

# Papaw information kit

Reprint – information current in 2000



## REPRINT INFORMATION – PLEASE READ!

For updated information please call 13 25 23 or visit the website [www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)

This publication has been reprinted as a digital book without any changes to the content published in 2000. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research:

- Chemical recommendations—check with an agronomist or Infopest [www.infopest.qld.gov.au](http://www.infopest.qld.gov.au)
- Financial information—costs and returns listed in this publication are out of date. Please contact an adviser or industry body to assist with identifying more current figures.
- Varieties—new varieties are likely to be available and some older varieties may no longer be recommended. Check with an agronomist, call the Business Information Centre on 13 25 23, visit our website [www.dpi.qld.gov.au](http://www.dpi.qld.gov.au) or contact the industry body.
- Contacts—many of the contact details may have changed and there could be several new contacts available. The industry organisation may be able to assist you to find the information or services you require.
- Organisation names—most government agencies referred to in this publication have had name changes. Contact the Business Information Centre on 13 25 23 or the industry organisation to find out the current name and contact details for these agencies.
- Additional information—many other sources of information are now available for each crop. Contact an agronomist, Business Information Centre on 13 25 23 or the industry organisation for other suggested reading.

Even with these limitations we believe this information kit provides important and valuable information for intending and existing growers.

**This publication was last revised in 2000. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.**

This information has been made available to assist users to identify issues involved in the production of mangoes. This information is not to be used or relied upon by users for any purpose which may expose the user or any other person to loss or damage. Users should conduct their own inquiries and rely on their own independent professional advice.

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained in this publication.



Queensland Government



# Problem **SOLVER**

*Every crop will inevitably have a problem or two. The key to dealing with problems is prompt identification and, where appropriate, prompt treatment. This section helps you with both of these decisions. The common problems are shown in a series of pictures grouped according to the main symptoms. From the contents, find the symptom that best fits your problem. On that page you will find the symptoms, the causes and a solution if there is one.*

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## Spots or marks on leaves



### Angular leaf spot

**Cause.** The fungus *Leveillula taurica*.

**Solution.** This is a minor disease that usually occurs during autumn and spring. It is not serious enough to warrant treatment.



### Brown spot

**Cause.** The fungus *Corynespora cassiicola*. This is a serious disease in hot, wet areas and during prolonged wet periods throughout Queensland. The spores are spread during wet, windy weather.

**Solution.** Spray with a suitable fungicide from the *Problem solver handy guide*.



### Bacterial leaf spot

**Cause.** The bacterium *Pseudomonas carica-papayae*.

**Solution.** This is a minor disease. The bacteria are spread during warm, wet and windy weather. No specific control measures are required.

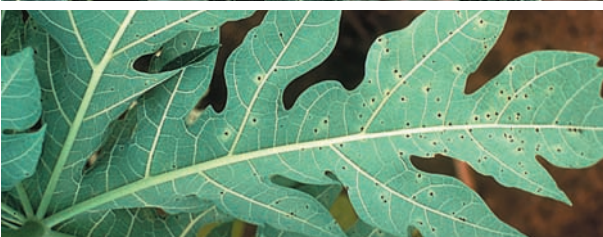


### Black spot

Upper: upper surface of leaf. Lower: underside of leaf.

**Cause.** The fungus *Asperisporium caricae*.

**Solution.** Remove badly affected leaves and fruit to reduce disease pressure. This disease is more prevalent in cool conditions, for example winter. Spray thoroughly with an appropriate chemical from the *Problem solver handy guide*. Refer to the *Key issue* on black spot control for details on spray program.





## Spots or marks on leaves



### Spray damage

**Cause.** Burning of plant tissues caused by a chemical application. Herbicides, unregistered pesticides or fertiliser products applied at too high a rate can cause damage.

**Solution.** Check that the chemicals you use are registered and are suitable for use on papaw. Do not allow spray drift from nearby spray operations to contact and cause damage to the papaw plant.



### Papaw ringspot

Left: early leaf symptoms.

**Cause.** The papaw ringspot virus.

**Solution.** There is no cure for this disease and all infected plants should be destroyed. If you suspect papaw ringspot, contact DPI immediately.

## Yellow leaves



### Nutritional deficiency

**Cause.** Several nutrient deficiencies, including nitrogen, magnesium or potassium, may cause similar symptoms.

**Solution.** Get a leaf analysis done to confirm the diagnosis and apply fertiliser as indicated by the analysis results.



### Mites

Upper: crown of papaw. Lower: fine webbing spun by the mites.

**Cause.** Two-spotted mite *Tetranychus urticae*.

**Solution.** Spider mites are normally well controlled by small predatory beetles and predatory mites. Only spray if at least 50% of inspected leaves have mites and there are no predatory beetles present. Where required, either release predatory mites (refer to *Contacts*) or treat trees with sulphur or appropriate miticide. If using sulphur, avoid applying it when temperatures exceed 24°C.



## Yellow leaves



### Yellow crinkle

**Cause.** Infection by tomato big bud phytoplasma.

**Solution.** There is no cure for this disease. When thinning plants at planting sites, maintain replacement female trees to make up for possible losses from yellow crinkle. Refer to *Key issues* for information on managing diseases.



### Mosaic

Young leaves are stunted and yellow with translucent areas around the margin. Latex flow is reduced.

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this disease. Destroy affected plants to prevent further spread. Refer to *Key issues* for information on managing diseases.



### Herbicide damage

**Cause.** A drift or overspray of herbicide. Papaws are highly susceptible to herbicide damage.

**Solution.** Take extreme care when applying herbicides near papaw. Do not spray the plants with equipment that has previously been used for herbicide application.



## Yellow leaves



### Dieback

Left: advanced dieback. Inset: close-up of leaf showing etched appearance on the underside.

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this problem. Vigorous trees may recover if the stem is cut back well below the dieback. Do this at a point on the stem where the leaf scars are close together. The stem at this point will be more solid and less likely to allow rainwater into the hollow to cause rotting.

## Distorted or twisted leaves



### Boron deficiency

**Cause.** A deficiency of boron in the soil.

**Solution.** Get a tissue analysis done to confirm your diagnosis. Treat deficiency by applying 10 g borax or 5 g Solubor per planting site, spread over at least 1sq m of the root zone. Do not apply within 30 cm of the trunk. It is most important that the fertiliser is applied very evenly, by mixing it with water and spraying it on the ground.

In future, use leaf analysis regularly to monitor boron levels in the plant.



### Papaw ringspot virus

Inset: severe distortion and narrowing of leaves.

**Cause.** Papaw ringspot virus.

**Solution.** There is no cure for this disease. Destroy affected plants. If you suspect papaw ringspot, contact DPI immediately.

## Distorted or twisted leaves



### Boron toxicity

**Cause.** Excessive boron application.

**Solution.** Check that the correct rates of borax or Solubor were applied. If they were, the fertiliser was probably not applied evenly enough over the soil surface. In future, consider mixing the fertiliser in water and spraying it on the ground.



### 2,4-D herbicide damage

**Cause.** Drift or overspray from herbicide spraying.

**Solution.** Do not use phenoxy type herbicides in the vicinity of papaw, as they are very susceptible to damage. Slightly affected trees will generally recover.



### Dieback

**Cause.** Infection by phytoplasma.

**Solution.** There is no cure for this problem. Vigorous trees may recover if the stem is cut back well below the dieback. Do this at a point on the stem where the leaf scars are close together. The stem at this point will be more solid and less likely to allow rainwater into the hollow stem to cause subsequent rotting.



### Mosaic

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this disease. Destroy affected plants to prevent further spread. Refer to *Key issues* for information on managing diseases.



## Distorted or twisted leaves



### Yellow crinkle

Leaf stalk bends downwards.

**Cause.** Infection by tomato big bud phytoplasma.

**Solution.** There is no cure for this disease. When thinning plants at planting sites, maintain replacement female trees to make up for losses from yellow crinkle. Refer to *Key issues* for information on managing diseases.



### Broad mite

Affected leaves have prominent veins and down-curved edges.

**Cause.** Feeding by the insect *Polyphagatarsanemus latus*.

**Solution.** Broad mite is difficult to treat as the damage is sporadic and is often noticed after the mites have gone. Inspect the growing point of trees regularly for evidence of mites, particularly in autumn.

Treat as required with sulphur. Do not apply sulphur when temperatures exceed 24°C.

## Mottled leaves



### Papaw ringspot

**Cause.** Papaw ringspot virus.

**Solution.** There is no cure for this disease. Destroy affected plants. If you suspect papaw ringspot, contact DPI immediately.



### Powdery mildew

Inset: Close-up of powdery mildew on the underside of leaf.

**Cause.** The fungus *Sphaerotheca humuli*.

**Solution.** Control is generally required only in the winter months. Spray with an appropriate fungicide from the *Problem solver handy guide*.



## Mottled leaves



### Mosaic

Close-up of mosaic pattern.

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this disease. Destroy affected plants to prevent further spread. Refer to *Key issues* for information on managing diseases.



### Mites

**Cause.** The insect *Tetranychus urticae*.

**Solution.** Check to make sure that the damage is serious enough to warrant treatment. Spider mites are normally well controlled in papaw by small predatory beetles and predatory mites. You need at least 50% of inspected leaves with mites and without predatory beetles to make it worth treating. Where required, either release predatory mites (refer to *Contacts*) or treat trees with sulphur.

If using sulphur, avoid applying it when temperatures exceed 24°C.



### Herbicide damage

**Cause.** A drift or overspray of herbicide. Papaws are highly susceptible to herbicide damage.

**Solution.** Take extreme care when applying herbicides near papaw. Do not spray the plants with equipment that has been used for herbicide application.

## Spots or marks on leaf stalks



### Mosaic

Note dark-green streaks on stem and leaf stalks.

**Cause.** Infection by a phytoplasma.

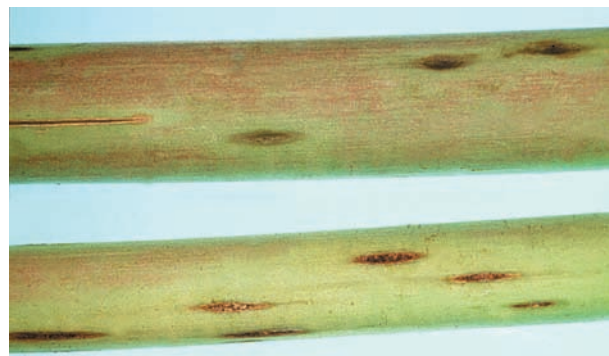
**Solution.** There is no cure for this disease. Destroy affected plants to prevent further spread. Refer to *Key issues* for information on managing diseases.



### Powdery mildew

**Cause.** The fungus *Sphaerotheca humuli*.

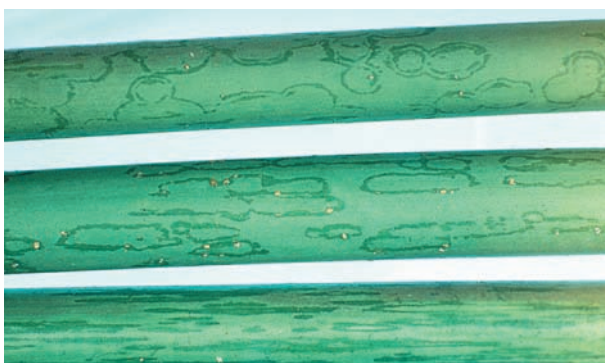
**Solution.** Spray with a recommended fungicide. Refer to *Problem solver handy guide*.



### Brown spot

**Cause.** The fungus *Corynespora cassiicola*.

**Solution.** Brown spot is a serious disease in hot, wet areas such as north Queensland, and during prolonged wet periods in south Queensland. The disease spreads during wet, windy weather and is favoured by hot, humid conditions. Spray with a recommended fungicide from the *Problem solver handy guide*.



### Papaw ringspot

**Cause.** Papaw ringspot virus.

**Solution.** There is no cure for this disease. Destroy affected plants. If you suspect papaw ringspot, contact DPI immediately.



## Spots or marks on leaf stalks



### Caterpillars, loopers or grasshoppers

**Cause.** Several species of loopers, caterpillars and grasshoppers that feed on papaw leaves. Hail damage can cause similar symptoms.

**Solution.** Treatment is usually not necessary as only occasional trees are affected.

## Distortion or cracking of leaf stalks



### Fruitspotting bugs

**Cause.** Feeding by *Amblypelta lutescens* and *Amblypelta nitida*.

**Solution.** Only spray if the damage is serious enough to warrant treatment. You need more than just the odd tree affected to make it worth spraying. Where required, spray with an appropriate insecticide from the *Problem solver handy guide*. Follow label directions and observe withholding periods.



## Green flowers



### Yellow crinkle

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this disease. Destroy affected plants.

## Bumpy or deformed fruit



### Cat-facing

Left: green fruit. Right: ripe fruit.

**Cause.** Carpellody or cat-face is an inherited trait. Low night temperatures combined with high moisture and nitrogen levels favour the development of carpellodic fruits in hermaphrodite trees.

**Solution.** Careful seed selection can reduce its occurrence.



### Chimera

**Cause.** A variegation or modification in an organ resulting from a mutation within certain cells.

**Solution.** None.



### Intra-ovarian fruit

**Cause.** Unknown. A defect that occurs occasionally during development in the tissue of the ovary. No external symptoms.

**Solution.** There is no control measure for this phenomenon.



### Soft fruit

**Cause.** Not known, but excess nitrogen is suspected. Excessive water can aggravate the condition.

**Solution.** Do a leaf tissue analysis. Reduce nitrogen application according to recommendation.



### Small fruit

**Cause.** Poor pollination, under-fertilised plants or multiple fruiting variety.

**Solution.** Fertilise according to soil and leaf analysis results. Avoid multiple fruiting varieties or cull out to two or three fruits per axil.



## Bumpy or deformed fruit



### Blossom-end defect

Left: Note tunnel effect at blossom end. Right: Internal view of problem.

**Cause.** Inherited trait.

**Solution.** None.



### Cold damage or chilling injury

**Cause.** Frost damage, prolonged cold, exposure of fruit to temperatures below 13°C during transport or storage in cold room set at too low a temperature.

**Solution.** There is no solution if chilling injury occurs in the field during winter. Grow papaw in warm, sheltered locations. Avoid exposing unripe fruit to low temperatures after harvest.



### Overcrowding

**Cause.** The variety chosen. Low temperatures result in slow growth. Short internodes lead to overcrowding.

**Solution.** Fertilise according to soil and leaf analysis results to increase rate of growth. Grow papaws in warmer regions. Avoid varieties that have short internodes.



### Deformed and bumpy fruit

**Cause.** Boron deficiency.

**Solution.** Get a tissue analysis done to confirm your diagnosis. Treatment involves applying 10 g borax or 5 g Solubor per planting site, spread over at least 1 sq m of the root zone. Do not apply within 30 cm of the trunk. It is most important that the fertiliser is applied very evenly, by mixing it in water and spraying it on the ground. In future, use leaf analysis regularly to monitor boron levels in the plant.

## Spots or marks on fruit



### Powdery mildew

Inset: severe scarring of fruit surface.

**Cause.** The fungus *Sphaerotheca humuli*.

**Solution.** Control is generally required only in winter. Spray with recommended fungicides from the *Problem solver handy guide*. Follow label directions and observe withholding periods.



### Oriental scale

**Cause.** The insect *Aonidiella orientalis*.

**Solution.** If predators and parasitoids are absent or not available, the occasional seriously infested trees can be cut out and destroyed. One spray with petroleum oil at recommended rates in cool weather should allow parasitoids to gain control of this pest.



### Star spot or winter spot

Left: ripe fruit. Right: green fruit.

**Cause.** Physiological disorder.

**Solution.** If the problem is severe, consider changing to a more resistant variety.



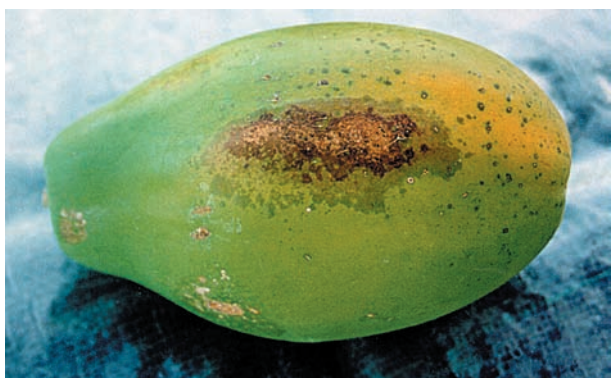
### Papaw ringspot

**Cause.** Papaw ringspot virus.

**Solution.** All affected plants should be destroyed. Notify DPI immediately if an outbreak is suspected.



## Spots or marks on fruit



### Sunburn

**Cause.** Fruit not shaded by leaves and exposed to the sun after leaf drop, or left in direct sun after harvest.

**Solution.** Maintain a healthy leaf cover and keep the plants well watered, especially during very hot weather. Avoid any tree damage that may expose fruit to the sun. Keep fruit out of direct sunlight after harvest.



### Mosaic

**Cause.** Infection by a phytoplasma.

**Solution.** There is no cure for this disease. Destroy affected plants to prevent further spread. Refer to *Key issues* for information on managing diseases.



### Black spot

**Cause.** The fungus *Asperisporium caricae*.

**Solution.** Remove severely affected leaves and fruit, and start with a spray program. Refer to *Key issues*.

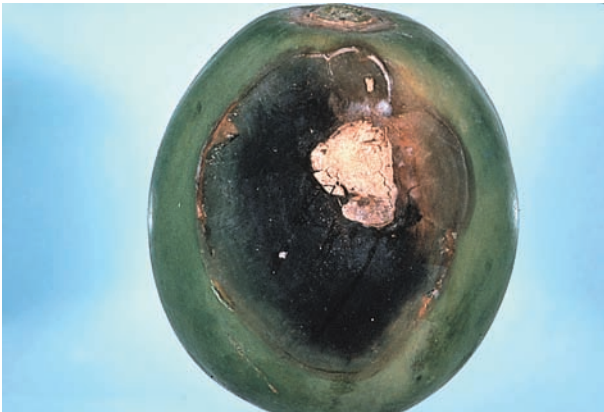


### Brown spot

**Cause.** The fungus *Corynespora cassiicola*. This can be a serious disease in hot, wet areas and during prolonged wet periods throughout Queensland. The spores are spread during wet, windy weather.

**Solution.** Spray with a suitable fungicide from the *Problem solver handy guide*.

## Spots or marks on fruit



### Black fruit rot

**Cause.** The fungus *Phoma caricae-papayae*.

**Solution.** This common disease often causes serious loss of fruit. Avoid susceptible lines and apply appropriate fungicides to fruit in the plantation and postharvest. Remove and destroy dying leaves and infected fruit.



### Phytophthora fruit rot

**Cause.** The fungi *Phytophthora nicotianae* and *P. palmivora*.

**Solution.** Generally only a problem in north Queensland in hot, wet weather. Spray with an appropriate fungicide from the *Problem solver handy guide*. Treatment is not warranted in south Queensland.



### Ripe fruit rot

**Cause.** Numerous fungal organisms.

**Solution.** Fungicide applications in the field and postharvest will reduce the incidence of ripe fruit rots. If rots are severe, consider planting a more resistant variety. Refer to *Problem solver handy guide*.



## Young fruit drop off



### Fruit gap

**Cause.** The main cause is poor pollination caused by environmental stresses or boron deficiency. Strong wind can also knock developing flowers and fruits off.

**Solution.** Keep plants well watered and grow papaw in warm, sheltered locations. Treat boron deficiency as indicated by tissue analysis results. Monitor for fruitspotting bugs.

## Crown of plant dying



### Dieback

**Cause.** Infection by phytoplasma.

**Solution.** There is no cure for this problem. Vigorous trees may recover if the stem is cut back well below the dieback. Do this at a point on the stem where the leaf scars are close together. The stem at this point will be more solid and less likely to allow rainwater into the hollow to cause rotting.

## Crown of plant dying



### Fruitspotting bugs

**Cause.** Feeding by *Amblypelta lutescens* and *Amblypelta nitida*.

**Solution.** Only spray if the damage is serious enough to warrant treatment. You need more than just the odd tree affected to make it worth spraying. Where required, spray with an appropriate insecticide from the *Problem solver handy guide*. Follow label directions and observe withholding periods.



### Yellow crinkle

Crown leaves become claw-like and older leaves dry and fall.

**Cause.** Tomato big bud phytoplasma.

**Solution.** There is no cure for this disease. When thinning plants at planting sites, maintain replacement female trees to make up for losses from yellow crinkle. Refer to *Key issues*.

## Mature plants die



### Dieback

**Cause.** Infection by phytoplasma.

**Solution.** There is no cure for this problem. Vigorous trees may recover if the stem is cut back well below the dieback. Do this at a point on the stem where the leaf scars are close together. The stem at this point will be more solid and less likely to allow rainwater into the hollow to cause rotting.



## Mature plants die



### Papaw ringspot

Reduced tree vigour and fruit set.

**Cause.** The papaw ringspot virus.

**Solution.** Destroy affected plants. Diseased trees are unlikely to produce a good crop. They also provide a source of infection for further spread of the virus. There is no cure for this disease. If you suspect papaw ringspot, contact DPI immediately.



### Root rot

**Cause.** The fungi *Phytophthora palmivora* and *P. nicotianae*.

**Solution.** There is no effective chemical control for this disease. Improve soil drainage in the plantation and plant on mounds to reduce disease incidence. Refer to *Key issues* for more information on managing root rot.



### Lightning strike

**Cause.** Lightning strike hitting the ground in the plantation.

**Solution.** This is a rare occurrence.



## Mature plants die



### Waterlogging

**Cause.** Root death caused by waterlogged soil.

**Solution.** If the site is prone to waterlogging you should consider resiting the plantation. You can also improve the drainage in the plantation and plant the trees on mounds to minimise the damage.

## Mature plants fall over



### Root rot

**Cause.** The fungi *Phytophthora palmivora* and *P. nicotianae*.

**Solution.** There is no effective chemical control for this disease. Improve soil drainage in the plantation and plant on mounds to reduce disease incidence. Refer to *Key issues*.

## Seedlings dying



### Cutworm

**Cause.** Feeding by cutworms.

**Solution.** Spray with an appropriate registered chemical. Refer to *Problem solver handy guide*.



### Fungal diseases

**Cause.** Infection by several fungus species.

**Solution.** Maintain nursery hygiene by sterilising pots and soil.



## Seedlings distorted



### Broad mite

**Cause.** Feeding by the insect *Polyphagatarsanemus latus*.

**Solution.** Broad mite is difficult to treat as the damage is sporadic and is often noticed after the mites have gone. Inspect the growing point regularly for evidence of the mites, particularly in autumn.

Treat as required with sulphur. Do not apply sulphur when temperatures exceed 24°C.



### Spray drift of 2,4-D

**Cause.** A drift or overspray of 2,4-D herbicide. Papaws are highly susceptible to herbicide damage.

**Solution.** Take extreme care when applying herbicides near papaw. Do not spray the plants with equipment that has previously been used for herbicide application.

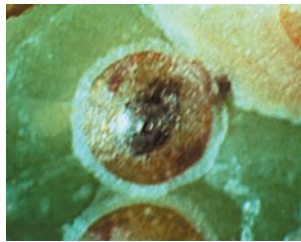
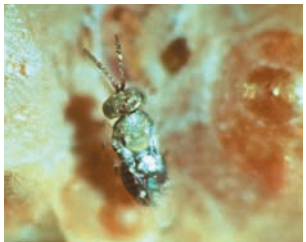
## Beneficial insects in papaw—an identification guide



### ***Comperiella lemniscata***

Black adult on oriental scale.

**What they do.** Primary parasitoid of oriental scale.



### ***Encarsia (Encarsia formosa)***

Left: adult laying egg. Right: wasp inside scale in pupal stage.

**What they do.** Parasitoid wasp of oriental scale.

**Suppliers:** Biological Services (for contact details, see Section 6, *Contacts and references* page 13).

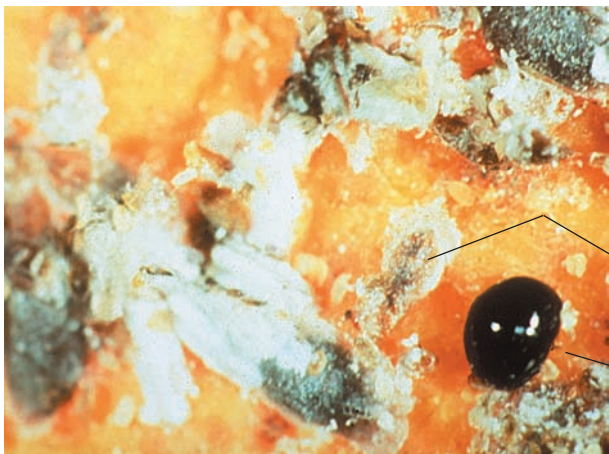


### ***Telsemia***

Left: juvenile feeding on scale. Right: adult.

**What they do.** Lady beetle predator of oriental scale.

juvenile



juvenile scale

adult



## Beneficial insects in papaw—an identification guide



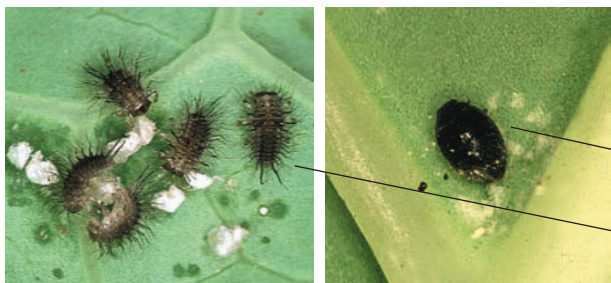
### *Aphytis (Aphytis melinus)*

**What they do.** Parasitoid wasp of oriental scale.

**Suppliers:** Bugs for Bugs and Biological Services (for contact details, see Section 6, *Contacts and references* page 13).

pupa

adult



### *Stethorus fenestralis*

**What they do.** Predatory beetle of two-spotted mite and broad mite.

adult

juvenile stage

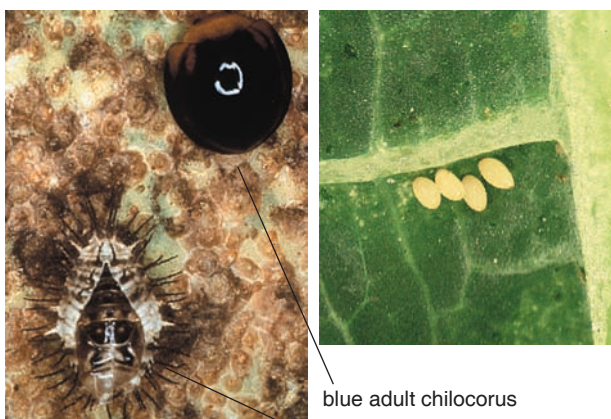


### **Red chilocorus** (*Chilocorus circumdatus*)

Left: adult red chilocorus. Right: red adults and black pupae.

**What they do.** Predatory lady beetle of oriental scale.

**Suppliers:** Bugs for Bugs (for contact details, Section 6, *Contacts and references* page 13).



### **Blue chilocorus** (*Chilocorus baileyi*)

Left: emerged adult and pupal case. Right: eggs of *Chilocorus*.

**What they do.** Predatory lady beetle of oriental scale.

**Suppliers:** Bugs for Bugs (for contact details, Section 6, *Contacts and references* page 13).

blue adult chilocorus

pupa