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PII: S2352-4073(17)30010-0
DOI: doi: 10.1016/j.plgene.2017.04.002
Reference: PLGENE 88

To appear in: *Plant Gene*

Received date: 8 February 2017
Revised date: 1 April 2017
Accepted date: 9 April 2017

Please cite this article as: Saikat Paul, Aryadeep Roychoudhury, Aditya Banerjee, Neha Chaudhuri, Puja Ghosh , Seed pre-treatment with spermidine alleviates oxidative damages to different extent in the salt (NaCl)-stressed seedlings of three indica rice cultivars with contrasting level of salt tolerance. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Plgene(2017), doi: 10.1016/j.plgene.2017.04.002

Seed pre-treatment with spermidine alleviates oxidative damages to different extent in the salt (NaCl)-stressed seedlings of three indica rice cultivars with contrasting level of salt tolerance

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Running title: Spermidine pre-treatment alleviates NaCl stress toxicity in rice

Abstract

The effect of seed pre-treatment with the triamine, spermidine (Spd), in mitigating the detrimental effect of NaCl stress in rice is poorly explored. Due to limited available reports, such an investigation was carried out in the seedlings of three indica rice cultivars, IR-64 (salt-sensitive), Nonabokra (salt-tolerant) and Gobindobhog (aromatic and salt-sensitive). The lethal effect of NaCl was particularly noteworthy in the two susceptible cultivars IR-64 and Gobindobhog, as evidenced by extensive tissue-growth inhibition, oxidative damages and chlorophyll degeneration. Seed pre-treatment with Spd could remarkably alleviate stress injury, especially in IR-64 and Gobindobhog, by reverting back from growth retardation and oxidative damages to near-normal conditions. Spd pre-treatment also promoted the levels of osmolytes, particularly proline in Gobindobhog, concomitant with enhanced anthocyanin, cysteine and polyphenol oxidase, but lowered total phenolics and reducing power in the susceptible cultivars. However, the antioxidant enzyme activities were more enhanced in salt-stressed Nonabokra seedlings with Spd, as means of ameliorating cellular NaCl toxicity. A clear-cut variation in GPX, APX, CAT and SOD isozyme profile was discernible among the three cultivars during NaCl stress, with specific isoform(s) being up regulated or down regulated with Spd pre-treatment. Our results indicated that seed treatment with Spd at the pre-sowing stage can promote NaCl tolerance with varying degrees in salt-sensitive and salt-tolerant rice cultivars by alleviating oxidative damages, triggering the antioxidants and osmolytes, and activating the antioxidative enzymes.