MONITORING OF ASH MORTALITY PATTERNS INFORMS EMERALD ASH BORER (EAB) RESISTANCE BREEDING EFFORTS: INTEGRATED PEST MANAGEMENT FOR EAB

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Integrated pest management (IPM) is a framework that combines multiple different strategies to reduce the impacts of pests and pathogens. Strategies include preventative measures; cultural, biological, and chemical control; monitoring of host and pest populations; and mitigation of impacts. Pest- or pathogen-resistant trees are cultural control techniques that, even standing alone, can reduce impacts by increasing survival and health of the host tree species. By combining tree resistance breeding with other strategies within an integrated pest management framework, even greater reductions in pest and pathogen impacts may be achieved and may last over a much longer term. We present a case study of the insect pest emerald ash borer (*Agrilus planipennis*) (EAB) and its impacts on ash trees (*Fraxinus* spp.) in the United States. Ten years of monitoring data on ash and EAB populations has clearly shown the typical trajectory of ash mortality and subsequent crash in EAB populations, and has also shown the factors that affect the rate of mortality of ash trees. Intensive monitoring of "lingering" ash populations after the EAB mortality wave has revealed how these factors that affect mortality may change in this post-infestation landscape. While areas with higher ash density exhibit slower mortality during the initial mortality wave, ash trees with neighboring ash trees exhibit greater decline and mortality in a post-infestation time period. This finding suggests that cultural control methods, while not useful prior to or during the initial wave of EAB, may be helpful in maintaining lingering ash populations after EAB has killed most of the trees. The remaining healthy trees, many exhibiting resistance to EAB, may benefit from reductions in susceptible declining neighbors. Consideration of natural patterns of mortality may inform resistance breeding programs: not only which trees to choose for breeding programs and the appropriate timing to choose them, but how to deploy them using appropriate cultural control measures that may influence their success.

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