Pakistan J. Sci. Ind. Res., Vol. 22, No. 6, December 1979

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

Part XXXVII. *Torilis japonica* (Hautt). DC (Laithy) and *Torilis leptophylla* (L), (Reichb) Seed Oils

Muhammad Ashraf, Rafi Ahmad, Bushra Asghar and Muhammad Khurshid Bhatty

PCSIR Labortories, Lahore 16.

(Received June 10, 1979)

The essential oils recovered from the two species of *Torilis* have been investigated for their physicochemical properties and chemical composition. The oils from *Torilis japonica* and *Torilis leptophylla,* with 0.002% yield in both cases respectively contain α-thujene (0.3, 0.0%), α-pinene (0.9, 0.1%), camphene (1.4, 0.4%), β-pinene (2.1%, traces), Δ^3-carene (2.3, 0.9%), α-phellandrene (4.1, 1.9%), limonene (2.4, 2.3%), β-phellandrene (1.7, 3.4%), γ-terpinene (1.9, 0.6), *p*-cymene (0.4, 1.3%), β-caryophyllene (4.4, 12.4%), unknown sesquiterpene (1.2, 8.9%), bornyl acetate (16.2, 22.1%), bornyl acetate and geranyl acetate (1.1, 1.5%), geranyl acetate (31.1, 8.0%), carotol (0.0, 1.9%), *p*-methoxy benzyl acetate (0.0, 7.9%) and a mixture of coumarins (11.9, 14.8%). Even though the essential oils possess a pleasant smell yet their chance of being commercialized is not bright because of the low yield of the oils. However, pharmacological investigation on the plants is expected to show some interesting results because some special of this genus such as *Caucalis microcaopa* and *Tordylium afficinole* have been used for rattlesnake bites and also as emmenagogue.

INTRODUCTION

Torilis is a genus of about 20 species which occur in regions spreading from the Mediterranean to South East Asia. A few species have been introduced in North and South America. The plants of this genus are annual herbs. Only four species, namely *Torilis arvensis, T. japonica, T. leptophylla* and *T. nodosa* have been located in Pakistan.

Torilis japonica and *T. leptophylla* are common wild growing species found from the foot hills to 2500 m in the northern parts of the country. The species have been successfully cultivated in the experimental fields of the PCSIR Laboratories, Lahore. The yield of the seeds has been recorded to be about 400 lb/acre. The present investigations have been undertaken to study the chemistry of the species.

MATERIALS AND METHODS

The seeds of the species were obtained from the cultivated crops. The seeds were crushed, steam-distilled for 15 hr and the oils recovered by extraction of the aqueous distillate with diethyl ether. The general methods used for these studies have been reported earlier [1].

The oils were resolved into hydrocarbon fractions and oxygenated components by column chromatography using silica gel as an adsorbent. The hydrocarbon fractions were eluted with n-hexane and the oxygenated components with 2–50% diethyl ether in n-hexane. The hydrocarbon fractions of the two oils were further resolved into individual components by GLC using a column packed with SE-30, nitrogen as the carrier gas and flame ionization detector. The column was operated at 110 and 150° for the resolution of the monoterpenes and sesquiterpenes respectively. The oxygenated components of the oil were separated by column chromatography and identified by TLC, GLC and IR comparison with their standard samples.

RESULTS

The percentage yield, physicochemical properties and the chemical composition of the essential oils obtained from the two species of *Torilis* are recorded in Tables 1 and 2.

DISCUSSION

The essential oils of the two species of *Torilis* possess reasonably pleasant smell. The hydrocarbon fractions of the two species, namely *Torilis japonica* and *Torilis leptophylla* are composed of almost identical constituents but different in proportion; the only difference in these frac-

Table 1. Percentage yield and physicochemical values of the essential oils of *Torilis japonica* and *Torilis leptophylla* seeds.

Values	*Torilis japonica*	*Torilis leptophylla*
Distillation period (hr)	14	14
Yield of the oil (%)	0.002	0.002
Specific gravity	0.8241^{32}	0.8818^{32}
Refractive index	1.5030^{32}	1.4930^{32}

Table 2. Percentage composition of the essential oils of *Torilis japonica* and *Torilis leptophylla* seeds.

Component	*Torilis japonica* (%)	*Torilis leptophylla* (%)
α-Thujene	0.3	–
α-Pinene	019	0.1
Camphene	1.4	0.4
β-Pinene	2.1	Traces
Δ^3-Carene	2.3	0.9
α-Phellandrene	4.1	1.9
Limonene	2.4	2.3
γ-Phellandrene	1.7	3.4
β-Phellandrene	1.7	3.4
γ-Terpinene	1.9	0.6
p-Cymene	0.4	1.3
β-Caryophyllene	4.4	12.4
Unknown sesquiterpene	1.2	8.9
Bornyl acetate	16.2	22.1
Bornyl and geranyl acetate	1.1	1.5
Geranyl acetate	31.1	8.0
p-Methoxy benzyl acetate	–	7.9
Carotol	–	1.9
Coumarins	11.9	14.8
Tarry material	16.6	11.6

tions exists in the presence of α-thujene in *Torilis leptophylla.*

The ester fractions of the oils, as eluted from the column with 2–10% diethyl ether in n-hexane was found to contain bornyl acetate and geranyl acetate as common components of the two oils while *p*-methoxy benzyl acetate was found to be an additional ester in the essential oil of *Torilis leptophylla.* The esters were separated into individual constituents by rechromatography on silica gel column, and identified by TLC and IR against their standard samples. Besides their identification by IR, the esters were also converted into their parent alcohols by hydrolysing with o.5*N* alcoholic KOH and the resulting products identified by IR comparison with their standard spectra.

Carotol was eluted from the column with 15% diethyl ether in n-haxane. It was identified by IR comparison with an authentic sample of this sesquiterpenic alcohol extracted from *Dacus carota* [2]. The only difference in the oxygenated components of the two oils lies in the presence of *p*-methoxy benzyl acetate and carotol in the essential oil of *Torilis leptophylla.*

Even though the essential oils of *Torilis japonica* and *Torilis leptophylla* possess good flavour yet their chance of being commercialized are not bright because of the low yield of the oils. However, the medicinal value of the species cannot be overlooked and in this respect our cultivation of the plants would prove useful.

Acknowledgements. We are grateful to the United States Department of Agriculture for financing this research under a PL-480 project and to Mr. Abdul Waheed Sabir, our Botanist for the identification and cultivation of the species.

REFERENCES

1. M. Ashraf and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **18**, 232, 236 (1975).
2. M. Ashraf, J. Aziz and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **20**, 103 (1977).