Department for Environment Food & Rural Affairs

Plant Pest Factsheet

Tobacco, Sweet potato or Silver leaf whitefly

Bemisia tabaci

Figure 1. Tobacco whitefly puparium or pupa (left) and adult (right)

Background

Bemisia tabaci (Gennadius) (Hemiptera: Aleyrodidae) (Fig. 1) is one of the most economically important agricultural and horticultural pests in the World, due in part to its adaptability, extreme host plant range and capacity to vector more than a 110 plant pathogenic viruses. It is not a single species but a complex of many taxa that are only distinguishable at the molecular level and the taxonomy has not yet been resolved. This is significant as different 'biotypes' or 'species' within the complex vary in biological characteristics such as host preferences, ability to vector viruses and pesticide resistance.

Until the 1980s, *B. tabaci* was considered to be a pest of field crops in tropical and sub-tropical regions, but is now widely distributed under glass in temperate areas including most of Europe. It is not established in the UK but it could establish in protected environments, where it has the potential to be a major pest, particularly of glasshouse salad crops such as tomato and cucumber. This is because of the risk of transmission of viruses such as Tomato yellow leaf curl virus (TYLCV) (Fig. 2) and Cucurbit yellow stunting disorder virus (CYSDV) (Fig. 3). Symptoms of TYLCV include small abnormally developed leaves and flower drop. If tomato plants are infested at an early stage, the disease may lead to total yield loss due to failure of fruit formation. TYLCV is the main

limiting factor on tomato production in certain areas of the world including parts of Spain, Portugal, Israel and Tanzania. In addition to virus transmission, *B. tabaci* causes direct damage by its' feeding activity and indirect damage can be caused by the sooty moulds that develop on honeydew excreted on the host plants.

The 'B biotype' and 'Q biotype' have been intercepted on imported plants in the UK. The 'B biotype' is of major concern as it develops faster than other biotypes, producing greater numbers of off-spring, larger amounts of honeydew, has a broader host plant range, is more insecticide resistant and induces several different phytotoxic disorders in certain plant hosts (e.g. squash silver leaf disorder which affects tomatoes and cucurbits). The 'Q biotype' is thought to have originated from the Mediterranean region and has been associated with whitefly control problems. It is known to have resistance to pyriproxyfen, buprofezin and reduced susceptibility to the neonicotinoid insecticides imidacloprid, acetamiprid and thiamethoxam.

Figure 2 TYLCV symptoms on tomato © D Blancard INRA

Figure 3 CYSDV symptoms on melon © http://www.nacaa.com

Geographical Distribution

Bemisia tabaci may be native to India but the evidence is inconclusive, and it is now cosmopolitan. However, certain areas within Europe are still *B. tabaci* free, e.g. Finland, Sweden, Republic of Ireland and the UK.

Host Plants

Bemisia tabaci feeds on an extremely wide range of host plants (800+ species assigned to 90+ families), and the number of recorded hosts is continually increasing. They include crops grown outside in the tropics and sub-tropics (e.g. cassava, cotton, sweet potatoes, tobacco and tomato), vegetable and salad crops grown under glass in Europe (e.g. cucumber, aubergine, pepper and tomato) and ornamental plants (e.g. poinsettia).

Description

Bemisia tabaci adults (Figs 1 and 8) are about 1 mm long, the male is slightly smaller than the female. The body and both pairs of wings are covered with a white, powdery, waxy secretion. The wings are held tent-like above the body and slightly apart, so that the yellow body is apparent. The eggs (Fig. 4) are oval, pale brown in colour, with a pedicel stalk at the base, approximately 0.2 mm long. They are laid randomly, either singly or in scattered small groups, on the under-surface of leaves, although they may be laid in partial circles on smooth leaves, e.g. on *Ficus*. The early larval-instars are yellow-white scales, 0.3-0.6 mm long. The fourth-larval instar (Fig. 1 and 6), known as the puparium or pupa, is oval, narrowing posteriorly, and about 0.7 mm long. On a smooth leaf the puparium lacks enlarged dorsal setae, but if the leaf is hairy or densely covered in whitefly, two to eight long dorsal setae are present.

In the UK, *B. tabaci* needs to be distinguished from those of the ubiquitous glasshouse whitefly (*Trialeurodes vaporariorum*), which is not a quarantine species. The adults and early instars of the two species are difficult to distinguish in the field. The glasshouse whitefly adults (Fig. 9) hold their wings at a shallower angle so that body is often hidden. The eggs (Fig. 5) are always laid in partial circles and are darker, being greyish in colour. The puparia (Fig. 7) are usually easy to recognise as they are cream coloured, oval, and bear marginal wax filaments and often long dorsal wax rods, although the latter are easily broken off. Marginal wax filaments and dorsal wax rods are absent from *B. tabaci*. *Trialeurodes vaporariorum* and *B. tabaci* are frequently found together (Fig. 10).

Figure 4 *Bemisia tabaci* eggs © Fera

Figure 5 *Trialeurodes vaporariorum* eggs © Fera

Figure 6 *Bemisia tabaci* puparium © Fera

Figure 7 *Trialeurodes vaporariorum* puparium © Fera

Figure 8 *Bemisia tabaci* adult © Fera

Figure 9 *Trialeurodes vaporariorum* adult © Fera

Figure 10 *Bemisia tabaci* and *Trialeurodes vaporariorum* puparia

Figure 11. *Bemisia afer* puparium

There is a second species of *Bemisia* that has been introduced and established in the UK: *Bemisia afer* (Priesner & Hosny). This species has a restricted distribution in the UK and is usually associated with *Laurus nobilis*. It can only be separated from *B. tabaci* accurately by examination by a specialist.

Biology

All whiteflies have six developmental stages: egg, four larval instars, and the adult. Each female lays up to 160 eggs on the undersides of the leaves. Hatching occurs after 5-9 days at 30°C depending on host species and humidity. The first instar or 'crawler' is flat, oval and scale-like, and is the only mobile larval stage. It moves to a suitable feeding location where it moults and becomes sessile throughout the remaining larval stages. The first three nymphal stages last 2-4 days each whereas the fourth larval stage or puparium lasts for about 6 days, dependant on the temperature. The adult emerges through a 'T'-shaped rupture in the pupal case and expands its wings before powdering itself with wax from glands on the abdomen. Mating begins 12-20 hours after emergence and takes place several times throughout the life of the adult. A female may live for 60 days, although the life of the male is generally much shorter, being between 9 to 17 days. Up to 15 generations can occur within one year.

Dispersal and Detection

Adult *B. tabaci* do not fly very efficiently but once airborne, can be transported quite long distances by the wind. All stages of the pest are liable to be carried on planting material and cut flowers of host species. The international trade in poinsettia is considered to have been a major means of dissemination of *B. tabaci* within Europe.

Detecting *B. tabaci* at low densities can be very difficult due to their small size and cryptic habits. The white waxy adults may be observed on the upper surfaces of foliage or on the growing points. The larvae, particularly the yellow puparia may be observed on the lower surface of the foliage. Yellow sticky traps are the main tool for monitoring outbreaks of *B. tabaci* and Fera diagnosticians have developed a method for accurately distinguishing *B. tabaci* from the non-quarantine whiteflies on sticky traps under low magnification.

Economic Impact

Bemisia tabaci is one of the most economically important agricultural and horticultural pests in the World. It causes damage directly by feeding and indirectly by honeydew egestion and virus transmission. Feeding by adults and larvae causes chlorotic spotting, growth distortion, and premature leaf drop. The honeydew egested by the feeding larvae covers the surface of the foliage and fruit and serves as a medium for the growth of sooty moulds. This reduces the photosynthetic potential of the infested plant. Honeydew and moulds also disfigure and lower the market value of fruit and flowers. However, it is the viruses vectored by *B. tabaci* that have the greatest economic impact. *Bemisia tabaci* vectors plant viruses in the genera *Geminivirus*, *Begomovirus*, *Closterovirus*, *Nepovirus*, *Carlavirus*, and *Potyvirus*. These can cause total failure of susceptible crops.

Advisory Information

The following measures can be taken to reduce the risk of introducing *B. tabaci*:

- Seek assurance from commercial suppliers that plants are free from this pest as part of your commercial contract.
- Thoroughly inspect all new plant material for all stages of the pest when it first arrives at the nursery, particularly on the lower leaves where immature stages are likely to be most visible.
- Keep recently received plants isolated to monitor closely and prevent the spread of any potential infestation.
- Monitor crops throughout the growing season with yellow sticky traps. Check for the presence of whiteflies by agitating plants to encourage flight by adults and inspect the leaves for immature “scales”.
- Never mix ornamental and vegetable crops in the same cropping area. A *B. tabaci* outbreak in such a situation would be difficult to control due to the limited number of insecticides registered for use on glasshouse edibles and the risk of virus spread.
- In high risk crops such as poinsettias, preventative release of biological control agents or an application of a systemic insecticide is recommended as soon as plants are brought on to the nursery.
- If any life stages of the pest are detected, begin whitefly treatment programmes immediately to ensure prompt eradication.
- At the end of the season, dispose of remaining plants and thoroughly clean and sterilise the glasshouse area. A complete crop break will help ensure complete eradication of the pest and prevent carry-over into subsequent crops.

Suspected outbreaks of *B. tabaci* or 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**, Sand Hutton, York. Tel: 01904 405138
Email: planthealth.info@apha.gsi.gov.uk

For **Scotland**, contact the **Scottish Government's Horticulture and Marketing Unit:**
Email: hort.marketing@gov.scot

For **Northern Ireland**, contact **DAERA Plant Health Inspection Branch:**
Tel: 0800 200 7847 Email: planthealth@daera-ni.gov.uk

For additional information on UK Plant Health please see:
https://planthealthportal.defra.gov.uk/
https://www.gov.uk/plant-health-controls
http://www.gov.scot/Topics/farmingrural/Agriculture/plant/PlantHealth/PlantDiseases
https://www.daera-ni.gov.uk

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