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Functional deficiency of phytochrome B improves salt tolerance in rice

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[Introduction]

rice (*Oryza sativa*) phytochrome B (*osphyB*) mutant has greater tolerance to salt stress than its parent *japonica* rice (cv. Dongjin). The osphyB mutant accumulated less Na^+ in the shoot and considerably more K^+ in both the shoot and root, maintaining a significantly lower Na^+ to K^+ ratio, possibly due to a lower rate of Na^+ uptake and a higher rate of K^+ uptake. The RT-qPCR analysis indicated that salt stress-associated genes, including transcription factors and high-affinity K^+ transporters, are upregulated in the *osphyB* mutant under high-salinity conditions.

[Materials and Methods]

The rice (*Oryza sativa*) cultivar "Dongjin" and the *osphyB-1* and *osphyB-2* mutants were grown in a rice paddy field in Suwon, Republic of Korea (37° N latitude), in a greenhouse in Seoul, Republic of Korea (37° N latitude), and in growth chambers in Seoul and Anseong, Republic of Korea (37° N latitude). The T-DNA knockout mutants *osphyB-1* and *osphyB-2* were obtained from the Crop Biotech Institute at Kyung Hee University, Republic of Korea

[Results and Discussions]

The *osphyB* mutant exhibited a higher survival rate and fresh weight and a lower ion leakage rate compared to the WT, suggesting that the *osphyB* mutant has a higher salt tolerance than the WT. The transcript levels of *OsPHYB* increased under salt stress compared to normal conditions. Under salt stress conditions, the Na^+ concentration was lower in the shoot tissues of the *osphyB* mutant compared to the WT. The net Na^+ uptake rates in the osphyB mutant were lower than those in the WT under salt stress. These data suggested that *OsPHYB* might affect the absorption and distribution of Na^+ and K^+ ions under salt stress. functional deficiency of *phyB* in rice promoted the expression of salt stress-associated genes, including transcription factors, and contributed to the maintenance of Na^+/K^+ homeostasis through increasing the expression of HKT genes.

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