OA-01

Physiological Responses of Wild Rice Relatives under Different Water Potentials

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[Introduction]

Rice is a major food crop feeding more than 50% of the world's population. Unsuitable environment like drought due to climate change is a big concern for rice production. The 24 *Oryza* species, which have different chromosomes, habitats and phenotype, have been discovered throughout the world, and this implies that rice plants are capable of being greater adaptability to various environments. In this study, we tried to understand physiological responses from wild rice relatives under different levels of water potential(drought).

[Materials and Methods]

Four rice species, *O. sativa* (cv. Gayabyeo, drought-sensitive), *O. meridionalis, O. nivara*, and *O. punctata*, were used in this study. To break dormancy, rice seeds were treated with gibberellin under dark condition for 3 days after standing at 50°C for 3 days. The seedlings were transplanted onto wetting-perlite at 28°C for 5 days, and transferred to a hydroponic container containing with 0.8×Hoagland nutrient solution for 20 days in growth chamber (12/12h, 27/25°C, RH=60%). To develop the gradient of water potential, a hydroponic growth media was adjusted to 0MPa (0%), -1.0MPa(8%) and -1.5MPa(10%) with PEG-6000 including 0.8x Hoagland nutrient solution. The seedlings were experienced with each water potential for 7 days, and shoot and root were carefully taken to analyze drought-responsive genes and physiological parameters like proline and chlorophyll at three time points (1, 4 and 7 days after treatment).

[결과 및 고찰]

The experience of negative water potentials for 7 days led to a significant reduction in not only plant height and root length but also leaf width in all four rice species, and, of wild relatives, *O. nivara* was most remarkable. The decreasing trend was proportional with the strength of negative water potential (greater limited water supply). Chlorophyll contents were also greatly decreased in all rice species, and, in particular, chlorophyll b was more significantly affected by negative water potential. Proline, an osmoprotectant, showed a tendency of higher accumulation in all rice species, and, *O. meridionalis* and *O. punctata*, which showed the relative resistance against negative water potentials, produced much more proline compared to *O. sativa* (cv. Gayabyeo) and *O. nivara*. Taken together, our observations suggest that higher proline-accumulating rice species (*O. meridionalis* and *O. punctata*) are likely to have greater resistance to drought environment, and the further step should be implemented to clarify our curiosity on the biochemical mechanism of chlorophyll b and proline.

[Acknowledgement

본 연구는 농촌진흥청 연구개발사업 "저탄소 그린라이스 생산기술개발, Project No. PJ017002"의 지원에 의해 이루어진 결과로, 이에 감사드립니다.

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