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THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

Part XII. The Fatty Acids Composition of the Fixed Oils of *Ocimum sanctum* and *Salvia aegyptica* Seeds

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The physicochemical properties and chemical composition of the fixed oils of the seeds of *Ocimum sanctum* and *Salvia aegyptica* both belonging to N.O. Labiateae were investigated. The amount of the oil extracted from their seeds were 18.2 and 17.4 % respectively. The fatty acid composition of the seed oils of *Ocimum sanctum* and *Salvia aegyptica* were determined by GLC and it revealed the presence of capric (0.00, 1.34 %), lauric (2.84, 0.00 %), myristic (1.90, 0.00 %), palmitic (5.54, 9.42 %), stearic (3.12, 3.18 %), oleic (6.00, 0.00 %), linoleic (59.1, 84.53 %), linolenic (21.7, 0.00 %), and arachidic (0.00, 1.53 %) acids respectively.

Key words: Fatty acids; *Ocimum sanctum;* and *Salvia aegyptica*.

INTRODUCTION

1. *Ocimum sanctum* (N.O. Labiatae) is a medium sized aromatic plant locally known as *tulsi.* It bears small dark brown seeds. The plant is believed to be sacred in Hindu religion. It is commonly cultivated near Hindu houses and temples throughout India and Sri Lanka. In Pakistan it is grown as an ornamental and medicinal plant [1]. All parts of the plant including leaves, roots and seeds are equally important and are reported for different ailments. The seeds are mucilaginous and demulcent and are prescribed in disorders of the genito-urinary system.

2. *Salvia aegyptica* Linn (N.O. Labiatae) is a low thickly branched straggling undershrub. It bears smooth bluish black seeds which are locally known as *Tukhm-i-malanga.* The plant is cultivated in the Punjab plains, Sind, Baluchistan, Afghanistan, W. Asia and N. Africa [2]. The plant is used as a cure for eye diseases, while the seeds are used in diarrhoea, gonorrhoea and haemorrhoids [3]. In the sub-continent a drink is made from the seeds to overcome the thirst problem in hot season. It is invaluable as a demulcent in cases of gastro-intestinal disorders. Like the flax seed, a grain of the seed placed in the eye forms a mucilage by means of which a foreign body may be removed from it. It is also applied as poultice [4]. When the seeds are ground and mixed with water it soon develops into a copious mucilaginous mass several times the original bulk; the swelling is due to the presence of mucilaginous substance forming the upper coating of the seeds.

Work on the seed oils of few species of the family N.O. Labiatae has already been reported such as *Salvia spinosa (Ranocha), Ocimum pilosum (tukhm-i-rehan), Plantage ovata (isabghol), Ocimum sanctum (tulsi) and Ocimum basilicum (baburi* or *niazbo)* [5].

The present studies have been carried out to evaluate the quality and chemical composition of the local seed oils of *Ocimum sanctum* and *Salvia aegyptica.* The physicochemical evaluation and chemical composition of the fixed oil of *Salvia aegyptica* has been studied for the first time.

EXPERIMENTAL

Materials and methods. Fresh seeds of *Ocimum sanctum* were collected from the plants cultivated in the botanical gardens of the University of the Punjab, Lahore, whereas the seeds of *Salvia aegyptica* (Tukhm Malangan) were obtained from the market.

Fixed oils of the seeds of *Ocimum sanctum* and *Salvia aegyptica* were extracted separately. The seeds (500 g) were crushed in a pestle and mortar and extracted with a Soxhlet apparatus using petroleum ether (30-40°) as solvent. The solvent was removed under vacuum and the residual oils were dried over anhydrous Na_2SO_2. Percentage yields of fatty oils of *Ocimum sanctum* and *Salvia ageyptica* (18.2, 17.4 % respectively) were recorded after decolourising and deodourishing by fuller's earth and steam distillation. Physicochemical properties such as colour, specific gravity, refractive index, acid value, saponification value and iodine value were determined by the standard methods [6-7] and are given in Table 1.

Preparation of methyl esters of the fatty acids. The oils (2.5 g. each) were refluxed separately with alcoholic potassium hydroxide (40 ml; 0.5N) for 3 hr. on water bath. The solvent was distilled out under reduced

pressure and the aqueous solution of soaps was washed thrice with diethyl ether to remove the unsaponifiable matter. The aqueous phase was acidified with sulphuric acid (10 ml; 2N). The liberated fatty acids were extracted with diethyl ether and dried over anhydrous sodium sulphate. After the removal of the solvent, the fatty acid mixture in the form of clear oil was obtained.

The fatty acid mixture (1.00 g each) obtained from the individual seed oils of *Ocimum sanctum* and *Salvia aegyptica* were refluxed separately for 3 hr. with absolute methanol (50 ml) and a few drops of conc. sulphuric acid. Excessive amount of methanol was distilled off. Methyl esters of the fatty acids were extracted with diethyl ether, dried over anhydrous sodium sulphate, filtered and the solvent was removed under vacuum. The methyl esters thus obtained were checked by TLC and infrared spectroscopy. The appearance of an intensive peak at 1720 cm^{-1} and the disappearance of peak at 3600 cm^{-1} indicated complete esterification of carboxyl group.

Examination of methyl esters by GLC [8]. A solution of methyl esters of the total fatty acids in petroleum ether were subjected to gas chromatography on a Pye Unicam 204 Series Unit using glass column 1.5m x 4mm packed with 20 % PEGS on diatomite (80-100 mesh). Column temperature was maintained at 200° and nitrogen was used as the carrier gas at a flow rate of 40 ml/min. Detector temperature was kept at 250°.

The identification was carried out by running a standard mixture of methyl esters under identical conditions and comparing their retention times and confirmation was made by coinjection technique.

The percentages were recorded by using Pye Unicam DP 88 Computing Integrator and are presented in Table 2.

DISCUSSION

The present work is a part of the earlier studies [9-18] aimed at the screening of indigenous resources of fatty oils for self sufficiency.

The yields of the seed oils of *Ocimum sanctum* and *Salvia aegyptica* and the various physicochemical properties of these oils are given in Table 1. The seed oil of *Ocimum sanctum* has been a subject of studies in the past [5]. The physicochemical values of the oil obtained in these studies are quite different from those reported earlier [19]. The results of present studies are compared with those of previous ones in Table 3.

The presence of lauric and myristic acids in the seed oil of *Ocimum sanctum* has also been recorded for the first time (Table 2). This may be due to the better technique and instrumentation employed in the present studies. The percentage of linolenic acid in the seed oil of

Table 1. Physicochemical properties of the seed oils of *Ocimum sanctum* and *Salvia aegyptica*.

Values	*Ocimum sanctum*	*Salvia aegyptica*
Yield	18.185%	17.43%
Colour	light yellow	light yellow
Specific gravity at 25°	0.90	0.891
Ref. index	1.480	1.492
Acid value	1.8	1.7
Saponification value	180.9	178.3
Iodine value	98.0	97.6
Unsaponifiable matter	1.9%	1.7%

Table 2. Percentage Composition of fatty acids of the seed oils of *Ocimum sanctum* and *Salvia aegyptica*

	Ocimum sanctum	*Salvia aegyptica*
Capric acid	0.00	1.34
Lauric acid	2.84	0.00
Myristic acid	1.90	0.00
Palmitic acid	5.54	9.42
Stearic acid	3.12	3.18
Oleic acid	6.00	0.00
Linoleic acid	59.1	84.53
Linolenic acid	21.7	0.00
Arachidic acid	0.00	1.53

Table 3. Comparative statement of the results of the previous and the present studies of the fatty acid composition of the *Ocimum sanctum* seed oil.

	Studies by Nadkarni V.A. Patwardhan	Present studies
Lauric acid	–	2.84 %
Myristic acid	–	1.90 %
Palmitic acid	6.9 %	5.84 %
Stearic acid	2.1 %	3.12 %
Oleic acid	9.0 %	6.00 %
Linolcic acid	66.1 %	59.1 %
Linolenic acid	15.7 %	21.7 %

Ocimum sanctum is higher, while the percentage of oleic and linoleic acids has been studied to be low as compared with that reported earlier. This may be due to the differences in soil and climatic conditions in which the plant grows.

The oils from *Ocimum sanctum* and *Salvia aegyptica* seeds contain high proportions of unsaturated acids and the amount of linoleic acid (an essential fatty acid) is predominant in both oils. The percentage composition of the fatty acids of both oils compare favourably with good quality edible oils.

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