

Tomato information kit

Reprint – information current in 1998



REPRINT INFORMATION – PLEASE READ!

For updated information please call 13 25 23 or visit the website www.deedi.qld.gov.au

This publication has been reprinted as a digital book without any changes to the content published in 1998. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research: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
- Financial information—costs and returns listed in this publication are out of date.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.deedi.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 1998. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.

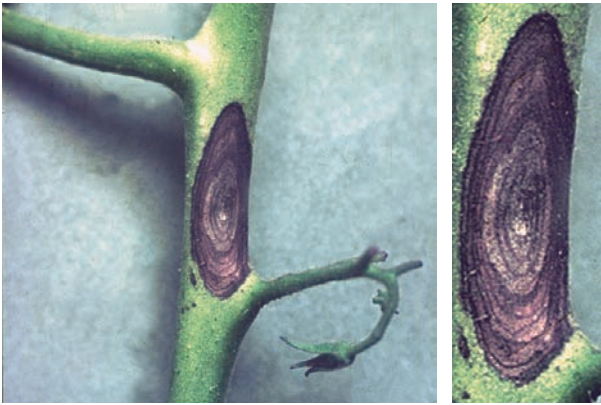
This information has been made available to assist users to identify issues involved in the production of tomatoes. This information is not to be used or relied upon by users for any purpose which may expose the user or any other person to loss or damage. Users should conduct their own inquiries and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

Spots on stems



Target spot

Left: target spot on stem. Right: close-up, note target rings.

Cause. The fungus *Alternaria solani*. Target spot occurs all year but is worse in warm weather or in winter when there are heavy dews or fogs.

Solution. Use disease-free seed. Destroy old crops immediately after harvest. Rotate crops so that tomatoes do not follow tomatoes or potatoes. Follow the recommendations in *Key issues* for the prevention of fungicide resistance. Spray with an appropriate chemical from the *Problem solver handy guide*.



Bacterial spot and bacterial speck

Left: bacterial spot on leaf petiole. Right: bacterial speck.

Cause. The seed-borne bacteria *Xanthomonas campestris* pv. *vesicatoria* (bacterial spot) and *Pseudomonas syringae* pv. *tomato* (bacterial speck). These diseases are difficult to control in wet weather.

Solution. Plant only treated seed, refer to *Key issues*. Destroy old crops immediately after harvest. Spray with a copper-based fungicide from the *Problem solver handy guide*. Thorough coverage of the leaves is essential.

Bleached stems



Sclerotinia rot

Left: note bleached stems. Right: black sclerotes (2 to 10 mm long) inside stem.

Cause. The fungus *Sclerotinia sclerotiorum*. It can survive in the soil for years as sclerotes. Infection is sporadic and usually occurs in cool, moist conditions through injury or dead tissue, for example spent flowers lying on leaves or stems. Infected stems become hollow.

Solution. Do not grow in infected soil during the cooler months. Spray with an appropriate chemical from the *Problem solver handy guide*, particularly during blossom set.

Bleached stems



Grey mould (*Botrytis*)

Upper: stem. Lower: close-up on fruit stem.

Cause. The fungus *Botrytis cinerea*. Infection is through injuries, for example after pruning, or where blossoms fall onto leaves, stems or fruit. Worse in cool weather with fogs or heavy dews.

Solution. Maintain a good crop rotation and ensure organic matter is decomposed before planting. Field sprays with an appropriate chemical from the *Problem solver handy guide*, particularly after pruning or topping, will reduce infections. Follow the recommendations in *Key issues* for the prevention of fungicide resistance. Apply a postharvest treatment to fruit if infected around harvest.

Hollow stems

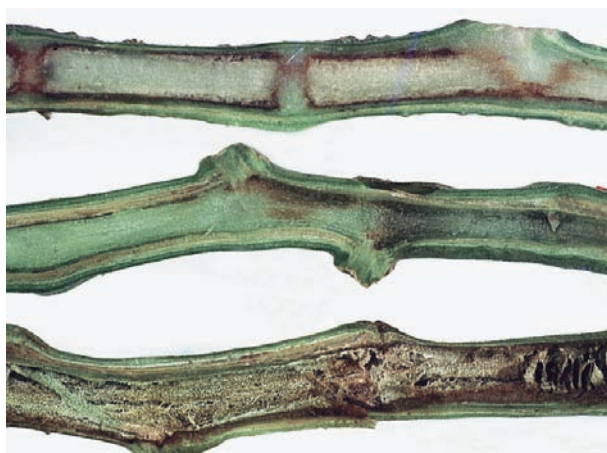


Pith rot

Cause. High nitrogen levels with secondary infection by bacteria helping break down the affected tissue. It is sporadic, worst in wet seasons and in crops with excessively high nitrogen levels. If crops are not stressed for water, fruit losses are minimal.

Lightning strike can also cause hollow stems. In ground crops, a circular area is affected, while in trellised crops the whole row is usually killed as the electricity follows the wire.

Solution. Do not apply excessive amounts of nitrogen.



Bacterial canker

Increasing severity from top to bottom.

Sclerotinia can also cause hollow stems, see the previous page.

Cause. The seed-borne bacterium *Clavibacter michiganense* ss. *michiganense*. It survives on weed hosts and undecomposed crop residue in the soil.

Solution. Use disease-free seed. If unavailable treat the seed, refer to *Key issues*. Prepare ground early so there is no undecomposed plant residue. Avoid handling affected plants. Wash hands regularly in a 10% TSP solution. If bacterial canker was severe in the crop, dip or spray trellis wires and posts in a 2% formalin solution then oil wire to prevent rusting. Dairy disinfectant products can be used instead of formalin.

Brown and hairless stems



Tomato russet mites

Left: plant in the field. Right: close-up of stems. Symptoms are a loss of hairs, centre, followed by bronzing of the stem, left. Healthy stem on right. See this section page 30 for a close-up of the mites.

Cause. Feeding by nymphs and adults of the tomato russet mite *Aculops lycopersici*. They are worst in warm dry weather. Mites spread by wind and are carried on clothing, machinery and insects. Fruit ripen unevenly.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Check that seedlings are not infested before transplanting. Do not plant downwind of infested plantings. Spray to control russet mites with an appropriate chemical from the *Problem solver handy guide*.

Stunted plants



Environmental stress or disease damage

Note healthy plants in the background.

Cause. Stunting is a response to environmental stress (dry or waterlogged conditions, compacted soil, high salt levels from fertiliser or irrigation) or diseases (discussed elsewhere in this section). Cold weather also reduces the size of plants.

Solution. Ensure good drainage and maintain adequate soil moisture. Water with a conductivity above 1500 microSiemens per centimetre (mS/cm) can cause leaf damage and lower yields, particularly if overhead irrigation is used. Do not apply excessive amounts of fertiliser at one time, or place fertiliser too close to the plants. Use a good crop rotation and control pests and diseases if possible. Do not allow the seedling plug to dry out.

Lower leaves die



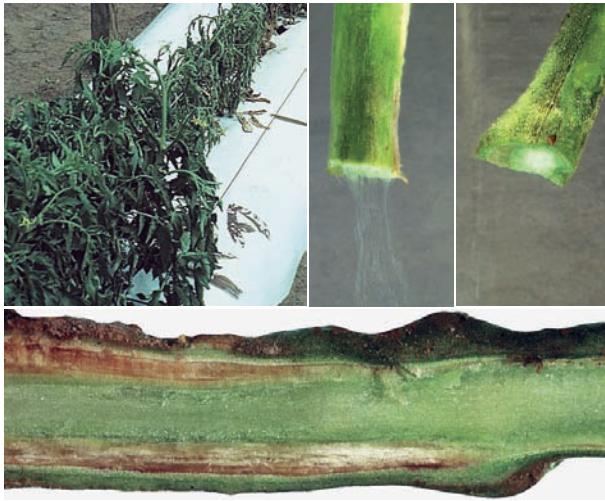
Pest or disease damage

Death of lower leaves caused by tomato russet mite.

Cause. Death of the lower leaves can be caused by tomato russet mites, potato moth, bacterial canker, fusarium and verticillium wilts, target spot, leaf mould and potato virus Y (PVY).

Solution. Look for other plant symptoms and find these in this section to identify the cause of the problem.

Plants wilt and stay green



Bacterial wilt

Left: susceptible and resistant varieties. Centre: bacterial ooze from infected stem. Right: healthy stem. Lower: affected stem.

Cause. The bacterium *Ralstonia (Pseudomonas) solanacearum*. It is common in soil and is carried over in crop residues and weed hosts. It spreads in irrigation and rain water, particularly downhill, and may spread by root contact.

Solution. Plant resistant or tolerant varieties. Bacterial wilt is worse in hot, wet weather and wilting is very quick. Do not crop infected soil through summer.



Waterlogging

Cause. Poor drainage that does not allow water to drain from the root zone, thus starving the roots of oxygen needed for plant respiration and root growth.

Solution. Avoid poorly drained soils. Deep rip to break up compacted soil and clay pans. Do not over irrigate. Plant on mounds for better drainage.

Plants wilt and turn yellow



Fusarium wilt

Upper: affected ground crop. Lower: internal symptoms.

Cause. The fungus *Fusarium oxysporum* f. sp. *lycopersici*. There are three races of Fusarium wilt. It is soil-borne and is worse in warm weather. Plants turn yellow from the bottom and take longer to wilt than those affected by bacterial wilt.

Solution. Plant resistant varieties. Do not take stakes or implements from a contaminated block to a clean block without first removing all soil.



Verticillium wilt

Left: affected leaf. Right: internal stem symptoms.

Cause. The fungus *Verticillium dahliae*. It is soil-borne and is rare in tropical climates. Hosts include potatoes and Noogoora burr.

Solution. Plant resistant varieties. There are two races of verticillium wilt, but resistance is only available to race 1. Do not rotate tomatoes with potatoes or egg fruit. Ensure good farm hygiene. Do not take stakes or implements from a contaminated block to a clean block without first removing all soil.

Plants wilt and turn yellow



Sclerotium base rot

Note white fungal growth. Inset left: immature creamy sclerotes. (magnified). Inset right: note mature brown sclerotes (1 mm) on stem.

Cause. The fungus *Sclerotium rolfsii*. It carries over in the soil as sclerotes. It is worse in warm, moist conditions particularly in soil containing undecomposed plant residue.

Solution. Good land preparation to ensure all organic matter is decomposed before planting. Drench with an appropriate chemical from the *Problem solver handy guide* one to two weeks after transplanting.



Nematodes

Note healthy roots on left, infested lumpy roots on right.

Cause. Root-knot nematodes, usually *Meloidogyne javanica* and *M. incognita*. Nematodes require moisture. Damage is worse in warm weather. They are common in sandy and well structured soils.

Solution. Use a cover crop that reduces nematode build-up. Plant resistant varieties. At or just before planting apply an appropriate nematicide from the *Problem solver handy guide*.



Root and foot rot

Left: affected plant. Right: internal stem symptoms. Note roots growing from the stem.

Cause. The soil-borne fungus *Fusarium solani*. It is rare and currently occurs only in the Bowen area where it can be serious in sandy soils.

Solution. Use good crop rotations.



Root rot complex (sudden wilt)

Left: external stem symptoms, note roots growing from the stem. Right: internal stem symptoms, roots are often twisted and dead roots are common.

Cause. Soil-borne fungi such as *Pythium* spp., *Fusarium oxysporum* and *F. solani*. It is only a problem when seedlings are root-bound, in claypans or in wet soil.

Solution. Do not plant root-bound seedlings. Ensure good drainage and do not over irrigate. Plant on mounds to improve drainage. Use good crop rotations. Fumigate if the problem re-occurs.

Blossom injury and shedding



Blossom blight

Upper: healthy flowers. Lower: blighted flowers.

Cause. Blossom blight may be caused by two bacteria, *Xanthomonas campestris* pv. *vesicatoria* or *Pseudomonas syringae* pv. *tomato*, or the fungi *Alternaria solani* and *Botrytis cinerea*. When flower blighting occurs foliage infection is severe. Blossom blight is worst in wet weather. Slight spray burn can look similar.

Solution. Protectant sprays for bacterial and fungal diseases help control blossom blight. Use an appropriate chemical from the *Problem solver handy guide*.



Weather conditions

Appearance is similar to blossom blight.

Cause. If minimum temperatures fall below 10°C, growth of the pollen tube is affected and the flower will not be pollinated. If minimum temperatures are above 23°C, pollen is not produced.

Solution. Do not plant crops to flower when minimum temperatures will be below 10°C or above 23°C.

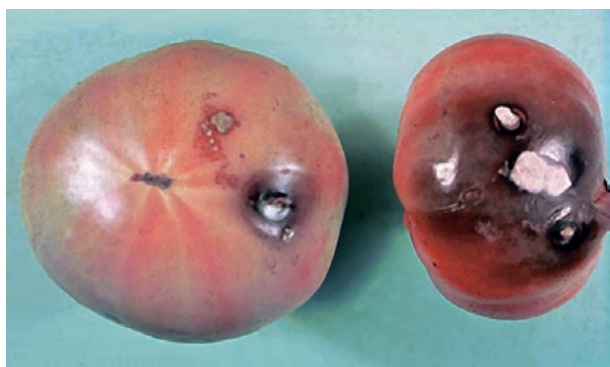
Rots on fruit near the soil



Fusarium fruit rot

Cause. Spores of the soil-borne fungi *Fusarium* spp. They can be splashed onto fruit by rain or overhead irrigation, but usually infect fruit touching the soil.

Solution. Use a trellis or plastic mulch to prevent fruit touching the soil. If possible do not harvest in wet weather. Cool fruit after harvest. Do not pack fruit showing symptoms of infection.

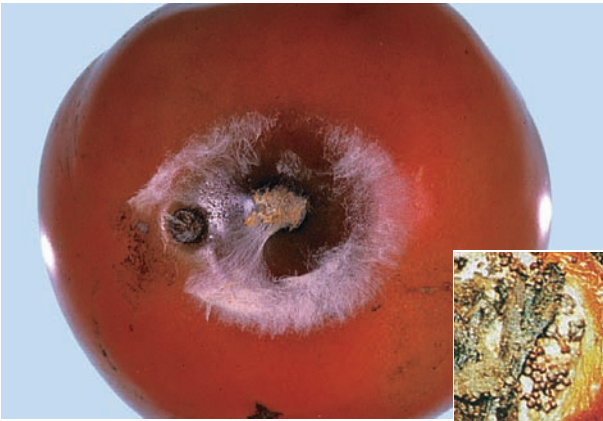


Rhizoctonia fruit rot

Cause. The fungus *Rhizoctonia solani*. Spores invade fruit touching the soil. Worse in warm, wet weather. Can cause fruit breakdown in transit, particularly if fruit is not cooled.

Solution. Use a trellis or plastic mulch to prevent fruit touching the soil. Do not pack fruit showing symptoms of infection. Cool fruit soon after harvest.

Fruit near the ground rots

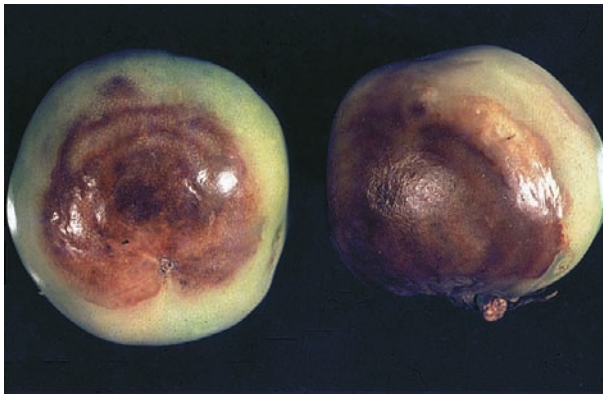


Sclerotium fruit rot

Note white fungal growth and immature sclerotes. Inset: mature brown sclerotes (1 mm diameter).

Cause. The fungus *Sclerotium rolfsii*. It carries over in the soil as sclerotes. It is worse in warm, moist conditions particularly in soil containing undecomposed plant residue.

Solution. Ensure good land preparation so there is no undecomposed organic matter present at planting. Use a trellis or plastic mulch to prevent fruit touching the soil.



Buckeye rot

Note concentric rings.

Cause. The fungus *Phytophthora nicotianae*. Fruit that is on the ground or close to it is infected. Worse in warm, wet weather. Can spread rapidly in wet areas.

Solution. Use a trellis or plastic mulch to prevent fruit touching the soil. Do not plant in low lying areas where this fungus has previously occurred.

Fruit rots

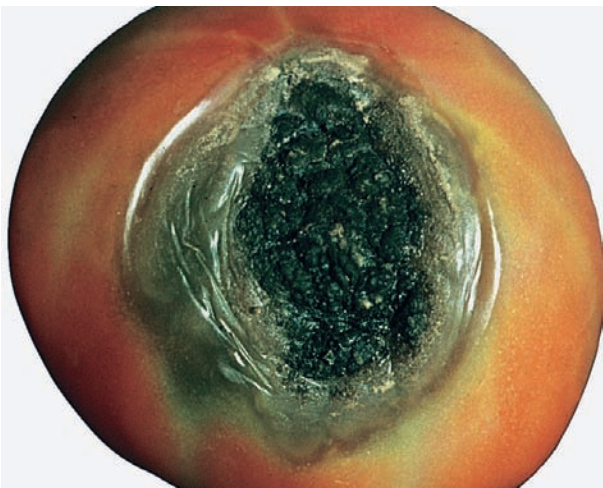


Anthracnose

Pink spores, left, are followed by black fruiting bodies, right.

Cause. The fungus *Colletotrichum* spp. Immature fruit do not show infection until fruit ripens.

Solution. Destroy crop residues promptly. Spray with an appropriate chemical from the *Problem solver handy guide*.



Phoma rot

Cause. The fungus *Phoma destructiva*. Infection is through cracks or damage on the fruit. Usually only a problem in wet seasons.

Solution. Handle fruit with care during harvesting and in the shed to avoid fruit damage. Protectant sprays used for other diseases reduce postharvest incidence. Spray with an appropriate chemical from the *Problem solver handy guide*.

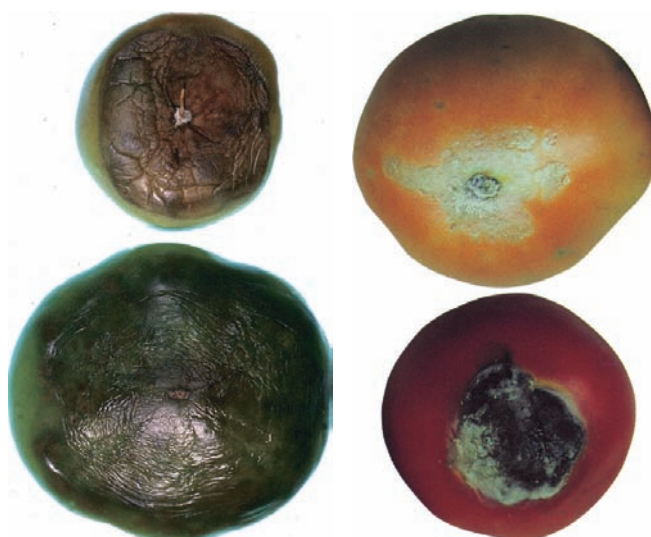
Fruit rots



Alternaria rot

Cause. The fungus *Alternaria alternata*. Can be serious after rain in varieties prone to cracking. Worse in cool, wet weather.

Solution. Protectant sprays used for other diseases reduce postharvest incidence. Treat fruit with an appropriate chemical from the *Problem solver handy guide*. Plant varieties less susceptible to cracking.



Blossom-end rot

Left: on immature fruit. Right: on mature fruit.

Cause. Irregular soil moisture levels, low calcium levels in the plant and poor root development due to compacted soils. Can occur in low pH soils. Saline irrigation water can lead to this disorder. Usually develops in hot dry conditions when plants are stressed.

Solution. Maintain an even supply of moisture, particularly in hot, dry, windy conditions. Check soil calcium levels before planting and use gypsum to raise if necessary. Do not use acidifying fertilisers, for example sulphate of ammonia. Spray young fruit with calcium nitrate at 800 g/100 L of water. Take care if using water with a conductivity greater than 2000 microSiemens per centimetre.



Grey mould (*Botrytis*)

Left: fruit truss infection. Right: infection from injury.

Cause. The fungus *Botrytis cinerea*. Infection occurs through injuries or where blossoms fall onto leaves, stems or fruit. Worse in cool weather with fogs or heavy dews.

Solution. Maintain a good crop rotation and ensure all organic matter is decomposed before planting. Field sprays with an appropriate chemical from the *Problem solver handy guide*, particularly after pruning or topping, will reduce infections. Follow the recommendations in *Key issues* for the prevention of fungicide resistance. Apply a postharvest treatment to fruit from the *Problem solver handy guide*.

Fruit rots



Penicillium rot

Spore masses may be blue or green.

Cause. Species of the *Penicillium* fungus. Infection is through injuries and is worse in wet weather. It is usually spread from diseased fruit in and around the shed.

Solution. Handle fruit with care. Maintain good shed hygiene. Remove reject fruit from around the shed.



Rhizopus soft rot (transit rot)

Note black spores among white fungal growth.

Cause. The fungus *Rhizopus stolonifer*. It affects fruit on or near the soil and through contact with infested fruit. Worse in warm, wet weather. Can cause serious breakdown in transit or storage.

Solution. Handle fruit with care. Discard damaged fruit. Maintain good shed hygiene. Treat fruit with an appropriate chemical from the *Problem solver handy guide*.



Soft rot

Cause. The bacterium *Erwinia carotovora* pv. *carotovora*. Infection is through injuries. Worse in hot, wet conditions. Mainly a problem in transit and storage.

Solution. Handle fruit carefully. Discard damaged fruit. Maintain good shed hygiene and wash equipment with a disinfectant solution. Do not harvest in wet weather, if possible. Treat fruit with a solution containing 50 mg/L of available chlorine. Check the concentration of the solution regularly with a swimming pool test kit. Replace the dip when it gets dirty.

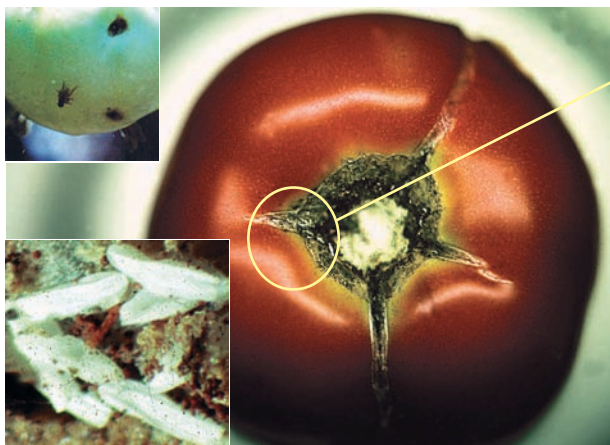


Yeasty rot

Cause. The fungus *Geotrichum candidum*. Infection occurs through the stem scar and injuries. Worse in hot, wet weather and at high storage temperature.

Solution. Avoid wet weather harvest if possible. Handle fruit carefully and discard damaged fruit. Maintain good shed hygiene. Cool the fruit to 13°C as soon as possible. Treat fruit with an appropriate chemical from the *Problem solver handy guide*.

White eggs around calyx



Atherigona

Eggs on stem scar. Inset upper: adult fly (4 to 5 mm long). Inset lower: close-up of eggs (1 mm).

Cause. The eggs of *Atherigona orientalis*, a small grey fly. It breeds in rotting fruit and organic matter. *Atherigona* is important only because of quarantine requirements for fruit exported to New Zealand.

Solution. Crush any fruit in or around the field and crush or bury rejects from the packing shed to reduce breeding sites for flies. Sprays applied to control other insect pests are believed to reduce numbers of *Atherigona*.

Holes in fruit



Heliothis (tomato grub, corn earworm, native budworm)

Upper left: larvae (35 mm) in fruit. Upper right: eggs (0.4 mm) on a flower bud. Lower: moth, 30 to 40 mm wingspan.

Cause. Feeding by larvae of *Helicoverpa armigera* and *Helicoverpa punctigera*. Flowers and leaves are also attacked. Worse from spring to autumn.

Solution. Monitor for eggs or larvae twice a week from late winter to autumn and weekly during winter. If necessary spray with an appropriate chemical from the *Problem solver handy guide*. Ensure the spray rig gives good coverage. Available beneficial insects include a predator, the green lacewing *Mallada signata*, and the egg parasites *Trichogramma* wasps.



Potato moth (leafminer)

Upper: larva (10 to 15 mm) and mine damage. Lower: adult moth, 10 to 12 mm wingspan.

Cause. Larvae of the moth *Phthorimaea operculella*. Larvae enter where two fruit touch or in the stem scar. Most severe in summer and autumn, but survives through mild winters if cropping is continuous.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Separate crops to avoid having young and old crops close to each other at the same time. Use traps to monitor for moths. Spray the crop with a desiccant herbicide as soon as harvest is complete. Remove the trellis and plastic as soon as possible and plough in crop residue. Crush any fruit in or around the field to prevent emergence of moths. Spray to control leafminer with an appropriate chemical from the *Problem solver handy guide*.



Stings and pinholing on fruit



Fruit fly

Upper left: sting marks. Right: Queensland fruit fly, top and cucumber fly lower, (adults of both flies 8 mm long). Lower left: larvae (up to 7 mm) in fruit.

Cause. Egg-laying by either the Queensland fruit fly *Bactrocera tryoni* or the cucumber fly *Bactrocera cucumis*. Creamy white larvae tunnel through the fruit, which then collapse. Worse in warm months, particularly after wet weather. Fruit flies are major quarantine pests.

Solution. Crush reject fruit in the field and crush or bury rejects from the packing shed to prevent flies breeding. Ensure good farm hygiene. Spray the crop with a desiccant herbicide after the final harvest then remove the trellis and plastic and plough in crop residue. Fruit flies are usually controlled by sprays to control tomato grubs. If spraying is necessary apply an appropriate chemical from the *Problem solver handy guide*.



Green vegetable bug

Left: fruit damage. Right: adult (18 mm) and nymphal stages.

Cause. Feeding by nymphs and larvae of *Nezara viridula*.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Sprays to control caterpillars usually keep green vegetable bugs under control. If spraying is necessary apply an appropriate chemical from the *Problem solver handy guide*.



Heliothis (tomato grub, corn earworm, native budworm)

Upper left: fruit damage and larva (35 mm). Upper right: moth 30 to 40 mm wingspan). Lower: eggs (0.4 mm) on fruit, sepals and leaves.

Cause. Feeding by small larvae of the moths *Helicoverpa armigera* and *Helicoverpa punctigera*. Pinholing occurs when small larvae chew fruit before being controlled by the next spray. Worse from spring to autumn.

Solution. Monitor for eggs or larvae twice a week from late winter to autumn and weekly during winter. If necessary spray with an appropriate chemical from the *Problem solver handy guide*. Ensure the spray rig gives good coverage. Available beneficial insects include a predator, the green lacewing *Mallada signata*, and the egg parasites *Trichogramma* wasps.

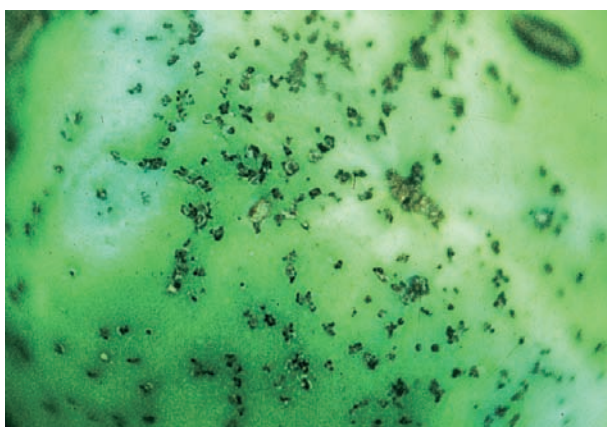
Spots on fruit



Bacterial canker

Cause. The bacterium *Clavibacter michiganense* pv. *michiganense*. Canker is usually introduced in seed.

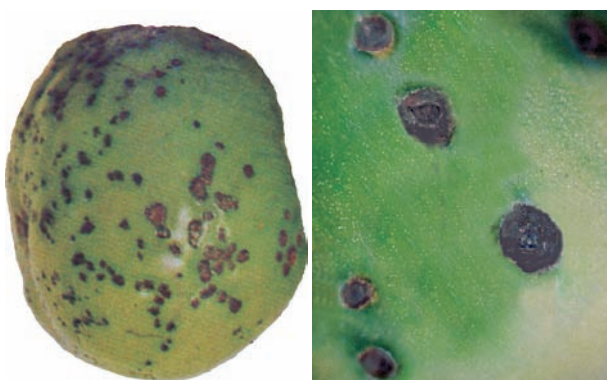
Solution. Use disease-free seed. If unavailable treat the seed, refer to *Key issues*. Prepare ground early so there is no undecomposed plant residue. Avoid handling affected plants. Wash hands regularly in a 10% TSP solution. If bacterial canker was severe in the crop, dip or spray trellis wires and posts in a 2% formalin solution or other disinfectant then oil wire to prevent rusting. Dairy disinfectant products can be used instead of formalin.



Bacterial speck

Cause. The bacterium *Pseudomonas syringae* pv. *tomato*. Commonly introduced on seed. Difficult to control in wet weather. A minor problem in dry areas.

Solution. Plant only treated seed, refer to *Key issues*. Destroy old crops immediately after harvest. Spray with a copper-based fungicide from the *Problem solver handy guide*. Thorough coverage is essential.



Bacterial spot

Left: affected fruit. Right: close-up, spots usually up to 1 mm.

Cause. The bacterium *Xanthomonas campestris* pv. *vesicatoria*. Difficult to control in wet weather. A minor problem in dry areas.

Solution. Plant only treated seed, refer to *Key issues*. Destroy old crops immediately after harvest. Spray with a copper-based fungicide from the *Problem solver handy guide*. Thorough coverage is essential.



Target spot

Cause. The fungus *Alternaria solani*. Spread by wind, rain and overhead irrigation. Occurs all year but is worse in warm weather or when there are heavy dews or fogs in winter.

Solution. Use disease-free seed. Destroy crops immediately after harvest. Rotate crops so that tomatoes do not follow tomatoes or potatoes. Follow the recommendations in *Key issues* to prevent fungicide resistance. Spray with an appropriate chemical from the *Problem solver handy guide*.

Spots on fruit



Spotted wilt

Note symptoms are different on green and red fruit.

Cause. The tomato spotted wilt virus (TSWV), which is spread by thrips. Most common in spring and autumn when thrip numbers increase rapidly.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Spray to control thrips with an appropriate chemical from the *Problem solver handy guide*.

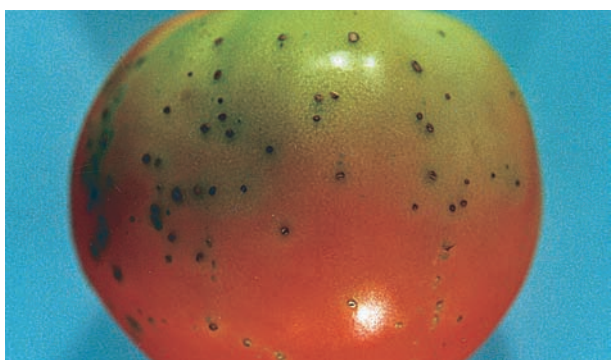
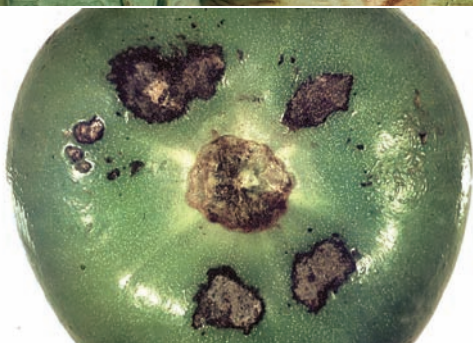


Weather blotch

Note two types of damage.

Cause. Usually the fungus *Stemphylium lycopersici*. Other fungi, for example *Alternaria* species, may be present. Infection develops when wet, windy weather damages the skin of fruit. Dead leaves touching fruit and rough handling can also result in infection.

Solution. Plant varieties that provide good leaf coverage of fruit, for example semi-determinate rather than determinate types. Spray to maintain a healthy leaf cover. Handle fruit carefully. Maintain good hygiene on picking and packing equipment. Postharvest treatments for other diseases will reduce losses from weather blotch.



Fruit pox and fleck

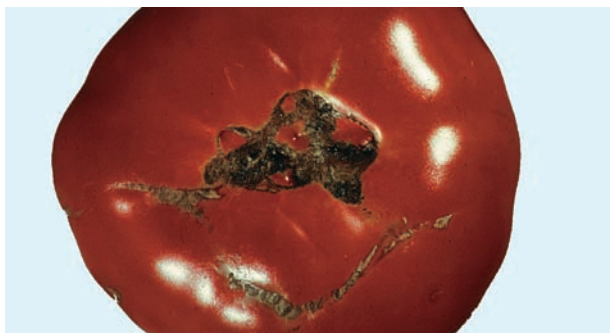
Upper: fruit pox. Lower: fleck.

Cause. A genetic disorder seen mostly in Flora-Dade but rarely occurs. It is introduced in seed and an outbreak can affect many fruit. It does not spread in the field.

Solution. Plant seed from a different seed lot.



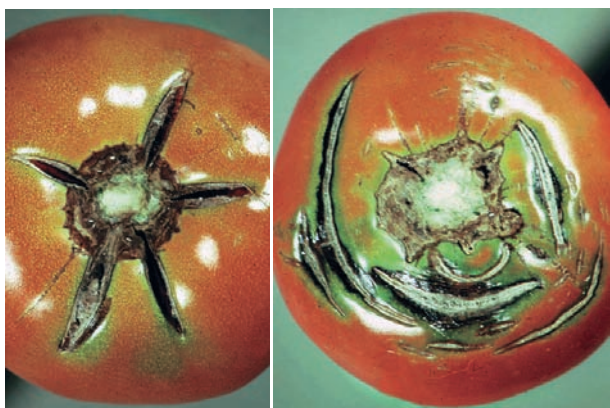
Other blemishes



Catface

Cause. Poor pollination caused by extremely hot or cold temperatures. Flat fruited varieties are more prone to catface than deep fruited varieties. Some older varieties are more susceptible than current varieties.

Solution. Do not plant crops that will flower when temperature extremes can be expected.



Cracks in fruit

Left: radial cracks. Right: concentric cracks.

Cause. Cracking can be caused by weather changes, for example warm weather after rain, or by excess water after plants have been stressed for water.

Solution. Plant varieties with good leaf cover, for example semi-determinate rather than determinate types, as fruit are less prone to cracking. Full shouldered varieties are more prone to cracking than flatter types. Maintain soil moisture through accurate irrigation scheduling. Control diseases and maintain leaf cover. Apply postharvest treatments to prevent fruit breakdown.



Sunburn

Left: sunburnt green and colouring fruit. Right: scalded red fruit.

Cause. Exposure to sunlight in hot weather. More common in ground crops. Sunburn can also occur when the plant is stressed for water, when not enough water was applied, or disease has reduced the plant's ability to take up water.

Solution. Maintain good water management. Protect against leaf diseases to maintain good leaf cover. Damage usually occurs after picking when the foliage has not been placed back over the fruit or the bushes have been physically damaged, suddenly exposing fruit to the sun.



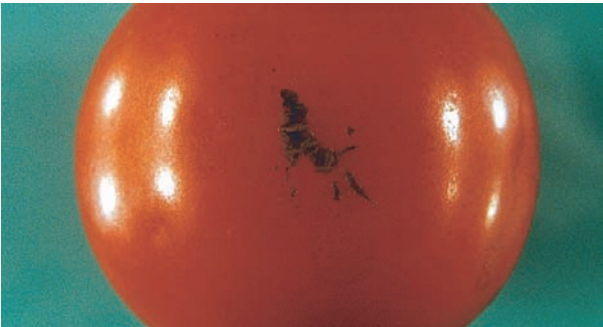
Frost damage

Note bleached appearance.

Cause. Light frost will damage tops of plants and exposed fruit, while heavy frost will kill plants and freeze fruit. Blocks with dry soil, dead leaves or dry grass around the plants are most susceptible.

Solution. Do not plant crops in frost-prone areas. Encourage air flow down the slope away from the crop. Keep soil moist and weed-free. If there is a frost apply overhead irrigation, if available, before sunrise.

Other blemishes



Wind rub

Left: damage on a ripe fruit.

Cause. Abrasion of fruit by rubbing against soil, leaves, stems or other fruit as a result of plant movement in wind.

Solution. Plant windbreaks. Plant ground crops off centre (upwind) on plastic mulch to allow plants to stay on the plastic in windy weather.



Wire rub

Note fruit and stem damage.

Cause. Fruit can be damaged during trellising or as a result of wind causing bush movement.

Solution. Take care when trellising. Plant windbreaks.



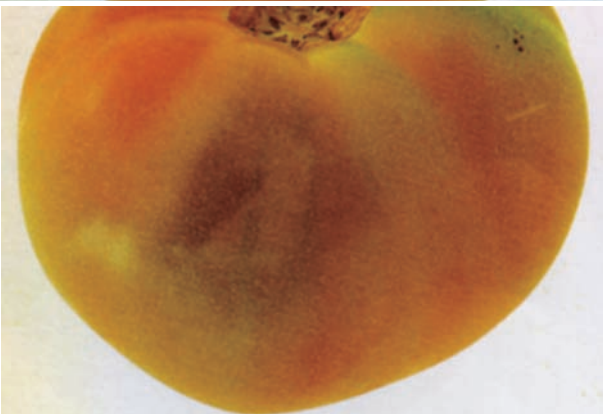
Bruising

Upper: glassy appearance of mild bruising.

Lower: severe bruising.

Cause. Rough handling of fruit, for example dropping or squeezing, during picking, transport to the packing shed, handling in the shed, transport to market and in the marketing chain.

Solution. Handle fruit carefully from harvest to consumer. If bruising develops, check where the damage is occurring and correct.



Zipper

Cause. The anthers (male part of the flower) were attached to the ovary wall in the newly forming fruit. It is more common in fruit set under cool conditions but can occur under other conditions.

Solution. Grow tolerant varieties. Most newer varieties are less susceptible. Some varieties, for example Rouge de Marmande and Grosse Lisse, are more susceptible.

Puffy fruit



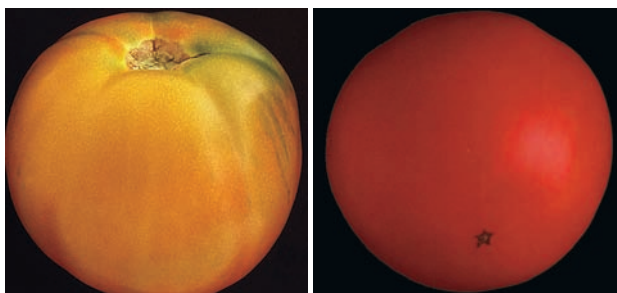
Puffiness

Note the angular flattened sides of the fruit and empty fruit locules.

Cause. Poor seed and gel development in the locules, usually from poor pollination caused by temperatures below 13°C, or minimum temperatures above 23°C. High nitrogen levels and variety susceptibility may also be involved. Later picks of ground crops show more damage than first or second picks. Some gourmet varieties are more likely to produce puffy fruit under adverse conditions.

Solution. Do not plant crops to flower during periods of very high or very low temperatures. Carefully manage crop nutrition. Avoid bush damage.

Yellow or orange fruit



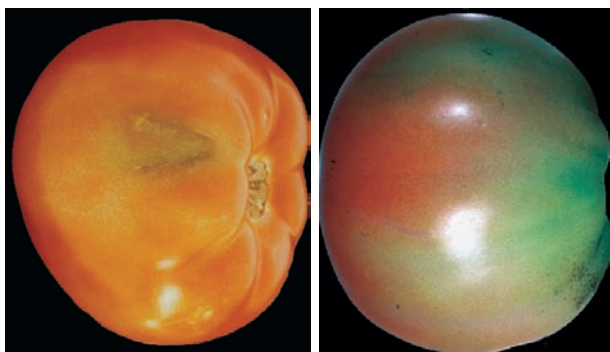
Fruit yellowing

Left: poorly ripened yellow fruit. Right: well ripened red fruit.

Cause. Fruit were ripened at too high a temperature in the field or in degreening rooms. At temperatures of 22°C or higher, the fruit turn orange, then yellow at 25°C and higher.

Solution. In hot weather, pick fruit at the mature green to 1/4 colour stage. Refer to the *Tomato colour grading chart* in *Key issues*. Cool fruit as soon as possible. When degreening fruit in gas rooms, set temperature at 20°C.

Uneven ripening



Shadow blight (grey wall)

Note large unripened areas.

Cause. Some varieties have a genetic defect which leads to grey wall affected fruit. Most damage appears to occur during cool, cloudy weather. Fruit maturing under these conditions develop the most severe symptoms.

On green fruit shadow blight shows as a grey-brown skin discolouration. Affected areas on ripening fruit change from green to yellow instead of red. The affected area appears woody when cut. It can also occur if vigorous bush development causes heavy shading of inside fruit.

Solution. Do not plant susceptible varieties. Most modern varieties are not prone to this disorder.

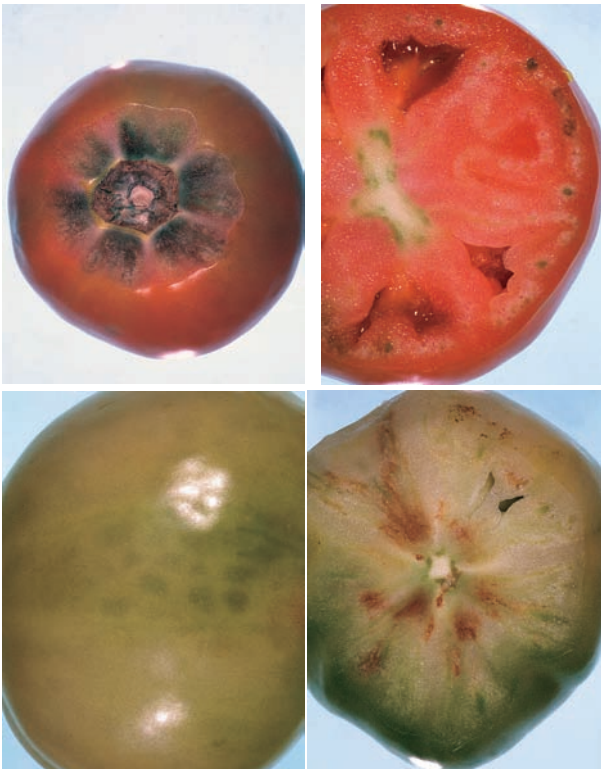
Uneven ripening



Ghost spot (grey mould)

Cause. The fungus *Botrytis cinerea*. If its development is restricted, pale ring-like spots or haloes known as ghost spots appear. Infection is through injuries or where blossoms fall onto leaves, stems or fruit. Worse in cool weather with fogs or heavy dews.

Solution. Maintain a good crop rotation and ensure all organic matter is decomposed before planting. Field sprays with an appropriate chemical from the *Problem solver handy guide* will reduce infections. Follow the recommendations in *Key issues* for the prevention of fungicide resistance. Apply a postharvest treatment to fruit.



Mosaic

External and internal symptoms on red fruit, upper, and green fruit, lower. Note internal browning.

Cause. Tomato mosaic virus (TMV). This seed-borne virus is highly infectious and can be carried over on tomato and related crops and spread on hands, equipment, by pruning and by contact between plants.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Use commercially treated seed or treat seed with 10% trisodium phosphate (TSP) for one hour. Do not handle seedlings after working in an older crop, or first ensure hands are washed in a 10% TSP solution. Treat pruning implements with TSP before entering another block. Spray or dip wires and posts with a 10% TSP solution before use. Most current varieties are tolerant of or resistant to mosaic.



Spotted wilt

Left: blotchy ripening symptom. Right: ring spot symptom.

Cause. The tomato spotted wilt virus (TSWV). It is spread by thrips. In south Queensland it is most common in spring while in north Queensland it is worst in autumn and winter.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Control thrips with an appropriate chemical from the *Problem solver handy guide*.

Uneven ripening



Silverleaf whitefly

Upper left: blotchy ripening symptom. Upper right: internal discoloration. Lower left: adult (0.8 to 1.2 mm). Lower right: nymphs (0.3 to 0.6 mm).

Cause. The sap sucking insect *Bemisia tabaci* biotype B. It feeds on the underside of the leaf and can transmit geminiviruses and excrete honeydew that becomes covered with black sooty mould.

Solution. Ensure all transplants are free of whitefly. Keep the farm weed-free and plough in the crop immediately after harvest. Plant new crops upwind of old crops. Whitefly quickly develop resistance to chemicals. Spray with an appropriate chemical from the *Problem solver handy guide*.

Blotchy ripening can result from several problems including potassium deficiency and feeding by mites.

Blotchy ripening



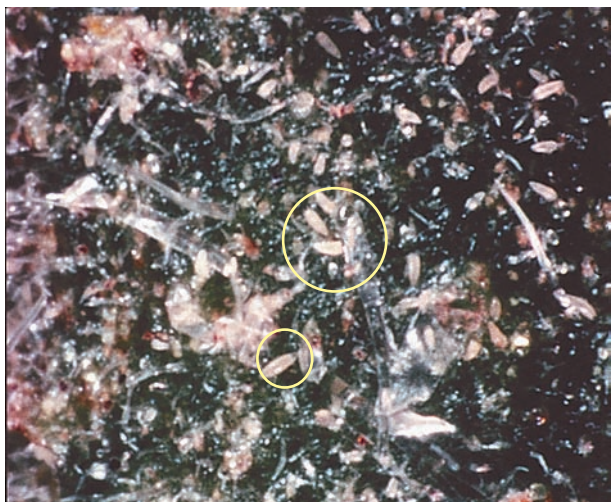
Potassium deficiency

A general photo of blotchy ripening.

Cause. Low potassium levels in the soil. Potassium is less available in soils with a pH below 5.4 or above 7.5. Potassium is easily leached in lighter soils.

Solution. Do leaf or sap tests and fertilise as recommended. Do a soil analysis six to eight weeks before planting. Adjust pH to around 6.5. Ensure sufficient potassium fertiliser is applied in the seedling mix, as a pre-plant soil dressing and apply as a side dressing. Apply a potassium fertiliser after heavy rain.

Blotchy ripening

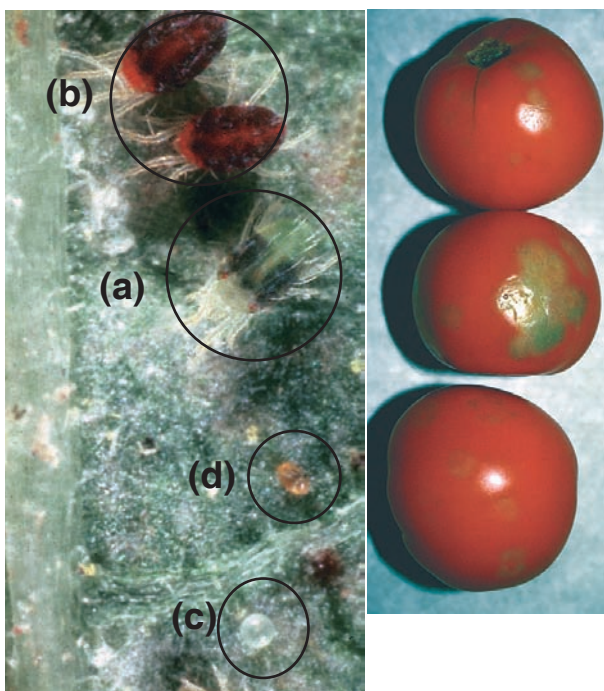


Tomato russet mites

Russet mites (0.15 to 0.2 mm long, 0.05 mm wide) on a stem.

Cause. Feeding by the mite *Aculops lycopersici*. Feeding causes loss of plant hairs, bronzing of the stem and death of lower leaves. On immature fruit, spots are a greenish-white. Worst in warm dry conditions.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Check that seedlings are not infested before transplanting. Do not plant downwind of infested plantings. Spray to control russet mites with an appropriate chemical from the *Problem solver handy guide*.



Spider mites

Left: close-up, (a) twospotted mite; (b) bean spider mite; (c) twospotted mite eggs; (d) bean spider mite eggs. Adult mites are about 0.5 mm long and eggs about 0.15 to 0.2 mm in diameter. Right: affected fruit.

Cause. Feeding by nymphs and adults of the twospotted mite *Tetranychus urticae* and the bean spider mite *Tetranychus ludeni*. Worst in warm, dry conditions. Spread by wind and on clothing, machinery, birds and insects.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Check that seedlings are not infested before transplanting. Do not plant downwind of infested plantings. Consider using predatory mites in the headlands around young crops. Spray to control spider mites with an appropriate chemical from the *Problem solver handy guide*, ensuring thorough coverage of the underside of leaves. The predatory mite *Phytoseiulus persimilis* is a possible alternative to spraying in some situations where few insecticide sprays are required.