

Title Integration of ethylene and jasmonic acid signaling pathways in the expression of maize defense protein Mir1-CP

Authors A. Ankala, D. S. Luthe, W. P. Williams and J. R. Wilkinson

Citation Molecular Plant-Microbe Interactions 22 (12): 1555-1564. 2009.

Keywords maize; jasmonic acid

Abstract

In plants, ethylene and jasmonate control the defense responses to multiple stressors, including insect predation. Among the defense proteins known to be regulated by ethylene is maize insect resistance 1-cysteine protease (Mir1-CP). This protein is constitutively expressed in the insect-resistant maize (*Zea mays*) genotype Mp708; however, its abundance significantly increases during fall armyworm (*Spodoptera frugiperda*) herbivory. Within 1 h of herbivory by fall armyworm, Mir1-CP accumulates at the feeding site and continues to increase in abundance until 24 h without any increase in its transcript (*mir1*) levels. To resolve this discrepancy and elucidate the role of ethylene and jasmonate in the signaling of Mir 1-CP expression, the effects of phytohormone biosynthesis and perception inhibitors on Mir1-CP expression were tested. Immunoblot analysis of Mir1-CP accumulation and quantitative reverse-transcriptase polymerase chain reaction examination of *mir1* levels in these treated plants demonstrate that Mir1-CP accumulation is regulated by both transcript abundance and protein expression levels. The results also suggest that jasmonate functions upstream of ethylene in the Mir1-CP expression pathway, allowing for both low-level constitutive expression and a two-stage defensive response, an immediate response involving Mir1-CP accumulation and a delayed response inducing *mir1* transcript expression.