

Evaluation of oat germplasm for adaptation to climate change

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The climate change has led to extreme temperature, and desertification and salinization of soil. Oat is characterized as resistant crop to drought, salt and adaptable to different environments, and has high potential for addressing the issue of climate change. The researches on evaluation oat germplasm for resistance to drought and salt, and adaptation to changing environments have been carried out by Institute of Crop Science of Chinese Academy of Agricultural Sciences in collaboration with Bioversity International. We improved the method for identification of drought resistance of oat germplasm. With the treatment of 20% PEG-6000, Germination vigor, germination rate, germination index and other eight identification indices of seventeen varieties of naked oat were measured. The results showed that all the tested varieties were affected more or less by 20% PEG-6000, and the seed vigor index was most susceptible to drought stress. An optimal regression model was established to predict the drought resistance of naked oat varieties at germination period through measuring germination rate, average germination velocity, the longest primary root, total length of primary roots, coleoptile length and vigor index of seed. With the treatment of 1.2% NaCl aqueous solution, comprehensive evaluation of salt tolerance at germination stage was carried for 278 oat accessions. With the weighted membership function method and cluster analysis, salt tolerance of 278 naked oat accessions were categorized into five grades. 17 accessions were highly salt tolerant, 114 accessions were salt tolerant, 106 accessions were middle tolerant, 25 accessions were susceptible, and 16 accessions were highly susceptible. It was found that the germination potential and germination rate were more closely associated with salt tolerance at germination stage. For evaluation of adaptability of oat germplasm, seven related traits with yield including plant height and the number of effective tillers were investigated for 81 oat accessions in seven sites. By integrating the observation values into a weighted subordinate function value, also called D value, the adaptation and stability of 81 oat accessions were analysed for the genotype \times environment model with GGE biplot software. Results showed that grain weight of main panicle was the trait with the largest variable coefficient among tested accessions of naked oat in all tested sites. It was demonstrated that the method of weighted subordinate function in combination with GGE biplot would be suitable in comprehensive analysis of oat agronomic traits for adaptation.

Key words: Oat germplasm, salt tolerance, drought resistance, adaptability