

# Under-vine cover cropping

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## Key messages

- When well-adapted plant species are used for under-vine cover cropping, grapevine yields can be maintained and improved on some soil types compared to the standard bare earth/herbicide treatment.
- Under-vine cover-cropping does not diminish wine quality.
- The need for application of herbicides (such as glyphosate) can be minimised and management costs significantly reduced.
- Soil carbon increases when legumes and grasses are grown under-vine, which may improve soil structure and water infiltration.
- Annual self-regenerating pasture legumes such as medics, sub clover and annual ryegrass are the preferred species, which can also provide feed for sheep grazing in the vineyard if required.
- Growers should speak with local agronomists or the authors of this factsheet to help identify the best locally adapted species for under-vine cover cropping.

## Summary

Results from three years of trials at Nuriootpa, Langhorne Creek and Eden Valley (SA) have shown benefits to vine yields, soil quality and financial returns when annual medic and ryegrass were grown in the under-vine zone (Figure 1). These results warrant growers conducting trials in their own vineyards to verify the results and potentially harvest the rewards of an improved under-vine management strategy.

## Background

Weeds in the under-vine zone of a vineyard are usually controlled with either herbicides, tillage or mowing to prevent or reduce negative impacts on grapevine productivity. Overuse of herbicides has generated resistance in many weed species, while the continual removal of growing plants has diminished soil organic matter and carbon over time, resulting in a decline in soil quality in many areas.

Alternatives to chemical controls, such as straw and compost mulches, can be used to reduce weed establishment and improve soil quality but require regular renewal at significant cost.

Three years of cover crop trials have shown that living mulches can provide similar or superior grapevine yield and soil quality improvement at a reduced cost. Impressive results were achieved with a range of annual pasture species including medics (*Medicago* spp.; Figure 1) and sub clover (*Trifolium* spp.; Figure 2). These naturally self-regenerating legumes fix nitrogen and have a mid-autumn to spring lifecycle, matching the dormancy of grapevines.

These species have provided the backbone for legume pastures in southern Australia. Depending on soil pH, they are generally well-suited to most environments and the seed is readily available commercially. Medics can be grown alone but are also effective with a grass such as annual ryegrass, which has an extensive fibrous root system and can therefore significantly improve



Fig 1. Medic and ryegrass used for under-vine cover cropping.

soil structure. When grown in conjunction, medic and ryegrass are likely to increase fruit yields from vines grown in degraded soils.

## What are the benefits of under-vine cover crops?

### Decreased herbicide use

- When sown in a weed-free environment, medics and ryegrass will suppress the germination and growth of most winter weeds. Where summer weeds are an issue, herbicide may need to be applied in spring as weeds emerge, after the cover crops have set seed.

### Improved soil quality

- Compared with herbicide treatments, medics and ryegrass improved soil carbon levels by up to 20 per cent in the top 10cm of soil over the trial period of 3 years.
- Soil compaction and surface sealing was reduced, enabling improved infiltration of water to grapevine roots.

### Improved yields and financial returns

- Provided that the most locally appropriate species are used, it is expected that vine yield will be similar to, or better than, a clean under-vine, with less input. An annual \$1600/ha increase in gross margin was achieved at the Barossa Valley trial site with the medic/ryegrass mix or medic alone when compared to the herbicide control.

### Long term benefits

- Once a seed bank is established, the plants will regenerate in most seasons with up to 2000 plants per square metre, providing considerable competition with weeds. In addition, a percentage of hard seeds that require more time to break dormancy will germinate over several seasons, ensuring long-term regeneration.



Fig 2. Mintaro sub clover in the under-vine zone.



Fig 3. Kasbah cocksfoot in the under-vine zone.

## What are the challenges?

### Summer weeds

- Kasbah cocksfoot (Figure 3), a perennial grass, remained active throughout the growing season and effectively competed against weeds such as prickly lettuce, milk thistle, fleabane and fat hen. However, grapevine yields were also reduced by up to 19 per cent.
- The mulch generated by the medic and ryegrass cover crops is generally not sufficient to prevent all summer weed growth.

### Regeneration

- Medic regeneration was not consistent across seasons. An early season break and warm soil temperatures were preferred. However, medics re-established when conditions were suitable, allowing their benefits to extend across seasons. Grasses (especially barley grass) invaded but were not detrimental to the grapevines and senesced early.

### Organic Systems

- Where a large seedbank of other plants exists, it is difficult for the small-seeded legumes and ryegrass to establish with the pre-existing competition. Potentially this can be overcome by establishing the cover crop in the mid-row from where it migrates to the under-vine or is mown and thrown after the seed has matured.

### Warm inland vineyards

- Under-vine cover crops at the Waikerie trial site were not able to provide total weed suppression without compromising yield.
- Medics and ryegrass grown under-vine should ultimately improve soil quality in warm inland regions but intervention for summer weed control may be required.



Fig 4. A Taeye disc seeder sowing one row either side of the vine.

## Cover crops: a how-to guide

- **Establishment:** sow fresh pre-inoculated seed dry (from mid-April onwards) into a weed-free under-vine zone that was controlled for weeds in the previous year. Ensure no residual herbicides if used in the previous season. Alternatively, sow into a moist and weed-free seedbed soon after the break of the season.
- **Seeding rate & sowing:** sow at 20kg/ha (600 grams / 100 metres of row) or higher. Higher seeding rates will improve competition against weeds and survival against insect attack, by spreading pest insect populations across a greater number of plants. Consider sowing a mixture of at least two varieties with early to mid-maturity, which will help overcome seasonal and soil variability. Aim for a sowing depth of 1–2cm, preferably using a disc seeder (Figure 4), in a single row either side of the grapevines. Ensure good seed-soil contact using press wheels or covering devices such as trailing chains.
- **Inoculation:** legumes require inoculation with the correct rhizobial strain (or use pre-coated inoculated seed). Good nodulation is essential to maximise legume production and nitrogen fixation for improved soil fertility.
- **Nutrition:** it is unlikely any benefit will be gained from the addition of extra nutrients.
- **Weed control:** trial results suggest there is minimal weed invasion when sowing into long-term herbicide strips, but some selective control may be required.
- **Pest control:** closely monitor for redlegged earth mite and lucerne flea damage to cover crop plants, both

- at the seedling and flowering stage, especially in the year of establishment. Control as necessary.
- **Mowing/grazing – establishment:** avoid mowing or grazing after sowing to maximise biomass production, flowering and seed set in the first year.
- **If grazing:** initially defer grazing at the break of the season to maximise plant establishment. Lightly graze, aiming to have sufficient spring growth which, when senesced, results in a thick mulch that will help to suppress summer weeds and reduce soil temperatures and evaporation.

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## Further information

More information on cover crops can be found at: <https://www.wineaustralia.com/au/growing-making/vineyard-management>

Project (UA 1303) Final Report. <https://www.wineaustralia.com/getmedia/fa895fab-efa3-4f86-8072-9c2f20e76f97/UA-1303-Final-Report>

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