Comparison of the Main Essential Oil Components of Different Species of Satureja from Iran: A Review

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Abstract

The genus Satureja is belong to family Lamiaceae and presents fourteen aromatic species in Iran which eight of them are endemic. Their essential oils include different amounts of active substances such as carvacrol and thymol. The subject of this review is comparison of the main essential oil components of different species of Satureja grown under different conditions in Iran such as S. hortensis, S. bachtiarica, S. khuzistanica, S. mutica, S. rechingeri, S. sahendica S. S. spicigera, S. atropatana, S. isophylla, S. edmond and S. kallarica. Main components of the essential oils could be markedly influenced by the genotype, environment and method of oil isolation.

Keywords: Lamiaceae, Medicinal plants, Carvacrol, Volatile oil, GC-MS

Introduction

The use of traditional herbs and medicinal plants has recently become very popular because of their natural products with biological activities. Plants are now one of the important sources of new pharmaceuticals and healthcare products (Mulabagal and Tsay, 2011). Medicinal and aromatic plants are used by 70% to 80% of global population for their medicinal effects (WHO, 2008).

Satureja belonging to family Lamiaceae (Labiatae) comprises approximately 200 species with wide distribution in the Mediterranean area, Asia and boreal America (Senatore et al., 1998). The genus Satureja presents 14 aromatic species in Iran which eight of them are endemic (Sefidkon and Jamzad, 2006) which can use as flavouring agents or because of medicinal properties. These characteristics can be due to their essential oils that include different amounts of active substances such as carvacrol and thymol (Hadian et al., 2011).

There are several properties related to active components of Satureja such as antibacterial and antifungal activities (Behravan et al., 2004; Vagionas et al., 2007) and antioxidant property (Eminagaoglu et al., 2007). Researchers indicated that the oils are natural larvicidal substances (Michaellakis et al., 2007). The antiviral activity of Satureja essential oils against HIV (Yamasaki et al., 1998) and improvement of fertility (Haeri et al., 2006) has been reported.

The subject of this review is comparison of the main essential oil components of different species of Satureja grown under different conditions in Iran.

Main Oil Constituents

Aerial parts of S. bachtiarica, S. khuzistanica, S. mutica and S. rechingeri from the state of Esfahan, Lorestan, Khorasan and Ilam, respectively, were collected by Hadian et al. (2011) from the wild growing plants at the full flowering stage. The main oil constituents of S. bachtiarica were thymol (28.0%), caryophyllene oxide (17.0%), carvacrol (13.2%), borneol (11.6%), linalool (9.6%) and the major oil components of S. khuzistanica were carvacrol (68.8%), p-cymene (7.3%) and γ-terpinene (5.5%), while thymol (29.8%), carvacrol (29.4%), p-cymene (15.1%) were the main constituents of S. mutica. Analysis of the S. rechingeri oil indicated carvacrol (77.0%) and p-cymene (4.7%) as main components.

The aerial parts of S. sahendica Bornm. were collected from Mazarnashih at East Azarbayejan by Tabatabaei-Raisi et al. (2008). The major components of the inflorescence oil were thymol (32.57%), γ-terpinene (29.33%), p-cymene (23.48%) and the main constituents of the leaf and stem oil were p-cymene (44.88%), thymol (28.22%) and γ-terpinene (10.70%).

The aerial parts of the S. khuzistanica cultivated at the Khorraman farm, Kashkan, Lorestan, were collected at the flowering stage. The oil contained 62.16% carvacrol (Khosravinia et al., 2013).

Ghasemi Pirbalouti and Dadfar (2013) collected the aerial parts of wild population of S. bachtiarica from Chaharmahal va Bakhtiar province in the Southwest of Iran and revealed that p-cymene (40.46%), thymol (17.93%), carvacrol (7.75%), γ-terpinene (6.89%), linalool (5.65%) and geraniol (4.60%) are the major components.
Another investigation (Karimi et al., 2012) with aerial parts of S. hortensis cultivated in growth chamber indicated that the main components before flowering were carvacrol (47.77%), γ-terpinene (17.99%), cymene (5.04%) and after full flowering were carvacrol (49.96%), n-hexadecanoic acid (2.60%), Cymene (2.54%), β- bisabolene (2.53%), and α-terpinene (2.40%).

A study regarding the fresh leaves, stem and aerial parts of S. bachtiariaca Bunge collected at the flowering stage of plants from Highland of Zagros Mountain in Ilam province in the West of Iran illustrated that the carvacrol was the main component found in essential oils from leaves (39.3%), stem (39.4%) and aerial parts (67.88%), (Meshkatalsadat et al., 2013).

The aerial parts of S. spicigera were collected at full flowering stage at Gazvin. The essential oil was isolated and analyzed. Carvacrol (53.74%) and thymol (36.03%) were the major components (Eftekhar et al., 2009).

Sharafzadeh et al. (2013) showed thirty seven compounds in the essential oils of S. hortensis grown under greenhouse conditions. γ-terpine (45.3-49.4%) and carvacrol (37.0-41.3%) were the major components when plant growth promoting rhizobacteria applied in the growing medium.

Hassanzadeh-Khayyat et al. (2012) analyzed the essential oil of the aerial parts of S. hortensis, from the Khorasan province, Northeast of Iran and twenty-one compounds were identified at which the main oil constituents were carvacrol (55.69 %), γ-terpine (24.93 %) and p-cymene (4.07 %).

An experiment with two Northern species of Satureja (Gohari et al., 2005) indicated that the major constituents of S. atropatana were thymol (62.1%), p-cymene (6.1%) and spathulenol (5.2%) and of S. mutica were thymol (62.6%), p-cymene (9.4%), carvacrol (6.6%) and methyl thymol (5.4%).

Sefidkon and Jamzad (2006) were analyzed the oil of two endemic species, S. edmondi Briquet and S. isophylla Rech. f. The oil of S. edmondi showed p-cymene (61.1%), γ-terpinene (9.6%), thymol (5.0%) as the major components and the oil of S. isophylla indicated α-eudesmol (11.3%), β-eudesmol (9.6%), camphor (7.1%), β-caryophyllene (6.1%), γ-eudesmol (5.8%) and geranial (5.5%) as the main constituents.

Essential oils of the aerial parts of S. spicigera (C. Koch) Boiss. were isolated by Sefidkon and Jamzad (2004). The major components of the essential oils were thymol (35.1%), p-cymene (22.1%), γ-terpinene (13.7%) and carvacrol (4.0%).

S. sahendica is one of the endemic species of Satureja in Iran. The main constituents of the essential oils at different populations were thymol (19.6-41.7%), p-cymene (32.5-54.9%) and γ-terpinene (1.0-12.8%), (Sefidkon et al., 2004).

S. kallarica Jamzad is another endemic plant in Iran. There are the wild plants in the Southwest of Iran. The essential oils from aerial parts of S. kallarica revealed piperitene oxide (71.2%), piperitene (6.7%) and pulegone (5.4%) as major components (Ghasemi Pirbalouti et al., 2013).

In conclusion, the components of the essential oils could be markedly influenced by the genotype, geographical environment, physical and chemical characteristics of the soil, plant age, drying method, oil isolation method, etc.

References


