EMERALD ASH BORER RESPONSES TO INDUCED PLANT VOLATILES

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ABSTRACT

Herbivore feeding and methyl jasmonate, a volatile derivative of the stress-eliciting plant hormone, jasmonic acid, induce responses in plants which include the synthesis and emission of volatiles. These induced volatiles can serve to attract or repel herbivores; therefore, they may have potential use in pest management programs. The exotic emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), has killed an estimated 15 million ash trees in southeastern Michigan and Windsor, Ontario, since its discovery in 2002. Accurate delimitation of the infested area and detection of new outlier infestations is critical for regulatory officials who must establish quarantine boundaries and implement eradication and control measures. Trapping and detection techniques would greatly enhance efforts to delineate the distribution of the emerald ash borer and locate new infestations.

We tested emerald ash borer responses to ash volatiles produced by adult feeding or treatment with methyl jasmonate. Volatiles from Manchurian ash, *Fraxinus mandshurica*, a species from the emerald ash borer's native range, were tested in a two-choice walking olfactometer bioassay. Male and female adults were given a choice between clean air and 1) seedlings damaged by feeding of 15-20 emerald ash borer adults for 7 days (15-20% leaf area removed); 2) seedlings treated overnight with 1.4 mM methyl jasmonate solution; 3) healthy unmanipulated ash seedlings; and 4) clean air. Female emerald ash borers were attracted to ash seedlings with feeding damage and those that had been treated with methyl jasmonate, but not to healthy ash seedlings or clean air.

Ash volatiles were collected from seedlings damaged by emerald ash borer feeding, seedlings treated with methyl jasmonate, and unmanipulated controls. Both feeding damage by adult emerald ash borers and methyl jasmonate treatment increased volatile emissions from ash compared to controls. Aeration extracts were analyzed by coupled gas chromatographic electro-antennographic detection (GC-EAD) to identify induced compounds from Manchurian ash that elicited an electrophysiological response from the antennae of adult emerald ash borers. At least 10 compounds from ash were found to be antennally active: hexanal, (E)-2-hexenal, (*Z*)-3-hexen-1-ol, 3-methyl butylaldoxime, (*Z*)-3-hexen-1-yl acetate, hexyl acetate, (*E*)-ß-ocimene, linalool, 4,8-dimethyl-1,3,7-nonatriene, and *E*,*E*-α-farnesene. Further studies are planned to determine emerald ash borer responses to combinations of the antennally-active compounds in the laboratory and in field trapping experiments. Ultimately, the results may lead to the development of an improved monitoring and detection system for emerald ash borer.