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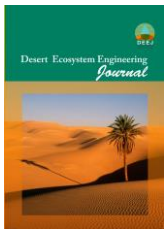

Investigation of Seasonal Changes in the Essential oil of *Artemisia sieberi* Besser and its Effect in the Livestock Grazing Behavior in the Steppes Rangeland of Golchakan Region of Kashan

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Extended Abstract

Introduction: Artemisia is a large and diverse genus from the Asteraceae family, that with Astragalus genus constitute the 60% of Iran's rangeland vegetation. This plant species has been used since ancient times as a medicinal plant. One of the most important species of this genus is the *Artemisia sieberi* Besser, which is feed by livestock in some season. Since, in addition to genetic factors, environmental factors affect the quantity and quality of essential oil of this plant. Also, the grazing of livestock is largely affected by changes of essential oil of this plant species. The aim of this study is the investigation of the seasonal changes in the essential oil of *Artemisia sieberi* Besser.

Material and Methods: This research was conducted in a randomized sampling with 3 replications from the Artemisia sieberi in 2017. Artemisia species were taken from step rangeland of Kashan province. In this study, 3 plant bases were selected randomly and dried at room temperature and shadow and prepared for essential oil operation, in this regard plant samples (100g) were dried and extracted by Clevenger distillation method for 60 minutes. The essential oil analyzed by GC/MS. GC analysis was performed by using a thermoset gas chromatograph with a flame ionization detector (FID). The analysis was carried out using the fused silica capillary Innowax column (60 m × 0.25 mm i.d.; film thickness 0.25 µm). The operating conditions were as follows: injector and detector temperatures were 230˚C and 250˚C, respectively. Nitrogen was used as carrier gas at a flow rate of 4 ml/min; oven temperature programme, 80˚C–230˚C at the rate of 3˚C/min, and finally held isothermally for 10 min. The constituents of the essential oil were identified by calculation of their retention indices under temperature-programmed conditions for n-alkanes (C5–C10) and the oil on an Innowax column under the same chromatographic conditions. In order to Identification of individual compounds was made by comparison of their mass spectra with those of the internal reference mass spectral library or with authentic compounds and confirmed by comparison of their retention indices with authentic compounds. In

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order to more accurately identify the compounds, relative area percentages obtained by FID were used without the use of correction factors.

Results and Discussion: The results showed that there are 43 compounds in Artemisia essential oil which 35 compounds are common between different seasons. The main components of the essential oil were alpha-thujene, alpha-pinene, Camphene, 1.8cineol, and alpha-phellandrene. The highest amount of alpha-pinene was observed in summer (32.50%) and the highest amount of Camphene was observed in spring (23.7%). The highest levels of alpha-thujene and 1.8cineol were observed in the spring and summer, in the amount of 50.56 and 24.5%, respectively. Except for some compounds such as alpha-thujene, alpha-pinene, and Camphene, other essential oil composition, not affected by seasonal changes. The evaluation of essential oil of this plant in different stages in this region indicated that the amount of this composition in the essential oil before the flowering stage was 87.9% and after the flowering stage was 91.33%. The studied plant was collected from the natural habitats of Kashan, which is considered being hot and dry regions, and in general, the plants that have been grown in these areas are alpha-tense. In contrast, there are more common parts of the essential oils of cold weather. The changes in Camphor from December to September were 45.2%, 37.5%, 14.1%, and 10.5% respectively, and the highest rate of camphor was observed in January. In the populations of Artemisia, Khorasan was 20% to 24.5% of Camphen, which is consistent with the results of this research. In Kerman, it was reported as 23%. 8 and 1, cineole was identified as one of the main components of essential oil in Artemisia populations of Turkey in plains. The amount of this substance in Kerman was 34.8%, which is more than the samples studied in this study. Some essential oil composition was converted to other compounds, and their concentration decreased in fall and winter and increased in the spring and summer which had a significant impact on livestock's grazing.

Conclusion: This appears that drought stress has been effective in producing more alpha-pinene. On the other hand, in winter, several compounds are produced in the essence of this plant species, and the reason for the decrease of alpha-pinene in fall and winter may be its conversion to other components in the essential oil. It seems that this compound is high in the essential oil of the plants grown in Iran. Because the amount of this compound has increased after autogenous grazing in fall, this may be due to the biochemical defense of the plant against grazing of the livestock, which needs to be more investigated. The observed differences are mainly related to environmental conditions, and each plant grown in one region is richer in one of the essential oil components. Different components of the essential oil of Artemisia plain have different applications, for example, alpha-pinene in perfumes and insecticides, cineol in perfumes, and pharmaceuticals are used as the suppository, anesthetizing and reducing blood pressure and amphetamine in perfume. Therefore, finding plants that are rich from the essential oil components is important in this regard.

Keywords: Alpha-Pinne, Rain, Grazing livestock, Artemisia, GC/MS