## The SPF Determination of Albanian Sideritis Raeseri Aqueous Solutions And Correlation With Phenolic Compounds

## Abstract

The rise in skin cancer incidence, notably melanoma and nonmelanoma types, is a significant global public health concern. This increase has been attributed to greater ultraviolet (UV) exposure and insufficient use of photoprotection, particularly in older adults and men [1]. While synthetic sunscreens are widely used, concerns about their safety and environmental persistence have motivated a search for natural alternatives. The wild Albanian "mountain tea", Sideritis raeseri belongs to Lamiaceae family was studied in this paper for its potential protective effects against direct sunlight, particularly UV radiation, and indirectly through its antioxidant properties with the "in vitro"method. This plant, typically found at elevations above 600 meters, is a mostly perennial herb that flourishes in calcareous, well-drained, slightly alkaline soils. This study evaluates the UV protective properties of S. raeseri through in vitro Sun Protection Factor (SPF) determination, correlating photoprotective activity with phenolic content. Aqueous extracts were prepared from dried aerial parts, leaves, flowers, stems, and the whole plant, following standardized infusion, filtration, and centrifugation protocols. UV-VIS spectrophotometry (290–320 nm, 5 nm intervals) was conducted on 20% v/v dilutions (5% for leaves, corrected by dilution factor), and SPF values were calculated using the Mansur equation [2].

Results revealed that leaf extracts exhibited the highest SPF (43.17), followed by flowers (13.14), the whole plant (8.29), and stems (4.92). These variations aligned strongly with phenolic content, as confirmed by a Pearson correlation coefficient (r = 0.958, p < 0.01). Phenolic compounds such as Carvacrol (36.7%) and Thymol (0.5%) known for their aromatic rings and hydroxyl groups, contribute to effective  $\pi \rightarrow \pi^*$  transitions responsible for UV absorption [3]. A marked absorption peak at 278–279 nm was observed, likely representing phenolic content and affected by aqueous solvent polarity, which causes a bathochromic shift when compared to spectra in methanol [4].

In addition to direct UV absorption, antioxidant activity plays a crucial secondary role in protection by neutralizing free radicals produced under UV exposure. Previous studies have established that phenolic-rich Sideritis species, especially the leaves, exhibit high antioxidant capacity, further enhancing their photoprotection efficacy [5].

In conclusion, this study supports the use of Sideritis raeseri, especially its leaf extracts, as a promising natural ingredient in sun-protective cosmetic formulations. The dual mechanism, direct UV filtering and antioxidant defense, suggests strong potential for safe, plant-based sunscreen development.

Keywords: Sideritis raeseri, SPF, UV protection, phenolic compounds, antioxidant, Mansur method

Primary author: Dr XHUVANI, Emil (University of Tirana, Physics Department)

**Co-authors:** Ms VASIAJ, Erjola (University of Tirana); Dr KRISTO, Kejda (University of Tirana, Physics Department); Dr MEMA, Matilda (Polytechnic University of Tirana, Faculty of Mathematical and Physical Engineering, Department of Physic)

**Presenter:** Dr XHUVANI, Emil (University of Tirana, Physics Department)