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Historical alfalfa landraces perform higher yield under dry farming in Turkey

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Abstract

Drought is a serious abiotic stress affecting crop yield and is an increasingly significant challenge to crop production with the climate change. Cultivars that perform well under limited water are the key for the global food security. One of the main problems for plant breeders is the availability of plant germplasm that could perform well under water limited conditions. There is wealth of wild germplasm adapted to water limited environments but they yield poorly in agricultural systems. However, historical landraces could be the key to counterbalance the yield loses due to increased drought caused by climate change. Alfalfa is a forge legume cultivated throughout the world and affected from drought significantly. USDA Germplasm Resources Information Network (GRIN) has a collection of Turkish alfalfa landraces gathered in second half of the last century. In this study, we evaluated the agronomic performance of a total of 100 historical landraces, wild accessions and modern cultivars in a replicated field trial in two locations in Kars Province of Turkey in order to evaluate the field performance of the accessions under non-irrigated conditions and to compare yield performance of landraces with modern cultivars.

The results revealed that when all 100 entries were evaluated, the historical landraces on average perform as high as modern cultivars for the agronomic traits such as total biomass yield and plant height. When the accessions and entries considered separately, the top 20 high yielding accessions were all landraces with a few high performing wild accessions outperforming modern cultivars. The results conclude that historical landraces could directly be used in dry agriculture possess significant alleles for water use efficiency. The outcome of the current study suggests that the evaluation of plant genetic resources, especially historical landraces, under different climate conditions is vital for effective breeding strategies.

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Keywords: Historical alfalfa landraces; Dry farming; Yield; Turkey

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