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SPECTROCHEMICAL CHARACTERIZATION OF LIPID FRACTION IN SUNFLOWER POLLEN

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Abstract. Sunflower *(Helianthus annuus* L.) pollen is a chemically rich but underexplored matrix containing bioactive lipids with nutraceutical and pharmaceutical relevance. Lipid fractions were isolated from hand-collected pollen samples across three distinct agroclimatic zones in Moldova *via* mini-Soxhlet extraction. Subsequent alkaline saponification and acid methylation enabled GC-MS characterization of fatty acid methyl esters (FAMEs) and unsaponifiable constituents. The mean lipid yield (9.23% w/w) exhibited regional variability, with the highest value in the sample from Visoca (9.90%), likely due to climatic modulation of lipid biosynthesis. Chromatographic profiling resolved >40 constituents, including: Polyunsaturated fatty acid esters (*e.g.*, methyl linolenate, a ω-3 precursor); diterpenoid derivatives (methyl labdatrien-19-oate); oxygenated sterols (lanostan-3-one); lipophilic vitamins (α-tocopherol, retinol derivatives). Chemometric analysis revealed stress-induced shifts in metabolite distribution, with heat/water deficits favouring terpenoid accumulation. The lipidome's structural diversity-spanning hydrocarbons, esters, and ketones-suggests multifunctional bioactivity (antioxidant, anti-inflammatory). These findings position sunflower pollen as a sustainable source of phytochemical precursors for functional ingredients. Further studies should address structure-activity relationships, stabilization strategies, and green extraction optimization.

Keywords: lipid fraction, gas chromatography-mass spectrometry (GC-MS), phytosterol, terpenoid, nutraceutical value, pollen.

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