Evaluating interspecific wheat hybrids based on heat and drought stress tolerance

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Abstract:

Three durum and three bread wheat genotypes were crossed to produce three tetraploid, three hexaploid and nine interspecific (pentaploid) F1 hybrids. All genotypes were evaluated for heat tolerance in the field and for drought using polyethylene glycol in vitro. Chromosome numbers and meiotic behavior in pentaploid F1 hybrids (2n=5x=35, genomes AABBD) were confirmed. Heat stress significantly reduced grain yield/plant and 1000-kernel weight (1000-KW), while grain protein content (GPC) was increased. Drought caused a significant reduction in root length, shoot length and seedling fresh weight, whereas root/shoot ratio was increased. P3 (durum), P4 (bread) and their pentaploid F1 hybrid could be considered as the most heat-tolerant genotypes. However, P2 (durum), P6 (bread) and their F1 were most tolerant to drought. The addition of a D genome single dose into pentaploid F1 hybrids obviously reduced grain yield/plant, 1000-KW and seedling traits, however GPC was increased. Moderate to high broad-sense heritability and genetic advance were obtained for the most investigated traits. Grain yield/plant was strongly positively correlated with stress tolerance index (STI), yield index (YI), mean productivity (MP), geometric mean productivity (GMP) and harmonic mean (HM) under heat stress and with root length under drought condition, suggesting that STI, YI, MP, GMP and HM are powerful indices for heat tolerance, while root length is most effective for drought. Successful interspecific hybridization obtained in the study is only an initial step for desired genes introgression. Successive progenies are going to be evaluated for further genetic studies aiming at improving abiotic stress tolerance in wheat.

Keywords:

durum wheat, bread wheat, abiotic stress, wheat genotypes, seedling traits

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