

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

Part XLIX. *Pimpinella anisum* Linn (Eng. anise, Var. *Roomi Sonf*) Seed Oil

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(Received November 22, 1979)

The essential oil obtained from the seed of *Pimpinella anisum* purchased from the local market but cultivated at Madyan (Swat) has been studied with respect to its physicochemical characteristics and chemical composition. The oil with a yield of 1.7% consists of α -pinene (1.8%), camphene (0.7%), phellandrene (2.4%), limonene (2.7%), anethole (84.1%), unidentified alcoholic compounds (3.2%), anisketone (4.3%), and tarry material (0.8%). The oil is sweet smelling and is mainly composed of anethole. The oil has been found to be antibacterial in properties. The species has long been used in the local materia medica. Its medicinal and pharmaceutical values are well-known. The cultivation of the species at Madyan (Swat District) has proved quite successful.

INTRODUCTION

The genus *Pimpinella* consists of 150 species which have been reported to grow in Africa, Europe, Asia and South America. Only six species including *Pimpinella acuminata*, *P. diversifolia*, *P. hazariensis*, *P. puberula*, *P. ranunculifolia* and *P. stewartii* have been recorded to grow wild in Pakistan. The plants are annual or perennial herbs.

Pimpinella anisum is native to the Near East and Egypt and is very widely cultivated in the Central, Southern and South Eastern Europe, Southern parts of the U.S.S.R., Syria, Tunis, Morocco, China, Chile and Mexico. The oil of anise is used in the flavouring of culinary preparations, beverages confectioneries, pharmaceuticals, tooth pastes and mouth washes. Medicinally, the oil is occasionally employed to stimulate peristalsis in cases of colic. It is antibacterial and has been recorded to be effective against *Staphylococcus aureus*, *Streptococcus faecalis* and *E. colic*.

The present studies have been undertaken to evaluate the quality and chemical composition of the essential oil with a view to obtain basic information for its use in developing new agriculture sources of such oils.

MATERIALS AND METHODS

Pimpinella anisum seeds were purchased from the Lahore market. The essential oil from the crushed seeds was obtained by the standard procedure which has been described in our earlier publications [1,2]. The general

methods used for the analysis of the oil have been reported earlier [1,2].

As usual the oil was column-chromatographed using silica gel as an adsorbent. The hydrocarbon fraction of the oil was eluted from the column with n-hexane and the oxygenated components with 2–20% diethyl ether in n-hexane. The hydrocarbon fraction was further resolved into its individual constituents by GLC using 7.5% carbowax on Celite, nitrogen as the carrier gas and flame ionization detector. The column temperature was maintained at 110° and 170° for the resolution of monoterpenes and sesquiterpenes respectively. The oxygenated components of the oil were identified by TLC, GLC and IR and also by converting into their known derivatives.

RESULTS

The percentage yield, physicochemical values and chemical composition of the essential oil of *Pimpinella anisum* seed are recorded in Tables 1–2.

DISCUSSION

Pimpinella anisum has acquired unique position in the plant family Umbelliferae and its essential oil has long been used especially as a flavouring agent. The oil is chiefly composed of oxygenated compound (92.1%) and its composition closely resembles the essential oil of *Foeniculum vulgare* [2], (fennel). The hydrocarbon fraction of the oil

Table 1. Percentage yield and physicochemical values of the essential oil of *Pimpinella anisum* seed.

Distillation time (hr)	10
Yield of the oil (%)	1.7
Specific gravity	0.9744 ²⁴
Refractive index	1.5540 ²⁴
Optical rotation	+7 ⁰ 30 ²⁴
Acid value	0.32
Ester value	1.15

Superscripts indicate the temperature at which these parameters were determined.

Table 2. Percentage composition of the essential oil of *Pimpinella anisum* seed.

Component	Percentage
α -Pinene	1.8
Camphene	0.7
Phellandrene	2.4
Limonene	2.7
Anethole	84.1
Mixture of anethole and unknown compounds	3.2
Anisketone	4.3
Unrecovered material	0.8

(7.9%) was eluted from the column with n-hexane which was further resolved into individual components by GLC. The fraction gave only 4 peaks which were identified as α -pinene, camphene, phellandrene and limonene as compared with their standard samples. No sesquiterpene was detected in the fraction.

The column when eluted with 2% diethyl ether in n-hexane gave a single compound. On removal of the solvent the fraction changed into crystalline form. The crystals were washed with n-hexane recrystallised from methanol and the compound was identified as anethole by TLC, m.p. 24⁰ and IR (3.4, 6.2, 6.6, 6.9, 7.2, 7.8, 8.0, 8.5, 9.0, 9.6, 10.4, 11.9, 12.8 nm) comparison with an authentic sample obtained from *Foeniculum vulgare* [2].

Elution of the column with 5% diethyl ether in n-

hexane gave a mixture of two compounds. One of the compounds was identified as anethole by TLC and GLC while the other has remained unidentified mainly because of its rather very small amount.

The column was then eluted with 20% diethyl ether in n-hexane. The fraction was found to contain four compounds by GLC. It was rechromatographed on silica gel column which gave a ketone in pure form. It was identified as anisketone by IR (3.5, 6.1, 7.6, 7.8, 8.0, 8.5, 8.7, 9.7, 10.8, 12.1, 13.1 nm) and through its conversion into semicarbazone m.p. 182⁰. The rest of the compounds which were alcoholic in nature have to be identified as yet.

It is clear from the above studies that the essential oil of the *Pimpinella anisum* predominantly consists of anethole which constitutes about 85% of the total oil. Although the major components of the oil are essentially the same as reported by earlier workers [3], yet there is a slight difference in the composition regarding the presence and relative proportions of some minor components. In our oil, the presence of fenchone, anisaldehyde and some sulphur-containing compounds which were indicated to be present in a similar oil [3], has not been confirmed. The species has long been used in the local materia medica. Its medicinal and pharmaceutical value is well-known. The cultivation of the species in Swat will, therefore, be useful.

Acknowledgements. We are grateful to the United States Department of Agriculture for financing this research under a PL-480 scheme and to Mr. Abdul Waheed Sabir our Botanist for the identification and procurement of authentic samples for these studies.

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