Fatty Acids in *Moringa oleifera* Oil

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Summary: The research work was conducted to investigate the total fatty acid contents in Moringa (*Moringa oleifera*) seed kernels oil by GLC. The oil was found to contain high level of unsaturated fatty acids. The dominant saturated fatty acids were Palmitic acid (12.51 %) and Lauric acid (1.97 %). The percentages of other fatty acids in *Moringa oleifera* seed kernel oil were Stearic acid (2.09 %), Linoleic acid (1.27 %) and Linolenic acid (1.75 %). Oleic acid (74.99 %) was the most abundant of the unsaturated fatty acids found in *Moringa oleifera* seed kernels oil. The above chemical composition of the oil recommends its use in pharmaceutical preparation preferably in skin treatment/ creams.

Introduction

Moringa oleifera is commonly referred to as "drumstick tree" or "horseradish tree". It is belong to Moringaceae family. It is a miracle tree, which grows through most of the tropics and is native to India, Bangladesh, Pakistan, Afghanistan, Malaysia, Caribbean and Central America. [1]. The tree's bark, roots, fruit, flowers, leaves, seeds and gum also have medicinal uses including as an antiseptic and in treating rheumatism, venomous bites and other conditions [2]. The seeds are a rich source of oil and protein and can be used for the purification of water [3-4]. The oil extracted from *M. oleifera* seeds is called Ben oil [5]. *M. oliefera* seed kernel oil can be used for rheumatism and gout [6], preparation of cosmetics, lubricant in watch making and precision equipment, purification of blood and enhancing cardiac function as medicine and also for edible purpose [7]. *M. oleifera* seeds are capable of attracting and sticking fast to bacteria and viruses that are found in contaminated water so it is helpful to retard microbial growth in water. The flowers are antitumor promoter [8-10].

Results and discussion

Fatty Acids in M. oleifera Seed Oil

The gas liquid chromatograph of *M. oleifera* seed oil showed different fatty acids. The amounts of unsaturated fatty acids are higher than the saturated fatty acids. Some polyunsaturated fatty acids were also present in *M. oleifera* seed oil. Different peaks were observed in the gas chromatograph of *M. oleifera* seed oil that helped to designate different fatty acids in *M. oleifera* oil. In the analysis of *M. oleifera* oil, following fatty acids were indicated. The name and the concentration of these fatty acids are mention in the calculation report (Table- 1).

Percentages of Fatty Acids in Moringa oleifera Oil

Lauric acid (dodecanoic acid), Myristic acid (tetradecanoic acid), Palmitic acid (hexadecylic acid), Arachidic acid (eicosanoic acid) were saturated fatty acids and their percentages in the *M. oleifera* seed oil were 1.97,0.86,12.51, 1.82 % respectively. Palmitoleic acid constituted 2.70 percent of total fatty acid contents in *M. oleifera* seed oil. Stearic acid (octadecanoic acid) that is nature's most common long chain fatty acids constituted 2.09 percent of total fatty acid content in *M. oleifera* seed oil. Linoleic acid, Linolenic acid, constituted about 1.27 and 1.75 percent of total fatty acid contents in *M. oileifera* seed oil respectively. Oleic acid was most abundant of the unsaturated fatty acids in *M. oleifera* seed oil. The above chemical composition of the oil recommends its use in pharmaceutical preparation preferably in skin treatment/ creams

Experimental

Plant Material and Oil Extraction

Clean and dried *M. oleifera* seeds were collected from the adjoining areas of Punjab University New campus, Lahore in May 2006. The

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Table-1. Calculation report of *M. oleifera* oil analysis

Pk No	Time	Area	Height	Conc.	Name
2	15.467	766	54	1.9777	Lauric acid
5	5.279	337	21	0.869	Myristic acid
6	7.679	4845	198	12.5129	Palmitic acid
7	8.433	046	45	2.7019	Palmitoleic acid
8	10.517	809	32	2.09	Stearic acid
9	11.465	2903	768	74.991	Oleic acid
11	14.321	494	11	1.2746	Linolenic acid
12	5.467	680	14	1.7566	Linolenic acid
13	20.45	707	9	1.8258	Arachidic acid

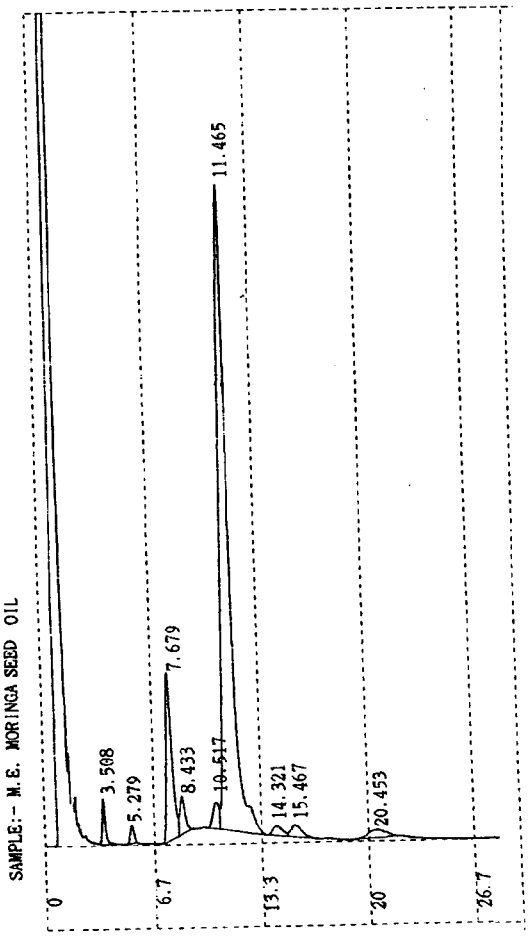

Fig.1. GLC of *Moringa oleifera* seed kernels oil.

seeds were identified from Department of Botany, University of Punjab Lahore, Pakistan. The seed coats and wings of collected seeds were removed manually. *n*-Hexane was used as solvent for essential oil extraction. In the experimental procedure 280 gm seeds kernel were dipped in suitable amount of hexane in a round bottom flask over night. After twenty-four hours whole material was filtered. The essential oil was separated out from the seed extract using rotary evaporator. The yield of the extracted oil was 28 %. The oil was also extracted in *n*-hexane by using Soxhlet. The yield was 35 %.

Gas-Liquid Chromatography (GLC)

Composition of fatty acids of *M. oleifera* oil sample was analyzed by GLC (Fig. 1). For GLC analysis of fatty acids, methyl ester derivatives were first prepared by transesterification as described by Garcés and Mancha [11]. The apparatus used for this purpose was Shimadzu GC-14 A, equipped with flame ionization detector (FID) and a glass column PEG (3m × 3mm i.d). The temperature programming of the column was set as 180 °C - 2min – 4 °C/ min -210 °C and nitrogen used as a carrier gas. The temperature of detector and injector were maintained at 250 °C and 230 °C respectively. 1 μl of methyl ester sample was injected in to injector and resolution of the sample in to individual fatty acid was recorded. These unknown fatty acids were identified by comparing their retention time with those of the standard methyl ester injected under the same conditions of temperature and pressure. The Shimadzu CR4-A Chromatopac determined the percentage of each fatty acid methyle ester.

Conclusions

From the above investigation it is concluded that *M. oleifera* oil has many medicinal applications due to the presence of oleic acid. Optimization of particle size, extraction temperature and residence time on maximum oil extraction yielded 32 % oil using hexane. Future research will be focused on *M. oleifera* oil purification.

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References

1. Muyibi, S. A. and L. M. Evison, *Water Research,* **29**, 1099 (1995).
2. Gassenschmidt, U., K. D. Jany, B. Tauscher and H. Niebergallisolation, *Biochimica et Biophysica Acta,* 477-481 (1995).
3. Ndabigengesere, A and K. S. Narasiah, *Water Research*, **32**, 781 (1998).
4. Ndabigengesere, A, K. S. Narasiah and B. G. Talbot. *Water Research*, **29**, 703 (1995).
5. Ferrao, A. M. B and J. K. Ferrao, *Agron. Angol*, **30**, 3 (1970).
6. Nautiyal, B. P. and K. G. Venhataraman, *My Forest,* **23**, 53 (1987).
7. Chaudhri, R. D., *Herbal drug industry: a practical approach to industrial pharmacology,* Eastern Publishers, New Delhi, India (1996).
8. Dayrit, Fabian, A. Alcantara and Villasenor, *Philippines Journal of Science*, **19**, 23 (1990).
9. I. Villasenor, Irene M. and Dayrit, *Kimika*, **10**, 47 (1994).
10. Guevara, A. P. C. Vargas, H. Sakurai, Y. Fujiwara, K. Hashimoto, T. Maoka, M. Kozuka, Y. Ito, H. Tokuda and H. Nishino, *Mutation Research*, **440**, 181 (1999).
11. Garcés, R. and Mancha, M., *Anal. Biochem,* **211**, 139 (1993).