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Effects of Halo- and Hydropriming on Early Rice Seedling Vigour under Salinity

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Abstract

For the food security of a growing world population, rice production needs to increase significantly. Therefore, current production will need to be maintained, intensified, and in some cases expanded to include less suitable areas. Meanwhile a rising sea level, linked to climate change, leads to impaired field emergence and salt stress from tidal flooding and saline groundwater. Priming as a seed pre-treatment, which includes soaking of the seed in a solution and subsequent redrying, has been reported to improve field establishment and plant stress tolerance in diverse species under a variety of abiotic stresses. Here, the effect of Hydro- and Halopriming on germination under saline conditions was tested in a blind test of three varieties. First, the moisture uptake pattern of the seeds during priming was assessed under three NaCl-concentrations (0,50,100mM). Afterwards, seeds were primed in these solutions, followed by a germination test under the three levels of salinity. It was found that the NaCl-concentration of the priming solution has no significant effect on moisture uptake. Furthermore, priming treatments were able to accelerate germination speed, with hydropriming showing the best results. In contrast, halopriming improved endosperm use efficiency depending on the variety.. These results suggest that priming can have a beneficial effect on germination, supporting rapid field emergence and field establishment under adverse conditions. Nevertheless, the underlying mechanisms have yet to be investigated and treatment×variety interactions, as well as the effect of different treatments on different germination parameters, need to be further evaluated to develop suitable priming methods applicable on a large scale. Priming has the potential to be a cheap and easy way to increase the productivity of rice production under unfavourable conditions and to help mitigate the effects of climate change.

Keywords: Germination, priming, Rice, Salinity