The impact of PEG-induced drought stress on seed germination and seedling growth of different bread wheat genotypes

ABSTRACT

Wheat is an important crop, used as staple food in numerous countries around the world. However, wheat productivity is low in the developing world due to several biotic and abiotic stresses, particularly drought stress. Non-availability of drought-tolerant wheat genotypes at different growth stages is the major constraint in improving wheat productivity in the developing world. Therefore, screening/developing drought-tolerant genotypes at different growth stages could improve the productivity of wheat. This study assessed seed germination and seedling growth of eight wheat genotypes under polyethylene glycol (PEG)-induced stress. Two PEG-induced osmotic potentials (i.e., -0.6 and -1.2 MPa) were included in the study along with control (0 MPa). Wheat genotypes included in the study were 'KLR-16', 'B6', 'J10', '716', 'A12', 'Seher', 'KTDH-16', and 'J4'. Data relating to seed germination percentage, root and shoot length, fresh and dry weight of roots and shoot, root/shoot length ratio and chlorophyll content were recorded. The studied parameters were significantly altered by individual and interactive effects of genotypes and PEG-induced osmotic potentials. Seed germination and growth parameters were reduced by osmotic potentials; however, huge differences were noted among genotypes. A reduction of 32.83 to 53.50% was recorded in seed germination, 24.611 to 47.75% in root length, 37.83 to 53.72% in shoot length, and 53.35 to 65.16% in root fresh weight. The genotypes, 'J4', 'KLR-16' and 'KTDH-16', particularly 'J4' better tolerated increasing osmotic potentials compared to the rest of the genotypes included in the study. Principal component analysis segregated these genotypes from the rest of the genotypes included in the study indicated that these can be used in the future studies to improve the drought tolerance of wheat crop. The genotype 'J4' can be used as a breeding material to develop drought resistant wheat genotypes.