Variation in the Essential Oil Composition of *Perovskia abrotanoides* of Different Growth Stage in Baluchestan

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**Abstract:** Aerial parts of *perovskia abrotanoides* plants from Taftan area of Baluchestan (Iran) were collected at different developmental growth stages including pre-flowering, flowering and post-flowering. Their essential oil were obtained by hydrodistillation and analyzed by technique of gas Chromatography/mass spectrometry. The yields of oil (w/w%) in different stages were in the order of: pre-flowering (2.19%), flowering (2.45%) and post-flowering (2.35%). In total 71, 76, 54 components were identified and quantified in the oil of pre-flowering, flowering and post flowering plants, representing 96.24%, 97.03 % and 100%. of the oil, have the amounts respectively 1,8 Cineole, Champhor, Linalool, β-Ocimene-x., β-Caryophyllene, α-Humulene, were the main compounds in all samples. Oxygenated-Terpenoids were the main group of compounds in pre-flowering (50.10%), flowering (53.64%) and post-flowering (54.97%) stages.

**Key words:** *Perovskia abrotanoides* • Different growth stage • Variation in the Essential oil composition • Linalool • 18 Cineole

**INTRODUCTION**

Originally this strain was imported from Afghanistan and selectively bred in Holland for indoor cultivation. Afghan silver sage (Labiatae) has a strong acrid aroma [1]. This plant are sustainable with shrub or woody bush, they may be small trees with height of 60-130 cm. Their leaves are of divided shape or with out deep divided traces with out villi or covered by simple villies or branched villies, Full-cellular, nodular with out base. They have a lot of flowers, with out base or have small peduncle, gathered in separated cycles in Festoon of Cyme cluster-plate is pipe-cup. That its growing in one of endemic area in around Taftan Mountain [2].

The geographical feature of geological structure and climate of special Taftan has caused the growth special Species and variety and of unique plants in this area. The photochemical studies on medicinal plants have served the dual purpose of bringing up new therapeutic _ agents and providing useful [3,4]. Akoto in their research in 2001 about The essential oil from collected *Perovskia abrotanoides* in Karakorum-Himalaya showed the components with the higer: 1,8 Cineole (25.7%), Pinene (20.6%) [5]. in another research in 2004 undertake by. Morteza-semnani about the essential oil from collected *Perovskia abrotanoides* Karel. in Mazandaran province of north Iran. The major constituents were, Camphor (34.1%), 1,8-Cineole (18.0%), β-Caryophyllene (8.2%) and α-humulene (6.5%) [6].

**Identification of Compounds:** The linear retention indices for all the compounds were determined by coinjection of the sample with a solution containing the homologous series of C6-C30 n-alkanes. The individual constituents were identified by their identical retention indices, referring to known compounds from the literature [10] and also by comparing their mass spectra with either the known compounds or with the Wiley7 mass spectral database.

**RESULTS AND DISCUSSION**

The essential oil of aerial parts of first plant sample which was collected at pre-flowering stage with efficiency of 2.19%/g, according Table 1 was prepared with 0.01% error. The essential oil was analyzed by
Table 1: Percentage of the essential oil from *perovskia abrotonoides*, in different growth stages

| Compounds | RI pre-flowering stage | % pre-flowering stage | % post-flowering stage | Compounds | RI | % pre-flowering stage | % post-flowering stage |
|-----------|------------------------|-----------------------|------------------------|-----------|------------------------|------------------------|
| Tricyclo | 921 | 0.09 | 0.09 | 0.10 | unknown | 1279 | - | 0.01 | - |
| Verbenene | 928 | 0.01 | - | - | Bicyclo[2.2.1]heptan-2-ol, 1,7,7-trimethyl-acetate | 1283 | - | 1.90 | - |
| Benzene-1,3-dimethyl | 1,3-dimethyl | 936 | 0.08 | 0.06 | 2-Cyclohexen-1-one, 3-methyl-6-(1-methylethyldiene) | 1297 | - | 0.07 | - |
| pinene | 937 | 2.29 | - | 4.23 | Benzenemethanol, 4,4-dimethyl | 1302 | - | 0.04 | - |
| unknown | 938 | - | 2.97 | - | Cyclohexanone, 2,2-Dimethyl-5-(3-methoxystyryl) | 1313 | - | 0.03 | - |
| Sabinene | 946 | 0.09 | - | - | 2,4-Cycloheptadiene-1-one, 2,6,6-trimethyl | 1317 | - | 0.05 | - |
| camphene | 950 | 2.21 | 2.27 | 2.38 | isopulegol | 1321 | - | 0.01 | - |
| Borneol | 1272 | 0.06 | - | - | Ent-pinane, 8,15-diene | 1883 | 0.15 | - | 0.1 |
| camphene | 1287 | 3.21 | 4.20 | 5.40 | Bicyclo[7.2.0]undec-4-ene, 4/11/11-trimethyl-8-methylene | 1703 | - | 0.44 | - |
| retention index relative to n-alkanes C6-C24 on the HP-5MS capillary column. | | | | | | | | | |

Techniques of GC/MS. 71 components were identified that include 96.24% of the total oil, 95.86% of the total oil, have the amounts of trace >0.05%. According to Table 1, 95.86% of the total oil, have the amounts of trace >0.05%. According to Table 1, the components having the highest percentage, are as follows: Linalool (19.12%), delta-3-carene (18.17%), 1,8-Cineole (15.83%), alpha-Humulene (8.14%), trans-caryophyllene (8.10%). The essential oil of second plant sample was collected at flowering with efficiency of 2.45 g/g, that it has a higher outcome. 54 components which comprise 99.96% of the total oil, have the amounts of trace >0.05%. According to Table 1, 51 components which 99.83% of the total weight oil, have the amounts (trace >0.1%). The compounds having the highest percentage include: ocimene-x (10.96%), linalool (10.96%), Dr. Sajjadi and her colleagues, in their research in 2005 about p<em>erovskiaabrotanoides</em> Karel. Were collected from Khorasan province (northeast Iran) showed the compounds which have the higher percentage include 1,8-camphor (9.1%), beta-Caryophyllene (7.9%) and alpha-Humulene (6.4%) Cineole (32.4%), Myrcene (13%) [7].

### MATERIALS AND ETHODS

**Plant Material:** The aerial parts of <em>perovskia abrotanoides</em> were collected during three periods of pre-flowering on 1<sup>st</sup> May flowering on the 15<sup>th</sup> June, and post-flowering on the 1<sup>st</sup> August of 2008 from the Sistan and Baluchestan region (Taftan Area) south-eastern of Iran. A voucher specimen was deposited at the Herbarium of Research Institute of Forest and Rangelands Iran (Tehran) and identified by Dr. V. Mozaffarian [8].

**Isolation of the Essential Oil:** The aerial parts (50g) were dried at 25 °C in the shade and subjected to hydro distillation, using a Clevenger-type apparatus for 3.5h. Obtained essential oil was collected in Hexane-solvent and was dried with anhydrous sodium Sulphate weighed and stored at 4 °C in dark until use.

### GC/MS Analysis:

The analysis of the essential oils were performed using a Hewlett-Packard 6890 Net work GC System, equipped with a 60m* 0.25mm id, 0.25 μm HP-5Ms capillary column and a HP 5973 mass selective detector. Helium was the carrier gas at 1 mL/min. The injector and MS transfer line temperature were at 250 and 260 °C respectively. Column temperature was set at 40°C for 1 min, then programmed from 40°C to 250°C at a rate of 3 °C/min, and finally held isothermally for 20 min. For GC/MS detection an electron ionization System was used with ionization energy of 70 ev. Retention indices were calculated by using retention times of C<sub>4</sub>-C<sub>26</sub> n-alkanes that were injected after the oil at the same chromatographic conditions according to Van Den Dool method [9].

### CONCLUSION

A comparison between different growth stages in Table 1. Suggests that the essential oil of plant sample which was gathered at flowering stage was extracted with a better outcome and it has a higher percentage of Terpenoids compounds, oxygenated-having compounds comprise more than 50 percent of the total oil of three plant samples and have 21 similar compounds with high percentage, as Table 1. Show. Compound of 1,8 Cineole is common in the essential oil of three plant samples.
This compounds has anti-bacterial effects. It can be used in making anesthetic and antiseptic drugs. Another important compound is alpha-pinene which is found only in the essential oil the samples collected at pre-flowering stage and post-flowering stage because of strong light the samples collected at pre-flowering stage and post-flowering stage because of strong light influence. Other important compound is camphor which is found in the essential oil of three plant samples, since the region of Iranian Baluchestan has suitable ecological conditions for valuable medicinal plants growing, so that more than 60 rare and unique species grow in this region. The region is paid a little attention by researches because of its width as well as its neighborhood with the countries of Pakistan and Afghanistan. So, because of the importance of the issue, we become determined to carry out the research.

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