Comparison of Ladd Traps, Red Spheres, and Yellow Panels for Capturing Apple Maggot Flies in Commercial Apple Orchards

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In a recent study in commercial apple orchards, it was found that sticky red spheres baited with butyl hexanoate caught four times more apple maggot flies (AMF) than unbaited red spheres. However, not everyone agrees that baited red spheres are the best AMF trap. For example, studies carried out in the western U.S. seem to place sticky Ladd traps as being equal or superior to sticky red spheres. Ladd traps consist of a square yellow panel with a red sphere in the center. The yellow panel is believed to attract immature AMF whereas the red sphere is believed to attract mature AMF. Trap position is critical for effectiveness. We speculated that Ladd traps in poor position could have been more effective than red sphere traps in poor position in studies favoring Ladd traps as being superior. Finally, some of the studies on Ladd traps were not performed in commercial

Table 1. Number of apple maggot flies caught by different traps in a commercial orchar in Massachusetts from late July to early September, 1997.

		Early (wk)				Late (wk)				
Trap type	Position in tree	1	2	3	Total*	4	5	6	Total*	Overall *
Red sphere	Optimal	12	19	17	48a	12	13	22	47a	95a
Red Sphere	Poor	4	15	14	33a	26	13	26	65a	98a
Ladd	Optimal	8	13	14	35a	15	18	32	65a	100a
Ladd	Poor	0	3	9	12b	4	6	9	19b	31b
Yellow Panel	Optimal	6	3	9	18b	4	8	2	14b	32b
Yellow Panel	Poor	1	2	1	4b	2	1	3	6b	10b

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

orchards, where incoming AMF populations are primarily composed of mature flies. To clarify conclusions on trap type effectiveness for AMF, we conducted the following experiment during the summer of 1997.

Materials & Methods

In nine rows of apple trees in a commercial orchard in Massachusetts, the first six trees in each row (i.e. trees nearest adjacent woods) were selected for use. In the first row, the first tree contained a red sphere (8 cm in diameter) placed in optimal position (surrounded by as much foliage and fruit as possible at a distance of 3-6 inches), in the mid-portion of the tree canopy. The second tree contained a red sphere in poor position (few leaves and no fruit nearby). The third and fourth trees contained a Ladd trap (9 cm diameter red sphere centered on a 9x11-inch yellow panel) in optimal and poor position, respectively. The fifth and sixth trees contained a yellow panel (9x11-inch rectangle) in optimal and poor position, respectively. For every succeeding row, trap positions were rotated so that each trap type appeared in each within-row tree position three times.

In every row, poor position was standardized for all traps, either low and out; high and out; or close to the trunk, high or low. A vial containing butyl hexanoate was placed 4 to 6 inches away from every trap. Traps were serviced every week for six weeks, during which flies were removed and counted and sticky was replenished if needed. The experiment was conducted from late July to early September.

Results

Overall, red spheres in both optimal and poor positions and Ladd traps in optimal position caught similar numbers of flies and three times more flies than Ladd traps in poor position or yellow panels in either positions (Table 1). During the first three weeks, red spheres in optimal position caught numerically more flies than red spheres in poor position and Ladd traps in optimal position; the difference, however, was not significant. During the last three weeks, as fruit reached maturity, red spheres in optimal position caught numerically fewer flies than red spheres in poor position and Ladd traps in optimal position; again however, the difference was not significant. Across all six weeks Ladd traps in poor position and yellow panels in either position caught significantly fewer flies than red spheres in either position and Ladd traps in optimal position.

Conclusions

From late July to mid-August, red spheres in optimal position caught 35-40% more AMF than red spheres in poor position or Ladd traps in optimal position. The proximity of foliage and fruit to red spheres in optimal position probably facilitated more frequent opportunity for AMF to encounter such spheres. This could explain the numerical difference in capture between red spheres in optimal position versus red spheres in poor position. Yellow panels were comparatively unattractive irrespective of panel position. Ladd traps in poor position caught numbers of AMF similar to those on yellow panels. Apparently, in poor position, the red sphere component of a Ladd trap is not perceived as fruit by foraging AMF.

By mid-August, the Paulared apples on the trapped trees had turned red and visually competed with red spheres in optimal position. At times, red sphere traps in optimal position were difficult for us to find in the trees. At that point, red spheres in poor position (placed farther away from competing fruit) and Ladd traps in optimal position began to capture more AMF than red spheres in optimal position. Ladd traps in optimal position might have enhanced the contrast of a red sphere against background by furnishing a yellow panel or background rather than red fruit. The effect could not be reproduced by Ladd traps in poor position.

Efficiency of red spheres for trapping AMF seems to decrease when fruit reaches a size and color similar to the spheres. This factor deserves more attention. Trap positioning may need to be adjusted toward harvest. We plan to conduct studies on the effect of fruit density on trap efficiency, an interfering factor that could affect management practices especially when early maturing cultivars of red apples are involved.

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