Optimizing Oriental Beetle Mating Disruption through a Better Understanding of Dispersal Behavior

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Objectives:

1. Examine the dispersal pattern of non-mated and mated oriental beetle females.
2. Explore the dispersal behaviors of male oriental beetle in pheromone-treated and non-treated areas.
3. Determine distance male oriental beetles travel in response to different pheromone rates and/or sources.

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Project Duration: two years
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The oriental beetle (OB) is the most important turfgrass insect pest in New Jersey, Connecticut, Rhode Island, and southeastern New York. Our overall objective is to investigate the dispersal biology of oriental beetle adults in order to improve the efficacy of mating disruption to control OB grubs in turfgrass.

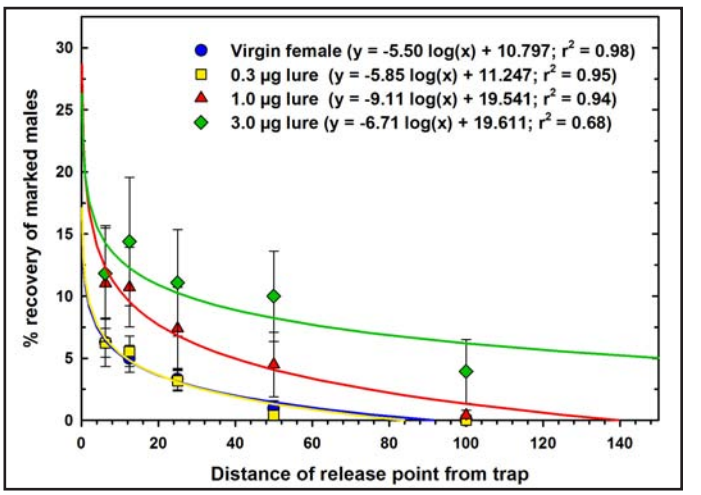
Females should not be affected by their sex pheromone but may mate outside of pheromone-treated areas and migrate into treated areas to deposit eggs. However, female dispersal studies are hampered by the lack of female attractants and the fact that females are active around dusk. Females placed into the turfgrass between 5 and 7 pm in early July mostly dug into the soil or crawled short distances. Females that alighted flew 3-12 feet, after which they either did not alight again or could not be found. However, 1:1 sex ratios in black light traps captures suggested that female may fly significant distances.

Males were attracted to females from as far as 100 feet in controlled studies.

OB male attraction to different pheromone sources was investigated in release and recapture field studies. Trécé Japanese beetle traps were placed in the ground with only the funnel part above ground in turf areas that had been treated with Merit in the previous year. The traps were lured with a virgin female placed in a metal mesh cage or with red rubber septa loaded with 0.3, 1, or 3 µg sex pheromone. Recapture rates of color-marked males released 6.25 to 100 ft downwind from the traps were determined after 24 hours. Recapture rates were higher for the 3 µg and 1 µg septa than for the 0.3 µg septa and the virgin females and declined logarithmically with distance for all pheromone sources.

Based on regression lines, 0% recovery for virgin female and 0.3, 1, and 3 µg septa was predicted at 92, 84, 140, and 842 ft, respectively. Capture of unmarked males from the background population was higher for 3 µg septa than 0.3 µg septa, with 1 µg septa and virgin females not significantly different from either.

We also compared male capture in Trécé Japanese beetle traps and cages each lured with a virgin female, or a red rubber septum loaded with 0.3, 1, or 3 µg pheromone. After 3 days exposure in a naturally infested turf area, OB male capture was more than 10-fold higher in traps than cages and was higher with the 3 µg and 1 µg lures than the 0.3 µg lures and virgin females. These data suggest that the use of virgin females can be substituted with the use of 0.3 µg lures but do not clarify whether cages or traps are more representative of natural mate-finding conditions. Additional research should not only fine tune the evaluation methods but also compare their performance and dispersal behavior in pheromone-treated vs. non-treated areas.



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Summary Points

- OB males are attracted to pheromone lures and formulation pellets from at least 200 feet distance, but attraction to females is weaker and usually under 100 ft.
- A 1:1 sex ratio in black light trap captures suggest that female OB may disperse similarly as males. Limited direct observations suggest limited dispersal of females over short periods.
- Traps used to evaluate the efficacy of mating disruption should use lower pheromone loads than previously used (0.3 µg vs. 30-300 µg) and red rubber septa with low pheromone loads (0.3 µg) could replace virgin females in cages used to evaluate mating disruption.