Extent of Early-season Plum Curculio Penetration into Commercial Apple Orchards

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In the first article in this issue of *Fruit Notes*, we evaluated the effectiveness of peripheral-row vs. all-row sprays in controlling plum curculios in New England apple orchards. We proposed two possibilities to explain why confining sprays exclusively to peripheral rows led to unacceptable PC control. In the preceding article, we provided information supporting the first possibility: some PCs are able to overwinter inside of orchards, and thereby they may escape sprays applied only to peripheral rows against immigrant adults. We suggested that one of the main factors influencing the amount of overwintering inside orchards might be type of orchard management, such as presence of vegetation beneath orchard trees, particularly during the period of time at which adult PCs seek overwintering sites in the autumn. Here, we report results of a study conducted in 2003 aimed at addressing the second possibility. We asked whether PCs overwintering in woods or hedgerows outside of orchards move into interior rows of orchards before petal fall and thereby escape effects of petal fall and subsequent sprays when they are confined only to peripheral rows.

Materials & Methods

This study was performed during April/May of 2003 in eight commercial apple orchards in Massachusetts. Within each orchard, blocks selected had similar length (about 200 yards of perimeter-row trees) and depth (at least 80 yards). For each block, trees used were of a particular size: either large (M.7 rootstock), medium (M.26 rootstock), or small (M.9 rootstock).

For this study we used Circle traps (originally developed by Edmund Circle, a pecan grower in Oklahoma), which are made of either aluminum or vinyl-coated polyester screen with a PC-capturing device integrated on top. Traps are wrapped around the base of tree trunks so as to completely encircle the trunk, thereby intercepting adults walking upward.

For each selected block, 20 Circle traps were deployed on April 24 (at the green-tip tree stage) on trees located in the central part (about 60-70 yards in length) of each orchard to minimize potential penetration of PCs from the lateral or back sides (Figure 1). For each block, traps were arranged in four transects of five traps each, starting on perimeter-row trees. Because there were different inter-row distances and tree densities due to the different tree sizes, blocks having large trees received traps deployed in consecutive rows (1-5), blocks having medium-sized trees received traps deployed in rows 1, 3, 5, 7, and 9, and blocks having small trees received traps deployed in rows 1, 4, 7, 10, and 13. Under this approach, traps were deployed at similar distances inside a block: on perimeter-row trees (A), and on trees about 12, 22, 32 and 42 yards inside of perimeter-row trees (B-E) (Figure 1).

On May 8 (at mid-pink), traps corresponding to two of the four transects in each block were baited with one dispenser of PC pheromone (grandisoic acid, releasing 1 mg per day) (GA) in association with one dispenser releasing the attractive host plant odor benzaldehyde (BEN) at a very low release rate (2.5 mg/day). Traps for the two remaining transects per block were left unbaited (Figure 1). Results show combined captures (baited + unbaited traps) because no differences in captures by either baited or unbaited traps were found. All traps were inspected for PCs on

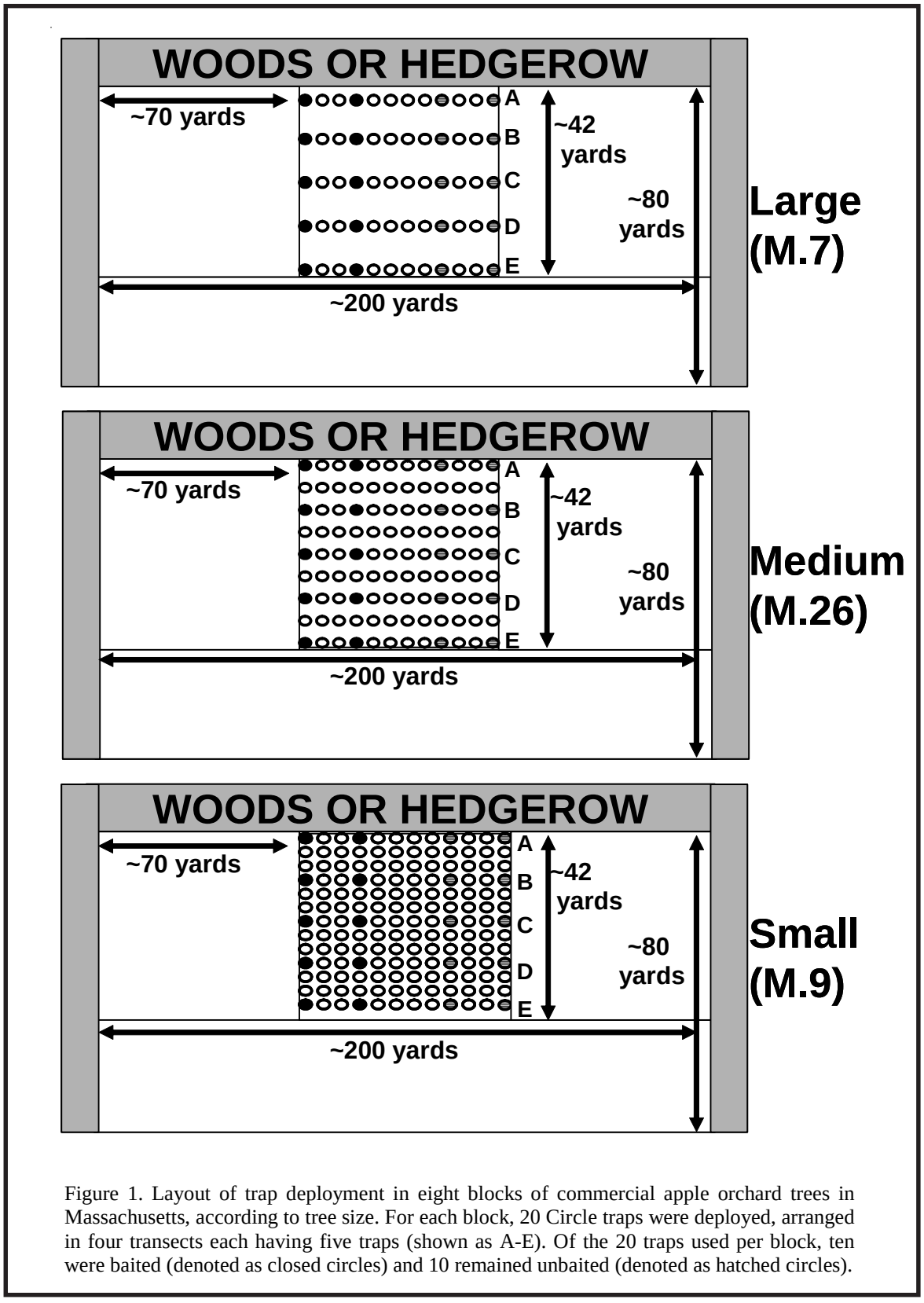

Figure 1. Layout of trap deployment in eight blocks of commercial apple orchard trees in Massachusetts, according to tree size. For each block, 20 Circle traps were deployed, arranged in four transects each having five traps (shown as A-E). Of the 20 traps used per block, ten were baited (denoted as closed circles) and 10 remained unbaited (denoted as hatched circles).

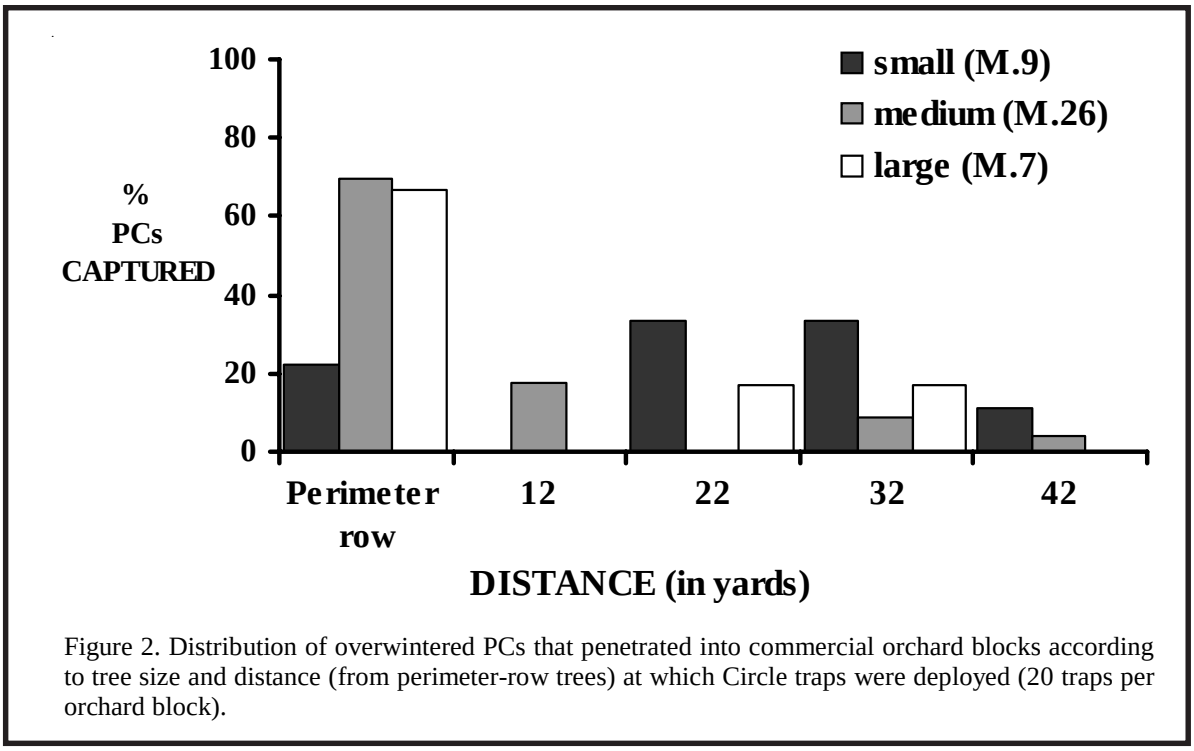

Figure 2. Distribution of overwintered PCs that penetrated into commercial orchard blocks according to tree size and distance (from perimeter-row trees) at which Circle traps were deployed (20 traps per orchard block).

May 23-24, just after the petal fall spray of insecticide against PC. Thus, results show captures that occurred during a two-week period.

Results

Figure 2 reveals that extent of PC penetration into commercial orchard blocks varied considerably according to tree size. For blocks having large and medium trees, most PCs were captured by Circle traps located on perimeter-row trees (about 70 and 67%, respectively). For blocks having small trees, most PCs (about 78%) penetrated into interior rows.

Conclusions

Based on our findings, we conclude that by petal fall: (1) most PCs were congregated on perimeter-row trees in blocks of large or medium-sized trees (M.7 or M.26 rootstock), and (2) a substantial number of PCs was able to penetrate inside blocks (at least up to 42 yards in our study) where trees were small (M.9 rootstock). An alternative explanation is that PCs may have overwintered within rather than penetrated into interiors of some blocks. Our results here, when combined with findings reported in the preceding article, may explain why growers who might limit all insecticide application against PC exclusively to peripheral-row trees would attain unacceptable PC control. We aim to repeat this study in 2004 to corroborate our findings here.

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