

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

Part XXXVI. *Pycnocycla aucheriana*, Dence (Bibibuto) Seed Oil

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The essential oil recovered from the seed of *Pycnocycla aucheriana* has been characterized and studied with respect to its physicochemical properties and chemical composition for the first time. The oil with an 0.35% yield contains α -thujene (0.2%), camphene (0.5%), β -pinene (2.6%), myrcene (0.4%), β -phellandrene (0.6%), γ -terpinene (2.4%), *p*-cymene (1.1%), β -elemene (0.2%), β -caryophyllene (0.1%), humulene (0.6%), myristicin (6.1%), linalyl acetate (2.6%), a ketonic compound (1.7%), linalool (41.2%), cuminyl alcohol (32.6%) and a mixture of coumarins (4.4%). The essential oil from the seed of the species can find good position in perfumery because of its pleasant fruity smell.

INTRODUCTION

The genus *Pycnocycla* includes about 10 species extending from the dry arid regions of North Africa to Afghanistan and Pakistan. The plants are perennial herbs. Only two species, namely, *Pycnocycla aucheriana* and *Pycnocycla caespitosa*, have been recorded to grow in Pakistan.

Pycnocycla aucheriana grows wild in the arid regions of the Baluchistan Province in Pakistan. The people in Baluchistan chew the leaves of this small bush when they are thirsty. It is said to be very cooling. The present work has been carried out to study the quality and chemistry of the essential oil of the species.

MATERIALS AND METHODS

For the present studies the seeds of *Pycnocycla aucheriana* were hand-collected from 'Mach (Quetta)'. The essential oil from the crushed seed, was steam-distilled according to the standard procedure [1]. The amount of the oil being too small to separate easily from the distillate, the total distillate was extracted with diethyl ether which on evaporation yielded the essential oil. The general methods employed for the analysis of essential oil have been reported earlier [1, 2].

The oil was resolved into hydrocarbons and oxygenated components by silica gel chromatography. The hydrocarbon fraction of the oil was eluted with n-hexane and further resolved into individual components by GLC using a copper column (3 m \times 3 mm) packed with 7.5% carbowax on Chromosorb G, nitrogen as the carrier gas and flame

ionisation detector. The column was operated at 110° and 150° for the resolution of the mono- and sesquiterpenes respectively. The individual components were identified against their standard samples.

The oxygenated fractions of the oil were eluted from the column with 2–20% diethyl ether in n-hexane. The fractions containing more than one components were re-chromatographed for single compounds. The various oxygenated compounds thus obtained were identified by TLC, GLC and IR comparison with their authentic samples and also by converting into their known derivatives.

RESULTS

The percentage yield, physicochemical properties and chemical composition of the essential oil recovered from the seed of *Pycnocycla aucheriana* are recorded in Tables

Table 1. Percentage yield and physicochemical values of the essential oil of *Pycnocycla aucheriana* seed.

Distillation period (hr)	12
Yield of oil (%)	0.35
Specific gravity	0.8763 ²⁸
Refractive index	1.4905 ²⁸
Optical rotation	+ 2° 20' ²⁸
Acid value	7.7
Ester value	7.0
Ester value after acetylation	107.2

The superscripts indicate the temperature at which these parameters have been determined.

Table 2. Percentage composition of the essential oil of *Pycnocycla aucheriana* seed.

Component	Percentage
α -Thujene	0.2
α -Pinene	0.7
Camphene	0.5
β -Pinene	2.6
Myrcene	0.4
β -Phellandrene	0.6
γ -Terpinene	2.4
p-Cymene	1.1
β -Elemene	0.2
β -Caryophyllene	0.1
Humulene	0.6
Myristicin	6.1
Linalyl acetate	2.6
Linalool and a ketone	41.2
Linalool	
Cumyl alcohol	32.6
Mixture of coumarins	6.4

1 and 2.

DISCUSSION

The essential oil steam-distilled from the seed of *Pycnocycla aucheriana* is very pleasant and sweet to smell. The oil contains relatively much smaller amount of hydrocarbons (9.4%) and bigger proportions of oxygenated components. An oil of this nature is, therefore, much more valuable as an item of commerce. Relatively higher ester value after acetylation of the essential oil indicates the presence of larger quantities of alcohols in the oil. An amount of 73.8% of alcohols in the oil is, therefore, in conformity with the ester value after acetylation determined for this oil.

The hydrocarbon fraction of the oil is composed of monoterpenes and sesquiterpenes. The fraction, as eluted from the column with n-hexane, was resolved by GLC and the individual components identified against their standard samples. The oxygenated fraction of the oil is consisted of a phenol ether, an ester, a ketonic compound, two al-

cohols and a mixture of coumarins.

The phenol ether was eluted from the column with 2% diethyl ether in n-hexane. It was identified as myristicin by IR: (3.4, 6.1, 6.6, 7.0, 7.6, 8.4, 8.8, 9.6, 12.1, 12.4, 14.5 nm) and by converting it into its tetrabromide m.p. 128°.

Linalyl acetate was eluted from the column with 3% diethyl ether in n-hexane. It was identified by IR comparison with an authentic sample of the compound. The ester was also hydrolyzed with 0.1N alcoholic KOH which gave linalool in quantitative yield. The alcohol was identified by TLC and IR comparison.

The column when eluted with 4% diethyl ether in n-hexane gave a single hydroxy compound by TLC and IR. It was one of the major components of the oil and was identified as linalool by TLC, GLC and IR comparison. The column was then eluted with 10% diethyl ether in n-hexane which gave a mixture of two hydroxy compounds. The fraction was aromatic in nature. It was rechromatographed on silica gel column. The major portion of the fraction was found to be cumyl alcohol by IR comparison with its standard spectrum. The second compound was identified as linalool by TLC and IR comparison with its authentic sample.

Finally, the column was eluted with pure diethyl ether which gave a mixture of unidentified coumarins and tarry material.

The essential oil from the seed of *Pycnocycla aucheriana* can find good position in perfumery because of its sweet fruity smell.

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