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EXPLORING THE VARIABILITY OF PHYTIC ACID IN A PANEL OF TRADITIONAL MAIZE VARIETIES: IMPLICATIONS FOR NUTRITIONAL ENHANCEMENT

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Phytic acid (PA) is the major storage form of phosphorus (P) in seeds and acts as an antinutritional factor, limiting the bioavailability of essential minerals. Only ruminants can degrade PA due to the presence of phytases in the digestive tract, while monogastric animals assimilate only 10% of phytate in feed and 90% is excreted, contributing to P pollution and water eutrophication. Addressing the reduction of PA in cereal seeds is crucial for improving nutritional quality and enhancing environmental P sustainability in agriculture. Although many *low phytic acid* (*lpa*) mutants have been isolated in major crops, the natural genetic variability of PA and inorganic phosphate (Pi) levels in landraces remains poorly understood. This study aimed to investigate the natural variability of PA and Pi contents in a panel of traditional maize varieties.

A collection of traditional maize varieties from Lombardy was selected from the MAISAlpi project (funded by Lombardy Region). Seeds from each variety were analysed for total P, PA and Pi levels using validated analytical methods, including Inductively-Coupled-Plasma Mass-Spectrometry (ICP-MS) and spectrophotometric assays (Chen assay for free P). Mineral and trace element content were also assessed using ICP-MS analysis. The results revealed significant variation in PA and Pi levels among the landraces under evaluation. Moreover, notable differences in mineral composition were

observed. These findings underscore the importance of preserving and valorising landraces for their genetic variability, both for biodiversity conservation and their potential use in breeding programs.

Understanding the natural genetic variability of PA and Pi in traditional maize varieties holds promise for developing improved varieties with enhanced nutritional profiles. The identification of maize landraces with lower PA content open avenues for addressing the adverse pleiotropic effects associated with PA reduction, while improving the overall nutritional quality of maize-based foods and feeds.

In conclusion, this study highlights the natural variability of PA and Pi content in a panel of traditional varieties. The identification of landraces with reduced PA content offers opportunities for developing varieties with enhanced nutritional profiles and supports the preservation of valuable genetic resources for sustainable agriculture.