PHYSIOLOGICAL AND BIOCHEMICAL MECHANISMS OF MICRONUTRIENT MEDIATED SALT STRESS TOLERANCE IN SOYBEAN

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Abstract

Like other abiotic stresses, salinity also adversely affects the vital morphological, physiological and biochemical mechanisms of plants and ultimately causes yield reduction. This experiment was carried out to study the morphological, physiological, biochemical, phenotypical and anatomical responses of soybean (*Glycine max* L., cv. BINA Soybean 5) upon exposure to different levels of salinity and to investigate the role of exogenous application of selenium (Se) and boron (B) in mitigating salt stress. Plants were treated with 0, 150, 300 and 450 mM NaCl at 20 DAS and 35 DAS to stimulate salinity. Exogenous application of Se (0.50 μM Na_2SeO_4) and B (1 mM H_3BO_3) was done individually (Se, B) and combinedly (Se+B) at 20 DAS and continued at three days interval until pod filling stage under normal and saline condition. Plants exhibited a reduction in plant height, shoot fresh weight, shoot dry weight, root fresh weight, root dry weight, number of branches$plant^{-1}$, number of flowers $plant^{-1}$, leaf area, relative water content and SPAD value under salinity in a dose-dependent manner, which were observed for assessing the growth and physiological responses. However, proline content and oxidative stress indicators such as MDA content and H_2O_2 content were increased with the increase of salinity. Consequently, it caused a reduction in pod length, pod $plant^{-1}$, seed pod^{-1}, seed yield $plant^{-1}$, stover yield and biological yield. In responses to, 300 and 450 mM NaCl-induced salt stress, plant death occurred after completing the vegetative stage. Phenotypical and anatomical parameters showed a visible deleterious effect of different levels of salinity on growth and number of stomata, respectively. On the contrary, exogenous application of Se, B and Se+B reverted the negative effect of salinity. Though, the combined application of Se+B showed a slight difference in result than Se or B alone, the findings indicate that exogenous application of Se, B and Se+B mitigated the adverse effects of salinity by up regulating physiological and biochemical processes and by enhancing growth parameters.

Keywords: abiotic stress, plant nutrition, ion homeostasis, oil crops, oxidative stress, trace elements