Some metabolic responses of boron-stressed canola plants to external application of calcium, silicon and salicylic acid at vegetative growth stage.

Abeer A. Radi, Ashraf M.A. Metwally, Rasha M. El-Shazoly and Afaf M. Hamada

Abstract:

Boron (B) toxicity is an important environmental constraint that limits plant growth and crop productivity worldwide. The aim of the present study is mainly to investigate the role played by silicon (Si), calcium (Ca^{2+}), and salicylic acid (SA) in counteracting and ameliorating of B-induced stress in canola plants at vegetative growth stage. In this context, canola plants were grown for 29 day period in soil cultures supplied with different concentrations of boron. Special emphasis was laid on the role of the applied priming agents in modifying the adverse effects of B-toxicity on the test plants. B-treated canola plants generally manifested a negligible change in superoxide anion and H_2O_2 formation in the test plants. At the highest B supply (100 ppm), canola leaves exhibited significant increase in MDA and SOD activity compared to absolute control. Salicylic acid treatment significantly or nonsignificantly stimulated the activity of SOD in leaves of B or non-B-treated plants. Furthermore Ca application induced significantly the specific activity of Glutathione reductase (GR) in B-treated test plants. In addition silicon treatment significantly enhanced the specific activity of GR at 25 ppm B compared to absolute control and corresponding stressed test plants. Calcium and salicylic acid treatments partially attenuated the activity of catalase (CAT) compared to the reached results displayed by B-stressed plants. The three applied priming agents significantly or non-significantly attenuated the activity of peroxidase (POD) manifested by B-stressed test plants, but generally failed to exhibit significant changes in activity of ascorbate peroxidase (APX) compared to absolute control. These responses seemed to be of beneficial and adaptive effects with awaiting more determination.

Keywords:

Calcium chloride, salicylic acid, silicon, boron toxicity, oxidative stress, antioxidants, canola

Published In:

Egyptian Journal of Experimental Biology (Botany) 10(2): 143-154. , 10(2) , 143-154