



## A comparative study of stress-related gene expression under single stress and intercross stress in rice

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**ABSTRACT.** Plant hormones play important roles in the crosstalk between biotic and abiotic stresses in rice throughout its entire growth period. However, these interactions are not completely understood. In this study, the physiological performance of rice seedlings under a single stress and a sequential combination of various stresses (intercross stress) was determined. We found that catalase, superoxide dismutase, and peroxidase activities and malondialdehyde were highly regulated by intercross stresses. Furthermore, the expression levels of pathogenesis-related genes and drought stress-related genes under various treatments were analyzed. We demonstrated that under drought-disease intercross stress, the expression levels of the *PR4*, *PAL*, and *Chl-1* genes were significantly upregulated, while under salt-disease intercross stress, the expression levels of the *PR1a*, *PBZ1*, *Gns1*, and *Chl-1* genes underwent significant changes. Regardless of the type of intercross stress, the

expression of *LOX-RLL* was significantly affected. We also showed that the expression of drought stress-related genes *OsSKIPa*, *OsNADPHI*, *JRC0594*, and *OsGLI-2* was significantly regulated, suggesting that these genes play important roles in the interaction between biotic and abiotic stresses. We, therefore, conclude that the interactions between various types of biotic and abiotic stresses vary in a complex pattern and would require further in-depth investigation.

**Key words:** Rice; Abiotic stress; Biotic stress; Hormone