Mitigation of Cigarette Beetle Infestations at Tobacco Receiving Stations

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Abstract

Cigarette beetle, *Lasioderma serricorne* (Coleoptera: Anobiidae), is a cosmopolitan pest of dried plant products including cured tobacco, nuts, herbs, spices, and processed grain products. Developing larvae burrow into foodstuffs and contaminate it with pupal cocoons, frass, and bodies. We investigated the use of mating disruption to mitigate these insect populations before they require fumigation. In each of four tobacco receiving stations, male cigarette beetles were monitored using sex pheromone baited sticky traps while female oviposition was monitored using small cups filled with attractive media. Halfway through the storage year, two receiving stations were provisioned with custom made pheromone dispensers that passively released a high level of synthetic sex pheromone to confuse males and prevent them from locating and mating with females. Data show that deployment of pheromone dispensers resulted in an immediate shutdown of captures in the sticky traps and very few offspring in oviposition pots. These results suggest that mating disruption should be further developed as an insecticide free control tactic for mitigating cigarette beetle populations inside tobacco receiving stations.

Materials and Methods

Fig. 1. Cigarette beetle life stages: larva, pupa, and adult.

Fig. 2. Pheromone baited sticky trap to monitor male activity.

Fig. 3. Oviposition pot for monitoring progeny suppression.

- Commercial tobacco receiving stations were monitored for cigarette beetle activity (Fig.1.) during the crop year using pheromone baited sticky traps and oviposition (egg laying) pots.
- Ten sticky traps per facility were checked weekly and pheromone lures were replaced every six weeks (Fig. 2.).
- Ten oviposition pots (filled with ~200 g of media consisting of green coffee beans, wheat, and ground cayenne pepper) were randomly placed in each facility (Fig.3.).
- Following 1 wk in each facility, oviposition pots were brought to the laboratory and incubated in growth chambers at 30° C for 6 weeks to allow eggs to develop into adults, which are easier to count than immatures.
- Halfway through each year in the study, pheromone dispensers were evenly distributed inside facilities in 2012 and 2013 to initiate a mating disruption treatment.
- Count data were analyzed as a two-way analysis of variance, modeled using a negative binomial distribution in PROC GLIMMIX. Data were plotted using SigmaPlot.

Results

Male Captures

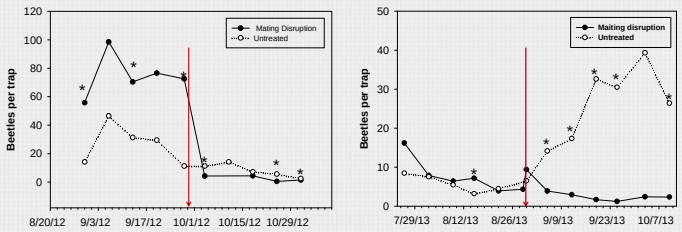

Fig. 4. Mean weekly capture of cigarette beetles at untreated receiving stations or stations treated with pheromone dispensers. Mating disruption was initiated on Sept. 28, 2012 and Aug. 29, 2013 (red arrow). Statistical differences between treatments within week (*).

- Regardless of treatment, there was a general trend in the data for decreasing captures in sticky traps after mid September in 2012.
- Prior to treatment, captures in sticky traps suggest that there were more slightly more cigarette beetles in receiving stations designated to receive mating disruption than the untreated stations. Immediately after treatment, beetle counts at stations receiving mating disruption were statistically less than those in the untreated stations.

Oviposition Pots

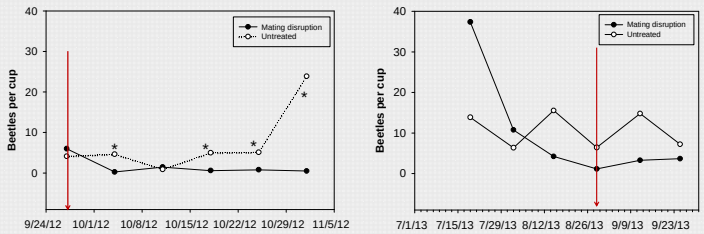

Fig. 5. Mean number of cigarette beetles per week emerged from oviposition pots at untreated or treated (pheromone dispensers) receiving stations. Mating disruption was initiated on Sept. 28, 2012 and Aug. 29, 2013 (red arrow). Asterisks (*) signify statistical differences in beetle reproduction between treatments within week. Note differences in both axis.

Sticky trap located outside of a tobacco receiving station

Cigarette beetle in the oviposition pot

Graduate student switching out the sticky traps in a tobacco receiving station

Discussion and Conclusions

- Pheromone disruption caused a dramatic drop in male cigarette beetle captures in both years (Fig. 4).
- Although decreased captures could be explained by inability of males to locate the traps, pheromone concentration would not affect the ability of females to locate and lay eggs in the oviposition pots (Fig. 4).
- The decreased emergence of offspring in the oviposition pots strongly suggests that the cigarette beetle populations were being suppressed (Fig. 5).
- A steep increase in progeny at the end of the 2012 study in the untreated receiving stations is likely explained by increased utilization of oviposition cups when tobacco was removed.
- No observed increase in progeny in the mating disruption treated receiving stations at the end of the year suggests that the population levels had declined (Fig. 5).
- Mating disruption provided excellent suppression without the use of insecticide residues, fumigation, or major changes in facility operations.

Males captured in sticky trap

Tobacco entering a tobacco receiving station

Cigarette beetles mating in an oviposition pot