



Grow Great Fruit

ESSENTIALS COURSE



[WEEK 12 – LATE WINTER]



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DIFFERENT TYPES OF ORGANIC FUNGICIDES

AT A GLANCE...

While we limit the use of fungicides as much as possible, spraying organic fungicides in spring can make the difference between getting fruit or not getting fruit.

While it is true that, like us, the healthier a tree the less likely it is to succumb to disease, and that perfect tree health gives natural protection from disease, the reality is that most of our trees are going to get hit with something at some stage. Spring is really the high-risk time when it comes to fungal outbreaks. Trees are going through a mad rush of new growth, and none of this growth is protected against fungal infections.

So, how do we protect our trees from fungal outbreaks? There are a number of fungicides we can use in organic systems, and so it's important to know what they are and when to use them. This is not only so we know our trees get enough coverage, but also so that we know we're not overusing things, which can also cause problems.

What we really like from a disease perspective is dry conditions in spring (although then we would like some soil moisture, but we can at least do something about that with irrigation). A short downpour or thunderstorm where things get wet but it's over in no time and things dry out quickly are not a problem. It's the damp, still spring days, when the trees are actively growing, that are a fruit grower's nightmare. When tree foliage gets wet and stays wet for a number of hours, it creates the perfect conditions for fungal outbreaks.

WHICH FUNGICIDE SHOULD I USE?

The main fungicides used in organic systems are copper (hydroxide, sulphate), sulphur (wettable powder), and lime sulphur. They all have their pros and cons, and are all chemicals so should be used with caution and according to the label (see Health & Safety box below).

COPPER: Copper is the big gun when it comes to fungicides in fruit production—it is very effective and relatively persistent. While this is its biggest plus, it's also its biggest minus—we want to encourage fungi in our soil, so having an effective fungicide dripping onto our soil is surely not a good thing? Dead right! On balance, however, we feel the protection it offers outweighs the potential damage; we just limit our use of it to a maximum of three applications per season, and then



Always wear the right protective gear when mixing sprays.

alternate with lime sulphur every other year if we're not carrying a big disease load from the previous year.

There are two main copper sprays—copper sulphate and copper (cupric) hydroxide.

BORDEAUX: Copper sulphate is usually applied as Bordeaux, a spray you mix yourself using copper sulphate and hydrated lime (builder's lime, not garden lime). It's simple to do, and has the advantages of being cheap and relatively rain-fast. The downside is that it can be a bit messy, it settles out so you need to keep it agitated, and the lime particles have a tendency to block spray nozzles.

Mix Bordeaux fresh each time, and use soon after mixing (a day or so) as mixed Bordeaux deteriorates quite rapidly. Bordeaux should not be used at full strength once the trees are in full leaf, as it can burn foliage. Use a more dilute solution.

Builder's lime goes off if stored too long, so buy small quantities, or mix it with water as per method (without the copper), and it can then be stored indefinitely. Stir vigorously before use.

WHEN SHOULD I SPRAY?

As mentioned, we want to minimise our chemical use, but also protect our crop, so when are the vital times to spray? Our spray program looks something like this:

Spring:

Fungicide on peaches and nectarines for leaf curl (copper or lime sulphur) at budswell (July-August, depending on variety), repeat 7-10 days later
Fungicide on apricots before blossom starts, to prevent blossom blight, and on apples and pears before blossom to prevent black spot (apple scab)
Repeat fungicides on all fruit (copper, sulphur) before rain is forecast (more than just a passing shower or thunderstorm)

Summer:

Fungicide on all fruit before big rain events, ie, more than just a thunderstorm or shower (sulphur)

Autumn:

Fungicide in late autumn (95% leaf fall) if disease pressure has been high (copper, sulphur)

Winter:

Dormant oil (white oil) spray if disease pressure has been high

COPPER HYDROXIDE: Copper hydroxide is easier to use than Bordeaux, but it is more expensive and not as rain-fast. It comes under several different brand names, two of the common ones being Blue Shield and Kocide Blue. The dilution rate for both of these is 20 gm per 10 litres of water. Copper hydroxide has a "withholding period" of 1 day, so do not harvest until a day after spraying.

Unlike Bordeaux, copper hydroxide does not burn and so can be used at any time.

For the reasons mentioned above, we limit our use of copper to the time when the trees are really vulnerable

WETTABLE SULPHUR: Sulphur is commonly used as a fungicide in organic systems. While it is not as persistent as copper, it does offer good protection against brown rot in stone fruit and black spot in apples. Wettable sulphur is elemental sulphur powder that has been treated so that it mixes easily in water and does not settle.

Once the high-risk period of spring has passed, we switch to sulphur as our main protection against fungal disease. If the weather is constantly drizzly and trees are staying wet for hours, it's a good idea to have a 'cover' spray on all the time. This means spraying approximately every 2 weeks. When conditions are drier, we keep a close eye on the weather forecast and generally only spray if it looks like there's going to be a wet few days coming up. Sadly weather forecasting is an inexact science, and we get caught out on occasion.

Wettable sulphur should not be used if the daytime temperature is over 30°C, as it can burn.

Wettable sulphur is available in small quantities (~1/2 kg) from garden centres for around \$12, and is used at the rate of 20gm per 10 litres of water.



Copper sprays at the right time will prevent leaf curl...

in spring. After that we recommend switching to sulphur, and only spraying as needed.

Kocide Blue Xtra is widely available at garden centres, and costs about \$8 per 30gm (enough to make up 15 litres).

LIME SULPHUR: Lime sulphur is effective against leaf curl and brown rot in peaches and nectarines and black spot (scab) in apples, less so against blossom blight in apricots.

Although it is relatively soft, the big downside of lime sulphur is that it is highly alkali, which means it can burn young foliage, so use with caution in these instances—safest to use it when there are no leaves on the trees (ie, for leaf curl). It also stings like crazy if you get it in your eyes, and is corrosive, so rinse any metal equipment thoroughly. It also smells pretty much like rotten eggs...

Although lime sulphur can be made at home, it's a pain to do this. Much simpler to buy it ready made. Yates make it in quantities suitable for small-scale use, and it retails for about \$12 per ½ litre. There is no withholding period for lime sulphur.

WHEN SHOULD I RESPRAY?

We get asked this question a lot. The rule of thumb we use is that if there has been 25 mm of rain or more in one event (so over the period of say a day), then it is safest to assume that any spray you had on has now been washed off. This doesn't mean you need to go out and respray immediately once things have dried off, although you may need to if more rain is forecast.

Similarly, if more than 2 weeks has passed since you sprayed, it's best to assume the 'cover' has worn off, even if it hasn't rained.

We generally try to maintain a 'cover' right through spring and summer, but it really depends on weather conditions—if it's dry (like it was here last summer), the risk of fungal outbreak is very low and there's no need to spray at all.

HEALTH & SAFETY

While all of the fungicides we describe are allowable organic inputs, it's still worth remembering that they are chemicals and need to be treated accordingly.

1. **Always read the label.** The label is a good place to start, not only for the correct dilution but also handling and safety instructions.
2. **Wear appropriate protective equipment.** Chemicals can be absorbed through the skin, so wear protective rubber gloves when handling them. Goggles are cheap and necessary. Some sort of breathing mask is also advisable. The bare minimum is a paper dust mask, but safety face masks with canisters that filter chemicals are widely available in hardware stores and are a good investment.
3. **Rinse equipment thoroughly after use,** being sure that anything tipped out can not find its way into a waterway. This can be tricky, especially in a home garden where waste water goes into the town storm water system.

Every chemical sold commercially must have a material safety data sheet (MSDS), which gives full details on all aspects of each chemical product—safe handling, storage, transport, poison information, treatment if swallowed, etc. The best place to find an MSDS is on the manufacturer's website.

BUILDING A HOT COMPOST PILE

In previous articles we've talked about **why** it's a good idea to be using compost on your fruit trees. This week we're looking at **how** to make your own hot compost pile.

WHY HOT COMPOST?

There are different ways to make compost, but hot compost (also called thermal or thermophilic compost) has a number of benefits. As the name suggests, the process involves heat, and the good thing about heat is that it kills seeds and pathogens, so your finished compost is not only chock full of good microbes (bacteria, fungi, protozoa, and nematodes) and organic matter, but it is also free of the things we don't want to be putting on our gardens—weed and grass seeds, and plant pests and diseases.

Hot composting is basically speeding up the process of breaking organic matter down into humus—a process that occurs naturally, but also takes a long time.

Freshly made compost is a pleasure to handle—it smells full of earthy goodness and is a beautiful rich dark-brown colour; it's hard to believe that this wonderful stuff is a product of some pretty smelly and horrible ingredients!

WHAT MAKES A COMPOST PILE HOT?

Rotting organic matter creates heat; microbes are busy breaking down the organic matter, and in doing so they give off heat. How much heat depends on how much nitrogen there is in the material—high-nitrogen material such as manures create lots of activity and therefore lots of heat; high-carbon materials such as straw don't, and so take much longer to break down.

In creating a hot compost pile we want to get the right balance of high-nitrogen and high-carbon materials to create the right amount of heat. We could just add lots of manure, but this would then result in an overly hot pile, and too much heat

is as bad as not enough. At very high temperatures (above about 70°C) valuable nitrogen starts to 'gas off' and we also start killing the good microbes and favouring the ones we don't want. So, by adding the right ratios of materials, we hopefully end up with a pile that will generate heat but is not out of control.

Having said all that, it doesn't need to be that precise—as long as you have a variety of ingredients, and know roughly whether they are high carbon or high nitrogen, and get the ratio roughly right, all should be fine. If you find your pile is not doing what it should, there are things you can do to remedy that, so don't stress too much.

The magic number we are looking for, in our carbon-nitrogen (C:N) ratio, is about 25-30:1, so 25-30 parts carbon to 1 part nitrogen. The table below gives the approximate values for some common ingredients. There are figures available that give more exact ratios, but this level of precision is unnecessary and, unless you're actually weighing everything and have exactly assayed each ingredient to establish its C:N ratio, guesswork still comes into it anyway!

AIR AND WATER

The other things that are needed to make compost are air, and water. Air must be able to move through your compost pile, and so it is important to turn the pile regularly. Woody

AT A GLANCE...

This is a great time of year to be applying a properly made, organic compost to your trees. Making your own compost—turning waste products from your own garden into a fantastic source of plant and soil food—is one of the most satisfying activities in the home garden, apart from eating the produce that is a result of all your hard work, of course.

Composting is almost a science in itself, but making your own hot compost pile is a simple thing to do—there are just a few guidelines you need to follow, and then nature does the rest!



Chipped prunings are a great composting ingredient

material such as small wood chips are good because they keep their shape and so create air spaces within the pile. They do of course take longer to break down.

A dry compost pile is a cold compost pile. The ideal water content is 50%-60%; your material should feel like a moist sponge—not dripping wet, and unless you squeeze really hard no moisture should come out. Too much moisture and the pile

CARBON:NITROGEN RATIO OF SOME COMMON COMPOST INGREDIENTS

~6:1	~12:1	~25:1	~50:1	~100:1
blood and bone, meat scraps, chicken manure, pig manure, fish waste	vegetable scraps, weeds, green grass clippings, horse manure, cow manure, silage, alfalfa hay, chicken manure litter (rice hulls)	dry (summer) grass clippings, seaweed, fruit, fresh hay	straw, old hay, chipped tree prunings, dry autumn leaves	sawdust, paper, bark

becomes a cold soggy mess. You'll soon get the hang of how much water to be adding to your pile. In normal weather conditions it's not necessary to cover the pile to stop rain making it wetter. In really hot, dry and windy weather it's useful to cover your pile to stop the outside layers drying out too much—the drier it is the less it will decompose.

SIZE OF THE PILE

It's harder to keep a smaller mass hot, so a small pile will heat rapidly and then cool rapidly, not giving adequate time for decomposition to occur. The minimum practical size for a hot compost pile is about 1.2 x 1.2 x 1.2 meters. If you have more material you can of course make it as big as you like, but the bigger the pile the more work it is to turn, and the harder it will be for air to penetrate.

If you're making a large pile to be turned by hand, then about 2m wide by 1.5m high (and any length) is the way to go. The pile will soon collapse to around 1m high once decomposition gets under way.

GATHERING MATERIALS

Hot compost piles have to be assembled all at once—it's no good gradually building a pile as you accumulate materials. You will eventually get compost doing this but it will be slow and won't have the benefits of having been heat treated.

The most practical way is to stockpile compostable materials from your garden over a period of weeks or months, and then assemble a pile when you have enough. You may decide to bring in some fresh manure or other high-nitrogen source at this stage as these materials generally don't store well—the nitrogen content decreases over time. Remember, the more diverse the inputs, the better the end product, down to including different weed species, as each will contribute different minerals.

BUILDING THE PILE

Layering is the key to building a successful hot compost pile. Start with something twiggy or coarse, and then layer each of your materials in turn in thin layers. Thickness of layers is not critical, as long as you don't have a thick layer of, say, paper or leaves that could become compressed and impenetrable.

It's a good idea to add some soil along the way—10% is not too much. Not only does soil contain useful micro-organisms that will help kick-start decomposition, but it also contains vital trace elements that may be in short supply in your compost materials. Rock dust is also useful in this regard. If you finish the pile off with a layer of soil it will help insulate it from both too much rain or drying winds.

MONITORING AND TROUBLESHOOTING

Now, watch and be patient! Ideally your pile will heat quite rapidly (say, over 48 hours), stay hot (around 65–70°C) for a few weeks, before gradually starting to cool. Compost thermometers (~\$70) are very handy if you really want to get serious. They are like an overgrown version of a meat thermometer, with a probe up to 1m long. Without a thermometer, you'll need to be guessing whether your pile is too hot—or too cold. You should be able to stick your hand in the pile and leave it there without risk of burning. If you can't, it's too hot. If your pile feels like it's not much warmer than your hand, it's clearly not hot enough.

Now that you know why a pile heats up, it's pretty simple to remedy temperature problems. If it didn't get hot enough, or cooled rapidly, the C:N ratio was too high (too much carbon, not enough nitrogen). The remedy is to turn your pile, adding some more high-nitrogen materials (and water if needed). If it gets too hot and starts smelling of ammonia, this is an indication that valuable nitrogen is heading skywards, which is not where we want it! Valuable microbes will also start to die off at high temperatures. In this situation, turn the pile as soon as possible to allow air in, and this will bring the temperature down. This may be enough, or you may need to add some high-carbon material as well. The important thing is to keep a close eye on your pile, and watch for signs of overheating. If the heat rises again rapidly, there's no alternative but to turn it again, and this is one good reason why it's good to try and get the ratios right to start with—you don't want to become a slave to your compost pile!

A thermometer is a great investment if you want to get serious about compost...

HOW MUCH OF EVERYTHING?

If you need to work it out, here's an example: If I have 150 kg of straw (C:N 50:1), how much chicken manure (at 6:1) do I need to get a C:N ratio of 25:1?

Well, compost made using 150 kg of straw would need to have 6 kg of N. My straw has ~1 kg of nitrogen (N) in each 50 kg (hence, 50:1), so I already have ~3 kg of N—I need another 3 kg. Every 6 kg of chicken manure has ~1 kg of N, so 18 kg of chicken manure will give me 3 kg, bringing it up to the required 6 kg. See, easy!

And remember, all these values are approximate and are just to be used as a guide. It's also good to use a variety of materials when building a pile—the more diverse the inputs, the more diversity there will be in the finished product.





Assemble your ingredients in layers, adding water as you go...

TURNING

Hot compost piles need turning, for a few reasons. Firstly, the material on the outside of the pile will not decompose rapidly unless it is moist and heats up, and the only way this is going to happen is if it gets moved to the inside of the pile. Secondly, once your pile has been through the initial flurry of heat and has cooled (to say 45°C or less), it's time to reactivate it by getting more air in there to get things working and heating again. This might be as much as a few weeks from when the pile was built. Thirdly, piles that are overheating should be turned, as the air will bring the temperature down.

WHEN IS COMPOST 'FINISHED'

This heating, cooling, and turning cycle is repeated several times, or as many times as necessary. Each time a pile is turned, the temperature will spike upwards, but with each turning the spike won't be as high and it will cool quicker.

Compost is 'finished' when the temperature doesn't

spike upwards after turning, and there is nothing of the ingredients really recognisable, except perhaps for some twiggy or woody bits if you added chips to the pile initially. The whole process takes anything from 1 to 3 months; the main variable is how often it gets turned.

Once the pile has reached its initial high temperature (65°–70°C) and left for at least a few days to kill any seeds or pathogens, it can then be turned every few days if you're really enthusiastic—this will speed up the process immensely. You can also leave it as long as you want before turning it (as long as the temperature is falling and not rising too high); it just means the microbial activity will slow right down until it is reactivated by turning.

If you've never made compost before, or had failures in the past, be bold, and give it a go. As with all these things, once you've done it a couple of times armed with the right knowledge, you'll get a much better idea of what works and what doesn't. The important thing is to know what you're aiming to achieve, to persevere, and to ask for help if needed!

After a few days, things should be really steaming....



RECOMMENDED ORGANIC SPRAY PROGRAM

PRINCIPLES OF SPRAYING:

1. Only spray if essential. Many diseases (especially fungal diseases) are much more likely in wet weather, and you may not need to spray at all in prolonged dry weather. Monitor conditions before you decide to spray.
2. For Pear and cherry slug, Aphids and Codling moth, only spray if triggers are met, ie if the pest population has built up to the point where large amounts of fruit will be lost or a tree may die (especially young trees), and if all physical methods have failed to control them.
3. Always follow the advice on the label, and wear appropriate protective gear (breathing mask, gloves, goggles). Even organic sprays can be toxic if ingested.
4. The most destructive diseases (and therefore the most important to prevent, monitor and treat) are Leaf curl, Blossom blight, Black spot and Brown rot. Treatments for these ones are shaded green in the tables, because they really are the sprays that should be put on each year to help make sure you get a crop. The only exception is in drought years, where rainfall is consistently very low, because the incidence of fungal diseases will usually be much lower as a result. If you're not sure if it's going to rain, err on the side of caution and get the sprays on in advance!

APRICOT SPRAY PROGRAM

	Why?	What treatment?	How and when?
April-June	Bacterial canker	Copper (Bordeaux, copper hydroxide) or lime sulfur	While leaves are falling freely (late Fall) or while trees are dormant (no leaves). One spray only, if required. Mid-winter dormant copper spray is the only effective control for bacterial canker (and avoiding winter pruning).
August - monitor for bud movement	Prevent blossom blight, bacterial canker	Copper (Bordeaux, copper hydroxide) or lime sulfur (if available for use in your state)	One spray, apply at bud movement and 7-10 days later. Continue to monitor weather, reapply if you've had more than 1" rain in a short period.
September	Blossom blight	Lime sulfur or sulfur	Apply at petal fall.
December-January	Brown rot	Sulfur	Monitor weather, and apply cover spray before wet weather (e.g. predicted falls of 1") to prevent brown rot. Monitor and repeat as required until all fruit is picked.



CHERRY SPRAY PROGRAM

	Why?	What treatment?	How and when?
August-September	Earwigs	Apply double-sided tape or horticultural glue	Needs to go on before leaves appear
October	Black aphid	Eco-oil or similar	Monitor for aphids, and if present, spot spray (extreme cases only)
November-December	Brown rot	Sulfur	In a wet season if there is evidence of brown rot in fruit, monitor weather and apply cover spray before predicted falls over 1" to prevent spread of disease. Monitor and repeat as required until all fruit is picked.



PEACH & NECTARINE SPRAY PROGRAM

	Why?	What treatment?	How and when?
April-May	Leaf curl	Copper (Bordeaux, copper hydroxide) or lime sulfur	Fall spray at 90% leaf fall, but only if there was a lot of Leaf curl in previous spring
May-June	Green peach aphid	Mineral oil (white oil)	Apply at early budswell or before, hygiene spray to smother aphid eggs.
July	Prevent leaf curl (will also help prevent shot hole and bacterial canker)	Copper (Bordeaux, copper hydroxide) or lime sulfur	Apply at early budswell (for each variety) and 7-10 days later
August	Blossom blight	Copper (Bordeaux, copper hydroxide) or lime sulfur	Monitor weather, and if wet weather is predicted, apply at mid to full bloom, and again at petal fall.
October	Green peach aphid	Eco-oil or similar	Monitor for aphids, and if present, spot spray
December-January	Brown rot	Sulfur	Monitor weather, and apply cover spray before wet weather to prevent brown rot. Continue until all fruit is picked.



APPLE AND PEAR SPRAY PROGRAM

	Why?	What treatment?	How and when?
April-May	Codling Moth	Band trees to capture pupae	As the weather cools down the larvae will be finding pupating sites to overwinter
August	Apple scab	Copper (Bordeaux, copper hydroxide)	Apply first spray in August before there is any sign of green tip (when leaves begin to emerge).
September	Apple scab	Copper (Bordeaux, copper hydroxide) or sulfur	2nd spray. Keep protective fungicide on newly exposed leaves (so replace if more than 1" rain has washed off previous spray). Do not use copper sprays after green tip as russetting may occur; if applying 2nd spray after this time replace with sulfur.
October	Apple scab	Sulfur	3rd spray - very high risk of black spot in March in wet weather. Apply cover spray throughout season before rain.



SPOTLIGHT ON PHYTOPHTHORA ROOT & COLLAR ROTS

AT A GLANCE...

Phytophthora is a pathogenic (disease causing) soil fungus that causes root rot, and collar rot, and can kill fruit trees.

It's favoured by poor conditions, and can be very hard to get rid of once established in the soil.

ABOUT:

Root rot is actually caused by three species of *Phytophthora*, including one called *P. cinnamoni* for the distinctive sweet cinnamon smell of infected wood. Regardless of which species is causing the infection, the symptoms are identical.

Phytophthora thrives in poor soil conditions—too much water, not enough oxygen, not enough organic matter and too few healthy soil organisms to out-compete it. Therefore, one of the best strategies to prevent *Phytophthora* is to provide conditions that favour the healthy soil organisms. Luckily, this is the same strategy that favours everything we're looking for in an organic garden! Adding plenty of organic matter, inoculating the soil with good microbes with compost, compost tea or worm castings, and making sure the soil is not compacted all help.

LIFE CYCLE:

Phytophthora needs wet soil for root infection to occur, and is often the result of waterlogging, compaction or flood. Fungal spores are spread through the soil in ground water, and infect susceptible plants. Unfortunately the spores can survive in soil for many years and germinate when conditions are favourable for them. They can also survive in infected wood for a long time, so it's important to remove and destroy any affected wood from your trees.

MONITORING:

ROOT ROT—if you dig a hole and check out the roots of an infected tree, you would see a reduction in the number of feeder roots. The remaining roots may be decaying, with brown black lesions. Even without digging a hole, you'll notice the tree starts to look stunted, some of the limbs start dying back, and once the tree has leaves, you may notice leaf yellowing, premature leaf drop and poor quality in fruit.

COLLAR ROTS—infections starting in the roots or through rain splash to the lower part of the tree cause the trunk to develop oozing lesions, which often ringbark the tree and kill it. When the bark is peeled away at the base of the tree there is a distinct brown margin to the diseased tissue.

Phytophthora symptoms can look similar to bacterial canker, but can be distinguished by:

- smell: *Phytophthora* cankers smell sickly sweet and bacterial cankers smell sour
- time of year: *Phytophthora* cankers occur during summer, bacterial cankers occur mainly during winter
- direction of development: the first above-ground lesions of *Phytophthora* occur at the base of the tree and progress upwards, bacterial cankers appear at the top and move down the tree.

PREVENTION AND TREATMENT:

There are no effective organic treatments for *Phytophthora*, so the best strategy is to prevent it by

- not allowing trees to become waterlogged from over-irrigation
- encouraging good drainage by planting trees on mounds, or installing drains
- improving soil with continuous addition of organic matter
- aerating soil if it has become compacted
- avoiding use of heavy machinery or walking too much on soil around fruit trees
- choosing rootstocks that are more resistant to *Phytophthora* if planting fruit trees in an area that is prone to waterlogging.



Phytophthora collar rot in a young cherry tree

YOUNG TREES...CHECKLIST FOR SUCCESS

Now that your new trees are planted, here's a quick checklist to tick off before they start growing, to make sure you're giving them the best possible chance of success.

1. PRUNING

If you didn't prune your tree when you planted it, it's still a good idea to do it before the tree really starts putting out new shoots in spring. Even though we don't normally prune apricots or cherries in winter, we make an exception for young trees, because it's so important to get the shape right in the first year or two.

2. PROTECT THEM FROM PREDATORS

Tender young trunks are very attractive to rabbits, hares and voles (among other things), so if you have those types of pests around, make sure your trees are protected with fences, tree guards, or by painting the trunks with a deterrent to stop these herbivore pests having a nibble (see below). Hopefully you've planned for netting your trees in the future, but there's no need to worry about it at this stage, as you probably won't be picking any fruit for the first couple of years (see #4.)

3. DRAINAGE

Pay attention to your young trees after periods of heavy rain over late winter and spring, to check that the drainage is good enough. If you find they are sitting in a pool of water that doesn't drain away within hours (or at most, a day) of a downpour, then you'll probably need to address the drainage, particularly if you've planted a cherry, apricot, peach or nectarine in that spot. You may be able to dig a simple drain to help the water get away, or it might need more serious action, like digging a deeper ditch and laying slotted agricultural pipe. We'll explain the technical ins and outs of proper agricultural drainage in the coming weeks.

4. ANTIFUNGAL SPRAYS

Even though you won't be picking any fruit from your new trees (it's better to let the tree grow and establish its shape before you let it carry any fruit), it's still important to protect your stone fruit trees from fungal diseases. Peaches and nectarines need a copper spray at budswell to prevent Leaf curl (because a severe case can kill a young tree), and apricots should also get a copper spray before the flowers open, to protect the tree from Blossom blight. Even small trees will often have a few flowers, and even though you'll be removing any fruit that forms, if the flowers get infected with blossom blight, the infection can (and usually does) lead to twig die back, which in a tiny new tree can result in the death of limbs.

5. WEED CONTROL

We love weeds (as you know...), but to help your new trees get established, it's a great idea to reduce the competition for water and nutrient around them, at least for their first year. You can do this by planting low impact cover crops, using mulch (e.g., woodchips or straw), weed mat, having animals graze under the trees regularly, or keeping the weeds mowed very frequently.

6. WATER

Plan and set up your watering system well before the trees are going to need it. If you already have a watering system, you can add your new trees into it, or the addition of new trees to your garden might be a good opportunity to overhaul the whole system so it works better for you. We'll have all the details of how to do this in the coming weeks.



HERBIVORE REPELLENT FOR FRUIT TREE TRUNKS

Use animal fat (your local butcher will usually oblige, for little or no cost). Melt it, and add crushed garlic and some strong smelling oil like peppermint, eucalyptus, clove, or a mixture of all of them. Paint it on the trunk of your trees, and keep an eye on it to check whether it needs replacing. Hares and other trunk-nibblers are usually only a problem for one season, as the bark on the trunks becomes much tougher and harder to chew after the first summer.

PLANTING A SPRING GREEN MANURE CROP

We've talked before about planting a winter green manure crop, and mentioned we'd get back to you in plenty of time to let you know when it's time to plant a spring crop. Well, here it is—it's time to plan your spring sowing.

To sow plants under your fruit trees in spring, you may need to do some soil preparation, rather than just sowing seed on top of existing grass or weeds. If you've just planted young trees, the soil has already been disturbed, and it's the perfect site to sow seed. Around mature trees, chooks or other animals can help to reduce the weeds and disturb the soil, or you may need to slash the weeds and lightly cultivate. Pulling up a few weeds will also create some bare soil to sow your seed into.

A green manure crop is usually a mix of fast-growing annual plants that are grown for soil improvement. As soon as the crop is tall enough, and before it flowers, it is either dug in or chopped off and left on the surface of the soil to add organic matter and nutrient to the soil.

It's a fantastic, fast way of enriching the soil.

You'll notice we've included lots of edible plants in this list... the thought being that if you can get a feed at the same time as you're feeding your soil, all the better! It's always a great principle (and a good way to minimise the risks inherent in growing your own food) to make sure every element in your garden has more than one use!

Green manure crops can either be planted around existing fruit trees, or in patches of soil where you plan to plant trees later. They are also often used to enrich and repair the soil between crops, for example in vegetable gardens. They are usually sown in spring after danger of frost has passed, usually around mid-September in temperate zones, but adjust for your local conditions, especially if you live in a more subtropical area.

It's a good idea to use organic seed if you can get it, to make sure you're not introducing any genetically modified plants to your healthy organic garden!

PLANT	CHARACTERISTICS
Barrel medic	Legume, nitrogen fixer, drought hardy, annual but will self-seed every autumn to give winter cover in frost-prone areas.
Basil (<i>Ocimum basilicum</i>)	Repels flies and mosquitos, grows well with tomatoes, deters harmful nematodes. Likes a warm, sunny position.
Beet	The expanding root helps to break up the soil.
Borage (<i>Borago officinalis</i>)	Attracts bees. Young leaves and pink and blue star-shaped flowers are edible. Accumulates potassium & silica; self-sows. Sow spring and summer; autumn in frost-free areas only. Suitable for temperate and subtropical areas. Not drought/traffic tolerant. Good companion to strawberries.
Broad bean (<i>Vicia faba</i>)	Withstands heavy frost, use as fresh or dried bean. Eat fresh from pods like peas. Rich in vitamins B and E. Sow spring and late summer.
Buckwheat (<i>Fagopyrum esculentum</i>)	Accumulates phosphorus, grows quickly, attracts lacewings, hoverflies, bees. You can also harvest the young sprouts as a salad green.
Coriander (<i>Coriandrum sativum</i>)	Seeds and leaf can be used in cooking, and rich in vitamin C. Also has many medicinal uses. Concentrates calcium. Companion to potatoes. Loved by bees, likes a moist, shady spot.
Cow pea (<i>Vigna unguiculata</i>)	Legume, adds nitrogen, helps to control nematodes, good animal and human fodder. Black and white seeds that can be used as fresh pea or dried, and also eaten as immature pods. Sow spring and summer.
Dill (<i>Anethum graveolens</i>)	Aromatic, culinary herb, annual. Can use leaves or seeds in cooking. Source of potassium, sodium, sulphur and phosphorus. Medicinal actions include calmative, diuretic. Companion to cabbage. Like sunny position. Sow spring, summer, autumn.
Fava bean	Legume, fixes nitrogen, tolerant of frost and wet conditions, adds bulk organic matter to the soil.
Fenugreek (<i>Trigonella foenumgraecum</i>)	Seeds used to make anti-congestion tea or in cooking. Source of phosphorus. Sow in spring, autumn or winter.
Field pea	Legume, adds nitrogen.
Lupins	Adds nitrogen, long taproot opens and aerates the soil, flowers are attractive to bees and other beneficial insects
Marigold	Sow spring and summer.
Millet (Japanese) (<i>Echinochloa esculenta</i>) and Millet (White)	Good bulky organic matter, can be grazed and comes back well, excellent used with legumes because it quickly adds bulk to the soil and builds soil structure. Sow in spring and summer. Can be frost sensitive. White French millet is fast growing, low water requirement. Sow in spring or summer.
Mung bean	Quick growing and hardy, legume, adds nitrogen, produces edible seeds. Frost sensitive.
Purslane (<i>Portulaca oleracea</i>)	High in vitamins A and C, and high source of iron. Sow in spring, summer and autumn.
Radish (<i>Raphanus sativus</i>)	The expanding root helps to break up the soil. Withstands light frosts.
Rocket (<i>Eruca sativa</i>)	Hardy annual, mildly spicy greens, used in cooking. Cold tolerant. Sow spring and autumn. Wild rocket is <i>Diplotaxis tennifoliai</i> , stronger flavour and slower growing.
Soybean	Good for hot humid areas (best sown in late spring or summer), adds nitrogen (legume), makes good animal forage and has edible seeds.
Subclover	Self-sowing, legume, adds nitrogen, in hot areas it dies back in summer and regrows in autumn. Taproot with fibrous supporting roots, smothers weeds. Host to several plant parasitic nematodes and ladybirds. Tolerates drought, loosens compacted soil. Sow autumn and spring.
Turnip (<i>Brassica rapa</i>)	Biofumigant, i.e., can kill nematodes, and other soil microbes. The expanding root helps to break up the soil. Brassicas don't support mycorrhizal fungi, can have allelopathic effect on other weeds (i.e., inhibit their growth).
Vetch	Legume, nitrogen fixing.

LIVING MULCH OR 'COVER CROPS'

Another way to think of spring planting is to plant a 'living mulch' around your fruit trees (this is also called a 'cover crop'). Instead of using annual plants, choose perennials, i.e., plants that live on for more than one season, or self-sowing annuals, to plant under your fruit trees.

Growing a cover crop can provide a much healthier environment underground for your fruit trees than bare soil, and is even better than mulch! The roots provide food and habitat for microbes, worms and other soil animals, which in turn provide free nutrition for your fruit trees.

The downside of a cover crop is that the perennial plants will compete with your trees for water throughout summer, so you need to do a 'cost-benefit' analysis for your individual situation before deciding which plants, if any, you'll sow in spring. On balance, once your fruit tree is mature, it usually gets much more benefit from having healthy plants growing under it than the 'cost' of the water lost because of competition.

Any of the plants you can use as a living mulch can also be planted as a green manure crop. Conversely, some of the plants listed as green manure plants are self-sowing annuals (e.g., subclover, barrel medic, and borage), and are also useful as cover crop plants. Here's a few suggestions (you can add many more plants to this list yourself...)

PLANT	CHARACTERISTICS
Alpine strawberry (<i>Fragaria vesca</i>)	Hardy, edible, perennial herbaceous groundcover, helps suppress weeds. Propagates mainly through runners, but also sets seed. Small, very sweet fruit. Likes a cool climate.
Caraway (<i>Carum carvi</i>)	Biennial or perennial, grows to 60 cm tall. Seeds are used in cooking, makes a good companion to peas. Good source of potassium, sodium, calcium, phosphorus and iron.
Chamomile, roman (<i>Anthemis nobilis</i>)	Traditional ground cover and pathway plant, it withstands traffic and can be cut like a lawn.
Chicory (<i>Chicorium intybus</i>)	Fragile, probably won't be too competitive, good for stock. Perennial, frost tolerant, good bee plant. It has been associated with large fruit on trees. Large tap root penetrates deep into soil, breaks clay pans and mines the subsoil. Source of nitrogen, potassium, sulphur and silica. The coffee-substitute chicory is <i>Stetorium intybus</i> , which has a very large root that can be roasted and ground.
Comfrey (<i>Symphytum officinale</i>)	Seed - needs to be cold stored for 2 weeks before planting. Can also plant roots. Can get out of control and be competitive for water. Good companion to fruit trees. Comfrey is good as a permanent crop where it can get its fat roots deep into the soil. It can be cut in the ground 4-5 times over summer. It is also well suited to the understorey of a mixed orchard where you can slash it back for mulch, in fact regular slashing will encourage the roots to mine more minerals from the soil, making it available to plant roots as the leaves break down into the upper soils. The unique combination of proteins, carbon, nitrogen, phosphates and high levels of potassium make for a potent compost additive that will break down rapidly making these, and many other trace elements, available to plants. Young leaves can also be added to salads, cooked, leaves and roots used in tea, and roasted roots in chicory coffee. It also has many medicinal uses.
Hyssop (<i>Hyssopus officinalis</i>)	Bee magnet, medicinal, makes a hedge. Hardy low-growing perennial to 45-60 cm that prefers light, friable, well-drained soil. Attractive deep blue-purple flowers and mint-like leaves. Use young leaves for flavouring salads, soups, stuffing, meat and egg dishes. Hyssop flowers are very attractive to bees and a trap plant for cabbage moth. Likes spring position. Sow spring, summer.
Perennial ryegrass	Sow autumn to early spring. Low drought tolerance, very persistent, grows mainly in spring and winter, needs minimum of 700 mm rain, easy to establish. Extensive shallow root system, sow with white clover, red clover, subclover, lucerne, fescue, cocksfoot, phalaris.
Plantain (<i>Plantago</i> sp)	Also called ribwort, the leaves have distinct ribs. Young leaves good in salads or pasta sauce.
Prostrate lucerne or alfalfa (<i>Medicago sativa</i>)	Legume (nitrogen fixing), deep taproot, provides food and shelter for beneficial insects. There are winter-active and winter-dormant varieties. Sow autumn or spring. Nutrient recycler, good orchard groundcover, can cut for mulch, animal forage, attracts beneficial insects and bees.
Strawberry clover (<i>Trifolium fragiferum</i>)	Legume, nitrogen fixing, medium drought resistance, taproot to 1 m, beneficial insect attractor, vigorous stand has a low, thick, weed-smothering growth habit. Summer vigorous, biennial. Difficult to establish but persists well, drought tolerant, almost no winter growth.
Tall wheat grass	Sow winter to spring. Good for reclaiming saline or waterlogged soil.
Warragul greens (New Zealand spinach) (<i>Tetragonia tetragonioides</i>)	Spreading and very persistent green vegetable, soft wide leaves. Edible but high in oxalic acid, so best cooked and eaten sparingly. Native to Australia and New Zealand, long season, survives drought, frost and disease resistant. Likes adequate moisture and sunny position. Hard to kill. Sow in spring. Can also transplant cuttings.
White clover	Sow autumn or spring, provides year-round soil cover. Attracts parasitic wasps of aphids and scales. Prefers moist, well-drained soil.
Wynn's Cassia	Legume, nitrogen fixing, self-sows readily, good orchard cover, useful for animal forage.
Yarrow (<i>Achillea millefolium</i>)	Hardy perennial from creeping rootstock. Repels insects. Organic potassium, copper, iron, sulphur. Soft feathery ground cover. Compost activator. Tea as blood builder. Healing and soothing effects on the mucous membranes. Sow after frost. Tolerant of frosts, slow to establish but re-establishes better in second year.



White clover provides good year-round ground cover...

CLEFT GRAFTING

Cleft grafting can be used when grafting onto a rootstock tree, e.g., if a volunteer tree pops up in your compost pile, or onto a small limb on an existing tree if you're adding a different variety to the tree. Or you might have a fruit tree that died but the rootstock lived and put up a new shoot—it's easy to turn it into a useful tree by grafting on a known variety.

The main limitation when doing a cleft graft is the size of the rootstock. It is perfectly suited to grafting rootstocks of 25–40 mm in diameter. It's also a useful technique to use when the scion (grafting wood) is much smaller than the rootstock, as it's hard to get a good match when using a whip and tongue graft. It can be harder to get a good union with cleft grafts, because the cleft is a major wound, and it can take a couple of years to fully heal over.

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...for a graft to work, the cambium layers (the active growing zone just under the bark) of the two pieces of wood must be in contact with each other

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CUTTING THE SCION WOOD

Hold the scion (stick of grafting wood) with the fat end closest to your thumb, and cut the end into a wedge shape. Cut one side of the wedge first, then turn the scion over to cut the other side. Make lots of practice cuts on random pieces of wood to give you confidence before you make the cut on your precious scion wood.

AT A GLANCE...

The grafting method you choose depends on the size of the rootstock tree you're grafting onto.

Recently we showed you the easy and useful whip-tongue grafting method, which is used when the rootstock is less than 25 mm in diameter.

This week we're looking at **cleft grafting**, which is perfect for larger rootstocks, or when you have a mismatch between the size of your rootstock, and the size of the scion (or grafting) wood.



Cutting the scion wood into a wedge



Leave a bud on one side of the wedge

SPLIT THE ROOTSTOCK

- Cut the rootstock or branch off at the place you want to attach the graft, with a flat cut.
- Place a blade (secateurs or knife) across the cut surface of the rootstock, so it bisects it, and tap the blade firmly with something, to split the rootstock in half.
- The split should be about 25–50 mm long



Tap gently to split

INSERT THE SCION WOOD INTO THE CLEFT

Insert the scion into the cleft with the bud on the outside—line it up so the inside of the bark of the scion wood is in line with inside of the bark of the rootstock, even if that means the outside of the bark of the two pieces is not in line. Remember, for a graft to work, the cambium layers (the active growing zone just under the bark) of the two pieces of wood must be in contact with each other, so if the rootstock has a thick bark and the scion wood has thin bark, the scion wood will need to be slightly set in from the edge.

Line up cambium layers when inserting scion wood



SEAL THE GRAFT

All grafts must be sealed to make sure they are waterproof, as this helps to keep them free of disease. It also holds them firmly in place while they heal, though this is less of an issue with a cleft graft than other types of grafting, as the cleft tends to naturally squeeze tightly shut, holding the scion very firmly.

- Wrap the graft with cling wrap, making sure you cover the entire length of the split, and that there is sufficient cling wrap around the scion that you'll be able to gather it in to make a tight seal.
- Secure the cling wrap with a strip of adhesive tape around the rootstock
- Seal around the scion with a short piece of budding tape



If you saved seed to grow your own fruit trees this year, it's time to start thinking of planting out seeds or cuttings when the parent trees start to show movement in spring.

- If you have peach seeds stored in damp sand, remove one and gently crack it open (without crushing the kernel inside), to check the progress within. If the kernel has started to sprout, it's time to crack the rest of your seeds and plant them into your garden.
- If you've stored apple or pear seed in damp sand (or the fridge), keep an eye out for when the buds start swelling on your apple and pear trees, which will signal the time to plant the seeds in your garden or nursery.
- When planting seeds, sprinkle a light layer of sand over the top rather than burying them the soil—it makes their first efforts to reach the sun a little easier!
- If you've previously stored plum cuttings in damp sand, check the bottom of them to see if they've started callusing—it will be an obvious layer of new white growth around the bottom of the cutting, which is the beginning of the new roots, and a sign it's the right time to plant the cuttings in your nursery or garden.

DO YOUR TREES NEED A DRINK...ALREADY?

In early spring (when it still feels like winter) root growth in most fruit trees begins, marking the end of dormancy. At this stage the trees draw on nutrients that were stored in buds and other parts of the tree to produce new roots, go through the blossoming period, and start growing new leaves and shoots. This stored energy is used throughout the flowering period, fertilisation, and the formation of tiny fruits.

While they're asleep over winter in the dormant period, the trees don't need any water. It is important to monitor soil moisture levels towards the end of winter, especially in dry conditions or drought, to make sure there's enough water present for the root growth and blossoming that is about to take place, so that optimal cell division can occur.

If you've had 'normal' rainfall over winter, there's no need to worry about irrigation in early spring, but if you've had a dry spell it's worth checking your soil, and giving your trees a drink as they come into the flowering period.

HOW DOES FRUIT GROW?

Fruit growth depends on two things happening inside the fruit—cell division and cell enlargement.

STAGE 1: CELL DIVISION

Immediately after fertilisation of the flower, the ovary starts to enlarge and begin the journey to becoming a piece of fruit. At this stage, the cells are rapidly dividing. The final number of cells in the fruit is set in stage 1, and this determines the maximum possible size for the mature fruit.

To grow the best quality fruit, it's important to maximise the number of cells that develop in stage 1. One of the main limiting factors is the availability of sufficient water in the soil, and that's why it's important to make sure your soil is not dry as you go into spring. Any size that is lost early in the development of a fruit can never be regained.

Other factors that help your fruit develop the maximum number of cells:

- Winter chilling is optimal
- Thinning occurs as early as possible (and definitely within stage 1)

AT A GLANCE...

There are two key times to make sure your fruit trees have enough water, and the period from blossom through early fruit formation is one of them...which means it's time to start thinking about it now.

- Stored nutrients (especially phosphorus) and carbohydrates need to be available to the fruit to their fullest potential, i.e., nutrition in the previous season was sufficient
- The tree doesn't have too much fruit

Stage 1 lasts from full bloom until about 50 days after bloom, but most of the cell division probably occurs during the first 30 days after bloom. The length of stage 1 can also be affected by temperature, lasting longer in cool weather. During stage 1, shoot growth begins but there aren't enough leaves on the tree to support the growth of the fruit and shoots.

STAGE 2: NOT MUCH HAPPENS!

In peaches and nectarines, it looks like not much is happening in stage 2, but inside the fruit the pit is beginning to harden. The fruit stays almost the same size, and though cells store some carbohydrate during that time, the tree is putting much more energy into the growth of shoots and leaves.

Shoots grow rapidly in stage 2, and heaps more leaves develop, to support fruit growth. The length of stage 2 depends on the variety, and it may last only a few days for early-season varieties (like Anzac peach) up to 6–8 weeks in late-season varieties (like Golden Queen).

If you're short of water, stage 2 is the time you can scrimp on how much you give your trees, with little or no effect on the final size of your fruit.

STAGE 3: CELL ENLARGEMENT

Stage 3 covers the period about 4–6 weeks before harvest, and in this final stage of fruit growth the fruit grows rapidly because of cell enlargement. This is the other crucial time to make sure your trees have enough water. In stage 3 the fruit flesh accumulates water and the leaves supply fruits with sugars.





make sure there's enough water present for blossoming...

Because the number of cells in a fruit and the size of those cells influence fruit size, there are really two ways we can influence fruit size. During stage 1 we can try to provide conditions for maximum cell division and during stage 3 we can try to provide conditions for maximum cell size.

GENETICS PLAYS A ROLE

Some varieties grow bigger than others, and each variety has an optimum size it can grow. There's no way you can make a Jonathan apple grow as big as a Bramley apple, no matter what conditions you provide, but making sure the tree has optimum conditions during spring will give each variety the best possible chance to reach its potential.

IRRIGATION REVIEW

Now is the time to review your irrigation system, before we bring you the detailed instructions for setting up or improving your watering system in the next few weeks, in time to get it working before the hot weather starts. Here's the principles to remember when reviewing your system:

- **Diversity of supply = resilience (it's great to have at least two potential sources of water for your trees, e.g., town water, and a tank).**
- **The more automatic, the better—if your system depends on you carrying buckets of water, you don't always feel like doing the hard work when your trees need it most. Being able to just turn on a tap, or set a timer, will often produce a much better result.**
- **Drippers are best for slow delivery of water to fruit trees and lead to more efficient water use.**
- **Your watering system should be big enough to provide enough water for mature trees with a full load of fruit in drought conditions.**
- **Ask yourself what was hard or didn't work well about watering your fruit trees last year, and make a few notes. Sometimes defining the problem helps to provide a solution.**

SPOTLIGHT ON... ACTINOBACTERIA

ACTINOBACTERIA are a common group of mostly aerobic bacteria that occur in both soil and water (fresh and sea). In the soil they include some of the most common forms of soil life and play a vital role in the decomposition of organic matter, especially cellulose and chitin found in woody material, and therefore in the formation of humus.

Until quite recently, actinobacteria were classified as fungi because some of them form branching filaments that somewhat resemble the mycelia (or branching) of fungi, and were called actinomycetes.

In a compost pile, if it isn't turned frequently enough, or if the pile becomes too compacted from an imbalance of materials and oxygen levels fall, such as if there's too much food waste, actinobacteria can take over. The problem with this is that they suppress the growth of beneficial organisms.

Actinobacteria are easy to spot in a compost pile, as they tend to form powdery or ashy white layers or patches. This is generally a sign of low oxygen conditions, and should not to be mistaken for beneficial fungi.

Apart from their great usefulness in the soil, some actinobacteria are of great interest medicinally as a source of antibiotics—the most common genus, *Streptomyces*, produces literally hundreds of antibiotics of natural origin. Many of these have been developed for clinical use today!

It has also been established that a by-product of a certain actinobacteria is responsible for the distinctive smell of wet soil after rain! And believe it or not, there is actually a word for this smell—petrichor!



Actinobacteria can form white powdery layers in compost piles...

WHAT IS CHILL FACTOR, AND DO I HAVE IT?

In winter, trees are dormant, but even then they are very slowly growing. All the miniscule flower parts and tiny leaves that were formed in buds in early autumn are ever so slowly expanding and developing. Under the right conditions in spring, some buds will develop into shoots or flowers, but others may remain dormant. By understanding the factors influencing bud dormancy we can influence tree growth.

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Climate change and global warming is likely to reduce available winter chill in many areas, and possibly reduce the amount of fruit we pick from our trees in the future, if temperatures (particularly minimum temps) increase as predicted

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There are four stages of dormancy:

EARLY AUTUMN BEFORE LEAVES FALL OFF IS CALLED ECTO-DORMANCY

Plants do not grow because it is starting to get too cold and the number of daylight hours is decreasing.

WINTER IS CALLED ENDO-DORMANCY

Deciduous trees survive harsh winter conditions by producing inhibitors (which are hormones) in the buds, to stop the tree from growing. Inhibitors are broken down by cold weather, so the concentration of inhibitors declines as buds are exposed to cold temperatures. After enough hours of being cold, the inhibitors have reduced to a low enough level that the tree can come out of dormancy and start growing again (when the days get longer and the weather warms up). And that, in a nutshell, is chill factor!

Winter chill is defined as the number of hours above 15°C subtracted from the number of hours below 5°C. The easier way to think about it is the number of hours your trees will spend below 7°C in winter. Peach and apple varieties all have different chill requirement to bring

them out of dormancy - when the chilling requirement is satisfied, the level of inhibitors within the bud is low enough that growth will start.

Low-chill areas have up to 450 chill units (e.g., tropical, sub-tropical and some coastal areas). You can only reliably harvest crops of fruit from low chill varieties in low chill areas.

Medium-chill areas have between 450 and 650 chill units (e.g., most temperate regions), and can generally grow all low and medium chill varieties, providing low chill plants are protected from late spring frosts.

High chill areas are those with more than 650 chill units (cool to cold regions), and can grow all low, medium and high chill fruit varieties, providing low and medium chill plants are protected from late spring frosts.

Be aware when planting varieties with chilling requirements less than 800 hours that such varieties usually bloom early and are susceptible to frost. At our farm we are lucky enough to have around 1,120 chill hours per year and to have very few frosts, so we can grow pretty much anything!

Climate change and global warming is likely to reduce available winter chill in many areas, and possibly reduce the amount of fruit we pick from our trees in the future, if temperatures (particularly minimum temps) increase as predicted.

LATE WINTER (USUALLY BY MID JULY) IS CALLED ECO-DORMANCY

Chilling requirement has been satisfied, but it's usually still too cold and dark for trees to start emerging from dormancy.

MID TO LATE SUMMER IS CALLED PARA-DORMANCY

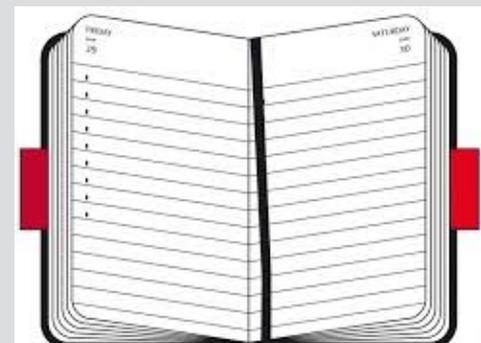
After the tree has grown throughout

Why keep a fruit tree diary? Because your situation, microclimate and how varieties behave at your place will be a bit different to how they behave elsewhere, and you need to get to know your trees well. This is important info when you're planning, because then you can accurately compare your area with known dates in other areas. It also helps you use the Fruit Tree Database more accurately.



spring and summer, growth slows and stops towards the end of summer, because all of the apical buds (buds at the end of each shoot) start to produce a hormone called auxin, which inhibits bud growth. This is called apical dominance, and comes into play when we're trying to understand the 10 key pruning principles (as we regularly cover in our articles and videos on pruning).

Many fruit trees are sold as "low chill", or "high chill", and trying to grow a high-chill variety in a warm climate can be disappointing, because the tree may not produce fruit, but it's always at least interesting, and possibly productive, trying to create microclimates to grow fruit outside of its 'ideal' environment, particularly if you're trying to create microclimates to protect early flowering low chill varieties from frost.



HOW DO I FIND OUT MY CHILL FACTOR?

In Australia, we're lucky enough to have access to the great Bureau of Meteorology (BOM) website. To figure out the chill hours where you live, visit the BOM website and go through the following steps:

1. Go to [Climate Data Online](#)
2. Fill in as follows, to get the Monthly Mean Minimum Temperature for your suburb:
 - a. Data about: Temperature
 - b. Type of data: Monthly
 - c. Select: Mean Minimum Temperature
 - d. Weather station: <<your own town/suburb>>
 - e. Nearest bureau: closest to your address
 - f. Get Data
3. At the bottom of the page (for the most recent year), choose the Lowest Monthly Mean Temperature (often June or July)
4. Now find the Mean Maximum Temperature for the same month (by going back to Climate Data Online and following the same steps for 2. again)
5. Add the Mean Minimum Temperature and the Mean Maximum Temperature together and divide by 2 to get the average. Check the chart below to see how many chill hours you get. You might want to go through the exercise for a few different years in case the most recent year was colder or warmer than average.

NOTE: Go to this week's "Inside Job" to be guided through this process.

CHILL HOURS	AVERAGE TEMPERATURE FOR COLDEST MONTH
0	19.7 degrees (No Chill)
300	15.5 degrees (Low Chill)
330	15.3 degrees (Low Chill)
450	14.0 degrees (Medium Chill)
500	13.6 degrees (Medium Chill)
520	13.1 degrees (Medium Chill)
600	12.7 degrees (Medium to High Chill)
800	10.2 degrees (High Chill)
1,100	7.9 degrees (High Chill)
1,250	0 degrees (Very High Chill)



A wintry day over Mt Alexander - quite a few chill(y) hours in this one...

BARK GRAFTING

Grafting is an ancient skill (it's been around for literally thousands of years), but is not often practiced these days. It's definitely one of those skills that's worth acquiring, and practicing, because being self-sufficient in growing your own fruit trees, preserving heritage varieties, and even creating your own dwarfing trees is not only incredibly satisfying, but can also save you lots of money.

Here at Grow Great Fruit we teach three types of winter grafting, which is not to say these are the only techniques that work, they're just the ones we've found to be most useful, reliable and easy to learn for most backyard fruit growers.

Choosing the right technique for the right situation is mostly dependent on the diameter of the rootstock you're grafting onto. Small rootstocks up to about 20-25 mm diameter (for example a seedling that has come up in your compost pile) can usually be successfully grafted using the whip-tongue method—as long as you can easily make the required cut on the rootstock with the knife you have available.

Slightly larger rootstocks, about 20-40 mm (for example a large seedling, or a small branch on a mature tree), are more easily grafted using the cleft grafting technique.

Bark grafting comes in very handy when you're trying to graft a branch that is more than about 30 mm in diameter, for example a large branch on a mature tree that you're changing to a new variety. You might also use bark grafting to change a single branch to a new variety, for example if you're adding a polliniser variety to a tree that isn't cropping very well, or if a tree you planted has died back and the rootstock has taken over.

AT A GLANCE...

There are three main grafting techniques we use in winter—whip tongue, cleft, and bark grafting. Bark grafting is used when grafting onto rootstocks or branches that are larger than about 30 mm in diameter, and is a good way to change a whole mature tree to a new variety.

BARK GRAFTING STEPS

Here's the six steps for changing a mature tree to a new variety using a bark graft:

STEP 1: REMOVE THE LIMBS

Remove the limbs to about the length you can see in the photos. It's good practice to leave one small limb intact as a "nurse" limb. This limb will come into leaf as normal, and photosynthesise to make sure the tree continues to get the nutrients it needs while the wounds are healing.



STEP 2: TRIM AROUND THE SAW CUTS

Trim around the edge of the stump to make it smooth. This makes it easier to find a smooth place to make the cut to insert the graft, and also to seal the graft without tearing the plastic wrap.



STEP 3: CUT A FLAT-EDGED SCION

Cut a flat-edged scion, similar to a whip tongue but longer. Leave a bud on the bark at the back of the cut.



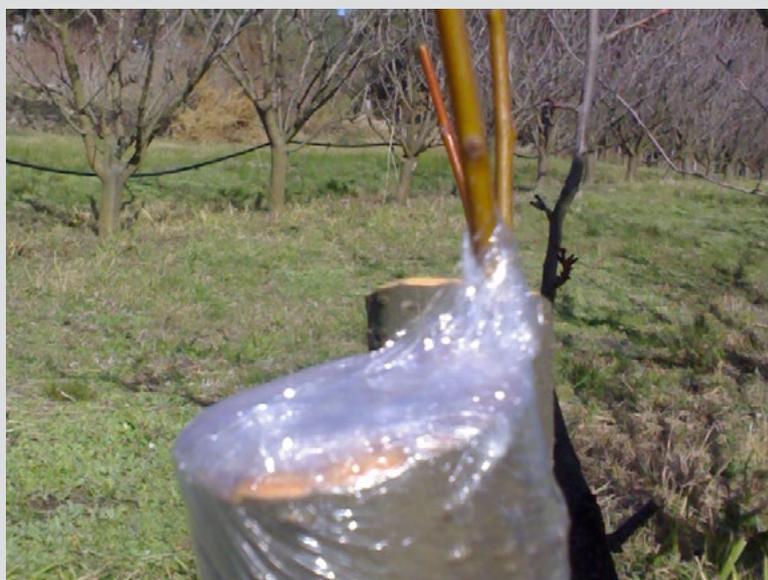
STEP 4: INSERT SCION INTO BARK

Make a cut in the bark and push the scion between the bark and wood with the flat edge against the wood. For large stumps, more than one scion can be inserted, but it's not usual practice to do that. In deciding whether or not to do this, imagine how big the grafts will become as they expand into limbs, and judge whether there's room for two limbs in the space. (You can always remove one limb later if the tree ends up too crowded). Strap grafts are another way to encourage the stump to heal. Strap grafts are similar to bark grafts, but another strip of bark is cut from the opposite side of the piece of scion wood (the strip stays attached to the scion at the top), placed across the stump and inserted into the bark on the other side of the stump. It's a highly specialised technique, and very difficult to achieve, but worth trying anyway!



STEP 5: COVER THE GRAFT

Use cling wrap to completely cover the graft to make it waterproof



STEP 6: SEAL THE GRAFT

Seal the bottom of the cling wrap tightly to the limb with adhesive tape, and seal around the scion with budding tape.

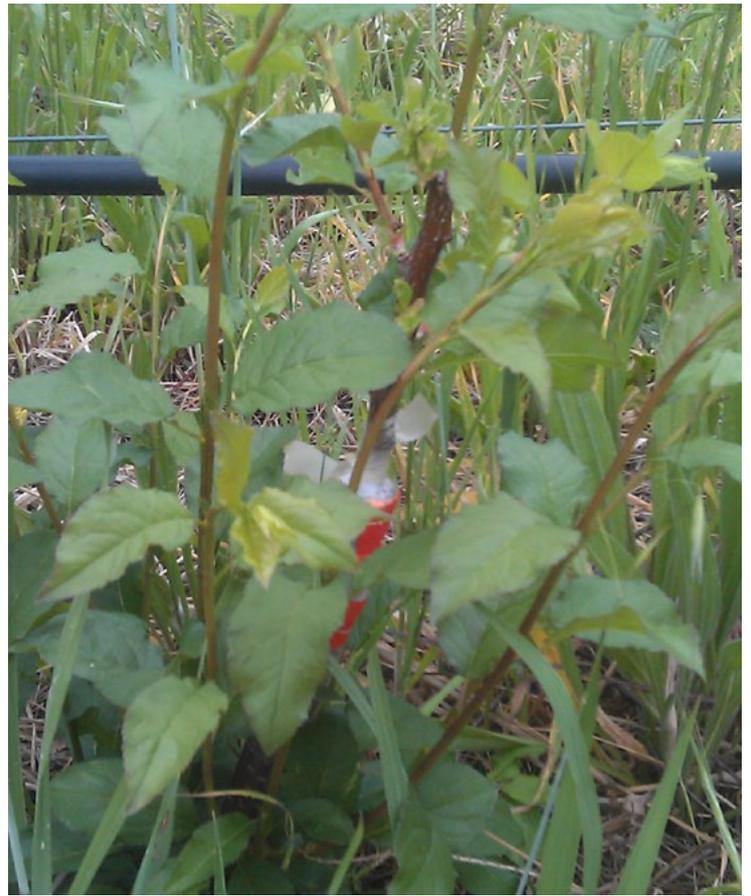


GRAFTING AFTERCARE

In late spring, remove the tying and sealing material (the 'bandage') before it starts to restrict growth. This can happen surprisingly quickly where the budding tape has been used to seal around the scion.

To decide whether the graft has worked, gently wiggle it – it should be held firmly in place by the scar tissue that has formed. If you're not confident that the graft has healed really firmly, re-wrap it and check it again in a month or so.

Summer pruning may be needed if the graft has grown very vigorously and become top-heavy, making it vulnerable to breaking in the wind. The other maintenance you need to do (religiously!) is to remove suckers, buds and shoots from below the graft, because they are usually much more vigorous than the graft, and can quickly take over.



ABOUT US

We—Katie and Hugh Finlay—run Grow Great Fruit from our farm in central Victoria, Australia. Teaching organic fruit growing was a natural progression from growing fruit commercially for years, and being asked thousands of fruit tree questions as we were selling fruit at markets.

We've always used organic, biological and regenerative farming methods, relying on building healthy soil to grow healthy trees and fruit—so that's what we teach. The trees get their nutrients from a diversity of microbes in the soil and plant tissues and from their relationships with other plants, rather than from artificial fertilisers.

We've been orchardists since 1998, both coming to it from non-farming careers, though Katie grew up on the orchard and Hugh worked on farms in Western Australia and the Middle East before roaming the globe for many years as a travel writer for Lonely Planet.

Training in organic farming, permaculture, soil biology, compost and holistic farming (as well as years of practical, hands-on experience) has all been important in developing our growing practices, the sustainable development of the farm, the establishment of the Harcourt Organic Farming Co-op, and the ethics of what we bring to you in Grow Great Fruit.

Diverse plantings rather than monoculture, spreading risk with biodiversity, and learning how to grow your own food successfully all contribute to food security—and we're on a mission to help build a secure food future for all!

DISCLAIMER: We make every effort to ensure the information given in this program is accurate. However, as conditions and methods vary, we cannot guarantee the results, and take no responsibility for any damage or injury that may occur, no matter how caused. But relax—you'll probably grow twice as much fruit as we predict...without incident!

Staying in touch

Part of what we love about the Grow Great Fruit Program is that we're building a community of like-minded fruit growers—something we wish we'd had when we were learning how to grow fruit.

There's lots of ways to join in, ask questions, share information, swap stories, make connections, and get to know us, and other GGF members.

On the socials...

See daily photos and updates from the farm, post comments, and share your own news on our social platforms:

Visit our [Facebook](#) page.



Instagram: [GrowGreatFruit](#)



For our exclusive community...

Grow Great Fruit Forum: Post your photos and questions online to get answers and feedback about fruit growing issues. Also a great place to brag about your success! Click [here](#).

Monthly Q&A Sessions: Join the community for a face-to-face friendly group chat once a month. Bring your questions and send photos in beforehand for us to share with the group. Register from the Members Home Page [here](#).

Blog. Our blog is another way we share what's happening on the farm, and go into more detail about various aspects of organic fruit-growing. Click [here](#) to view the blog.

All the material in the Grow Great Fruit program is the property of Hugh and Katie Finlay. It is provided to you as a member of the Grow Great Fruit program, and is not to be shared or distributed in any form without written permission.

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