



Cucurbit Moths

Diaphania species



Fig. 1. Adult *Diaphania indica*. © Ian McMillan [creativecommons](#)

Background

Diaphania indica (cucumber moth), *D. hyalinata* (melonworm) and *D. nitidalis* (pickleworm) (Lepidoptera: Crambidae) are moths which have historically been serious pests of plants within the Cucurbitaceae (gourd) family across much of the Americas, as well as Africa, Asia and Oceania in the case of *D. indica*. They are currently restricted to tropical and sub-tropical regions and seem unable to establish in cooler climates. These three species are therefore unlikely to establish outdoors in the UK in the long-term. Transient populations,

however, have the potential to cause damage in the summer and the moths may be able to establish within protected environments, so growers of cucurbits may wish to be aware.

One pathway these species may enter the UK on is imported plant produce: *Diaphania indica* is intercepted regularly in England and Wales on produce, primarily from Africa and Asia; *D. nitidalis* has been intercepted occasionally from the Dominican Republic; *D. hyalinata* has yet to be intercepted but has a very similar biology to *D. indica* and so is also covered here.

Geographical Distribution

Diaphania indica, *D. hyalinata* and *D. nitidalis* are distributed in the tropical and sub-tropical regions of South America, Central America and the Caribbean. All three species have been recorded in the USA, including as far north as New York state for *D. nitidalis*, but all species only appear to be able to overwinter outside in Florida and possibly Texas.

Diaphania indica also occurs outside of the Americas, and is found across the tropical and sub-tropical regions of Africa, Asia and Oceania. It occurs as far north as South Korea, where it is able to overwinter as a pupa. *Diaphania indica* is present in Madeira (Portugal) but is not recorded elsewhere in Europe. While there has been one record of *D. indica* in the UK, dating to the 19th century, this was likely a vagrant, and the species has not established in the UK.

Host Plants

Diaphania indica, *D. hyalinata* and *D. nitidalis* primarily feed on plants within the Cucurbitaceae family, including economically important crops such as cucumber (*Cucumis sativus*), melon (*Cucumis melo*), pumpkin (*Cucurbita moschata*) and watermelon (*Citrullus lanatus*). *Diaphania nitidalis* also feeds on wild cucurbits in its range, such as bitter melon (*Momordica charantia*), which may act as reservoirs for the pest during times when cultivated crops are unavailable.

While *D. hyalinata* and *D. nitidalis* are confined to hosts in the Cucurbitaceae family, *D. indica* has also been recorded on plants within the Fabaceae (bean), Malvaceae (cotton) and Passifloraceae (passionflower) families.

Description

Due to the similarities of these three pests, precise identification of the species is difficult and expert identification is required.

Eggs of these species are white or whitish in colour, but those of *D. hyalinata* are sometimes green. In *D. hyalinata* and *D. nitidalis*, eggs turn yellow as they develop. Eggs are small, usually laid in very small clumps of around two to six eggs (as well as singly in

D. indica) and are roughly 0.7-0.95 mm long and 0.3-0.6 mm wide in *D. indica* and *D. hyalinata*, and 0.4-0.8 mm in diameter in *D. nitidalis*.

Larvae: *Diaphania indica*, *D. hyalinata* and *D. nitidalis* all have five instars (larval stages), with mature larvae growing up to 25 mm long. In *D. indica* and *D. hyalinata*, young larvae are transparent, and change colour to, respectively, green or yellow-green as they develop. Upon maturity, larvae have two white dorsal stripes running the length of their bodies that disappear prior to pupation (Fig. 2) and four very small black spots in a square just behind the head may be seen. In *D. nitidalis*, the first to fourth instars are covered with tubercles (or nodules) that contain long setae (bristles) and appear as dark spots (Fig. 3). The fifth instar of *D. nitidalis* is white to yellowish green, depending on what it has eaten, and turns pink prior to pupation.

Pupae are 12-20 mm long and around 3-4 mm wide and are often found in a loose cocoon formed by spinning leaves together with silk. The pupae turn from white (*D. indica*) or green (*D. nitidalis*) to brown as they develop. Pupae of *D. hyalinata* are also light to dark brown in colour.

Adults are about 13-16 mm long, with a wingspan of 24-33 mm. The adults are also marked by a tuft of orange/brown hair at the tip of the abdomen, though this may not always be displayed. The wings of *D. nitidalis* have a central yellow patch (Fig. 5) that is banded by brown with a purple iridescence, the head and body are predominantly brown in *D. nitidalis*, except for a section of yellow close to the tuft of hair at the tail end. *Diaphania indica* (Fig 1) and *D. hyalinata* (Fig 4) have a white central patch on their wings and their body colours are similar, with the head, first two segments directly behind the head and a section further down the body being brown, with the central portion and section near to the tuft of hair generally being white in colour.



Fig. 2. *Diaphania hyalinata* mature larva © John L. Capinera, University of Florida.



Fig. 3. *Diaphania nitidalis* larva. © John L. Capinera, University of Florida.



Fig. 4. *Diaphania hyalinata* adult. © John L. Capinera, University of Florida.



Fig. 5. *Diaphania nitidalis* adult. © John L. Capinera, University of Florida.

Biology

Diaphania indica, *D. hyalinata* and *D. nitidalis* undergo multiple generations per year, possibly over ten in some regions, such as for *D. indica* populations in Hainan Province, China. Active populations of the moths can occur throughout the year but flying tends to peak between April and September. Adults of *D. nitidalis* are nocturnal, with most individuals actively flying around midnight. Mating occurs three days after emergence and is induced by a female-produced sex pheromone. This behaviour is likely to be similar in both *D. indica* and *D. hyalinata*.

Females of *D. indica* and *D. nitidalis* have been recorded laying hundreds of eggs, with as many as 1053 eggs reported for *D. indica*. In both species, there is a preference for egg laying on leaves (hairy leaves in the case of *D. nitidalis*), though eggs of *D. nitidalis* are also deposited on stems, buds and flowers. *Diaphania hyalinata* has similarly been observed laying its eggs on leaves, stems and buds. Eggs of all three species are laid in clusters, as well as singly in *D. indica*, and hatch within around 2-5 days.

All three species feed on leaves, flowers, fruit, and stems. *Diaphania indica* larvae have been observed binding leaves together with silk and feeding from within. The larval period lasts roughly eight to ten days in *D. indica* and 14 days in *D. hyalinata* and *D. nitidalis*. Towards the end of this period, mature larvae spin a silky cocoon either on the leaves or among leaf debris on the ground. In South Korea, *D. indica* overwinters as pupae 5-10 cm below the soil surface. The pupal period generally lasts 7-12 days if the pupa is not overwintering.

Dispersal and Detection

A possible route of entry for these *Diaphania* species into the UK is on infested plant produce. Though not expected to establish outdoors in the long-term, if a *Diaphania* species were to be imported into the UK on infested produce, this could result in a localised transient population. If these pests became established in Southern Europe, it is possible that dispersal of the adults could appear in the UK in the late summer, similar to the USA where moths disperse from Florida to more northerly states.

Feeding by *D. hyalinata* and *D. indica* results in leaf skeletonization (Fig. 6) or in serious outbreaks, destruction of much of the foliage. All three species cause damage to flowers and fruits, which can result in secondary infections. Characteristic signs of fruit feeding in *D. nitidalis* include entry holes (Fig. 7), greenish/brown/white frass (Fig. 8), and silk webs, which are formed over entry holes to block the path of natural enemies. *Diaphania nitidalis* also tunnels into stems, impeding plant growth.



Fig. 6. Skeletonisation of snake cucumber leaf by the larvae of *Diaphania hyalinata*. © Suliman Ali, Huazhong Agricultural University.



Fig. 7. *Diaphania nitidalis* larval exit holes in squash flower buds. © J. Capinera, University of Florida.



Fig. 8. Frass excreted by the larvae of *Diaphania nitidalis* on pumpkin. © John L. Capinera, University of Florida

Economic Impact

Larval damage to fruit often leaves the fruit unmarketable, particularly after secondary infection by pathogens. Feeding on flowers may reduce fruit yield.

Diaphania indica is considered a serious pest in Africa and Asia, and greatly reduces fruit yield on some hosts in some years. *Diaphania hyalinata* and *D. nitidalis* are also considered serious pests in South and North America, and although these two species are only able to successfully overwinter in the extreme southern parts of the USA, damage is still seen further north later in the summer as moths disperse and form transient populations.

Diaphania indica, *D. hyalinata* and *D. nitidalis* are unlikely to survive the winter outdoors in the UK but could have the potential to survive under protection. However, to date interceptions of *Diaphania* spp. have been on produce and not on growing material meant for protected cultivation, making introduction to protected cultivation unlikely.

Advisory Information

As no statutory action is being taken on UK findings of *Diaphania indica*, *D. hyalinata* or *D. nitidalis* there is no longer a requirement to report findings of these pests to the PHSI (Plant Health and Seeds Inspectorate).

Suspected outbreaks of any other non-native plant pest should be reported to the relevant authority:

For **England and Wales**, contact your local **APHA Plant Health and Seeds Inspector** or the **PHSI Headquarters**, York.

Tel: 0300 1000 313

Email: planthealth.info@apha.gov.uk

For **Scotland**, contact the **Scottish Government's Horticulture and Marketing Unit**:

Email: hort.marketing@gov.scot

For **Northern Ireland**, contact the **DAERA Plant Health Inspection Branch**:

Tel: 0300 200 7847 Email: planthealth@daera-ni.gov.uk

Web: www.daera-ni.gov.uk/topics/plant-and-tree-health

For additional information on UK Plant Health please see:

planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-risk-register/

planthealthportal.defra.gov.uk/

www.gov.uk/plant-health-controls

www.gov.scot/Topics/farmingrural/Agriculture/plant/PlantHealth/PlantDiseases

www.daera-ni.gov.uk

Authors

Chris Malumphy (Fera); M. Everatt, A. Korycinska, and Laura Cooper (Defra)

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