

Development of a Higher Throughput EAB Egg Transfer Bioassay

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The United States Forest Service, Northern Research Station in Delaware, OH has been developing ways to screen ash trees for resistance to the emerald ash borer (EAB). The current egg transfer bioassay protocol is conducted in an environmentally controlled greenhouse, in which EAB eggs are placed on 2-3-year-old grafted trees or seedlings, and the larvae are left to feed for 8 weeks before being dissected from the trees. Outcomes measured include larvae killed by host tree defenses and the developmental instar and weight of live larvae. Hand dissection of these 8-week bioassays is labor intensive so we are developing a 1-year bioassay to decrease labor time and increase screening capacity. In the 1-year bioassay, eggs are transferred to trees in an outdoor growing area covered with bird enclosure netting. After a year, larvae that were able to complete their life cycle without being parasitized or killed by defense responses of the tree will have emerged as adult EAB. The number of EAB exit holes and parasitoid exit holes are counted and relative to the number of hatched eggs with a larval entry hole present. The health of the canopy is also assessed. The egg density used for the 8-week bioassay is 400 eggs/m² of bark surface area, but this density causes high mortality in trees undergoing the 1-year bioassay, which may not allow trees with partial resistance to be distinguished from susceptible trees. Experiments were performed to optimize the density of eggs. Lower densities of 200 and 100 eggs/m² of bark surface area were tested in a sample of grafted green ash trees. Mortality rates at the end of one year were 19 % at 100 egg/m² and 40 % at 200 egg/m² densities, an improvement over mortality rates previously observed at 400 eggs/m².