

ESSENTIAL OILS OF THE SPECIES OF LABIATAE

Part. II. Studies on the Essential oil of *Ocimum sanctum*

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The essential oil from the leaves and stalks of *Ocimum sanctum* (N.O. Labiatae) grown in Pakistan has been studied with respect to its physico-chemical values and chemical composition. The percentage composition of the oil has been recorded to be as caryophyllene (1.6%), carvacrol (30.4%), methyl eugenol (1.8%), eugenol (61.2%) and an unidentified compound (3.7%).

INTRODUCTION

Ocimum sanctum is a small aromatic herb, known as "holy basil"; its local name is "tulsi". It is found throughout India, Sri Lanka and Pakistan. The herb is mainly raised in gardens and public places as an ornamental and aromatic plant. Various parts of this plant are used in the preparations of local medicines for a number of diseases. Its seeds are mucilaginous and demulcent. Dried plant is stomachic and expectorant. Leaves are anti-catarhal, expectorant, fragrant and aromatic.

The plant is reported to be mosquito repellent. A poultice made from leaves ground with a little water is applied on bad boils. Infusion of the leaves is given in malaria and in gastric diseases of children and in hepatic affections. Persons affected with bad skin diseases such as itches, ringworm, leprosy, bad blood, etc. show radical cure by drinking the juice of basil leaves and also applying the same on skin. Leaf juice poured into the ear is a good remedy for earache. It is also used in curing chronic fever, haemorrhage, dysentery and dyspepsia.^[1]

The present studies have been carried out to evaluate the quality and chemical composition of the essential oil of *Ocimum sanctum* to obtain basic information for the use in developing new agricultural sources of such oils. It has been observed that the oil contains eugenol as major component (61.2%) besides carvacrol (30.4%) and it is assumed that its medicinal importance may be mainly due to these components.

MATERIAL AND METHOD

The plant material comprising fresh stalks and leaves of *Ocimum sanctum* was collected from local nurseries. The

essential oil from this material was recovered by steam distillation^[2]. Standard methods, usually employed for such studies were followed for the evaluation of the recovered essential oil^[3]. The percentage yield and various physico-chemical properties of the essential oil are given in Table 1.

Table 1. Physico-chemical properties of the essential oil of *Ocimum sanctum*

S. No.	Constants	Values
1.	Yield	0.85%
2.	Distillation time	6 hr.
3.	Colour	Light yellow
4.	Odour	aromatic
5.	Specific gravity	0.896
6.	Refractive Index 20°	1.497
7.	Acid value	5.231

Chromatographic analysis of the oil: The essential oil (5 g), recovered by steam distillation, was further resolved into different fractions by column chromatography using glass column (100 cm x 3.5 cm) packed with activated silica gel (200 g). The column was first eluted with *n*-hexane to recover the hydrocarbons fraction. The oxygenated components were then eluted with increasing proportions of diethyl ether in hexane. The column was finally washed with diethyl ether eluting more polar constituents.

The hydrocarbon fraction was further resolved into individual components by GLC using a glass column (6.35 mm x 1.5 m) packed with polyethylene glycol succinate (20%) on dolomite (60-80 mesh), nitrogen as the carrier gas and flame ionization detector. The column was operated at

150° with a detector at 200°. The components were identified by coinjecting with authentic samples but only a simple peak of caryophyllene was obtained. The oxygenated components were resolved and identified by GLC comparison techniques with the authentic samples. The chemical composition of the essential oil thus determined is recorded in Table 2.

Table 2. Chemical constituents of the essential oil of *Ocimum sanctum*

Caryophyllene	1.6%
Carvacrol	30.4%
Unidentified compound	3.7%
Methyl eugenol	1.8%
Eugenol	61.2%

DISCUSSION

The essential oil distilled from the fresh leaves and stalks of *Ocimum sanctum* possesses a very sweet and pleasant smell. The oil was resolved into hydrocarbon and oxygenated fractions by column chromatography using silica gel as an absorbent and *n*-hexane and a mixture of *n*-hexane with different proportions of diethyl ether as an eluent. The column was finally washed with pure diethyl ether in order to recover the residual material from the column.

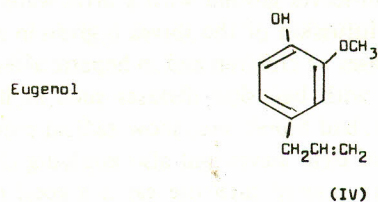
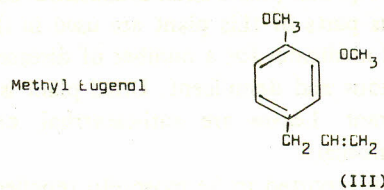
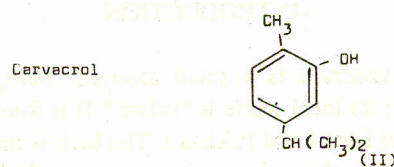
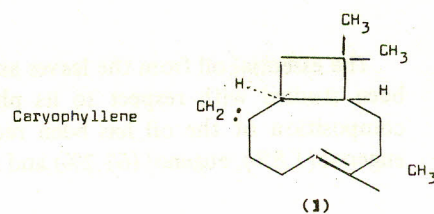
The fraction comprising 1.6% of the essential oil was eluted with *n*-hexane. It was tried to resolve by GLC and was found to be composed of a single compound only which was identified as caryophyllene (I) by coinjecting the column by the authentic sample. The oxygenated fraction of the oil was eluted with a mixture of 5% diethyl ether in *n*-hexane. It consisted of two types of compounds, viz. phenols and phenolic ethers. The R_f values of these compounds were very close to each other so they were best resolved by GLC and identified by coinjecting the column with authentic samples of the individual compounds. They were recovered and found to be composed of carvacrol (II), 30.4%; an unidentified compound, 3.7%, methyl eugenol (III), 1.8%; and eugenol (IV), 61.2%.

It is of interest to mention here that the percentage existence of these substances in the essential oil is remarkably different from those reported previously [4,5]. This difference could either be attributed to the climatic and soil changes or the procedure of evaluation. Although the percentage yield of oil is small, yet it is higher than that reported previously.

It is an important oil because it has a sweet fragrance,

high percentage of eugenol and other phenolic substances. The flavouring and medicinal value of all these oxygenated substances present in the essential oil are well known and therefore, this oil has a potential of becoming a commercial crop.

Structural formulae of the constituents of the essential oil of *Ocimum sanctum*



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