SPECTROCHEMICAL CHARACTERIZATION OF LIPID FRACTION IN SUNFLOWER POLLEN

Maria Duca[a*], Alexandru Ciocarlan[b], Ana Mutu[a], Steliana Clapco[a*]

[a]Center of Functional Genetics, Institute of Genetics, Plant Physiology and Protection, Moldova State University, 65A, Kogalniceanu str., Chisinau, Republic of Moldova
[b]Institute of Chemistry, Moldova State University, 3, Academiei str., Chisinau, Republic of Moldova
**e-mail: mduca2000@yahoo.com; steliana.clapco@usm.md*

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 pollen samples collected 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 favoring 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.