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Induced release of a plant-defense volatile ‘deceptively’ attracts insect vectors to plants infected with a bacterial pathogen

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In this investigation, we experimentally demonstrated specific mechanisms through which a bacterial plant pathogen induces plant responses that modify behavior of its insect vector. Candidatus Liberibacter asiaticus, a fastidious, phloem-limited bacterium responsible for causing huanglongbing disease of citrus, induced release of a specific volatile chemical, methyl salicylate, which increased attractiveness of infected plants to its insect vector, Asian citrus psyllid (Diaphorina citri), and caused vectors to initially prefer infected plants. However, the insect vectors subsequently dispersed to non-infected plants as their preferred location of prolonged settling because of likely sub-optimal nutritional content of infected plants. The duration of initial feeding on infected plants was sufficiently long for the vectors to acquire the pathogen before they dispersed to non-infected plants, suggesting that the bacterial pathogen manipulates behavior of its insect vector to promote its own proliferation. The behavior of psyllids in response to infected versus non-infected plants was not influenced by whether or not they were carriers of the pathogen and was similar under both light and dark conditions. Feeding on citrus by D. citri adults also induced the release of methyl salicylate, suggesting that it may be a cue revealing location of conspecifics on host plants. Collectively, our results suggest that host selection behavior of D. citri may be modified by bacterial infection of plants, which alters release of specific headspace volatiles and plant nutritional contents. Furthermore, we show in a laboratory setting that this apparent pathogen-mediated manipulation of vector behavior may facilitate pathogen spread.

References

Mann, R.S., J.G. Ali, S.L. Hermann, S. Tiwari, K.S. Pelz-Stelinski, H.T. Alborn, and L.L. Stelinski. 2012. Induced release of a plant defense volatile ‘deceptively’ attracts insect vectors to plants infected with a bacterial pathogen. PLoS Pathogens. 8(3): e1002610.