Seed germination of Egyptian Pancratium maritimum under salinity with regard to cytology, antioxidant and reserve mobilization enzymes, and seed anatomy

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Abstract:

Pancratium maritimum (Sand lily) is a perennial endangered halophytic species native to the sand coasts of the Mediterranean Sea. Information about seed germination properties of this species under salinity is scanty, therefore we investigated seed germination and recovery responses under salinity (0, 50, 100, 200, 400 mM NaCl) for short-term (21 d), and under 200, 400 mM for long-term (75 d). The responses of germination were investigated with regard to cytology, the activities of antioxidant (catalase, CAT, and peroxidase, POX) and reserve mobilization enzymes (esterase, EST, and amylase, AMY), and the role of seed coat in germination in non-saline and saline medium. Both germination rate and ratio were decreased at 50 and 100 mM NaCl compared to control. Germination ratio was 86% at 50 mM, 50% at 100 mM NaCl and it was delayed until 75 day at 200 mM NaCl. Un-germinated seeds recovery was one week after transfer to distilled water, but for those treated at 400 mM NaCl they recovered after 75 days. Mitotic index was significantly decreased by salinity with a sharp increase in abnormality ratio. Interphase vacuolated nuclei, disturbed and metaphase lagging chromosomes, and anaphase bridges were the most evident abnormal chromosome behavior. Cell division restoration after recovery with the reduction of chromosomal abnormalities suggests possible recovery at cytological level. On the other hand, only esterase and peroxidase activities increased at the lowest salt concentration (50 and 100 mM NaCl). With long-term salt stress the activities of AMY2 and EST5 were enhanced while POX and CAT were decreased. For recovered seeds, all enzymes showed the same pattern observed in salt-treated seeds. Uncoated seeds germination inhibition by NaCl strongly supports the role of seed coat as toxic ions barrier. These results suggest the importance of Egyptian Pancratium maritimum as salt-tolerant plant and their seeds as candidate source to conserve this species.

Keywords:

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