

CHEMICAL COMPOSITION AND BIOLOGICAL ACTIVITIES OF *Ephedra alata* Subsp. *Alenda* ESSENTIAL OIL COMPARED WITH PUBLISHED ESSENTIAL OILS FROM SAHARAN REGIONS

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Abstract. *Ephedra alata* subsp. *alenda*, a resilient shrub known in Algeria as "Alenda", widely used in traditional Saharan medicine, yet its volatile fraction remains poorly characterized along the bioclimatic gradients of North Africa. This study investigated the phytochemical and biological properties of the essential oil (EO) harvested from wild populations in Bechar (Southwest Algeria). The EO was obtained via hydrodistillation, analyzed by GC-MS, and evaluated for antioxidant capacity (DPPH, FRAP, β -carotene) and anti-inflammatory potential (albumin denaturation and HRBC membrane stabilization). GC-MS analysis showed 94.7% of the total composition, which was primarily characterized by β -Pinene (18.3%), α -Terpinyl acetate (13.8%), and Limonene (9.2%). Biological results revealed a DPPH IC₅₀ of 28.45 μ g/mL, an EC₅₀ for FRAP of 42.15 μ g/mL, and an IC₅₀ for protein denaturation inhibition of 92.30 $\pm$ 3.45 μ g/mL. Further significant findings included an IC₅₀ for HRBC heat lysis of 84.50 $\pm$ 2.90 μ g/mL and hypotonic lysis of 68.15 $\pm$ 2.20 μ g/mL. One-way ANOVA confirmed significant quantitative disparities in the distribution of chemical classes compared to regional populations from Ain Sefra, El Oued, and Tunisia. These findings establish the Bechar population as a distinct, highly bioactive transitional chemotype, providing a robust scientific basis for its traditional therapeutic use in Saharan medicine.

Keywords: *Ephedra alata* subsp. *Alenda*, essential oil, antioxidant activity, anti-inflammatory activity, Sahara.