

**STUDIES ON THE ESSENTIAL OILS OF THE PAKISTANI SPECIES OF  
THE FAMILY UMBELLIFERAE**  
Part XXX. *Ammi majus* Seed Oil

MUHAMMAD ASHRAF, RAFI AHMAD and MUHAMMAD KHURSHID BHATTY

*PCSIR Laboratories, Lahore*

(Received March 20, 1979)

**Abstract.** The essential oil of the *Ammi majus* seed cultivated in Pakistan has been examined for its quality and chemical composition for the first time. The percentage composition of the oil is: high boiling hydrocarbons (1.34%), *dl*-piperitone (10%), an unsaturated cyclic terpenic alcohol (15%) and a mixture of furocoumarins (60%). The furocoumarins fraction is composed of xanthotoxin, bergaptene, imperatorin, *iso*imperatorin and *isop*pimpinellin of which xanthotoxin is the major component. The species is quite valuable for the treatment of leucoderma.

### Introduction

*Ammi majus* is described from Europe and has distribution in Asia, North Africa, Middle East and North and South America. It grows wild in Pakistan in the Mianwali District of the Punjab Province and Abbottabad, Hazara and Peshawar in the North West Frontier Province. It has been reported to be a species introduced to the country from outside.<sup>1</sup> *A. majus* has been cultivated in the experimental fields of these Laboratories for the first time and the experiment proved quite successful. The yield of the seed has been found to be half a ton per acre.

The medicinal value of this plant has been described in old Arabic literature.<sup>2</sup> Its seed have long been used, especially by Egyptians, for the treatment of leucoderma. However, its importance has not yet received due attention in Pakistan.

The present studies have been carried out because even though an extensive work has been reported on the furocoumarins<sup>3-7</sup> extracted from the seed of this species yet little is known about the nature of its essential oil. This communication, therefore, sums up the results of chromatographic and chemical investigation on the essential oil of the *Ammi majus* seed.

### Experimental

**Materials and Methods.** Fresh seeds of the *Ammi majus* cultivated in Lahore, were used for the recovery of the essential oil by dry steam distillation.<sup>8</sup> The yield of the oil is 0.08% only. The general methods employed for these studies have been described in Parts I and II of this series.<sup>8</sup> In addition, a Beckman DB spectrophotometer was used to record ultraviolet spectra of furocoumarins.

The essential oil of the *Ammi majus*, especially its water soluble fraction contained furocoumarins mainly. The furocoumarins were isolated from the oil and resolved into individual constituents by column chromatography coupled with preparative TLC according to the methods described by earlier workers.<sup>3-7</sup> The identification of the furocoumarins was carried out by m.p. TLC and UV comparison with their standard samples.

Both the essential oil and the water-cobobation oil were mixed together and resolved by column chromatography using activated alumina as an adsorbent.

### Results

The systems of elution of the column and the chemical composition of the essential oil as determined by column chromatography are shown in Table 1. Figs. 1-6 show the UV-spectra of furocoumarins extracted from the essential oil of *Ammi majus* seeds.

TABLE 1. PERCENTAGE COMPOSITION OF THE  
ESSENTIAL OIL OF *Ammi majus* SEED.

Solvents used	Component	Percentage
n-Hexane	Hydrocarbons	1.34
5-10% Diethyl ether in n-hexane	<i>dl</i> -Piperitone	10.00
	Unsaturated cyclic terpenic alcohol	15.00
10-20% Diethyl ether in n-hexane	Xanthotoxin	15.00
50% Ethanol in benzene	Furocoumarins	50.00
	Unrecovered material	8.66

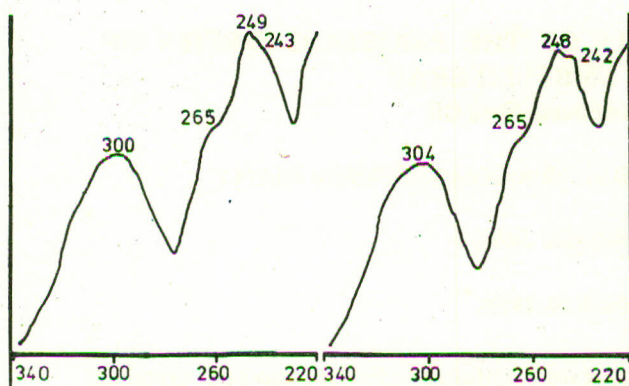


Fig. 1 Xanthotoxin.

Fig. 2. Imperatorin.

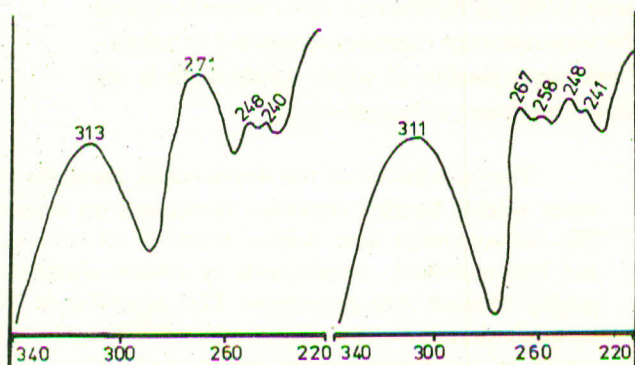


Fig. 3. Isopimpinellin.

Fig. 4. Bergaptene.

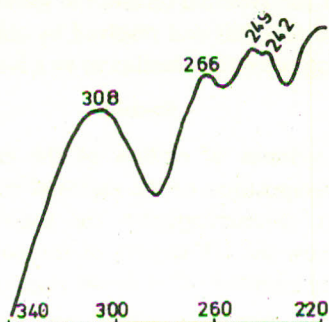


Fig. 5. Isoimperatorin.

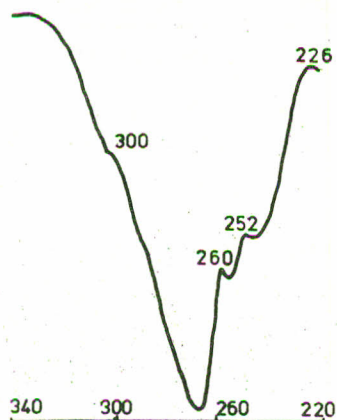


Fig. 6. Marmesin.

## Discussion

The essential oil of the *Ammi majus* seed possesses brownish colour, unpleasant smell and bitter taste. The hydrocarbons content of the oil was left unresolved because of its very small amount in the oil. It appeared fluorescent under UV-light indicating the presence of some hydrocarbons with conjugated double bonds.

The oxygenated fraction of the oil consisted of two types of compounds, namely cyclic terpene compounds and furocoumarins.

In terpenic compounds, *dl*-piperitone was identified by TLC and IR comparison but the alcohol with IR: (3.0, 3.5, 6.1, 6.9, 7.3, 9.1, 9.6, 10.0, 11.3, 12.2 nm) requires further work to establish its identification.

The furocoumarin fraction consisted of xanthotoxin, bergaptene, imperatorin, *iso*imperatorin and *isopimpinellin*. It contained xanthotoxin as the major constituent while the amount of *iso*imperatorin was very small as compared with the other components. This fraction also contained two more unidentified coumarins in traces. All the furocoumarins were separated and identified according to the methods reported in literature<sup>3-7</sup> and their presence are in good agreement with the earlier reports.

In the light of the present studies, it can be concluded that the essential oil of *Ammi majus* seed may not possess commercial importance because of its very poor yield. However, pharmaceutical importance of the seed which contains about 2.8% of furocoumarins of the total material may indeed be high. The value of the seed as a medicine needs to be closely examined and from this standpoint our successful cultivation of the plant will prove quite useful.

Further, it could be added that xanthotoxin, the major component of the oil, is probably the active compound for the treatment of leucoderma, has been shown medical acceptance. It is however, surprising to note that xanthotoxin could be carcinogenic under certain conditions.<sup>7</sup> There are several publications on *Ammi majus* by Egyptian workers and the seeds of this plant have long been used by the people of this country for the treatment of Leucoderma but they have never mentioned any carcinogenic effect of xanthotoxin. Chopra<sup>9</sup> has also reported that leucoderma could be cured by the oral administration of an extract made from *Ammi majus* seed and subsequent exposure to sunlight.

**Acknowledgement.** 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 procurement and plantation of the species for these studies.

We are also thankful to Mr. Iftikhar Ahmad, SRO for recording UV spectra for this work.

### References

1. E. Nasir and S.I. Ali, *Flora of West Pakistan, No. 20 Umbelliferae* (Stewart Herbarium, Gordon College, Rawalpindi, 1972).
2. Dawood El-Antake, *Tazkarat Oli El-Albad*, (1923). 3rd ed., vol. I, p. 32.
3. A. Schoenberg and Ali Sina, *Nature*, **161**, 481 (1948). and *J. Am. Chem. Soc.*, **72**, 4826 (1956).
4. Nicolas A. Starkowsky and Nasry Badran, *J. Org. Chem.*, **23**, 1818 (1958).
5. Elena Tarpo, O. Contz and Marcela Gheoghiu, *Farmacie* **13**, 6, 331 (1965), *Farmacie* **14**, 8, 473 (1966).
6. Effat A. Abu-Mustafa and M.B.E. Fayaz, *J. Org. Chem.*, **26**, 161 (1962), and *Nature*, **182**, 54 (1958).
7. Mervin. E. Brokke and Bert E. Christerisen, *J. Org. Chem.*, **23**, 589 (1958).
8. M. Ashraf and M.K. Bhatti, *Pakistan J. Sci. Ind. Res.*, **18**, 232 (1975).
9. R.N. Chopra, *Indigenous Drugs of India* (1958). 2nd ed., p. 9.