Are Adult Plum Curculios Capable of Overwintering Within Apple Orchards?

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In the preceding article on the effectiveness of peripheral-row vs. all-row sprays against plum curculio (PC), results indicated that spraying only peripheral rows of apple trees beginning at petal fall was insufficient for adequate orchard-wide control of PC. Two reasons, alone or in combination, were put forward to explain this insufficiency: (1) enough PCs overwintered within the interior of commercial orchards (inside of peripheral rows) to cause excessive fruit injury on interior trees that were left untreated against PC, and (2) excessive fruit injury on interior trees was caused by PCs that overwintered in woods and hedgerows and penetrated into interior rows before a petal fall spray was applied to peripheral rows.

Here, we report results of an experiment conducted in 2003 aimed at addressing the first explanation. We asked whether PCs were able to overwinter successfully inside of two blocks of a commercial orchard in Massachusetts that differed primarily with respect to type of management (weed control).

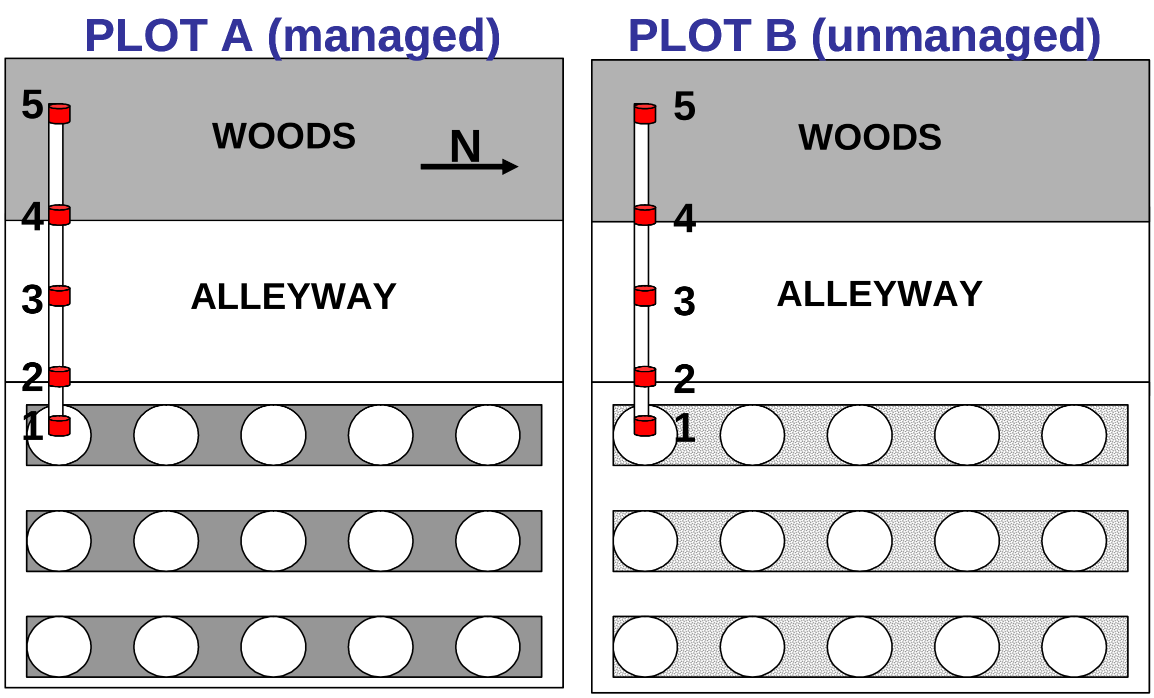

Figure 1. Representation of trap deployment in Plot A (subjected to weed management) and Plot B (not subjected to weed management) to determine distribution of PC overwintering in 2003. For each plot, 60 emergence traps were arranged in 12 transects (only one transect is shown). Each transect consisted of five emergence traps located at different sites (denoted as 1-5) along each transect.

Materials & Methods

Study site. This study was performed during April-June of 2003 in two unsprayed plots of a commercial apple orchard (University of Massachusetts Cold Spring Orchard Research & Education Center, Belchertown, MA) that differed in level of management. For each plot, the perimeter row selected for our experiment had a similar length (about 150 yards) and orientation (west). For each plot there was an alleyway (about 20 yards width) separating perimeter-row trees from woods (which were composed primarily of deciduous trees) (Figure 1). These two alleyways were mowed in August, 2002.

In the first plot (Plot A), fungicides, insecticides, and herbicides were applied throughout 2002. Thus, area beneath tree canopies was devoid of vegetation. At the time of trap deployment in plot A (see below), approximately 120 fruit (from the previous year) were present beneath each tree. The second plot (Plot B) was not managed, with no insecticide, herbicide, or fungicide applied for at least 6 years. Thus, there were tall grass and other vegetation growing beneath tree canopies. In this plot, there were fewer fruit present beneath each tree (approximately 30) than in Plot A due to low fruit load the previous year (2002).

Figure 2. Depiction of a pyramidal emergence trap used for the determination of PC overwintering within two orchard plots in Massachusetts. Trap dimensions: 1.1 x 1.1 yards at base. Traps were purchased from Pest Management Innovations (Harpers Ferry, WV).

Trap deployment. For our study, we used pyramidal emergence traps (depicted in Figure 2) that were 1.1 x 1.1 yards at base and were made of PVC and steel screen. Traps were purchased from Pest Management Innovations (Harpers Ferry, WV). A plastic device topping each trap permitted the capture of PCs that, upon emergence from hibernation, walked upward on the interior surface of the trap.

For each plot, 60 emergence traps were deployed in 12 transects. Each transect consisted of five emergence traps arranged in the following manner: (1) a trap placed next to the trunk of a perimeter-row tree (denoted perimeter-row trap), (2) a trap placed in the alleyway, in close proximity to the edge of the canopy of a perimeter-row tree (denoted canopy-edge trap), (3) a trap placed in the alleyway, midway between perimeter-row trees and woods (denoted alleyway trap), (4) a trap placed at the edge of woods (denoted woods-edge trap), and (5) a trap placed 6-8 yards inside the woods (denoted woods-interior trap) (see Figure 1). Traps were deployed in such a way that no PCs emerging in the area covered by a trap could exit, and no PCs could enter a trap from the outside.

Traps were deployed on April 15 (at the silver tip stage). Each trap was baited with one PC pheromone dispenser (releasing 1 mg of grandisoic acid per day) to draw PCs towards the capturing device. All traps were inspected for PCs two to three times per week until late June.

Results

Figure 3 reveals that for the plot subjected to weed management (plot A), 50% of the total number of PCs was captured by perimeter-row traps, whereas 36% of the total was captured by woods-interior traps. For the unmanaged plot (plot B), 62% of the total number of PCs was captured by perimeter-row traps, whereas 25% of the total was captured by woods-interior traps. For both plots, canopy-edge and woods-edge traps

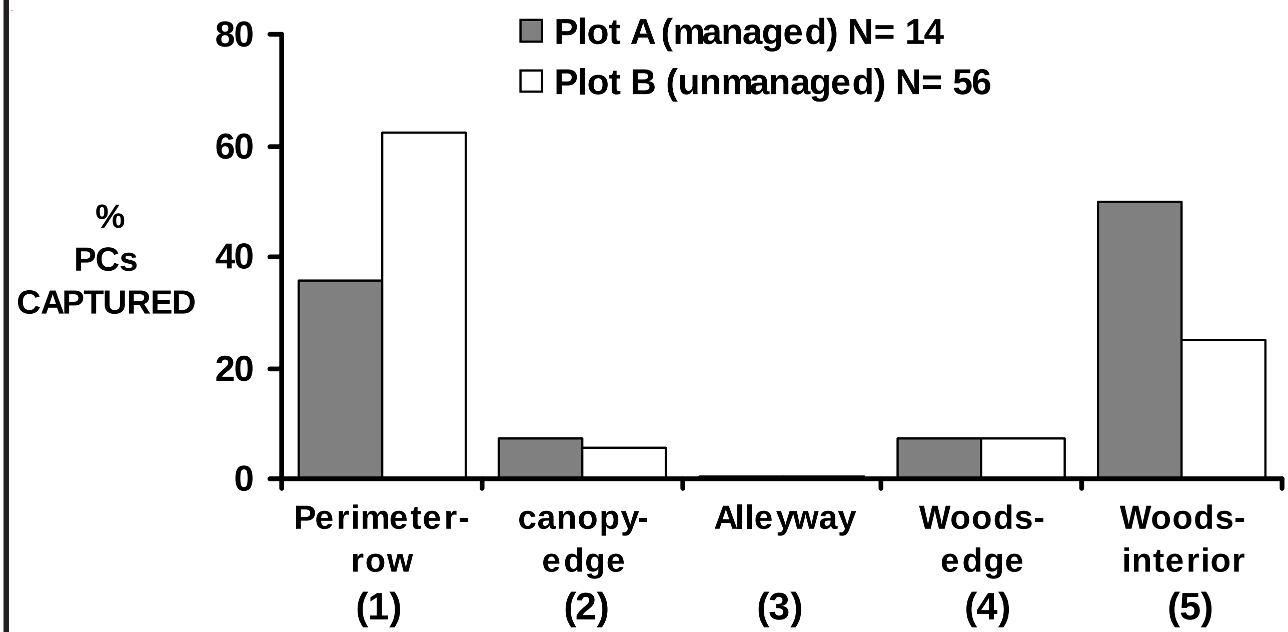

Figure 3. Distribution of PC overwintering that took place within two apple orchard plots in Massachusetts that differed in type of weed management. For each plot, "N" refers to the total number of PCs captured across all (60) emergence traps.

caught low percentages of PCs (5-7%) relative to the total number of PCs captured across all traps. For both plots, no PCs were found in traps located in the alleyways.

Conclusions

Based on our results, we conclude that (1) PCs are able to overwinter inside apple orchards in Massachusetts, and (2) extent of overwintering seems to be influenced by type of weed management. Our findings, when combined with those reported by researchers in Quebec (e.g., LaFleur et al., 1987), suggest that geographical zone along with weather conditions prevalent in a given year, in particular during late summer and early autumn when PCs seek overwintering sites, might also influence the distribution of overwintering PCs. We plan to repeat this study in 2004 to determine if results presented here are consistent over a two-year period.

Acknowledgments

This study was supported with funds provided by a USDA Northeast Regional IPM grant, a Hatch grant, a grant from USDA Crops at Risk program, and the New England Tree Fruit Research Committee.

Literature Cited

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