



University of Zabol
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Faculty of Agriculture
Department of Agronomy

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Title

**Evaluation of the effect of altitude and phenological stage on
morphological traits, The quantity and quality of essential oil of wild
origin (*Mentha Longifolia*) and *Artemisia aucheri* Boiss. in Mount
Taftan**

Supervisor

Dr. Ahmed Ghanbari

Advisors

Dr. Esmaeel Seyedabadi

Dr. Mustafa Khajeh

By

Parviz Bakhtiari Nia

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Abstract

Mentha longifolia L. is a mint species that grows naturally in Iran. *Artemisia aucheri* Boiss. is a dominant plant in dry and semi-arid steppes. This study investigated the effects of altitude and phenological stages on the morphological traits, quantity, and quality of secondary metabolites of these plants in the highlands of Taftan. The study was conducted in a factorial experiment with a completely randomized basic design. The first factor was altitude, with four levels (1600-1800, 1800-2000, 2000-2200, and 2200-2400 meters above sea level). The second factor was phenological stage, with two levels (beginning of flowering and complete flowering). The experiments were done in triplicate. After collecting samples from the branches of the plants at the desired heights and phenological stages, the researchers measured quantitative traits such as plant height, number of leaves, fresh weight, dry weight, root length, and fresh and dry weight of the roots. They also measured biochemical traits such as essential oil yield percentage, essential oil compounds, total flavonoid content, total phenol, and antioxidant activity. Then, they correlated the experimental treatments and investigated traits. The researchers extracted the essential oil of the studied species using a clevenger device and water distillation method. Gas chromatography (GC) devices connected to mass spectrometry (GC/MS) were used to identify the constituent compounds of the essential oil. SAS statistical software was used for statistical analysis and Excel software were used for drawing graphs. The means compared using Duncan's multiple range test. The results showed that for both plants, the plant height, plant fresh and dry weight decreased with increasing altitude. Root length, root fresh and dry weight, total phenol content, total flavonoid content, and antioxidant activity increased with increasing altitude. The full flowering stage improved all of the quantitative and qualitative traits investigated. There was a negative and significant correlation between essential oil yield and antioxidant activity in both wild oregano and mountain sage. There was a positive and significant correlation between total phenol and antioxidant activity, and a negative and significant correlation between flavonoid and antioxidant activity in both species. There was also a positive and significant correlation between phenol and flavonoid in both species. The most important compounds of *Artemisia* were thymol, alpha-thujone, alpha-pinene, camphene, sabinene, beta-pinene, borneol, camphor, alpha-phelandrene, geraniol, alpha-terpinene, 1,8-cineol, geranyl acetate, Z-citral, alpha-citral, and myrcene. The most important compounds of *Mentha* were alpha-thujone, alpha-pinene, beta-pinene, 1,8-cineole, limonene, menthol, piperitenone oxide, piperitenone, alpha-terpinene, thymol, myrcene, and pulegone.

Keywords: Chromatography, Correlation, Flavonoid, Pastures, Topographical Factor