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Emergence and Adult Biology of *Agrilus Difficilis* (Coleoptera: Buprestidae), a Pest of Honeylocust, *Gleditsia Triacanthos*

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EMERGENCE AND ADULT BIOLOGY OF *AGRILUS DIFFICILIS* (COLEOPTERA: BUPRESTIDAE), A PEST OF HONEYLOCUST, *GLEDITSIA TRIACANTHOS* [1]

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ABSTRACT

Emergence and adult biology of *Agrilus difficilis* were examined in relation to its host *Gleditsia triacanthos*. Emergence began as early as 5 June in 1982 and completed as late as 22 July in 1983. Females lived significantly longer, 48 days, than males, 29 days. Average fecundity was one egg per day during a 36-day oviposition period.

Honeylocust, *Gleditsia triacanthos* L., is endemic to the eastern United States and has been widely used as a landscape tree since the 1950's after thornless and fruitless cultivars were developed (Wyman 1965). Once considered pest free (Webster and St. George 1947), honeylocust now has several serious insect pests, including mimosa webworm, *Homadaula anisocentra* Meyrick (Webster and St. George 1947), a spider mite, *Eotetranychus multidigituli* (Ewing) (English and Snetsinger 1957), the pod gall midge, *Dasineura gleditschiae* (Osten Sacken) (Neiswander 1959), and the honeylocust plant bug, *Diaphnocoris chlorionis* (Say) (Wheeler and Henry 1976).

Three wood-boring *Agrilus* beetles (Coleoptera: Buprestidae) are known to colonize honeylocust: *A. fallax* Say, *A. egeniformis* Champlain and Knull, and *A. difficilis* Gory (Hespenheide 1969, 1976). Only *A. difficilis* has been recognized as a pest (Schuder 1958, Westcott 1973, Pirone 1978, Wilson et al. 1982). Larval feeding scars the cambium and restricts translocation of nutrients and water. Schuder (1958) reported that exudation of large quantities of gum around infested nodes is commonly the first symptom of attack. Drought-weakened trees have been reported to be most susceptible to borer colonization (Westcott 1973).

Information about seasonal emergence and adult biology of *A. difficilis* is limited. In Indiana, adult emergence has been reported in June (Schuder 1958). If *A. difficilis* is similar to other buprestids, emergence varies with local temperature (Dunbar and Stephens 1974, Akers and Nielsen 1984). This study was conducted to investigate emergence and adult biology of *A. difficilis* in northeastern Ohio.

MATERIALS AND METHODS

On 2 June 1982, four dying 'Rubylace' honeylocust trees, 1.9 cm dia. 1 m above ground, were felled in the Wooster vicinity and placed in a laboratory at the Ohio State

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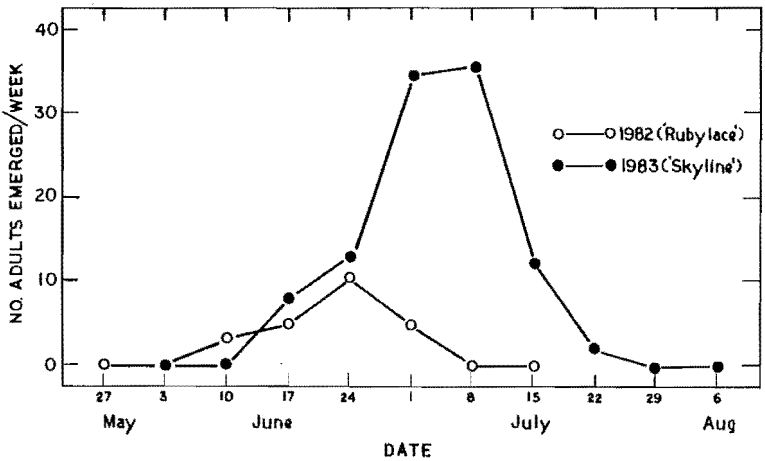

Fig. 1. Weekly adult emergence of *Agrilus difficilis* from honeylocust near Wooster, Ohio in 1982 and 1983.

University, Ohio Agricultural Research and Development Center (OARDC), Wooster. Trees were inspected daily for *A. difficilis* emergence; new holes were marked with a wax pencil.

In 1983, emergence and adult biology of *A. difficilis* were investigated. Two 'Skyline' honeylocust (32.8 cm dbh, 11.1 m in height and 25.8 cm dbh, 11.3 m in height) exhibiting dieback were felled 9 May and 1 June, respectively, at the OARDC and placed in an insectary. Adult emergence was monitored as in 1982. Newly emerged, unmated *A. difficilis* beetles were collected daily and separated by sex. Influence of adult host on reproductive biology was determined by caging pairs of 1- to 2-day-old virgin beetles on attached leaves of 'Moraine' or 'Skyline' honeylocust. Three beetle pairs were caged on each of four trees/cultivar (12 pairs/cultivar). Cages were made of 19.2 cm^3 transparent plastic petri dishes with tops and bottoms partially replaced with nylon mesh to provide ventilation. All cages were positioned on the north side of the tree to minimize heat build-up within cages. Cages were moved to fresh foliage at least every other day when they were inspected for eggs and dead beetles. When eggs were found, beetles were moved to a new cage. Cages with eggs were positioned in the interior of the tree canopy and examined daily for egg hatch.

In 1983, adult longevity, length of the maturation feeding period, fecundity, incubation period, and egg viability were compared between the two cultivars using Student's *t*-Test. Each beetle pair was considered an experimental unit.

RESULTS AND DISCUSSION

Emergence. *A. difficilis* adults began emerging from 'Rubylace' 5 June; peak emergence occurred 24 June, with last emergence on 28 June in 1982. In 1983, emergence began 11 June, peaked 28 June, with last emergence on 22 July (Fig. 1). The overall emergence period was 18 days longer in 1983 than 1982. In 1982, all beetles emerged from small-diameter stems of 'Rubylace' honeylocust. The small diameter of the infested wood may have resulted in all larvae and pupae being exposed to similar temperatures, thereby synchronizing development and reducing the adult emergence period. In 1983,

emergence from relatively large 'Skyline' honeylocust was monitored. Nearly all beetles emerged from branches larger than 1.5 cm in diameter. A longer emergence period would be expected from larger diameter wood, as reported for carpenter worm, *Prionoxystus robiniae* Peck (Solomon and Neel 1972).

Adult Biology. In 1983, reproductive biology did not vary with host (Student's *t*-Test, $P \leq 0.05$), so data for all beetles were pooled and expressed as $\bar{X} \pm$ S.D. Females lived significantly longer (48 ± 35 days) than males (29 ± 20 days) ($P = 0.09$). The maturation feeding period was 18 ± 7 days; females averaged 1 ± 1 egg per day during a 36 ± 32 day oviposition period. Eighty-five percent of all females oviposited. Incubation averaged 15 ± 3 days; 30 ± 22% of eggs hatched.

To our knowledge, this is the first report on *A. difficilis* biology, although it is recognized as a pest of honeylocust (Schuder 1958, Westcott 1973, Pirone 1978, Wilson et al. 1982). Beetles lived twice as long and were twice as fecund as the closely related bronze birch borer, *Agrilus anxius* Gory (Akers 1985). However, *difficilis* egg hatch was only half that of *anxius*.

Detection of *A. difficilis* as a casual agent in honeylocust decline may be difficult, since emergence holes and raised areas of bark associated with subcortical larval galleries are cryptic. Careful inspection is required to detect these symptoms of borer attack on honeylocust.

A. difficilis colonizes large and small trees successfully. Its apparent preference for stressed trees would indicate that it can be expected to be more common in the landscape than in nurseries. However, since it colonizes even small trees, producers of honeylocust within the range of this beetle should be vigilant for its presence in unirrigated trees during periods of summer drought when oviposition occurs.

It is not known whether *Agrilus* beetles oviposit selectively only on trees of low vitality or on all host trees they encounter. The former scenario is more likely, since fecundity and egg hatchability are low. Further investigations of *A. difficilis* reproductive behavior and biology are needed before effective management programs can be prescribed for honeylocust.

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