

Planting and Caring for Citrus Trees:

A Practical Guide for Gardeners



Content Originators

Coenraad Fraenkel, Wayne Kirkman, Wayne Mommsen, Lizeth Swart, Elma Carstens, Jan van Niekerk, Jacquie van der Waals, MC Pretorius and Paul Fourie

Editing

Melanie Visser (Citrus Academy)

Layout and Design

Candice Burgin (Citrus Academy)

Copyright and Use

All rights reserved.

This publication may not be reproduced or distributed without written permission from Citrus Research International (CRI). Images, illustrations, and diagrams remain the property of CRI and affiliated contributors unless otherwise indicated.

Contact Information

Citrus Research International (CRI)

Website: www.citrusres.com

Email: biosecurity@cri.co.za

Phone: +27 (0)13 759 8000

Address: 2 Baker Street, Mbombela, South Africa



Disclaimer

Always consult your local agricultural authority for region-specific advice. Information in this guide is based on expert recommendations from Citrus Research International (Pty) Ltd. Conditions may vary by location. Always adapt advice to your local climate, soil, and nursery guidance.

By accepting this document and reading its contents you agree to be bound by the terms of this disclaimer.

The use of the contents of this document is at your own risk. Citrus Research International (Pty) Ltd does not warrant that the content of this document is suitable for your intended use or that it is free of inaccuracies or omissions. The opinions and advice expressed in this document are not necessarily those of Citrus Research International (Pty) Ltd. Citrus Research International (Pty) Ltd shall not be liable for any loss or damage of any nature suffered by any person as a direct or indirect result of the use of, or inability to use any advice, opinion or information contained in this document, or any misrepresentation, misstatement or omission, whether negligent or otherwise, contained in this document.

You indemnify Citrus Research International (Pty) Ltd against any claim by any third party against Citrus Research International (Pty) Ltd, their directors, officers, employees, agents or contractors arising from, or in connection with, the use of, or reliance on, the contents of this document. It is your responsibility to determine suitability of the contents of this document for your intended use.

Contents

Planting and Caring for Citrus Trees: A Practical Guide for Gardeners	2
Citrus and Climate	3
Finding the Right Spot	3
Choosing Your Tree	3
Citrus Varieties	5
Nursery Tree Types	7
Planting Your Tree	9
Best Time to Plant	9
Planting in the Ground	9
Planting in Pots or Containers	10
After Planting Care	11
Mulching	11
Staking for Support	11
Watering Your Tree	12
Checking Soil Moisture	13
Feeding Your Tree	14
When It Is Not Nutrition Deficiency	19
Pruning for Shape and Health	20
Citrus Pests and Diseases	22
Common Citrus Pests	23
Aphids	23
Orange Dog	24
Leafminer	24
Citrus Thrips	25
Mealybugs	25
Citrus Red Scale	26
Sooty Mould on Citrus Fruit and Leaves	26
Rust Mite	27
Psylla	27
Woolly White Fly	28
Common Citrus Diseases	28
Phytophthora Root and/or Collar Rot	29
Alternaria Brown Spot	30
Citrus Black Spot	31
Citrus Scab	32
Fruit Rots and Moulds	33
Green and Blue Mould	33
Sour Rot	34
Glossary of Important Terms	35
Citrus Growth Stages	36
Citrus Production Calendar	37

Planting and Caring for Citrus Trees:

A Practical Guide for Gardeners

Citrus fruit, whether eaten fresh or processed, is one of the world's most popular fruits. Because of the high demand for top-quality fruit, the South African citrus industry has become very successful, employing 15% of people working in South African agriculture. To stay successful, biosecurity - protecting trees from pests and diseases - is very important.

Home-grown citrus can be a biosecurity threat when trees are planted or moved without following the strict safety guidelines. The aim of this guide is to help gardeners learn how to plant and care for citrus trees safely and responsibly, protecting both their own trees and the citrus industry.



Citrus and Climate

Citrus trees prefer hot summers and mild winters. Some variety types can survive in areas with mild frost, but none can survive harsh frost. If your garden has frost in the winter, you should cover your citrus trees with hessian cloth during frosty periods.

WATCH OUT FOR

Avoid frost pockets or low areas where cold air settles.

Finding the Right Spot

Sunlight: Citrus trees need full sun to grow well. Choose an area that receives sunlight for most of the day.

Space: Leave enough space for your citrus tree to grow. Depending on the type, rootstock, climate and soil, trees can grow 2-4 meters tall and wide. If you do not have enough space, you can:

- Plant in a large pot to limit size;
- Choose a dwarfing, or semi-dwarfing rootstock (such as C35 Citrange or Flying Dragon), or
- Prune lightly yearly to limit the tree-top or canopy size.

Soil: Citrus trees prefer well-drained soil with a medium texture – not heavy clay soils that stay waterlogged. The best soil pH for citrus trees is between 6 and 7. If your soil is too acidic (below 6) or too alkaline (above 7), ask the nursery for rootstocks suited for your soil conditions.

QUICK TIP

Plant citrus in full sun - they need at least 6 hours of sunlight daily to thrive.



Movement of Citrus trees is regulated by the Plant Health Act in South Africa. These regulations are regularly updated based on the occurrence of Citrus Black Spot and African Citrus Greening. Please check the latest Citrus Movement Restriction Maps before transporting or buying trees from another region. DO NOT MOVE TREES FROM THE AREAS WITH CITRUS BLACK SPOT OR AFRICAN CITRUS GREENING DISEASE TO AREAS THAT ARE FREE FROM THESE DISEASES.

DID YOU KNOW?

Trees made from uncertified material might be carrying diseases that will only show up when the trees are older.

Choosing Your Tree

Always plant disease-free trees. Many citrus diseases cannot be seen in young trees and only show up months, or even years later.

To be safe, buy trees that come from nurseries certified by the South African Citrus Improvement Scheme (CIS). Many retail nurseries already source their trees from CIS approved citrus nurseries, but rather ask first before you buy.

QUICK TIP

Choose certified, disease-free citrus trees from a CIS certified nursery to avoid long-term problems.

It is important to know that citrus trees cannot be moved to disease-free areas from areas where certain diseases like African Citrus Greening or Citrus Black Spot are present.

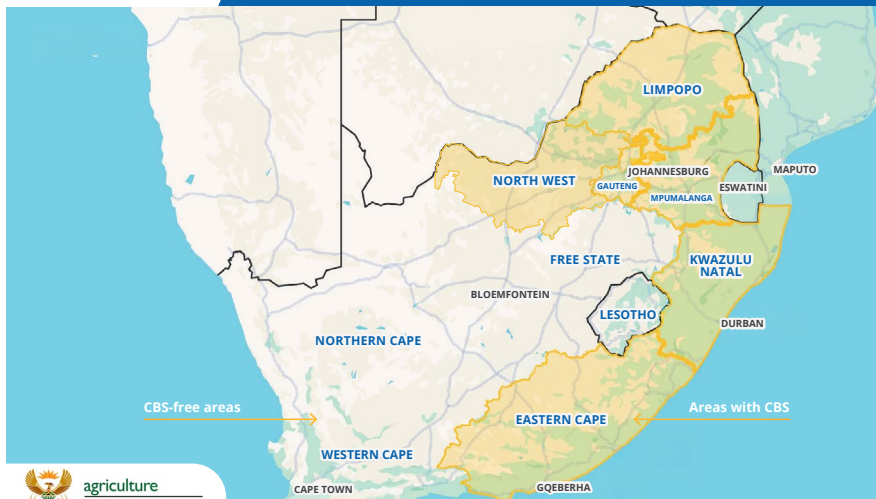
WATCH OUT FOR

Never move citrus trees from restricted disease areas – it is against the law.

Areas in South Africa with Citrus Black Spot disease

KwaZulu-Natal, Mpumalanga, Gauteng, Eastern Cape, Limpopo, and North West province (excluding magisterial districts of Christiansburg and Tzong)

No movement of propagation material of *Citrus* (including species in the synonymous/ related genera *Fortunella*, *Poncirus*, *Microcitrus*, *Eremocitrus*) and any cross thereof from these areas to pest-free areas according to the regulations of the Plant Health Act



agriculture

Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

For more information, contact YolandaT@nda.gov.za or Biosecurity@cri.co.za

Areas in South Africa with African Citrus Greening disease

KwaZulu-Natal, Mpumalanga, Gauteng, Limpopo, North West, and Western Cape districts of City of Cape Town, Grahamstown (south of Hermanus), Stellenbosch, Thembekwini, Overstrand, and south of Lingsberg corridor in Breede Valley, Langeberg, Swellendam, Breda, and Maseru City, including buffer zones in Kruger, Gqeberha, Ngwenya City and Oliver Tambo and Alfred Nzo districts

No movement of *Citrus*, *Bergera koenigii*, *Cosmibuca edulis*, *Chalcidius termitis*, *Clausena anisata*, *Murraya paniculata* and *Veprya lanceolata* propagation material from these areas to pest-free areas according to the regulations of the Plant Health Act



agriculture

Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

For more information, contact YolandaT@nda.gov.za or Biosecurity@cri.co.za

Citrus Varieties

Many different types of citrus are available, and each has its own special features and climate preferences.

DID YOU KNOW?

Homegrown citrus is one of the biggest biosecurity risks for South Africa’s citrus industry.

QUICK TIP

Match your citrus type to your climate – grapefruits are best in warmer climates, mandarins prefer cooler winters.

Frost Tolerance				Preferred Sun		Preferred Climate			Tree Size (h x w)
Frost Hardy	Light Frost	Frost Sensitive	Moderate Frost	Full Sun	Partial Shade	Cool Subtropical	Warm Subtropical	Warm	 3m × 2-3m
									
				Lemons: Lemon trees are easy to grow, but they are sensitive to frost, so plant them in a warm, protected area. They grow about 3m tall and 2-3m wide.					
									 3-4m × 2-3m
				Limes: Lime trees are only suitable for frost-free areas and grow 2-4m tall and 2-3m wide. As temperatures cool down, lime fruit may turn yellow - a natural sign that they are ready to be picked.					
									 2-4m × 2-3m
				Finger Limes: Finger lime trees are moderately hardy, can withstand light frost, but prefer subtropical and warm temperate climates. Trees typically grow to 2 to 4m high and 3m wide under optimal conditions.					
									 2-4m × 3m

	Navel oranges: Navel orange trees grow best in cool subtropical or Mediterranean-type climates. They produce sweet, easy-to-peel fruit with a small “navel” at the end. Depending on the variety, trees grow about 3-4m tall and wide.      3-4m × 3-4m
	Valencia oranges: Valencia orange trees are ideal for home gardens. Their fruit are smaller than navels with a thin rind and few seeds and they are very sweet and juicy. Depending on the cultivar, trees grow around 3-4m tall and wide.     3-4m × 3-4m
	Easy-peelers (Mandarins, Clementines, “Naartjies”): These are favourites because they are sweet, easy-to-peel fruit. They do best in areas with cool to cold winters, without frost. They don’t do as well in hot, humid regions. Trees grow about 3-4m tall and wide.     3-4m × 3-4m
	Grapefruit: Grapefruit trees grow best in frost-free, subtropical climates. The fruit develop their best colour and flavour in warm areas. Trees are large, about 3-5m tall and wide and better suited to bigger gardens.      3-5m × 3-5m
	Kumquats: Kumquat trees are popular in home gardens, or perfect for pots, grown for ornamental or culinary purposes. They grow about 2m tall and wide and can survive light frost if planted in a sheltered area.      2m × 2m



Fingered Citron or Buddha's Hand: This unusual citrus variety is often grown for its decorative and fragrant fruit rather than eating. The yellow “fingers” have no pulp or juice but are excellent for perfume, zest, and preserves. Best suited to warm, frost-free areas or pots in sheltered gardens.



2-4m ×
2-3m

Other cosmetic or culinary varieties: Citrus trees that are also often planted in home gardens or pots for cosmetic or culinary purposes include popular cosmetic cultivars like green and variegated Calamondins, Chinotto and varieties grown for culinary purposes, like Thai lime, Meyer lemon, Bergamot, or Bitter Seville and Rex Union, which are often used in marmalade.

Nursery Tree Types

When buying a citrus tree from certified citrus nurseries, you might see different nursery terms used. Here's what they mean and how to choose the right one for your garden.

Whip tree: A whip tree is the standard size usually supplied to farmers (see Figure 1). It has a straight, single stem without any side branches yet. The stem should be firm and woody (“hardened off”) up to the height where it will later be pruned or topped. Whip trees are generally strong enough to stand on their own, although it's still best to stake them after planting, especially in windy areas.

Scaffold tree: Some nurseries keep whip trees longer and grow them into “scaffold trees.” These are larger, more mature trees that already have a few main side branches (called scaffold branches). Scaffold trees have thicker stems to support these branches and usually do not need extra support after planting. They give you a bit of a “head start” on shaping your tree.

Mini-tree: A mini-tree is a smaller, younger citrus tree with at least 15cm of hardened-off growth above the graft. Because both the tree and its roots are still small, it needs a stake for support. Mini-trees are not common in garden centres and are best suited for experienced gardeners who can nurture them carefully through their early growth stages.

DID YOU KNOW?

CIS certified nurseries comply with production standards that ensure healthy and quality trees.

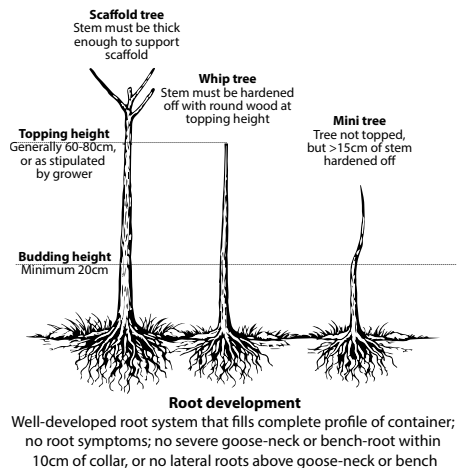


Figure 1 - Illustration of tree standards according to the South African Citrus Improvement Scheme

QUICK TIP

Always buy a tree with a healthy root system - it's the ideal starting point.

The tree's roots should be strong and well developed, filling the whole container (see Figure 2A). It's very important that the roots show no signs of rot. Healthy roots are firm, light brown and alive, although the exact colour can vary depending on the potting mix.

Rotten roots are usually dark brown or black, soft and poorly developed. The bark on these roots slips off easily, leaving fine, hair-like strands behind (see Figure 2B).

DID YOU KNOW?

A mini-tree needs more care early on, and will grow as large as a whip or scaffold tree.



Figure 2A - Good root development



Figure 2B - Symptoms of root rot



Problematic root development



WATCH OUT FOR

Avoid trees with black, mushy roots or bark that peels away easily - signs of root rot.

Planting Your Tree

Best Time to Plant

The best planting time depends on your climate and region.

Hot summer areas: Plant in early spring or early autumn. This avoids the stress of extreme heat.

Frost-prone areas: Wait until late spring to plant. Young trees are very sensitive and can die if frost hits their new growth.

Winter rainfall regions (no frost): Plant in early spring or early autumn so trees have time to settle before winter rains.

If you must plant in summer, take extra care, because extreme heat can quickly dry out roots. Water well and add mulch to keep soil cool.

QUICK TIP

The best time to plant is when temperatures are mild and soil is warm - early spring or autumn in most regions.

DID YOU KNOW?

Trees planted in autumn often establish faster because soil stays warm even as air cools.

QUICK TIP

Loosen compacted roots gently by hand before planting.

Planting in the Ground

Before you plant, take time to inspect the tree and its roots carefully. Use the tree standards on the previous page as a guide. Never plant a weak or unhealthy tree, especially if the roots are soft, rotten, or poorly developed.

Prepare the planting hole

- Dig the hole just before planting, not days in advance.
- Make the hole at least twice as wide and deep as the root ball.
- Do not plant in clay soils that are very wet, because a spade can smear the sides of the hole, forming a hard barrier that stops roots from spreading out of the planting hole.

After digging, loosen the walls and bottom of the hole with a garden fork so that roots can easily grow into the surrounding soil.

QUICK TIP

Make the planting hole twice as wide and deep as the root ball.

Do not add compost or fertiliser

Do not add compost, fertiliser, or any other materials directly into the planting hole. Fresh amendments can burn the roots or cause them to circle within the soft soil pocket instead of spreading into the natural ground.

Keep the hole filled with the same soil you dug out, because this helps the tree adapt more easily.

Prepare the roots

If your tree was grown in a pine bark or coir mix, gently remove at least 25% of that potting medium before planting. If the roots have become pot-bound or tightly packed, loosen them gently by hand. This encourages the roots to grow outward instead of circling.

Set the tree at the right depth

- Replace some of the soil into the planting hole. Place the tree so it sits slightly higher than the surrounding soil level.
- Never plant deeper than it was in the nursery bag, as a buried stem can rot easily.
- Cover the top roots with soil, but don't mound soil too high up against the trunk.

The soil will settle slightly after watering, bringing the tree to the correct level.

Water well after planting

- After planting, form a small basin or pond around the tree to hold water.
- Fill it completely to settle the soil and remove air pockets around the roots.
- If the soil sinks after watering, add more soil to keep the roots covered.

Make sure water does not stand around the tree for more than a day, because standing water can cause root or collar rot.

WATCH OUT FOR

Planting too deep is a common mistake and will cause collar rot - the trunk base must stay above soil level.

Planting in Pots or Containers

Planting citrus trees in pots or containers is a great option if you have limited space or want to decorate patios and courtyards. With the right care, potted citrus trees can grow and fruit beautifully for many years.

Choosing the right container

- Pick a pot that's larger than the one your tree was grown in. This gives the roots room to expand.
- The bigger the pot, the bigger the tree will grow. Smaller pots will naturally keep the tree smaller and may need regular pruning to manage the canopy size.
- If your tree outgrows its pot, you can replant it into a larger container later.

QUICK TIP

Always choose a pot larger than the nursery bag to allow root growth.

DID YOU KNOW?

Smaller pots keep trees compact - perfect for patios and small spaces.

Drainage is essential

Make sure the pot or container has enough and big enough holes at the bottom for water to drain freely. Citrus trees cannot tolerate standing water as it leads to root rot and weak growth. If the pot has a saucer underneath, empty it regularly so water does not collect at the base.

WATCH OUT FOR

Ensure there are enough drainage holes - citrus roots quickly rot in standing water.

The right potting mix

Use a loose, well-draining mix, because citrus roots need oxygen as much as they need water.

A good potting mix should:

- Hold moisture and nutrients,
- Have a pH of between 6 and 7,
- Drain freely (never waterlogged), and
- Feel light and crumbly ("friable") to the touch.

A good blend is:

- High-quality potting soil, mixed with:
 - Compost or pine bark, and a little coarse sand or perlite for drainage.
 - Avoid heavy garden soil, which compacts and traps water over time.

Position and care after planting

- Place the pot in a sunny spot that gets at least 6 hours of sunlight a day.
- Water thoroughly after planting to settle the roots.
- Allow excess water to drain away completely.
- Add a layer of mulch (bark chips or straw) on top of the soil to help keep moisture in.

After Planting Care

Mulching

Adding a layer of mulch around your citrus tree is one of the easiest and most effective ways to keep it healthy. Mulch helps the soil stay moist, keeps roots cool and reduces weed growth around your tree.

How to apply mulch

- Use chipped bark or other coarse organic material as mulch.
- Spread it evenly on top of the soil, not mixed in.
- A layer about 5-10cm thick is ideal.

Never dig the mulch into the soil. If it breaks down inside the soil, it can compete for nutrients with the tree's roots while decomposing.

QUICK TIP

Apply bark mulch to keep soil moist and reduce weeds - but keep it away from the tree trunk.

Keep mulch away from the trunk

Always leave a gap at least one hand's width between the mulch and the trunk of the tree.

Mulch that touches the stem can hold moisture against the bark, which leads to collar rot which is a serious disease that can kill young trees.

WATCH OUT FOR

Mulch helps to retain soil moisture. Be careful not to over-water your citrus trees.

Check moisture regularly

Mulch helps the soil retain water, but it can sometimes keep it too wet if drainage is poor. Do a regular soil moisture check under the mulch and if the soil stays wet for days, let it dry out for a day or two before watering again.

Healthy citrus roots need moisture and oxygen - not soggy, over-wet soil.



Figure 3 - Hand width (10cm) spacing between the mulch and the tree stem

Staking for Support

After planting, it's important to stake your young tree so that wind does not rock it or damage the tree while it's still getting established. A properly staked tree will grow straight and strong.

Choosing the right stake

- Use a strong, straight stake long enough to go deep into the soil while still reaching above halfway up the trunk.
- Drive the stake firmly into the soil next to (but not touching) the tree.
- Make sure it's secure - it should not wobble in the wind.

You can find suitable stakes and ties at most nurseries or hardware stores.

Tying the tree

Use a soft, flexible tie such as coarse rope, cloth tape, or nursery binding tape. Avoid wire or anything that can cut into the bark.

Tie the tree to the stake using a “figure 8” knot (see Figure 4).

This method creates a small loop between the stake and the tree so that the trunk does not rub or chafe against the wood as it moves.

Removing the stake

Once the tree has formed strong roots and can stand firmly on its own, remove the stake, usually after 6-12 months.

Be careful, as leaving the rope too long can “suffocate” the growing stem.

QUICK TIP

Use a sturdy stake and a soft “figure 8” tie to secure young trees in windy areas.



Figure 4 - A “figure 8” tying knot to stake young citrus trees and avoid chafing

Watering Your Tree

Water is vital for young citrus trees, but too much water is more harmful than too little. Citrus roots need both water and oxygen to stay healthy, so the soil must be moist but well-drained.

How often to water

- Water once or twice a week during the first six weeks after planting.
- Each time, give the tree a deep soak so that water reaches the entire root zone.

If you are using a garden hose, form a small pond or basin around the tree and fill it completely once a week. Let the water soak in naturally.

QUICK TIP

Water deeply once or twice a week instead of small daily amounts - roots need both oxygen and moisture.

Avoid overwatering

Before watering, check the soil moisture in the root zone:

- If the soil still feels damp 10-15cm below the surface, wait another day or two.
- If it is dry and crumbly, it is time to water.

Too much water pushes out oxygen, causing root rot and stunted growth.

WATCH OUT FOR

Do not overwater! Constantly wet soil suffocates roots.

Using drip or micro irrigation

If you use drip or micro sprinklers, take care not to constantly wet the trunk or the same patch of soil.

Adjust your drip irrigation as the tree grows, preferably in the rainy season:

Tree age	Dripper distance from trunk
First 6 months	At least 15cm away
After 1 year	Move 30cm away
After 2 years	Move 50cm or more

This helps roots grow outward and prevents trunk rot.

If using micro-sprinklers, replace them with a wider spray pattern after one year so the water reaches the full root zone.

DID YOU KNOW?

Moving drip lines further from the trunk each year helps roots spread outward.



Checking Soil Moisture

Checking Soil Moisture

To water your citrus trees correctly, you first need to understand how wet or dry your soil really is. A quick way to check this is by doing a “sausage test” - it is simple, reliable and does not need any special tools.

How to do the sausage test

1. Before watering, use a spade to dig a small hole about 20-30cm deep near the tree's roots.
2. Take a handful of soil from the root zone.
3. Squeeze the soil firmly in your hand to form a sausage shape (see Figure 5).
4. Then, check how it feels and looks since this tells you how wet the soil really is.



Figure 5 - Soil observation in the root zone

QUICK TIP

Use the “sausage test” - squeeze soil in your hand; if it holds shape but does not drip, it is just right.

WATCH OUT FOR

Soil that leaves water on your hand is too wet - wait a day or two before watering again.

Understanding the “Sausage Test”

Use the table below to rate your soil’s moisture level from 1 (dry) to 5 (soaked):

Soil moisture class	Observation (Sausage test)	Water left in soil	What it means
1 - Dry	Dusty and powdery; soil falls apart easily and cannot hold shape.	0-25%	Too dry - water your tree soon.
2 - Slightly moist	Crumbly and soft; not wet, but no longer dusty.	25-50%	Getting dry - water soon, especially in hot weather.
3 - Ideal (Moist)	Holds together when squeezed; forms a sausage that cracks or crumbles slightly; feels moist but leaves no residue on hands.	50-75%	Perfect moisture - roots have water and oxygen.
4 - Wet	Soil is sticky; makes a solid sausage and leaves wet residue on hands.	75-100%	Too wet - wait before watering again.
5 - Soaked	Heavy and slimy; water drips when squeezed.	100%	Waterlogged - roots can suffocate; improve drainage.

Table 1 - Soil moisture classes

Your goal is to keep the root zone around Class 3 (Ideal Moisture).

That means your soil should form a soft, flexible “sausage” when squeezed - moist, but not sticky or dripping. If it feels wetter (Class 4 or 5), skip watering until the soil dries to Class 2-3. If it feels too dry (Class 1-2), water deeply to bring it back to Class 3.

Feeding Your Tree

Healthy citrus trees need a steady supply of nutrients both from the soil and through the leaves to grow well and produce high-quality fruit.

Soil applications (Feeding the roots)

The safest and easiest way to feed citrus trees is to apply the main nutrients: nitrogen (N), phosphorus (P), and potassium (K) directly to the soil.

A balanced fertiliser such as 2:3:2, 7:1:3 or 10:1:5 (N:P:K) is a good choice.

Soil pH affects how well the tree can absorb nutrients:

Soil pH	What it means	Nutrient uptake
Slightly acidic (pH 6–7)	Ideal range	Most nutrients available
Alkaline (pH > 7)	Common in some areas	Micro-elements like zinc, boron, copper, and manganese become harder to absorb by roots

Table 2 - Soil pH effects on nutrient absorption

If your soil is alkaline, it is better to apply these micronutrients as foliar sprays (see next section).

How and when to apply soil fertiliser

- Start feeding about 6 weeks after planting.
- Apply 200-300 grams of fertiliser per tree per year.
- Split this into 10 small doses, given every 10-14 days during the growing season (spring to autumn).

Spread the fertiliser evenly over a 1m × 1m area around the tree - not in a ring or directly against the trunk. This ensures that the whole root zone receives nutrients.

QUICK TIP

Apply small amounts of fertiliser often
- every 10-14 days is better than one
heavy dose.

Foliar applications (Feeding through the leaves)

Micronutrients such as zinc (Zn), boron (B), copper (Cu), and manganese (Mn) can also be sprayed directly onto the leaves. This is called foliar feeding.

- Spray once a month during active growth.
- Always add a biofilm sticker to help the spray stick and absorb better.
- Choose a combination micronutrient product to supply several elements at once.
- Apply early in the morning or late afternoon, when it is cool.
- Never spray when the temperature exceeds 28 °C.

Recognising and treating nutrient deficiencies

If your tree shows yellowing or unusual leaf patterns, it may have a nutrient deficiency. You can apply products that contain only the specific nutrient the tree needs. For example:

- LAN (28%) for nitrogen deficiency
- Epsom salt (magnesium sulphate) for magnesium deficiency

While an accurate diagnosis often requires lab testing, you can make a good estimate by observing the leaves. The position of the symptoms on the tree (young vs. old leaves) helps to identify which nutrient is lacking.

Different growth sites are usually affected by the deficiency of different nutrients – as illustrated in Figure 6.

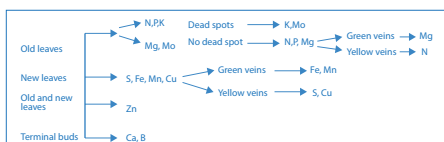


Figure 6 - Key to deficiency symptoms in citrus leaves
(Handbook of fertilization of citrus in South Africa)

WATCH OUT FOR

Never place fertiliser directly against the trunk - it can burn the roots.

DID YOU KNOW?

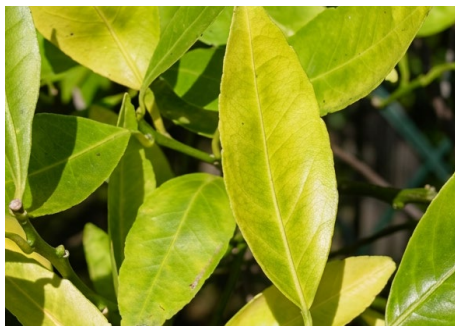
Foliar sprays are more effective when applied early in the morning or late afternoon.

QUICK TIP

Most yellowing starts on older leaves - this helps identify nitrogen or magnesium shortages.

Nitrogen (N) deficiency:

- **Where:** Older leaves
- **Symptoms:** Leaves turn pale green or yellow; tree lacks vigour; poor crop.
- **Result:** Weak growth and small fruit.



Phosphorus (P) deficiency:

- **Where:** Older leaves
- **Symptoms:** Leaves are small and dull; fruit becomes coarse and puffy.
- **Result:** Slow growth and reduced yield.



Potassium (K) deficiency:

- **Where:** Older leaves
- **Symptoms:** Yellowing starts at leaf tips and edges; leaves lose deep green colour and may twist (corkscrew).
- **Fruit:** Smaller with thin rind.



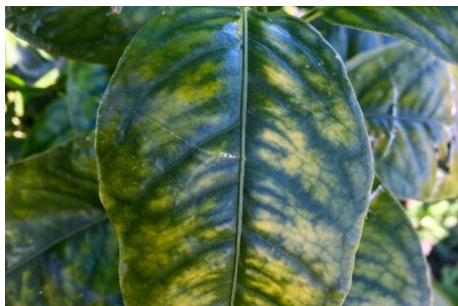
Magnesium (Mg) deficiency:

- **Where:** Older leaves
- **Symptoms:** Yellowing along leaf edges while a green wedge remains near the base.
- **Tree:** Sparse foliage, leaf drop and reduced growth.



Manganese (Mn) deficiency:

- **Where:** Young leaves
- **Symptoms:** Yellowing between green veins (“interveinal chlorosis”).
- **Result:** Reduced crop and gradual tree decline.



Zinc (Zn) deficiency:

- **Where:** Young leaves
- **Symptoms:** Mottled yellowing between veins; leaves become small and narrow (“little leaf”).
- **Result:** Reduced yield and slow decline over time.



Iron (Fe) deficiency:

- **Where:** Young leaves
- **Symptoms:** Leaves turn pale yellow with green veins; chlorosis spreads over time.
- **Result:** Reduced fruit production and gradual decline.



Copper (Cu) deficiency:

- **Where:** Young leaves and fruit
- **Symptoms:** Leaves become thick and dark green; shoots ooze gum; fruit may split or show gumming on rind.
- **Result:** Enlarged nodes, twig dieback and gumming disease symptoms.



Boron (B) deficiency:

- **Where:** Terminal leaves and young growth
- **Symptoms:** Brown or dead tips (necrosis) on young leaves; short, stunted twigs with shortened internodes; fruit may show brown discoloration or gum pockets under the rind.
- **Result:** Dieback of growing points on branches.



Molybdenum (Mo) deficiency:

- **Where:** Leaves (all ages)
- **Symptoms:** Yellow (chlorotic) spots between veins with small gum deposits underneath.
- **Result:** Reduced yield and gradual decline.



When It Is Not Nutrition Deficiency

Not all yellowing or leaf changes are caused by a lack of nutrients. Some pests, diseases, or chemical problems can produce similar symptoms, which often leads to incorrect treatment.

Always look carefully at the pattern, position, and timing of symptoms and if you are unsure, get advice from a qualified horticulturist or extension specialist.

Boron (B) toxicity:

Too much boron can be just as harmful as too little. This usually happens when boron-containing fertilisers are overused or applied too often.

Symptoms:

- Leaf tips and edges appear burnt or brown.
- Leaves may fall prematurely.
- Root growth is reduced, and fruit may be smaller.

What to do:

Stop using boron products immediately and flush the soil with clean water to wash out excess salts.



WATCH OUT FOR

Do not mix foliar fertiliser products unless the label says it's safe - you can damage leaves.

Citrus greening:

Citrus greening is a serious disease caused by bacteria that blocks sap flow in citrus trees, leading to nutrient-deficient symptoms and tree decline.

Symptoms:

- Leaves show blotchy yellow patches that are not symmetrical either side of the leaf midrib.
- Fruit are misshapen, green on one side and bitter.
- Over time, the tree becomes weak and dies back from the top down.

These symptoms can look like zinc or iron deficiency, but unlike those, greening often affects individual branches unevenly.

What to do:

- Remove and destroy infected trees immediately.
- Do not transport citrus plants from affected areas to disease-free areas.
- Buy only certified disease-free trees from registered nurseries.



Biuret toxicity:

Biuret toxicity occurs when urea fertilisers with high biuret content are used as foliar sprays.

Biuret forms during urea production and can damage young leaves if concentration is too high.

Symptoms:

- Yellow or brown tips on young leaves shortly after foliar feeding.
- New growth appears burnt or shrivelled.
- Severe cases cause leaf drop or dieback at the tips.

What to do:

- Always use low-biuret urea (less than 1% biuret) for foliar feeding.
- Avoid spraying in hot weather or at high concentrations.
- Wait until new leaves harden before applying nitrogen sprays.



Pruning for Shape and Health

Pruning keeps your citrus tree strong, healthy and productive. It helps the tree grow in a balanced shape, lets sunlight and air reach all parts of the canopy and reduces the risk of pests and diseases.

Why prune?

- To form a strong structure that can carry fruit.
- To allow light and air into the canopy.
- To remove dead, diseased, or crossing branches.
- To control size for easier picking and spraying.

DID YOU KNOW?

Good pruning lets sunlight reach all parts of the tree - improving fruit set, colour and sweetness.

Formative pruning (Year 1-2)

In the first two years after planting, your goal is to shape the young tree and build a good framework for future growth.

- After planting, cut the main stem to about 50–80cm above the ground.
- Of the new shoots growing from the stem, choose 3 to 5 strong, evenly spaced side branches (called scaffolds) that will form the main structure.
- Remove any weak shoots, duplicates, or branches growing inward or crossing over others.
- Prune as close to the main stem as possible to limit regrowth of the removed shoots.
- Remove all rootstock shoots that develop below the bud union.

This forms a strong, open canopy that lets sunlight reach all leaves.



Maintenance pruning (After year 2)

Once your tree is shaped, it only needs light pruning each year to stay healthy.

Do this:

- Remove dead, diseased, or damaged wood.
- Cut out crossing branches that rub against each other.
- Thin out small twigs and water shoots (long vigorous shoots) inside the canopy to improve airflow and sunlight.
- Remove any suckers (shoots growing from the rootstock below the graft).
- Prune as close to the trunk/branch as possible to limit regrowth of the removed branches/shoots.

When to prune

The best time to prune is after harvest in late winter or early spring, just before new growth starts. Avoid pruning in midsummer or late autumn, as new tender shoots may be damaged by frost or sunburn.

WATCH OUT FOR

Prune in late winter or early spring to shape young trees before new growth starts.

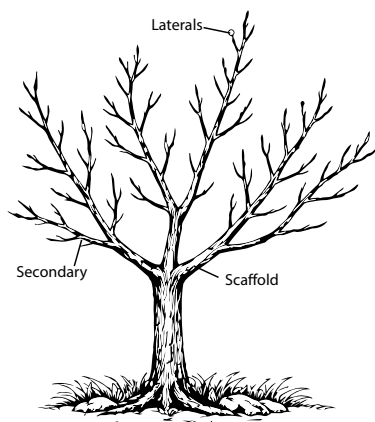


Figure 7 - Scaffold branches on a young tree from which secondary branches and lateral branches grow

After pruning care

- Seal large cuts with a tree wound sealant to prevent infection.
- Remove pruning debris from underneath trees. Debris can be shredded and composted or disposed as waste.
- Fertilize lightly and water after pruning to encourage healthy regrowth.



WATCH OUT FOR

Always disinfect pruning tools using a QAC or chlorine sanitiser to prevent spreading disease.

Citrus Pests and Diseases

Protective Gear and Safety Equipment

When using any agricultural remedy - such as pesticides, fungicides, or fertilisers - it's important to protect yourself properly.

Always read the product label carefully. It shows small safety pictograms that tell you which protective gear to wear when mixing or applying the product.

Even though home-use products are smaller and easier to handle, they can still be harmful if used carelessly.

WATCH OUT FOR



Environment



Health (Acute Toxicity)



Chemicals under Pressure



Corrosive



Flammable



Acute Toxicity



Oxidising



Explosive



Wear gloves



Wear protection
over nose and mouth



Wear eye protection



Wear respirator



Wear boots



Wear overalls



Wear apron



Wash after use

Common Citrus Pests

Citrus trees can host a range of insect pests and diseases. Learning to recognise the signs early helps you protect your tree before serious damage occurs. Managing pests and diseases starts with prevention. Integrated Pest Management (IPM) means using good tree care, natural predators, and only minimal chemical control when necessary.

Many pests can be managed naturally if the garden's ecosystem is healthy. Overuse of harsh chemicals often harms helpful insects as well as pests.

Aphids

Symptoms:

Found on new leaf flushes and fruit stems. They suck sap, causing leaf curling and stunted growth. They secrete sticky honeydew, which attracts ants and encourages black sooty mould to grow on leaves and fruit.

Control:

- Light infestations are usually controlled by natural predators (ladybirds, lacewings, hoverflies).
- For severe infestations, use a systemic insecticide with imidacloprid (soil treatment), or a contact spray containing pyrethroid, neem, or oleum oil.
- Keep ants out of the tree canopy using stem protectors or ant baits, because ants protect aphids from their natural enemies.



QUICK TIP

Regularly check new growth for insects
- catching infestations early saves your tree.

WATCH OUT FOR

Ants in the canopy protect sap-sucking pests like aphids or mealybugs from their natural enemies.

DID YOU KNOW?

Ladybirds and lacewings are natural allies - they eat hundreds of aphids each week!



Orange Dog

Symptoms:

Eggs (small, round, silver) and young larvae appear on new leaves. Larvae feed on soft leaves, chewing and defoliating young growth. Mature caterpillars are bright green with white bands and distinctive markings. The adult stage is a butterfly.

Control:

- Inspect and remove eggs or larvae by hand.
- If caterpillars persist, spray a biological insecticide containing *Bacillus thuringiensis* (Bt), or a contact insecticide with methomyl.
- Protect young flush growth, especially in spring.



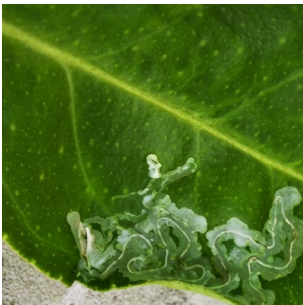
Leafminer

Symptoms:

Tunnels or silvery winding lines on leaf surfaces, especially on young flush. Leaves may curl or twist. Adults are rarely seen.

Control:

- Natural enemies often control leafminers later in the season.
- Early in the season, if needed, a soil treatment with imidacloprid (for aphid control) also suppresses leafminer.



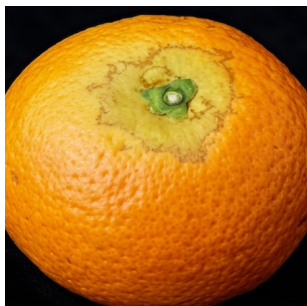
Citrus Thrips

Symptoms:

Tiny yellow-orange insects that feed on soft new leaves and young fruit. Cause scarring and silvery patches on fruit surface, often around the fruit's calyx.

Control:

- Preserve natural predators like mites, lacewings and spiders.
- Avoid harsh insecticides - mild damage is mainly cosmetic.
- Systemic imidacloprid soil treatment (for red scale) also helps suppress thrips between flowering and December.



Mealybugs

Symptoms:

White, cottony insects found in leaf folds, fruit calyxes and twig joints. They excrete honeydew, leading to sooty mould and ant activity.

Control:

- Natural enemies like ladybirds, lacewings and parasitic wasps are highly effective.
- Block ants from entering the tree canopy using sticky trunk barriers.
- Imidacloprid soil treatments for red scale also suppress mealybugs long-term.



Citrus Red Scale

Symptoms:

Small, red-orange scales on fruit, stems and leaves. Severe infestations cause yellow patches, poor growth and can lead to sooty mould.

Control:

- Encourage natural predators such as ladybirds, lacewings and tiny parasitic wasps.
- Keep ants out of tree canopies.
- For heavy infestations:
 - Apply systemic imidacloprid soil treatments (winter–spring), or
 - Spray with horticultural mineral oil to smother scales.



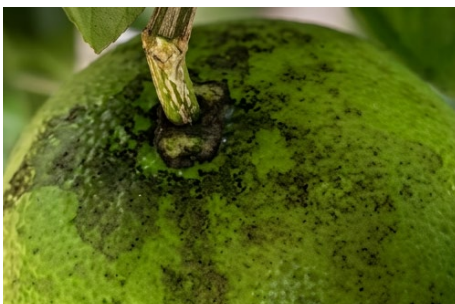
Sooty Mould on Citrus Fruit and Leaves

Symptoms:

Black, soot-like fungal growth on leaves, stems and fruit. Caused by fungi growing on honeydew excreted by sap-sucking insects (aphids, scales, mealybugs, white flies). It blocks sunlight and slows fruit colouring.

Control:

- Control the insects that produce honeydew.
- Stop ants from protecting these insects.
- Lightly wipe affected leaves with a damp cloth if mould is heavy.



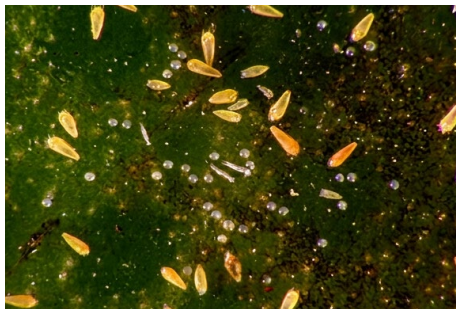
Rust Mite

Symptoms:

Microscopic mites cause the fruit to look powdery or dusty. On oranges and grapefruit, feeding causes brown or purple blemishes on the rind. Leaves may show brown edges or silver patches.

Control:

- Prune dense canopies to improve airflow.
- Spray with sulphur-based fungicides, horticultural oils, or neem products.



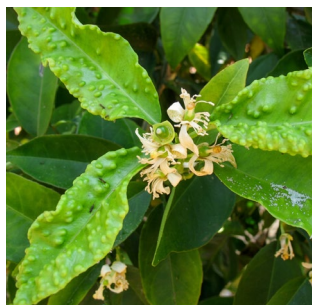
Psylla

Symptoms:

Small yellowish to black sap-sucking insects found on new growth. Eggs are laid along leaf edges; nymphs cause pocking, curling and distorted leaves. Psylla are also vectors of citrus greening disease.

Control:

- Soil drench with imidacloprid around the root zone in August (preventive).
- Foliar sprays with registered insecticides to protect the new growth: dimethoate, methamidophos, acephate, acetamiprid, chlorpyrifos and others.
- Always follow label instructions and local regulations.



Woolly White Fly

Symptoms:

Recognised by white, woolly wax on the underside of leaves. Produce large amounts of sticky honeydew, leading to sooty mould. Eggs are laid in circles under soft new leaves; tiny crawlers settle and feed beneath the wax layer.

Control:

- Effective treatments include buprofezin, pyriproxyfen, abamectin, chlorpyrifos, or neonicotinoids (registered for citrus).
- Encourage predators like lacewings, parasitic wasps and beetles.
- Reduce ant activity to help natural control.



Common Citrus Diseases

Citrus trees are hardy, but they can still be affected by a few common diseases, most of which can be managed through good planting practices, balanced watering and clean trees from certified nurseries. Knowing what to look for helps you act early before disease spreads.



QUICK TIP

Keep the area around the tree clean - fallen leaves and fruit can harbour fungi.

Phytophthora Root and/or Collar Rot

Cause:

A soil- and water-borne organism (*Phytophthora* spp.) that thrives in wet or poorly drained soils. This is one of the most common causes of tree decline and death in home gardens.

Symptoms:

- **Collar rot:** Gum oozes from the trunk near soil level (gummosis).
 - Bark becomes cracked and darkly stained.
 - Leaves turn pale green with yellow veins; canopy declines.
 - Partially girdled trunks cause defoliation and twig or branch dieback; complete girdling kills the tree.
- **Root rot:** Outer root bark slips off easily, exposing pale inner wood.
 - Trees show slow decline, yellowing leaves and twig dieback.

Control:

- Plant in light, well-drained soils (avoid heavy clay, waterlogged or over-irrigated spots).
- Avoid Rough Lemon rootstock in poorly drained soils since it is highly susceptible.
- Use foliar sprays or stem paints containing phosphonate to help trees resist infection.
- Always keep mulch and wet soil away from the trunk. Never over-irrigate young trees (allow soil to dry out between irrigations).



WATCH OUT FOR

Gumming or oozing near the base of the trunk is often a sign of Phytophthora.



Alternaria Brown Spot

Cause:

A fungal disease (*Alternaria alternata*) that affects susceptible varieties such as Nova Mandarin, Minneola Tangelo and Rough Lemon. It spreads during humid, rainy, or warm conditions.

Symptoms:

- Young leaves develop small brown spots with yellow halos.
- Lesions enlarge along veins and may cause leaf drop.
- Young fruitlets can become infected and drop early.
- On older fruit, raised, brown, wart-like spots appear.

Control:

- Most citrus cultivars are resistant. Focus on pruning to open the canopy and reduce leaf wetness.
- Manage irrigation to prevent long periods of moisture on leaves.
- Protect susceptible trees during warm, wet periods with copper-based or strobilurin fungicides.



Citrus Black Spot

Cause:

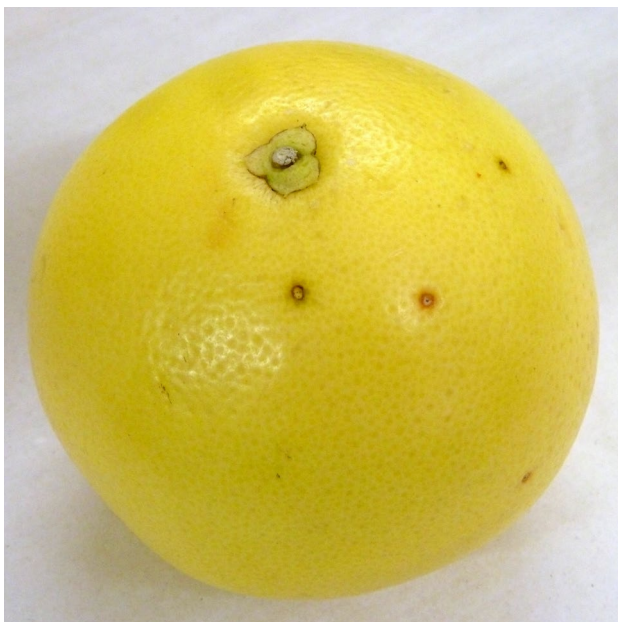
A fungal disease (*Phyllosticta citricarpa*) that affects fruit rind under warm, humid, and wet conditions. Citrus Black Spot occurs in KwaZulu-Natal, Limpopo, Mpumalanga, North West and Eastern Cape provinces, but is absent in the Western and Northern Cape.

Symptoms:

- Fruit: Red to black spots on the rind - spots are cosmetic but affect market value.
- Leaves: Occasionally show small, grey-centred spots with yellow halos (more common on lemons).
- The most typical symptom is the “hard spot” lesion, which appears before fruit turns yellow.

Control:

- Home-garden trees rarely need treatment. Keep trees well-pruned for quick drying after rain.
- If needed, spray copper or strobilurin fungicides from October to March.
- Remove fallen leaves and dead branches to reduce spore buildup.



Citrus Scab

Cause:

A fungal disease (*Elsinoë fawcettii*) that infects young leaves, twigs and fruit, particularly in humid climates.

Symptoms:

- On young leaves, small, raised warts or bumps form on one side, with a matching depression on the other side.
- On fruit, lesions become scabby, corky patches that may merge and crack as fruit expands.
- Twigs develop small, raised scab-like spots.

Control:

- Apply copper oxychloride or cuprous oxide sprays from fruit set (after flowering).
- Avoid excessive watering and improve airflow through pruning.



DID YOU KNOW?

Most fungal diseases spread during long periods of rain or high humidity.

Fruit Rots and Moulds

Even healthy citrus fruit can develop fruit rots after harvest if fruit is damaged or handled roughly. Fungal spores are always present in the environment and usually enter through small wounds on the fruit's rind. The most common fruit diseases are green mould, blue mould, and sour rot.

Good hygiene, gentle handling and cool storage are the most effective controls.

How fruit infections start

Fungi infect fruit when:

- The rind is wounded during harvest, transport, or washing.
- Dirty tools, hands, or bags carry spores between fruit.
- Fruit is left in warm, damp places after picking.

Green and Blue Mould

Cause:

Fungal infections by *Penicillium digitatum* (green mould) and *Penicillium italicum* (blue mould).

Symptoms:

- Soft, watery spots appear on the rind, usually at wound sites.
- Green or blue fluffy mould develops as the infection spreads.
- Affected fruit soften quickly and can spread spores to nearby fruit.

Control:

- Prevent injuries during harvest and handling.
- Remove and discard infected fruit immediately.
- Keep fruit dry and cool after harvest.

QUICK TIP

Pick fruit gently - even small wounds invite rot.

WATCH OUT FOR

Never leave harvested fruit in the sun or a wet container - it spoils faster.

Prevention tips:

- Pick fruit into clean containers.
- Avoid dropping or bruising fruit.
- If fruit is dusty or dirty, rinse gently and dry completely before storage.
- Store at cool temperatures (5-8 °C) in a well-ventilated place.



Sour Rot

Cause:

A fungal infection (*Geotrichum candidum*) that develops mainly on injured or overripe fruit, especially under warm, humid conditions. The fungus survives in the soil and spreads through the low-hanging fruit from water splashes.

Symptoms:

- Soft, watery spots that quickly become sunken and slimy.
- Fruit emits a distinct sour or fermented smell.
- Decay can spread rapidly to neighbouring fruit.

Control:

- Handle fruit gently to avoid breaks in the rind.
- Keep fruit dry since sour rot needs moisture to develop.
- Cool storage (5-8 °C) slows fungal growth and extends shelf life.



DID YOU KNOW?

Clean, cool storage (5-8°C) can keep citrus fruit fresh for several weeks.

USEFUL LINKS AND RESOURCES

Citrus Research International – Citrus Production Guidelines (www.citrusres.com)

Citrus Academy – AV module Citrus Types and Cultivars (Citrus Planting series) (Citrus Academy YouTube channel)

Citrus Academy – AV series Plant Structures and Functions (Citrus Academy YouTube channel)

Citrus Academy – AV series Citrus Planting (Citrus Academy YouTube channel)

Citrus Academy – AV series Citrus Propagation (Citrus Academy YouTube channel)

Citrus Academy – AV series Citrus Pruning (Citrus Academy YouTube channel)

Citrus Academy – AV series Integrated Pest Management for Citrus (Citrus Academy YouTube channel)

All documents are also available in the Citrus Resource Warehouse. (www.crw.org.za)



Glossary of Important Terms

This glossary explains some of the technical words used in this booklet. Understanding these terms will help you care for your citrus trees with confidence.

Biofilm sticker	A helper product added to sprays, so they stick better to leaves.
Canopy	The upper part of the tree made up of branches and leaves.
Collar (tree collar)	The part of the trunk where it meets the roots, just above the soil level.
Collar rot	A disease at the tree base caused by poor drainage or mulch touching the trunk.
Contact insecticide	A pesticide that remains where it is applied on the plant, and does not spread systemically in the tree.
Copper fungicide	A fungicide containing copper, used to prevent or control fungal diseases.
Dieback	When branches or twigs die from the tips backward, usually due to stress, pests, or disease.
Drainage	How easily water moves through soil. Poor drainage can cause root rot.
Drip irrigation	A watering system that delivers water slowly and directly to the root zone.
Feeder roots	Fine roots near the surface that absorb most of the tree's water and nutrients.
Fertiliser	Plant food that provides nutrients through soil or leaf application.
Foliar spray	A fertiliser or pesticide sprayed onto leaves for quick absorption.
Fruit set	When flowers change into small fruit after pollination.
Fungicide	A product used to control fungal diseases.
Girdling	Damage that circles a trunk or branch, cutting off sap flow and often killing the section above.
Green / Blue mould	Common fungi that cause soft rot on injured fruit after harvest.
Gummosis	Sticky gum oozing from bark, often caused by disease or injury.
Harvest maturity	The stage when fruit reaches full size, colour, and flavour for picking.
Honeydew	A sticky, sugary liquid made by insects such as aphids or mealybugs as they feed.
Integrated Pest Management (IPM)	A smart, eco-friendly way to control pests using natural predators, good care, and minimal chemicals.
Irrigation	Supplying water to plants through pipes, hoses, sprinklers, or drippers.
Lateral branches	Smaller side branches that grow from the main scaffolds and carry most of the fruit.
Macro-elements	The main nutrients plants need in larger amounts: nitrogen (N), phosphorus (P), and potassium (K).
Micro-elements	Nutrients needed in small amounts, such as zinc (Zn), iron (Fe), and boron (B).
Mulch	Material such as bark or leaves spread on top of the soil to keep it moist and suppress weeds.
Mulching	Covering soil with organic material to help keep moisture, improve soil health, and reduce weeds.
Natural enemies	Helpful insects, such as ladybirds and lacewings, that feed on pests.
Nutrients	Mineral elements plants need to grow strong and healthy.
pH	A number showing if soil is acidic or alkaline. Citrus grows best in soil with a pH between 6 and 7.
Pest	Any insect or organism that damages plants.
Phytophthora	A water mould that causes root and collar rot, especially in wet conditions.
Postharvest	The period after picking, including handling and storage of fruit.
Pruning	Cutting selected branches to shape the tree, let in light, and remove dead or diseased wood.
Rootstock	The lower part of a grafted citrus tree, chosen for strong roots and disease resistance.
Sausage test	A simple way to check soil moisture by squeezing a handful of soil into a "sausage."
Scaffold branches	The main side branches that form the tree's basic structure.
Scion	The top part of a grafted tree that produces the fruit.
Sooty mould	A black fungus growing on honeydew left by sap-sucking insects.
Sour rot	A fungal infection that makes fruit soft, slimy, and sour-smelling.
Systemic insecticide	A pesticide absorbed by the plant, spreads inside the plant and kills pests feeding on sap.
Waterlogging	When soil stays too wet for too long, pushing out air and damaging roots.

Citrus Growth Stages

Citrus trees grow and produce fruit over a full year. Understanding these stages helps you water, feed, and care for your tree at the right time.

(Season timing for warmer Southern Hemisphere e.g. most of South Africa.)



Flower Bud Formation

Tree prepares to flower inside the buds. Nothing is visible yet.

May - July



Flowering (Bloom)

White flowers appear on the tree and will later become fruit.

Aug-Sept



Fruit Set (Small fruit forms)

Tiny green fruit begin to grow. Some fruit drop, the strongest stay.

Sept-Nov



Fruit Growth

Fruit gets bigger, fills with juice, remains green in colour.

Dec-Feb



Fruit Ripening and Harvest

Fruit ripens, changes colour, and sweetens. Pick when fully ripe.

Feb-Sept

Citrus Production Calendar

Indicative timing of key production practices by citrus type — southern African season

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grapefruit	 			 	 	 	 	 	  	 	 	 
Lemons	 		 	 	 	 	 	 	  	 	 	 
Navels	 				 	 	 	 	  	 	 	 
Valencias	 					 	 	 	  	 	 	 
Easy Peelers	 		 	 	 	 	 	 	  	 	 	 

 Picking
  Pruning
  Planting
  Fertilising
  Pest Control
  Water demand (1–3 drops = low to high demand)

Indicative timing only — adjust for region, cultivar and orchard conditions.



© Citrus Research International 2026

Website: www.citrusres.com

Email: biosecurity@cri.co.za

Phone: +27 (0)13 759 8000

Address: 2 Baker Street, Mbombela, South Africa