Pakistan J. Sci. Ind. Res., Vol. 30, No. 8, August 1987

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

Part LIII. The Essential Oil of *Bupleurum tenue* Buch Seed

Mushtaq Ahmad, Jamila R. Maqbool, A.W. Sabir and M.K. Bhatty

PCSIR Laboratories, Lahore-16

(Received June 10, 1987)

The essential oil of *Bupleurum tenue* Buch growing wild in Pakistan, has been characterized and studied with respect to its physico-chemical properties and chemical composition. The percentage composition of the oil as determined by column chromatography coupled with gas liquid chromatography of the hydrocarbons and the oxygenated components have been reported. The composition thus obtained is santene (8.70 %), *p*-cymene (1.81 %), β-phellendrene (2.11 %), camphene (3.95 %), α-pinene (1.68 %), α-thujene (1.97 %), limonene (2.99 %), geranyl acetate (9.78 %), citronellyl acetate (8.39 %), borneol (3.02 %), mixture of unknown hydroxy compounds and coumarins (22.80 %) and tarry matter (9.70 %).

Key words: Umbelliferae, essential oil, *Bupleurum tenue.*

INTRODUCTION

Bupleurum tenue belongs to the genus *Bupleurum* of the family Umbellifereae. *B. tenue* has been found growing in Abbotabad District, NWFP. The plants are usually perennial or annual herbs. The genus *Bupleurum* has 150 species of which only 20 species including *Bupleurum tenue* have been found in Pakistan. This genus have been reported to grow mostly in the temperate regions of Europe and Asia. *B. tenue* grows wild along with the road side-sand on the grassy slopes [1]. The plant material for our studies was collected at mature and immature fruiting stages.

Although, no literature has been cited on the medicinal importance of *B. tenue,* but there are few species of *Bupleurum* which have proved to be successful for the cure of certain stomach and liver ailments [2,3,4]. Therefore, the physiological studies of the essential oil of *B. tenue* will have to be evaluated for determining the medicinal importance of the oil.

The present work aims at the study of the physico-chemical characteristics and the chemical composition of the essential oil of the seeds of *B. tenue* especially of Pakistani variety.

MATERIALS AND METHODS

The essential oil of *B. tenue* from crushed seeds was recovered by dry steam distillation [5]. The essential oil of *B. tenue,* with an yield of 0.24 % was studied with respect to its physico-chemical properties according to the procedures reported in the literature [6].

The essential oil was subjected to fractionation by column chromatography using silica gel as an adsorbent. The hydrocarbon fraction of the oil was eluted with *n*-hexane and further resolved into individual components by GLC. The oxygenated components of the oil were eluted with different ratios of *n*-hexane and diethyl ether and were identified by TLC, GLC and IR by the methods described in our previous papers [6,7].

RESULTS

The percentage yield, physico-chemical values and the chemical composition of the essential oils of the seeds of *B. tenue* are presented in Tables 1 and 2.

Table 1. Percentage yield and physico-chemical values of the essential oil of the seed of *B. tenue.*

Yield	0.24%
Specific gravity	0.8007^{18} *
Refractive index	1.5202^{18} *
Acid value	15.23
Ester value	18.67

*The subscripts indicate the temperature at which these parameters were determined.

Table 2. Percentage Composition of the Essential oil of seed of *B. tenue bunch.*

Eluents	Components	Column/GC percentage
n-Hexane	Santene	8.70
	p-Cymene	1.81
	β-Phellandrene	2.11
	Camphene	3.95
	α-Pinene	1.68
	α-Thujene	1.97
	Limonene	2.99
2 % Diethyl ether in hexane	Geranyl acetate	9.78
	Citronellyl acetate	8.39
10-15 % Diethyl ether in *n*-hexane	Borneol	3.02
	α-Terpeneol	21.02
	Buplerol	2.08
5 % Ethanol in diethyl ether	Mixture of unknown hydroxy compounds and coumarins	22.80
100 % Alcohol	Tarry matter	9.70

DISCUSSION

The essential oil of *B. tenue* seed having acceptably sweet smell with an yield of 0.24 % has been studied with respect to its physico-chemical properties and chemical composition.

The hydrocarbon fraction (23.21 %) of the essential oil of *B. tenue* was obtained by the elution of the column with *n*-hexane, and it consisted of santene (8.70 %) *p*-cymene (1.81 %), β-phellandrene (2.11 %), (3.95 %), α-thujene (1.97 %) camphene α-pinene (1.68 %) and limonene (2.99 %). The oxygenated components of the oil were eluted with different ratios of *n*-hexane and diethyl ether. Thin layer chromatography was used for further separation of the oxygenated fractions and the resultant individual components were identified by GLC, IR and by preparing their known derivatives. The oxygenated constituents (44.29 %) recovered and identified were geranyl acetate(9.78 %), citronellyl acetate (8.39 %), borneol (3.02 %), α-terpeneol (21.02 %), buplerol (2.08 %); the mixture of the unknown hydroxy compounds and coumarins was 22.80 % [8].

The essential oil of *B. tenue* has a composition comparable to *B. stewartianum* [9]. The hydrocarbon fractions of the two species are composed of almost identical constituents but different in proportions; the only difference in these fractions exists in the presence of terpinene and myrsene in *B. stewartianum.* The ester fraction of the oil was identical in composition. Buplerol was eluted from the column in the case of *B. tenue.*

The essential oil of *B. tenue* is pleasant to smell on the basis of which it can find application in perfumery. However, the medicinal value of the species cannot be overlooked.

Acknowledgement. The authors are grateful to the Pakistan Science Foundation for financing this research programmes under grant No. PCSIR/Chem. 151.

REFERENCES

1. E. Nasir, *Flora of West Pakistan,* No. 20, Umbelliferae Stewart Herbarium (Gorden College, Rawalpindi, 1972), pp. 55.
2. V.H. Heywood, Bot. J. Soc., **64**, 396 (1971).
3. R.N. Chopra, S.L. Nayar and I.C. Chopra, Counc. Sci. Ind. Res., New Delhi, p. 42 (1956).
4. K.R. Kirtikar, and B.D. Basu, *Indian Medicinal Plants* (Lalit Mohan Basu, M.B., Allahabad 1935), Vol. II, pp. 1197.
5. E. Guenther *The Essential Oils* (Van Nostrand, New York, N.Y., 1948), Vol. I, pp. 263.
6. M. Ashraf and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **18**, 232 (1975).
7. M. Ahmad, S. Mahmud, A.W. Sabir and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **29**, 265 (1986).
8. M.K. Bhatty, M. Ahmad and A.W. Sabir, First Annual Report of the Essential Oils of the Species of Umbelliferae of Pakistan , research conducted under PSF Grant No. PCSIR/Chem. 151.
9. M. Ahmad, J.R. Maqbool, A.W. Sabir and M.K. Bhatty, Pakistan J. Sci. Ind. Res. (in press).