
Rice allelopathy and anti-herbivore defense priming

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Abstract

Rice (*Oryza sativa*) is one of the most important food crops. Momilactones are the most toxic allelochemicals released from rice plants. Our study showed that momilactones inhibited seed germination of *Arabidopsis thaliana* by enhancing abscisic acid (ABA) pathway leading to up-regulation of the transcription levels of key transcription factors and biosynthesis genes in ABA signaling pathway. The diterpenes inhibited the seedling root growth by affecting auxin distribution and transportation in the roots. Priming of plant defense refers to increased readiness of induced defense through the perception of indicative signal cues or the experience of previous enemy attack, which allows plant to induce more effective and rapid defense responses upon subsequent attack. We found anti-herbivore priming effects of silicon (Si) in rice. Si-pretreated rice plant showed enhanced resistance against *Cnaphalocrocis medinalis* (rice leaffolder, LF) and *Nilaparvata lugens* (brown planthopper, BPH). Upon LF attack, rice plants subjected to Si pre-treatment exhibited enhanced defense responses relative to untreated controls, including higher jasmonic acid (JA) accumulation levels, increased levels of transcripts encoding defense marker genes, and elevated activities of peroxidase, polyphenol oxidase and trypsin protease inhibitor. We compared the defense responses of rice ratoons generated from parent plants that had been either infested by LF caterpillars or treated with methyl jasmonate (MeJA) during vegetative growth, with ratoons generated from control parent plants. Ratoon plants generated from parents receiving prior LF infestation or MeJA treatment exhibited higher LF resistance, higher JA levels, as well as elevated levels of transcripts of defense-related genes associated with JA signaling. Appropriate utilization of plant allelopathy and defense priming is a promising approach to minimize application of herbicides and insecticides.

Keywords: Rice, allelopathy, momilactones, defense priming, silicon

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