Circle Traps for Plum Curculio: Revisiting Their Potential for Population Suppression

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Plum curculio (PC) remains one of the most important early-season pests of apples in eastern North America, and management continues to rely largely on insecticide applications around petal fall. At the same time, there is increasing interest in approaches that take advantage of insect behavior. Circle traps exploit the natural climbing behavior of PCs adults by intercepting them as they move up tree trunks, and we need to determine whether odor lures could be added to enhance captures.

A commercial apple grower in North Carolina has been evaluating Circle traps over multiple years with two practical objectives: to determine whether sustained trapping can reduce local PC populations and injury, and to develop deployment strategies that are feasible under commercial conditions. Early results were encouraging. In 2023, six traps captured 593 adult PCs over the season. In 2024, increasing trap density to eighteen traps resulted in 723 PCs captured, along with noticeable improvements in fruit quality in previously high-pressure areas . These results prompted a more structured evaluation in 2025, including comparisons among lure types and unbaited traps.

Materials and Methods

The 2025 study was conducted in a commercial apple orchard of approximately 1,000 trees on M.111 rootstock, located adjacent to wooded areas with historically high plum curculio pressure. Two trapping settings were used: a perimeter block targeting immigration from surrounding habitat, and a smaller (~40-tree) test orchard used to compare lure treatments.

In the test orchard, Circle traps (Figure 1) were deployed on individual trees using three treatments: plum essence, methyl salicylate (= wintergreen oil), and unbaited controls. Each tree represented a different cul-

Figure 1. Circle (trunk) traps deployed at Kordick Family Farm, North Carolina. The mesh band intercepts plum curculio (PC) adults moving along the trunk. A methyl salicylate (wintergreen oil) lure (left) or a plum essence lure (right) is placed nearby and is being evaluated for attractiveness to PCs. These traps exploit PC crawling behavior: adults climb to feed but often drop at night; as they move along the trunk, they are funneled into the collection device.

tivar or genotype, and there was substantial variation in bloom and fruit set across the orchard. Some larger trees required multiple traps due to trunk diameter, although trap fit was not always ideal under those conditions.

Traps were installed early in the season and checked frequently during the main period of PC activity. Daily captures were recorded, along with general observations on bloom stage and tree condition. For analysis, captures were grouped into biologically meaningful periods defined by the data. The period of peak activity was identified as the interval with the greatest accumulation of captured PCs. Earlier captures were classified as pre-peak, and later captures through late May as post-peak. Data after June were excluded from lure comparisons, as they likely represented a new generation and lures were not replaced.

Results

Seasonal pattern of plum curculio captures in a North Carolina orchard. Capture patterns showed a pronounced and early peak in plum curculio activity, with the highest captures occurring in late March to early April. Following this peak, captures declined steeply but did not drop to zero. Instead, a prolonged low-level activity persisted through May and into the summer, with occasional minor increases. By late May, captures were consistently low, indicating the end of the main immigration period of overwintered adults (Figure 2).

Lure Performance over time. This analysis included captures of overwintered PCs only – until May 31. First captures occurred on March 29, when activity was minimal. During this before-peak period, wintergreen oil and plum essence traps performed similarly, while unbaited traps captured no PCs (Figure 3).

The main immigration period occurred from March 30 to April 7. During this peak window, lure-baited traps numerically captured more PCs than unbaited traps. Wintergreen oil traps averaged 20.2 PCs per trap, plum essence 16.6, and unbaited traps 6.4, suggesting a potential lure effect during movement of overwintered adults.

From April 8 to May 31, captures declined and the pattern shifted. Unbaited traps averaged 10.5 PCs per trap, compared with 8.5 for wintergreen oil and 8.3 for plum essence (Figure 3), suggesting that after peak immigration, trap performance depended more on placement and tree-level factors than on lures. These results reflect conditions in a single commercial orchard in North Carolina, so additional research across multiple orchards and regions is needed to determine how broadly these findings apply.

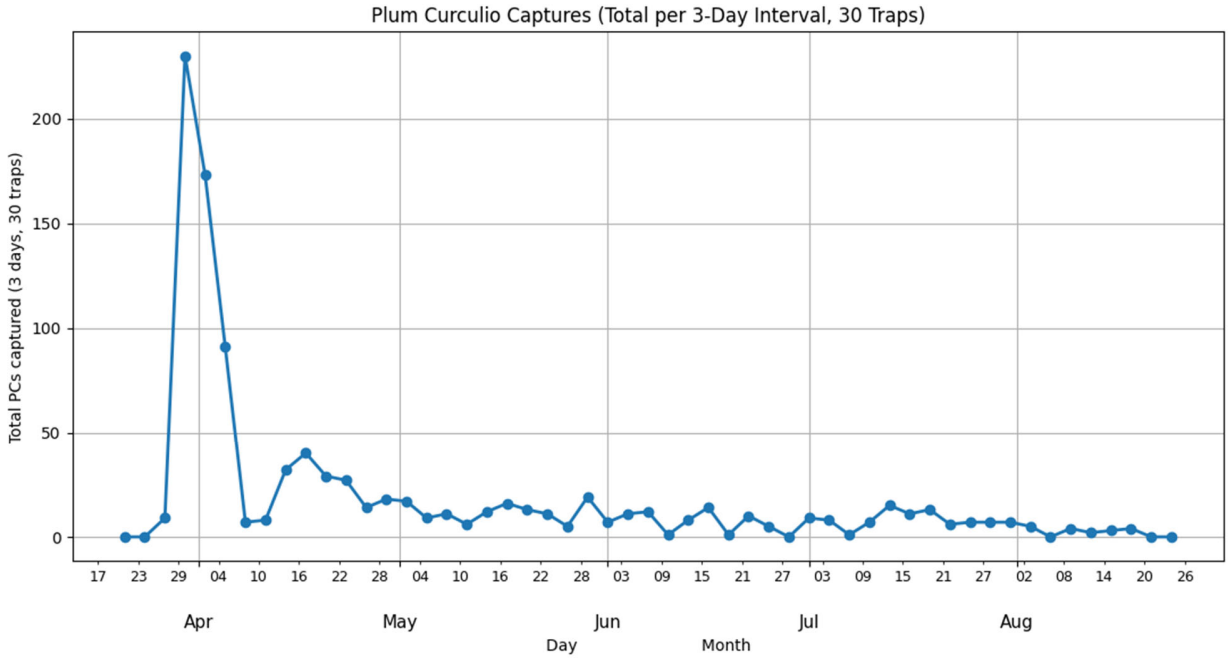

Figure 2. Total plum curculio captured in 30 Circle traps summed over 3-day intervals. Captures were near zero early, then surged sharply at the end of March/early April (peak activity), followed by a rapid decline and low, steady captures for the rest of the season.

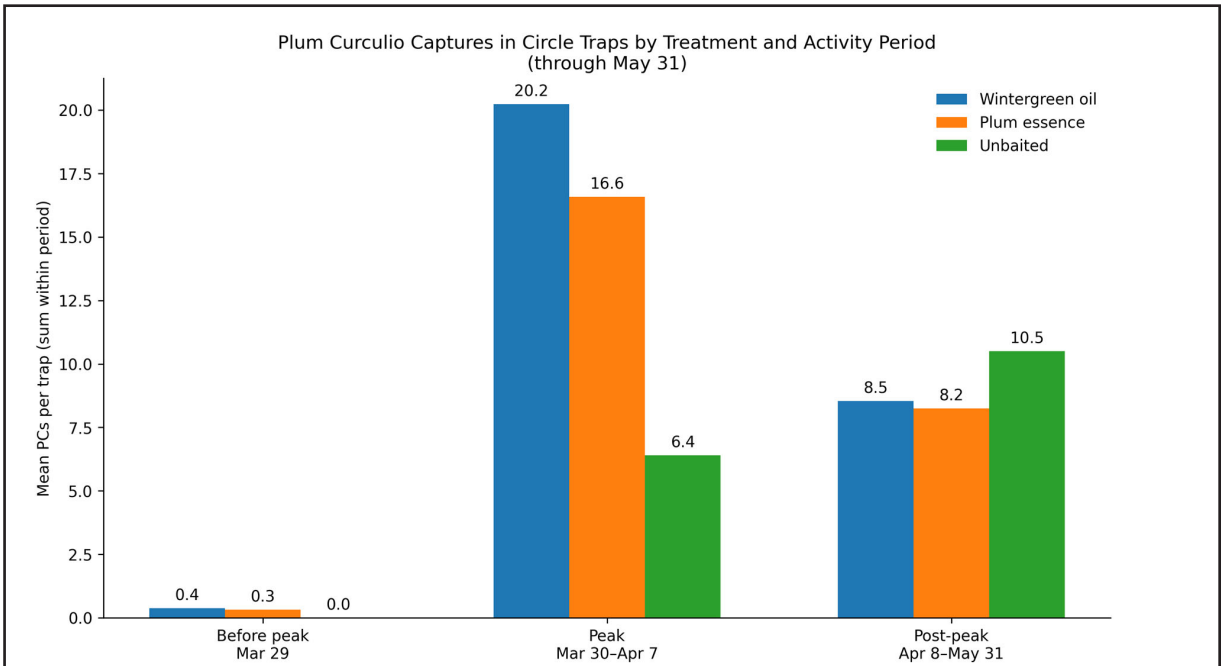

Figure 3. Mean plum curculio captures per trap (summed within each period) for overwintered adults in a North Carolina orchard. Peak activity (Mar 30–Apr 7) showed higher captures in wintergreen oil and plum essence traps, while post-peak (Apr 8–May 31) captures were higher in unbaited traps, indicating a shift from lure-driven to movement-driven trap performance. Data after May 31 were excluded.

Grower observations: Localized reduction in injury. Grower observations suggest a meaningful reduction in injury in high-pressure areas. In a row of Wickson crabapple trees that historically produced heavily damaged, unmarketable fruit, the introduction of Circle traps over two seasons coincided with a marked improvement in fruit quality, with substantially fewer oviposition scars per fruit. While not quantified experimentally, this observation is consistent with the hypothesis that sustained trapping may reduce local pest pressure. This remains to be verified through further experimentation.

Orchard-scale observations. At the orchard scale, effects were less clear, although there was some indication of reduced early-season fruit drop. It is plausible that trapping may intercept immigrating adults at orchard borders, potentially easing pressure on interior trees, but this requires further study.

A practical note on trap maintenance: Circle traps may capture non-target insects in addition to PC, especially early in the season. In Brittany's orchard, earwigs were among the most common bycatch. Because earwigs are beneficial predators that contribute to biological control in many orchard systems, growers using circle traps should consider checking traps frequently to release non-target organisms when feasible. This improves stewardship of beneficial insects, although it does add labor.

Conclusions

This on-farm study shows that Circle traps can capture meaningful numbers of PCs, and this has been a consistent finding in that North Carolina orchard. In 2025, peak activity occurred earlier than expected and was more closely linked to temperature than to petal fall. Circle traps are not a stand-alone solution due to continued immigration, but they are a useful complementary tool and provide insight into PCs movement. Lures may improve trap efficiency early in the season; however, they were not replaced during this study. Future work will evaluate the effect of regular lure replacement. Because this was an on-farm observational comparison with tree-level variability, these results should be interpreted cautiously.

How to Install Circle Traps

Circle traps can work very well, but only if they are installed carefully. The goal is to force any insect walking up the trunk to enter the trap, so small gaps or poor fit can greatly reduce effectiveness.

Place the trap around the main trunk about 1–2 feet above the ground, on a relatively even section. If the bark is rough or flaky, remove loose pieces so the screen can sit flush against the surface. Wrap the screen tightly around the trunk and secure it with staples so it remains snug. Attach the wooden support piece with a single screw to keep the trap stable under field conditions. Adjust the screen so it directs insects upward into the capture device, taking advantage of the natural climbing behavior of plum curculio.

The most important step is to eliminate gaps. Pay close attention to bark irregularities and add extra staples where needed to maintain a tight seal all the way around the trunk. In our work, traps have been most effective when installed early and tightly sealed, allowing them to intercept adults moving from the ground into the canopy.

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