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SHORT COMMUNICATION

MAIN COMPONENTS IN AROMA PROFILE OF GENUS *THYMUS*: A SHORT REVIEW

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ABSTRACT: The genus *Thymus* belonging to family Lamiaceae reveals around 300 species of perennial, aromatic herbs and subshrubs. The flowering parts and leaves of *Thymus* species have been widely used for medicinal properties. Essential oils are the important active substances in this genus which show wide chemical polymorphism due to genotype, environmental conditions, ontogeny, etc. This review focuses on major constituents of the volatile oils of several species of *Thymus* reported by other researchers.
KEYWORDS: Lamiaceae, Essential Oils, Thymol, Carvacrol, GC/MS.

INTRODUCTION

Thymus from family Lamiaceae shows around 300 species of perennial, aromatic herbs and subshrubs and is predominantly found in Mediterranean region, Asia, Southern Europe and North Africa (Maksimovic *et al.*, 2008). Pharmacological activities such as spasmolytic and expectorant have been reported regarding the genus *Thymus* (Rasooli, 2005). The flowering parts and leaves of *Thymus* species have been widely used as herbal tea, carminative, antiseptic and for treating colds (Karaman *et al.*, 2001; Rasooli and Mirmostafa, 2003; Rota *et al.*, 2008). Essential oils are known as biologically active compounds (Bishop and Thornton, 1997). Recently, the application of the essential oils as antioxidant materials and natural substances is considerable (Milhau *et al.*, 1997; Al-Maqtari *et al.*, 2011). Researchers have indicated antibacterial and antifungal properties of the essential oils (Kivanc and Akgul, 1986; Pandey *et al.*, 1996).

Essential oils can preserve the food (Faid *et al.*, 1995) or use in aromatherapy. The chemical polymorphism of the essential oils of genus *Thymus* is a widespread phenomenon (Stahl-Biskup, 1991). Several factors such as genetic, climatic and geographic conditions and ontogeny of collected plants may severely affect essential oil composition and their biological properties (Zouari *et al.*, 2012). Wide variability in the essential oils of different species of the *Thymus* and comparison of them was the subject of this review.

CHEMICAL COMPOSITION

Mkaddem *et al.*, (2010) in a Tunisian experiment indicated that the major component of *T. capitatus* Hoff. et Link. essential oil was thymol (89.06%). *p*-cimene (5.04%) and γ-terpinene (3.19%) were another components. The essential oil of *T. linearis* (Benth. ex Benth) from the Western Himalaya, India was analyzed by Verma *et al.*, (2010). Thymol (52.28-66.65%), *p*-cymene (1.81-21.60%) and γ-terpinene (1.94-12.48%) were identified in all populations. The oil of wild thyme (*T. serpyllum* L.) from 20 different natural growth environments in Estonia was analyzed and the major constituents were (E)-nerolidol, caryophyllene oxide, myrcene, (E)-b-caryophyllene and germacrene D (Raal *et al.*, 2004). An Italian investigation by Shabnum and Wagay, (2011) regarding the *T. vulgaris* L. oil revealed that thymol, γ-terpinene, ρ-cymene, linalool, myrcene, α-pinene, eugenol, carvacrol and α-thujene were the main compounds. Main constituents of the oil of *T. comosus* from Romania were investigated. Caryophyllene-oxide (54.82%), camphene (10.73%), β-bourbonene (5.90%), eudesmol (3.65%) and α-pinene (3.67%) were the major components (Pavel *et al.*, 2009). Another Romanian experiment showed that the main oil constituents of *T. pulegioides* were carvacrol (50.5-62.6%), γ-terpinene (9.8-9.9%) and *p*-cymene (5.8-7.1%). *T. glabrescens* revealed geraniol (55.5%), neryl acetate (11.1%) and *β*-bisabolene (6.7%) as major compounds (Pavel *et al.*, 2010). Sharafzadeh *et al.*, (2009) reported that the main component of *T. vulgaris* grown under greenhouse conditions was thymol. Salas *et al.*, (2012) illustrated that the main oil constituents of the essential oil of a protected Spanish species, *T. praecox* ssp. *penyalarensis*, were thymol (18.5%), *p*-cymene (14.6%), carvacrol (11.6%), and γ-terpinene (10.1%) in flowering stage and *p*-cymene (19.0%), carvacrol (16.5%), and borneol (10.5%) in

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fruiting stage. An investigation by Miguel *et al.,* (2004) indicated that the main components of the essential oil of *T. caespititius* and *T. mastichina* were α-Terpineol (32%) and 1,8-cineole (58%), respectively. A study with *T. cilicicus* Boiss & Bal. and *T. syriacus* Boiss was carried out by Zayzafoon *et al.,* (2012) in Syria in order to identification of volatile oil constituents. The results indicated that the main constituents of *T. cilicicus* oil were thymol, carvacrol, γ-terpinene, carvyl acetate, dihydrocarvone and anis aldehyde whereas the major components of *T. syriacus* were carvacrol, dihydrocarvone, β-caryophyllene, *p*-cymene, farnesol, limonine, menthol, myrecene, γ-terpinene, terpinene-4-ol and thymol. Salgueiro *et al.,* (2000) studied on two endemic taxa from Portugal, *T. lotocephalus* G. LoH pez and R. Morales and *T.mourae* Paiva and Salgueiro. They revealed that 1,8-Cineole and borneol were the main constituents in the essential oil of *T.mourae*, and linalool, geranyl acetate and 1,8-cineol were the major ones in *T. lotocephalus*. The essential oil constituents of the Croatian wild-growing *T. pulegioides* L. showed geraniol and linalool as major ones followed by thymol, γ-terpinene, thymol methyl ether, borneol and geranyl acetate (Radonic and Mastelic, 2008). The essential oil of *T. Kotschyanus* Boiss. & Hohen var. kotschyanus, growing wild in Iran indicated thymol (89.08%) and γ-Terpinene (4.62%) as main constituents (Mazooji *et al.,* 2012). Goodner *et al.,* (2006) reported that the volatile oils of *T. hyemalis* L. represent linalool, borneol, thymol, and β-damascenone as main compounds and Spanish *T. vulgaris* subsp. *vulgaris* revealed eucalyptol, borneol, terpinyl acetate, and β-damascenone as main ones. Volatile oil of *T. vulgaris* from Yemen was analyzed by Al-Maqtari *et al.,* (2011). The main components were thymol (51.34%) and *p*-cymene (18.35%) followed by caryophyllene (4.26%), α-pinene (2.95%), β-myrcene (2.50%), thymyl methyl ether (2.16%) and carvacrol (2.03%). Mushtaq Ahmad *et al.,* (2006) isolated the essential oil of *T. serphyllum*. Thymol (53.33%) and carvacol (10.4%) were the major components. *T. algeriensis* plants collected during the vegetative and the flowering phases and from eight different geographical regions were investigated by Zouari *et al.,* (2012). The main constituents in the level of species were α-pinene (7.41-13.94%), 1,8-cineole (7.55-22.07%), cissabinene hydrate (0.10-12.95%), camphor (6.8-19.93%), 4-terpineol (1.55-11.86%), terpenyl acetate (0-14.92%) and viridiflorol (0-11.49%). The main constituents of the essential oil before and at the flowering stages of *T. persicus* L. were carvacrol (38.96, 27.07%), thymol (6.48, 11.86%), *p*-Cymene (7.51, 10.16%), α-terpineol (0, 9.51%) and nerol (15.66, 9.41), respectively (Rasooli, 2005). Nezhadali *et al.,* (2012) were collected wild *T. vulgaris* from North Khorasan Province in Iran. Main components of the volatile oil were thymol (45.4 %), o-cymene (13.4 %), γ-terpinene (6.9 %) and borneol (6.6 %). In the essential oil of *T. marschallianus* from Kazakhstan the Major constituents were *p*-cymene, thymol and γ-terpinene (Dembitskii *et al.,* 1985). Kasumov, (1987) reported that geraniol was the main component of *T. marschallianus* from Caucasus. A Chinese experiment indicated that thymol (32.87%) and γ-terpinene (22.41%) were the major components of the essential oil of *T. marschallianus* (Jia *et al.,* 2008). An Iranian investigation by Amiri, (2012) regarding the three wild-growing *T.* species (*T. kotschyanus* Boiss. and Hohen, *T. eriocalyx* (Ronniger) Jalas, and *T. daenensis* subsp lancifolius (Celak) Jalas) during the flowering stage from west of Iran illustrated that the major components of the volatile oil were thymol (16.4-42.6%), carvacrol (7.6-52.3%) and γ-terpinene (3-11.4%). Aromatic profile of the *T.vulgaris* growing wild in Turkey showed thymol (46.2%), γ- terpinene (14.1%), *p*-cymene (9.9%) and linalool (4.0%) as main compounds (Ozcan and Chalchat, 2004). In conclusion, the composition of the essential oils can widely affected by the genotype, stage of the growth, drying and isolation methods and geographical and growing conditions.

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