

OBSERVATIONS ON TWO *PAPAPEMA* BORERS
(LEPIDOPTERA: NOCTUIDAE) AS LITTLE
KNOWN PESTS OF INTENSIVELY
CULTURED HARDWOOD TREES

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ABSTRACT

Papaipema cataphracta (Grote) and *P. nebris* (Guenée) were found injuring the shoots of cottonwood, sycamore, and silver maple in nurseries and young plantations. Injury became noticeable from late May to early June as evidenced by wilting, drooping, and dying shoots and foliage. Infested shoots exhibited small round entrance holes from which white frass and excrement pellets were ejected. Infestations appeared when larvae moved from grass and weed hosts within plantings to the succulent shoots of the young trees. The larvae repeatedly burrowed into susceptible shoots, abandoned them, and searched for progressively larger-diameter shoots. Injury rates of current-year shoots in four plantings ranged from 4 to 12 percent.

Key Words: *Papaipema cataphracta*, *Papaipema nebris*, stalk borers, *Populus*, *Platanus*, *Acer*

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INTRODUCTION

The burdock borer, *Papaipema cataphracta* (Grote), and the stalk borer, *Papaipema nebris* (Guenée), are native species that occur throughout the United States east of the Rocky Mountains (Metcalf et al. 1962). Both species are polyphagous feeders. Over 30 plant species have been recorded as hosts of *P. cataphracta*, with burdock and thistle being the favored wild hosts (Bird 1898; Tietz 1972). Nearly 200 hosts have been recorded for *P. nebris*, with giant ragweed being the favored wild host (Decker 1931). The larvae of both borers feed primarily on wild grasses and weeds, but they readily feed on many cultivated crops such as corn, wheat, tomatoes, and rhubarb. Although both species show preference for thick stemmed herbaceous plants, they occasionally infest the succulent current-year shoots of young deciduous trees and woody shrubs. Economic damage to trees rarely occurs over wide areas, but noticeable losses sometimes occur in nurseries and young plantations and, to a lesser extent, reproduction in natural stands. Although several woody species have been listed previously as hosts of the *Papaipema* borers (Decker 1931; Tietz 1972), little else has been recorded on these borers as pests of hardwood trees. Observations on the biology, habits, and injury of *P. cataphracta* and *P. nebris* as little known pests of intensively cultured hardwood trees are reported here.

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METHODS AND MATERIALS

Field observations of *Papaipema* infestations were made in several southern and midwestern states, whereas cage studies and injury counts were conducted in west-central Mississippi. Studies were made from 1976 to 1986, mostly in 1- to 3-year-old, intensively cultured hardwood plantings when landowners and nurserymen called attention to noticeable damage. About 25 plantings of cottonwood (*Populus deltoides* Bartr. ex Marsh), sycamore (*Platanus occidentalis* L.), and silver maple (*Acer saccharinum* L.), having *Papaipema* infestations were examined. Notes were taken on signs of infestation and other evidence of injury. Samples of 25 or more injured shoots from each planting were collected for larval identification. Larvae were present in about one-third of the injured shoots.

The infested shoots were dissected to study larval habits, characterize the galleries, and to measure gallery dimensions. Several groups of 5 to 10 larvae of each species were caged on nursery-grown cottonwood and sycamore at the USDA Forest Service's Southern Hardwoods Laboratory, Stoneville, Mississippi, for rearing trials. Sixty-four early-instar *P. cataphracta* larvae were collected from infested shoots in the Mississippi Forestry Commission nursery at Winona, MS and initially caged in nylon-sleeve cages on succulent cottonwood shoots at Stoneville for rearing and study. The larvae were transferred to nylon-tent cages over clumps of cottonwood sprouts in early July. Caged colony observations were made of larval feeding habits, gallery abandonment, search for new shoots, pupation, and adult emergence. Infestation rates were determined for *Papaipema* attacks in two cottonwood nurseries at Winona and Stoneville, MS, and in single plantations of sycamore near Greenville, MS and silver maple near Lawrence, KS.

RESULTS AND DISCUSSION

Adult moths of *P. cataphracta* reared from cottonwood shoots had light brown bodies, forewings with grayish-brown markings and a yellow spot, and a wingspan of 24 to 28 mm. Larvae were white, with four broad purplish-brown stripes running the full length of the body, and 20 to 26 mm in length when mature (Fig. 1A). Both adults and mature larvae reared from cottonwood were smaller, and adults were slightly darker in color, than those reported from herbaceous hosts (Franklin 1908; Forbes 1954). Moths of *P. nebris* reared from sycamore had gray bodies, reddish-gray to purplish-brown forewings with small white spots along the apical margin, and a wingspan of 20 to 28 mm. The larvae were similar to those of *P. cataphracta*, except the broad stripes were interrupted by a purplish-brown band around the third thoracic and first three abdominal segments (Fig. 1B). Mature larvae became purplish-white and measured 18 to 24 mm in length. Once again, adults and larvae were generally smaller, and adults were slightly darker in color, than those previously reared from herbaceous hosts (Decker 1931; Forbes 1954).

Sixteen *P. cataphracta* adults reared from caged cottonwood emerged September 20-October 10. Emergence dates for moths reared from herbaceous hosts have been recorded from early September to mid-October (Drake and Decker 1927; Leonard 1928; Knutson 1944). The emergence of 11 moths of *P. nebris* reared from sycamore occurred from September 16 to October 18. Emergence of moths feeding on herbaceous plants has been recorded as early as mid-August, a month earlier than those which fed on trees (Decker 1931; Bailey et al. 1985).

Papaipema moths deposit up to 2000 eggs in the creases of rolled or folded leaf blades of dead grasses and weeds; there the eggs overwinter and hatch the following spring (Decker 1931, Drake and Decker 1927; Metcalf et al. 1962). Initially, the newly hatched larvae burrow into stems of grasses and small-stemmed weeds. Current observations indicate that when the larvae are 2 to 4 weeks old they leave their initial herbaceous hosts and move to new hosts, which include thick-stemmed woody plants. Most reports which have come to the Stoneville laboratory about larvae infesting tree shoots have been in May, although infestations have been observed through July and early August. Results from field and cage studies show that a typical larva wanders considerably during its development and repeatedly burrows into susceptible shoots for 1- to 2-week periods, abandons them, and seeks progressively larger shoots. In cages over clumps of cottonwood sprouts, single larvae tunnelled up to 12 shoots.

Injury by *P. cataphracta* in cottonwood nurseries in Mississippi usually became noticeable from late April to early May when coppice sprouts were 30 to 60 mm tall. Injured stems were easily detected by the wilting and drooping or dying shoots having browning or blackening leaves. Examination of an affected shoot often revealed a round entrance hole 2-3 mm in diam and 8-30 cm below the shoot tip (Fig. 1C). Entrance holes were usually open but occasionally were loosely plugged with frass. The frass was sometimes fragmented and mixed with oozing sap on the stem just below the entrance hole. More typically, frass occurred as distinctly white, cylindrical excrement pellets 1-2 mm in diam and 2-3 mm long near the entrance hole and on the ground below.

Dissection of injured cottonwood shoots revealed tunnels in the stem center extending in either direction from the entrance hole, but usually extending upward or distally. Galleries were kept open and relatively free of frass. During May, most vacated galleries ranged from 2 to 4 cm in length.

Early in the growing season, especially April to June, injured cottonwood shoots were able to tolerate the tunneling without dieback or breakage. Injured tissue in the shoots that survived quickly healed, and shoot growth was resumed.

In late July to early September, full-grown larvae in cottonwood shoots usually abandoned their galleries and moved to the ground where they formed pupation cells of loose silk and frass just below the soil surface or under debris. A few larvae simply enlarged their tunnels in the shoots and formed pupation chambers. The duration of the pupal stage lasted 25 to 33 days.

An evaluation of shoot injury by *P. cataphracta* in a cottonwood nursery at Winona during late May showed that 12 percent of the coppice shoots (about 1 m in height) had been attacked (Table 1). About three-fourths of those attacked had either died back or were broken. Injury rates were highest among sprouts on rootstocks 2 years old or older, probably because the shoots were thicker than those on first-year rootstocks. Similar counts made in a cottonwood nursery at Stoneville revealed that about 4 percent of the shoots had been attacked (Table 1). Inspection showed that both nurseries lacked adequate weed control; grass and weeds were prevalent between rows at both locations. Apparently these wild hosts had attracted moths the previous fall for ovipositing. During the subsequent spring, when the larvae were about one-fourth grown, they abandoned the grass and weed hosts and moved to the succulent cottonwood shoots.

An evaluation during May of the injury rates by *P. nebris* in a second-year sycamore plantation in the Mississippi Delta, when most of the plants were 1 to 2

m high, revealed that nearly 9 percent of the terminal shoots had been tunnelled (Table 1). Although damaged sycamore frequently died back, none of the plants were killed. Also, shoot injury by *P. nebris* assessed during late June in a silver maple fuelwood plantation (Fig. 1D) in eastern Kansas, when sprouts were 0.5 to 1.2 m high, showed an injury rate of nearly 7 percent (Table 1). The maple stems had been harvested the previous fall, and the rootstocks were allowed to coppice, producing succulent, thick-stemmed shoots that were attractive to the larvae. Grass and weeds were inadequately controlled in both the sycamore and maple plantations which probably contributed to the problem by having attracted moths the previous fall for ovipositing.

Table 1. Extent of damage by two *Papaipema* borers in current-year shoots of three hardwood hosts in Mississippi and Kansas.

Kind of planting	Location	Host species	No. shoots examined	No. shoots attacked	% shoots attacked
<i>Papaipema cataphracta</i>					
Nursery	Stoneville, MS	Cottonwood	600	25	4.2
Nursery	Winona, MS	Cottonwood	500	61	12.2
<i>Papaipema nebris</i>					
Timber plantation	Greenville, MS	Sycamore	500	44	8.8
Fuelwood plantation	Lawrence, KS	Silver maple	300	20	6.7

Energy plantations may be even more susceptible to *Papaipema* injury than nurseries and timber plantations. In energy plantations the stock is alternately harvested and coppiced, producing many succulent thick-stemmed sprouts that are preferred by the larvae. Cultural practices such as good weed control within plantings and elimination of favored wild hosts from field borders should help remove the major reservoirs of *Papaipema* infestation.

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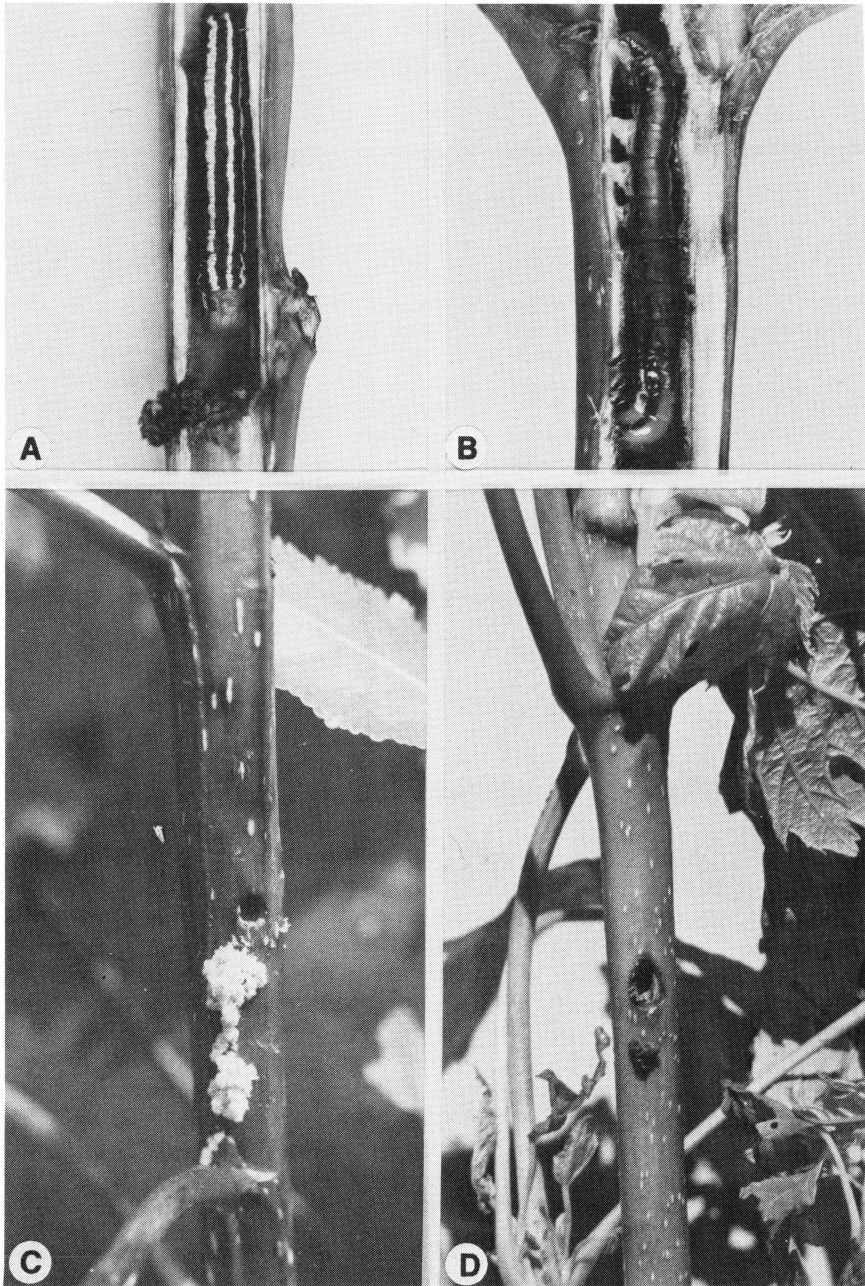


Fig. 1. Injury to woody hosts by *Papaipema* borers: (A) larva of *P. cataphracta*; (B) larva of *P. nebris*; (C) entrance hole and white frass of *P. cataphracta* in cottonwood shoot; (D) entrance hole and dark frass of *P. nebris* in silver maple shoot.

LITERATURE CITED

- Bailey, W. C., G. D. Buntin, and L. P. Pedigo. 1985. Phenology of the adult stalk borer, *Papaipema nebris* Guenee), (Lepidoptera: Noctuidae) in Iowa. Environ. Entomol. 14: 267-71.
- Bird, H. 1898. Notes on the noctuid genus *Hydraecia*. Can. Entomol. 30: 126-31.
- Decker, G. C. 1931. The biology of the stalk borer, *Papaipema nebris* (Gn.). Iowa Agric. Exp. Stn. Bull. 143: 289-351.
- Drake, C. J., and G. C. Decker. 1927. Some caterpillars frequently mistaken for the European corn borer. Iowa Agric. Exp. Sta. Circ. 103. 16 pp.
- Forbes, W. T. M. 1954. Lepidoptera of New York and neighboring states. Noctuidae. Pt. 3, p. 191-203. Cornell Univ. Agric. Exp. Sta. Mem. 329. Ithaca, N.Y. 433 pp.
- Franklin, H. J. 1908. Descriptions of larvae and pupae of certain species of *Papaipema*. Minn. State Entomol. 12th Rep.: 197-200.
- Knutson, H. 1944. Minnesota Phalaenidae (Noctuidae): The seasonal history and economic importance of the more common and destructive species. Minn. Agric. Exp. Sta. Tech. Bull. 165. 128 pp.
- Leonard, D. M. 1928. List of the insects of New York with a list of the spiders and certain other allied groups, p. 637. Cornell Univ. Agric. Exp. Sta. Mem. 101. Ithaca, N.Y. 1,121 pp.
- Metcalf, C. L., W. P. Flint, and R. L. Metcalf. 1962. Destructive and Useful Insects — Their Habits and Control, pp. 493-495. McGraw-Hill, New York. 1,087 pp.
- Tietz, H. M. 1972. An index to the described life histories, early stages, and hosts of the macrolepidoptera of the continental United States and Canada, p. 171, vol. 1, 536 p. Publ. by A. C. Allyn for the Allyn Museum of Entomology, Sarasota, FL.
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