Characteristics of *Moringa oleifera* seed oil

Physicochemical Properties	*Moringa oleifera* seed oil
Specific gravity at 200C	1.0598± 0.12
Refractive index at 290C	1.465 ± 0.04
Acid value (mg/KOH/g)	0.67± 1.93
Iodine value mg/100g	110.89 ± 4.13
Peroxide value (meq/kg)	7.00 ± 0.12
Saponification value (mg-KOH/g)	178.10 ± 2.35
Free fatty acid (as oleic acid)	0.99 ± 0.02
Melting point	36.7± 3.04
Flash point(0c)	162 ± 7.32
Rancidity	14.0 ± 1.09
Colour	Yellow

Data are Mean±SEM of triplicate determination

ORGNAOLEPTIC SCORING

The results of the organoleptic scoring of foods fried with *Moringa* seed oil in comparison with foods fried with vegetable oil. yam fried with *Moringa* seed oil had more taste, colour, aroma and overall acceptance than plantain fried with vegetable oil while egg and chicken fried with vegetable oil had higher taste, colour aroma and overall acceptance scoring than yam and egg fried with *Moringa* seed oil (table 2)

Table 2. Organoleptic assessment of *Moringa* seeds

Sensory attribute	yam		egg		Chicken	
	M.S.O	V.O	M.S.O	V.O	M.S.O	V.O
Taste	6.12±0.64	5.87±0.99	5.50±0.53	5.87±1.12	5.25±1.03	5.50±0.92
Colour	5.7±1.03,	5.12±1.35	5.50±0.92	5.62±1.30	5.25±1.28	5.37±0.51
Aroma	5.75±1.03	5.00±0.53	5.50±1.30	5.87±1.12	5.00±1.06	5.12±1.12
Overall. Acceptance	6.12±0.83	5.69±0.74	5.50±.75	5.87±0.64	5.00±1.06	5.3±0.51

Data are Mean±SEM (N= 8)
M.S.O = *Moringa* seed oil
V.O = vegetable oil

DISCUSSION

The oil extracted from Moringa seed is yellow in colour. The colour of the oil is used preliminarily in judging the quality and in determining the degree of bleaching of the oil. The darker the colour, the poorer the quality. Power (2008), Therefore the yellow colour of Moringa oil shows that the quality of the oil is good and confirms to Encyclopedia of Chemical Technology. (Onimawo *et al.*, 2003).

The moisture content of the oil was 2.0% low moisture content of this seed oil is an indication of low perishability of the oil and this responsible for it relatively long sheif life (Kester and Kader, 1993).in addition, low The moisture content shows the presence of a lesser amount of dirt and impurities in the oil.(Edidiong, 2013). Thus low moisture content observed in this study is an Indication that the dirt and impurities in Moringa seed oil is very low However this value is lower than the moisture contents (10.9) of melon seed oil (Power, 2008).

Acid value give an idea of the free fatty acid composition due to enzymatic activities. The acid value obtained for moringa seed oil in this study (0.67mg/KOH/g) is very low as compare to the acid value (7.09mgKOH/g) reported for melon seed oil (Edidong and Ubong, 2013) 1.68mgKOH/g for almond seed oil (Akpabio, 2012) and 2.37mgKOH/g for coconut oil (Peter, 2006). This implies that Moringa seed oils contain low level of free fatty acid

According to the (Kaly, 2008) oil with iodine value in the range of 100-150 have higher affinity for oxygen when expose to atmosphere and cannot be classify as drying oil, thus the result obtained in this study (110g/100g) compare with iodine value obtained for water melon (114.94g/100g) by (Edidong and Ubong 2013). The oil can form thicken, sticky but cannot develop into hard dry film. However this property makes them suitable for the production of soap (Kinkela, 2006).this findings indicate that Moringa seed oil can be use as a raw material for the production of soap

The value of saponification reflect the molecular weight of oil (Booth and Wickens, 1988) in this study saponification value obtained for Moringa seed oil was found to be high (178.10 mg/KOHg) and are comparable with the saponification value reported for palm kernel (190-206mg/KOHg) and oil obtained from groundnut (188-196mg/KOHg) (Cock and Van Reed,1966). High saponification value implies greater proportion of fatty acids of low molecular weight. Thus the high saponification value of Moringa seed oil indicate that the oil contained higher proportion of low molecular weight fatty acids. High saponification is an additional properties that makes it suitable as a raw material for soap and lather industry (Nzikou *et al.*, 2007).

The peroxide value reflect the degree of oil oxidative rancidity (Ekpa and Ekpa 2006), The peroxide values of fresh and stored *Moringa* seed oils were obtained to be 7.0. The peroxide values obtained for oil in this study is lower compare to the

value (20.0meq/kg) reported for melon seed oil (Edidong and Ubong, 2013). Oxidative rancidity is the addition of oxygen across the double bonds in unsaturated fatty acids in the presence of enzyme or certain chemical compounds (Oyenuga, 2008). The odour and flavor associated with rancidity are due to liberation of short chain carboxylic acids. High peroxide values are associated with higher rate of rancidity. The low peroxide values of Moringa seed oils obtained in this study is an indication that they are less liable to oxidative rancidity at room temperature (Odoemelam, 2005). These oils are fresh because the content peroxide lower than 10 meqO2/kg and oil grow rancid when the content peroxide lies between 22 and 40.0 meqO2/kg (Ojeh, 2001).

The specific gravity of Moringa seed oil obtained in this study (1.0598 kg/dm^3) is higher than the value (0.956kg/dm^3) for *Blighia sapida* oil (Akpabio, 2012). However the refractive index (which reflect the purify the oil) obtained in this study (1.465) is similar to the reported value (1.462) for *Blighia Sapida* oil. (Akpabio, 2012). The results indicate that the moringa seed oils are of high purity

The panelist's assessment indicate that yam fried with Moringa seed oil have higher acceptability for colour, taste and flavor than the yam fried with commercial vegetable oil. However chicken and egg fried with commercial vegetable oil have more acceptable taste, colour and aroma than those fried with Moringa seed oil. This findings is an indication that the sensory attribute of oil depend on the kinds of food in which the oil is used to prepared and thus Moringa seed oil is suitable for frying yam.

CONCLUSIONS

The data presented show that *Moringa oleifera* may be considered as Nigeria's potential asset in the seed oil for industrial application. The oil of the plant found in this area has a considerable high quality. The study also showed that *Moringa seed oil can* be used nutritional oil, industrial raw material and nutraceuticals. The oil is a good source of edible oil.

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