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C. G. Wertheim
University of Michigan

H. L. Morton
University of Michigan

HONEYLOCUST TWIG-GALL MIDGE (DIPTERA: CECIDOMYIIDAE) IN MICHIGAN

C. G. Wertheim and H. L. Morton[1]

ABSTRACT

Emergence and oviposition data were gathered for *Neolasioptera brevis*, a recently described pest of honeylocust. In 1984 the insects first emerged on 21 May and first oviposited on 4 June; in 1985 they first emerged on 28 April and first oviposited between 5–20 May. Average raceme length at emergence and at oviposition were 2.7 and 4.4 cm in 1984 and 2.6 and 4.8 cm in 1985. Approximate duration of the emergence period was one week. In 1985 observed oviposition wounds averaged 0.5/cm.

A twig gall of honeylocust, *Gleditsia triacanthos inermis* (Pursh.) Schneid., was recognized and its cause identified in 1911 as an unknown species of *Neolasioptera* (Felt 1911). Interest in the causal agent of the gall has intensified as the use of honeylocust (with accompanying damage) has increased. The insect has since been described as *Neolasioptera brevis* Gagne (Gagne and Valley 1984).

Honeylocust cultivar selections that lack both thorns and pods have been widely planted throughout the country. Cultivars also have been selected for leaf color, growth habit, and tree form (Wyman 1965). Until recently, all cultivars have been considered relatively free of pests. In recent years, however, widespread planting of honeylocust has made it more vulnerable to pests. Damage may be a result of any of several pests. For example, where mimosa is found, honeylocust is susceptible to the mimosa webworm, *Homadaula anisocentra* Meyrick. The honeylocust pod gall midge, *Dasineura gleditschiae* (Osten Sacken), causes reddish galls on the leaves, and the honeylocust spider mite, *Eotranychus multidigituli* (Ewing), causes a bronzing of the leaves. The honeylocust plant bug, *Diaphnocoris chlorionis* (Say), and a leafhopper, *Macropsis fumipennis* (Gillette & Baker), stipple and eat foliage (Pirone 1978).

The objectives of this study were to (1) document damage to honeylocust cultivars in Michigan, (2) determine cultivar susceptibility to *N. brevis*, including dates and conditions for adult emergence and dates of oviposition, and (3) relate phenology of the host to pest development.

MATERIALS AND METHODS

Cultivars. Wild honeylocust and the following cultivars were studied: 'Moraine,' 'Shademaster,' 'Skyline,' 'Sunburst,' and 'Rubylace.' All trees used in this study were located on the campus of The University of Michigan in Ann Arbor.

Emergence. Several tests and observations were made to determine time and conditions for emergence. To ensure that natural emergence was actually observed as early as possible in the field, insects were forced to emerge in the laboratory, and the decreasing time for adult emergence was recorded. Groups of heavily infested trees were

[1]School of Natural Resources, The University of Michigan, Ann Arbor, MI 48109.

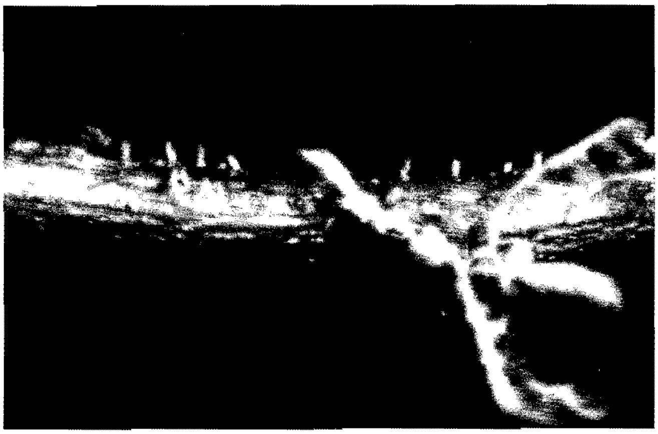

Fig. 1. Cast skins on bark surface after emergence of *N. Brevis*.

located in the field and 10 or more individuals chosen randomly for sampling. Three twigs from each tree were then randomly sampled. Only infested twigs were used in the experiment. For each twig, the past three year's growth was removed, placed in petri dishes on moistened filter paper, and incubated at 24°C. This treatment was done within 3 h of collecting the samples and was repeated weekly until the insects emerged. When adults emerged in the lab within one day after sampling, daily observations were made in the field. Emergence was recognized by the presence of pupal skins protruding from emergence holes (Fig. 1).

To determine the length of the emergence period, three twigs were collected weekly from each of 10 'Moraine' trees. These were collected the day following first field emergence and continued weekly for two months.

The age of twigs from which emergence took place was also examined by a similar test. One-, two-, and three-year-old twigs were collected the day following first emergence and incubated separately as above. These twigs were kept for three weeks and observed.

Oviposition. Oviposition, studied in the field only, was recognized by the presence of a localized swelling of new shoots and an associated brown spot (Fig. 2). Dissection of these swellings revealed white eggs. To relate the stage of plant development to that of the insect, the length of both the rachis of the inflorescence (to be referred to as "raceme") and the new shoots were measured at the time of emergence and oviposition. Fifty measurements of both characteristics were made. Ten trees were examined in 1984 and six trees in 1985, using those trees where emergence was first observed. In 1985 the same six trees were also examined to determine degree of oviposition. Five current terminal shoots from each tree were randomly selected and measured, and the numbers of wounds were tabulated.

To compare emergence and oviposition from year to year, degree-days were tabulated using a 10°C base and average daily temperatures for both years from records of The University of Michigan Department of Atmospheric and Oceanic Sciences. The number of degrees above 10°C for each daily average temperature was calculated from the beginning of the year, and a cumulative total was kept for the period of interest.

RESULTS

Cultivars. Midge damage was observed on wild honeylocust and all the cultivars. Unlike other pests of honeylocust, the twig gall midge does not damage foliage. It causes

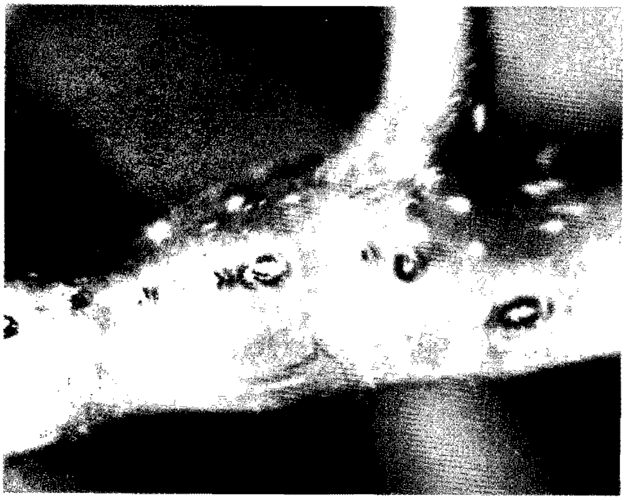

Fig. 2. Twig swellings and necrotic regions following oviposition by *N. brevis*

Fig. 3. Twig dieback and sprouting caused by *N. brevis*

swollen twigs, tip dieback, and sprouting from the base of dead tips (Figs. 2, 3). In this study, no cultivars were found to be free of damage; they did not appear to differ in susceptibility.

Emergence. In 1984 emergence began 21 May at 81 degree-days (Table 1). Emergence in 1985, however, was nearly a month earlier, on 28 April at 99 degree-days. The length of the emergence period was quite short. Emergence was heavy during the first week from the first weekly-incubated collection on 22 May, but only one insect emerged from twigs collected one week later and none emerged from material collected weekly through 31 July. The twig-age emergence test was also conclusive. Insects emerged from all 24 of the one-year-old twigs, but from none of the 24 two- or 24 three-year-old twigs. Shoot lengths at emergence ranged from 5.7 cm in 1984 to 4.1 cm in 1985, whereas raceme lengths

Table 1. Average shoot and raceme length (with standard error), degree-days, and date at the time of emergence and oviposition in 1984 and 1985, and the differences between the two years (n = 50).

	Emergence		Oviposition		Difference between emergence and oviposition	
	1984	1985	1984	1985[a]	1984	1985[a]
Shoot length, (cm)	5.7 ± 0.36	4.1 ± 0.27	17.0 ± 0.86	20.2 ± 0.82	11.3	16.1
Raceme length, (cm)	2.7 ± 0.14	2.6 ± 0.11	4.4 ± 0.23	4.8 ± 0.19	1.7	2.2
Degree-days	81	99	148	229	67	130
Date	May 21	April 28	June 4	May 20	14 days	22 days

[a]1985 dates and degree-days for oviposition reflect the earliest observation. No observations were made for two weeks before this date, and therefore oviposition may have occurred earlier.

ranged from 2.7 cm in 1984 to 2.6 cm in 1985. There was no statistical difference between the means of raceme length at emergence in 1984 and 1985 ($P > 0.05$).

Oviposition. In 1984, oviposition wounds were first observed on 4 June after 148 degree-days (Table 1). The earliest that oviposition wounds were observed in 1985 was on 20 May at 229 degree-days. No observations were made between 5 May and 20 May, and comparisons with previous year's data suggests that oviposition may have occurred as much as a week earlier at 188 degree-days. In 1985, observed oviposition wounds averaged 0.5/cm on current year shoots. Shoot lengths at oviposition ranged from 17.0 cm in 1984 to 20.2 cm in 1985, whereas raceme lengths varied from 4.4 cm in 1984 to 4.8 cm in 1985. There was no statistical difference between the means of raceme length at oviposition in 1984 and 1985 ($P > 0.05$). The difference between shoot lengths at emergence and oviposition was 11.3 cm in 1984 and 16.1 cm in 1985, whereas the difference in raceme lengths ranged from 1.7 cm in 1984 to 2.2 cm in 1985.

DISCUSSION

The twig gall midge was found in all trees examined. The damage caused by the honeylocust twig gall midge is more harmful than from other pests because it persists after leaf drop. The form of the tree is changed, and the dead tips are clearly visible. There is also the chance that the tree will become weakened and less able to withstand damage from other pests.

The phenology of the host proved to be a good general guide to pest development. The difference in both emergence and oviposition dates between 1984 and 1985 was due to a week of unseasonably warm temperatures (ca. 28°C) in April of 1985. Although degree-days and shoot length were inconsistent from year to year, time of emergence and oviposition remained consistent with raceme lengths. Adult emergence was associated with raceme length of about 2.5 cm, whereas oviposition was associated with raceme length of about 4.5 cm.

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