

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

Part XXI. *Oenanthe javanica*, DE (Surkhai) Seed Oil

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(Received May 18, 1978)

Abstract. The essential oil of the seed of the Pakistani *Oenanthe javanica*, obtained in a 3.5% yield, has been examined for its physico-chemical characteristics and chemical composition for the first time. It contains α -pinene (0.79%), β -pinene (15.96%), myrcene (1.58%), limonene (61.88%), γ -terpinene (11.01%), an unidentified monoterpene (4.52%), myristicin (0.03%), carvone (1.23%), linalool (0.97%), and a mixture of unidentified hydroxy compounds (0.20%). The oil predominantly consists of hydrocarbons of which limonene is the major component.

Introduction

Oenanthe javanica is native to Pakistan and is met with in many countries, particularly of the South East Asia.¹ It is sweet and pleasant in flavour and is used as a vegetable in Pakistan. It is believed to be a good carminative and stimulant. The dried seed of the plant is preserved by the local inhabitants for use in stomach ailments. The species also possesses diuretic and anti-asthmatic properties.

The present studies have been carried out with a view to filling the gap in our knowledge regarding the quality and chemistry of the essential oils of the species and to highlighting their relative commercial importance.

Experimental

Materials. Fresh and mature seeds of *O. javanica* were collected from Madyan in the Swat district. The essential oil recovered from the seed and the general methods employed for these studies have been described in Parts I-II of this series.^{2, 3}

Chromatographic analysis of the oil. A weighed quantity of the oil (10 g) was loaded on a glass column packed with silica gel (150 g). The hydrocarbon fraction and the oxygenated components of the oil were eluted from the column with *n*-hexane and with progressively increasing proportions (1-50%) of diethyl ether in *n*-hexane respectively. The hydrocarbon fraction was further resolved into individual components by GLC using a copper column (3 mm \times 3 m) filled with 7.5% carbowax on celite (60-80 mesh), nitrogen carrier gas and flame ionization detector. The column temperature was maintained at 110° and 170° for the resolution of mono- and sesquiterpenes respectively.

The oxygenated fractions containing more than one component were rechromatographed and the components thus resolved were identified by TLC, GLC, ir and by preparing their known derivatives.

Results

The physico-chemical values and the chemical composition of the essential oil are shown in Tables 1-2.

TABLE 1. PERCENTAGE YIELD AND PHYSICO-CHEMICAL PROPERTIES OF THE ESSENTIAL OIL OF *O. JAVANICA* SEEDS.

Distillation time	8 hr.
Yield	3.5%
Specific gravity	0.8402 ²⁵
Refractive index	1.4720 ²⁵
Optical rotation	+ 28°.12' ²⁸
Acid value	0.83
Ester value	8.50
Ester value after acetylation	15.20

The superscripts indicate the temperature at which these parameters were determined.

Discussion

The essential oil distilled from the seeds of *O. javanica* possesses a very sweet and pleasant smell. The oil mostly consists of hydrocarbons in which limonene is the major monoterpene. Sesquiterpenes were, however, found to be absent in the oil.

The oxygenated fraction amounting to 4.36% of the total oil was separated into individual components by column chromatography. Myristicin was

TABLE 2. PERCENTAGE COMPOSITION OF THE ESSENTIAL OIL OF *O. JAVANICA* SEED.

Solvent	Component	Percentage
<i>n</i> -Hexane	Hydrocarbons*	95.74
	Unidentified mono-terpene	4.52
	α -Pinene	0.78
	β -Pinene	15.96
	Myrcene	1.58
	Limonene	61.88
	γ -Terpinene	11.01
1, 2-diethyl ether in <i>n</i> -hexane	Myristicin	0.03
5% diethyl ether in <i>n</i> -hexane	Carvone	1.23
15-20% diethyl ether in <i>n</i> -hexane	Linalool	0.97
25% diethyl ether in <i>n</i> -hexane	Mixture of hydroxy compounds	0.20
100% diethyl ether	Tarry material	1.50

*Resolved and estimated by gas-liquid chromatography.

the first oxygenated component eluted from the column. The ir spectrum of this phenol ether gave the following absorption data: 3.4, 6.1, 6.6, 7.0, 7.6, 8.4, 8.8, 9.2, 9.6, 10.4, 12.1, 12.4, 14.5 μ m. It was identified through the preparation of its tetrabromide m.p. 128° (lit,⁴ 130°) and by the comparison of its ir with that of its authentic sample. Harborne *et al.*⁵ studied the distribution of myristicin in the seeds of Umbelliferce family and concluded that genus where it occurred regularly was *Oenanthe* and found it to be present in all the five species they examined.

Both the second and third fractions were found to contain single compounds by TLC and were ketonic

and alcoholic in nature. The compounds were identified as carvone and linalool respectively by ir comparison with their standard samples. Carvone was also separated from the essential oil by the bisulphite method⁶ and identified as above.

The next fraction was found to be a mixture of 3-4 compounds by TLC, linalool being one of them. Its ir indicated the presence of hydroxy compounds. Finally the column was eluted with 100% diethyl ether which gave a tarry material. It seems to contain coumarins which have not been studied as yet.

These studies indicate that the essential oil of the *O. javanica* seed with a total yield of 3.5% is a good source of limonene. The species can also be used as a useful vegetable.

Acknowledgments. The authors 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 sample for this work.

Thanks are also due to Dr. F. M. Chaudhary for undertaking GLC for this work.

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