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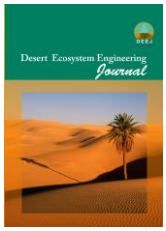

Investigation of the Essential Oil's Phytochemical Profile in *Pulicaria gnaphaloides* Grown in Rangeland Ecosystems (Fars Province, Darab County, Iran)

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Extended Abstract

Introduction: *Pulicaria gnaphaloides* (Vent.) Boiss, locally known as "Alaf Heizeh," is a medicinal plant prevalent in arid natural ecosystems. This species frequently colonizes disturbed and degraded lands, roadsides, dry riverbeds, and loose soils at the foothills of arid to semi-arid mountainous regions within the Irano-Turanian floristic zone. Fars Province serves as a significant habitat for *P. gnaphaloides*, making data collection on its distribution across the province highly valuable.

Previous studies highlight the diverse medicinal properties of *P. gnaphaloides*, including anticancer, antioxidant, antibacterial, antiviral, disinfectant, and antifungal activities. In the traditional medicine of southern Iran, its extract is historically used as a suppository to alleviate constipation. Furthermore, topical application of an aqueous extract (decoction) from this plant acts as an insect repellent, specifically noted for its efficacy against flea bites.

Given its broad traditional uses and documented biological activities, this research aims to investigate and characterize the phytochemical properties of the essential oil derived from *Pulicaria gnaphaloides* (Vent.) Boiss cultivated in the rangeland ecosystems of Darab County, Fars Province.

Materials and Methods: Initially, the natural habitats of Pulicaria gnaphaloides (Vent.) Boiss within Darab County were identified and mapped through a field survey. For each identified area, elevation (height above sea level), latitude, and longitude were recorded using a Global Positioning System (GPS) device (Vista model, Taiwan). Given the high density and abundance of P. gnaphaloides in the Fasarood area of Darab, soil samples were collected from this specific habitat. Physical and chemical characteristics of the soil, including acidity (pH), electrical conductivity (EC), and elemental composition, were subsequently analyzed.Fresh leaves of the plant were collected from the determined habitats. To prevent degradation, the collected plant material was shade-dried at a temperature range of 10-20 degrees Celsius. For essential oil extraction, 100 grams of crushed flowering branches were subjected to hydro-distillation using a Clevenger-type apparatus for 3 hours. This process was conducted in the medicinal plants laboratory of the Faculty of Agriculture and Natural Resources, Darab. The essential oil was separated from the distillation column using a specialized syringe. The collected essential oil was then dehydrated by treating it with anhydrous sodium sulfate, weighed, and the essential oil yield percentage was calculated using a

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standard formula. After dehydration, the essential oil was stored in a sealed glass container at 4 degrees Celsius in a refrigerator until further analysis. The quantitative and qualitative analysis of the essential oil compounds was performed using Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC-MS).

Results and Discussion: The extraction and analysis of the essential oil from *Pulicaria gnaphaloides* (Vent.) Boiss collected from various habitats within Darab County resulted in the identification of 37 distinct chemical compounds. The essential oil yield percentage exhibited minimal variation across these habitats, averaging approximately 0.3%. The predominant chemical compounds identified in the essential oil of *P. gnaphaloides* across the investigated habitats were: Eudesma-4(15),7-dien-1-β-ol (20.58%), Caryophylla-4(14),8(15)-dien-5β-ol (16.68%), Terpinen-4-ol (8.40%), p-Cymene (2.48%), *trans*-Cadina-1(2),4-diene (2.53%), and Spathulenol (2.25%).This study reveals that the essential oil of *P. gnaphaloides* is a rich natural source of Eudesma and Caryophylla derivatives. This finding suggests the plant's significant potential as a valuable natural resource for pharmaceutical and related industries. The isolation and commercial extraction of compounds such as Eudesma from *P. gnaphaloides* essential oil could present substantial economic benefits, including potential for significant profits and foreign exchange generation for domestic stakeholders. Such endeavors could also contribute to reducing reliance on imported compounds, thereby curtailing currency outflows from the country.

The identification of *P. gnaphaloides* as a source of these valuable compounds underscores the importance of further research into its phytochemical profile. Promoting the large-scale cultivation of this plant and optimizing essential oil extraction techniques could significantly bolster domestic industries. Moreover, the export of *P. gnaphaloides* essential oil or its refined derivatives could contribute substantially to strengthening Iran's economy by diversifying its export portfolio and adding value to its natural resources.

Keywords: *Pulicaria gnaphaloides (Vent.)*, Clevenger, essential oil, chemical compounds.