INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2006/08–1–45–46
http://www.fspublishers.org

Essential Oils of Qare-Qat (*Vaccinium arctostaphylos)* Shoots and Chemical Composition of Berries

SHAHRAM SEDAGHATHOOR[1], A.K. KASHI†, A.R. TALAEI AND A. KHALIGHI
PhD of Horticulture, Islamic Azad University, Science and Research Branch, Tehran (Scientific member of Islamic Azad University, Rasht Branch, Rasht, Iran)
†*Department of Horticulture, Tehran University, Iran*
[1]Corresponding aurhor's e-mail: Sedaghathoor@yahoo.com

ABSTRACT

Qare-Qat or Iranian *Vaccinium (V.arctostaphylos L.)* is a shrub that grows in the north of Iran. The fruits of Qare-Qat were collected from natural habitats and examined for chemical composition such as minerals. The results showed that the ripe fruit of *V.arctostaphylos L.* had 30.6% sugars, 15.5% protein, 1.5% total fat and 2% soluble solids. Dry matter, nitrogen and calcium contents of fruits were 22.3%, 2.5% and 1.4%, respectively. Furthermore, about twelve compounds were identified as essential oil components of shoots of this plant. The major volatiles present in *Vaccinium arctostaphylos L.* shoots were hexadecanoic acid (27.0%), vitispirane (6.5%), *Beta*-ionone (5.9%) and sandaracopimaradiene (4.8%).

Key Words: *Vaccinium arctostaphylos L.;* Chemical composition; Essential oils

INTRODUCTION

Iranian *Vaccinium* or Qare-Qat (*Vaccinium arctostaphylos L.*) is a perennial and deciduous plant, which grows as a shrub or woody bush in the northern mountains of Iran. The berries and leaves of the plant are used as diabetes treatment and blood pressure as well (Amin, 1991; Akhondzadeh, 2000). Nickavar (2001) has studied some chemical traits and essential oils of flowering shoots of Qare-Qat and reported 26 volatile compounds. His phytochemical study showed the ripe berries contain three major anthocyanins. Essential oils and antocyanins of foliage and fruits of the plant have recognized it as an important medicinal plant (Amin, 1991; Nickavar, 2001). Ayaz *et al*. (2001) studied effect of fruit maturation on sugar and organic acid composition in two blueberries such as *V. arctostaphylos* in Turkey. Present study was carried out to identify essential oils in shoots and chemical composition of Qare-Qat berries.

MATERIALS AND METHODS

Shoots of Qare-Qat were collected from its habitat (Asalem Mountains). Fresh material was dried and 72 g of dried material was chopped, macerated and subjected to water distillation in a Clevenger type apparatus for 4 h. Analysis of obtained essence was carried out using GC-MS (Mirza *et al*., 1996). 2 µl essence was injected in GC-MS. The instrument was temperature programmed from 60ºC to 220ºC at 6ºC min^{-1}. Injector temperature was 250ºC. The carrier gas was helium and a Hewlett Packard GC 6890, coupled to Hewlett Packard mass spectrometry 5973, using ionization energy 70 eV, obtained the GC mass spectral data.

Qare-Qat berries were collected from Talesh Mountains at ripening stage. Chemical composition of berries was determined on the basis of procedure suggested by Emami (1996) and Ghazanshahi (1997). In this experiment total sugars, protein, fat, soluble solids, dry matter, nitrogen and calcium contents of fruits were measured.

RESULTS AND DISCUSSION

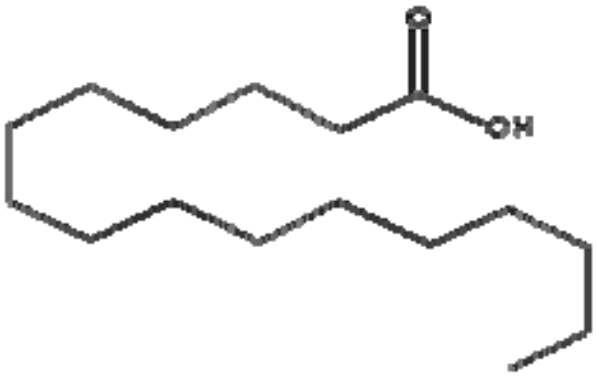
Yield of essential oil obtained by water distillation from shoots of *V. arctostaphylos L.* was low (about 0.01%). The preliminary GC analysis showed the presence of 23 components (Fig. 1), of which 12 compounds were identified (Table I) using their retention time, measuring Kovats indices and comparison of mass spectral data of each component with standard MS data. Nickavar (2001) identified 26 compounds in flowering shoots of Qare-Qat, of which some components (including vitispirane & Beta-ionone) were same with our results. Of course, samples and habitats of plants in two experiments were different. Plants are able to produce different secondary metabolites in different geographical areas (Ardakani *et al.*, 2003).

As shown in Table I, hexadecanoic acid (27.0%), vitispirane (6.5%), Beta-ionone (5.9%) and sandaracopimaradiene (4.8%) were recognized as major components of Qare-Qat shoot volatiles. Hexadecanoic acid [CH_3 $(CH_2)_{14}COOH$] is an unesterified fatty acid. Ionone is used in perfumery, flavoring, and vitamin A (retinol) production for cosmetics and toiletries (Annonymous, 2004). Delta-3-Carene is a bicyclic monoterpene that has not oxygen. Sandaracopimaradiene is a diterpene, which exhibits significant antimicrobial activity against several bacteria and fungi (Van Puyveldevan *et al*., 1986).

The results of chemical analysis of Qare-Qat berries are shown in Table II. Ayaz *et al.* (2001) found that the soluble sugars fructose, glucose and sucrose and the sugar alcohol inositol exist in *V. arctostaphylos* berries. It is widely accepted that fruits play an important role in human nutrition. While they contribute relatively little to protein and dry matter requirements of the human diet, they are rich

Table I. Compounds identified in essential oil of Qare-Qat and their Kovats indices

Compound	Retention Time	Kovat's indices	Percent
2-Cyclopenten-1-one, 4-acetyl - 1,2,3,5,5-pentamethyl	11.37	1164.96	0.58
6- Octen-1-ol, 3,7, dimetyl acetate	11.48	1169	1.37
Delta- 3-Carene	11.99	1188	0.41
Vitispirane	12.45	1204	6.54
Naphthalene, 1,2-dihydro-1,5,8-trimethyl	13.75	1252	0.79
1,3-Diacetylbenzene	15.02	1300	2.46
Beta-Ionone	15.87	1333	5.89
2-Pentadecanone	20.83	1532	1.99
Sandaracopimaradiene	22.31	1594	4.83
Hexadecanoic acid	22.43	1600	27.06
Eicosane, 2,6,10,14,18-pentamethyl	22.72	1613	0.78
Isopimaradiene	22.91	1621	1.02



Hexadecanoic acid

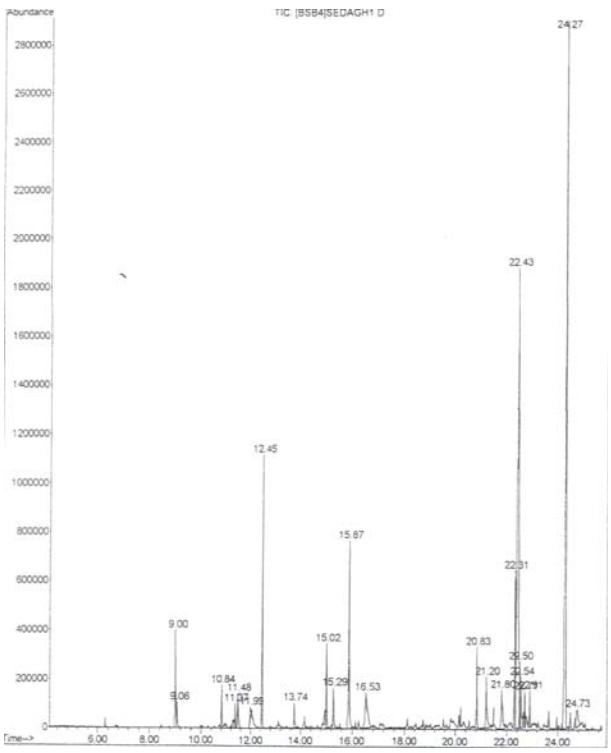
in both essential nutrients and phytonutrients (Kalt, 2001). Since, according to Nickavar (2001), Qare-Qat berries have some anthocyanins, and therefore they are beneficial to human health. Furthermore the berries have minerals and other important compositions (Table II) alike other fruits that all require to favorable human diet.

The medicinal properties and biological activities of plants are usually due to their chemical profile. The information on essential oil profile can be used for the possible exploitation of this species for various research and pharmaceutical purposes. Moreover, the chemical data may give complementary information to the taxonomy of this species.The variation in the oil composition of Qare-Qat shoot oils obtained from plants collected at different growth phase and from different locations (difference between this experiment and Nickavar (2001) results) may be due to a number of reasons.

Table II. Chemical composition of fresh berries of Qare-Qat

Component	G /100 g fresh berries
Total sugar	30.6
Total fat	1.5
Protein	15.5
Soluble solids	2
Dry matter	22.3
Nitrogen	2.5
Calcium	1.4

Fig. 1. Chromatogram of Qare-Qat shoots essential oil



REFERENCES

Akhondzadeh, Sh., 2000. *Encyclopedia of Iranian medicinal plants,* P. 144. Institute of Medicinal Plants, Arjomand press

Amin, Gh., 1991. *Popular medicinal plants of Iran,* P. 235. Iranian medicinal plants Research Institute

Anonymous, 2004. *Beta-Ionone*. http://www.chemicalland 21.comarokorhi/index.html

Ardakani, M.S., M. Mosaddegh and A.R. Shafaati, 2003. Volatile constituents from the aerial parts of *Verbena officinalis* L. *Iranian J. Pharma. Res.*, 39–42

Ayaz, F.A., A. Kadioglu, E. Bertoft, C. Acar and I. Turna, 2001. Effect of fruit maturation on sugar and organic acid composition in two blueberries (*Vaccinium arctostaphylos & V. myrtillus)* native to Turkey. *New Zealand J. of Crop and Hort. Sci*., 29: 137–41

Emami, A., 1996. *Plant analysis methods,* p. 128. Soil and Water Research Institute press

Ghazanshahi, J., 1997. *Soil and plant analysis,* p. 311. Motarjem press

Kalt, W., 2001. Health functional phytochemicals of fruit. *In*: Janick, J. (ed.), *Horticulture review*, Vol 27. P. 269–315. John Wiley & Sons, Inc New York

Mirza, M., F. Sefidcon and L. Ahmadi, 1996. *Natural essence extracting, identification and applications*. P. 205. Research Institute of Forests and Rangelands of Tehran

Nickavar, B., 2001. Study on pharmacognosy and biological effects of Qareqat plant. *PhD Thesis*. Department of Pharmacognosy, School of Pharmacy, Tehran University of Medical Sciences

Van Puyveldevan, L., S. Nyirankuliza, R. Panebianco, Y. Bioly, I. Geizer, B. Sebikali, N. de Kimpe and N. Schamp. 1986. Active principles of Tetradenia riparia. I. Antimicrobial activity of 8(14), 15-sandaracopimaradiene-7 alpha, 18-diol. *J. Ethnopharmacol*., 17: 269–75

(Received 01 September 2005; Accepted 20 November 2005)