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Classification of Wheat Genotypes Based on Yield and Grain Zinc and Iron Density using Cluster Analysis

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Abstract

Cultivation of micronutrient-efficient genotypes may be the most sustainable and cost-effective solution for increasing the grain yield of food crops for the fast growing human population and in the same time improving human mineral nutrition. Breeding high-yielding micronutrient-dense genotypes is a great challenge. In this study cluster analysis was used to select Zn-efficient genotypes with high yield potential and high density in grain Zn and Fe. The Stress Tolerance Indicator (STI) as a criterion to explain the grain yield response of wheat genotypes to Zn fertilisation and grain Zn and Fe concentration were considered for the cluster analysis. Thirty spring wheat genotypes (Trial 1) and twenty winter wheat genotypes (Trial 2) were grown on two different sites during the 2006–2007 growing season with and without Zn fertilisation on each site. In the Zn fertiliser treatment 40 kg Zn ha^{-1} were applied in the form of $ZnSO_4.7H_2O$. In addition to these variables, we determined the STI as a criterion to compare the response of the various genotypes to the treatments. All these variables varied significantly ($p < 0.01$) among the spring and winter wheat genotypes. Zinc fertilisation significantly enhanced yield and grain Zn and Fe concentrations ($p < 0.05$), with effects differing on the two sites. Also the STI significantly depended ($p < 0.01$) on the sites. On the basis of the cluster analysis, wheat genotypes were divided into three groups, one group being micronutrient-dense, high grain yield genotypes. Although the clustering was different for the two sites, the classification proved to be useful to identify genotypes producing yields of high quantity and quality.

Keywords: Grain micronutrient concentration, grain yield, micronutrient-efficient, wheat genotype

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