

CHEMICAL AND GENETIC CHARACTERIZATION OF MAIZE TRADITIONAL LANDRACES FROM NORTHERN ITALY

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Traditional populations of major crops are a valuable source of potentially useful traits for modern breeding programs, including resistance to pests and diseases, tolerance to abiotic stresses and improved nutritional quality. In addition, traditional populations often exhibit a high level of genetic diversity, which can be used to create new varieties within a wide range of desired traits. Local maize landraces are also an important source of raw materials for the traditional food industry because they have distinctive flavor and aroma that are valued by consumers.

In the framework of the research project VALOMAYS (2021-2023), financed by Regione Lombardia, ten varieties of maize were characterized by Near Infrared Spectroscopy (NIRS) for their grain composition in terms of protein, lipid, starch, fiber, and ash. The varieties analyzed were harvested in 2022 in Bergamo and in other locations across the Lombardia region (Bergamo, Milano, Varese provinces) with different pedoclimatic characteristics, and their compositions were compared to data obtained from a vitreous maize hybrid developed for the food industry. As expected, landraces showed on average a higher protein, lipid, and fiber content than the hybrid, which instead had a higher content of starch and ash.

The same varieties were also genotyped by tGBS technology, as part of a group comprising a further 33 landraces from Lombardy. A total of 286 DNA samples were analyzed and produced 2x1,075,208,363 reads with an average read count of 2x3,759,470 per sample. After applying a series of quality

controls, the filtered SNP set was used to perform several statistical analyses. Heterozygosity indices and marker PIC values were calculated. Phylogenetic trees were obtained with the filtered SNP set and PCA analyses were performed. AMOVA analyses were then realized to verify the distribution of the total variability present in the population across the groupings present in the phylogenetic trees.

A high level of genetic variability could be detected among the landraces studied, and the ten characterized landraces were found to be a good representation of this variation. The results of this study suggest that traditional maize landraces could be a valuable resource for modern breeding programs and for the traditional food industry.

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