2004 Utah State Horticulture Association Research Project Report

PEACH TWIG BORER MANAGEMENT IN NORTHERN UTAH: 2004

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Objectives

Investigate the abundance, distribution, and management of peach twig borer (PTB) in the major tree fruit growing areas of Utah. Monitor weather and test the validity of the PTB development model in Utah. Determine a treatment threshold for PTB treatments based on shoot strike counts.

Justification

Peach twig borer (*Anarsia lineatella*) is a perennial and significant pest of peach, nectarine, plum, and apricot in Utah. The models for PTB development that have been used in Utah were originally developed in stone fruit growing regions outside of the Inter-Mountain West. As a result, there has been a need to validate the model for the stone fruit growers of Utah.

Methods and Materials

Pheromone-based trapping at eight sites in northern Utah (Perry, Willard, Kaysville, Santaquin, northern Santaquin, Payson, Genola, and Lincoln Point) was undertaken to determine site-specific biofixes and local population pressure. Trapping was initiated in early-April and continued weekly through late-September, 2004. Standard PTB pheromone lures were used with Scentry LPD traps (delta style traps). Lures were changed monthly.

Temperature data was obtained for each of the above-mentioned sites during the growing season of 2004, and the PTB development model was used to generate degree-day (DD) totals.

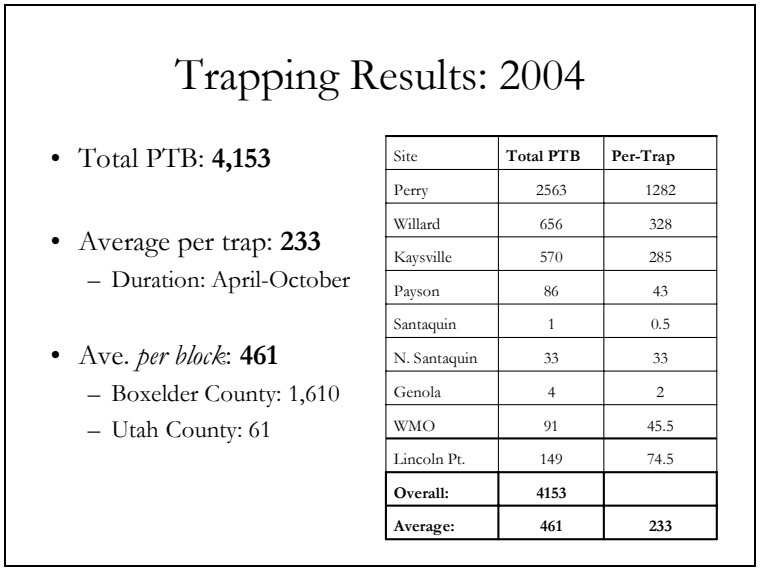
Shoot strikes were monitored throughout the growing season to quantify infestation levels. Shoot strike totals were cross-referenced with degree-day totals as the season progressed. Intensive shoot strike counts were undertaken during the 2nd generation PTB egg-hatch at each site in order to generate accurate estimates of site-specific infestation levels. During the 2nd generation shoot strike counts, 32 trees per site were examined for the presence of shoot strikes. A subset of the strikes found at any site was examined (larva extracted) to verify that the strikes were caused by PTB, not Oriental fruit moth.

Damage at harvest was measured at each of the monitored sites, and the damage was categorized based on the nature of the fruit injury (PTB-induced damage was a separate category). At the Kaysville Research Farm, 1000 fruit (10 fruit/tree) were examined on 8/13/04; in Payson, 200 fruit (5 fruit/tree) were examined on 8/14/04; in Santaquin, 250 harvested fruit (in bins) were examined on 8/16/04; in Willard, 200 fruit (5 fruit/tree) were examined on 8/17/04; in Perry, 250 fruit (in bins) were examined on 8/17/04; in Lincoln Point, 200 fruit were examined on 8/26/04.

The shoot strike counts at a given site were regressed against the respective harvest damage at that site. The regression provides an assessment of the strength of the relationship between shoot strike counts and harvest damage.

Results and Discussion

Trapping of adult PTB in 2004 produced over 4,000 moths (Fig. 1), though populations were generally lower in 2004 than in 2003. Per trap, the average number of moths caught in 2004 in northern Utah was 233, and the average number of moths per orchard was 461.



Site	Total PTB	Per-Trap
Perry	2563	1282
Willard	656	328
Kaysville	570	285
Payson	86	43
Santaquin	1	0.5
N. Santaquin	33	33
Genola	4	2
WMO	91	45.5
Lincoln Pt.	149	74.5
Overall:	**4153**	
Average:	**461**	**233**

Figure 1. Site-specific peach twig borer moth counts, per-trap averages, and county averages.

It should be noted that a disproportionate amount of the total trap-catch came from Boxelder County (Perry and Willard, UT), and these high numbers clearly inflated the regional average (Figs. 1-2). For example, an average of 61 moths/orchard was caught in Utah County, while Boxelder County averaged 1,610/orchard. This is the second year in a row in which tremendous numbers of moths were caught in the monitored orchards of Boxelder County, and there appears to be an issue with certain abandoned and/or neglected orchards in this county. Entrenched PTB populations in this area will likely require greater vigilance in monitoring and management.

Figure 3 presents the general flight pattern of PTB in northern Utah peach orchards. The points along the graph represent the average across all eight monitored sites for a given week-long period. From May to September, there were three distinct flights: May-June, mid-July, and mid-August. It is likely that there were 3 full generations of PTB since the individuals hatching after the 3rd flight should have had enough time to feed and burrow into the tree cambium before winter.

The 1st flight of the year appears to have been delayed to a significant degree (Fig 3). From early April through mid-May, there were several periods of sustained sub-freezing temperatures, combined with frequent inclement weather. This probably had a major

impact on the PTB larvae in northern Utah this past spring. As young PTB larvae emerge from their winter burrows (in the tree cambium), they seek young leaves and flower petals on which to feed. A "cold snap" combined with wind and precipitation can immobilize and dislodge larvae that are feeding in the tree canopy. Starvation, drowning, predation, or desiccation is the likely fate for such larvae.

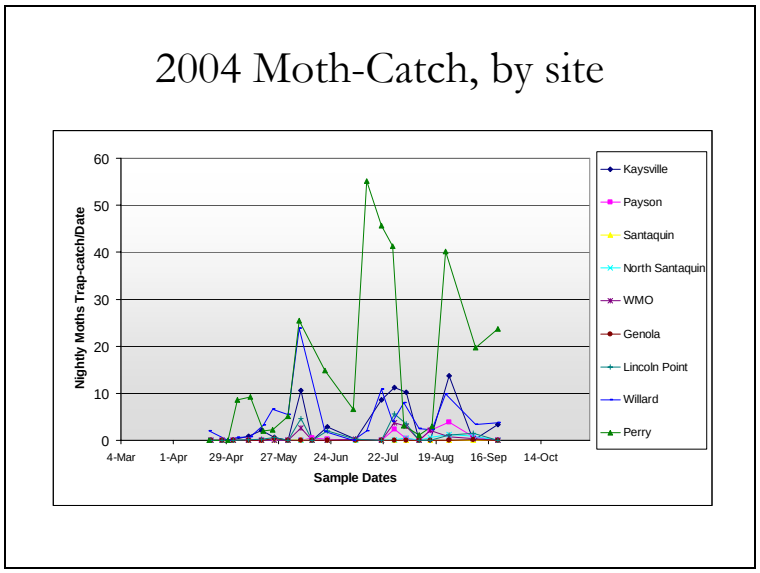


Figure 2. PTB flights at each of the monitored orchards in 2004. Each point represents the mean number of males caught/night at a given site in a week-long period.

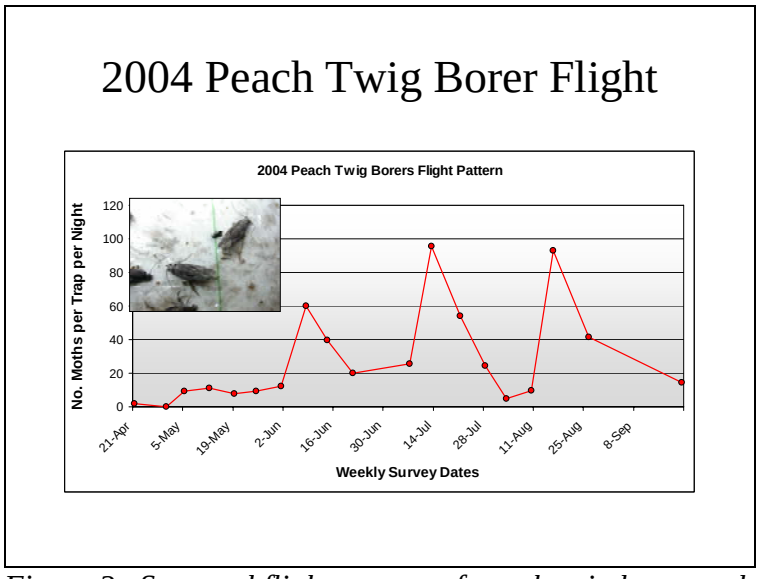


Figure 3. Seasonal flight pattern of peach twig borer males caught in northern Utah in 2004. Each point represents the mean number of males caught/night at all monitored sites during a week-long period.

As the weather warmed in mid-spring (by late May), more PTB larvae were likely able to survive and finish their development, allowing greater numbers of moths to be caught in mid-June. The trap catch records (Figs. 2-3) seem to substantiate this, given the pulse of

males caught in mid-June following weeks of relatively low trap catches at all sites. It is likely that a substantial segment of the PTB population was removed by the inclement weather during the spring of 2004.

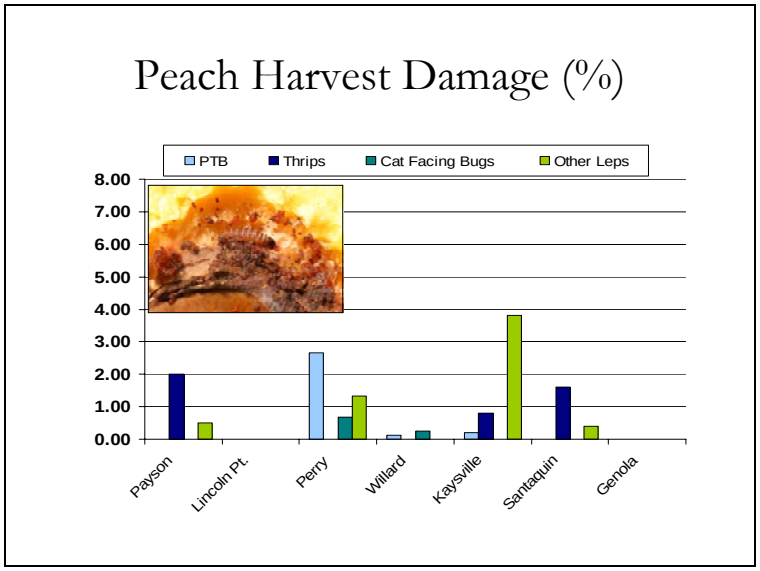


Figure 4. Fruit damage caused by PTB. Significant damage to harvestable peaches was found only in Perry and Kaysville, UT.

Significant PTB-induced harvest damage was found only in Perry, UT (Fig. 4). PTB-infested peaches were also found in Willard and Kaysville, but infestation levels were at acceptable levels (< 0.5%). The relatively low infestation levels at most sites in Utah are likely the result of well-timed insecticide applications. Most growers at the monitored orchards used degree-day accumulations derived from trapping and weather monitoring, and the treatments were timed for 300-400 DDs during the first generation and approximately 1300-1400 DDs during the 2nd generation. The peach grower in Perry had to contend with tremendous PTB populations, so even though this site registered approximately 2.5% damage by harvest, the level of pest suppression achieved by this grower was quite good. This is attributable to well-timed insecticide applications which were based on an accurate biofix and season-long estimates of PTB development.

The regression of shoot strikes versus PTB-induced harvest damage produced a very strong relationship (Fig. 5). However, the spread of data points along the regression line was clustered at the origin (zero-point) of the graph. The cluster of points at zero is a function of the fact that many growers had no strikes and no harvest damage, and while these are valid data, the result is that all such points are essentially "removed" from the regression line. Having few points along the line makes it difficult to assert that the line truly describes the relationship between strikes and damage. The more data points there are along a regression line, the greater confidence in the relationship described by the line. Despite the shortcomings of the regression, the relationship does make intuitive sense and suggests that mid-season shoot strikes will likely translate into harvest losses. From the line (Fig. 5), it appears that 0.33 strikes/tree (1 strike per 3 trees) in mid- to late-July will translate into a 2% harvest loss by August and/or September.

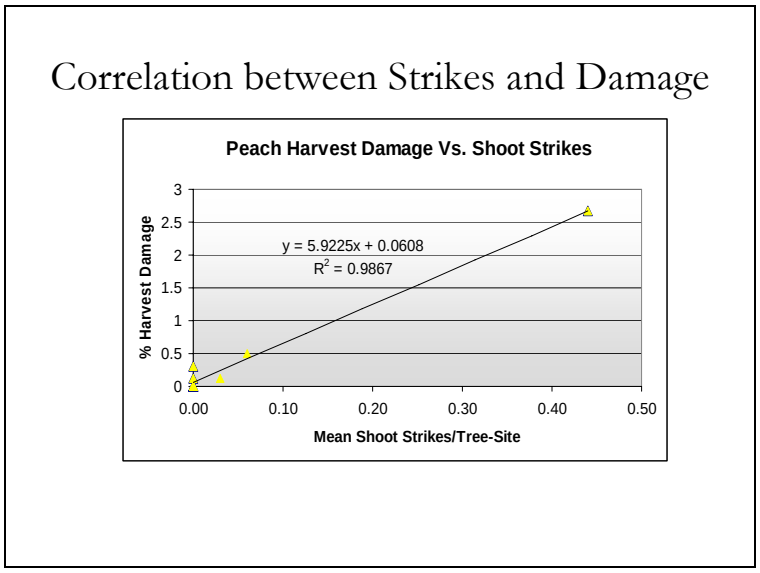


Figure 5. Regression line describing correlation between shoot strikes and harvest losses due to PTB.

To manage populations of PTB, it is helpful to understand when the egg-hatch periods of each generation begin and end. Using site-specific temperature data and the development model for PTB, the egg-hatch periods for PTB can be estimated with confidence for each orchard. Egg-hatch progression typically starts slowly, accelerates rapidly, and tapers off as it approaches 100% completion (Fig. 6). The best "window of opportunity" for pest suppression is generally the period of time represented by the middle of the development curves (Fig. 6). The middle of the curve for a given generation is the peak egg-hatch period, and this is when pest emergence accelerates, bringing the greatest number of pests in the shortest period of time. For PTB, peak egg-hatch is typically a 300 DD "window" that begins around 8% egg-hatch for each generation and tapers off at 90%.

The peak period of egg-hatch (averaged across all the sites for brevity and simplicity) was estimated for each generation in 2004 (Fig. 7). It appears that a two-week period in mid-June and a two-week period in late-July/early-August were critical PTB suppression periods for peach growers in northern Utah. The site-specific egg-hatch periods were reported to growers via the IPM Advisory system in the growing season of 2004, and most growers used this information to refine their pest management approaches.

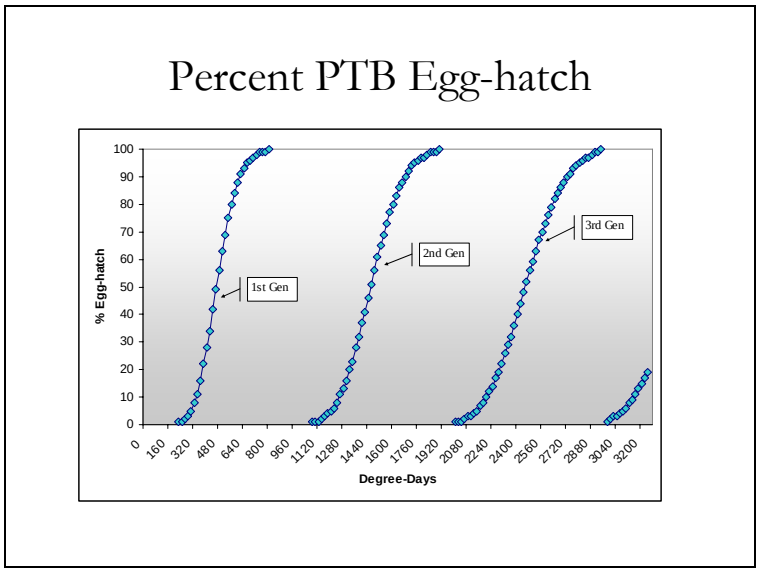


Figure 6. Generalized progression of PTB egg-hatch relative to degree-day running total (post-biofix).

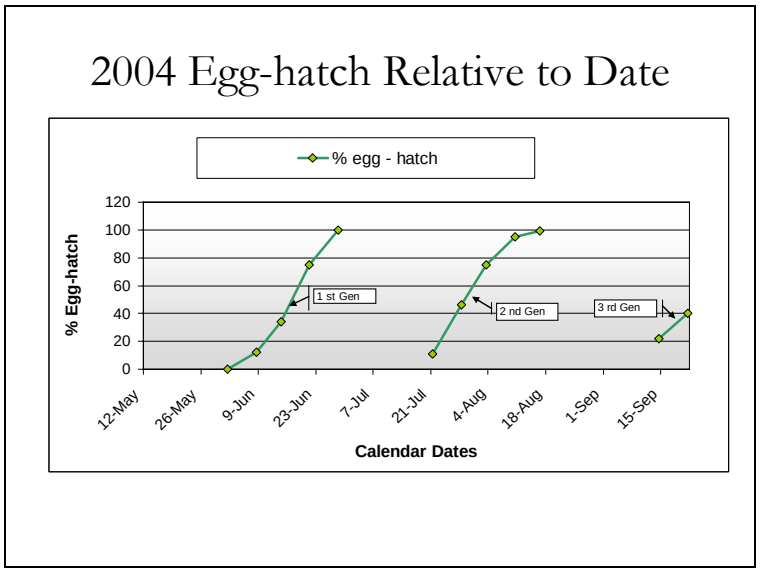


Figure 7. Using the PTB development model, the percentage of a given generation's egg-hatch can be estimated. The percent of each PTB generation that had hatched relative to calendar date is presented for Utah peach orchards in 2004.