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APHIS-PPQ

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Pest

EGGPLANT FRUIT BORER
Leucinodes orbonalis Guenée

Selected
Synonyms

Pycnarmon discerptalis (Hampson)

Order: Family

Lepidoptera: Pyralidae

Economic
Importance

In India, L. orbonalis is a serious pest of eggplants. This internal feeder is difficult to control after it enters a shoot or fruit (Mehto and Lall 1981). Damage, as high as 70 percent, prevents the successful cultivation of eggplant (Khurana 1975). A total of 116 larvae per 0.04 ha plot in August damaged 0.53-26 percent of the fruit (Atwal and Verma 1972). In Bangladesh, the percentage of damage to shoots and fruit of eggplant may be as high as 12-16 percent and 20-63 percent, respectively (Nath and Chakraborty 1978). The fruit becomes unfit for human consumption. Vitamin C is reduced 68 percent (Gupta and Dhari 1981). Injury by this pest also leads to secondary fungal infection (Yazdani et al. 1981).

Hosts

The chief host is Solanum melongena (eggplant). It has also been recorded on Cucumis sativus (cucumber), Ipomoea batatas (sweetpotato) (Taley et al. 1984), Lycopersicon esculentum (tomato) (Paddock 1974), Momordica charantia (Taley et al. 1984), Physalis minima, Physalis peruviana (Cape gooseberry) (Paddock 1974), Pisum sativum (pea) (Atwal 1976), Ribes sp. (cape currant), Solanum erianthum (Paddock 1974), S. indicum, S. nigrum (black nightshade) (Udayagiri and Mohan 1985), S. torvum (terongan) (Paddock 1974), S. tuberosum (potato), S. viarum, and S. xanthocarpum (Udayagiri and Mohan 1985).

General
Distribution

Unless cited otherwise, the Commonwealth Institute of Entomology (1976) listed the following distribution: AFRICA - Burundi, Cameroon, Ethiopia, Ghana, Kenya, Lesotho, Malawi

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Leucinodes orbonalis distribution map (Prepared by Technical Information Systems Staff, PPQ, APHIS, USDA).

(Pinhey 1975), Mozambique, Nigeria, Rwanda, Sierra Leone, Sao Tome (Pinhey 1975), Somalia, South Africa, Tanzania, Uganda, Zaire, Zambia (Pinhey 1975) and Zimbabwe; and ASIA Andaman Islands, Bangladesh, Brunei, Burma, China (including Taiwan), Hong Kong, India, Indonesia, Japan (Tamaki and Miyara 1982), Malaysia, Nepal, Pakistan, Philippines (Maurel et al. 1982), Singapore, Sri Lanka, Thailand, and Vietnam (northern area).

Characters

ADULTS (Fig. 1) - Wings mostly white, opalescent, translucent. Forewing with brown shading at base, a double, crescent-shaped, subapical brown patch near outer margin, and an incomplete, rust-brown transverse band in middle; this medial band widest at inner margin, narrowing and often fading toward costa, thus appearing as little more than a large, rust-colored, triangular patch adjoining middle of inner margin; undersurface similar but with markings reduced. Hindwing marked with traces of brown submarginal bands toward apex, a small black discal dot, and a similar black dot near middle of outer margin; undersurface

(Fig. 1)



Leucinodes orbonalis adult, dorsal view, 4 X actual size.

almost unmarked. Head, thorax, and abdomen mottled brown, but abdominal segment 1 white; underside of body mostly whitish. Forewing length: 8-13 mm; average: 10 mm (N = 16).

L. orbonalis is a conspicuously colored moth; it would be easy to recognize but for the presence of several similar species, especially in the American tropics. Its Old World relatives are not known to be pests, but the New World genus Neoleucinodes includes N. elegantalis (Guenée), a widespread neotropical pest of tomato, eggplant, and other Solanaceae. Although adults of L. orbonalis and N. elegantalis are superficially almost indistinguishable, they may be separated easily by a difference in the front of the head between the eyes. In L. orbonalis the front bulges strongly in the middle to form an almost conical protuberance, lacking in N. elegantalis and closely related American species. Neoleucinodes prophetica (Dyar), another similar species that could cause confusion, occurs in southern Florida, but its host is unknown. N. elegantalis occurs as near as Cuba but has not been reported from the United States.

EGGS - No information available. These would not be expected to differ from eggs of many other Pyraustinae.

LARVAE - Full-grown length 20-22 mm. Pinkish in life (fading in alcohol), without conspicuous markings but usually identifiable by the following combination of characters: head, prothoracic shield, and body pinacula brown, not concolorous with body; prothoracic shield with a few darker brown spots but without well-defined pattern; dorsal and lateral setae with pinacula 2-4 times larger than spiracles; abdominal segment 1 with one

subventral seta (Fig. 2) rather than two (one or two in the related N. elegantalis); pinaculum of seta D1 on abdominal segments 2-8 with small dark spot near its anterior margin (Fig. 3).

The dark spot on the D1 pinaculum is the most useful feature for identifying larvae of this species. It was thought to distinguish larvae of L. orbonalis from those of the closely related neotropical genus Neoleucinodes (for example, N. elegantalis); however, absence of the dark spot in some African larvae and its presence in a few American larvae suggest unresolved taxonomic problems in this group. Occasional larvae from Solanaceae in Central America and the West Indies key out to L. orbonalis, but probably belong to an as yet unidentified American species. There is no other evidence of L. orbonalis occurring in the Western Hemisphere. Leucinodes and Neoleucinodes may not really be distinct genera, as larval and other characters that supposedly distinguish them seem to overlap.

PUPAE (Figs. 4-5) - Length 11-14 mm. Typically pyraustine in having a "shouldered" appearance (thorax widening immediately behind the head), a labrum positioned so far forward as to be almost at front of head; a distinct cremaster bearing a set of hooked setae; and legs and antennae extending beyond tips of wings. In L. orbonalis, part of the pupal shell encasing the tips of legs and antennae extends as a free process beyond the wing tips for a distance of about one and one-half abdominal segments; and prominent hoodlike protuberance is present above each spiracle on abdominal segments 2 and 3, found also in Neoleucinodes but not noted in any other pest species.

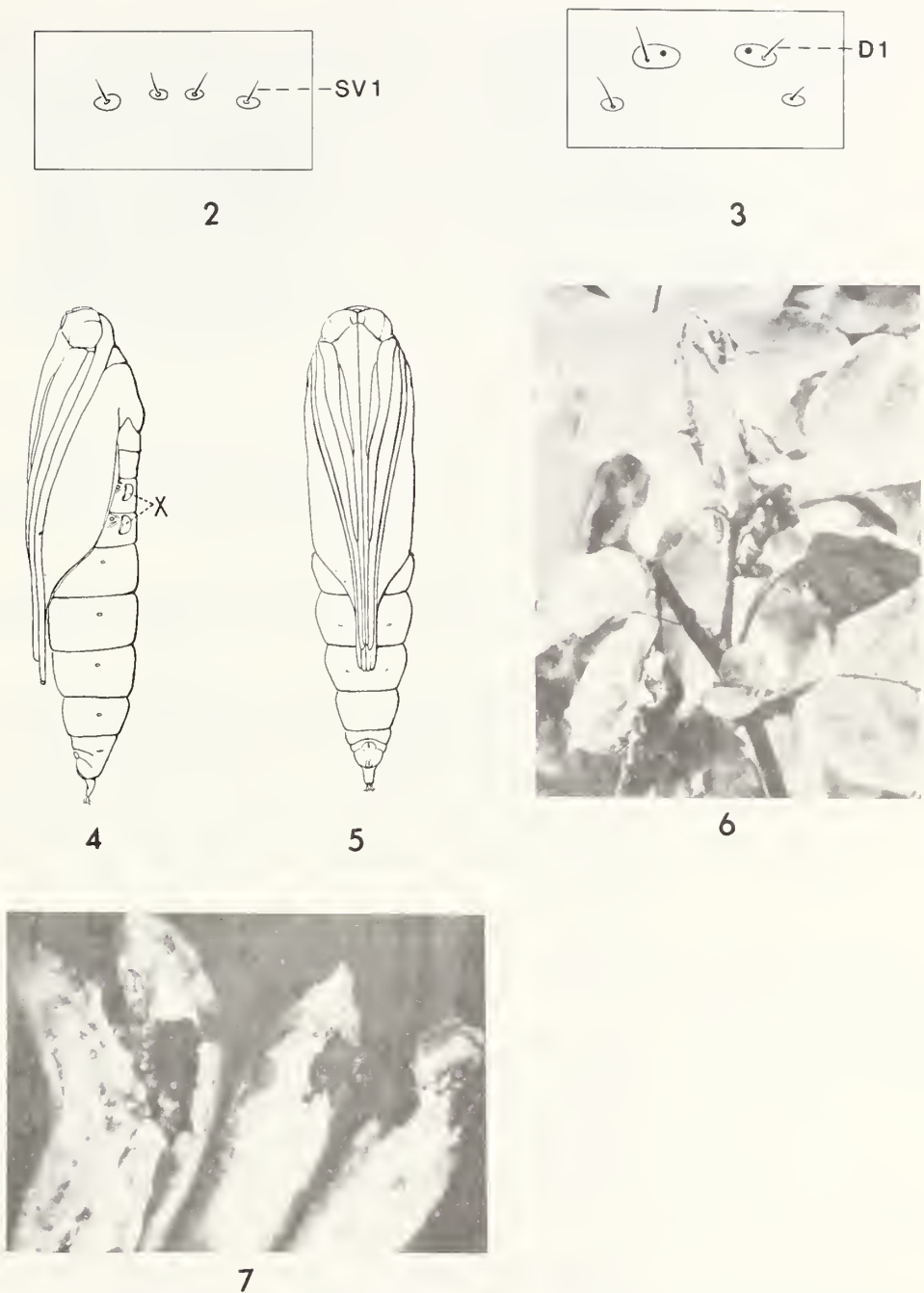
Characteristic Damage

Young leaves of host plants are mined between the upper and lower epidermis. Attacked leaves usually dry or rot depending on field conditions (Paddock 1974). In early growth stages of the plant, larval feeding within shoots interferes with plant sap flow and causes drooping and withering (Fig. 6) of terminal shoots (Yazdani et al. 1981). Later, larval feeding in fruit (Fig. 7) results in rotting and premature fruit fall (Maurel et al. 1982). Fruit may show entrance holes plugged with exceta (Baksha and Ali 1982) or no external sign of entry if larvae bored under the calyx. Large circular holes (Fig. 8) indicate where larvae exited (Butani and Varma 1976).

Detection Notes

In the past 10 years, there were 1,291 interceptions of L. orbonalis at U.S. ports of entry. This pest is most frequently intercepted on Solanum melongena in passenger baggage. Additional hosts not recorded in the literature but

(Figs. 2-7)



2-3. Leucinodes orbonalis larva. 2. Abdominal segment 1 with two subventral setae (SV). 3. Abdominal segments with pinaculum of seta D1. 4-5. Neoleucinodes elegantalis pupae. 4. Lateral view, X indicates hoodlike protuberance. 5. Ventral view. 6-7. Leucinodes orbonalis damage to eggplant. 6. Withered shoots. 7. Larva feeding in fruit (2 and 3 from Weisman 1986, 4 and 5 from Capps 1948, 6 and 7 from Maurel et al. 1982).

found infested with this pest by PPQ officers include Abelmoschus esculentus, Capsicum spp., Cucurbita maxima, Cyphomandra betacea (tree tomato), Dacryodes edulis (eben tree), Sesbania grandiflora, Solanum integrifolium, Solanum mammosum, Solanum muricatum, Solanum quitoense, Solanum sisymbriifolium, and Vigna spp. Interceptions from Egypt, France, Gabon, Guinea, Iran, Ivory Coast, Liberia, Senegal, Sudan, Turkey, and the United Kingdom, countries that are not cited in the literature, may represent transshipments from other areas. The commodities are regulated under Title 7, Part 319.56, of the Code of Federal Regulations.

Surveys are best conducted during the rainy season when pest populations increase.

1. Look for mined areas in leaves of solanaceous plants and larvae between upper and lower epidermal layers early in the growing season (Paddock 1974).
2. Look for wilted plants and larvae inside shoots during early to middle growing season (Paddock 1974).
3. Look for dead, dried leaves, dead plants, and rotting or dropped fruit late in the growing season (Paddock 1974). Cut the fruit to expose the larval tunnels in the pulp.
4. Inspect for pupae on soil, calyxes, leaf undersides, leaf axils, lower branches, or among fallen leaves.

For identification, submit suspect adult specimens, pinned and labeled. Preserve larvae and pupae in alcohol.

Biology

In India, there are 5-9 generations a year (Atwal 1976, Maurel et al. 1982). The total life cycle ranged 23-35 days with an average of 29 days (Taley et al. 1984). Observations showed that 30 °C and 70-90 percent relative humidity during the monsoon period favored pest development and survival (Atwal and Verma 1972).

Larvae overwintered in a hard, leathery, and dark colored cocoon attached to eggplants (Fig. 9), usually 1-3 cm below the soil surface from October to April or early May (Lal 1975). Pupation also occurred on the soil (Allam et al. 1982), calyxes, underside of leaves, leaf axils (Maurel et al. 1982), lower branches (Saxena 1965), or among fallen leaves (Atwal 1976). In the laboratory, the pupal period ranged 7-12 days with an average of 10 days (Taley et al. 1984). The adult emerged from the cocoon through an exit hole made by the larva (Saxena 1965). The adult male lived about 3-5 days with food

(Figs. 8-9)



8



9

Leucinodes orbonalis on eggplant. 8. Fruit with larva exiting. 9. Two overwintering larval cocoons on plant (8 from Atwal 1976; 9 from Lal 1975).

and 1-2 days without food while the female survived 4-6 days and 1-3 days, respectively (Taley et al. 1984).

In the laboratory, each female laid about 210 eggs, averaging 65 eggs per day, in 3-4 days (Maureal et al. 1982). Eggs were laid singly, rarely in batches of 2-3, on leaves (mostly the underside), petioles, shoots, stems, buds (Taley et al. 1984), flower sepals, and rough surfaces of fruits (Maureal et al. 1982) at night (Taley et al. 1984). Females laid more eggs on the growing points of the plant (Patnaik and Das 1967).

Eggs hatched in 3-6 days. A newly hatched larva moved about the leaf surface for a while (Taley et al. 1984) and then bored into young axillary shoots. Occasionally, larvae bored into and riddled petioles of large leaves and stems. Larvae also bored beneath the calyx into fruit at all stages of development, and fed on the soft tissues. Entry holes were often plugged with excreta. A single infested fruit contained 1-20 larvae (Frempong 1979). In the absence of fruit, the larva fed on growing points of the plant. All larvae, except first instars, were voracious feeders (Maureal et al. 1982). In India, the larval period lasted 8-26 days (Mehto et al. 1979). Full-grown larvae then left fruit through large exit holes (Fig. 8) (Frempong 1979) and searched for a dry surface to pupate. The fifth instar larva underwent a short prepupal period when it stopped feeding (Maureal et al. 1982).

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