

## Intraspecific Biochemical Diversity of Dalmatian Pyrethrum Across the Different Bioclimatic Regions of Its Natural Distribution Area

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**Abstract :** Dalmatian pyrethrum (*Tanacetum cinerariifolium* (Trevir.) Sch. Bip.) is a plant species that occurs naturally in the eastern Mediterranean. It is of immense economic importance as it synthesizes and accumulates the phytochemical compound pyrethrin. Pyrethrin consists of several monoterpene esters (pyrethrin I and II, cinerin I and II and jasmolin I and II), which have insecticidal and repellent activity through their synergistic action. In this study, 15 natural Dalmatian pyrethrum populations were sampled along their natural range in Croatia, Bosnia and Herzegovina and Montenegro to characterize and compare their pyrethrin profiles and to define the bioclimatic factors associated with the accumulation of each pyrethrin compound. Pyrethrins were extracted from the dried flower heads of Dalmatian pyrethrum using ultrasound-assisted extraction and the amount of each compound was quantified using high-performance liquid chromatography coupled to DAD-UV/VIS. The biochemical data were subjected to analysis of variance, correlation analysis and multivariate analysis. Quantitative variability within and among populations was found, with population P15 Vranjske Njive, Podgorica having the significantly highest pyrethrin I content (66.47% of total pyrethrin content), while the highest levels of total pyrethrin were found in P14 Budva (1.27% of dry flower weight; DW), followed by P08 Korčula (1.15% DW). Based on the environmental conditions at the sampling sites of the populations, five bioclimatic groups were distinguished, referred to as A, B, C, D, and E, each with rare chemical profile. The first group (A) consisted of the northern Adriatic population P01 Vrbnik, Krk and the population P06 Sevid - the coastal population of the central Adriatic, and generally differed significantly from the other bioclimatic groups by higher average jasmolin II values (2.13% of total pyrethrin). The second group (B) consisted of two central Adriatic island populations (P02 Telašćica, Dugi otok and P03 Žman, Dugi otok), while the remaining central Adriatic island populations were grouped in bioclimatic group C, which was characterized by the significantly highest average pyrethrin II (48.52% of total pyrethrin) and cinerin II (5.31% DW) content. The South Adriatic inland populations P10 Srđ and P11 Trebinje (Bosnia and Herzegovina), and the populations from Montenegro (P12 Grahovo, P13 Lovćen, P14 Budva and P15 Vranjske Njive, Podgorica) formed bioclimatic group E. This bioclimatic group was characterized by the highest average values for pyrethrin I (53.07 % of total pyrethrin), total pyrethrin content (1.06 % DW) and the ratio of pyrethrin I and II (1.85). Slightly lower values (although not significant) for the latter traits were detected in bioclimatic group D (southern Adriatic island populations P07 Vis, P08 Korčula and P09 Mljet). A weak but significant correlation was found between the levels of some pyrethrin compounds and bioclimatic variables (e.g., BIO03 Isothermality and BIO04 Temperature Seasonality), which explains part of the variability observed in the populations studied. This suggests the interconnection between bioclimatic variables and biochemical profiles either through the selection of adapted genotypes or through the ability of species to alter the expression of biochemical traits in response to environmental changes.

**Keywords :** biopesticides, biochemical variability, pyrethrin, *Tanacetum cinerariifolium*

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