Journal of Plant Interactions
Vol. 6, Nos. 2–3, June–September 2010, 161

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SHORT COMMUNICATION

Microorgans in herbivorous two-spotted spider mites regulate ecological interactions with lima bean plant

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(Received 30 November 2010; final version received 1 December 2010)

In response to herbivore attack, plants' defense against herbivores are not only made by physical and chemical barriers that directly act to harm their attackers, but also they employ strategies of indirect defense. One form of indirect defense in plants is to attract predators and parasitoids by emitting specific blends of volatiles to defend from herbivores' attack. These volatiles are referred to as herbivore-induced plant volatiles (HIPVs), which are released specifically in response to herbivore attack (Arimura et al. 2000).

We hypothesized that microorganisms in spider mites (*Tetranychus urticae*) could regulate the induction of HIPVs, because spider mites were found to induce accumulation of salicylic acid (SA) as well as expression of SA-inducible genes in lima bean plants. Thus, microorganisms in spider mites were postulated to be involved in the production of HIPVs.

Bacteria have been found to occur in spider mites (Yoon et al. 2010). We found two types of microbes existing in spider mites. Namely, one type is microbe present in the digestive tract or surface (exo-microbe). Another type is intercellular microbe (endo-microbe). We prepared two types of microbe-free spider mites that are named -exomicrobe (-Exo), -all microbe (-All), and normal one. We quantified the amounts of HIPVs, SA, and the expression of several defense genes and observed bacteria-dependent Ca^{2+} and H_2O_2 accumulation in lima bean (*Phaseolus limensis*) leaves. In these respects, significant differences were observed between normal and sterilized spider mites, suggesting that two types of microorganisms in spider mites are involved, at least in part, in the induction of the specific blend of HIPVs.

References

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ISSN 1742-9145 print/ISSN 1742-9153 online

DOI: 10.1080/17429145.2010.544912
http://www.informaworld.com