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Biological Characteristics That Make The Lesser Peachtree Borer (Lepidoptera: Sesiidae) a Pest on Peach Trees

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BIOLOGICAL CHARACTERISTICS THAT MAKE THE LESSER PEACHTREE BORER (LEPIDOPTERA: SESIIDAE) A PEST ON PEACH TREES[1]

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ABSTRACT

The lesser peachtree borer, *Synanthedon pictipes*, is a native insect with well distributed hosts near peach orchards, which has high mobility between sylvatic and domestic hosts. It is able to take advantage of the susceptibility of the peach tree to periodic freeze injury and disease cankers. The moth stage is present through most of the growing season and effectively conceals the eggs singly at the most favorable sites for larval success.

The lesser peachtree borer (LPTB), *Synanthedon pictipes* (Grote & Robinson), is a pest both on single fruit trees in home plantings and in peach and cherry orchards. While most major pests of stone fruits can be controlled by current methods, the LPTB remains expensive to control and shortens the useful life and production of peach and cherry trees. Experiments in applying chemical controls (Meyer 1962, 1965), peach harvest surveys, and direct observation on peach trees have provided a knowledge of LPTB biology. Results of experiments in applying and evaluating new chemicals during 1973 and 1974 were applied to peach insect control recommendations, and their results were observed through 1981. The observed biological characteristics coordinated with those given in the literature describe why the LPTB remains a major pest on peach trees.

LITERATURE REVIEW AND OBSERVATIONS

Being a native insect, the LPTB has enough hosts (Girault 1907) to maintain abundant insect populations (Wong et al. 1971). Sharp et al. (1978) in Florida generally found greater populations in orchards, but the males moved freely between the orchards and nearby wooded areas. Many midwestern orchards are situated near wooded areas, and even though they may be isolated from other orchards, trees soon become infested as they mature. King (1917) noted that LPTB prefers to oviposit on disease cankers, winter injuries, sun scalding, narrow angle and split limb crotches, and mechanical wounds. Smith and Harris (1952) indicated a positive correlation between high tree vigor and dead trees due to winter kill, increased gumming (tree sap exudate), and LPTB injury. *Cytospora* canker is widely present in Illinois (Gairola and Powell 1970) and is also aided by winter injury in becoming established in young orchards (Luepschen 1976). The canker as well as winter injury provide favorable egg laying sites. When the canker wounds are closed off against further advance by callus tissue (Hildebrand 1947), the larvae in turn aid the canker by boring openings to new wood. This has often been observed by tracing borer tunnels through successive callus layers.

The LPTB, which overwinters as partially grown and mature larvae, probably has as much or greater tolerance of cold temperature as the peach tree. Pupal skins were observed where moths had emerged from limbs on trees killed by severely cold winters. Immature

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larvae remain near live bark through the winter and feed when temperature gets high enough to permit activity. After a winter freeze which kills an area of bark around an infested wound, larval tunnels can be found from the pre-freeze feeding areas to the edge of the live bark after the freeze. These tunnels are usually perpendicular to the former live bark edge and proceed straight to the live bark.

Bobb (1959) watched moths seeking egg-laying sites and found that fresh gumming was very attractive to them. Most of the eggs are placed near wounds on roughened bark. Armstrong (1943) placed many eggs on smooth healthy bark during several seasons and found that newly hatched larvae could not survive. Vigorous bark, which is more attractive to egg laying moths than non-vigorous live bark, exudes a very sticky gum soon after wounds are made. The outer bark has a greater propensity for gumming than the inner bark. The larvae prefer the inner bark for food. After finding many young larvae in a variety of situations, it is evident that the larvae must find a location where they can get under the protection of dead bark and be close enough to live bark to feed upon it. First instar larvae have been found trapped in fresh gum. Mature larvae have been found on branches as small as 1 cm in diameter. Usually there is a dead twig, a canker, or a mechanical damage at the center of such wounds, which provided the essentials for successful infestation.

Moths crawl into wounds and probe for cracks with their abdomen to hide the eggs. Eggs were found under bark and deep in cracks often not visible at the surface. Larvae can usually be located by the frass or "sawdust" they produce. The presence of frass in gum usually determines whether LPTB are present in the wound. The size of frass particles also indicates the relative size of the larva. Fresh frass is lighter and brighter in color and darkens with age. The larvae actively push frass out of their tunnels and may crawl all the way out and turn around to go back in when doing so. First instar larvae produce very small particles, and when they feed in cracks in old bark it is often dry and easily blown by wind.

OBSERVATIONS IN 1973 AND 1974

In conjunction with experiments in applying and evaluating new chemicals for LPTB control, seasonal observations were made in three adjacent peach tree blocks of about 20 ha at Belleville, Illinois, during the autumn of 1973 and through 1974. Larvae were excised from entire trees with knives. In 1974, larval instars were recorded in all samples as listed in Table 1. Average instar sizes for second through sixth instar as indicated by Bobb (1959) were carried in an alcohol vial to aid identification in the field. Pupal skins were also counted as described by Yonce et al. (1977) on all trees examined for larvae during the spring season of 1974.

Table 1. The seasonal distribution of larvae instars and pupae of the lesser peachtree borer in peach trees at Belleville, IL, 1974.

Sample dates	Pupal skins[a]	Pupae[b]	Larval instars[b]						Total live insects
			6	5	4	3	2	1	
22/5	25	50	27	22	1	0	0	0	70
3/6	28	36	9	5	12	9	17	12	42
18–21/6	25	7	19	25	25	13	8	3	331
29/6	22	8	27	21	26	12	5	1	264
9/7	13	4	39	16	26	10	4	1	132
22/7		5	42	19	21	11	2	0	375
6–8/8		13	37	22	19	7	1	1	1660
19–21/8		26	30	26	12	3	2	1	646
8–10/10		0	37	22	19	15	6	1	336
23–25/10		0	29	22	24	16	8	1	747
10/12		0	32	20	24	23	1	0	257

[a]Number of pupal skins as percentage of total skins and live insects.
[b]Number as percentage of total living pupae and larvae.

Bobb (1961) had commented on the difficulty of finding early instars in making accurate assessments of LPTB populations. On 3 June, an intensive search was made of three average sized mature peach trees for both early instar lavae and eggs. The bark near wounds was cut off and examined under a low power microscope. All cracks and dead tissue that was near live tissue were broken open. All rough bark was examined using magnifying glasses.

LPTB populations had reached high levels by autumn of 1973. On unsprayed trees there was an average of 224 larvae per tree with a single tree having 405. The high populations may have attracted predators. In late autumn 47% of the larvae were mature, but by late January woodpeckers had removed two-thirds of them. The remaining third were under heavy bark, gum, or between crotches or other unaccessible places. Only those larvae that had prepared a cell for pupation were dug out by the birds. Almost none in accessible locations were missed by the birds. In the 22 May and 3 June 1974 samples (Table 1), 11.5% of the larvae were dead, filled with hardened fungus growth. Populations of LPTB remained lower in 1974 than in 1973 with untreated trees averaging 20–65 with a single high of 77 on one tree. Bird predation on 10 December 1974 was also lower at 7% and 3% of the larvae were found dead. Little parasitism was observed except in the two August 1974 samples where parasites had emerged from 20 of the 406 pupae found (4.9%).

The distribution of LPTB at the various sampling dates in Table 1 shows the typical two-peak emergence pattern for the latitude (Bobb 1959, Sharp et al. 1978, Yonce et al. 1977). Farther north, there may be only one peak (Wong et al. 1971), but there are always some moths present, and therefore continuous hatch of larvae occurs throughout the season. In coordinating first emergence with the stage of growth of the peach tree (Reis et al. 1976), LPTB moths appear during the time shucks are falling off the young peach fruit. Weather conditions may cause early season development of both plants and insects to vary up to two weeks from an average calendar date. The peak of LPTB moth emergence usually follows in four weeks (Bobb 1966). By the first sampling date of Table 1, the peak of moth emergence was soon to occur, but no young larval stages were found. On 3 June, all young stages were found probably due to more intensive searching. While 29 eggs were found on the three trees which was 41% of all the insects found, the method was considered too time-consuming and harmful to the trees. The intensive search helped to know where to look and what to watch for to find more early instar larvae. On the last sampling date, special care was taken to search for young instars, but no first instar larvae were found. On 30 September 1975, 337 LPTB were excised in trees of this same orchard. A similar pattern of instars were found as in the 8–10 October date of Table 1. One pupa was also found, and a moth was observed laying an egg.

During the last half of 1974, the number of wounds per tree was counted on six peach cultivars (Table 2). The cultivar 'Redhaven' is conspicuous in having many more wounds per tree than the other cultivars, yet the trees survive as long as the other cultivars. This is often easily observed in many orchards where 'Redhaven' is planted next to other cultivars of the same tree age. The number of LPTB per wound was found to be a good sampling technique as many more trees could be sampled in the same amount of time rather than

Table 2. The number of wounds and lesser peachtree borer found in six peach cultivars during July through December 1974 at Belleville, IL.

Peach cultivar	Number examined		Live insects	Wounds[a] per tree	Borers per	
	Trees	Wounds			Tree	Wound
Culhaven	13	291	310	22.4	23.8	1.07
Blake	11	261	125	23.7	11.4	0.48
Redskin	26	619	401	23.8	15.4	0.65
Glohaven	30	819	874	27.3	29.1	1.07
Cresthaven	30	893	1065	29.8	35.5	1.19
Redhaven	32	1573	963	49.2	30.1	0.62

[a]Means for all cultivars except 'Redhaven' not significantly different (Duncan's Multiple Range Test, $P > 0.1$).

sampling whole trees. Some fruit growers have found that sampling a few wounds at several locations in their orchards gives both a larval age structure to know when to expect peak moth emergence and a continuing check on fluctuation of population levels.

SUMMARY OF PEST CHARACTERISTICS

A range of acceptable native host trees located near most peach orchards or even single trees, plus the active flying range of the moth and its mobility between native and cultivated hosts makes infestation possible on most trees. The natural susceptibility of peach trees to periodic freeze injury coupled with the complementary attack of both *Cytospora* canker and LPTB greatly increase the attractiveness of maturing peach trees to LPTB moths for egg laying sites. Egg placement singly in the most protected locations near gummy wounds apparently not only reduces the chances of predation and contact from chemical sprays, but also places the newly hatched larvae in the most favorable situation to remain protected near food. While moths do crawl about on open surfaces of the tree which makes them susceptible to chemical sprays, their continuous presence from the time the young peach appears until well after harvest gives at least some of them the opportunity to penetrate all but the most persistent protection. The interplay of these characteristics have kept the LPTB a formidable pest on peach trees.

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