

Tomato

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Mealybugs on protected tomato crops

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In recent years there has been an apparent increase in mealybug incidence in protected tomato crops in the UK with increasing crop losses reported. A variety of physical, chemical and biological control methods are available to growers, but these are considered to be time consuming, ineffectual or incompatible with integrated pest management techniques. This factsheet summarises the results from a survey of commercial growers to determine the pest status of mealybug on protected tomato crops in the UK and provides recommendations on how to improve existing control methods. Further research is in progress to identify integrated pest control strategies, in particular non-chemical control measures.

Pest status

Despite the slow dispersal rate of mealybugs, they appear to be spreading to previously uninfested nurseries and to larger areas within infested nurseries. 70% of infestations occurred for the first time in the last decade. In the 1998 season, at least 13 tomato nurseries from different parts of England were infested with approximately 20 hectares (ha) affected (7% of the total UK tomato

growing area). It is not known whether this increase is due to reduced chemical use, which has given mealybugs a better chance of establishment, or to an increase in mealybug numbers in the outside environment.

Symptoms

Mealybugs cause a range of damage symptoms to tomato crops and the resultant economic losses can be considerable. Adults and nymphs feed on the leaves and stems causing

necrotic areas and reduced plant vigour. The pest also excretes excess sap (honeydew) on which black sooty moulds grow, reducing fruit quality.

Damaged stems and sticky honeydew were observed in all of the infested nurseries surveyed. In half of these nurseries, stem damage was so severe that the plants died and yield loss resulted. Mealybug damage was also thought to increase the incidence of grey mould (*Botrytis cinerea*).



Mealybugs feeding on the stems of tomato plants can lead to reduced plant vigour



Severe necrosis of leaves and stems as a result of mealybug infestation

Biology and life cycle

Information on the identification and behaviour of the species infesting nurseries was determined to enable growers to target control actions properly. All specimens collected from tomato crops in the UK were *Pseudococcus viburni* (Signoret), commonly known as the obscure mealybug, vine mealybug or glasshouse mealybug.

Mealybugs breed continuously in protected tomato crops at temperatures above 11°C. Their development is temperature dependent and the life cycle takes 56 days at 20°C and 37 days at 30°C. The life cycle consists adults, eggs and 3 immature nymphal stages.

Females are 4 mm long, wingless, sucking insects with oval shaped, pink bodies. They are covered in white waxy filaments with one pair of tail filaments that are half as long as the body. Once the female has mated and laid her eggs, she shrivels and dies. Unfertilised females do not lay eggs and can survive for up to 8 months.

Males are delicate insects, less than 2 mm long, with long tails and two pairs of wings. They do not feed and have no mouthparts. Adult males only live for a few days during which time they actively seek females to mate with.

Eggs are laid in batches of 100 to 500. They are yellow, 0.3 mm long and protected inside a cotton-like pouch

made of wax filaments. Eggs take approximately 3 weeks to hatch at 18°C.

Nymphs are similar in appearance to the adult female. There are 3 immature nymphal stages (instars). The first instar nymphs are small (less than 2 mm long) and pink in colour. The

second and third instar nymphs get progressively larger, slower moving and increasingly white in colour due to the presence of more waxy filaments. The third nymphal stage of males takes place inside a white cocoon. Once female nymphs find a suitable host plant they tend to stay there feeding for the rest of their lives.



Mealybug eggs protected in wax filaments



Female nymphal and adult mealybugs

Minimising spread

Mealybugs are usually transported on to uninfested nurseries on infested plants (typically ornamental 'house plants') or on equipment. Spread within infested nurseries can occur by moving irrigation lines and packing boxes from mealybug infested areas to new areas without first being cleaned and sterilised. Humans and animals are also known to spread mealybugs over short distances. The waxy filaments make egg masses and mealybugs sticky and they are

spread down crop rows attached to crop workers or by birds, such as wagtails, that are feeding on the mealybugs. In addition, ants feed on mealybug honeydew and are known to move mealybugs to new plant hosts and protect them from natural enemies.

A few simple quarantine measures will prevent the spread of mealybug on to uninfested nurseries or within infested ones:

- Inspect all incoming plant material to ensure that it is clear of pests.

- Avoid bringing ornamental species (eg house plants) on to tomato nurseries.
- Restrict movement of plant material from infested areas.
- Ensure that no infested equipment is brought in from other nurseries.
- Ensure crop workers visit infested areas at the end of the day if possible and wear protective clothing.

Mealybug control

The cost of controlling mealybug on the nurseries surveyed averaged £3,100/ha/season, of which 75% were labour costs. A wide variety of control methods are available but an integrated control programme using a combination of different methods is the most successful. The most effective control of mealybugs can therefore be achieved by:

- 1 Selected chemical treatments at the end of the season.
- 2 A strict hygiene programme during the clean-up period between crops.
- 3 The use of glues and traps to prevent emergence of nymphs from the structure of the glasshouse.
- 4 Carefully timed treatments of Applaud (buprofezin) at the first sight of nymphs in the new crop.
- 5 Physical controls to prevent spread of mealybugs during the season.

Chemical control of adult mealybugs can be difficult as they have a water-repellent waxy covering and live in hidden areas. Where possible, nymphs should be targeted as their undeveloped waxy covering makes them the most susceptible to treatment. A carefully placed high volume spray will help penetrate the hidden areas that mealybugs inhabit.

Most mealybugs survive between crops as eggs. Eggs are laid in a variety of sites (see below) and these require the most attention during the clean-up procedure:

- Concrete bases of roof supports (dollies)
- Irrigation drippers and lines
- Dried up plant debris
- Packing crates
- Concrete roadways
- Hollow metal posts
- Slabs
- Strings
- Soil



Mealybug egg masses in the depressions in concrete dollies



Sealing concrete dollies with traps or glues reduces mealybug emergence

Suggested control strategy

At the end of the cropping season

- Spray infested plants with 2 high volume sprays of Applaud (30 ml/100 l) at 14-day intervals. Control all active stages at least 2 weeks before the crop is removed.
- If the infestation is limited to very small areas, Decis or Malathion 60 may be used as an alternative but these chemicals may disrupt biological control for up to 3 months.
- De-leaf before treatment to improve penetration of sprays.
- Spray areas where mealybugs lay their eggs (eg concrete dollies and irrigation tubes).
- Remove the crop and crop debris extremely carefully making sure you pick up and destroy any small pieces of infested leaves or stems.
- Remove and destroy or treat infested ornamental plants.

Between crops

- Replace irrigation lines and drippers from infested areas.
- Steam sterilise or replace rockwool/stonewool slabs.
- High pressure wash all structures.

- Paint concrete dollies with a thick paint or glue or wrap them in sticky traps.
- Replace floor plastic. Seal all the gaps between sheets with glue. Draw plastic sheets over the top of the concrete dollies, concrete paths and pipe rail posts and seal with glue.
- Maintain good weed control.
- Inspect all plant material for mealybugs before introducing it into the greenhouse.

In the new crop

- Inspect plants weekly for presence of mealybugs concentrating on areas where mealybug was found in the previous season and on the plants beside posts.
- At the first sign of mealybugs (first generation nymphs), spray Applaud at 30 ml/100 l water on the infested plants and structures. Repeat after 14 days. Do not apply more than 2 sprays within a 65 day period.
- If a few plants are heavily infested they should be removed and destroyed.

During the season

- Ensure that no infested plant material (eg from deleafing) or equipment (eg packing crates) is moved to other areas.
- Crop workers should visit infested areas at the end of the day and wear

protective clothing that remains in that area.

- Control ants as they move mealybugs to new areas and guard them from natural enemies.
- Prevent mealybug numbers from increasing during the season and prevent crop damage by rubbing off mealybug colonies by hand every 7 to 14 days. Alternatively flame the stems with a propane burner or spray with soaps and oils.
- Repeated use of Applaud (buprofezin) throughout the season is **not** recommended as it may lead to the development of pesticide resistance or disrupt whitefly control by depriving the biological control agent, *Encarsia formosa*, of its prey.

It is essential to follow the instructions on the label of approval before handling, storing or using any crop protection product. Approved off label uses are made entirely at the risk of the user.

Applaud is a UK registered product of Zeneca Crop Protection, Decis is a registered product of Aventis Crop Science UK Ltd and Malathion 60 is a registered product of United Phosphorus Ltd.

Always read the label. Use pesticides safely.