Positioning Unbaited Pyramid Traps to Capture Plum Curculios

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In the 1996 Winter issue of *Fruit Notes*, we reported results of our 1995 research on plum curculio responses to unbaited "Tedders" traps. These traps are pyramidal in shape, dark in color, and are placed on the ground. They capture curculios that arrive on the trap surface and subsequently crawl upward to the tip, where they enter an inverted screen funnel (a cotton boll weevil trap top) placed over the tip, from which they cannot escape.

All reported tests to date using Tedders traps (hereafter referred to as pyramid traps) for capturing plum curculios have involved deploying unbaited traps between canopies of apple trees within rows. In 1996, we evaluated unbaited pyramid traps at four different positions on the ground in a small commercial apple orchard (Prokopy orchard) in Conway, MA. In addition, we compared curculio captures by pyramid traps with captures by unbaited cotton boll weevil trap tops placed in tree canopies. For each position or type of trap, we compared daily trap captures with daily incidence of orchard fruit scarring by plum curculios.

Materials & Methods

Each pyramid trap was black and measured 40 inches in vertical height, 22 inches in base width, and 2 inches in top width. Each was staked to the ground to prevent toppling by wind. All traps were constructed from plywood in our laboratory, but beginning in 1997, traps of essentially identical type can be purchased from Gemplers Inc., Mt. Horeb, WI (only known supplier).

The orchard consisted of ten rows of five trees per row. Tree trunks were 20 feet apart between rows and 13 feet apart within rows. Trees were about 12 feet tall and about 10 feet in canopy diameter. Soil beneath tree canopies was treated with glyphosate in April and was devoid of vegetation throughout our study. The remainder of the orchard floor was covered with grass, which was maintained at a height of 2 to 4 inches. Dense woods, which we considered to be prime overwintering habitat for plum curculios, lay about 25 feet north of the end tree of each row, and a large open field of grass lay immediately south.

At the pink stage of bud development, pyramid traps were placed in association with each of the trees in the second through ninth rows (Figure 1). One trap was placed 10 feet north of the trunk of the northernmost tree (15 feet from the woods), one trap 10 feet south of the trunk of the southernmost tree of a row (at the edge of the open field), one trap mid-way between the canopies of the northernmost and next northernmost tree of a row, and one trap 1 foot from the trunk of the center tree of a row. At the same time, a boll weevil trap top was placed on the cut end of a 4-inch upright twig in the upper part of northernmost trees in the second through ninth rows.

Traps were examined daily at 7 AM from time of installation (May 14) until four weeks after petal fall (June 27). In addition to recording numbers of curculios captured each day, we also recorded daily (from full bloom on May 23 until June 15) the number of fruit receiving a curculio feeding or oviposition scar in samples of five fruit per tree per day (200 fruit per day among 40 trees).

Orchard trees received no insecticide before bloom but were treated with phosmet on May 28 (80% petal fall) and on June 15. All traps were removed during treatment, which was applied by a motorized back pack sprayer to the

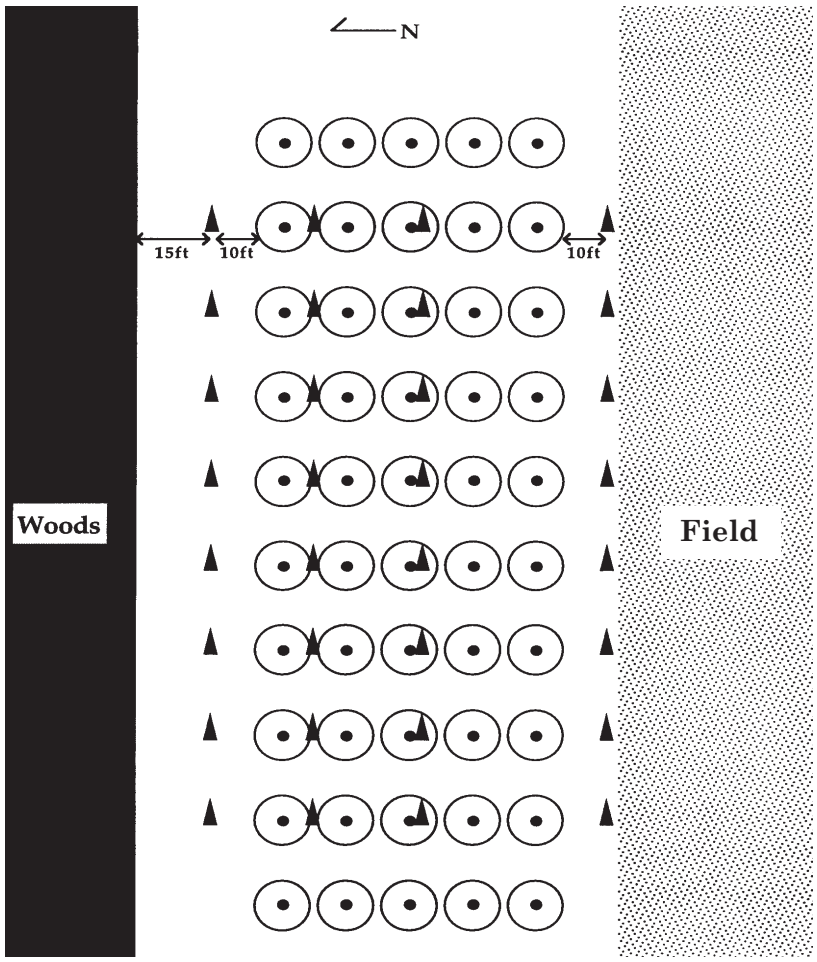

Figure 1. Pyramid-trap deployment in this experiment in relation to tree location.

Table 1. Numbers of plum curculios captured by pyramids capped by boll weevil trap tops or by boll weevil trap tops alone at different locations in a small commercial apple orchard, May 14-June 27, 1996, Conway, MA.

Trap type	Trap location	Average number per trap*
Pyramid	Apple tree trunk	6.0a
Pyramid	Between apple tree canopies	0.8b
Pyramid	Between apple trees and woods	1.1b
Pyramid	Between apple trees and open field	1.1b
Trap top alone	Apple tree canopy	0.4b

*Numbers followed by a different letter are significantly different at odds of 19:1.

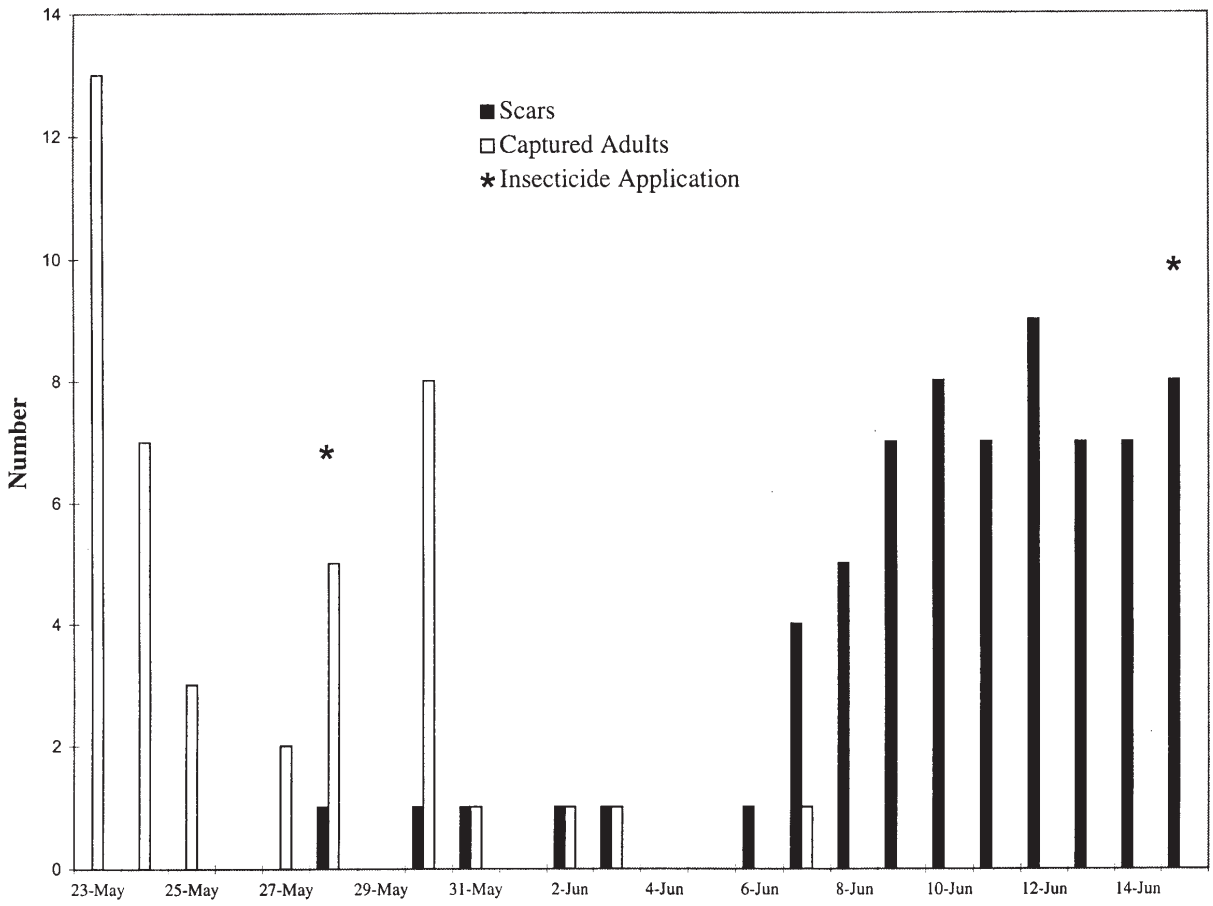

Figure 2. Egg-laying scars and trap captures from May 23 through June 15, 1996.

tree canopy and trunks.

Results

Unbaited pyramid traps placed adjacent to tree trunks captured at least five times more curculios than unbaited pyramid traps at any other position and 15 times more curculios than unbaited boll weevil trap tops placed in tree canopies (Table 1).

Capture of substantial numbers of curculios by unbaited pyramid traps next to tree trunks could entice one to believe that such captures might be used as a basis for determining need for and timing of insecticide sprays against curculio. Unfortunately, this did not prove to be the case in the Conway orchard in 1996. In fact, there was no trap position for which there was even a faint positive correlation between daily trap captures and daily numbers of sampled fruit injured by plum curculios. Indeed, the correlation between daily captures by pyramid traps at tree trunks and daily fruit injuries was a negative rather than a positive one (Figure 2). In other words, during periods when captures were greatest, injury was least.

Conclusions

Our findings show that placing black pyramid traps next to apple tree trunks is the most effective position in terms of capturing the greatest numbers of plum curculios in an apple orchard. Results of additional studies (see following article) indicate that the principal reason why this position is better than any other position stems from the strong tendency of curculios, when crawling, to move toward

areas of greatest darkness within an orchard (that is, toward tree trunks). Placement of black pyramid traps next to tree trunks capitalizes on this behavioral tendency, which is expressed just as strongly in an understory of vegetation as on bare ground.

Even at this most favored tree-trunk position, however, unbaited black pyramid traps fall well short of being an effective means of monitoring the occurrence of curculio injury to apples. Additional studies (see following article) indicate that a principal cause for the failure of captures by unbaited pyramid traps on ground to be good predictors of fruit injury in tree canopies lies in the means by which curculios approach pyramid traps and approach tree canopies: by crawling or by flight. Evidence suggests that during warm weather, curculios may enter tree canopies directly by flight, bypassing tree trunks and pyramid traps. Injury to fruit is greatest during periods of warm weather, such as occurred from June 5 through June 9 in the Conway orchard in 1996 (Figure 2). It appears that during this time period, most curculios arrived in tree canopies by flight and not by crawling up tree trunks (or up pyramid traps).

What might be a solution to this shortcoming of pyramid traps during warm weather? One solution might be to use a powerful attractive odor in conjunction with a pyramid trap positioned next to a tree trunk (see following articles). Another solution might be to develop an effective odor-baited trap for use in the tree canopy. We are working toward both solutions.

Acknowledgments

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