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Abstract

HPLC Profiling of Soluble Carbohydrates for Unveiling Low-Flatulence Potential Soybean Genotypes †

Edward Muntean [1,2,*], Camelia Urda [2] and Raluca Rezi [2]

[1] Department of Food Science, Faculty of Food Sciences and Technology, University of Agricultural Sciences and Veterinary Medicine Cluj Napoca, 400372 Cluj Napoca, Romania
[2] Research & Development Station for Agriculture, 401100 Turda, Romania; camelia.urda@scdaturda.ro (C.U.); ralucutza_dana@yahoo.com (R.R.)
* Correspondence: emuntean@usamvcluj.ro
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Soybean is a globally significant crop, holding multifaceted importance due to its diverse applications in food, feed, and fuel production, along with its utilization in the synthesis of various chemicals. Beyond these, soybeans are gaining importance in health and medicine due to their exceptional nutritional and health-promoting attributes. Consequently, there are increasing efforts to enhance soybean breeding, focusing on enhancing the protein, fatty acid, and soluble sugar content. Soluble carbohydrates, particularly sucrose, are pivotal constituents that shape soybeans' quality and nutritional worth. The composition of these compounds plays a pivotal role in shaping the soybean's quality, digestibility and nutritional worth. However, their potential is hindered by compounds like stachyose and raffinose, which are known for causing flatulence. This research aimed to develop a high-performance liquid chromatographic (HPLC) method for comprehensively fingerprinting the soluble carbohydrates in soybeans in order to differentiate soybean genotypes that are abundant in flatulence-inducing carbohydrates from those with minimal quantities of such compounds. Plant materials were harvested from various cultivars at the Research and Development Station for Agriculture Turda, Romania. An optimized isocratic HPLC method was developed for the analysis of glucose, fructose, sucrose, raffinose, and stachyose using a Shimadzu Prominence HPLC system with differential refractive index detection; separations were completed in less than 22 min using a Nucleosil amino column. Subsequently, the preprocessed chromatographic data underwent principal component analysis (PCA) using MatLab. The analysis revealed distinct carbohydrate profiles in different genotypes, influenced by genetic factors; notably, saccharose and stachyose were the predominant carbohydrates, with levels exceeding 4 g/100 g. The resultant PCA model provided insights into the genotypes with superior quality attributes and highlighted similarities among the studied genotypes. This approach holds promise for quality control assessments and practical implications in soybeans' nutritional attributes. It addresses flatulence-related concerns associated with soybeans consumption, offering valuable insights for breeders and researchers working towards enhancing soybeans' quality.

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