

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 We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research: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- Financial information—costs and returns listed in this publication are out of date.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



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 these decisions. The common problems are shown in a series of pictures, grouped according to the main symptom. From the contents, find the symptom that best fits your problem. On that page you will find the causes and the solution, if there is one.

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Seedlings die in the nursery



Fertiliser burn

Note the dead tips and edges of upper leaves.

Cause. Too much fertiliser in the seedling mix or foliar spray, or incorrect application of foliar spray.

Solution. Do not use too much fertiliser in the seedling mix or foliar sprays. Do not use high analysis fertilisers. Refer to *Key issues* for more information on container-grown seedlings.



Poor quality water

Note dead tips and edges of lower leaves.

Cause. The electrical conductivity (salt content) of the irrigation water is too high.

Solution. Check the conductivity of the water before applying. Only use water with an electrical conductivity of 1200 microSiemens per centimetre ($\mu\text{S}/\text{cm}$) or less.



Spray burn

Left: discoloured, burnt areas of leaflets. Right: spots and burnt areas on leaflets. Inset: advanced damage where spray has concentrated.

Cause. Incorrectly applied pesticides. Either the concentration of pesticide or the temperature was too high.

Solution. Read the label and apply chemicals at the recommended rate. Do not apply chemicals when the weather is excessively hot or plants are under stress.



Damping-off

Left: in a seedling tray. Right: healthy plants in the middle.

Cause. Soil-borne fungi, usually *Pythium*, *Phytophthora* and *Rhizoctonia* species. Damping-off is more common in the field than in hygienically run nurseries. It is more severe in soil containing undecomposed plant residue.

Solution. Ensure all organic matter in the field is decomposed before planting. In the nursery use Ridomil 50G granules, 2.5 g/10 L of potting mix, to control *Pythium*. Keep seedling trays at least 1 m above soil to prevent contamination. Do not over water. Use sterile potting mix.

Seedlings die in the field



Cutworms

Left: cut off plants and cutworms. Right: close-up of cutworms (up to 40 mm long).

Cause. Larvae of the brown cutworm *Agrotis munda* and the black cutworm *Agrotis ipsilon*. Areas that were weedy just before planting are most affected. Damage often occurs during the first night of planting and may continue for up to three weeks.

Solution. Cultivate to remove weed growth well before planting and to expose larvae and pupae to bird predators. If you suspect cutworms are present, use a boom spray over the area to be planted or, before evening of the day of planting drench the soil around the base of the plant with a chemical from the *Problem solver handy guide*.



Wireworms and false wireworms

Upper: wireworm (20 mm). Lower: false wireworm (adult 10 mm, larva 15 to 20 mm long).

Cause. Larvae of the click beetle, family Elateridae, and larvae and adults of the beetle *Gonocephalum* spp., the false wireworm or northern false wireworm. Larvae feed on roots and stems, while the adults of the false wireworm chew the stems just below the soil. Worse in winter and spring.

Solution. Cultivate well before planting to expose larvae and pupae to bird predators. Choose a chemical from the *Problem solver handy guide* and spray around the base of the plants, or use a boom spray over the entire area. Irrigate to leach spray down to the larvae.



Crickets

Upper left: damaged plants. Upper right: black field cricket (25 mm). Lower: mole cricket (30 mm).

Cause. Feeding by adults and nymphs of the black field cricket *Teleogryllus commodus* and the African mole cricket *Gryllotalpa africana*. Field crickets feed on the above ground parts of the plant, while the mole cricket feeds on below ground parts. Worse in summer. Crickets also chew holes in thin plastic trickle irrigation tube.

Solution. Place baits in the field before planting and in the crop if crickets are a problem. Refer to the *Problem solver handy guide*. Use a heavier gauge irrigation tube if tubing is being damaged.



Spots and blotches on leaves



Target spot

Left: leaf. Right: close-up, note the circular target rings.

Cause. The fungus *Alternaria solani*. Target spot is common and is worse in warm weather or in winter when there are heavy dews or fogs.

Solution. Ensure good air movement in seedling trays. Use disease-free seed. Destroy old crops immediately after harvest. Rotate crops so that tomatoes do not follow tomatoes or potatoes. Do not allow plants to become stressed. Refer to *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. Right: bacterial speck.

Cause. The bacteria *Xanthomonas campestris* pv. *vesicatoria* (bacterial spot) and *Pseudomonas syringae* pv. *tomato* (bacterial speck). Bacterial diseases are common in southern Queensland and are difficult to control in wet weather.

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



Mosaic

Upper: plant. Lower: leaflets, note healthy leaflet on left.

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. Plant commercially resistant varieties or use commercially treated seed, or treat seed with 10% trisodium phosphate (TSP) for one hour (see *Key issues*). Do not handle seedlings after working in an older crop, or first wash hands 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.



Spots and blotches on leaves



Spotted wilt

Left: plant. Right: leaflet.

Cause. The tomato spotted wilt virus (TSWV). This virus is sporadic and is spread by thrips. In south Queensland it is most common in spring when thrip numbers increase rapidly. In north Queensland it is worst in autumn and winter.

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



Potato moth (leafminer)

Upper left: damage. Upper right: close-up, note miner (10 to 15 mm). Lower: moth (10 to 12 mm wingspan).

Cause. Larvae of the moth *Phthorimaea operculella*. Larvae eat the area between the upper and lower leaf surfaces, creating a mine in the leaf. They may also tunnel into the stems of young plants. Most severe in summer and autumn, but will survive through mild winters if cropping is continuous.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Separate crops in space and time to avoid having young and old crops planted close to each other at the same time. Spray the crop with a desiccant herbicide as soon as harvest is complete. Remove 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*.



Frost damage

Cause. Light frost will damage tops of plants and exposed fruit, while heavy frost will kill plants and freeze fruit. Frost is sporadic.

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



Powdery mildew

Left: affected plant. Right: close-up of leaflet.

Cause. The fungus *Oidium* spp. Powdery mildew can sometimes be severe in the Bowen area and occurs occasionally in other areas. It is sometimes associated with low nitrogen levels in the plant.

Solution. Increase nitrogen levels and destroy old crops. Spray with an appropriate chemical from the *Problem solver handy guide*.



Spots and blotches on leaves



Leaf mould

Left: upper leaflet surface. Right: lower surface.

Cause. The fungus *Fulvia fulva*. This common disease is worse in warm, humid weather.

Solution. Ensure old crop residues are fully decomposed before planting. Spray with an appropriate chemical from the *Problem solver handy guide*.



Manganese toxicity

Cause. An excess of available manganese. It is sporadic and usually develops in high manganese soils with a pH below 5.8, particularly after wet conditions have made the manganese in the soil more soluble and more available to the plant. Symptoms are more severe as pH decreases. Waterlogging reduces oxygen levels in the roots and can induce manganese toxicity.

Solution. Ensure soil pH is above 5.8, preferably 6.5, before planting.

New growth wilts



Rutherglen bug

Left: adult (4 to 5 mm long). Right: nymphs.

Cause. Adults and nymphs of the Rutherglen bug *Nysius vinitor* feeding by sucking sap. Plague numbers can develop in spring and early summer.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Check for Rutherglen bug and spray when necessary with an appropriate chemical from the *Problem solver handy guide*.

Distorted leaves



Aphids

Aphids under a leaf. Note winged adult (1.5 to 3 mm) in centre.

Cause. The green peach aphid *Myzus persicae* and the potato aphid *Macrosiphum euphorbiae* infest tomato leaves and shoots. They can spread leaf shrivel, fern leaf and yellow top viruses. Most common in cool dry conditions.

Solution. Ensure good farm hygiene, destroy weeds and old crops. Control aphids with an appropriate chemical from the *Problem solver handy guide*. Beneficial insects such as lady birds, lacewings, hoverflies and parasitic wasps also help to control aphids.

Distorted leaves



Big bud

Left: affected plant. Right: close-up.

Cause. A phytoplasma (virus-like) organism. Spread by leafhoppers which move into the crop in dry conditions. It is sporadic, with little spread within the crop.

The solution. Ensure good farm hygiene, destroy weeds and old crops.



Hormone damage

Left: healthy leaf. Right: affected leaf.

Cause. Usually a drift (for up to several kilometres) of a hormone spray, for example 2,4-D, used to control weeds. Plants can also be damaged if spray equipment has been contaminated.

Solution. Use separate spraying equipment for herbicides. Do not use hormone sprays in windy weather. Make sure your neighbours know where your crops are.



Leaf roll

Note healthy leaflets in centre.

Cause. Possible causes include high nitrogen levels; high temperatures; calcium and magnesium deficiencies; varietal characteristics; and virus infection. It is sporadic.

Solution. Avoid high nitrogen levels. Do leaf or sap tests and fertilise as recommended. Check for the presence of virus (leaf mottling) and take precautions to prevent further spread.



Leaf shrivel (potato virus Y)

Upper: affected plant. Lower: spots do not always appear.

Cause. Potato virus Y (PVY). A sporadic virus that is spread by aphids. Can be severe during the cooler months.

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



Distorted leaves



Mosaic

Upper: plant. Lower: close-up of distorted leaflets.

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. Plant resistant varieties or use commercially treated seed, or treat seed with 10% trisodium phosphate (TSP) for one hour (see *Key issues*). 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.



Yellow top virus

Cause. Tomato yellow top virus (TYTV). This rare virus also affects weeds and is spread by the green peach aphid and the potato aphid.

Solution. Control the weed hosts. Spray to control aphids with an appropriate chemical from the *Problem solver handy guide*.

Discoloured and mottled leaves



Glyphosate damage

Note young leaves go pale yellow.

Cause. Usually a drift of a glyphosate herbicide spray. Young plants can also be damaged if glyphosate has been sprayed over the beds before planting and a residue remains on the plastic mulch.

Solution. Use shielded nozzles when spraying weeds in interrows. Do not use transplants if there is a glyphosate residue on the plastic.



Paraquat damage

Left: sprayed leaf. Right: affected leaves. Note the discolouration of the veins.

Cause. Paraquat herbicide sprayed onto lower leaves during interrow spraying. It usually appears on one side of the plant.

Solution. Use shielded spray nozzles. Do not spray in windy weather.

Discoloured and mottled leaves



Nitrogen deficiency

Cause. Low nitrogen levels in the soil. Nitrogen is easily leached out of the root zone by heavy rain and excess irrigation. High levels of decomposing organic matter can tie up nitrogen until decomposition is complete.

Solution. Get a leaf or sap test done and fertilise as recommended. Get a soil analysis done six to eight weeks before planting. Ensure sufficient nitrogen fertiliser is applied in the seedling mix, and as a pre-plant soil dressing. Ensure organic matter has decomposed. Apply a nitrogen fertiliser as a side dressing after heavy rain.



Phosphorus deficiency

Left: note purple discoloration. Inset: healthy plant on left.

Cause. Low phosphorus levels in the soil. Phosphorus deficiency occurs in acid soils, in cold weather and in soils low in organic matter.

Solution. Get a soil analysis done six to eight weeks before planting. Adjust pH to around 6.5. Ensure sufficient phosphorus fertiliser is applied in the seedling mix and as a pre-plant soil dressing.



Potassium deficiency

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. Get a leaf or sap test done and fertilise as recommended. Get a soil analysis done 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.



Magnesium deficiency

Left: plant. Note yellowing of older leaves. Right: leaf.

Cause. Low magnesium levels in the soil. High levels of potassium and calcium through trickle irrigation can induce a deficiency.

Solution. Get a soil analysis done six to eight weeks before planting. Apply dolomite instead of lime if pH is low. Do not apply high rates of potassium or calcium. Apply magnesium sulphate through the trickle irrigation at 15 to 20 kg/ha after every second application of potassium nitrate. Apply magnesium sulphate as a foliar spray at 1 kg/100 L.

Discoloured and mottled leaves



Boron deficiency

Left: plant. Right: note death of growing points.

Cause. Low boron levels in the soil. Common in alkaline or strongly acid soils, particularly in cold weather.

Solution. Get a soil analysis done six to eight weeks before planting. Adjust pH to around 6.5. Apply foliar sprays of Solubor at 200 g/100 L three weeks after planting and again at early fruit set.



Calcium deficiency

Note healthy leaf on left.

Cause. Low calcium levels in the soil. High levels of potassium, magnesium and sodium can induce a deficiency.

Solution. Get a soil analysis done six to eight weeks before planting. Apply lime instead of dolomite if pH is low. Do not apply high rates of potassium or magnesium, or acidifying fertilisers, for example sulphate of ammonia.

Molybdenum deficiency



Cause. Low molybdenum levels in the soil, particularly if the pH is below 6.0. Soils with highly weathered limestone and soils with high hydrous iron or aluminium oxides can also cause a deficiency.

Solution. Apply foliar sprays of sodium molybdate (60 g/100 L), or other molybdenum source, in the nursery and three weeks after planting. Before planting apply superphosphate mixed with molybdenum to the soil and ensure pH is about 6.5.



Zinc deficiency

Cause. Low levels of zinc in the soil, worse if pH is above 7.0 or below 5.0. High phosphorus levels, and wet or cold soil can induce symptoms.

Solution. Get a leaf or sap test done and fertilise as recommended. Apply foliar sprays of zinc sulphate heptahydrate (100 g/100 L) in the nursery and two weeks after planting. Three weeks before planting apply 20 kg/ha zinc sulphate monohydrate to the soil.

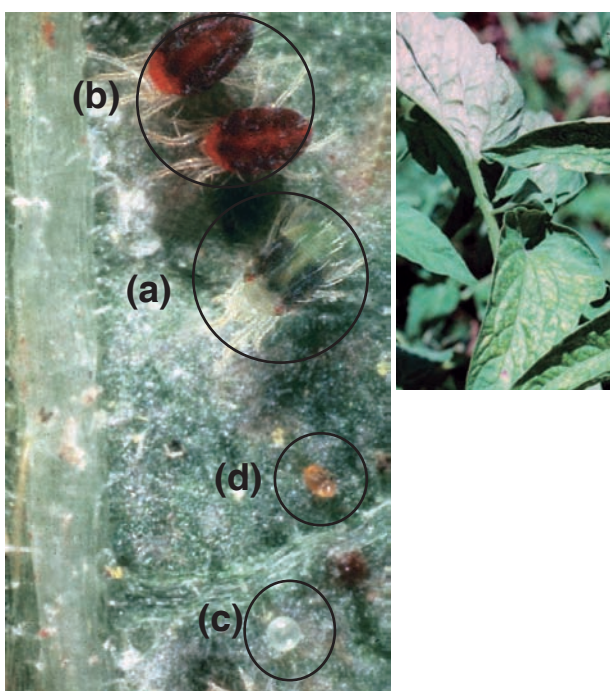
Discoloured and mottled leaves



Salt burn

Cause. Poor quality irrigation water or high salt levels in the soil.

Solution. Check your irrigation water. Water with a conductivity above 1500 microSiemens per centimetre (mS/cm) can cause leaf damage and lower yields, particularly if overhead irrigation is used.



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: Note mottling of leaves and whitish underside of leaf.

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. 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*. Thorough coverage of the underside of leaves is essential. The predatory mite *Phytoseiulus persimilis* is a possible alternative to spraying in some situations, for example where few insecticide sprays are required, as it is susceptible to many insecticides.

Leaflets die on one side of leaf



Bacterial canker

Left: note dead leaflets on one side of leaf. Right: bark peels easily from stem.

Cause. The bacterium *Clavibacter michiganense* pv. *michiganense*. It is usually introduced in seed. It spreads in sap when planting, trellising and pruning, and off fruit.

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.