

## VOLATILE CONSTITUENTS OF A MEDICINAL PLANT OF IRAN, *ECHIUM AMOENUM* FISCH. AND C.A. MEY

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### ABSTRACT

*Echium amoenum* Fisch. & C.A. Mey. (Boraginaceae) is an endemic Iranian plant, that its dry violet–blue petals has long been used in traditional medicine of Iran.

The chemical composition of the volatile fraction of the dried petals of this plant which was isolated by steam distillation extraction with pentane (in yield of 0.05%) was examined by GC-MS. The constituents were identified by their mass spectra and Kovats' indices. The major components except aliphatic alkanes which belong to sesquiterpenes were:  $\beta$ -cadinene (24.25%), viridiflorol (4.9%),  $\alpha$ -muurolene (4.52%), ledene (3.8%),  $\alpha$ -calacorene (3.04%), and  $\alpha$ -cadinene (2.9%).

**Keywords:** *Echium amoenum*, Boraginaceae,  $\beta$ -Cadinene, Viridiflorol

### INTRODUCTION

*Echium* genus has 4 species in Iran (1). *Echium amoenum* Fisch. & C.A. Mey. (Boraginaceae) is a biennial or perennial herb indigenous to the narrow zone of northern part of Iran and Caucasus, where it grows at an altitude ranging from 60-2200 m (2). Its dry violet–blue petals has long been used as tonic, tranquillizer, diaphoretic, cough suppressant and a remedy for sore throat and pneumonia in traditional medicine of Iran (3,4). A search through the literature revealed that *E. amoenum* has the capacity of increasing the cellular immune response (5) and there is only one brief report about its chemical constituents (13% anthocyanidine, 0.15% flavonoid aglycons and trace amount of alkaloid) (6). Because the decoct of its dry petals in folk medicine has a special odor, we tried to identify the volatile oil components of *E. amoenum* petals.

### MATERIALS AND METHODS

#### *Plant Material*

Petals of *E. amoenum* were collected from a farm at 80 km north of Ghazvin in June 2000. Voucher specimens were authenticated and then deposited in Herbarium of the Department of Pharmacognosy, Faculty of Pharmacy, Isfahan University of Medical Sciences, Isfahan, Iran.

#### *Isolation of the oil*

Since other routine methods were not successful, the air-dried petals were subjected to steam distillation extraction with pentane by the use of SDE apparatus for 4 h (7).

The pentanelic extract was subsequently dried over anhydrous sodium sulfate and concentrated under nitrogen gas.

#### *GC/MS Analysis*

The oil was analyzed on a Hewlett-Packard 6800 mass selective detector coupled with a Hewlett-Packard 6800 gas chromatograph, equipped with a HP5-MS capillary column (30 m  $\times$  0.25 mm; film thickness 0.25  $\mu$ m).

The oven temperature was programmed from 60°C to 280°C at 4°C/min. The carrier gas was helium with a flow rate of 2 ml/min. Injector temperature was 280°C. The MS operating parameters were: ionization voltage of 70 eV; and ion source temperature of 200°C. Identification of components of the oil was based on their retention indices relative to *n*-alkanes and computer matching with the WILEY275.L library, as well as comparing their spectra with those reported in the literature (8,9). The relative percentage of the oil constituents was calculated from GC peak areas.

**Table 1.** Percentage composition of the oil of *Echium amoenum* Fisch. & C.A. Mey.

No.	Compound	Percentage	RI
1	n-Decane	0.11	991
2	Undecane	0.22	1091
3	Dodecane	0.23	1191
4	n-Decanal	0.47	1198
5	Unidentified	2.49	1235
6	Tridecane	0.51	1292
7	Unidentified	3.85	1371
8	̂-Caryophyllene	2.18	1391
9	Tetradecane	0.65	1394
10	Alloaromadendrene	0.68	1430
11	̂-Amorphene	1.87	1453
12	Ledene	3.80	1473
13	̂-Muurolene	4.52	1482
14	Pentadecane	5.59	1490
15	̂-Cadinene	2.90	1495
16	Unidentified	0.8	1499
17	̂-Cadinene	24.25	1511
18	Unidentified	1.55	1525
19	̂-Calacorene	3.04	1529
20	Spatullenol	1.41	1568
21	Viridiflorol	4.90	1581
22	Hexadecane	8.71	1608
23	Unidentified	8.37	1643
24	Unidentified	8.84	1678
25	Heptadecane	4.70	1712
26	Octadecane	3.36	1814
		100	

RI=Retention indices on HP<sub>5</sub>-MS capillary column

## RESULTS AND DISCUSSTION

The petals of *E. amoenum* yielded 0.05% of a clear lemon-yellow volatile oil with a strong special odor.

Twenty-six components were detected in the oil of *E. amoenum*; of which twenty compounds representing 74.10% of the volatile oil were characterized. The identified components and their percentage are given in table 1, where the components are listed in the order of their elution on the HP<sub>5</sub>-MS column. The major components, except aliphatic alkanes, which belong to sesquiterpenes, are ̂-cadinene (24.25%), viridiflorol (4.9%), ̂-muurolene (4.52%), ledene (3.8%), ̂-calacorene (3.04%), ̂-cadinene (2.9%). As it can be concluded from the table, the oil of *E. amoenum* is characterized by a high content of sesquiterpenes (49.55%).

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