

EFFECT OF LOCALITY ON THE OIL YIELD AND PHYSICO-CHEMICAL CHARACTERISTICS OF OIL FROM *THYMUS SERPYLLUM* L.

Mohammad Bashir Khan, Pazir Gul, Muhammad Farooq and F. W. Khan

Summary

Thymus serpyllum L. collected from different localities of N.W.F.P. and Baluchistan were analysed for essential oils and phenol contents. It was observed that the change in plant locality had a remarkable effect on the yield of oil and phenol contents and had no effect on the physico-chemical characteristics of the oil. The leaves collected from various localities of Baluchistan contained more oil (1.45% to 2.64%) as compared to those of N.W.F.P. (0.35% to 0.75%). Plant material found in Baluchistan can be commercially exploited in order to save the amount of foreign exchange spend on the various products of the said plants.

Introduction

Thyme oil is usually obtained from the leaves of *Thymus serpyllum* Linn; belonging to the family labiatae. It is a small branched, spreading perennial herb and is known as wild thyme in English; Hasha in Persian; Ban-jawain in urdu, Marizha masho in Punjabi and Mauri in Baluchi (15). Hasha is the Persian name of *Thymus serpyllum* Linn; but it has also been adopted by the Arabian physicians. It grows wild over wide areas on arid mountain slopes in the South of France, in the South Eastern Province of Spain, in Algeria and in Morocco (6). In Pakistan *Thymus serpyllum* Linn; is scattered throughout hilly tracts of Kaghan, Azad Kashmir, Baluchistan and Chitral at an elevation ranging between 1600-4500 meters.

Thymus serpyllum is considered to be very beneficial to the sight whether used as an article of food or as a medicament; it is considered useful for inveterate coughs. Used as an electuary with vinegar and salt it facilitates expectoration. When taken with honey it prevents the blood from coagulating. It has also been used in cases of epilepsy. It is used for hardness of breathing, for asthma and obstruction of catamenia. Mixed with wine it is used as an external application for sciatica. Beaten with oil, sprinkled upon wool it is employed for diseases of the joints and for sprains. It is mixed with lard and employed to burns(4).

Oil of thyme a powerful germicide, finds wide application as a disinfectants and anti-septic of rather pleasant odour. It is used as such in many pharmaceuticals and oral-preparations such as gargles and mouth washes. The oil is said to cause mental excitement and serves as a diffusible stimulant in collapse. On an increasing scale oil of thyme is used for flavouring of food products such as meat, sausages, sauces and canned foods. It is also used in soap industry for scenting purpose(3).

* The authors are Bio-Chemist, Asstt. Forest Chemists and Forest Chemist at the Pakistan Forest Institute, Peshawar respectively.

The volatile oil of *Thymus serpyllum* L. contains phenol, P-cyamene, terpene and terpene alcohol. It contains about 50% of phenol which mainly consists of thymol. The oil also contains amyl alcohol, B-r-hexanol, r-x-pinene, B-pinene, camphene, linalool, turpinene, I-boroneal and geraniol(6).

A lot of work has been done on the quantitative and qualitative aspects of the oil from *Thymus* spp. all over the world especially in France, Spain, United States and United Kingdom (6). Originally thyme oil was distilled in France but latter on the low priced spanish oil replaced the French oil. Spain is the largest producer of thyme oil in the world and supplies oil mostly to the United States and United Kingdom.(6) In Pakistan though, the annual yield of crude drug is 7400 kg. in N.W.F.P. (8), 774.55 maunds in Chitral (16) and lot of it in Baluchistan, no chemical study in this respect has been carried out so far. The present study was taken up with a view to determine the quantity and quality of thyme oil and to study the effect of changing plant localities on the yield and physico-chemical characteristics of oil from *Thymus serpyllum* L.

Review of Literature

E. Guenther (6) reported 0.73% of Thyme oil in the Spanish field studies. It was further reported that *Thymus vulgaris* contain 2.0% of volatile oil. According to Rosenthal (14), the content of volatile oil in *Thymus vulgaris* varies considerably among single plants. The maximum was found to be 2.60%, as calculated upon the dried herb. The second cutting yield more oil than the first one. It has been reported (8,4) that the first cut of cultivated thyme yielded on the average 1.58% of volatile oil, whereas the second cut in October gave 1.9% oil. *Thymus serpyllum* L. grown in North America has 0.27% of oil in the fresh herb and that of the dried herb upto 0.60%. Rao and Sing (13) reported that the plant growing in Punjab and Kashmir had 0.5% of oil. *Thymus serpyllum* collected from Galies had 0.5% oil in whole plant (11). The yield of oil from the leaves and stem of plant collected from Baluchistan had 3.0% and 0.3-1.2% of oil respectively (12). Plant collected from Kaghan Forest Division had 0.25 to 0.5%, from Miranshah 0.2-0.5% of oil in the leaves (11, 12).

It has been reported that oil obtained from *Thymus serpyllum* L. collected from Punjab and Kashmir had the following physico-chemical characteristics, refractive index, 1.4968 at 30°C; specific gravity, 0.9269 at 30°C (13). The oil examined by Cancer had: Specific gravity at 21°C, 0.8995; refractive index at 21°C, 1.488 (10). B.N. Rutovski (2) examined an oil from *Thymus* spp. Which had the following physico-chemical characteristics specific gravity at 20°C, 0.9131; refractive index at 20°C, 1.4941 (13) phenol content reported by Cancer is 24.0% and reported by Rao and Sing is 52.7%. It has also been reported that the oil is soluble in 85% alcohol.

Materials and Methods

Samples of *Thymus serpyllum* L. were collected from different selected sites at Kaghan, Naran, Miranshah, Parachinar and Baluchistan. The leaves were separated from the stems and

shoots and were dried under shads for a month. The dried leaves were crushed and the volatile oil were extracted using steam distillation techniques prescribed by Guenther (5). The oils were recovered from the aqueous phase with the help of petroleum ether (40–60°C) using separating funnels. The impurities such as colouring matters were removed from the oil by treating it with activated charcoal. Finally the oils were dried over anhydrous sodium sulphate and preserved for analysis.

The physico-chemical properties such as specific gravity and refractive index of the oil were determined following the standard methods given by A.O.A.C. and Jacobs (1,7). Total phenol content in the oil was determined by treating it with IN KOH. From the undissolved oil the percentage of phenol was calculated using the method of Gildemiester (5).

Results and Discussion

The yield of oil from the leaves of *Thymus serpyllum* Linn; collected from Sharan, Saiful Maluk, Kaghan, Naran, Miranshah, Parachinar, Zarghoon (Quetta), Khushnub (Ziarat), Gundak (Ziarat), Daber (Ziarat) and Milikut (Ziarat) was found and the results obtained are presented in Table. 1.

Table 1: Showing yield of oil from *Thymus serpyllum* L.

Sl. No.	Locality	Oil %	Sl. No.	Locality	Oil %
1.	Sharan	0.45	7.	Zarghoon	1.45
2.	Saiful Maluk (Naran)	0.35	8.	Khushnub	1.89
3.	Kaghan	0.52	9.	Kasa (Ziarat)	0.65
4.	F.C ₂ (Naran)	0.75	10.	Ghundak (Zargi)	1.95
5.	Miranshah	0.35	11.	Daber (Ziarat)	1.95
6.	Parachinar	0.37	12.	Milikut (Ziarat)	2.17

It was observed that the yield of oil from the localities such as Kaghan (0.52%); Naran (0.75%); Zarghoon (1.45%); Khushnub (1.89%); Gundak (1.95%), Daber (2.64%) and Milikut (2.17%) is higher and encouraging enough as compared to those of oil from plants reported by Rao and Sing (0.5%) and from those reported by Malik and Khan (0.5%) in case of the *Thymus serpyllum* leaves collected from Galies, Kaghan and Miranshah. It was also observed that plant leaves collected from different localities of Baluchistan gave high yield of oil as compared to other localities of Pakistan. It is also obvious from the result given in Table-1 that the leaves of *Thymus serpyllum* collected from Daber (Ziarat) has maximum oil content. It is probably due to the soil texture, climatic condition of surrounding flora of that area for all these factors do effect the morphology and active constituents of the plant.

Fig. 1: Showing the variation of essential oil with plant locality

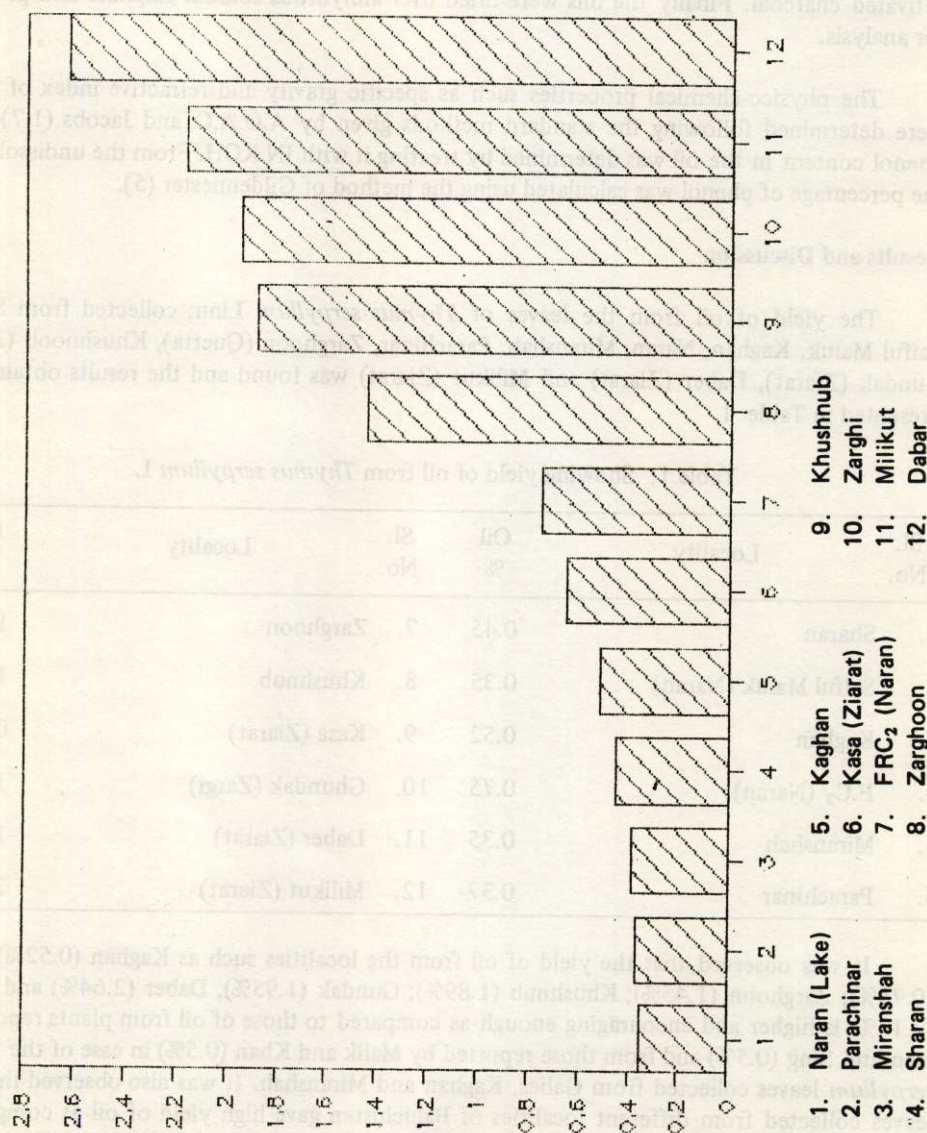


Table 2 Physico-chemical characteristics of oil from *Thymus serpyllum* L.

Sl. No.	Locality	Refractive index		Specific gravity		Phenol content	
		Lab work	reported	Lab. work	reported	Lab. work	reported
1. Sharan		1.503	1.4968 (<i>T. Serpyllum</i> from Kashmir-Rao and Sing).	0.8992	0.9269 (<i>T. Serpyllum</i> from Punjab and Kashmir).	43.20%	52.7% (reported by Rao and Sing).
2. Saiful Maluk (Naran)		1.485	1.488 (reported by Cancer).	0.9132	0.8995 (reported by Cancer).	45.00%	24.00% (reported by Cancer).
3. Sari (Kaghan)		1.481	1.4941 (reported by Rutoski and Kondratoko).	0.9008	0.9131 (reported by Rutoski and Kondratoko).	40.70%	—
4. FR C ₂ (Naran)		1.487	—	0.9141	—	45.30%	—
5. Zarghoon		1.497	—	0.9186	—	46.30%	—
6. Khushnub		1.493	—	0.9108	—	44.60%	—
7. Kasa (Ziarat)		1.505	—	0.9120	—	44.80%	—
8. Daber (Ziarat)		1.499	—	0.9190	—	46.80%	—
9. Ghundak (Zarghi)		1.497	—	0.9190	—	46.80%	—
10. Milikut		1.503	—	0.9143	—	45.50%	—

The oil obtained was orange red in colour and had the same odour like those of oil from other species. The physico-chemical characteristics of the oil were determined and presented in Table 2.

These constants were compared with those of oil reported in literature. It was observed that the constants such as specific gravity and refractive index were the same as those reported in literature for other species from different localities. It was noticed that changing plant locality, though effect the oil yield, does not show any significant effect on the physico-chemical characteristics of the oil. Phenol content obtained in the Lab. From the oil of *Thymus serpyllum* Linn. are given in Table-2. The results obtained (40.70–46.80%) was high enough as compared to those reported by Cancer (24%) whereas it is in the agreeable range as compared to those reported by Rao and Sing (52%).

Conclusion

The following conclusions could be drawn from the study:—

1. Steam distillation techniques gave good recovery of the essential oil.
2. The physico-chemical characteristics of the oil indicated that this oil is of fair standard and can be put to similar uses as those of the oil from the exotic species.
3. The plant locality had a marked effect on the yield of oil indicating that the plant from the dry zone like Baluchistan are suitable for commercial exploitation.
4. The changing plant locality had no effect on the quality of the oil.

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