IOSR Journal of Applied Chemistry (IOSR-JAC)
e-ISSN: 2278-5736. Volume 5, Issue 3 (Sep. – Oct. 2013), PP 06-08
www.iosrjournals.org

Extraction and Characterization of Vegetable Oil from Mango seed, *Mangifera indica*

Olagunju Esther Olajumoke
(Science Laboratory Technology/ Osun State Polytechnic, Iree)

Abstract: *A study of the proximate composition of the seed of Mango, Mangifera indica was conducted. The proximate composition of the seed is Ash 2.82%, Moisture 19.80%, Ether extract 25.57%, Crude protein 6.58%, Crude Fibre 4.69% and Carbohydrate 40.50%. The result of the proximate composition led to the extraction and characterization of the physiochemical properties of vegetable oil obtainable from the seed. Solvent extraction yielded oil with physiochemical results: Melting point (20 ^{o}C), Refractive index (1.449), Peroxide value (1.20), Acid value (16.68mg), Iodine value(5.58), Saponification value (71.52). The results reveals that the oil extracted can be useful economically.*
Keywords: *Mango, proximate, oil, extraction, physiochemical,*

I. Introduction

Plants is one of natures' gift to man but its full potential may not be utilized until the chemist makes his contribution on the constituents of the plant thereby exposing to humanity the use into which such plants can be put. Recently, there has been a significant change in interest towards African traditional sources of food and there is currently a reversal of an earlier decline in the use of traditional crops [1].

Mango, *Mangifera indica* belong to the family *Anacardiaceae.* The ripe fruit is fleshy and it covers a single seed with the seed containing the plant embryo [2].Mango is one of the choicest fruit crops of tropical and sub-tropical regions of the world, especially in Asia. Its popularity and importance can easily be realized by the fact that it is often referred to as 'King of fruits' in the tropical world [3]. Mango fruit is mainly used for consumption in South Western Nigeria and an extract of Mango tree bark (possibly Vimang isolated by Cuban Scientist [4] is used as medicinal herb. The feasibility of processing mango fruits into juice, jam or dried products has been demonstrated [5]. This can ensure consumption of the fruits all-year round and good recovery of some important bio-constituents like vitamin A whose lack constitute a public health problem in Cameroon [6]. The physiochemical characteristics of fruits and the technological qualities of the products processed there vary with the variety of mango as some are more suitable than others for specific applications [7, 8]. Mango fruit contains essential vitamins and dietary minerals. The antioxidant vitamins A, C and E comprise 25, 76 and 9% of the Dietary Reference Intake (DRI) in a 165 g serving. Vitamin B6 (pyridoxine, 11% DRI), vitamin K (9% DRI), other B vitamins and essential nutrients such as potassium, copper and 17 amino acids are at good levels. Mango peel and pulp contain other phytonutrients, such as the pigment antioxidants - carotenoids and polyphenols - and omega-3 and -6 polyunsaturated fattyacids.

The edible mango peel has considerable value as a source of dietary fiber and antioxidant pigments[9]. Contained within the peel and pulp are rich contents of polysaccharides as fiber sources, especially starch and pectins [10].

Information in most literature is on the leave, peel and fruit. It is however necessary to conduct investigations on the seed that is seen as a waste material in South Western Nigeria to determine if waste can be turned into wealth.

II. Material and Methods

Sample Collection and Preparation: Fruits of *Mangifera indica,* were collected from Science Department of Osun State Polytechnic, Iree. The fruits were sun-dried after which the seeds inside were removed mechanically. The seeds were then sun-dried for another two weeks after which they are de-coated. The samples were grounded into powder using a manual grinder, packed in an air tight container and stored in a dessicator, ready for further analysis.

Methods

Proximate Analysis: The recommended methods of the Association of Official Analytical Chemists ,[11] were used for the proximate composition analysis.

Physiochemical Analysis: The oil was extracted by Soxhlet extraction method with petroleum ether [12] while the Physiochemical properties of the oils for specific gravity, refractive index, melting point, iodine value, acid value, Saponification value and peroxide value were determined by AOAC 1990 method [11].

Table 1: Proximate composition of Mango, *M. indica,* seed

(a)	Parameters	Value (%)
	Ash	2.82
	Moisture content	19.80
	Ether extract	25.57
	Crude protein	6.58
	Crude fibre	4.69
	Carbohydrate	40.50

Table 2: Physiochemical characteristics of oil from Mango (*M. indica)*

(a)	Parameters	Value (%)
	Oil content (%)	25.57± 0.10
	Perioxide Value(millieq/kg)	1.20 ± 0.05
	Acid Value(mg/100g)	16.28 ±0.10
	Saponification value (mgKOH/100g)	71.52 ±0.10
	FFA (mg/100g)	8.17 ± 0.05
	Iodine value (gI_2/100g)	5.58 ± 0.05
	Refractive Index	1.45 ± 0.05
	Melting point (^oC)	20 ± 1.00
	Specific gravity	1.995 ± 0.05

Result are average of duplicate determinations ±S.D

III. Discussion

The moisture content of mango seed was 19.80 based on dry weight and the result is comparable to 17.5 obtained for bottle gourd seed [13]. The relatively low moisture content of the sample is of advantage since high moisture content is associated with increase in bacterial action during storage [14].

Ash content which is an indicator for mineral elements was 2.82%, this is comparable to 2.62% reported by Fowomola.[15]The result is very close to the 3.2 -4.6 g/100g in Nigerian under-utilized legume flours [16, 17].

Crude fibre content of 4.69 is lower than 29.00 reported for Balsam Apple, *Momordica balsamil* [18](Hassan and Umar, 2006) but higher than 3.50 reported for calabash seed by Badiffu and Ogunsua, [19]. Mango seed could not be a rich source of crude fibre because it fell short of the RDA for fibre in children, adults, pregnant and lactating mothers are 19 – 25%, 21 -38%, 28% and 29% respectively[20].

Crude protein was 6.58 which is very low compared to those reported for *Acacia Mellifera* (41.6%); *Bauhinina triandra* (42.7%), *Lathyrus odoratus*(42.8%), and Soybean(42.8%) which is an indication of a poor source of protein.[21].

Ether extract in *M. indica* is 25.57 which is slightly higher than 22.8 -23.5% as reported by for soybeans and lower than 33.83 for bottle gourd seed[11]. From the result, it can be seen that *M. indica* seeds are good source of oil and this can be exploited for domestic and industrial purposes.

Carbohydratre content of *Mangifera indica* seed (40.50) analysis show that mango seed is a relatively good source of carbohydrate with protein of about ten times that of cassava. [15].

Table 2 reveals the Physiochemical properties of the oil from Mango seed. Ether extract in *M. indica* is 25.57 which is slightly higher than 22.8 -23.5% as reported for soybeans and lower than 33.83 for bottle gourd seed[5]. The oil yield 25.57% compared favourably with the oil yield reported for cotton seed (19.50%). Therefore the seed studied is rich in oil content and could be exploited economically.

Peroxide value is used as indicator of deterioration of oils. The peroxide value of *Mangifera indica* is 1.20, this value is lower than that expected of rancid oil which ranges from 20.00-40.00mg/g oil [20]. This shows that the oil is not rancid therefore it is considered stable [21].

Acid value of 16.28 indicates that the oil is non-edible because it does not fall within the recommended codex of 0.6 and 10 for virgin and non-virgin edible fats and oil respectively [23]. The high acid value means that the oil contains many fatty acids [24]. It also gives a general indication of the condition and edibility of the oil [25].

Saponification value of 71.52 was recorded for *Mangifera indica* this value is higher than 54.12 reported for Fluted pumpkin by Adebisi &Olagunju[26] and 22.45 for *Vitellaria paradoxa* by Adebisi [27]. The values for *Mangifera indica is* high enough and could be utilized industrially for soap production if refined.

The iodine value which is useful in predicting the drying property of oils was found to be 5.58. The iodine value less than 100 confirms that the seeds produce non-drying oils [23]. The low iodine values recorded for the oils are of significance in the manufacture of lubricants, leather, dressing and candle [22]. However the low iodine value of *Mangifera indica* makes it unsuitable for paint production.[28]. The seed oils can also be used in the electrical industry as insulators as vegetable oils are non-toxic to the environment and are biodegradable if spilled. Vegetable oil is being used to produce bio-degradable hydraulic fluid and lubricant.

Refractive index is an indication of quality assurance analyzing the stability of oil during thermal treatment and the level of saturation of oil.

IV. Conclusion

In developed nations, there is an aggressive drive for alternate seed oil feedstock for biodiesel, in particular. This is in anticipation of a major need of biodiesel by internal combustion engines; a justification for source in unorthodox new oil seed crops world over.

Mango seed has been studied and confirmed to be a rich source of oil which could be exploited for National Development and a possible instrument in achieving Vision 20:20:20.

References

[1] Oyeleke G.O & Olagunju E.O.(2011). Studies on Cucurbita maxima and *Telfairia occidentalis*(Seeds and Seed oils) as Potential Raw materials in Food and Allied Industries. *.JNSTA*,1(1):43-56.

[2] Barreto JC, Trevisan MT, Hull WE (2008). Characterization and quantitation of Polyphenolic compounds in bark, kernel, leaves, and peel of mango (*Mangifera indica L.*). *J. Agric. Food Chem.* 56(14):5599-5610.

[3] Singh SK, Sharma HC, Singh SP. In vitro polyembryony in monoembryonic mango cultivars (*Mangifera indica L.)*. In: Kapoor AC, editor. Sustainability of Hill Agriculture: Emerging Trends and Possible Solutions; 2002. p. 295–9.

[4] Rodeiro I, Cancino L, González JE, Morffi J, Garrido G, González RM, Nuñez A, Delgado R (2006). Evaluation of the genotoxic potential of *Mangifera indica L.* extract (Vimang), a new natural product with antioxidant activity. *Food Chem. Toxicol.* 44(10): 1707-1713.

[5] Jiokap-Nono Y, Nuadje GB, Raoult-Wack AL, Giroux F (2001).Déshydratation-Imprégnation par immersion de rondelles de mangue(Mangifera indica) : influence de la température et de la concentration de la solution sur les cinétiques de certains éléments constitutifs du fruit. Fruits 56 : 169 – 177.

[6] Sibetcheu D, Nankap M, Kollo B (1999). La carence en vitamine A au Cameroun: épidémiologie, traitement et prévention. Bull. liais. Doc. *OCEAC* 32 (4): 17-22.

[7] Doreyappa ING, Ramanjaneya KH (1995). Evaluation of some mangovarieties for their suitability for canned mango juice. *J. Food Sci. Technol*. 32: 323 – 325.

[8] Mercadante AZ, Rodriguez–Amaya DB (1998). Effects of ripening, cultivar differences, and processing on the carotenoïd composition of Mango. *J. Agric. Food Chem.* 46: 128 – 130.

[9] Ajila CM, Prasada Rao UJ (2008). Protection against hydrogen peroxide induced Oxidative damage in rat erythrocytes by *Mangifera indica L.* peel extract. *Food Chem. Toxicol.* 46(1): 303-309.

[10] Iagher F, Reicher F, Ganter JL (2002). Structural and rheological properties of polysaccharides from mango (*Mangifera indica L.*) pulp".*Int. J. Biol Macromol*. 31(1-3): 9-17.

[11] AOAC 1984. Association of Official Analytical Chemists, Official methods of Analysis, 14th edition, Washington D.C. U.S.A.

[12] AOAC 1990. Association of Official Analytical Chemists, Official methods of Analysis, 15th edition, Washington D.C. USA.

[13] Hassan L.G., Sani N.A., Dangoggo S.M. and Ladan M.J. 2008. Nutritional value of bottle gourd(Lagenaria siceraria) seeds. *Global Journal of Pure and Applied Sciences*. Vol.14, No 3: 301-306.

[14] Akintayo, O., Adebayo, E.A. and Arogundade, L.A.(2002). Chemical composition, physical and functional properties of Akee(*B. Sapid*) pulp and seed flours. *Food Chemistry* 77:333-336.

[15] Fowomola, M.A.(2010). Some Nutrients and Antinutrient Content of Mango(*Mangifera Indica*) 4(8):472-476.

[16] Aremu M.O., Olonisakin A., Bako D. A. and Madu P. C.(2006). Compositional studies and physico-chemical characteristics of cashew nut (Anarcadium ocidentale) flour. *Pakistan Journal of Nutrition* 5(4):328-333.

[17] Yusuf, A. A., Mofio, B.M. and Ahmed, A. B.(2007). Nutrient contents of Pride of Barbados (*Caesalpinia pulcherrima Linn.*)Seeds. *Pak. J. Nutr.*, 6(2): 117-121.

[18] Hassan L.G., Sani N.A., Dangoggo S.M. and Ladan M.J. 2008. Nutritional value of bottle gourd(*Lagenaria siceraria)* seeds. *Global Journal of Pure and Applied Sciences*. Vol.14, No 3: 301-306.

[19] Badiffu, G.I.O. and Ogunsua, A.O.(1991). Chemical composition of kernel from some species of cucurbitaceae grown in Nigeria. *Plant Food Nutr*. 41: 409-414.

[20] Ishida, H., Suzuno, H., Sugiyama, N., Innami, S., Todokoro, T. and Maekawa, A.(2000). Nutritional evaluation of chemical component of leaves, stalks and Stems potatoes(Ipomea batatas poir). *Food Chem.*, 68: 359-367.

[21] Prakash, D., Abhishek, N., Tewari, S.K. and Pushpangadan, P.(2001). Underutilised legumes: Potential sources for low-cost protein. *Int. J. Food Sci. and Nutr*. 52:337- 341.

[22] Oderinde R.A and Ajayi.I.A.(1998).Metal and oil characteristics of Terminalia catappa. *Riv.Ital.Sostanze Grasse*. 75:361-362.

[23] Adelaja, J.O.2006). Evaluation of mineral constituents and Physico-chemical properties of some oil seed. M.Sc. Industrial Chemistry, University of Ibadan, Ibadan.

[24] Amadi B. A., Nwachukwu M. J and Agomuo F.N. (2007). Extraction and Characterization of Vegetable Oil from Avocado Pear(Persea americana). *International Journal of Tropical Agriculture and Food Systems*, 1(4):352-354.

[25] Ajayi, I. A. and Oderinde, R.A. 2002). Studies on oil characteristics of Dacryodes edulis pulp and seed. Discov. Innov. 14,20-24.

[26] Adebisi G.A. & Olagunju E.O.(2011). Nutritional Potential of the seed of Fluted Pumpkin(Telfairia occidental).*JNSTA,1*(1):7-18.

[27] Adebisi, G.A.(2009). The Physico-chemical properties of seed oil of shea nut(*Vitellaria paradoxa*), Wild Custard Apple(*Annona senegalensis*) and Camwood(*Baphia nitida*). *Nig. J. of Sci. and Tech. Research(NISJOSTER*), 3(2):6-10

[28] Akpabio U.D, Ukpong J.A, Eka O.U. 2008. Determination of the chemical composition, the physicochemical properties of the oil extract and the amino acid profiles of the seeds of *Telfairia occidentalis* (Fluted pumpkin). *Global Journal of Pure and Applied Sciences* 14(3): 295-299.