Exogenous Calcium at Pre-anthesis Enhances the Thermotolerancelevel of Wheat under Terminal Heat Stress

Suneha Goswami[1], Ranjeet R. Kumar[2], Khushoo Singh[3], Richa Gupta[4], Kavita Dubey[5], Puja Verma[6], Himanshu Pathak[7], Raj D. Rai[8]

[1,2,3,4,5,8]*Division of Biochemistry, Indian Agricultural Research Institute, New Delhi 110012*
[7]*CESCRA, Indian Agricultural Research Institute, New Delhi, India-110012*

ABSTRACT

Calcium as a signaling molecule is involved in many biochemical and physiological processes insidethe plantsystem and plays a very important role in tolerance against abiotic stresses including heat stress. Here, we report the effect of exogenous calcium($CaCl_2$-10mM) at pre-anthesis stage on different biochemical and molecular parameters associated with thermotolerance in HD2967 (thermotolerant) and HD2329 (thermosusceptible) wheat cultivars under terminal heat stress. We could observe very high accumulation of H_2O_2 (2.7µmole/g FW) in (Ca+HS) treated samples compare to control. Lipid peroxidation (in terms of MDA content) was observed minimum in response to calcium in both the cultivars (0.25nmole g^{-1} FW in HD2967 and 0.41 nmole g^{-1} FWin HD2329). Further high expression of *CDPK* (5.7 fold in HD2967 and 2.7 fold in HD2329) in Ca+HS compared to control at grain-filling stage induced the expression of heat stress responsive transcription factor,*HSFA4a* (4.8 fold in HD2967 and 3.4 fold in HD2329) and heat shock protein,*HSP17* (8.6 fold in HD2967 and 5.1 fold in HD2329) in Ca+HS samples compared to control. Transcript expression of antioxidant enzymes, superoxide dismutase (SOD) was found to be 2.1fold in HD2967 and 1.5 fold in HD2329 and ascorbate peroxidase (APX) was 3.3 fold in HD2967 and 1.6 fold in HD2329 in Ca+HS samples compared to control.Application of calcium at pre-anthesis has been observed to be a cheap technology for enhancing the thermotolerance of wheat under terminal HS and it can be used at field level also.