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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 10 (16): 2775-2777, 2007
ISSN 1028-8880

Chemical Compositions of the Essential Oils of Stems, Leaves and Flowers of *Prangos acaulis* (Dc) *Bornm*

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Abstract: Chemical composition of the essential oils obtained of stems, leaves and flowers of the *Prangos acaulis*, at full flowering stage were isolated by hydrodistilation method and investigated by GC/MS. A total of 11 compounds constituting 100% of stems oil, eighteen compounds constituting 99.74% of leaves oil and 22 compounds constituting 98.18% of flowers oil have been identified and quantified. The major components of stems oil were 3-ethylidene-2-methyl-1-hexen-4-yne (56.8%) and α-pinene (34.2%). The major components of leaves oil were α-pinene (39.54%), 3-ethylidene-2-methyl-1-hexen-4-yne (37.94%) and α-terpinene (10.9%) and the major components of flowers oil were α-pinene (25.04%), 3-ethylidene-2-methyl-1-hexen-4-yne (23.51%), α-terpinene (17.26%) and limonene (13.64%).

Key words: *Prangos acaulis*, essential oil, GC/MS

INTRODUCTION

Essential oils represent a small fraction of the composition of plants but confer the characteristics for which aromatic plants are used in the pharmaceutical, food and fragrance industries. Essential oils have a complex composition, containing from a few dozen to several hundred constituents, especially hydrocarbons (terpenes and sesquiterpenes). Both hydrocarbons and oxygenated compounds are responsible for the characteristic odors and flavors (Doneanu and Anitesscu, 1998).

The genus *Prangos acaulis* belongs to the Umbelliferae family consists of about 30 species (Evans, 1989). It is herbaceous and perennial and grows up to 1 m high; it is widespread in Iran to India (Zargari, 1988). Fifteen species of the genus *Prangos* are found in Iran, among which five are endemic: *P. gaubae*, *P. crossoptera*, *P. tuberculata*, *P. cheilanthifolia* and *P. cattigonoides* (Mozaffarian, 1996). The Persian name of the plant is Joshire Kotolei. Some *Prangos* species have been used in the folk medicine as emollient, carminative (Zargari, 1988), antifungal (Ozcan, 1999), antioxidant (Mavi *et al*., 2004), Anti bacterial, cytokine, release inhibitor (Tada *et al*., 2002), anti-HIV (Shikishima *et al*., 2001a), tonic, anti flatulent, anti helmintic (Baser *et al*., 2000a; Ulubelen *et al*., 1995).

In this study, hydro-distilled volatile oils from crushed dry stems, leaves and flowers of *Prangos acaulis* were isolation and analyzed with GC/MS.

MATERIALS AND METHODS

Plant materials: The fresh plant of *Prangos acillus* (Family Umbelliferae) were collected during full flowering stage from of altitude 600 m Zagros Mountain in the Lorestan state, west of Iran, in July 2006. The plant was identified and authenticated by Dr. H. Amiri at the Department of Biology University of Lorestan. Voucher specimens were deposited in the Herbarium of Research Institute of Forest and Rangeland Tehran.

Isolation of essential oil: The air-dried stems, leaves and flowers (50 g) of the plant were subjected to hydro distillation for 4 h in a Clevenger-type apparatus to produce the oils. Were dried over anhydrous sodium sulphate. The air-dried stems, leaves and flowers of the plant yielded 0.18, 0.25 and 0.38% (w/w) oil, respectively.

Analyses of oil: GC-FID analyses of the oil were conducted using a Thermoquest-Finnigan instrument equipped with a DB-1 fused silica column (60 m×0.25 mm i.d., film thickness 0.25 μm). Nitrogen was used as the carrier gas at the constant flow of 1.1 mL min^{-1}. The oven temperature was raised from 60 to 250°C at a rate of 5°C min^{-1}. The injector and detector (FID) temperatures were kept at 250 and 280°C, respectively. GC-MS analysis was carried out on a Thermoquest-Finnigan Trace GC-MS instrument equipped with the same column and temperature programming as mentioned for GC.

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Transfer line temperature was 250°C. Helium was used as the carrier gas at a flow rate of 1.1 mL min^{-1} with a split ratio equal to 1/50.

The constituents of the volatile oils were identified by calculation of their retention indices (Gonzales and Nardillo, 1999) under temperature-programmed conditions for n-alkanes (C_6-C_{24}) and the oil on a DB-1 column under the same conditions. Identification of individual compounds was made by comparison of their mass spectra with those of the internal reference mass spectra library (Wiley 7.0) or with authentic compounds and confirmed by comparison of their retention indices with authentic compounds or with those of reported in the literature (Adams, 1995). Quantitative data was obtained from FID area percentages without the use of correction factors.

RESULTS

Table 1 presents the list of compounds identified in the oils. As can be seen, the major components which were determined in the stems oil are 3-ethylidene-2-methyl-1-hexen-4-yne (56.8%) and α-pinene (34.2%). The major components of leaves oil were α -pinene (39.54%) and 3-ethylidene-2-methyl-1-hexen-4-yne (37.94%) α-terpinene (10.9%). The major components of flowers oil were α-pinene (35.4%), 3-ethylidene-2-methyl-1-hexen-4-yne (23.51%), α -terpinene (17.26%) and limonene (13.64%).

Table 1: Percentage composition of oils from stems, leaves and roots of *Prangos acaulis*

Compound	RI *	Flowers	Leaves	Stems
α-pinene	935	25.04	39.54	34.2
Camphene	952	tr	tr	_
Sabinene	970	0.11	tr	_
β-pinene	977	2.47	0.21	0.3
Myrcene	982	5.35	1.52	0.2
Z-2-Nonen-4-yne	985	_	0.23	2.4
α-phellandrene	1002	6.94	3.29	0.3
α-terpinene	1012	17.26	10.9	3.4
p-cymene	1015	0.17	tr	-
Limonene	1027	13.64	5.21	1.1
Z-β-ocimene	1035	0.22	0.18	_
γ-terpinene	1050	tr	tr	_
3-ethylidene-2-methyl-1-hexen-4-yne	1061	23.51	37.94	56.8
o-methyl styrene	1070	tr	tr	0.1
α-terpinolene	1082	3.22	0.72	0.5
m-methyl styrene	1104	0.1	tr	0.7
Verbenol	1130	tr	_	_
Citronellol	1200	tr	_	_
Bornyl acetate	1265	tr	_	_
β-caryophyllene	1418	0.12	tr	_
α-humulene	1451	tr	_	_
Ar-curcumene	1465	tr	_	_
Germacrene D	1475	tr	tr	_
Total percentage		98.15	99.74	100

tr = trace<0.1%, *Retention index identification was achieved using retention times and retention indices on a DB-1 capillary Colum

DISCUSSION

According to the GC mass analysis a total of 23 compounds were identified in stems, leaves and flowers, together. As can be seen, between stems, leaves and flowers, four compounds are similar with high percentage than other compounds however with various quantities. Limonene (13.64%) and α –terpinene (17.26%) were had high percentage in flowers oil, α-pinene (39.54) was had high percentage in leaves oil and 3-ethylidene-2-methyl-1-hexen-4-yne (56.8%) was had high percentage in stems oil (Fig. 1). The oil composition of some *Prangos* species has been the subject of several investigations (Ozcan *et al*., 2000; Shikishima *et al*., 2001b; Sefidkon and Navii, 2001; Baser *et al*., 2000b; Mazloomifar *et al*., 2004; Sajjadi and Mehregan, 2003; Masoudi *et al*., 1999; Baser *et al*., 1996). A comparison of the chemical composition different parts of *Prangos acaulis* with previous studies on volatile oils of other species showed variation of the major components. α-Pinene is the main constituent of oils of fruits of *P. uloptera* (41.9%) and *P. ferulacea* (16.7%) (Mazloomifar *et al*., 2004; Masoudi *et al*., 1999). The previous study on volatile oils of leaves and stems of *P. latiloba* (Sajjadi and Mehregan, 2003) Showed that the main constituents are a-pinene (25.1%), limonene (16.1%) and myrcene (9.51%). The published reports of essential oils in other members of *Prangos* show that α-pinene is a major compound in *Prangos*. However, according to the results of our study on volatile oils of stems, leaves and flowers, 3-ethylidene-2-methyl-1-hexen-4-yne and α-pinene with variation percentage are the major components of different parts of *Prangos acaulis*.

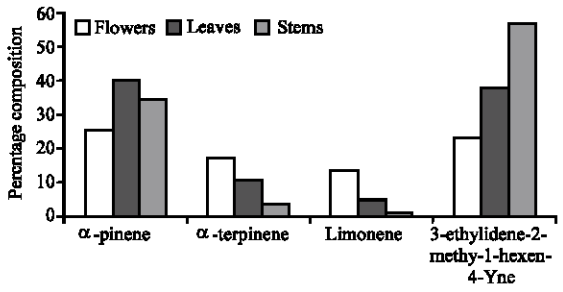

Fig. 1: Show percentage similar composition in different part of *Prangos acaulis*

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