Echinochloa response to osmotic stress induced by PEG and salt

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[Introduction]
Echinochloa species is distributed around the world and regarded as one of the most problematic weeds because of its high competitiveness against crop and ecological adaptability. In Korea, two Echinochloa species, E. oryzicola (2n=4X) and E. crus-galli (2n = 6X), are known to inhabit crop lands. Interestingly, each Echinochloa species inhabits a different habitat: E. oryzicola inhabit flooded paddy fields, while E. crus-galli mainly inhabits upland area, particularly E. crus-galli var. praticola. It is assumed that the difference in the habitat of the two Echinochloa species may be related to its adaptability to osmotic stress. Therefore, this study was conducted to investigate the adaptability of Echinochloa species collected from different habitats to osmotic stress.

[Materials and Methods]
Osmotic stress was induced by PEG and salt. Plant response to each osmotic stress was investigated at various growth stages of the Echinochloa species including germination (petri-dish assay), seedling emergence (growth pouch assay), and early juvenile plant growth (pot assay).

[Results and Discussions]
At germination stage, the ability and rate of germination in each Echinochloa species decreased with increasing PEG and salt concentration. At seedling emergence, Echinochloa species showed stress response in its shoot and root growths with increasing stress level. Interestingly, R/S (root/shoot) ratio was greater in Echinochloa crus-galli var. praticola than in E. oryzicola, suggesting that greater R/S ratio of upland adapting Echinochloa crus-galli is related to its adaptation to dry upland condition. At juvenile plant growth stage, Echinochloa showed similar response to osmotic stress. In conclusion, our results demonstrate that the different adaptability of Echinochloa to osmotic stress enables Echinochloa species widely distribute at various crop lands with different water regimes. We are now under molecular investigation to uncover molecular mechanism of ecological adaptive diversity in Echinochloa species.

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