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STUDIES ON THE ESSENTIAL OILS OF THE PAKISTANI SPECIES OF THE FAMILY UMBELLIFERAE

Part XLVIII. *Petroselinum crispum*, (Miller), Hills (Eng. Parsley) Oil of the Green Plant

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The percentage yield, physicochemical characteristics and chemical composition of the essential oil obtained by dry steam-distillation of the green plant of *Petroselinum crispum* cultivated in the PCSIR Laboratories, Lahore, have been studied. The oil with a yield of 0.06% is composed of santene (0.2%), α -thujene (0.1%), α -pinene (0.2%), camphene (0.7%), β -pinene (0.2%), α -phellandrene (0.3%), limonene (1.0%), β -phellandrene (traces), γ -terpinene (1.6%), terpinolene (1.0%), β -caryophyllene (1.1%), unknown sesquiterpenes (2.8%), myristicin (65.2%), apiole (traces), osthole (5.6%) and tarry material (20.0%). The oil is used in high-grade perfumery. The plant has been successfully cultivated in these Laboratories. Its cultivation has provided a very useful raw material for the production of a valuable essential oil.

INTRODUCTION

Petroselinum is a small genus of only three species with a wild distribution in Asia, Europe and North and South America. The plants are biennial, rarely annual herbs. Only one species, namely *Petroselinum crispum* is reported to grow in Pakistan.

Petroselinum crispum is an important species of the plant family Umbelliferae which has since long been used in medicine and as a flavouring agent. The plant is a native to the Mediterranean countries and is widely cultivated in the temperate regions of the world. It is employed as a culinary plant for garnishing and seasoning. Parsley is also cultivated in Pakistan on a small scale as a garden plant in Quetta. It has now been cultivated in the PCSIR Laboratories, Lahore, for the first time. The species is well-known for its medicinal value. It is an aperitive, carminative, stimulant and diuretic. The leaves of the plant are used for flavouring soups and foods. The essential oil extracted from the seed of the species possesses typical odour and flavour of parsley.

These studies have been carried out to determine the relative status of the indigenous oil and the oils of the same species grown elsewhere in the world. These are the first ever studies so far as the Pakistani species is concerned.

MATERIALS AND METHODS

For the present studies the plant was cultivated successfully in the PCSIR Laboratories, Lahore. The essential oil

from the green plant before flowering was recovered by dry steam-distillation. The total aqueous distillate was extracted with diethyl ether because of the poor yield of the essential oil. The ethereal extract was dried over anhydrous sodium sulphate and the oil recovered by a careful removal of the solvent. The general methods employed for the analysis of the oil have been described in our earlier work [1,2].

The oil was fractionated into hydrocarbons and oxygenated component by column chromatography using activated silica gel. The hydrocarbons of the oil were recovered with n-hexane and the oxygenated components with 2-30% diethyl ether in n-hexane. The column was finally washed with pure diethyl ether. The hydrocarbon fraction of the oil was further resolved into individual components by GLC using a copper column (3 mm x 3 m) packed with 7.5% carbowax on Celite (60-80 mesh), nitrogen as the carrier gas and flame ionization detector. The column was operated at 110^o and 150^o for the resolution of monoterpenes and sesquiterpenes respectively. The oxygenated components of the oil were identified by TLC, GLC, IR comparison with their standard samples.

RESULTS

The percentage yield, physicochemical values and the chemical composition of the essential oil obtained from the green plant of *Petroselinum crispum* are recorded in Tables 1-2.

Table 1. Percentage yield and physicochemical values of the essential oil of *Peteroselinum crispum* green plant

Distillation time (hr)	12
Yield of oil	0.06% including water cohobation oil
Specific gravity	0.9150 ³⁰
Refractive index	1.5220 ³⁰
Optical rotation	1.5220 ³⁰
Acid value	1.0
Ester value	11.15

Superscripts indicate the temperature at which these parameters were determined.

DISCUSSION

The essential oil distilled from the green plant of *Peteroselinum crispum* possesses very sweet smell. The oil was split into hydrocarbon fraction and oxygenated components by column chromatography. The hydrocarbon fraction of the oil was further resolved into mono and sesquiterpenes by GLC and their identification was carried out by coinjection of the standard samples of these terpenes.

The column when eluted with 2% diethyl ether in n-hexane gave a phenolic ether by IR (3.4, 6.1, 6.6, 7.6, 8.4, 8.8, 9.2, 9.6, 10.9, 12.1, 12.4, 14.5 nm). It constituted 65.2% of the total oil. The compound was identified as myristicin by TLC and IR comparison with its authentic sample and also by converting it into tetrabromide [3]. The column was then eluted with 3% diethyl ether in n-hexane. It also contained a single compound whose IR gave close resemblance with the standard spectrum of apiole.

Elution of the column with 15% diethyl ether in n-hexane gave another single compound. It appeared fluorescent under UV light. The compound was identified as osthole by m.p. 84°. UV analysis: EtOH_{max} 318, 258.5 nm and IR comparison with an authentic sample of this coumarin. The IR spectrum of osthole reads as: [s (3.4, 5.7, 6.9, 7.3, 7.9, nm), m(6.0, 6.2, 7.6, 9.4, 10.2, 11.3, 11.6 nm), w(7.8, 8.2, 8.6, 8.8, 10.8, 12.2 nm)]. Osthole was further identified through the formation of its dibromide derivative [4].

The constituents of the oil determined in the present work are essentially the same as those of the seed essential oil of parsley. However, osthole is a new finding in the oil and has not been reported earlier. Myristicin has been found to be the major oxygenated component of the green plant essential oil of this species. Apiole which is the major

Table 2. Chemical composition of the essential oil of *Peteroselinum crispum* green plant.

Component	Percentage
Santene	0.2
α-Thujene	0.1
α-Pinene	0.2
Camphene	0.7
β-Pinene	0.2
α-Phellandrene	0.3
β-Phellandrene	Traces
Limonene	1.0
γ-Terpinene	1.6
Terpinolene	1.0
β-Caryophyllene	1.1
Unknown sesquiterpenes	2.8
Myristicin	65.2
Apiole	Traces
Osthole	5.6
Tarry material	20.0

constituent of the essential oil of parsley seed grown in Pakistan, is present only in traces in the essential oil of the green plant investigated here.

The present studies suggest that the constituents of the essential oil determined in the present work are primarily the same as those of the seed essential oil of parsley. However, osthole is a new finding in the essential oil which has not been reported earlier.

The essential oil of the species, therefore, can find application in high grade perfumery provided the plant is tamed through cultivation. Our preliminary trials on the species have shown encouraging results.

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