

Trehalose Application Increased Membrane Stability and Cell Viability to Affect Growth of Wheat Genotypes under Heat Stress

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Abstract : Heat stress is one of the major environmental factors drastically reducing wheat production. Crop heat tolerance can be enhanced by preconditioning of plants by exogenous application of osmoprotectants. Presently, the effect of trehalose pretreatment (at 1 mM, and 1.5 mM) under heat stress of $35\pm 2^{\circ}\text{C}$ (moderate) and $40\pm 2^{\circ}$ (severe) for four and eight hour was conducted in wheat (*Triticum aestivum* L.) genotypes viz. HD2967, PBW 175, PBW 343, PBW 621, and PBW 590. Heat stress affects wide spectrum of physiological processes within plants that are irreversibly damaged by stress. Membrane thermal stability (MTS) and cell viability was significantly decreased under heat stress for eight hours. Pretreatment with trehalose improved MTS and cell viability under stress and this effect was more promotory with higher concentration. Thermal stability of photosynthetic apparatus differed markedly between genotypes and Hill reaction activity was recorded more in PBW621 followed by C306 as compared with others. In all genotypes photolysis of water showed decline with increase in temperature stress. Trehalose pretreatment helped in sustaining Hill reaction activity probably by stabilizing the photosynthetic apparatus against heat-induced photo inhibition. Both plant growth and development were affected by temperature in both shoot and root under heat stress. The reduction was compensated partially by trehalose (1.5 mM) application. Adaption to heat stress is associated with the metabolic adjustment which led to accumulation of soluble sugars including non-reducing and reducing for their role in adaptive mechanism. Higher acid invertase activity in shoot of tolerant genotypes appeared to be a characteristic for stress tolerance. As sucrose synthase play central role in sink strength and in studied wheat genotype was positively related to dry matter accumulation. The duration of heat stress for eight hours had more severe effect on these parameters and trehalose application at 1.5 mM ameliorated it to certain extent.

Keywords : heat stress, *Triticum aestivum*, trehalose, membrane thermal stability, triphenyl tetrazolium chloride, reduction test, growth, sugar metabolism

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