

Management of Broad Mite & Cyclamen Mite in Production Nurseries

Production nurseries are ideal environments for mite pests as plants are often lush and actively growing. This can lead to a rapid increase in mite populations that cause severe damage. Broad mite and cyclamen mite can be particularly challenging because they cannot be seen with the naked eye and may not even be visible with a hand lens. As a result, damage to crop plants can be the first sign that they are present. The two species can be found on most above-ground plant parts, however, there is a preference for the growing tips and expanding leaves, which can be grossly deformed by even small populations. Management of these pests should include a range of cultural practices and preventative actions, particularly if they are regularly encountered pests at your nursery. Do not rely solely on pesticides as both species are naturally resistant to a range of products.

DESCRIPTION

Broad mite (*Polyphagotarsonemus latus* – even experts just say “P” *latus*) and cyclamen mite (*Phytonemus pallidus*) are both from the same family of mites (Tarsonemidae). They both can cause similar damage (see below) but broad mite has a more extensive host range and distribution. Both species are essentially microscopic (about 0.1–0.3mm)



Severe broad mite infestation on *Hedera*.

and generally require a microscope to be observed with confidence. Both species are similar in appearance. Females are typically ovoid and may have light brown to deep amber colouration. Males are smaller than females, more circular to globular in shape and their last pair of legs are much stronger than females. Males are opaque in colour but develop a light brown to amber colouration over time. Larvae have six legs, are whitish in colour and often appear pointed at the back of the body. They gain an extra pair of legs when they moult into adults.

Broad mite can be easily identified to species level by observing their eggs, which are dome-like, with a flat base and have white polka-dot-like structures on top (tubercles). Broad mite is the only species with this type of egg and can be used by staff to make a positive identification. Cyclamen mite eggs are more typical of many mites, being opaque and ovoid in shape.

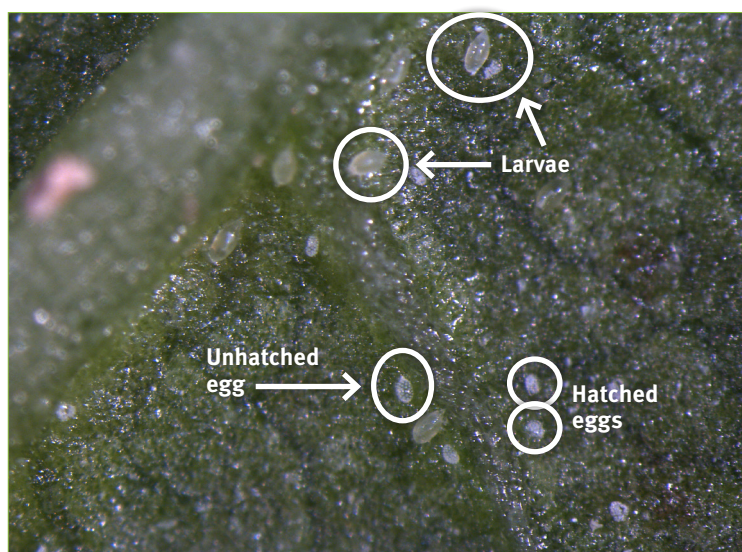
LIFECYCLE

Like all species from this family, broad mite and cyclamen mite have only three life stages: egg, larva and adult; nymphs tend not to occur. Under ideal conditions, their lifecycle can be completed in under a week, so populations can build up very quickly. But development times vary substantially depending on the host plant species and environmental conditions so can take 2–3 weeks in certain situations. Both species develop throughout the year when temperatures are suitable.

Most individuals are female. Male broad mites will find and carry female larvae that are ready to turn into adults on their back. After the larva turns into an adult, he will mate with her and repeat the process. Unmated cyclamen and broad mites can still lay eggs.



Male broad mites (orange) carrying immature females (opaque).



Broad mite eggs and larvae. White polka dots are more easily observed when eggs are unhatched, however they are still visible after they have hatched.

DAMAGE HOST RANGE AND SPREAD

Broad mites tend to damage young leaves and growing tips, and are mainly present on the underside. At high infestations, leaves do not expand normally and tend to be deformed, crinkly and small. Flowers have a distorted appearance or have discoloured rays and fruit may have corky, russetting symptoms. Plant growth may effectively stop when all growing tips are infested, and the plant may die when damage is severe for extended periods of time. On some host plants, young growth may crack, swell and necrotic areas may occur, like damage caused by herbicide. Broad mite damage can also be mistaken for virus infection and even nutritional disorders.

Broad mites have been reported from at least 57 plant families including some monocots (e.g. orchids) and many dicots including weed species. Many vegetable crops are severely affected, including beans, brassicas, capsicums, chillies, cucumbers, tomatoes, potatoes and eggplants. Many fruit crops are also damaged including citrus, avocado, blackberry, melons, mango, passionfruit raspberry and grapes. Ornamental crops are also damaged including camellias, datura (weed and ornamental species), gerberas, impatiens, basil, African violet, begonia, chrysanthemum, cyclamen, dahlia, fuchsia, verbena, zinnia, pittosporum and hibiscus among many other species; some weeds are also damaged.



Male and female broad mites.



Cyclamen mite adults, larvae and eggs.
Photo by University of California.

Cyclamen mites also damage young leaves and flowers. However, they typically feed on the upper leaf surface, particularly when leaves are folded. Leaves can appear twisted, curled, deformed, and fail to expand normally. Some host plants (e.g. gerbera) may have bronzed patches along midribs and flowers become deformed. Cyclamen mite also has a wide host range, but not quite as much as broad mite. This includes cyclamen, African violet, azalea, begonia, chrysanthemum, gerbera, geranium, petunia, snapdragon and other ornamentals.

Broad mites and cyclamen mites can spread short distances by walking, particularly when leaves of adjacent plants are touching. They may also spread by wind, infested equipment and are known to hitch-hike on silverleaf whitefly and glasshouse whitefly.

Low populations tend to cause very little or undetectable levels of damage, so they can spread within a nursery without being observed. Noticeable damage only occurs when sufficient numbers are present and can often seem to appear as if overnight. Also, their damage can be similar to that caused by other factors (e.g. nutrient deficiency, environmental conditions, damage from thrips, treatment with plant hormones, or low-dose herbicide damage). Therefore, misidentification is a common problem that can lead to mismanagement. For these reasons it is important to confirm the presence of mites before management actions are implemented.



Moderate damage to chilli caused by broad mite.

MANAGEMENT

Tarsonemid mites can be managed using a combination of cultural, biological, and chemical management strategies. Pesticides should not be the sole management approach due to their natural tolerance to pesticides and the risk of developing pesticide resistance. For host plants that are regularly damaged by broad or cyclamen mites it is recommended to monitor and recognise the earliest signs of damage. Monitoring could also involve using an even more susceptible host plant as a sentinel plant.

MONITORING

Tarsonemid mites are so tiny that they cannot be observed without significant magnification (at least using a x20 hand lens). Your nursery will have the best chance of early detection using a stereo (dissecting) microscope. It should have a good light source and preferably have a camera so you can send pictures to experts for confirmation. A basic microscope with a camera can be purchased for less than a thousand dollars. Purchasing from a reputable and professional microscope supplier (e.g. Olympus, Nikon, Zeiss and Leica) will likely cost more, but the microscope will have higher quality hardware and superior camera software. These companies often provide on-site technical support that includes training staff to use the equipment.

Examine the damaged plant tissue under the microscope, keeping in mind that the damage may have been caused by mites feeding on the growing tip; they may not be present on older foliage. Also the presence of hatched eggs can provide evidence that broad mites have been present and damaged the crop, even if adults are not present. Be sure to use sufficient magnification that even the smallest mites and eggs will be observed (ideally x40 magnification).

Keep track of plant species and varieties that are susceptible to tarsonemid mites, and the conditions associated with infestations (e.g. warm spring conditions). During high-risk periods, frequently monitor (twice per week) the health of growing tips and flowers of highly susceptible species. Remove growth that appear suspicious and examine it under the microscope (reliance on a hand lens to detect broad mite or cyclamen mite can lead to misidentifying of the problem).

It may also benefit the nursery to develop a quality assurance program when collecting cuttings from susceptible plant lines. Monitor mother stock regularly leading up to when cuttings will be taken using a microscope to ensure no broad mites are present on growing tips and newest growth.

It is important to understand that there are many mites that appear very similar to cyclamen mite that can occur on plants. If you observe mites that could be cyclamen mite continue monitoring carefully for damage to plants. If no damage occurs the mites observed may not be pests.



Many unhatched broad mite eggs.



Broad mite russetting damage on a lime.

CULTURAL MANAGEMENT

The following actions that will reduce the likelihood that broad mite and cyclamen mite will infest or reinfest your crop.

1. Always inspect incoming stock for pests and diseases, including mites. Ideally, hold new stock in a separate area for 1–2 weeks (depending on the crop and practical constraints) before incorporating with other nursery stock. For high-risk lines it is recommended to inspect the growing tips of some plants under a microscope.
2. Quarantine or place a buffer around infested plants to reduce their spread to other susceptible lines. Reduce staff movements to areas of the nursery that are known to have mite infestations. Visit these areas last and do not re-enter 'clean' areas.

3. Discard plants that are unsalable. Highly infested plants that remain in the growing area increase the likelihood that they will spread to other plants.
4. Remove heavily infested growing tips and stems if practically feasible. Ensure the material is bagged and placed in a covered bin.
5. Remove all discarded material from the growing area promptly and do not discard plants onto a compost pile on site.
6. If possible, grow highly susceptible plants under protected cropping that may be modified to exclude a wide range of pests, particularly whiteflies that can spread broad mites and cyclamen mites. Even keeping doors closed can reduce the incidence of various pests.
7. Whenever possible, grow resistant/tolerant varieties.
8. Conserve natural enemies by only spraying pesticides when monitoring indicates that numbers will reach damaging levels. Apply products soft on beneficials. Avoid applying highly residual, broad spectrum products, e.g. organophosphate, pyrethroid, neonicotinoid and similar products).
9. If pesticides are required, apply to hot-spot areas and high-risk plants (i.e. not a blanket spray), which will help conserve natural enemies. Ensure that heavily infested growing tips and whole plants are discarded before applying pesticides.
10. Remove weeds within and around the nursery as they can be alternative hosts for pests.
11. Only propagate from clean plant material. If the plant species has a history of infestation, examine a subset of the propagation material to ensure tarsonemid mites are absent, i.e. establish a quality assurance program.

BIOLOGICAL CONTROL

There are several predatory mites that can feed on broad mites and cyclamen mites that are commercially available including cucumeris, californicus, montdorensis and the new product doreenae (Table 1). All of these predators also feed on a range of food items sometimes including thrips, whitefly, spider mites and other small mites. They are only effective if applied against relatively low populations of broad mite and cyclamen mite. Doreenae is a relatively new product that may be more specialised towards broad mite and cyclamen mite.

In general, these predators will be effective between the temperatures of about 18–30°C, though some species are better suited to higher temperatures than others. There are

several advantages for using predators over pesticides. Predators move between plants in search of mites and feed on many stages of the pest, including eggs. Under good environmental conditions they can provide long-term management of mites without ever damaging plants. Some predators also feed on multiple groups of mites making them more versatile for preventing mite populations. Biological control can also be used on short-term crops that are susceptible to mite damage and commercial packs of some products are relatively inexpensive making it cost-effective even for small infestations.

Like pesticides, the application of commercially available predators may not always be possible (e.g. extreme temperatures above 35°C or below 10°C). The application of highly residual and broad-spectrum pesticides (insecticides, miticides and fungicides) will also preclude the successful release of almost all predator species. Until you are relatively experienced with the predator, seek advice from the biological control agent producer (before release). Refer to the factsheet on [management of beneficials in production nurseries](#) for more information.

TABLE 1. COMMERCIALY AVAILABLE BIOCONTROL AGENTS THAT CAN BE USED AGAINST BROAD MITE AND CYCLAMEN MITE

| COMMON NAME | CALIFORNICUS | CUCUMERIS | DOREENAE | MONTDORENSIS |
|------------------------|--|---|---|---|
| Scientific name | <i>Neoseiulus californicus</i> | <i>Neoseiulus cucumeris</i> | <i>Typhlodromus doreenae</i> | <i>Typhlodromips montdorensis</i> |
| Description | Buff to tan, teardrop shaped mites <1mm long. | Buff to tan, teardrop shaped mites <1mm long. | Buff to tan, teardrop shaped mites <1mm long. | Opaque, transparent, white to yellow teardrop shaped mites <1mm |
| Diet | Primarily spider mites, but also other small mites including broad mites | Thrips, whitefly, spider mites, broad mites, cyclamen mites | Broad mite, rust mites, Bryobia mite and probably other mites | Whiteflies, thrips larvae, broad mite, rust mites, variety of other small insects and mites |
| Supplier | Bugs for Bugs and Biological services | Biological Services | Biological Services | Bugs for Bugs and Biological services |

CHEMICAL CONTROL

The regular, scheduled use of pesticides against broad mite and cyclamen mite is not recommended because their natural tolerance and tendency towards becoming resistant. Furthermore, both species tend to occur in the growing tips and curled leaves. As a result, many contact products are not suitable for use against these mites. Systemic and translaminar products are more likely to be effective. Very few products are registered for use against broad mite and cyclamen mite, preserve their use for when pest pressure is high. The following recommendations apply when using pesticides to manage broad mite and cyclamen mite.

1. Prune or remove highly infested plant material prior to pesticide application.
2. Apply to hot spot areas and perhaps nearby susceptible crops.
3. Apply products that are not as toxic to predators and apply predators when pest populations are low and other conditions are suitable.
4. Apply translaminar or systemic products
5. Rotate between products of different modes of action.
6. Oil products can sometimes improve efficacy but should not be used without a translaminar or systemic product.

TABLE 2. PRODUCTS AVAILABLE FOR USE AGAINST BROAD MITE AND CYCLAMEN MITE IN PRODUCTION NURSERIES (AS AT JANUARY 2022).

| MOA | ACTIVE | EXAMPLE TRADE NAME | PESTS | ACTION* |
|------|---------------------------------|--------------------|--|------------|
| 6 | Emamectin | Proclaim | All mites (PER81707) | C, T |
| 6+28 | Abamectin + Chlorantraniliprole | Voliam Targo | All mites (PER88695) | C, I, T, S |
| 12A | Diafenthiuron | Pegasus | All mites (PER81707) | C, I, T |
| NA | Petroleum oil | Pestoil | All mites (PER81707) | C |

* Action: C = contact; S = systemic; I = ingestion; T = translaminar

This factsheet was written by Andrew Manners and Emily Lancaster (Queensland Government, Department of Agriculture and Fisheries - DAF) as part of the Hort Innovation, Nursery Levy and DAF funded project "Resourcing, supporting, and assessing biosecurity in nursery production (NY20000)" in 2021. It was originally written as part of a mite pest management plan in 2015.