

Measurement of Pheromone Concentration Using a Portable Electroantennogram

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Abstract

Mating disruption is an increasingly important tactic against the gypsy moth in the United States. Since the full implementation of the federal Slow-the-Spread of the Gypsy Moth program in 2000, mating disruption has become the predominant method used. Support for this tactic is strong because it is species specific, environmentally benign, and has been shown to be highly effective. However, because funding for the program is limited, efforts are underway to reduce the cost of mating disruption applications by using lower doses, developing less costly and/or more efficient formulations, modifying application methods, etc. During 2001, a dose response test was conducted with an experimental microcapsule formulation developed by 3M Canada, London, Ontario to obtain data to help determine to what extent operational doses could be reduced. Application rates ranging from 0.15 to 75 g a.i./ha were tested in 25-ha plots in central Virginia. There were two replicate plots for each rate. Treatment effectiveness was assessed by moth capture in pheromone traps and mating success of laboratory-reared virgin females tethered to tree trunks. To ensure uniform moth populations across plots, laboratory-reared male moths were released in the plots. Application rates lower than 15 g a.i./ha did not reduce trap catch or mating success. Trap catch and mating were disrupted at the 15 g rate, but not as much as they were at 37.5 and 75 g/ha.

For the past 3 years and in conjunction with other STS research efforts, work has been under way to determine the feasibility of using a portable electroantennogram device (EAG) to measure pheromone levels in the air in areas treated with mating disruptants as a way of assessing the quality of the treatment. An EAG uses a moth antenna connected to electrodes to measure pheromone levels in the air. The strength of electrical impulses produced by the antenna indicate the amount of pheromone in the air. The development of the portable EAG as an analytical tool to directly measure pheromone concentration within blocks treated with gypsy moth mating disruptants could simplify and streamline the process of evaluating new mating disruption formulations and use patterns. The availability of this tool could facilitate the development and testing of new formulations capable of releasing pheromone more efficiently so that the applied dose can be reduced. In 2001, two portable EAG devices manufactured by Syntech, Hilversum, The Netherlands were purchased and tested. EAG readings were taken with both units in all dose-response test plots on a weekly basis from June 23 to August 6. EAG readings were highest in plots treated at the two highest application rates (37.5 and 75 g/ha). These higher EAG readings corresponded to higher levels of biological efficacy as determined by reduced moth capture in pheromone traps and decreased mating among monitor females. These findings support the conclusion that it is possible to detect and measure disparlure levels in plots treated at 75 or 37.5 g/ha (currently the most commonly used rate), but further refinement may be needed to detect pheromone at lower levels. Based on these results, and the results of previous EAG work, it appears that the Syntech EAG units may not be sensitive enough to detect pheromone at low application rates (<37.5 g/ha), even though these rates may be sufficient to disrupt mating. However, it appears that the units are capable of detecting pheromone at the application rates currently in operational use. Therefore, the EAG continues to show promise as a potential method to assess pheromone concentrations in treated plots, and work will continue to further refine procedures for its use.