PROJECT NO: 5801 (Termination report)

TITLE: Monitoring and Control of Campylomma

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REPORTING PERIOD: 1992-1995

ACCOMPLISHMENTS:

1. A degree-day based model for predicting emergence of overwintering Campylomma was developed and should improve timing of spring monitoring.
2. A degree-day based model for predicting peak spring tap counts was also developed.
3. Various materials, rates and application timings were evaluated to determine most effective controls.
4. A relationship between fall trap captures of adult Campylomma in pheromone traps and spring Campylomma densities to identify high risk orchards was investigated.
5. The relationship between stage of fruit development and fruit vulnerability to injury from Campylomma feeding was determined.
6. The relationship between prey availability and the extent that Campylomma feeds on fruit was examined.
7. The relationship between alternate summer hosts or aphids and orchard populations of Campylomma was investigated.

RESULTS:

Phenology data was collected during 1992-1994 from three orchard blocks in the Wenatchee area. Campylomma nymphs were collected and daily maximum and minimum temperatures were determined from each block. These data indicate that, in Washington, Campylomma begin hatching from overwintering eggs between tight cluster and pink on apple. This emergence is earlier than originally expected. The collected Campylomma were separated into their different life stages and cumulative emergence for each life stage was calculated. Degree-days were calculated from the max-min temperature data and summation of degree-days began March 1. A logistic model was fit to the degree-day/Campylomma emergence data. Predicting emergence of the first instar nymphs (our best estimation of egg hatch under field conditions) is most important to correctly time sampling. In the field, the first nymphs were usually detected between 130 and 145 degree-days. The model predicted 10-95% emergence of first instar Campylomma within ± 2 days of that observed in the field for all blocks in all three years. Recommendations based on this model are that sampling should begin at about 160 degree-days accumulated from March 1. The efficiency of the monitoring program should be improved by the ability to time sampling more precisely in relation to Campylomma egg hatch.

A model for predicting peak tap counts was also developed from the phenology data. Peak tap counts are important because the economic thresholds for Campylomma are based on them. This model allows us to calculate economic thresholds for various degree-day accumulations. For example, the economic threshold for 'Delicious' is ca. five nymphs/tap. This model predicts that at 165 degree-days a tap count is at 10% of the peak, and therefore the economic threshold would be 0.5 nymphs per tap or five nymphs in ten taps. This is important because peak Campylomma activity usually occurs too late to apply effective controls. However, if early season samples can be used to predict the peak tap count a more informed decision to apply controls can be made. This model should further streamline the monitoring program for Campylomma.

Campylomma pesticide trials were conducted on 'Golden Delicious' and 'Delicious'. A number of different materials, rates and application timings were evaluated for their efficacy against Campylomma. Carzol, Lorsban, Provado and Thiodan were the most effective materials tested. Prebloom and full bloom were the most effective application timings. Delayed dormant treatments of Lorsban 4E + oil at half-inch-green (HIG) provided suppression of Campylomma nymphs, and when Campylomma pressure was moderate or lower (a peak of < 6 nymphs/tap) this treatment provided commercially acceptable control on 'Delicious'. On 'Golden Delicious', the delayed dormant with Lorsban 4E only provided commercially acceptable control when Campylomma pressure was low (a peak of ≤ 2 nymphs/tap). Half rates of Carzol (0.5 lb/acre) and Lorsban 50W (1.5 lb/acre) applied at pink provided commercially acceptable control except when pressure was high (> 10 nymphs per tap). Postbloom (petal fall) treatments did not provide acceptable control in any of the tests. Dimethoate, Asana, M-Pede, and Sevin were less effective against Campylomma. Neemix was tested at pink and petal fall and provided about 50% suppression of nymphs. Under low to moderate pressure Neemix may be effective enough for use on 'Delicious'.

The relationship between trap captures of adults in the fall and peak nymph densities in the same blocks the following spring was examined in an attempt at early identification of high risk orchards. Adult male Campylomma were found in all study blocks during the entire flight season. Significant positive correlations between late-summer to fall trap captures and nymph densities the following spring were revealed by regression analysis. These correlations were strong enough to develop thresholds for identifying high risk orchards. Several trapping seasons were examined, and an early August to late September trapping season provided the best correlations. The strongest correlations were revealed in blocks that received no spring applications toxic to Campylomma (untreated). These correlations should be particularly useful in SARE blocks and organic orchards. High risk threshold recommendations for an early Aug.-late Sept. trapping season in untreated orchards are 200 and 300 cumulative adults in 'Golden Delicious' and 'Delicious', respectively. The correlations in the conventional blocks were not quite as strong; however, they were strong enough to develop thresholds to identify high risk blocks. High risk threshold recommendations in conventional orchards for the early Aug.-late Sept. trapping season are 400 cumulative adults in both 'Golden Delicious' and 'Delicious'.

Campylomma feed on apple fruitlets and are also predatory, feeding on mites, thrips, aphids and psylla. Prey availability may affect the degree that Campylomma feed on fruit, thus manipulating prey densities could be used to reduce fruit feeding by Campylomma. We investigated the relationship between prey availability and fruit feeding by Campylomma and determined the stages of fruit development most vulnerable to injury. Prey availability did not reduce damage to fruit caused by Campylomma feeding. In addition, it was discovered that Campylomma can cause damage during the bloom period and that this period is the stage most vulnerable to injury. In 1994, after the fruit had reached the 1/2 inch stage only one damaged fruit was detected. However, in 1995, no damaged fruits were detected after fruit reached the 1/4 inch stage. Consequently, although they kill the Campylomma, postbloom sprays are applied after most of the injury has already occurred. In addition, after the fruit has passed the vulnerable stage, Campylomma is essentially beneficial because it feeds on aphids, mites and thrips.

Mullein is a favorite summer host for Campylomma, and the proximity of mullein to orchards may be related to orchard populations of Campylomma. Mullein populations were surveyed near ca. 30 orchard blocks over two years. No correlation was found between mullein populations within 100 meters of orchards and orchard populations of Campylomma the following spring. In addition, there was no correlation between summer mullein populations within 100 meters of orchards and fall pheromone trap captures in the same year.

The relationship between orchard populations of apple aphids and Campylomma populations was examined. There was no correlation between aphid populations and Campylomma populations the following spring. In addition, there was no correlation between aphid populations and pheromone trap captures of Campylomma in the same year.

PUBLICATIONS:

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