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Abstract

Characterizing Genetic Variation in Late, Deep Wheat Root Architecture to Improve Yield and Yield Stability under Terminal Water Stress †

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Abstract: Root systems play an important role in crop performance particularly under rain fed conditions. Root architecture is key in determining the ability of crops to extract water at various soil depths. In many rain fed production regions, opportunities to improve yield through changes in management practices are limited. Thus, genetic solutions to improve yield under water limitation are required. We postulate that in drought-prone environments, genotypes with greater yield and yield stability can be developed by breeding for genotypes with favorable root systems. We studied wheat root architecture late in the developmental cycle. Narrow and deep root systems may help wheat to extract more water at depth late in the season and give an advantage to yield and yield stability where crops rely on stored moisture deep in the soil. To improve yield stability in rain fed regions, an effective phenotypic method is needed. However, studying root traits in mature field-grown crops is extremely challenging. A PVC tube method was developed and has been used to identify genotypic differences in root architecture late in crop development. Identification of root traits to improve deep water uptake late in crop development and the development of phenotypic methods to identify genetic sources of such traits will assist breeders to improve yield and yield stability in water-limited environments.

Keywords: root system; water deficit; crop adaptation; phenotyping method