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Farmers' and academia's views"

Harnessing genetic diversity in wheat to enhance grain nutrition and yield

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Abstract

Micronutrient malnutrition, especially iron and zinc, affect more than two billion people around the world. Improving these micronutrients content in staple food crops is a straightforward strategy to combat malnutrition through biofortification breeding. However, the genetic improvement of micronutrients depends on the genetic diversity and variability in the primary gene pool. Moreover, to ensure the synergistic effects and trade-offs between grain nutrients, morpho-physiological and yield traits should also be improved simultaneously. Therefore, the present study was conducted to ascertain the magnitude of genetic variability among different *Triticum* species for iron and zinc and standard leaf and seed morphological traits. For this purpose, a diverse germplasm of 813 genotypes including *T. aestivum, durum*, and *Triticale* was screened for grain color. A core collection of twenty-six genotypes was selected for the elemental analysis from a set of sixty genotypes after quantification of grain color. The results indicated high magnitude of diversity for Fe and Zn content ranging from 52 to 113 mg kg^{-1} and 14 to 62 mg kg^{-1}, respectively. Overall, durum had higher mean iron content (80 mg kg^{-1}) while *T. aestivum* had higher average zinc content (34 mg kg^{-1}). High estimates of variability (> 80 %) were observed for Fe, Zn, leaf angle, groove type, and plant height. The lower environmental variance for quality traits indicates strong genetic control supported by strong positive correlation among the micronutrients. The genotypes coded as 87 followed by 309 showed high Fe (94.1 mg kg^{-1}) and Zn (62.2 mg kg^{-1}) along with amber grain color and high grain yield (501 g plot^{-1}). Positive associations were found among the micronutrients, amber grain color and yield contributing traits favoring the simultaneous improvement of all these traits. This set of genotypes can be utilised in biofortification breeding programs to elucidate the bioavailability of iron and zinc. Moreover, the strongly positive association between iron and zinc content indicates that similar genes control the pathways for uptake and translocation without having an antagonistic effect and should further be explored.

Keywords: Biofortification, grain colour, iron, malnutrition, zinc

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