Night Sweeping
to Enhance Cranberry Pest Monitoring

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Sweep-net sampling is the basis for most thresholds and decisions in cranberry insect management. Sweep-netting and related action thresholds are used by around ¾ of cranberry growers commodity-wide, and over 85% of Wisconsin growers, according to our 1997 grower survey. However, the same survey showed that few growers sweep at night, especially in Wisconsin, since root weevils, which are the only specific target of night sweeping in other regions, are not a cranberry pest in Wisconsin.

Growers and scouts have felt for several years that several species were likely to be captured in different numbers by sweep-netting, based on the time of day or night. Root weevil and cranberry weevil adults seem to be strongly nocturnal and diurnal (day-active), respectively. Neither of these cranberry pests is important in Wisconsin. However, fragmentary information on cutworms, which can be very destructive in Wisconsin, suggested nocturnal captures were higher, especially for later instars.

The Study

With these clues, our objectives were to examine the diel (24-hour cyclical) pattern of sweep-net captures systematically, for several pest species at different times during the growing season. We also wanted to gain insight into variability amongst individual sweepers, and how much a sweeper's different sweep-sets differed on the same cranberry bed. The experimental design reflects a balanced approach to address these objectives. For each of the three months of May, June and July, we located three beds with significant infestations of pests of interest. Three sweepers then swept each of the three beds, each with three sweep-sets every three hours for a total of two daily cycles (48 hours). For each sample, we counted all cranberry pests, and also noted other insects.

What we found

For ten cranberry pests, we had sufficient sweep-net captures to be able to look at patterns including 24-hour (diel) cycles. These species were: blossomworm, false armyworm and green spanworm (May and June); brown spanworm, tarnished plant bug, and grasshoppers (June and July); Sparganothis (June only); flea beetle and black vine weevil (July only); and cranberry weevil (all three months). In general, time of day had by far the greatest influence on sweep-net captures of most important pests. Variation amongst individual sweepers was surprisingly small, although we could have underestimated this, since we had similar training and swept on the same beds together. Variation among sweeps by the same person showed the least variability. Sweep-netting procedures differ slightly from region to region: Wisconsin uses a 15-inch-diameter net and 20 sweeps per set, whereas Massachusetts uses 12-inch-diamter nets with 25 sweeps per set, as in this study. However, the trends for the same insect species, and probably for related cutworms and spanworms, are likely to be similar from region to region.

Our results for blossomworm are typical of those for other cutworms and also for the spanworms. Early larval instars showed some daytime activity, but sweep counts peaked between dusk and midnight, exceeding thresholds more often than day sweeps. As larvae grew with age, the pattern was even more strikingly nocturnal. Figure 1 shows the results of May sweeping for blossomworm, plotted on a linear scale over the two days of sampling. To see the diel (24-hour) trends in this same data, it can be combined by site and day, then displayed on a circular plot (Figure 2). The top is midnight, and the bottom of the circle or clock is noon. Bars correspond to when we sampled at 0200, 0500, 0800, 1100, 1400, 1700, 2000, and 2300 hours, with the bar length (out from the center) proportional to the number of insects caught. From our captures of 1940 blossomworms in May, the best time to sample was about 11pm. This was also true with later instar blossomworms (fish-bait size) in June (Figure 3), but the trend was even stronger. That is, very few blossomworm were swept outside the optimal time, which was near 11pm.

This nocturnal trend held true for the middle- to late-instar cutworms and spanworms, and as with blossomworm, the trend strengthened over the course of the season as the caterpillars grew. A few other species were exceptions. As expected, cranberry weevil, not considered a pest in Wisconsin, was strongly diurnal (day-active). Cranberry flea beetle adults were among the few pests active around the clock, with slightly more captures in the afternoon than at other times of the day or night (Figure 4), possibly a behavioral response to temperature.

Why?

It's interesting to speculate why caterpillars, especially larger caterpillars, tend to be nocturnal. First, in this study, that means they tended to be high enough in the cranberry canopy to be captured by sweep netting, only after dark. The threat of bird predation may be important. Birds are foraging actively during the daytime of their prime nesting season. Growers often notice bird activity corresponding to cutworm and other lepidopteran infestations. Humidity and water balance may also be more favorable to caterpillars being up in the canopy at night. Finally, the insects which are day-active, are either cryptic feeders (leafrollers such as blackheaded fireworm and *Sparganothis*, or cranberry fruitworm), not particularly choice morsels for birds (such as tiny lep instars and cranberry weevil), or capable of effective escape (flea beetle).

So what?

Our findings emphasize the importance of weekly sweeping during the day so as not to miss early-instar foliar-feeding lepidoptera larvae before they "go nocturnal." Night sweeping may be desirable at least once before bloom on each monitored bed, to make sure that lepidopteran worm infestations have not escaped notice. Sometimes, cutworm or spanworm numbers will be at or near threshold, then dip unexpectedly. Following such a trend, it would be a good idea to sweep after dusk, since the decrease may be caused by a change in behavior of the larvae rather than a population decrease. Night sweeping may be most convenient on potential frost protection nights, after dusk but before the dew or frost forms.

Lastly, our current thresholds were adopted some years ago when cultural practices were different and before night sweeping was contemplated. Therefore, these thresholds may need revision in the future. For now, however, they should be retained as the best basis for cranberry IPM decision-making in Wisconsin and elsewhere.

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Figure 1. 48-Hour Sweep Sampling - Blossomworm (May 199

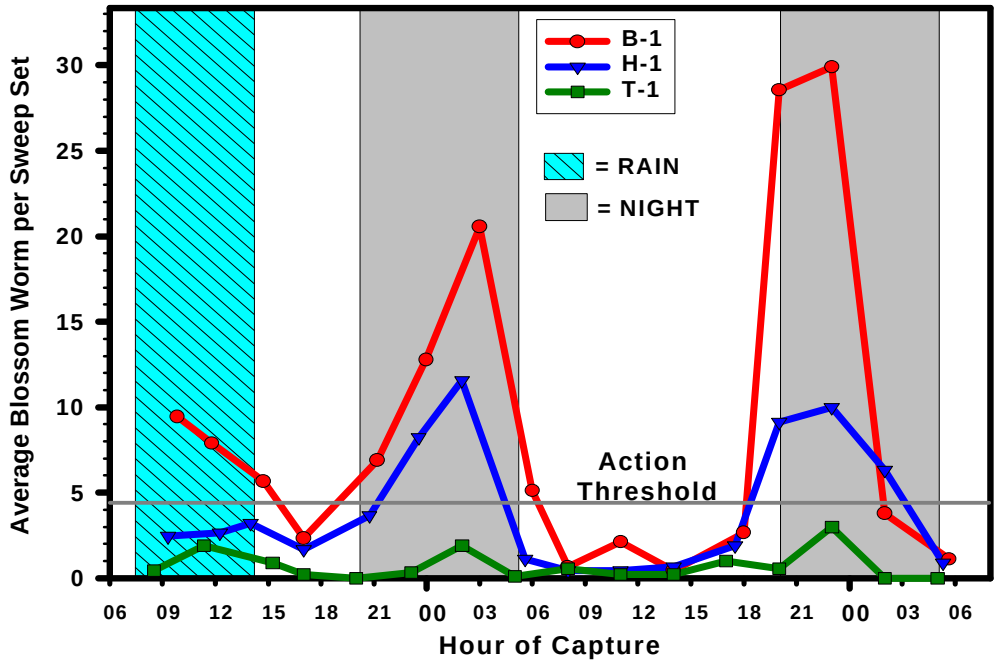

Figure 2. Same data as Figure 1, combined over the three sites to show frequency of all sweep captures in May 1999 for BLOSSOMWORM versus TIME of DAY

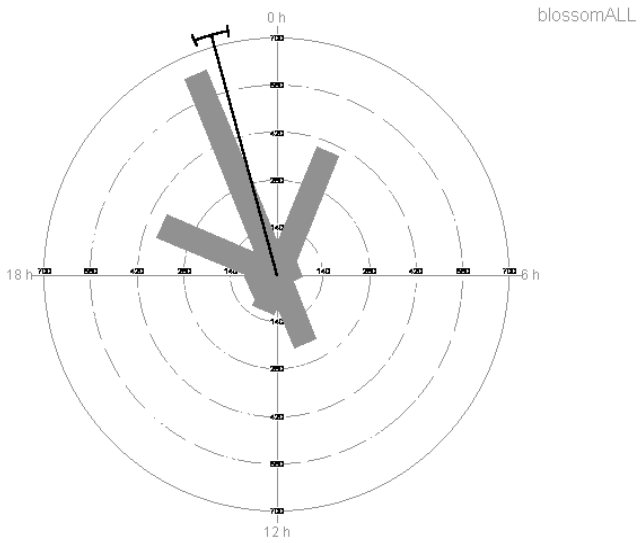

Figure 3. Frequency of all sweep captures in June 1999 for BLOSSOMWORM versus TIME of DAY

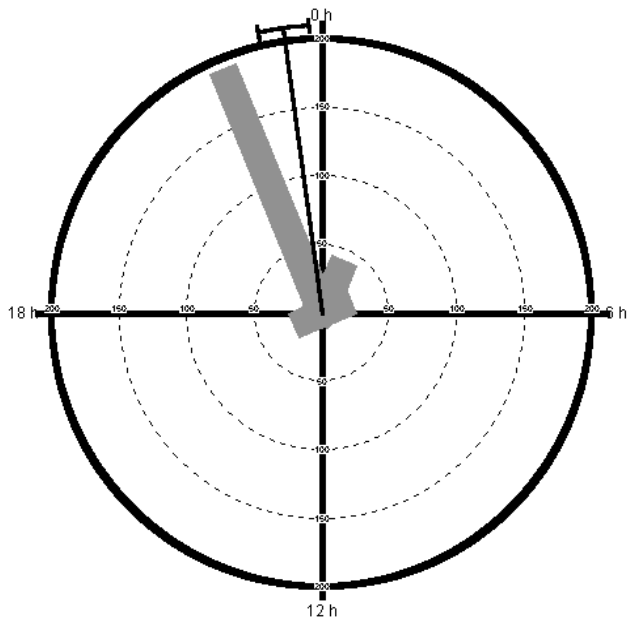

Figure 4. Frequency of all sweep captures in July 1999 for CRANBERRY FLEA BEETLE versus TIME of DAY