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# ESSENTIAL OILS OF THE SPECIES OF LABIATAE
## *Part - IV.* Composition of the Essential Oil of *Thymus serpyllum*

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The composition of the essential oil of *Thymus serpyllum* (N. O. Labiatae) growing wild in Pakistan has been studied with the help of gas chromatography. The major terpenes found in the oil are γ-terpinene (1.66%), *p*-cymene (9.54%), camphor (3.54%), caryophyllene (2.19%), terpinen-4-01 (2.90%), borneol (3.13), thymol (42.63%) and carvacrol (8.16%) alongwith other terpenes in minor amounts.

***Key words***: Essential oil, *Thymus serpyllum*, Labiatae, Thymol, Carvacrol.

### Introduction

*Thymus serpyllum* (N.O. Labiatae) is a small, much branched and strongly scented shrub with slender stems having dotted, ovate and blunt leaves [1]. It bears tiny purple coloured flowers in spring. The plant grows in the wild and is found in various parts of Pakistan. *Thymus serpyllum,* locally known as "Masho" possesses strong antiseptic properties and enjoys medicinal importance in the Ayurvedic system of medicine because of the presence of two isomeric phenols, thymol and carvacrol in its essential oil.

Varying compositions of the essential oil of *Thymus serpylum* have been described thrice in the literature. Guenther [3] reported the presence of *p*-cymene (17%) γ-terpinene and other monoterpene hydrocarbons (8%), amonoterpene alcohol (5%), sesquiterpenes (4%), thymol (and phenols) (2-4%) and carvacrol (50-55%) in the essential oil of *Thymus serpyllum*. Agarwal *et al.* [2] in one study reported the presence of α- pinene, camphene, β- pinene, -3-carene, α-terpinene, limonene, γ-terpinene, *p*-cymene, terpinolene, cineole, citronelolal, linalool, trans-β-terpineol, terpinen-4-ol, geraniol, thymol and carvacrol [2] and in another [4] showed that the essential oil contains mainly thymol (60%), and less carvacrol (2-4%) with monoterpene hydrocarbons (18%), alcohols (8%), esters and ketones (4%) and sesquiterpenes (7%) as the minor components.

The present report describes the chemical composition of the essential oil of *Thymus serpyllum* of local origin that has been studied for the first time. This study was undertaken not only because the development of local essential oil resources particularly of Labiatae family [5] is part of the R&D programme of PCSIR but also to see if the local plant's essential oil had more of thymol or carvacrol as this has relevance to the commercial market.

### Experimental

*Extraction of the oil* . The plant material was collected from Ziarat (Baluchistan) hills during the month of October. The whole plant without the roots was dried under shade and steam distilled for 4 hrs to obtain the oil which after separation from the aqueous distillate was dried over anhydrous sodium sulphate (yield 0.45%). Specific gravity (0.8995 at 27°) and refractive index (1.4749 at 30°) of the oil was determined according to standard procedure [6].

*Chromatographic analysis of the oil.* A portion of the essential oil (1g) recovered by steam distillation was split into hydrocarbon and oxygenated fractions by column chromato-graphy on silica gel (60-80 mesh) using hexane and hexane-ether solvent systems. The composition of whole oil as well as that of the fractions was studied with the help of gas chromatography using CBPI (type SE-30) and CBP 20 (type carbowax 20m) capillary columns (30 m long x 0.2 mm dia) under temperature programming from 70° to 180° at a rate of 4° / min. FID was used for the detection of components and hydrogen was used as carrier gas. Retention time indices were used for the identification of the individual components and confirmation was made by coinjecting known standard terpenes. The percentage composition of the oil was determined with the help of Shimadzu CR6A model computing integrator and has been reported in the Table 1.

### Discussion

The composition of the essential oil of *Thymus serpyllum* growing wild in Ziarat (Baluchistan) as determined here shows that it has over thirty constituents (Table 1). The major components are thymol (42.63%), carvacrol (8.15%), *p*-cymene (9.54%) and possibly a sesquiterpene hydrocarbon (8.84%) eluting between geranial and geraniol on CBP 20 column that could not be identified. Except for γ-terpinene (1.66%), camphor (3.54%) β-caryophyllene (2.19%), terpinen-4-01 (2.90%) , borneol (3.13%) and two unknown substances (1.26% and 1.46% respectively) eluting after geraniol, all other compounds are present in varying amounts but less than 1.0%.

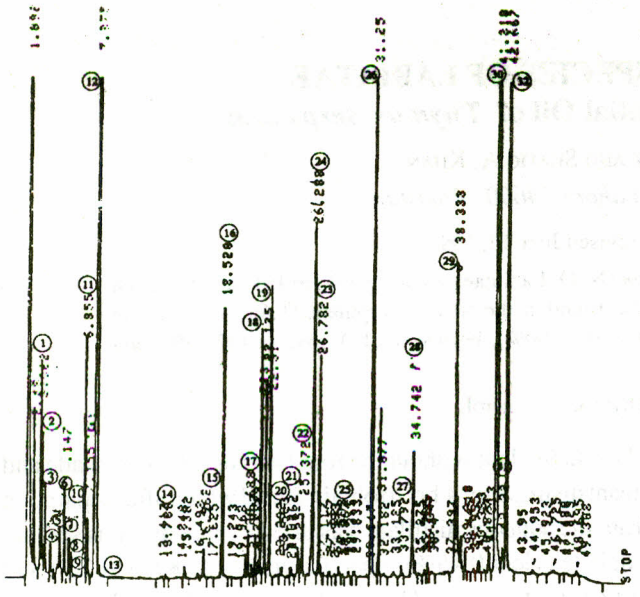

Fig. 1. Thymus oil on CBP 20 column.

TABLE 1. COMPOSITION OF THE OIL OF *THYMUS SERPYLLUM*.

| S. No. | Component | (%) | S. No. | Component | (%) |
|---|---|---|---|---|---|
| 1. | α-pinene | 0.27 | 17. | α-Linalcol | 0.50 |
| 2. | Fenchene | 0.14 | 18 | β-caryophyllene | 2.19 |
| 3. | Camphene | 0.20 | 19. | Fenchol | 0.91 |
| 4. | β-Pinene | 0.51 | 20. | Pulegone | 0.21 |
| 5. | Sabinene | 0.56 | 21. | Neral | 0.10 |
| 6. | -Carene | 0.96 | 22. | Undecanal | 0.23 |
| 7. | α-Phallendrene | 0.88 | 23. | Terpinen-4-01 | 2.90 |
| 8. | α-Terpinene | 0.67 | 24. | Borneol | 3.13 |
| 9. | Limonene | 0.85 | 25. | Garanial | 0.35 |
| 10. | Cineol | 0.16 | 26. | Unknown | 8.84 |
| 11. | γ-Terpinene | 1.66 | 27. | Ceraniol | 0.35 |
| 12. | *p*-Cymene | 9.54 | 28. | Unknown | 1.26 |
| 13. | Octanal | 0.11 | 29. | Unknown | 1.46 |
| 14. | Nonanal | 0.17 | 30. | Thymol | 42.63 |
| 15. | Citronellal | 0.17 | 31. | Unknown | 0.57 |
| 16. | Camphor | 3.54 | 32. | Carvacrol | 8.15 |

Thyme oil of commerce is distilled from two similar herbs, *Thymus valgaris* and *Thymus zygis*. The predominant component of the oil is thymol varying from 20 to 60%. Carvacrol, an isomer of thymol and *p*- cymene are the other major components of the thyme oil.

The essential oil of *Thymus serpyllum* also contains all these constituents and has a potential to become an article of commerce provided the wild shrub is collected for the purpose and its oil is properly rectified. Such a step is necessary to reduce the carvacrol percentage as it imparts harshness (pungency) in the odour profile. The thymol (42.63%) of this essential oil is comparable to that of the commercial thymol oil (20-60%). The present composition of the essential oil also suggests that it has a higher percentage of thymol content (42.63%) and lesser amounts of the isomeric alcohol, carvacrol (8.16%). This finding, therefore, is similar to that of Agarwal *et al.* [4] where it is claimed to have 60% thymol [4]. The percentage variations in the thymol content, however, may well be due to the regional environments of the shrubs.

*Dedication.* This publication is dedicated to the memory of our senior colleague late Dr. M. K. Bhatty, who passed away on 12th February, 1990.

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