

# **EVALUATION OF ASIAN AND EUROPEAN ASH (*FRAXINUS SPP.*) BIOTYPES FOR PREFERENCE AND SUSCEPTIBILITY FOR THE EMERALD ASH BORER (*AGRILUS PLANIPENNIS*)**

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Emerald ash borer (*Agrilus planipennis* Fairmaire), an Asian species was discovered attacking ash trees (*Fraxinus* spp.) in 2002. EAB is established throughout much of the Midwestern and eastern United States. In North America, the emerald ash borer (EAB) attacks only native ash species. To date, none have been observed to be resistant.

## **The objectives of this study were to determine:**

- The relative suitability and preference of Asian and European ash (*Fraxinus* spp.) biotypes for the emerald ash borer, *Agrilus planipennis*
- Which Asian and European ash (*Fraxinus* spp.) biotypes are suitable for future ash breeding programs

Beginning in the 2009 and continuing through the 2013 field season, a series of studies were conducted to evaluate Asian and European ash (*Fraxinus* spp.) biotypes for preference and suitability for the emerald ash borer (EAB). Laboratory no-choice adult feeding studies were used to test for feeding preference and suitability. Adult beetles were reared from infested logs and two to three adult female beetles were placed in clear plastic cylinders with candidate ash foliage and allowed to feed. Feeding cylinders were held in a rearing cage at approximately 75°F and 60-70 relative humidity, with a 16:8 photoperiod. The beetles were monitored daily for evidence of feeding and mortality and records kept.

Results from the no-choice feeding studies on Asian and European ash biotypes indicate that adult EAB beetles lived the longest (mean=14 days) on *F. pennsylvanica* (preferred host) compared to the Asian and European species tested. Several beetles lived several months on *F. pennsylvanica*. Adult beetles lived the second longest period (mean=8 days) on *Fraxinus angustifolia* var. *australis* and consumed approximately 22% of the leaf tissue. The mean # of fecal pellets (275) was second only to *F. pennsylvanica* with a mean of 326 fecal pellets. Beetles feeding on the remaining Asian and European ash biotypes (*F. angustifolia* var. *pannonica*, *F. excelsior*, *F. ornus*) all removed an average of 3% of the leaf tissue, lived less than six days, and had a mean of <100 fecal pellets.

Additional Asian no-choice laboratory feeding bioassays have revealed adult beetles feeding on *F. chinensis* ssp. *rhynchophylla*, and *F. longicuspis* var. *sieboldiana* removed <8% of leaf tissue. Biotypes with medium susceptibility included *F. bungeana*, *F. chinensis*, *F. platypoda* and *F. mandshurica* var. *japonica* with 10-15% of the foliage consumed. Highly susceptible species

(24-32% foliage consumed) included *F. apertisquamifera*, *F. insularis*, *F. paxiana*, *F. stylosa* and *F. pennsylvanica* (highly preferred species)

Mortality rate were higher on less suitable hosts and lower on more suitable hosts. Biotypes with low susceptibility consisted of *F. angustifolia* var. *pannonica*, *F. apertisquamifera*, *F. chinensis*, *F. chinensis* ssp. *rychophylla*, *F. mandshurica*, *F. mandshurica* var. *japonica* and *F. syriaca*. Highly susceptible biotypes included *F. angustifolia* var. *austalis* and *F. longicuspis* var. *sieboldiana*.

These initial findings suggest *F. bungeana*, *F. chinensis*, *F. angustifolia* var. *austalis* appear to be more suitable for adult EAB feeding and may not be good candidates for inclusion in ash tree breeding programs. In addition, *F. apertisquamifera*, *F. insularis*, *F. languinos*, *F. oxycarpa* var. *tamariscifolia*, *F. pallisae* and *F. syriaca* appear to be less suitable for adult EAB feeding and may show promise for inclusion in future ash breeding programs.

In the original EAB literature, *Ulmus* is also mentioned as a susceptible host for EAB, but species are not mentioned. During the 2013 field seasons, a series of no-choice adult feeding studies were conducted as outlined above. Fifteen different Asian (9), North American (4), and European (2) elms were tested. EAB adults failed to feed (<1% leaf tissue removed) on any of the 15 *Ulmus* species with the exception of *U. pumila* where adult EAB's removed 4% of the leaf tissue. Adult EAB's feeding on *F. pennsylvanica* and *F. stylosa*, both preferred species for EAB, had 11% and 19% of leaf tissue removed, respectively. In addition, EAB's feeding on the preferred ash species of *F. pennsylvanica* and *F. stylosa* produced 10 to 20 times more frass as compared to the *Ulmus* species tested.

These preliminary findings suggest that certain *Ulmus* species do not appear to be susceptible to feeding by adult EAB's and are not capable of completing their required maturation feeding. Without maturation feeding, reproduction is severely reduced resulting in fewer EAB larvae and tree phloem damage. Further field research is needed to support laboratory feeding studies.