GENETIC MANIPULATION OF RICE GIBBERELLIN METABOLISM IN CONDITIONS OF SUBMERSION AND HYPOXIA

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Total submergence during rice field implementation improves soil nutrient availability and control weeds, but also limit survival of plantlets. Oxygen deprivation is the primary stress in these conditions. Rice has developed biochemical and morphological adaptations to maintain basal energy production and/or increase aeration, such as a shift to a fermentation, aerenchyma formation, rapid elongation of the submerged tissues to reach out the water. These responses are regulated by ethylene, gibberellins and abscisic acid. In this work, it was studied the adaptative behavior upon submergence of transgenic rice plants expressing gibberellin 2-oxidase (GA2-ox), involved in the degradation of bioactive gibberellins under the control of OsACS-5 (Oryza sativa 1-aminocyclopropane-1-carboxylic acid synthase) promoter, responsive to hypoxic and submergence. It was analyzed the number of insertion copies of the transgene and the level of mRNA transcription of three independent lines. Compared with nontransgenic rice, all the transgenic lines displayed reduced elongation upon submergence, increased photosynthesis, gas exchange capacity, aerenchima formation and survival rate. The stability and inheritance of these traits shows the feasibility of engineering rice for increased tolerance to submergence through stress-dependent modulation of GA metabolism.
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