

Mite pests of citrus

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There are five mite pests of citrus in New South Wales. They damage fruit, leaves, twigs and buds. They are citrus red mite, *Panonychus citri*, brown citrus rust mite, *Tegolophus australis*, citrus rust mite, *Phyllocoptruta oleivora*, broad mite, *Polyphagotarsonemus latus*, and citrus bud mite, *Eriophyes sheldoni*. A flat mite, *Brevipalpus* sp., is sometimes found on the trees, but does no harm.

Mites are not insects and are related more closely to spiders and ticks. They are very small and most of the citrus pest mites are almost invisible to the naked eye. These mites pierce plant surface cells with their mouth parts and suck out the cell contents. The damage is typical for each pest mite.

Citrus red mite

Citrus red mite, which damages both the leaves and fruit, is one of the world's worst pests of citrus. Red mite was first recorded in Australia at Oxford Falls, a Sydney suburb, in 1966. It has since been found in other parts of the Central Coast of New South Wales, including orchards near Gosford, in the County of Northumberland and in Sydney metropolitan home gardens, in the County of Cumberland. This mite has not been recorded elsewhere in Australia.

Alternative hosts such as rose, almond, pear and several broad-leaved evergreen ornamentals have been recorded overseas, but to date, only citrus has been infested in New South Wales.

Citrus red mite is not a serious pest on the Central Coast. The high humidity and an abundance of

natural enemies usually keep red mite population levels low. However, it could be very damaging in inland areas, where the dry conditions would be more favourable for the development of the mite, and the trees grown in dry areas are more susceptible to damage. To prevent spread of citrus red mite there are restrictions on movement of citrus trees and propagating material from the Central Coast*.

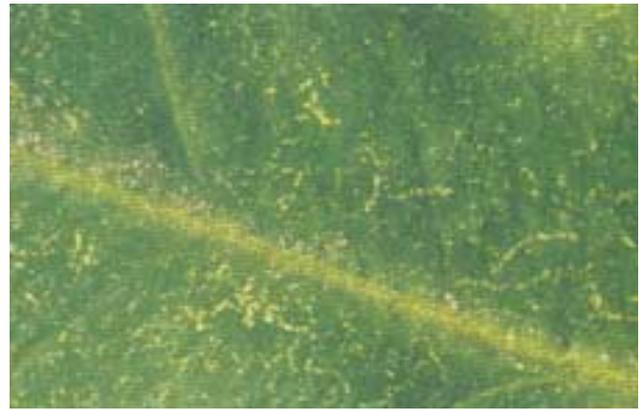
The mites feed on leaves, preferring light green, maturing foliage, on green bark and on immature and mature fruit. The scratch-like feeding marks give the leaves and green immature fruit a pale appearance. Injured mature oranges and lemons turn a pale straw yellow. On the Central Coast orange trees are the preferred host. In very light infestations the feeding marks are most commonly at the base of the upper leaf surfaces.

Heavy infestation when trees are under stress from drying conditions such as mild dry winds and low soil moisture leads to defoliation, fruit drop and twig and branch dieback. These dry conditions often occur on the Central Coast in autumn, early winter and spring. Defoliation starts in the tops of trees.

* It is an offence under the Plant Diseases Act to move citrus trees and propagating material from within the shire of Wyong and City of Gosford to any place other than within the Counties of Cumberland or Northumberland without a permit from an Inspector under the Act. Before granting such a permit the Inspector is required to supervise a quarantine treatment to prevent the spread of citrus red mite on the trees or propagating material.



Citrus red mite, adult female. Length up to 0.5 mm. Photo M. Hill



Citrus red mite feeding marks on leaf. Photo M. Hill



Citrus red mite and cast skins, eggs and egg shells. Eggs are about 0.13 mm in diameter. Photo M. Hill



Citrus tree partially defoliated by citrus red mite (unaffected tree behind). Photo L. A. Scott

Adult female mites are oval-bodied, plump, up to 0.5 mm long, with 4 pairs of legs. They resemble the bean spider mite which infests beans, cucumbers and many ornamental plants, but are dark red to purple red and have long bristles on prominent tubercles on the back and sides. Males are smaller, and abruptly narrowed towards the rear.

The adult females lay 20 to 30 eggs, at a rate of 2 or 3 per day, placing them on the infested surface, commonly along the midribs of the leaves. The egg is about 0.13 mm in diameter, bright red and nearly spherical. There is a vertical stalk on the top of the egg with 10 or 12 very fine guy threads radiating from the tip of the stalk to the plant surface. Mite larvae, which have 3 pairs of legs, hatch from the eggs in 8 to 30 days. They develop through 2 nymphal stages (with 4 pairs of legs), each lasting several days, then become adults.

In summer, a generation from egg to egg may be as short as 3 weeks, and adults may live 18 days. Development continues all through the year, but at a slower rate in cool conditions. Extremely hot dry weather accompanied by wind usually causes high

mortality of the mites. Prolonged periods of high humidity are also unfavourable to them.

Brown citrus rust mite **Citrus rust mite**

These mites blemish citrus fruits. They are important in New South Wales mainly in the humid coastal districts, particularly the North Coast. Sometimes rust mite damage is important in wet summers in north-western districts such as Narromine. Generally they are of little consequence in hot dry areas in the south-west of the State.

Citrus rust mite is a serious pest of citrus in many tropical and sub-tropical areas of the world. Brown citrus rust mite is native to Australia and has only been recorded in New South Wales and Queensland. Here it is the more common of the two mites. Records in New South Wales suggest that citrus rust mite prefers grapefruit and lemon, and brown citrus rust mite prefers orange and mandarin. Citrus is the only host for both mites.

Each of these pests causes a typical blemish on the skin of the fruit. Brown citrus rust mite attacks the outer exposed surface of the fruit, preferring the ins n



Oranges blemished by brown citrus rust mite. Photo M. Hill



Grapefruit blemished by citrus rust mite. Photo J. G. Gellatley



Photomicrograph of rust mite blemish on orange. The mites' elongate white cast skins are present. It is characteristic that the blemish markings have poorly defined edges. Photo M. Hill

outside fruit on the trees, causing a smooth blemish, the skin appearing as if polished with dark tan shoe polish. Citrus rust mite prefers more sheltered fruit, inside the tree, and the inner surfaces of the fruit, and causes a slightly rough, greyish-brown blemish with the outside edges deeper brown. The blemishes by both mites show up prominently when the fruit colours, and become more severe the longer the fruit remains on

the tree. Blemished fruit lose water faster than undamaged fruit and appear smaller and substandard, deteriorating rapidly.

Fruit blemish results from infestation by huge numbers of mites on green, immature fruit in summer-autumn. On heavily infested young fruit the mites and their cast skins can be seen as a dust-like layer on the fruit surface.

Rust mites can also cause bronzing of leaves and green twigs, with general loss of tree vigour, sometimes resulting in severe damage to young trees.

Brown citrus rust mite adults are about 0.18 mm long, light to dark brown, broad and strongly wedge-shaped, and have 2 pairs of legs. The females lay disc-shaped, transparent eggs singly in depressions on fruit and leaf surfaces near where the mites are feeding. Immature mites are lighter in colour than the adults, and slimmer.

Citrus rust mite adults are 0.13 to 0.17 mm long. The females are longer than the males. Both are yellow to yellow brown, spindle-shaped and rather slender, with 2 pairs of legs and a pair of false feet on the last abdominal segment. The adult females deposit spherical, pale, large eggs singly in depressions on fruit and leaf surfaces.

Female citrus rust mites have been observed laying up to 29 eggs each. The eggs hatch in about 3 days in summer. There is a larval stage and a nymphal stage before the immature mites become adult. The life cycle from egg to adult can be as short as 7 to 10 days, so there are many generations during summer-autumn. Development continues in winter and spring, but at a slower rate.

Broad mite

In New South Wales, broad mite sometimes seriously blemishes lime and intermediate crop lemons. This fruit can be very valuable, so down-grading because of the blemish causes serious loss of profit. Broad mite has been recorded only in coastal districts. It can develop on a wide range of broad-leaved crop, ornamental and weed plants. Warm, humid summer-autumn weather and availability of tender growth provide ideal conditions.

Intermediate crop lemons are produced from summer and autumn blossoming. When affected by broad mite they are blemished severely during their first few weeks of growth, while 1 to 4 cm long. The injury shows as an extensive silver or lead coloured blemish with "sharkskin" texture, often extending over the whole fruit surface. Sometimes the blemish has



Lemon blemished by broad mite. Photo M. Hill



Lemon foliage bunched and distorted by citrus bud mite. Photo M. Hill



Broad mite adult and tuberculate eggs. The eggs are about 0.1 mm long. Photo M. Hill

bronze coloured margins. Fruits low on the trees are usually affected first.

Main crop lemons are not damaged significantly. They are produced from spring blossoming and are beyond the susceptible size range when weather conditions favour development of broad mite.

Blemishing on main crop Valencia oranges has been seen as diffuse brown markings on slow-growing young fruit, usually inside or on the south side of the tree.

Broad mite can damage young foliage of citrus, and this can harm the development of nursery trees. Infestation develops on young, tender foliage and the mites can be found on the undersides of the leaves. Affected leaves become narrowed and distorted, with a pronounced downward curling of the margins, and are often bronzed on the lower surface.

Young stem growth may be distorted and the plants look as if damaged by herbicide. The adults are active, 8-legged mites, shiny, translucent white or very pale yellow, and oval—shaped. Females are about 0.25 mm long but males are smaller. The eggs, about 0.1 mm long and ornamented with tubercles on their upper

surface, stick firmly to the infested tissue. The life cycle under glasshouse conditions has been recorded as: females produce 5 eggs per day in an average life of 10 days; eggs hatch in 2 to 3 days; young mites become adult within a further 4 days.

Often the mites cannot be found on damaged tissue. Before mating, pre-adult females are carried about by males, which move actively. By this means new sites become infested and old sites depopulated, for unfertilized females produce only male young.

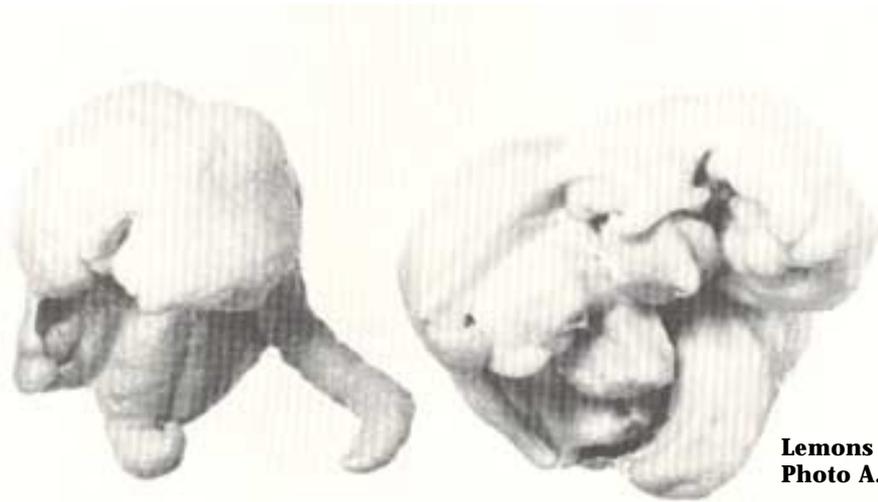
Citrus bud mite

Feeding by citrus bud mite in foliage and blossom buds causes distortion of shoot growth, deformed blossoms and sometimes deformed fruit. This occurs throughout the citrus growing areas of New South Wales, but is mainly important in coastal districts. Mature trees may be affected and nursery trees can be severely damaged. The damage is most frequent on lemons and navel oranges and, to a lesser extent, on grapefruit and some common oranges. Valencia oranges and mandarins are not much affected.

Foliage growth from infested buds is seriously distorted. Rosetting or bunching of leaves at the apex of the shoot is common. On vigorous trees the shoots may be flattened and twisted and leaves are deformed—often constricted at the middle or indented at the apex. Weak trees have many short, thin shoots with small, narrow leaves.

Bud mite damage in the blossom buds causes deformed flowers and these sometimes set and produce distorted and sometimes grotesquely shaped fruit.

The mites are mostly found on tender tissue in leaf axil buds on recent shoot growth. On older wood the buds are small and the mites penetrate deeply into their centres. In heavy infestations there may be 100



Lemons deformed by citrus bud mite.
Photo A.Searle

mites in a single bud. The bud scales are blackened by the mites' feeding and the bud may die. Secondary buds may develop at the base of the injured bud and, in turn, become infested. The mites also occur in flower buds, and beneath the calyx lobes of fruit.

The adult mites are about 0.17 mm long, worm-like, with 2 pairs of legs, and are cream or pale pink. Each female deposits about 50 eggs singly on tender tissue where the mites are feeding. The eggs are globular, large compared with the mites' size, and glistening white. They are most abundant during late winter and spring, but are present at any time of the year. There are 4 immature stages of the mites—2 mobile feeding nymphal stages and 2 moult stages that remain still. The period from egg to adult is 10 to 15 days in summer and autumn, and 2 to 3 times longer in winter. Many generations develop during the year.

Citrus bud mite injury is sometimes confused with minor element deficiency symptoms. For field identification, the symptoms of bud mite infestation are the rosetting of the leaves at the tips of some twigs and the variations in shape, especially irregular margins, of leaves. Foliage, fruits and flowers are normal in colour and texture. There is no gum staining and no dieback of twigs or leaf fall.

Flat mite

Flat mites occur on citrus trees in coastal and inland areas. They are not known to be pests of citrus in New South Wales, but as they are often seen on maturing, blemished fruit, they have been blamed in the past for the blemish on lemons caused by broad mite.

The mites are red and flat, and adults are about 0.25 mm long, with 2 pairs of short legs at the front of the body and 2 pairs of short legs flanking the narrow

abdomen. The eggs are red and oval, and usually laid singly. These mites are rarely seen moving about.

DISPERSAL OF CITRUS MITES

Mites can disperse within and between trees by a number of means. Most can wander around over a limited area of the plant surface. They can be dislodged easily and transported by wind or rain, or by visiting birds and insects, or by people or machinery working between the trees. Nursery trees may be infested due to use of infested budwood.

CONTROL

Natural

Natural enemy mites and insects commonly prey on pest mites in coastal orchards. The predatory mites play an important role in suppressing citrus red mite and the citrus rust mites but the insects—mainly ladybirds—are less useful. They do not increase their numbers rapidly until the pest mites are present in high numbers. The natural enemies of broad mite and citrus bud mite have not been studied.

Three predatory mites—*Amblyseius elinae*, *A. deleoni* and *A. lentiginosus*—feed on citrus red mite and the citrus rust mites in coastal orchards. The adult mites are shiny, off-white, about 0.4 mm long with 4 pairs of legs and are easily visible to the naked eye. They shelter alongside the midribs on the undersurfaces of leaves, under the sepals on fruit and in cracks in the bark, but can move rapidly over the plant surface. They also feed on pollen from various plants.

Many species of ladybirds occur in coastal citrus orchards. The most common are the steel blue ladybird, *Halmus chalybeus*, *Serangium bicolor* and *Stethorus nigripes*. Adult *H. chalybeus* are round, about 4 mm in diameter and metallic blue in colour. This ladybird feeds on a wide range of insects and mites. Adult *S.*

bicolor are slightly ovoid, about 2 mm long and black. Adult *S. nigripes* are oval, about 1.2 mm long and black. It is the most common ladybird associated with heavy infestations of citrus red mite. Large numbers of adults and larvae of these three ladybirds have been observed feeding on heavy infestations of citrus red mite.

Spraying

Most citrus mites are not readily visible to the naked eye. By the time much damage has been observed, spraying would usually be too late to be worthwhile. Use a hand lens at frequent intervals to look for the mites at the times when infestation is expected to commence. Pay special attention to trees recently sprayed with insecticides.

Treatment of minor infestations with low potential risk of damage is not warranted due to the cost of treatment and to possible upsets of biological control of pest mites and insects. If only isolated trees or rows of trees are likely to be seriously affected then only these trees should be sprayed.

If spraying is needed, cover the trees thoroughly with spray.

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DISCLAIMER

The information contained in this publication is based on knowledge and understanding at the time of review January 2003. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.