

# Evaluation of Drought Resistance of Winter Wheat Varieties Based on Principal Component Analysis

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**Abstract:** **【Objective】** The long growth cycle and wide seasonal span of wheat make it vulnerable to frequent drought stress, which poses a serious threat to wheat production. Selecting drought-resistant varieties is an effective way to improve wheat production. **【Method】** In this study, 275 wheat varieties from different sources were planted separately under normal winter irrigation (well-water, WW) in Yangling, water limited after flowering (WL), and rain-fed conditions in Heyang Ganjing (RF). During the seedling stage, filling stage, and maturity stage, drought-related traits such as Ground Cover(GC), Canopy Temperature(CT), Yield Photon Flux Density, agronomy(YFPD), and Grain Yield(GY) were investigated, and the Carbon Isotope Discrimination(CID) of flag leaves was measured during the filling stage. The drought resistance indexes of each trait under WW, WL, and RF were calculated respectively, and then principal component analysis (PCA) and membership function analysis were used to calculate the comprehensive scores of drought resistance indexes of different wheat varieties, and cluster analysis was carried out to classify the different drought resistance levels of the tested wheat varieties. **【Result】** The results showed that the response of drought-related traits to different growth environments was significantly different, GC, PH, CID traits could accurately reflect the differences in drought resistance of different varieties. The correlation between the different traits varied under different water conditions, and the response of traits to water conditions, and the correlation between the traits varied with the water environment. The comprehensive evaluation of drought resistance and cluster analysis of different wheat varieties showed that there were 20 varieties performing well under both kinds of water stress environments, which were Longjian301, Luohan7, Longjian127, Linhan536, Bainong207, etc.; 14 varieties showed relatively drought resistance, such as Kedong81, Xinong893, Chang6878, etc.; 10 varieties showed moderate performance, such as Pubing151, Ningdong11, Jimai22, etc.; 10 varieties showed sensitivity, and 17 varieties were highly sensitive. **【Conclusion】** The results of this study will provide a basis for the rational layout of existing wheat varieties, and provide a material basis for the exploration of drought-resistant genetic resources in the future.