PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY

19th BIENNIAL CONFERENCE

Official publication of The Australian Rangeland Society

Form of Reference

The reference for this article should be in this general form:

Author family name, initials (year). Title. In: Proceedings of the 19th Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Bastin, G., Sparrow, A., Scarth, P., Gill, T., Barnetson, J. and Staben, G. (2015). Are we there yet? Tracking state and change in Australia's rangelands. In: 'Innovation in the Rangelands. Proceedings of the 18th Australian Rangeland Society Biennial Conference, Alice Springs'. (Ed. M.H. Friedel) 5 pages. (Australian Rangeland Society: Parkside, SA).

Disclaimer

The Australian Rangeland Society and Editors cannot be held responsible for errors or any consequences arising from the use of information obtained in this article or in the Proceedings of the Australian Rangeland Society Biennial Conferences. The views and opinions expressed do not necessarily reflect those of the Australian Rangeland Society and Editors, neither does the publication of advertisements constitute any endorsement by the Australian Rangeland Society and Editors of the products.

The Australian Rangeland Society

Investigation of Chemical Essential Oil Components of *Thymus Kotschyanus* in Zagheh Area (In Lorestan Province)

Elahe Karami[1], Ali Ariapour[2], Amir Heidari Jamshidi[3]
1 M.Sc. Graduate, Department of Rangeland Management, Young Researchers Club, Borujerd Branch, Islamic Azad University, Borujerd, Iran. (Corresponding author), karamik65@gmail.com
2 Associate Professor, Department of Natural Resources, College of Range Management, Borujerd Branch, Islamic Azad University, Borujerd, Lorestan, Iran, aariapour@iaub.ac.ir
3 Sinior Expert of Cultivation and Crop Breeding, Jihade Agriculture Organization of Lorestan Province, Iran.

Keywords; *Thymus kotschyanus*, Essential oils, Chemical components, Botanical properties, Thymol

Abstract
The flora of the Middle East is estimated at 15,000 species. The use of medicinal and aromatic plants, herbs and species in the region has a long history and forms an important part of a number of cultures. Traditional medicine still plays a major role in health care systems, despite the availability of modern medicine (Heywood, 1999). Medicinal and aromatic plants constitute the basis of primary health care for the majority of the population in Asia and are a critical source of income for rural populations. The book, Canon of Medicine (Al-Ghanoon) by Avicenna has been used by the European scientific community for more than 600 years. The works of Avicenna and Razes, another famous scientist have been translated into various languages (Mosaddegh and Naghibi, 2003). Lamiaceae family has about 200 genuses and 4000 species, of which one is Thymus. The majority species in the family have essence and uses for medicinal, nutritional, toiletry and health industry purposes. The genus includes many species in Iran. According to components retention volume, retention time, Kovats retention index and mass spectrum and comparing those to standard components results show that there are 52 components in essence that formed 78/87% of all essences. Most of the components in the species were Thymol (32/77%), Gamma-terpinene (8/43%), Carvacrol (5/61%), Borneol (4/35%) and Cynol (4/35%). Researchers in previous studies have previously pointed out that weather is one of the most important affecting to essential oil in medicinal plants, this study has confirmed this. Weather can change number of components and percent of each components of essence in different species, because each species growth in different environmental factors which cause on number of endocrine glands in lower and upper of leaves.

Introduction
The flora of the Middle East is estimated at 15,000 species. The use of medicinal and aromatic plants, herbs and species in the region has a long history and forms an important part of a number of cultures. Traditional medicine still plays a major role in health care systems, despite the availability of modern medicine (Heywood, 1999). The collection, grading and processing of medical and aromatic plants is a major income generating activity in this region. The great majority of these plants are still collected from the wild, thus endangering the existence of many valuable species. Traditional medicine dates back more than 3,000 years in Iran. Evidence of the use of medicinal plants goes back thousands of years when Avicenna, the well known Iranian medical scientist and practitioner, wrote a volume on medicinal plants upon which western medicine was based until the 13th century (Sabra and Walter, 2000). The flowering plant species of Iran have been estimated to be about 8000 (WHO, 2001). Among 300 to 400 species are used for medicinal purposes. It is one of the largest biodiversity regions in the world containing some of the richest countries in terms of plant resources. Medicinal and aromatic plants constitute the basis of primary health care for the majority of the population in Asia and are a critical source of income for rural populations. The book, Canon of Medicine by Avicenna has been used by the European scientific community for more than 600 years. The works of Avicenna and Razes, another famous scientist have been translated into various languages (Mosaddegh and Naghibi, 2003). Lamiaceae family has about 200 genuses and 4000 species, one of which is Thymus. The majority of species in the family have essence

and have been used for medicinal, nutritional, toiletry and health industry purposes for many years. The genus includes many species in Iran. The study also included some of the plants used by rural inhabitants as herbal medicines (Amin *et al.*, 2002). Results of Gersbash's(2002), Baran's(2008) and Buyisile's(2009) research show that there is essential oil resources from *Prostanthera ovalifolia, Salvia argentea* and *Schistostephium heptalobium.* Climate and weather are the most important factors affecting essence of medicinal plants in each area. Nickavar *et al.* (2005) research on shoots of *T. daenensis* show that the largest component of the species is Thymol (about 47%). He also showed in other research in the same year that components of *T. kotschyanus* are Thymol (38.6%), Carvacrol (33.9%), Gamma-terpinene (8.2%) and p-Cymin (7.3%). In studies carried out between 1991 to 1997 by Stahl–biskup,(1991) Jemminez (1993) and Salgueral (1997), the important essential oil in Thymus, Thymol, was recognized.The aim of this study was to recognize components of essential oil in biomass of *Thymus kotschyanus* which collected from Zagheh area of the Lorestan province.

Materials and Methods

Iran with a land area of about 1,648,000 km2 is located in the southwest of Asia and lies approximately between 25N and 40N in latitude and between 44E and 64E in longitude. Iran's most important mountain ranges are the Alborz and Zagros chains, which stretch in northwest-northeast and northwest- southeast respectively. The area under study is located at 39º 29´ 52˝ N and 48º 40´ 12˝ E (Fig. 1). The average annual rainfall of the area is 490 mm, falling mainly in the autumn and winter. Samples were collected in the Zagheh area (in Lorestan Province) in 2011 when plants were flowering. Samples were initially investigated anatomically, and then samples dried and extracted through a Clevenger device, using a Hydro-distillation method. After essences were produced, essential chemical components were recognized and separated completely by using GC and GC/MS devices and percentages recorded. Retention volume, retention time, Kovats retention index, mass spectrum were compared to standard components.

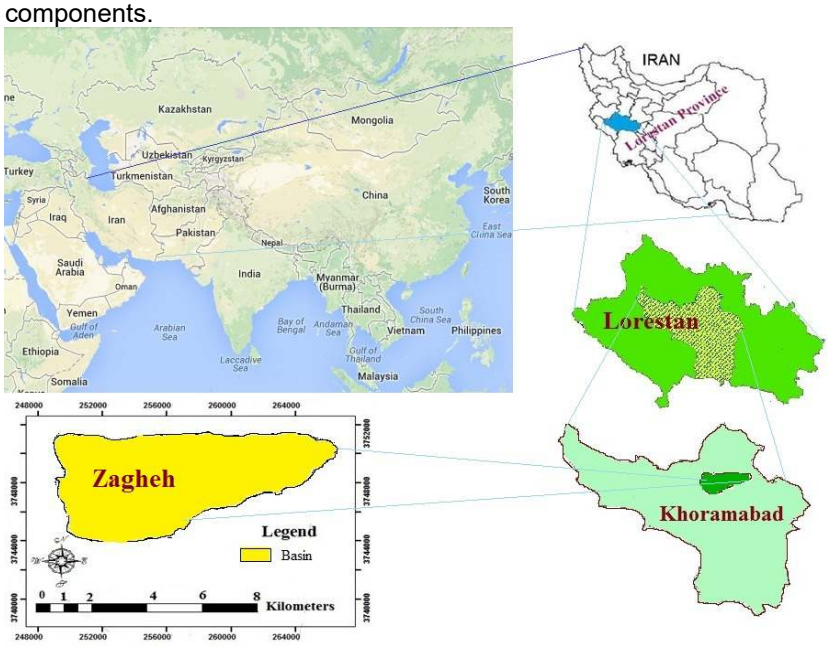

Fig. 1: Location of study area (Iran and Lorestan Province, Zagheh)

Results

Stem of *T. kotschanus*

Cross cutting of the stem during preparation showed that the epidermis contains non gland secretory and gland secretory structures (Fig. 2). The next layer, the integument of the plant, consists of collanchima and parenchyma. Following this layer there is phloem and xylem then marrow in center of integument (Fig. 3 and 4).

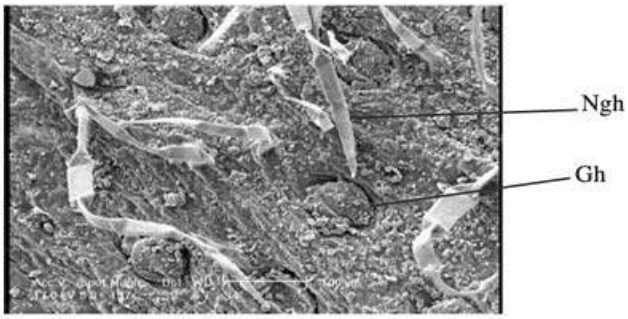

Fig. 2: Stem of the species using by SEM electronically microscope 400X zoom, Ngh: non gland secretory, Gh: gland secretory

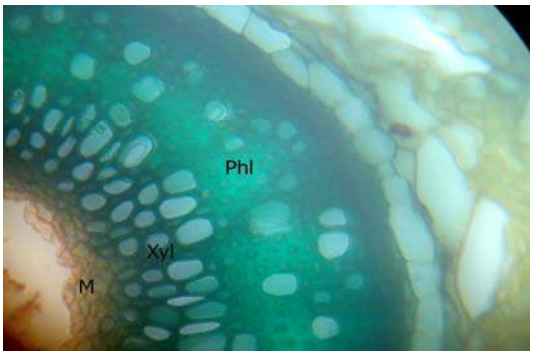

Fig. 3: Cross cutting of *Thymus kotschyanus* stem with 400X zoom, Ph: Phloem, Xyl: Xylem and M: Marrow

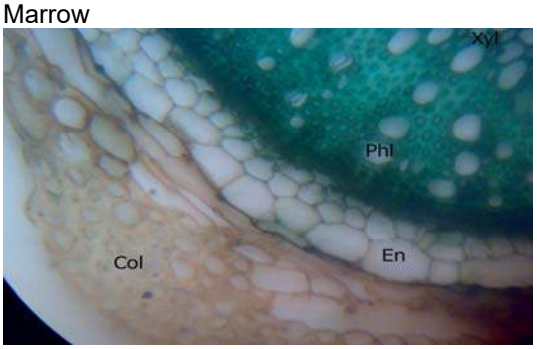

Fig. 4: Cross cutting of *Thymus kotschyanus* stem with 400X zoom, Ph: Phloem, Xyl: Xylem, Col: Collansim and En: Endoderm

Leaf of *T. kotschanus*

Microscopic investigations show that leaves of the plant have an upper and a lower epidermis. On the lower epidermis there is “fuzz”, which is mainly lance-shaped non gland secretory structures.

Recognition of components in the essence of *Thymus kotschyanus* in flowering stage

According to the analysis of components retention volume, retention time, Kovats retention index and mass spectrum and comparing those to standard components, results show that there are 52 components in essence that formed 78/87% of all essences. Most of the components in the species were Thymol (32/77%), Gamma-terpinene (8/43%), Carvacrol (5/61%), Borneol (4/35) and Cynol (4/35%) (Tab. 1).

Table 1: Recognition components in essence of *Thymus kotschyanus* in flowering stage

No.	Components	Kovats retention index	Percent	No.	Components	Kovats retention index	Percent
1	Tricyclene	909	0.02	27	4-terpineol	1187	2.50
2	Alpha-thujene	916	0.50	28	Alpha-terpineol	1192	0.25
3	Alpha-pinene	926	0.49	29	Carvacrol methyl ether	1258	0.20
4	comphene	961	0.72	30	Beta-bourbonene	1391	0.06
5	sabinene	970	0.13	31	Beta-elemene	1414	0.10
6	Beta-pinene	967	0.16	32	Trans-caryophyllene	1479	1.67
7	3-octanone	980	0.18	33	Germacrene D	1491	1.25
8	1-octen-3-ol	977	0.11	34	valencene	1492	0.08
9	Beta-myrcene	992	0.66	35	bicyclogermacrene	1360	0.33
10	3-octanol	988	0.04	36	Neryl acetate	1511	0.03
11	Phellandrene	1000	0.10	37	Beta-bisabolene	1470	0.1
12	Delta-3-carene	1006	0.03	38	Beta-cadinene	1526	0.04
13	Alpha-terpinene	1019	1.22	39	Delta-cadinene	1737	0.03
14	Cymol	-	4.35	40	Cis-alpha-bisabolene	1571	1.17
15	1,8-cineole	1009	1.45	41	Geranyl butyrate	1589	0.14
16	limonene	1025	0.17	42	spathulene	1581	0.25
17	Cis-ocimene	1038	0.05	43	Caryophyllene oxide	1472	0.60
18	Beta-ocimene Y	1039	0.71	44	Geranyl peropionate	1139	0.06
19	Gamma-terpinene	1062	8.43	45	Trans-Isolimonene	1469	0.07
20	Cis-sabinene hydrate	1069	2.87	46	Gamma-gurjunene	1469	2.17
21	p-cymenyl	1027	0.02	47	geraniol	1285	0.2
22	Alpha-terpinolene	1016	0.19	48	Bornyl acetate	1267	0.18
23	Cis-beta-terpineol	1144	0.38	49	Thymol	1299	32.77
24	Linalool	1098	0.12	50	carvacrol	1351	5.61
25	comphor	1143	0.06	51	Acetyl thymol	1379	1
26	borneol	1166	4.35	52	Geranyl acetate	1382	0.03

Discussion

Researchers in previous studies have previously pointed out that weather is one of the most important affecting to essential oil in medicinal plants, this study has confirmed this. Weather can change number of components and percent of each components of essence in different species, because each species growth in different environmental conditions affects the endocrine glands in lower and upper surfaces of leaves. This study has largely confirmed the result of previous work (Gersbash (2002), Baran (2008) and Buyisile (2009). Some differences in the percentage of components recorded may be because of differences in the niche that the species was growing. It may affected by environmental factors and techniques used in this study, such as; time of collection, the location that the plant was collected and climatic factors.

References

Amin, G., Dehmoobed-Sharifabadi, A., Surmaghi, M. H. S., Yasa, N., Aynechi, Y., Emami, M., Shidfar, M., Amin, M., Moghadami, M., Kordbacheh, P. and Zeini, F., 2002, Screening of Iranian plants for antifungal activity: Part I. Available at: http://www1. tums. ac.ir/daru/DaruVolum10-No1-2002/Amin1.htm (31 Jul. 2003)

Baran, P., & Ozdemir, C., & Aktas, K., 2008. Morphological and anatomical properties of *salvia argenteal*, Research journal of agriculture and biological sciences, 4(6), 725-733.

Buyisile, M., 2009, Morphological and Chemical Composition of the essential oil of the leaf of *schistephium heptalobium*. African journal of biotechnology, 8(8), 1509-1519.

Gersbash, P.V., 2002. The essential oil secretory structures of *prostanthera ovalfolia* (Lamiaceae), Annals of Botany, 89, 255-260.

Jemminez, J., Navarro, M.C., Montella, N.P., Martin, A., Martinez, A., 1993. *Thymus zigis* oil: Effect on cc14-indoost capatotoxicity and free radical scan venjer activity. J., Esset. Oil Res, 5, 153-158.

Heywood, V., 1999, Plant resources and their diversity in the Near East, In: International Expert Meeting on Medicinal, Culinary and Aromatic Plants in the Near East, Forest Products Division FAO Forestry Department and the FAO Regional Office for the Near East, Cairo, Egypt, 19-21 May 1997.

Mosaddegh, M. and Naghibi, F., 2003, Iranian traditional medicine, past and present. Available at: http://www. islamset.com/ioms/cam/Abstracts/mosadegh.html (30 Jul. 2003).

Sabra, A. and Walter, S., 2000, In: (Eds.), Country reports, In: Non-Wood Forest Products in the Near East: A Regional and National Overview, Non-Wood Forest Products Programme FAO, Rome, Italy.

Nickavar, B., Mojab, F., Dolat-Abadi, R., 2005. Analysis of the essential oils of two *Thymus species* from Iran. Food chemistry 90(2005) 609-611.

Salgueral, L.R., Vila, R., Tomi, F., Figueiredo, A.P., Barroso, J.G., Canigueral, S., Casanova, J., Cunha, A.P., Azadet, J., 1997. Competition and variability of the essential oil of *Thymus caespitius*, From, Portugal photochemistry 45,307-11.

Stahl–biskup, E., 1991. The chemical composition of Thymus oil, J. Essent, Oil. res. 3(61-82).

WHO, 2001, Legal Status of Traditional Medicine and Complementary/Alternative Medicine: A Worldwide Review, WHO/EDM/TRM/2001.2, WHO, Geneva, p. 188.