

Research Article

## Extraction of *Moringa oleifera* Oil by Cold Press Method and its Physiochemical Analysis

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### Abstract

*Moringa oleifera* native to India grows everywhere around the world and is commonly known as 'Drumstick tree' or 'horseradish tree'. *Moringa* seeds were used to extract its oil. *Moringa* is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. With its high nutritive values, every part of the tree is suitable for either nutritional or commercial purposes. It is used as potential antioxidant, anticancer, antiinflammatory, antidiabetic and antimicrobial agent. Almost all parts of the plant have medicinal applications. *Moringa* may lower blood sugar levels and reduce Inflammation. Due to the current need of oil both in domestic and industrial purpose; moringa oil can be used as an alternative resource. *Moringa* oil is same as that of other oil which also aids in reduction of cholesterol. In this study, *Moringa oleifera* oil was extracted using cold press method. The physiochemical analysis of the extracted *Moringa oleifera* shown that it contains Oleic acid (69.15%) which is a good source of omega-9 fatty acid, Palmitic acid (7.91%), Behenic acid (5.76%), Arachidic acid (4.31%), Eicosenoic acid (2.24%), Palmitoleic acid (1.52%), Margaric acid (0.13%) and Myristic acid (0.15%) and Erucic acid (0.14%). The extracted oil can be used for various purposes like healthy cooking oil, essential oil, ingredient in cosmetic products cleanser and moisturizer.

**Keywords:** *Moringa oleifera*, *Moringa* seeds, cold press, physiochemical analysis, oleic acid.

### Introduction

*Moringa oleifera* belongs to the family Moringaceae and is cultivated for a variety of purposes across the whole tropical belt (Jahn, 1989). It is widely grown in tropical and subtropical countries for food, medicine and economic purpose (Stoys and Hartman, 2015). *Moringa* can withstand both severe drought and mild frost conditions and hence widely cultivated across the world. The fact that moringa is easily cultivable makes it a sustainable remedy for malnutrition. *Moringa oleifera* can be grown in any tropical and subtropical regions of the world with a temperature around 25–35°C. It requires sandy or loamy soil with a slightly acidic to slightly alkaline pH and a net rainfall of 250-3000 mm (Thurber and Fahey, 2010). Soil is an important factor that defines nutrient content and strength of the plant (Mbikay, 2012). The seed or extracted seed oil is consumed raw in Nigeria where it is traditionally believed to relieve stress and associated health conditions such as fatigue. Domestic consumption of edible oils has been growing at 4.0 to 5.0% per year. These effects may be due to the quality and composition of the fatty acids in the seed.

Fatty acids are known to be essential components of the human diet and it is one of the most effective sources of storage energy. It functions as insulators of delicate internal organs and plays important role in cellular activities within the membranes (Singh *et al.*, 2014). Various parts of the plant contain essential nutrients, minerals, proteins, vitamins,  $\beta$ -carotene, amino acids and phenolic acids (Ross, 1999; Nambiar and Seshadri, 2001; Farooq *et al.*, 2007; Basuny and Al-Marzouq, 2016). The leaves, fruit, flowers, roots, seed, bark and pods have been reported to possess analgesic, antitumour, cardiac and circulatory stimulatory activities (Sutar *et al.*, 2008; Makonnen *et al.*, 2002) antipyretic, antiepileptic, anti-inflammatory and antiulcer activity (Pal *et al.*, 1995). Phytochemicals identified in the plant includes nitrile and saponin from the pod (Faizi *et al.*, 1994; Sharma and Paliwal, 2013), flavonoid pigments such as kaempferol, rhamnetin, isoquercitrin and kaempferitrin from the leaves, moringyne and amino acids from the seed (Ram *et al.*, 2004), vanillin, 4-hydroxy mellein,  $\beta$ -sitosterol and  $\beta$ -sitosterone from the stem bark (Ram *et al.*, 2006) and kaempferol-3-rutinoside from the flowers.

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Table 1. Physical parameters of extracted *Moringa oleifera* oil by cold press method.

Test	Batch No. CB001	Batch No. CB002	Batch No. CB003
Appearance	Liquid	Liquid	Liquid
Colour	Pale Yellow	Pale Yellow	Pale Yellow
Odour	Characteristic, Mild	Mild as Moringa	Mild
Iodine value	67.25	66.43	67.92
Refractive index @ 40°C	1.4569	1.243	1.4329
Density 24°C	0.87	0.84	0.86
Saponification value	180.22	181.21	180.99
Unsaponification value	0.90	0.89	0.96
Acidity	0.54	0.53	0.59
Optical Rotation	+0.4° to 0°	+0.4° to 0°	+0.4° to 0°
Viscosity	75.3	74.2	75.5
Trans Fatty Acids	< 0.1%	< 0.1%	< 0.1%
Saturated Fatty Acids	28.44 %	28.36	27.98
Monounsaturated Fatty Acids	71.23 %	73.44	71.98
Polyunsaturated Fatty Acids	0.33 %	0.35	0.29

Fig. 1. *Moringa oleifera* seeds (a. With and b. without husk).



Many concepts and traditional beliefs exist on the potencies of the Moringa plant to treat many illnesses. However, one of the most speculative concepts about the plant is that it is a potent medicinal plant which is nontoxic and without risks to human health. The Moringa seeds are heavily used because of their oil content. Seeds are fleshy, covered by a fine shell. They have three wings, or winged seeds from 2.5 to 3 mm in length. When the shell is taken away, the endosperm is discovered. It is whitish and very oleaginous which can be used for extraction of oil that has plenty of nutritional value (AOCS, 2009). In this study *Moringa oleifera* oil was extracted from its seeds using cold press method and the physiochemical parameters were analyzed.

## Materials and Methods

**Moringa oil extraction:** Moringa seeds were collected from organics moringa farm of Crescent Biologicals Pvt. Ltd., Gandhipet, Tirupattur, Tamil Nadu, India (Fig. 1). The seeds were sun dried for 2-3 weeks. The shells and the kernels are removed separately. The kernels are the one which gives us the oil when we do cold press.

Before exuding the oil from the kernels, it has to be dried properly, so that we get a better result. The kernels after complete drying are passed through the cold oil press machine, where oil and the seed cake are collected separately during a period of time. The extracted oil undergoes sedimentation process to remove all the impurities. Once it has been settled, it was filtered to obtain the filtrate in clear oil free from haziness. This oil was transferred to glass bottles (Janaki and Yamuna Devi, 2015; Olubunmi et al., 2018).

**Physiochemical analysis of Moringa oil:** Physical parameters of oils such as determination of appearance, colour, odour, iodine value, refractive index, density, saponification value, unsaponifiable matter, acidity, optical rotation, viscosity, trans fatty acid, saturated fatty acids, monounsaturated fatty acids and poly unsaturated fatty acids of the extracted oil was carried out according to standard methods. Along with this, different chemical parameters have been checked in the moringa oil (Saini et al., 2016).

## Results and Discussion

The physical analysis of moringa oil has shown that the appearance of the oil is in liquid form with pale yellow colour, Characteristic with mild odour. Then iodine value, refractive index, density, saponification value, unsaponification value, acidity, optical rotation, viscosity, transfatty acid, saturated fatty acids, monounsaturated fatty acids and poly unsaturated fatty acids is shown in Table 1. The chemical analysis of the extracted *Moringa oleifera* shown that it contains Oleic acid (69.15%) which is a good source of omega-9 fatty acid, Palmitic acid (7.91%), Behenic acid (5.76%), Arachidic acid (4.31%), Eicosenoic acid (2.24%), Palmitoleic acid (1.52%), Margaric acid (0.13%) and Myristic acid (0.15%) and Erucic acid (0.14%).

Table 2. Chemical parameters of extracted *Moringa oleifera* oil by cold press method.

S.No.	Test	Batch No.	Batch No.	Batch No.	Units	Loss of Quality
		CB001	CB002	CB003		
1.	C 22:1 (Erucic acid)	0.14	0.13	0.11	%	0.1
2.	C 4:0 (Butyric acid)	<0.1	<0.1	<0.1	%	0.1
3.	C 6:0 (Caproic acid)	<0.1	<0.1	<0.1	%	0.1
4.	C 8:0 (Caprylic acid)	<0.1	<0.1	<0.1	%	0.1
5.	C 10:0 (Capric acid)	<0.1	<0.1	<0.1	%	0.1
6.	C 11:0 (Undecanoic acid)	<0.1	<0.1	<0.1	%	0.1
7.	C 12:0 (Lauric acid)	<0.1	<0.1	<0.1	%	0.1
8.	C 13:0 (Tridecanoic acid)	<0.1	<0.1	<0.1	%	0.1
9.	C 14:0 (Myristic acid)	0.15	0.12	0.16	%	0.1
10.	C 14:1 (Myristoleic acid)	<0.1	<0.1	<0.1	%	0.1
11.	C 15:0 (Pentadecanoic acid)	<0.1	<0.1	<0.1	%	0.1
12.	C 15:1 (Pentadecenoic acid)+ Isomers	<0.1	<0.1	<0.1	%	0.1
13.	C 16:0 (Palmitic acid)	7.91	7.77	7.89	%	0.1
14.	C 16:1 (Palmitoleic acid)	1.52	1.50	1.55	%	0.1
15.	C 17:0 (Margaric acid)	0.13	0.12	0.13	%	0.1
16.	C 17:1 (Margaroleic)	<0.1	<0.1	<0.1	%	0.1
17.	C 18:0 (Stearic acid)	6.66	6.79	6.45	%	0.1
18.	C 18:1 (Oleic acid)	69.15	68.88	69.00	%	0.1
19.	C 18:1n9t Elaidic acid	<0.1	<0.1	<0.1	%	0.1
20.	C 18:2 (Linoleic acid)	0.56	0.53	0.51	%	0.1
21.	C 18:2t (Linolelaidic Acid)	<0.1	<0.1	<0.1	%	0.1
22.	C 18:3 n3 (alpha-Linolenic acid)	<0.1	<0.1	<0.1	%	0.1
23.	C 18:3n6 gamma-Linolenic acid	<0.1	<0.1	<0.1	%	0.1
24.	C 20:0 (Arachidic acid)	4.31	4.33	4.29	%	0.1
25.	C 20:1 (Eicosenoic acid)	2.24	-	-	%	0.1
26.	C 20:2 (Eicosadienoic acid)	<0.1	<0.1	<0.1	%	0.1
27.	C 20:3 (Eicosatrienoic acid)	<0.1	<0.1	<0.1	%	0.1
28.	C 20:3n6homo-gamma-Linolenic	<0.1	<0.1	<0.1	%	0.1
29.	C 20:4n6 (Arachidonic acid)	<0.1	<0.1	<0.1	%	0.1
30.	C 20:5 (eicosapentaenoic acid)	<0.1	<0.1	<0.1	%	0.1
31.	C 21:0 (Heneicosanoic acid)	<0.1	<0.1	<0.1	%	0.1
32.	C 22:0 (Behenic acid)	5.76	5.88	5.73	%	0.1
33.	C 22:2 (Docosadienoic acid)	<0.1	<0.1	<0.1	%	0.1
34.	C 22:6 (docosahexaenoic acid)	<0.1	<0.1	<0.1	%	0.1
35.	C 23:0 (Tricosanoic acid)	<0.1	<0.1	<0.1	%	0.1
36.	C 24:0 (Lignoceric acid)	1.05	0.98	1.04	%	0.1
37.	C 24:1 (Nervonic acid)	<0.1	<0.1	<0.1	%	0.1

The extracted oil can be used for various purposes like healthy cooking oil, essential oil, ingredient in cosmetic products cleanser and moisturizer (Table 2).

### Conclusion

The physiochemical analysis of the extracted *Moringa oleifera* shown that it contains Oleic acid (69.15%) which is a good source of omega-9 fatty acid, Palmitic acid (7.91%), Behenic acid (5.76%), Arachidic acid (4.31%), Eicosenoic acid (2.24%), Palmitoleic acid (1.52%), Margaric acid (0.13%) and Myristic acid (0.15%) and Erucic acid (0.14%). The extracted oil can be used for various purposes like healthy cooking oil, essential oil, ingredient in cosmetic products cleanser and moisturizer.

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