Pome Fruits—Biology

Pear Psylla

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Topical applications of the insect growth regulator fenoxycarb in fall cause a premature termination of diapause in the overwintering morph (winterform) of pear psylla. Effects include maturation of ovaries, mating, and egg laying. Diapause often functions to confer survival through an inimical season by halting development at a life stage that is adapted for survival during that part of the season. In many north temperate insects, including pear psylla, diapause occurs during the winter months when conditions are not conducive to reproduction.

Here, I present some preliminary laboratory results from studies that tested whether fenoxycarb reduces cold tolerance of female winterform pear psylla. Ultimately I hope to determine whether a fall application of fenoxycarb in the field would reduce cold tolerance of psylla sufficiently to justify its use in a management program.

Female winterform psylla were collected at several periods during the fall of 1993 and returned to the laboratory. Psylla were placed on field-collected foliage for 1 week under one of the following conditions (all at 20°C): a) fenoxycarb (0.1 g/l A.I.), short-day photoperiod (10:14 L:D); b) no fenoxycarb, long-day photoperiod (16:8 L:D); c) no fenoxycarb, short-day photoperiod. Treatments (a) and (b) cause termination of diapause; treatment (c) maintains diapause. Fenoxycarb was misted onto foliage for treatment (a). As a control treatment, psylla were collected from the field on the day the cold tolerance experiment was conducted.

After the 1-week conditioning period, psylla were placed in glass vials and the vials placed in a cold-water bath. The bath was programmed to decrease in temperature from 10°C to -5°C, at the rate of 1° per 10 minutes. Once the bath reached -5°C, psylla were placed in a low temperature cabinet at the desired subzero test temperature for 24 hours. Psylla were removed from subzero conditions after 24 hr and placed in petri dishes held at room temperature. Numbers of dead and living psylla were counted after 24 hours at room temperature. For one experiment, half of all psylla were lightly misted with deionized water before being placed in the cold water bath to determine whether subzero temperatures accompanied by moisture cause mortality.

Fenoxycarb and long-day conditions caused increased mortality in psylla exposed to -15°C for insects tested on Oct. 14 (Table 1). However, by Nov. 9 (Table 1), psylla were not susceptible to -15°C temperatures, irrespective of treatment (this seasonal change in cold tolerance is common in insects). Misting caused increased mortality of psylla treated on Dec. 8 (Table 2); as with the Nov. 9 experiment, there were no conditioning effects.

In summary, forced termination of diapause caused a decrease in cold tolerance of

winterform psylla; the effect is seasonal, however. Light misting by water prior to exposure to subzero temperatures caused an increase in mortality.

Table 1. Percent mortality of female winterform psylla after 24 hours at subzero temperatures. Control refers to psylla that were collected from the field on the day of the experiment. Dates refer to days that psylla were exposed to the subzero temperature. Values in parentheses indicate median ovarian score (scores >3 indicate post-diapause state). Sample sizes at least 30 per treatment and date.

Treatment	Oct 1 -20°C	Oct 7 -10°C	Oct 14* -15°C	Nov 9 -15°C
Control	100	7.2	18.5 (1)	8.6 (2)
Short day	100	0	30.0 (1)	8.6 (2)
Long day	100	0	72.7 (2)	12.1 (2)
Fenoxycarb	100	0	85.7 (6)	12.1 (6)

*Significant differences among treatments in psylla mortality ($P<0.01$).

Table 2. Percent mortality of female winterform psylla after 24 hours at subzero temperatures; effects of misting with deionized water. Other than misting, protocol same as in Table 1. Experiment conducted on Dec 8.

Treatment	Misted -15°C	Not misted -15°C
Control	34.3	17.6
Short day	52.9	25.8
Long day	62.9	17.1
Fenoxycarb	39.3	19.3
Overall	47.7	19.8 ($P<0.001$)