

Spotted wing drosophila

Drosophila suzukii



Figure 1. *Drosophila suzukii*, adult male fly
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Background

Drosophila suzukii (Matsumura) is an Asian species of vinegar fly (drosophilids are also known in Britain as small fruit flies) with a wide host range that has recently been introduced into both North America and southern Europe (in 2008 and 2009 respectively). Most species of *Drosophila* are secondary pests, their larvae only developing in previously damaged or rotting fruit. The biology of *D. suzukii*, however, is unusual in that the female is able to oviposit directly into healthy ripening fruit still attached to the plant and so the larvae can cause primary damage to soft-skinned fruit crops. In North America, *D. suzukii* currently appears to be spreading rapidly, and there have been reports of severe damage being caused by the fly to some cherry, berry and peach crops. The evidence that *D. suzukii* combines a potential for both rapid spread and an ability to cause economic damage has prompted the European Plant Protection Organisation to add *D. suzukii* to its Alert List. The common name spotted wing drosophila has now been adopted for *D. suzukii*, but some early reports used the name cherry vinegar fly.

To date, *D. suzukii* has not been found in Britain, nor has it been intercepted by the Plant Health Authorities on fruit being imported into Britain.

Geographical Distribution

Drosophila suzukii is an Asian species that has been recorded from China, India, Japan, Myanmar, South Korea and Thailand, as well as the far-eastern part of Russia. It was introduced into Hawaii in the 1980s. In 2008 it was found on the mainland of the United States, in California. Through 2009 its known North American range was extended northwards to Oregon, Washington and into Canada (British Columbia), and it was also found across the continent in Florida. The first finding in Europe was in 2009, in the north east of Italy, in the region of Trentino-Alto-Adige. In 2010, there have been further European findings, in central and southern Italy (Tuscany, Calabria), southern France (Alpes-Maritimes, Corsica and Var), and Spain (Catalonia).



Figure 2. Adult female fly showing the absence of a wing spot and the serrated ovipositor
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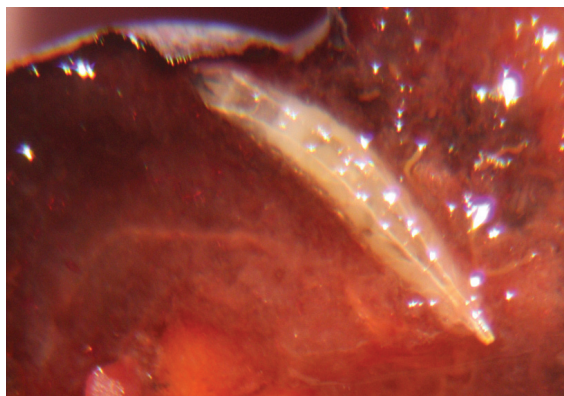


Figure 3. Larva in blueberry
 © British Columbia Ministry of Agriculture and Lands



Figure 4. Pupae
 © Oregon State University



Figure 5. Damage on cherries
 © University of California, Agriculture and Natural Resources

Host plants

In the USA and Canada, *D. suzukii* has been recorded in cherries, peach, raspberries, blackberries, blueberries and strawberries; in Italy, on the latter four berries; in France, on cherry and strawberry. In Japan, it has caused damage to cherries, grapes and blueberries.

Drosophila suzukii has a wide host range and has been recorded attacking a wide variety of small fruit crops, fruit trees and grapevine. Recorded hosts include: *Actinidia* spp. (kiwi fruit), *Cornus kousa* (dogwood), *Diospyros kaki* (Japanese persimmon), *Eugenia uniflora* (Surinam cherry), *Ficus carica* (common fig), *Fragaria ananassa* (strawberry), *Malus domestica* (apple), *Morus rubra* (red mulberry), *Murraya paniculata*, *Prunus avium* (sweet or wild cherry), *P. domestica* (plum), *P. persica* (peach), *P. persica* var. *nucipersica* (nectarine), *Pyrus pyrifolia* (Chinese pear), *Rubus armeniacus* (Himalayan blackberry), *R. loganobaccus* (loganberry), *R. idaeus* (raspberry), *R. laciniatus* (evergreen blackberry), *R. ursinus* (marionberry), *Rubus* spp. (other blackberries), *Vaccinium* spp. (blueberries) and *Vitis vinifera* (table and wine grapes).

Identification

The general appearance of *D. suzukii* is that of a typical vinegar fly, about 2-3 mm long with a yellow-brown body colour with brown lateral bands on the abdomen. The adult male fly (Fig. 1) has a small dark spot on the leading edge of the wing, towards the apex, though this is not a character unique to the species; the female, however, lacks the wing spot. The males also have two black “combs” on the

fore legs (two dense rows of darkened spines on the tarsi, one above the other). The females (Fig. 2) possess a saw-like serrated ovipositor (unusual for *Drosophila*) that allows it to pierce the skin of the fruit in order to lay its eggs. The larvae are typical fly maggots, legless, and about 3 mm long and white or cream at maturity (Fig. 3). The pupae are typical of the genus *Drosophila*: 3 mm long, reddish-brown with the anterior spiracles projecting as two stalks with emergent finger-like processes (Fig. 4).

Biology and Damage

The fly has a high reproductive potential. Early Japanese studies recorded that there are multiple generations per year (about 13 in Japan), that under optimal conditions a single life span could be as short as 8-14 days, and that females may lay 7-16 eggs per day with an average lifetime fecundity of 384 eggs. Scientists have predicted as many as 10 generations annually under Californian climatic conditions. On average, each female lays 1-3 eggs per fruit but as many different females may lay eggs in the same fruit up to 60-70 flies may eventually emerge from a single fruit. Adults are highly mobile.

In cherries, most of the damage is caused by the larvae feeding within the fruit and very quickly the fruit begins to collapse around the feeding site (Fig. 5). The initial signs of attack are small scars or depressions on the fruit surface at the points where the females have used their specially adapted ovipositors to deposit their eggs into the fruit (Fig. 6). Secondary infection by fungal or bacterial agents or other insect pests including other vinegar flies such as *D. melanogaster* often compounds the damage.

Pest Management

The primary objectives are: i) to control the adult flies before they can lay eggs in the fruit; ii) to reduce fly populations available to re-infest later crops or carry over to the following year. The latter can be achieved by immediately removing and safely disposing of infested or leftover fruit on the plant. It is essential to detect the adults as early as possible. This can be achieved by setting monitoring traps in the field, ideally when temperatures are consistently >10°C, and/or when fruit starts to form.



Figure 6. Oviposition sites on cherry
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Commissioner, Los Angeles County, US

In the past, organophosphate (e.g. malathion) and carbamate (e.g. carbaryl) insecticides were used to control adult fruit flies, but newer insecticides – with generally lower human toxicity – such as spinosad, imidacloprid, acetamiprid and certain pyrethroids have been shown to be effective. Insecticides can be applied as sprays (where good coverage and even distribution is important to target the adults) or as baits (where the pest is attracted to the insecticide). Choice of compound will depend on the availability of registered products in different fruit or orchard crops in the UK. Foliar sprays are the conventional method of control but bait sprays have potential for IPM systems since much lower concentrations of active ingredient are needed per hectare. A spinosad bait treatment, containing the active ingredient and a mix of sugars, water and attractants, has been shown to be effective against other fruit flies, but further research is needed against this species. It is important to rotate classes of insecticides to delay the development of insecticide resistance.

It is also essential to carry out management practices over a wide area as the pest is able to fly many kilometres and any unmanaged crops will serve as a source of infestation to other nearby crops. Spray applications should be made about two weeks before harvest to try and kill the adults before they lay any eggs. The fruit is most susceptible to attack after it has coloured and developed some sugar, but if monitoring traps indicate high populations earlier in the season, an earlier spray application can be applied.

Advisory Information

Suspected outbreaks of *Drosophila suzukii* or any other non-native plant pest should be reported to your local Fera Plant Health and Seeds Inspector, or:

Tel: 01904 465625

Email: planthealth.info@fera.gsi.gov.uk

Web: www.defra.gov.uk/fera/plants/plantHealth

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