

CHEMICAL EVALUATION OF OIL FROM *OCIMUM AMERICANUM* L.

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Abstract

Yield, physio-chemical characteristics and chemical composition of the oil from the leaves of *Ocimum americanum* L. were determined. The results obtained compared well with those of oil from *Ocimum canum* Sims. and *Ocimum basilicum* Var. minims. It is concluded that this oil is of fair standard and could be used in many products in place of oil from other *Ocimum* spp.

Introduction

The oil is usually extracted from the fresh or dried leave of *Ocimum species* by steam distillation. The *Ocimum americanum* L. belongs to the plant family Labiatae, which includes, in addition to *Ocimum* species. other commonly grown oil yielding plants species such as *Mentha*, *Rosemary*, *Thyme* and *Salvia* species (Smal, 1986).

Ocimum americanum L. is an old world plant, native to the paleotropics; it occurs wild in tropical West Africa (Guinea, Ivory Coast, and Congo), East Africa (Tanganyika, Mozambique and Madagascar), in East India and Ceylone; and naturalized in tropical South America. In several places in India, *Ocimum canum* has also been cultivated but mostly on a small scale. Large plantation for the production of essential oil exists only in Southern France (Guenther, 1949).

In Pakistan *Ocimum basilicum* L. and *Ocimum americanum* L. are found wild in Azad Kashmir, Balochistan, NWFP, Punjab and Sindh at an elevation from 2,000–3,500 m. It is now cultivated as an

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ornamental plant in NWFP, Sindh and Punjab (Kazmi, 1960 and Zaman, 1970).

The volatile oils distilled from *Ocimum* are important flavouring agent throughout the world. Although not used in large quantities, oil of *ocimum* is employed in all kinds of flavours, including those for confectionery, baked goods and condimental products, (Chilli sauces, catsups, tomato pastes, pickles, vinegars) and in spiced meats, sausages etc. The oil also serves for imparting distinction of flavour in certain dental and oral products (Guenther, 1949). Oil distilled from *Ocimum canum* Sims contains a high percentage of d-camphor and this plant is considered as a new source of natural camphor (Guenther, 1949).

Camphor separated from the *Ocimum* oil is a natural dextro-organic compound. It exists in the form of colourless long needle-like crystals. The camphor content of the oil increases in fall. An oil distilled during the August harvest contained 47 percent of camphor; and that in October, 74 followed by a sensation of cold (Guenther, 1949 and Khan & Khan, 1986).

Atal and Kapur (1977) reported 0.5 – 2.0 percent oil from the leaves of *Ocimum basilicum* Var. *Minims* and 2.5 – 5.0 per cent from the leaves of *Ocimum canum* which contained 60–80 percent of camphor.

Guenther (1949) reported that 1000 kg fresh herb *Ocimum* Var. *Camphoratum* gave 7.67 kg of an essential oil with these properties; specific gravity, 0.9340; optical rotation $10^{\circ} - 3^{\circ}$; refractive Index at 65°C , 1.4940. The oil contained 54.0 percent of camphor.

Youngken (1948) reported that the leaves of *Ocimum kilimandscharicum* growing in Sudan, upon steam distillation, yielded 5.0% of volatile oil which contained 77.0% of total camphor.

It has been reported (Guenther, 1949) that steam distillation of flowers and floral stalks of *Ocimum canum* Sims collected during January and February yielded 0.22 to 0.30 percent of oil from the dry

herbs and 0.13 to 0.21 percent from the fresh herbs. The oil contained 66.0 percent crystalline camphor. The oil had physico-chemical properties varying within the following limits. Specific gravity at 30°C, 0.9205 to 0.9249; refractive Index at 30°C, 0.9205 to 0.9249; and optical rotation at 30°C, + 23° – 48' to 30° – 42'.

It has been reported that *Ocimum* spp. grow on a wide range of soils, but thrives best in deep rich, well drained lands. Various types of loamy upland soils are best suited. Volcanic soils seem to favour the development of camphor in the plant (Rabak, 1916 and Guenther, 1949).

The present preliminary study was undertaken to find the yield of oil and camphor contents and to determine the physico-chemical characteristics of oil from *Ocimum americanum* L. in order to explore its possibility for commercial utilization in various products like soap, dental cream, food products and pharmaceuticals.

Material and Methods

Leaf samples of *Ocimum americanum* L. were collected from the plants grown in Medicinal Plant Farm of Pakistan Forest Institute, Peshawar in the month of October, 1995. The leaves were separated from the stem and shoots and were dried under shade for a month and then powdered. The oil was extracted from the dried leaves by steam distillation, followed by the use of petroleum ether as solvent for the complete recovery of the oil (Guenther, 1949 and Rabak, 1916).

Physico-chemical characteristics such as specific gravity, refractive index and optical rotation of the oil were determined following the methods given by A.O.A.C., (1980), Griffin (1965) and Jacobs (1962). Isolation of Camphor was carried out by cooling the oil to a low temperature. For this purpose the essential oil extracted was first freed from moisture, filtered and then poured into suitable container. The container containing oil was placed into a freezing mixture for 24 hours or until the camphor crystallized. It was, then, centrifuged and the oil was drawn off through a drain cock at the bottom

of the container, whereas the camphor crystals remaining in the vessel were dissolved in solvent ether with warming and recrystallized by placing in the freezing mixture as before. It was dried at 60°C for several days in an oven where any adhering solvent or oil was evaporated and pure crystalline camphor was isolated following the method outlined by Guenther and Gul (Guenther, 1949 and Khan & Khan, 1986).

Results and Discussion

Yield of oil obtained in the laboratory from the leaves of *Ocimum americanum* L. was found to be 2.44 percent on dry weight basis. It was encouraging enough as compared to oil yield (2.4%) reported in case of *Ocimum americanum* L. and 2.5% in *Ocimum* var. *minims* by Atal and Kapur (1977). It was low as compared to oil yield (5%) reported by Youngken (1948) in case of *Ocimum Kilimandscharicum*. It is probably due to the soil texture, climatic conditions of the surrounding flora of that area, locality and age of the plant which do affect the morphology and active constituents of the plants.

Camphor content obtained in the laboratory from the oil of *Ocimum americanum* was found to be 63.6%. It was within the range of camphor yield (60 – 80%) reported by Atal and Kapur in case of Indian *Ocimum canum* (1). However, it was low as compared to that of camphor yield (77%) reported by Youngken (1948) in case of *Ocimum kilimandscharicum* grown in Sudan. It may be due to difference in plant variety, climatic conditions and physico-chemical properties of the soil of the region.

The observed physico-chemical properties of oil from *Ocimum americanum* were compared in Table-1, with those of oil from exotic species reported in literature.

Table 1. Physico-chemical Characteristics of oil from *Ocimum americanum* L.

Physico-Chemical constants	<i>Ocimum americanum</i> L. Lab. Work	<i>O. canum</i> Var. <i>amphoratum</i> , (Guenther) eported	<i>Ocimum canum</i> Sims (Guenther) reported
Specific gravity	0.9255 at 25°C	0.9340 at 65°C	0.9205-0.9249 at 30°C
Refractive Index	1.4937 at 25°C	1.4940 at 65°C	1.4830-1.4865 at 30°C
Optical rotation	+25°-48' at 25°C	+10°-3' at 65°C	+23°-48' -31°-42' at 30°C
Solubility of camphor	Soluble in 0.5 vol. Of 90% alcohol	=	Soluble in 0.5 vol. Of 90% alcohol

It is evident from the results, given in Table 1, that the physico-chemical characteristics of the oil from *Ocimum americanum* are comparable with oil from *Ocimum canum* Var. *Camphoratum* and *Ocimum canum* reported in literature.

Conclusion

Yield of oil obtained (2.44%) in the laboratory from *Ocimum americanum* L. is encouraging enough and compares to the oil yield (2.4%) reported in literature.

The Physico-chemical characteristics of the oil from *Ocimum americanum* L. indicated that this oil was of fair standard and could be similarly used as a flavouring agent in Pharmaceuticals, Soap, Dental cream and Cosmetics in place of oil from other *Ocimum* spp.

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