TIMING AND SUSCEPTIBILITY OF WALNUT CULTIVARS TO WALNUT HUSK FLY ATTACK – EPISODE 2

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ABSTRACT

Population levels of walnut husk fly (Rhagoletis completa) were assessed in Wolfskill Experimental Orchard in Winters in relation to English walnut cultivar and time of year in the summer of 2000. Fly population densities, as determined with Pherocon® AM-NB yellow sticky traps baited with ammonium carbonate Superchargers, rose between July 5 and September 11, then declined through the last monitoring date of September 28. Walnut husk fly population densities, as evidenced by trap captures, differed significantly among the different cultivars. The greatest total numbers of female flies were trapped on Sunland (578 females), followed by Chandler (468 females) and 67-13 (445 females) trees, but the greatest numbers of males were trapped on Chandler (251 males), Hartley (195 males), Serr (194 males) and Sunland (193 males) trees. Thus, the patterns of trap capture of males and females were not the same. This differs from 1999 when significantly greater numbers of both male and female walnut husk flies were captured on Sunland, Tehama and Hartley cultivars than on all other cultivars. In addition, this year gravid female flies were first trapped July 19, over a week earlier than they were seen in 1999. The year-to-year fluctuations in walnut husk fly population density and in pattern and timing of cultivar attack make controlling this pest difficult.

OBJECTIVE

Evaluate walnut husk fly emergence in relation to English walnut cultivar using standard yellow sticky monitoring traps baited with ammonium carbonate Superchargers.

PROCEDURES

Monitoring: We evaluated timing of emergence and egg development of walnut husk fly adults in Wolfskill Experimental Orchard in Winters by biweekly assessment of monitoring traps. Standard Pherocon® AM-NB yellow sticky traps baited with ammonium carbonate Superchargers were donated by Trécé Inc. Beginning July 5, 2000, one trap plus Supercharger was hung per pair of trees of 16 commercial English walnut cultivars: Ashley, Payne, 67-13, Tulare (67-11), 68-104, Chico, Sunland, Serr, Vina, Tehama, Amigo, Pedro, Scharsch Franquette, Hartley, Chandler and Howard. In addition, 2 traps and Superchargers were hung in black walnut (Juglans hindsi) trees located in the southeast portion of the Wolfskill orchard. Every two weeks, flies were removed from the traps and sexed. Superchargers were replaced every 2-4 weeks, and traps were replaced as needed. Trapping continued for 12 weeks, through late September. Presence of gravid female flies (i.e., with mature eggs) on traps signaled the approximate earliest date of fly oviposition. Numbers of males and females captured on each trap were standardized to proportions of total trap captures for each two week trapping period to eliminate the confounding effect of changing fly population density. Effects of fly gender and tree cultivar on fly capture were analyzed with a two-way ANOVA.
RESULTS

The numbers of flies captured in monitoring traps increased steadily early in the season, with peak numbers of flies captured during the week of September 11 (week 10) before declining again until the last week of trapping (week 12). Eggs were first detected in three female flies captured on traps in black and English walnuts (Tehama and Hartley cultivars) during the week of July 19 (week 2). Cultivars differed significantly in the numbers of flies trapped over the season but captures of males and females did not differ significantly from each other (Figure 1) (ANOVAs on arcsine transformed proportions of captures) (effect of fly gender: $F = 0.04$, d.f. = 1, 160, $p = 0.85$; effect of cultivar: $F = 4.34$, d.f. = 15, 160, $p < 0.001$). The greatest numbers of female flies were trapped on Sunland, Chandler, and 67-13 trees, but the greatest numbers of males were trapped on Chandler, Hartley, Serr, and Sunland trees, in that order (Figure 1).

DISCUSSION

As we mentioned last year, walnut husk fly is known for being a variable problem on both a year to year and an orchard to orchard basis. This year, we detected a similar pattern in the timing of walnut husk fly emergence in Winters as in 1999, yet the pattern of fly trap captures on the different cultivars was not the same as in 1999. Yearly infestation levels may be affected by a variety of environmental factors, including temperature and rainfall, but the mechanisms of these effects are poorly understood. Typical cultivar guidelines indicate that husk fly preferentially attacks mid- to late-season varieties, with early-maturing varieties escaping damage in most years. Nevertheless, in 1999, we found that nearly all varieties of English walnut escaped damage in Wolfskill, despite the fact that the black walnut trees were very heavily infested. Based on this result in 1999, we hypothesized that WHF populations might be low in 2000 because flies had not reproduced in the English walnuts. Overall, in 2000, fly population levels were higher than in 1999, contrary to what we had predicted (Figure 2). As in 1999, all trees had evidence of adult fly activity, based on monitoring traps. But this year, fly populations were much higher on certain cultivars, such as Chandler, Serr, Ashley, and 67-13, than they were in 1999. Alternatively, Tehama and Sunland, heavily infested trees in 1999, had lower infestation levels this year. Based on trap capture data and the detection of a single sting last year, we hypothesized that Sunland should be a heavily infested variety in a “normal” year. Although we did not sample and dissect walnut husks to detect walnut husk fly eggs in 2000, we frequently saw infested walnuts in the Sunland trees.

It is important to remember that the fly population levels seen this year are the result of fly reproduction last year and/or the year before (since pupae may remain in the soil for two years). Thus, the spatial pattern of flies trapped in Wolfskill this year may have been affected by low reproduction in the orchard by flies last year as well as pupae that diapaused for two winters. We have found that walnut husk fly population densities are not easily predicted based on trap captures from the previous year. We plan to continue monitoring walnut husk fly population levels in Wolfskill to begin to develop an understanding of long-term fly population fluctuations, fly emergence patterns in space and time, and cultivar preferences.
Figure 1. Total numbers of male and female walnut husk flies captured on different cultivars of English walnut in Wolfskill Experimental Orchard, 2000.

Figure 2. Total numbers of walnut husk flies captured on different cultivars of English walnut in Wolfskill Experimental Orchard in 1999 and 2000.