



Hort
Innovation

01

Dried Grape Best Practice Guide

Post-harvest and winter


driedfruits
australia

Contents

Introduction	1	Canopy management	8
Autumn	1	Pruning	8
Winter	1	- When to start	8
Irrigation	2	- Under-vine sweeping	8
Post-harvest	2	- Pruning technique	9
Winter	2	Worksafe practices	10
Nutrition	3	Vineyard health	10
Pest & disease control	4	- Cover cropping	10
Diseases	4	- Cover cropping with drip irrigation	10
- Powdery mildew	4	- Mulching	11
- Downy mildew	4	Weed control	11
Pests	5	Frost management	12
- Snails	5	Redevelopment	12
- Vine scale	5		
Repairs & maintenance	6		
Take a break	6		

Introduction

The completion of the busy harvest season marks a shift in focus for dried grape growers and vineyard managers. After being tightly focused on the operational aspects of running a property, growers' attention now moves to vineyard management. The aim during this phase is to assist in vine recovery and optimise their condition.

Although vines are heading towards dormancy in the post-harvest phase, and are in full dormancy during winter, careful vineyard management is critical in setting the foundation for next season's productivity. Attention to post-harvest management will help vines recover from the productive phase of their cycle and build up stores of carbohydrate and nutrients for the development of the next crop.

Autumn

Close attention to post-harvest care needs to be maintained throughout the period that vines remain active. The retention of functional leaves throughout April and May offers the potential for vines to continue replenishing carbohydrate reserves in preparation for new root and shoot growth the following spring. Adequate irrigation and appropriate application of fertiliser in the post-harvest period will help to maintain canopy photosynthesis.

Remaining attentive to pest and disease control will also help ensure vines enter dormancy well prepared for the next season.

Winter

Winter is a time to invest in the longer-term health of your vines and consider the overall operations and condition of your vines and property. While pruning is number one on the agenda, it's important to continue to monitor and manage pest and disease issues along with weed control.

Winter is also the time to sow and manage cover crops. Frost control becomes a consideration, particularly in late winter and early spring.

This guide outlines the current recommended best practice in relation to key decision making in the post-harvest and winter phase of dried grape production.

Information in this guide is based largely on industry knowledge and experience, as well as a review of published research by former senior research scientist in horticulture at DEPI Mildura, Dr Karl Sommer. It has been compiled with the assistance of a grower-based advisory committee.

This project is co-funded by the Dried Fruits Trust and Hort Innovation using the dried grape industry levy and funds from the Australian Government.



Irrigation

Harvest and post-harvest are times when irrigation can become a secondary priority, but the evidence is clear that vines are still using and need water during this period.

Post-harvest

Trellis drying best practice recommends that irrigation with low level sprinklers should cease shortly before or immediately after canes have been cut to accelerate drying, and that vines should not be irrigated during the drying period. However, evidence from soil moisture monitoring capacitance probes clearly shows significant daily water use by vines after they have been cut and throughout the drying process. So, by ceasing irrigation, vines are often subjected to drought-like conditions over harvest.

Maintaining soil moisture levels with drip irrigation can continue, but care should be taken not to increase humidity levels under the vine canopy with this form of irrigation. Post-harvest watering is therefore critical, particularly if harvest is early. Irrigate as soon as possible after harvesting.

Winter

As the weather cools, there is a risk that attention to adequate irrigation can wane. Evidence from trials by CSIRO and SARDI indicate that a significantly dry winter (two thirds reduction in winter rainfall) can reduce yield by 20–40 per cent. This is not overcome by pre-budburst irrigation, so thought needs to be given to maintaining winter soil moisture levels if it has been dry.

BEST PRACTICE

Put the vineyard “to bed” with adequate moisture by continuing to irrigate as required until vines go into dormancy. Continue using moisture monitoring technology such as capacitance probes and checking weather forecasts, vineyard soils and the condition of vines. Continued attention will allow anticipation of likely irrigation requirements and maintenance of appropriate soil moisture.



For more information on irrigation, visit driedfruitsaustralia.org.au/additional-resources-links



Top: Soil moisture probes
Below: Under-vine sprinklers

Nutrition

Fertiliser should be applied post-harvest as part of the seasonal nutrition program to help vines replenish carbohydrate reserves and enable good, strong budburst in spring. A balanced application of NPK is recommended so most of the vine's seasonal nitrogen (N) needs are applied at this stage. If excessive nitrogen is applied in spring, it can promote growth that is too vigorous, creating unfruitful buds due to shading of canes and buds.

BEST PRACTICE

Do not over-apply fertiliser. Over application can mean that the buds on canes for next season are triggered/induced to shoot, which will render them unsuitable for cropping in the coming season. If you are uncertain of what fertiliser or balance you should be using, consult a trusted agronomist.



Pest & disease control

Is there a need for post-harvest application of fungicides? The simple answer is that if diseases have been well controlled during the growing season, there is generally little need to apply sprays after harvest. However, if there has been a build-up of some diseases earlier in the season and autumn is wet, post-harvest fungicide sprays may be required.

Diseases

Powdery mildew

In most seasons there is no need to spray for powdery mildew after harvest, provided there has been good control throughout the growing season. However, if left unchecked, powdery mildew can quickly develop spores from which infection can spread through flag shoots the following season. In most cases, if it has been about three months since the last spray of fungicides, one post-harvest application of a sulphur-based product should protect the foliage from further infection. As the shoots lignify (convert into wood), they become resistant to infections.

BEST PRACTICE

If the incidence of powdery mildew is particularly high and fungicides other than sulphur forms are contemplated, single-site mode of action fungicides should be avoided. This reduces potential for the development of fungicide resistance.

Downy mildew

Maintaining healthy leaves aids in the restoration of carbohydrate and mineral nutrient reserves, especially after leaf volume has been reduced by summer pruning. Post-harvest downy mildew infections of mature leaves are not very common, but when they occur they can seriously impair leaf function and should therefore be avoided. The risk of late infection reduces once night-time temperatures drop below 12°C.

BEST PRACTICE

Downy mildew results from weather conditions in spring rather than the seasonal carryover of spores on vines. However, spores will persist over winter in the soil and, if existing infections are allowed to spread, there is potential for a higher carryover into the next season. Prevention may be achieved by the application of an early-autumn protectant fungicide.

Pest & disease control

Pests

Snails

Pruning is the best opportunity to identify snail “hot spots”. As pruning begins, keep a good lookout for snails and be aware of areas where numbers are increasing.

Control measures such as a baiting program, removing debris where snails can shelter, and disturbing potential egg beds with light, shallow cultivation are good to undertake in winter.

It is easier and more cost effective to eliminate snails in the field rather than sifting through harvested fruit and still running the risk of penalties from processors if some are missed.

BEST PRACTICE

Snail baiting programs during winter can be highly effective. Rain is likely to make snails more mobile and attracted to the bait. There is a brand of pellets that is more rain tolerant and stays intact longer than some of the other cheaper products. If there is a big snail problem, use of the more rain tolerant pellets should be considered.

Vine scale

Pruning is a time when most of the vine is examined while selecting canes. It is a good opportunity to watch out for infestations of vine scale, which is found on the underside of canes or spurs. In early spring, they grow rapidly and produce eggs under the scale cover.

Grapevine scale is parasitised by predators such as lacewings, which will kill up to 60 per cent of mature scales during the growing season. Only heavily infested vines require spraying for scale control.

BEST PRACTICE

If scale is in prolific amounts, it is recommended that affected vines are marked with flagging tape and sprayed with winter oil once pruning has finished but before buds begin to burst.



For more information on snail control, visit driedfruitsaustralia.org.au/additional-resources-links



Top: Vine scale
Below: Snail moving up vine trunk

Repairs & maintenance

Winter is a good opportunity to check on the condition of trellises and posts and undertake necessary maintenance to set them up for carrying the next crop. Tasks such as repairing and replacing broken trellis heads and posts are best done when the crop load has been removed from the trellis and there is little or no foliage.

BEST PRACTICE

When the trellis has been tipped over it is a good time to tighten up sagging wires to prevent canes from falling out during summer pruning. Canes and fruit held on properly tensioned trellis are easier and cleaner to harvest.

Take a break

Harvest is usually a time of intense workload and long hours, and of stress and worry about successfully producing the best-possible fruit and avoiding quality being affected by weather. Post-harvest is often the most convenient time of year to get away from the property.

BEST PRACTICE

Once fruit is sent to the processor and cleaning up is completed, and even after an irrigation and fertiliser application, leaves will still be on the vines, making it difficult to prune. Take a break; relax and recharge to be ready for pruning.



Top: Tipping swingarm trellis
Below: Testing drip irrigation flow rates



Canopy management

Canopy management is the manipulation of shoots, leaves and fruit towards optimum yield and fruit quality. Pruning plays an important role in maximising yield while maintaining healthy grapes and vines.

Pruning

Pruning is a critical step in preparing for next year's crop and setting the foundation for effective management of the vine. Pruning keeps vines in a form that allows efficient general management and harvesting. It regulates the crop to obtain consistent yields and assists in optimising pest and disease management.

When to start

Immediately after harvest is a good time to make a start on pruning, especially the removal and clean-up of spent fruiting canes. This clears the way and allows plenty of time for pruning, factoring in time losses from rain interruptions.

Pruning can start as soon as leaves have fallen at the beginning of winter and should be completed before budburst in early September. Vines pruned in June may burst a few days earlier than those pruned in late August. However, many growers observe later pruning leads to more even budburst and may improve fruit set. If pruning is carried out in late winter or early spring, a free flow of sap may occur, but this will not harm the vine.

BEST PRACTICE

A number of grower gadgets have been developed to remove old, spent canes. These machines, known colloquially as cane strippers or floggers, can take the hard work out of the hand removal of these canes. This task can commence any time after vines have been harvested and the tractor is free for use.

Under-vine sweeping

After spent canes have been removed from the trellis, sweeping of the under-vine area can be undertaken. This clears any debris that could be a breeding habitat for snails and harbour disease spores such as downy mildew. It also allows good access for herbicide application to any winter-germinating weeds.

BEST PRACTICE

Under-vine sweeping provides a clean, firm area for the absorption of heat, assisting in frost control. It is especially important to have as wide an area as possible where mulch is retained in the inter-row space.



Above: Under-vine sweeping

Canopy management

Pruning technique

There are several things to consider when pruning on swingarm trellis. This trellis system was designed to minimise the amount of work required at pruning.

One option is to simply capture all canes from the non-fruiting side of the cordon by pinning them into place with the floating wire. This is usually followed by a clean-up of the old fruiting canes along the harvested side of the cordon by cutting old canes back to the base bud or a single bud spur. When cleaning up the cordon, canes that are damaged, too densely clustered, or not captured in the floating wire can be removed.

Rolling canes onto the bottom wire may not be necessary, particularly with vigorous canopies. Cane and tendril growth during the season ensure canes remain in place through cutting, wetting, drying and harvesting. This is supported by the results of a minimal pruning trial in 2019/20. Growers using this system may opt to remove canes hanging below the bottom wire with a cutter bar.

Another common option is to be more selective with retaining canes. This is usually done by pruning out unwanted canes before pinning them in place with the floating wire. This system tends to increase focus on selecting healthy looking canes, limiting the number of canes per

vine and creating a more even distribution of canes along the cordon.

A good cane:

- appears tan to dark tan in colour
- faces in the right direction for cropping the next year
- has short internode spaces
- has not grown in the shade or isn't showing long internode spaces
- is not a "bull" cane with large internode spaces
- tapers off in diameter as it reaches desired length.

This system is often accompanied by some level of rolling canes onto the bottom wire to ensure they are held in place.

There is currently no evidence of production, canopy management or pest and disease management benefits from either system. However, evidence from the DFA benchmarking program indicates a 20 per cent time saving during pruning for the less selective method.

With either system, the stage at which the trellis is tipped over is best left to management preference. However, DFA and individual grower trials with mechanised pruning systems suggest it should be done after cleaning up the cordon

to allow better access for tractor-mounted pruning implements.

BEST PRACTICE

Do not have clumps of canes at either the crown or end of the cordon. Remove any dominating canes at the crown of the vine to prevent these canes from dominating and killing the cordon. Avoid multiple or, more importantly, a multitude of spurs from the one site.



For more information on winter pruning, visit driedfruitsaustralia.org.au/additional-resources-links



Above: Mechanical cane removal

Canopy management

Work-safe practices

Winter activities around the vineyard are particularly hazardous, with pruning equipment in use and flying debris from pruning operations. There is a risk of cut and severed fingers during pruning, particularly with pneumatic and battery-operated secateurs. Always wear eye protection. When using pneumatic and battery-operated secateurs, always hold the air hose or cord with your spare hand to ensure your hand is out of harm's way. Some electric secateur brands include a safety shutdown system built into gloves to protect hands and fingers.

BEST PRACTICE

A number of variants of mobile elevated platforms have been developed to aid pruning and the cleaning up of cordons. These platforms make tasks quicker, less tiring and painful on the arms, and result in fewer strain injuries.

Vineyard health

Cover cropping

Cover crops are an effective way to maintain or improve the soil's nutrient level and condition. Some cover crops encourage natural nitrogen and organic matter to build up in soil. They encourage better soil structure and drainage by encouraging fibrous root development and offer harbour for beneficial insects such as ladybirds, lacewings and predatory mites.

The use of cereals, especially rye corn, will be most effective in raising the levels of organic material in soil, although it should be noted that cereals do not grow well among Ramsey vines. However, you may need to consider that the cultivation associated with sowing annual cover crops actively reduces stored soil carbon and breaks down soil structure.

BEST PRACTICE

Improving soil structure requires long-term effort and attention. In a study at DPI Dareton, structurally poor sandy loam soil was continually cover cropped with legumes for four years. Organic matter in the top 10cm of soil was 0.5% in the first year and 1% in the fourth year. This small increase under minimum tillage conditions demonstrates the long-term nature of trying to improve the physical characteristics of the soil.

Cover cropping with drip irrigation

Weeds and naturally volunteering plants can be used as a mixed annual self-seeding and perennial cover crop, especially where drip irrigation is the preferred irrigation method. Sown cover crops such as cereals and medics will struggle to establish under these conditions unless there is favourable and timely rainfall to germinate and establish. Weeds and volunteer plants will grow naturally in the dryer mid-row area and should be encouraged as a cover crop.

BEST PRACTICE

Volunteer cover crops (weeds) will eventually break down, providing mulch and carbon to the soil. The roots will also create capillaries through the soil as they die, allowing better water penetration. Competition from these plants may reduce the germination and growth of unwanted spiked weed seed-producing plants such as three-corner jacks and perhaps caltrop in early spring.

Canopy management



Mulching

The mulching of cover crops or natural vegetation and weeds is beneficial, encouraging a mat of decomposing plant tissue. Mulching may be done mechanically or by desiccating the vegetation with herbicides. The presence of a mulch layer helps cool the vineyard floor, slowly builds soil carbon, and assists in allowing better access to the vineyard in wet weather.



Top: Voluntary cover crop
Below: Pruning platform
Right: Three-corner jack



Weed control

It is a more difficult operation to eliminate and control weeds once they mature to larger weeds and have established under the vine row. It is easier to deal with them when they are small and vulnerable to weedicide applications.

Three-corner jack (*Emex australis*) is a source of spiked weed seeds with the potential to contaminate dried grapes. Processors will reject fruit that is found to contain spiked weed seeds. Control in the field is the preferred method of keeping the seeds out of fruit and bins, rather than removing them once fruit is harvested. It's a winter-growing weed best controlled and even eliminated by winter cultivation and/or spraying with herbicide.

BEST PRACTICE

To avoid development of herbicide resistant weeds, maintain a strategy of rotating through herbicides with different modes of action and ensure effective chemical concentrations and spray coverage are maintained.



For more information on weed control, visit driedfruitsaustralia.org.au/additional-resources-links

Canopy management

Frost management

If the property is in a low location and prone to frosts, consideration must be given to frost mitigation management. For every 300mm of height gained from the vineyard floor, there is a 1°C increase in the ambient air temperature. Although swingarm is a tall trellis, with the cordon approximately 1.8 metres from the ground, the bottom wire is quite low (in some cases, significantly lower than some of the previously used tee trellis).

Soil conditions that most suit the uptake of heat during the day and aid its release at night are:

- a clean inter-row area free of weeds or cover crops (vegetation shades the soil and reduces available moisture, thereby limiting heat uptake during the day)
- moist soils (which have a greater heating capacity than dry soils)
- compact, rather than aerated soils (compact soils have a greater mass and are quicker to heat and store heat better, whereas the air in recently cultivated soils acts as an insulating layer that limits warming during the day and the release of heat at night)
- a clean under-vine space prepared by killing weeds with herbicides and sweeping debris off the under-vine area.

BEST PRACTICE

Compacted, moist soil best absorbs and holds heat from the sun. This is done by cultivating the soil to have bare earth, compacting it with a roller, then irrigating. On the other hand, if retaining the mulch or stubble from a cover crop, it should be slashed or mulched to near bare earth to maximise solar radiation absorption. Again, the soil should be kept moist. If retaining a mulched vineyard floor, have as wide a section of swept under-vine area as possible (it is a good compromise to totally cultivated soil to help manage frost control).



Above: Frost damage

Redevelopment

Post-harvest and winter is traditionally a time for the removal of old vines and preparation of the cleared ground for replanting. Deep ripping, and the inclusion of fertiliser around the root depth in the soil, can give new vines a good start in their establishment. Consultation with an agronomist associated with a fertiliser company or a chemical reseller is advised to get the best advice about how much and what fertiliser to use.

BEST PRACTICE

Developing a program to replace older and less-productive vines is a critical element of the ongoing business planning process. Consult your processor and agronomist and use industry research to make informed decisions most appropriate to your circumstances.



For more information on frost management, visit driedfruitsaustralia.org.au/additional-resources-links

Disclaimer: The information contained in this guide is made available by Dried Fruits Australia for the use and information of growers. Dried Fruits Australia assumes no legal liability or responsibility whatsoever by reason of negligence or otherwise for the accuracy, completeness or usefulness of any information, product or process disclosed in this publication. In relying on or using this document, or any advice or information expressly or implied contained within it, you accept all risks and responsibility for loss, injury, damage, costs or consequences. It is for you to obtain your own advice and conduct your own investigations and assessments that you may be considering in light of your circumstances. Hort Innovation makes no representations and expressly disclaims all warranties (to the extent permitted by law) about the accuracy, completeness or currency of information in the Dried Grape Best Practice Guide. Users of this material should take independent action before relying on its accuracy in any way. Reliance on any information provided by Hort Innovation is entirely at your own risk. Hort Innovation is not responsible for, and will not be liable for, any loss, damage, claim, expense, cost (including legal costs) or other liability arising in any way (including from Hort Innovation's or any other person's negligence or otherwise) from your use or non-use of the Dried Grape Best Practice Guide, or from reliance on information contained in the material or that Hort Innovation provides to you by any other means.



driedfruitsaustralia.org.au



2021 EDITION

