UDC: 633.34:577.112:543.42 DOI: https://doi.org/10.53040/ppap2026.77

PROTEINOGENIC AMINO ACID COMPOSITION OF INDIGENOUS SOYBEAN (*Glycine max* (L.) MERR.) VARIETIES ASSESSED BY NEAR-INFRARED SPECTROSCOPY

BÎRSAN Ana, https://orcid.org/0000-0003-1696-080X

Moldova State University, Chișinau, Republic of Moldova
Corresponding e-mail: *ana.birsan@usm.md*

Soybean proteins nutritional properties are determined by the chemical composition of essential and non-essential amino acids, which confer a biological value comparable to that of proteins of animal origin. The aim of the present study was to evaluate the impact of direct climatic effects on the profile of essential and non-essential amino acids in the seeds of several indigenous soybean varieties, with a view to assessing their nutritional quality.

The biological material consisted of seeds from four indigenous soybean varieties: Aura (control), Deia, Igorina, and Flamura, developed by the Institute of Crop Science «Selecția» and cultivated in the experimental fields of the National Center for Seed Research and Production, Bălți Branch. Mature, well-dried seeds with a moisture content of approximately 8–10% were subjected to biochemical analysis using near-infrared spectroscopy (NIRS) with a SpectraStar XT analyzer operating within a wavelength range of 1100–2600 nm. For the first time, advanced NIRS technology was employed to characterize the comprehensive biochemical composition of these soybean varieties, including seed moisture, crude protein, ash, lipid, and amino acid contents. For each variety and year, all determinations were performed in at least three replicates, and amino acid concentrations were expressed as percentages of dry matter. Climatic variables were obtained from the openly accessible POWER NASA and Open-Meteo (ERA5-Land) databases.

The NIRS method enabled the reliable identification of 18 proteinogenic amino acids in all soybean varieties studied. The overall metabolite profile revealed the presence of nine essential and nine non-essential amino acids. The results demonstrated that the qualitative amino acid profile was similar among all investigated varieties; however, significant quantitative differences were observed among the different genotypes.

Although crude protein content is generally regarded as the principal nutritional indicator of soybean flour, the nutritional quality of soybean-derived products is pri-

marily determined by their essential amino acid composition. Among the essential amino acids, lysine, leucine, phenylalanine, and histidine were the predominant constituents, whereas methionine and, particularly, tryptophan were identified as the limiting amino acids. Among the non-essential amino acids, arginine, aspartic acid, tyrosine, and glycine were present at relatively high concentrations, while serine and especially cysteine occurred at comparatively low levels. The amino acid composition also varied according to annual environmental conditions. Abiotic stress associated with the climatic conditions of 2024 exerted more pronounced effects on the investigated metabolites than those recorded in 2025. In contrast to 2024, when significant variations in amino acid content were observed across all soybean varieties, no significant differences were detected in 2025 between the Igorina and Flamura varieties or in comparison with the Aura variety, for either essential or non-essential amino acids. Nevertheless, a significant increase in the concentration of all amino acids was observed in the Deia variety. Therefore, among the investigated soybean genotypes, under more favorable environmental conditions, the Deia cultivar exhibited the highest crude protein and amino acid contents, highlighting its considerable potential as a valuable genetic resource for soybean breeding programs aimed at improving nutritional quality.

Keywords: soybean, seeds, amino acids, NIRS.

Acknowledgments. This research was supported by the subprogram PHYSTECH research project with code 011210, funded by the Ministry of Education and Research.