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Does UVB seed priming affect different traits in rice genotypes under drought stress?

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Abstract

Drought stress remains a critical constraint to rice productivity, particularly in regions experiencing increasing climate variability. Ultraviolet Radiation-B (UVB) priming has been considered an approach enhancing plant defense and tolerance to abiotic stresses. So far, UVB seed priming in rice, and its effects on genotype-specific responses to drought stress remain largely unexplored. We hypothesised that i) UVB seed priming differentially affects the physiological and phenological traits of rice genotypes, ii) Rice seeds exposed to high UVB radiation increase the drought stress resilience.

Greenhouse experiments were performed in potted soils to assess the effect of seed priming with UVB radiation at 7 KJ m^{-2} hr^{-1} (an equivalent radiation exposure of rice at high altitudes) on improving drought stress resilience. Agronomic traits (tiller numbers, plant height), stress response indices (leaf flavonoid and anthocyanin content), as well as biomass and grain yield were measured on three rice cultivars grown in two contrasting water regimes (well-watered vs drought). Drought stress was gradually increased following an initial drought period until the wilting after two weeks and followed with re-watering. The measurements were taken at initial drought (10 days after drought initiation) and after wilting occurred (24 days). Biomass and grain yield data were measured at harvest.

Plant height was significantly reduced under drought stress at initial phase, while this was recovered at later stage of drought. Interestingly, UVB-primed plants were significantly higher under drought condition, especially drought tolerant genotype FL483 and highland cultivar Marshi than drought sensitive genotype $IR^2$9. At later phase, only Marshi demonstrated positive phenological traits to seed priming under drought stress. UVB priming increased leaf flavonoids content in $IR^2$9, but decreased in FL483 and Marshi, and lower anthocyanic content was observed in both sensitive and tolerant genotypes. Seed exposure to high UVB radiation did not significantly alter drought resilience of traditional genotypes, but improved some performance attributes of modern genotypes. The possible role of UV-priming on abiotic stress resistance of traditional as well as modern genotypes will gain relevance with the ongoing expansion of rice production in the south (high-altitude) or in the north (temperate region) and needs further investigation.

Keywords: Abiotic stress, anthocyanin, flavonoids, *Oryza sativa*, phenology, stress resilience, ultraviolet radiation

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