

Interaction between salinity and ALS-inhibitor resistance and consequences on germination and seedling growth in rice, weedy rice and barnyardgrass

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ABSTRACT

Water and soil salinization are among the most important abiotic stresses affecting many rice cultivation areas worldwide. Weeds are the principal biotic constrain to rice production and the occurrence of herbicide resistant populations has made more difficult their control. The study aimed at evaluating the effect of salinity on seed germination and seedling growth of rice and some barnyardgrass (*Echinochloa* spp.) and weedy rice populations (*Oryza sativa*), collected in Italian rice fields, resistant and sensitive to ALS-inhibitor herbicides. Seed germination tests were conducted in Petri dishes under nine different salt concentrations from 0 to 400 mM NaCl. Effect of salinity on emergence and seedling growth of weeds and rice were evaluated in greenhouse by growing plants in alveolar trays with a saline solution at concentrations ranging from 0 and 250 mM. The effect on weeds of the possible interaction between salinity and herbicide treatment (with penoxsulam and imazamox applied at field rate) was also tested. Germination and plant growth of herbicide resistant rice and weeds were generally more affected by salinity as resistant weedy rice and the resistant variety CL80 showed 98% and 96% germination reduction, respectively. The species less affected by salt was the sensitive rice variety Baldo that only showed a 57% of germination reduction. Barnyardgrass growth was generally less affected by salt presence than the other species, while weedy rice and rice were devitalized at salt concentration of about 100 mM. When weedy rice was treated with imazamox, only few growth parameters were affected by salinity, such as plant height and chlorophyll content. Link between salinity response and herbicide resistance was not observed for all species and growth parameters; however, weeds tolerant to salt, i.e. barnyardgrass, also characterized by herbicide resistance, can be more problematic in saline rice areas.

Key words: salt, red rice, ALS-inhibitor herbicides, herbicide resistance.