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DIFFERENTIAL SENSITIVITY OF ITALIAN RICE CULTIVARS TO SALT STRESS CONDITIONS

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Soil salinity is one of the main threat to agricultural production. FAO statistics report that nowadays more than 800 million hectares worldwide are affected by salt, about 6% of the earth's total surface, and the area is increasing. A soil is considered saline when ionic concentration exceeds an electrical conductivity of 4 dS m^{-1}, a value that corresponds to about 30-40 mM, depending on composition. Excess salt exerts both osmotic and ionic effects. Plants can cope with moderate salinity either by limiting uptake at the root level, by compartmentalizing/extruding ions in the vacuole/apoplast, or by counteracting the consequent water withdrawal through the intracellular accumulation of compatible osmolytes, the most common of which is the amino acid proline. At increasing soil conductivity, salinity stress causes a progressive reduction of the photosynthetic rate and stimulates the production of reactive oxygen species, which in turn leads to oxidative damages at the cellular level.

Rice (*Oryza sativa* L.), which represents a staple food for more than one third of world's population, is remarkably sensitive to excess salt, especially at the seedling level and at the flowering to panicle-initiation stage. A summary of field experiments pointed out that rice growth is even more sensitive than previously though, with a significant reduction of grain yield at an average seasonal salinity of the field water in excess of 1.9 dS m^{-1} (Grattan *et al*., Calif. Agric. 56:189-198, 2002). Because soil salinity has long been identified as a major issue for yield, many researchers investigated the occurrence of a differential sensitivity to salt stress among rice cultivars. However, all these studies dealt with Asian rice genotypes, whereas no information has been made available to date with respect to the Italian rice germplasm. Italy is the only country in Europe with a significant land area used for rice production, and the Italian rice germplasm comprises no less than 120-150 varieties belonging to the *japonica* ssp. Moreover, a valued rice is produced in the Northern Adriatic coastal region, that is vulnerable to salt inflow from the sea. This notwithstanding, the occurrence of a natural variability among these cultivars with respect to salt tolerance has never been investigated.

In the frame of a research project for integrated genetic and genomic approaches for new Italian rice breeding strategies, we aim at a better understanding of the biochemical bases for salt tolerance in rice. To achieve this goal, a few cultivars with a contrasting capability to cope with salt stress conditions will be identified, and the levels and the properties of selected enzymes playing a pivotal role in antioxidant defense and in proline metabolism will be studied.

Here we report the results of a preliminary investigation on the susceptibility to salt stress conditions of a panel of 11 Italian rice cultivars. The effect of salt (NaCl, $CaCl_2$, $MgSO_4$ and Na_2SO_4 in a 10:1:2:1 ratio) increasing concentrations, corresponding to a range of 0.7 to 12 dS m^{-1}, was investigated under axenic conditions either during seed germination or at the seedling level. Results showed the occurrence of a significant variability in salt sensitivity among varieties. A

differential tolerance was evident also with cell suspension cultures of the same genotypes, suggesting that it relies on biochemical processes expressed at the undifferentiated tissue level.

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