

The biology and control of mites in pot and bedding plants

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Protected ornamental plants are susceptible to a number of mite species which produce a range of different damage symptoms. This factsheet covers the biology, recognition and control of these mite pests. Further specific information on the two-spotted spider mite and its control can be found in the HDC Factsheet 08/05.

Action points for growers

- Ensure staff members have access to a good quality 10 x magnification hand lens, as this is vital to aid correct identification.
- Monitor crops regularly during the summer and note any 'hot spots' of mite damage. Work on these areas last, as mites such as the two-spotted and tarsonemid mite can be unwittingly spread by workers.
- Be aware of the range of symptoms that the different mite species cause, and ensure that nursery personnel can recognise unusual symptoms such as those caused by tarsonemid mites.
- In the specific case of fuchsia crops, early detection of an attack by the fuchsia gall mite is vital, so train staff to aid identification.
- Plan an integrated pest management (IPM) programme at the start of each season, and vary the level of predator introductions depending on the pest levels noted during the previous season.
- Check the IPM compatibility of the acaricide products in store, using the details in Table 5; alternate products from different chemical groups to minimise resistance build up.

Introduction

A range of mite species cause damage to protected ornamental crops, but in recent years the number of species found in the UK has increased; a result of the increasing international nature of plant trade. There are also several native species of mite that are less well known, and the aim of this factsheet is to provide guidance on their recognition and control.

This factsheet covers the following mite species:

- Two-spotted spider mite (update only)
- Broad and cyclamen mites
- *Bryobia* mite
- *Tyrophagus* mite
- Fuchsia gall mite

The two-spotted spider mite continues to be the most important species which damages protected ornamental crops. Further detail on this mite can be found in the HDC Factsheet 08/05. Species such as the broad

and cyclamen mite are becoming more common, but the damage they cause is not always correctly identified, leading to poor control and serious plant damage (Figure 1). The *Bryobia* mite and *Tyrophagus* mite

are less common, and as a result are often not recognised. The information in this factsheet will aid their identification and control. New mite species such as the fuchsia gall mite will also be covered in this publication.



1 Flecking on the petals of plants is a typical symptom of cyclamen mite

Identification and symptoms

Two-spotted spider mite (*Tetranychus urticae*)

This species occurs mainly on the lower leaf surface, and is easily recognisable by the two dark spots on the dorsal body surface (Figure 2). Feeding damage usually leads to small white or pale yellow spots all over the leaf, but it can also take the form of yellow patches or chlorosis. Careful monitoring of crops is vital in order to spot mite outbreaks early, before crop damage has occurred. Outbreaks often occur in patches, reflecting the site of initial infestation, spreading outwards from this point.

Breeding continues throughout the summer months. The two-spotted spider mite can have many generations, with speed of build up directly related to prevailing temperatures. As populations rise, webbing can be produced by the mites, which aids their dispersal to other plants (Figure 3). Diapause (dormant) adult females survive the winter after mating, and are resistant to adverse environmental conditions. They may cluster around pot rims and on other structures.



2 Adult two-spotted spider mites, nymphs and eggs on the lower leaf surface

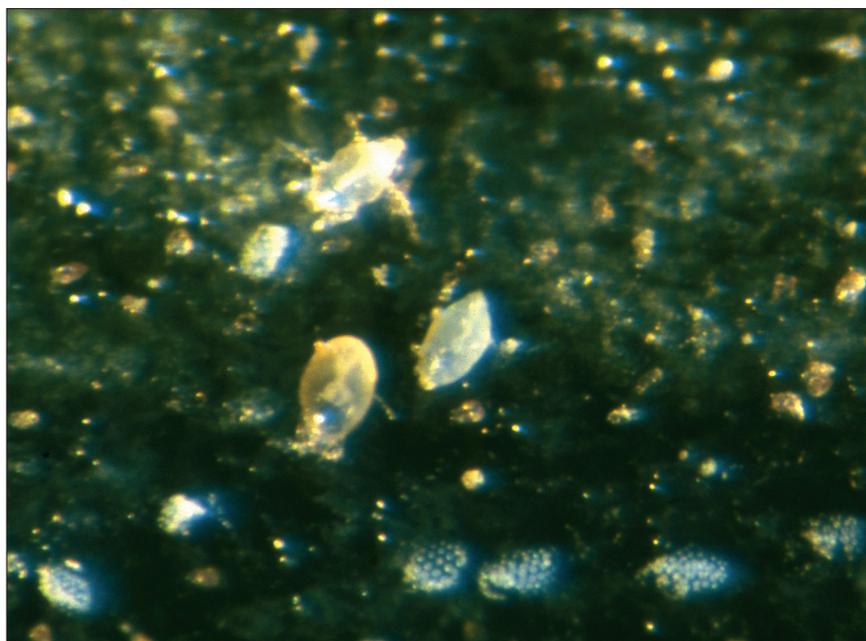


3 Webbing on flowers and growing points aids the dispersal of mites

Broad mite (*Polyphagotarsonemus latus*) and cyclamen mite (*Tarsonemus pallidus*)

Both these tarsonemid mite species are tiny (less than 0.3 mm long) and hard to see even with a hand lens. Broad mite adults are whitish and translucent, or sometimes greenish or yellowish (Figure 4). Larvae are similar to the adults, but smaller and six legged. The eggs are comparatively large and elliptical in shape. Cyclamen mite adults are pale brown and translucent; the larvae are very similar to broad mite and the eggs of this species are smooth and whitish. A microscope is essential to see all the stages effectively.

The mites occur on the underside of young expanding leaves or within



4 Broad mite adults alongside their eggs

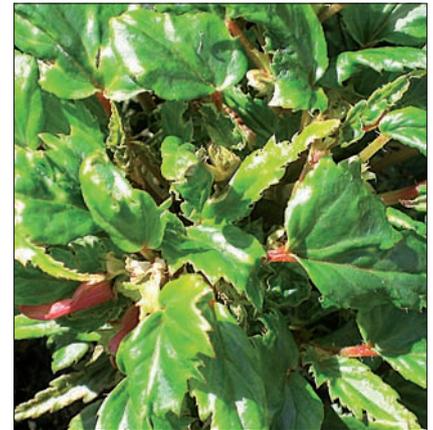
growing points, where humidity levels are highest; they are rarely found on lower leaves. Short range dispersion within a plant and from plant to plant occurs by males transporting the female pupae, so 'hot spots' of mite damage can occur. Longer range dispersion within glasshouses can occur on

workers clothing, via infested cuttings, or on air currents. The life cycle is dependent upon temperature but is relatively short: at 15°C it takes about 15 days and at 20°C about 10 days from egg to adult. They damage a wide range of ornamental plants grown under protection (see Table 1). When feeding, the

mites inject toxic saliva into the plant causing a range of symptoms including leaf scarring and distortion, mainly of new growth; leaf blackening (on celosia), leaf browning and distortion (on begonia, Figure 5), stunting, leaf thickening and distortion (Figure 6) and flecking of flowers, especially on cyclamen (Figure 1 – front page).

Table 1 Host plants of broad and cyclamen mite

Bedding plants	Pot plants
Antirrhinum	African violet
Begonia (Figure 5)	Azalea
Celosia	Cyclamen
Dahlia	Gerbera
Fuchsia	Gloxinia
Verbena	New Guinea impatiens



5 Intense leaf distortion in begonia, a result of the toxic saliva of broad mites



6 Distortion to the growing point and young leaves of New Guinea impatiens as a result of broad mite feeding

***Bryobia* mite (*Bryobia praetiosa* and *B. cristata*)**

Bryobia mites are dark reddish brown, 0.6–0.7 mm long (larger than a two-spotted spider mite), and are found mainly on the upper leaf surface. The adults have a very long pair of front legs (Figure 7), which are usually held outstretched in front of the body. Eggs and nymphal stages are also dark orange-red. Feeding causes silvering on the upper leaf surface, and this can be confused with damage caused by thrips or two-spotted spider mites.

During the summer the mites breed continuously under glasshouse conditions, and the life cycle takes about 4 weeks from egg to adult, so that 5–6 generations can be completed each year. Some mites overwinter in the glasshouse or tunnel structure, whilst others hibernate in sheltered locations outdoors. In spring, activity resumes and large numbers of mites can enter glasshouses or tunnels from grassland or grassy areas in the vicinity. The main recorded host plants of *Bryobia* mites are shown in Table 2.

***Tyrophagus* mite (*Tyrophagus longior*, *T. putrescentiae* and *T. weiswanderi*)**

The appearance of these mites is essentially very similar; they are all cream coloured, slow moving mites with conspicuous long hairs, particularly at the rear of the body (Figure 8).

They occur naturally in the soil, where they feed on rotting plant matter, and often occur in the growing media of container grown plants. Under normal conditions they cause no problems, but if conditions are favourable, (especially under high humidity levels and in the presence of organic material) they can increase in number and cause plant damage. This pest was once common on cucumbers grown on straw bales and was known as ‘French fly’.

This species feeds inside the growing points, flower buds and young leaves of plants, piercing



7 Adult *Bryobia* mite with distinctive long front legs

Table 2 Host plants of *Bryobia* mites

Bedding plants	Pot plants
Dianthus	Cyclamen
Polyanthus	Hedera



8 Adult *Tyrophagus* mite – such mites are difficult to see without the aid of a hand lens or microscope

the leaf tissue with its mouth parts. Later, as the leaves expand, small holes or irregular cavities appear, and the damage often goes unrecognised (Figure 9), or is attributed to other factors.

The presence of *Tyrophagus* mites can be established by tapping plants out over a sheet of white card, or examining growing points under a microscope. Table 3 shows the main plant species on which damage from *Tyrophagus* species has been recorded.

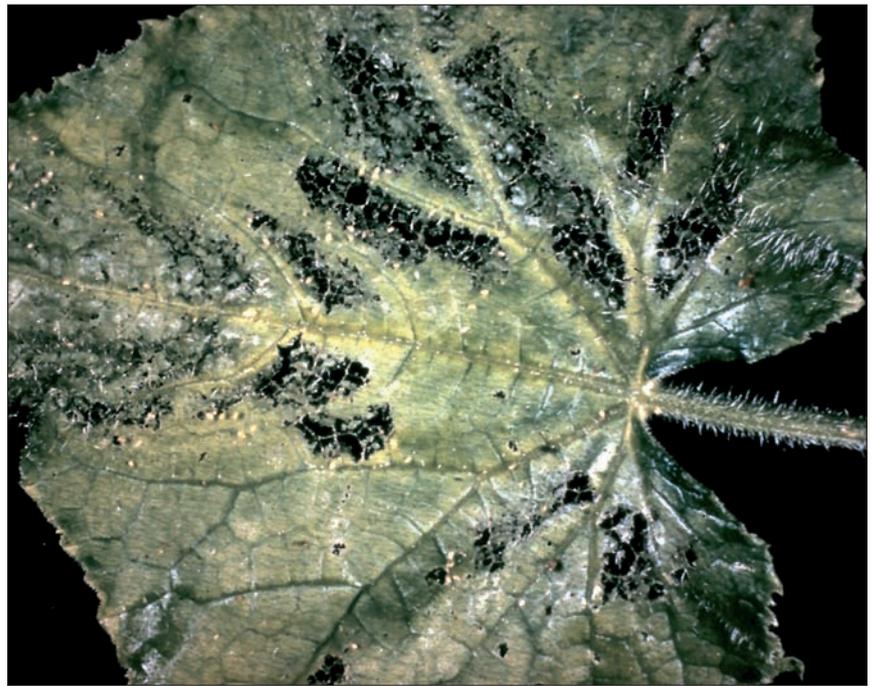
Fuchsia gall mite (*Aculops fuchsiae*)

This is a statutory, EU listed quarantine pest which attacks and seriously damages fuchsias. It is native to Brazil, but became established in California in 1981, and rapidly spread through the southern part of the state. It was first detected in Europe in 2002, and in 2006, was found in Guernsey and Jersey. By 2007, outbreaks had been found in mainland UK, in Hampshire, West London and Kent, primarily in private gardens.

Initially, statutory action was enforced by Defra Plant Health Division, but in 2008, after a further two findings in Devon and Hampshire, the policy was revised. Statutory action is now only enforced if this pest is found on commercial nurseries. It is likely that exposure to frost will eradicate this pest and so hard winters may limit its spread outdoors.

The potential for economic damage to fuchsias in the nursery trade is very significant, and so growers need to be aware of, and be able to recognise, the damage symptoms caused by this pest.

The fuchsia gall mite is sausage shaped, pale cream in colour and only 0.2–0.25 mm in length (Figure 10). Huge numbers of mites can build up in the shoots and growing points of plants, but this species is specific to fuchsia and cannot damage any other plant genera. When plants are first infested, little or no damage is visible, so cutting material can be moved within the trade unwittingly, thus spreading the infestation.



9 Damage to cucumber leaf as a result of feeding by *Tyrophagus*

Table 3 Host plants of *Tyrophagus* spp mites

Bedding plants	Pot plants
Begonia	Cyclamen
Lavatera	Gerbera
Verbena	Kalanchoe



10 Close up image of fuchsia gall mite

However growing points and new leaves eventually become distorted as a result of feeding (Figure 11). Therefore, propagators need to be fully aware of this pest and have their stock plants tested for it at regular intervals by a reputable laboratory. For further details on the biology and recognition of this damaging pest, go to the Defra Plant Health Division website link at <http://www.defra.gov.uk/planth/pestnote/fuchsia.pdf>



11 Distortion to the growing point of fuchsia as a result of the fuchsia gall mite

Control measures

Cultural and physical control measures

- Start with clean propagating material.
- Sweep up plant debris and use a recommended biocide between crops.
- Remove weeds from cracks in floor and under benches, as these can act as alternate hosts for many pest species, and maintain weed control during the season.
- Note mite hot spots if possible. For instance, two-spotted spider mite and broad/cyclamen

mites are easily carried on clothing, so always work on affected areas last.

- Discard badly affected plants and prune out infested/affected shoots.

- A hand lens (10 x magnification) is an invaluable tool to confirm the presence of mites. The lens is also useful when introducing biological control agents, to help assess the ratio of predatory mites to prey.

Monitoring

- Sticky traps are ineffective for monitoring mite outbreaks. There is no substitute for regular and intensive crop walking, carried out by someone who has been trained to recognise the early symptoms of mite damage.
- Concentrate on known susceptible plant species or cultivars.

Biological control

There are a range of commercially available predatory mites and a predatory midge for use in biological control programmes (Table 4), but there are also several predators that occur naturally outdoors (Appendix 1) that can supplement the control of pest mite species.



12 *Phytoseiulus persimilis* is heavily relied upon for two-spotted spider mite control



13 *Amblyseius californicus* can be used to supplement *Phytoseiulus* for two-spotted spider mite control during summer months

Table 4 Commercially available biological control agents

Mite species	Biological control agent	Comments
Two-spotted spider mite	<i>Phytoseilus persimilis</i> (Figure 12)	Mainstay of biological control programmes. Dies out when no prey present and less effective at high temperatures. Needs a regular planned programme of introductions during the summer.
	<i>Amblyseius andersoni</i>	Feeds on a range of prey, so can establish early and late season, and augment a biological control programme. Common species outdoors, overwinters successfully.
	<i>Amblyseius californicus</i> (Figure 13)	Active at high temperatures, can also feed on a range of prey, and may overwinter successfully in some areas.
	<i>Amblyseius swirski</i>	Feeds mainly on thrips and whitefly but will also feed on spider mites.
	<i>Feltiella acarisuga</i> (Figures 14 & 15)	The larvae of this midge are predators of all active stages of mites. Most effective in 'hot spots' of spider mite.
Broad mite/ cyclamen mite	<i>Amblyseius californicus</i>	Research has shown that this species can complete its development on broad mite and so has potential. Further research work is needed in this area.
	<i>Amblyseius cucumeris</i>	This predatory mite is used widely for the control of thrips, but is known to enter growing points of plants, and prey on broad and cyclamen mites. However complete control is unlikely.
	<i>Amblyseius swirski</i>	This species takes a wide range of prey including broad mites.
<i>Bryobia</i> mite		Predatory mites which feed on a range of mite prey may feed on the eggs and larvae of <i>Bryobia</i> mite, but no research has been carried out to confirm this.
<i>Tyrophagus</i> species	<i>Hypoaspis</i> sp (Figure 16 – overleaf)	These predators feed on a range of prey and have been shown in trials to attack <i>Tyrophagus</i> mites. However, complete control is unlikely.
	<i>Amblyseius cucumeris</i>	When present on the crop in high numbers, this predator can contribute to biological control.
Fuchsia gall mite		No recommendations for biological control.



14 Larva of *Feltiella acarisuga* which can be used to eradicate hot spots of spider mite



15 Pupa of *Feltiella acarisuga*. The adult predatory midge emerges from the cocoon



16 *Hypoaspis* species may attack and give some control of *Tyrophagus* within the growing media

Chemical control

There are currently a range of acaricides which can be used on protected ornamental crops many of which are compatible with natural enemies, as shown in Table 5. It is important to note differences between acaricides in terms of the mite stages controlled and the chemical group to which each product belongs to, as the rotation of products from different groups is vital to reduce the development of resistant strains of mites. At present, there is evidence to indicate that some UK strains of two-spotted spider mite have resistance to tebufenpyrad and fenpyroximate and also that there is some resistance to bifenthrin. Resistance to abamectin is suspected in some cases but not yet proven.

Product approval status

On-label approvals

Many of the product label recommendations listed in Table 5 specify mite control in ornamental plant production. As such the products can be used in bedding and pot plant production, but it is important to emphasise that crop safety on a range of varieties should be tested first.

Specific off-label approvals

Some products may be used on ornamental crops, including bedding and pot plant crops, via specific off-label approvals (SOLAs). It is important to recognise that these uses are not supported by manufacturers and therefore are, in all cases, at the growers' own risk (Figure 17).

Use by extrapolation

Due to changes in EU pesticide legislation the Long Term Arrangements for Extension of Use (LTAEU) are gradually being phased out and replaced (in some cases) with specific off-label approvals (SOLAs). A number of active substances have already been evaluated and SOLAs issued. For these active substances the LTAEU cease to apply on 1 June 2009. For all other active substances the LTAEU continue until such time that the product comes up for re-registration.



17 Growers must realise that the use of specific off-label approvals (SOLAs) is entirely at their own risk

Table 5 Commercially available acaricides approved for use in the UK for mite control on ornamental crops (May 2009)

Insecticide group and product	Active ingredient	Stages controlled			Permitted on crops		Approval status	Compatibility with IPM	Comments
		Egg	Nymph	Adult	Protected	Outdoors			
Macrocyclic lactone									
Clayton Abba	abamectin	x	✓	✓	✓	x	Label approval for use on ornamentals.	Moderate. Some effect on predatory mites only short term.	Contact acting and translaminar. Effective against both tarsonemid and spider mites.
Dynamec		x	✓	✓	✓	x			
METI inhibitor									
Masai	tebufenpyrad	✓	✓	✓	✓	✓	Continuation of LTAEU from SOLA 0131/2008.	Yes. Safe to beneficial insects and mites.	Good spray coverage needed, resistant strains are known in UK. Effective against both tarsonemid and spider mites.
Sequel	fenpyroximate	✓	✓	✓	✓	x			

Table 5 continued...

Table 5 continued...

Insecticide group and product	Active ingredient	Stages controlled			Permitted on crops		Approval status	Compatibility with IPM	Comments
		Egg	Nymph	Adult	Protected	Outdoors			
Oxazoline									
Borneo	etoxazole	✓	✓	x	✓	x	SOLA approval 1216/2008.	Yes.	Does not control adult mites, only eggs and nymphs.
Pyrethroid									
Brigade 80 SC	bifenthrin	x	✓	✓	✓	✓	Label approval for use on ornamentals. *Until July 2010	No. Harmful to beneficials for several weeks.	Contact acting only, very broad spectrum activity. Resistant strains are known in UK. Likely to have some effect on both tarsonemid and spider mites.
Gyro*		x	✓	✓	✓	✓			
Starion Flo		x	✓	✓	✓	✓			
Talstar 80 Flo		x	✓	✓	✓	✓			
UPL Bifenthrin*		x	✓	✓	✓	✓			
Tetronic acid									
Oberon	spiromesifen	✓	✓	✓	✓	x	Used under SOLA 1718/2004.	Yes. Good compatibility with IPM programmes.	Slow acting as inhibits lipid synthesis. Active against spider mites and broad/cyclamen mite.
Tetrazine									
Apollo 50 SC	clofentezine	✓	✓	x	✓	✓	Continuation of LTAEU from SOLA 2268/2001 or 2271/2001.	Yes. Safe to beneficial mites and insects.	Contact acting only, good spray coverage required. Only controls eggs and young stages of two-spotted spider mite.

Table 5 notes:

- **Floramite 240 SC (bifenazate) is also available, but its future use on protected ornamentals beyond June 2009 has yet to be confirmed.**
- For full list of pest targets, application rates, activity spectrum and crop safety issues see individual product labels.
- For full details of compatibility with biological controls, contact the supplier.
- Read the label before application of any acaricide, and restrict application frequency to that specified on the label.
- To reduce resistant strains of mite arising, always alternate products from different chemical groups.
- Two-spotted spider mite outbreaks may require several applications in order to achieve good control, and tarsonemid mites are particularly difficult to control. The addition of adjuvants such as wetters (at growers own risk) may help with the control of tarsonemid mites.

Further information

Useful publications

- Alford, D.V. (1991). A colour atlas of pests of ornamental trees, shrubs and flowers. Wolfe Publishing Ltd.
- Malais, M.H. and Ravensberg, W.J. (1992). Knowing and recognising: the biology of glasshouse pests and their natural enemies. Koppert BV and Reed business information.
- Plant pest notice; Fuchsia gall mite. Colour information leaflet available from the CSL website; www.csl.gov.uk
- HDC Factsheet 08/05 – The biology and control of two-spotted spider mite in nursery stock.

Acknowledgements

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Appendix 1 Predators that occur naturally and may be found outdoors or under protection

Predator	Description	Comments
<i>Amblyseius andersoni</i>	Found naturally on many species of trees and shrubs. Overwinters as adults.	An abundant and widespread predatory mite, which feeds on two-spotted spider mite. Many other predatory mite species occur naturally but <i>A. andersoni</i> is one of the most common.
Anthocorid bugs (<i>Anthocoris</i> spp)	Several species native to the UK, adults are black and brown, about 4 mm long.	Adults and nymphs are voracious predators of mites, aphids and other small prey. Adults fly readily.
Black kneed capsid bug (<i>Blepharidopterus angulatus</i>)	Common and widespread predatory bug.	Adults and nymphs feed on mites, aphids, thrips and other small prey.
<i>Stethorus punctillum</i>	Tiny black ladybird, adults can fly and are attracted to colonies of spider mites.	Only found where significant numbers of mites have built up. Adults and larvae are active predators on all stages. Likely to predate upon two-spotted spider mite.
<i>Typhlodromus pyri</i>	A very common species found in many habitats especially fruit trees.	Feeds on pollen, fungal spores and mites, especially fruit tree spider mite but also many other species of mite pests.

Additional information: