Technical note

Controlling undervine couch and kikuyu in vineyards without herbicides

Couch and kikuyu grass are two of the most problematic weeds in Australian vineyards, contributing to yield losses, reduced water use efficiency and our industry's ongoing reliance on herbicides for weed control. As summer-active grasses, they are well adapted to growing in vineyards where they can use water and nutrients provided by irrigation systems. Once established in the undervine area, couch and kikuyu compete heavily with vines for water and nutrients. In young vineyards, competition from couch and kikuyu can stunt growth and delay development.

Couch and kikuyu are perennial, winter-dormant (in cold regions) grasses that spread by seed, by expansion of the rhizome and stolons, and by stem fragments moved by cultivation. Dense stands of couch can release allelopathic chemicals into the soil that reduce the germination and growth of other plants. Couch and kikuyu both tend to form patches and dense mats that exclude most other species.

To answer the question of how to control these challenging weeds without using herbicides, AWRI Senior Viticulturists Robyn Dixon and Chris Penfold interviewed growers from across Australia to find out their tips and tricks. The clear message received was that the best way to manage couch and kikuyu non-chemically is to use an integrated approach encompassing a range of practices, adapted to individual vineyard conditions.

Cover crops

Suppression of couch and kikuyu is often achieved by using strategic cultivation when the soil is dry, followed by the establishment of cover crops. For the best results, cover crops with allelopathic activity against couch and kikuyu (e.g. cereal rye or a mix of medic and annual ryegrass) can be sown in autumn, when the couch and kikuyu are dormant. A dense stand of these will compete with the couch and kikuyu for sunlight, nutrients and moisture in spring, leading to suppressed vegetative growth.

Gemtree Wines has had great success in controlling couch and kikuyu with cover crops. At its McLaren Vale vineyard, slashing and side throwing have been used to encourage the annual veldtgrass that was growing naturally in the mid-rows to establish undervine. This vigorous, tufted, winter-active grass grows rapidly after spring, summer and autumn rains to provide good soil cover and reduce the spread of couch. Timing is critical for the

success of this practice. To avoid spreading couch undervine, slashing should be done before the couch has had a chance to set seed. Couch can flower all year round in South Australia, but viable couch seed comes from late summer to early autumn flowers.

Figure 1. An outside row at Gemtree with kikuyu left uncontrolled compared to rows where the kikuyu has been managed effectively using cultivation and undervine cover crops

At its McLaren Flat vineyard, Gemtree has devised a different method to manage kikuyu. Here the allelopathic activity of cereal rye is harnessed to outcompete kikuyu in the undervine area. Although this method has proven to be very successful, Gemtree admits that it is a labour-intensive option, which requires soil preparation and seeding each year. To achieve the best results, Gemtree uses a dodge plough in autumn to pull the kikuyu out into the mid-row, followed by a finger weeder to even out the undervine area. An undervine seeder is used to sow the cereal rye undervine.

Figure 2. Effective undervine kikuyu management at Gemtree's McLaren Flat vineyard, using cultivation and a cereal rye cover crop

In Margaret River, Vasse Felix has also had great success controlling couch and kikuyu with strategic cultivation followed by sowing a competitive crop. The best results have been achieved when cultivation is timed to occur just before a stretch of really hot days. A disc cultivator is used to break up the ground first and then a power harrow is used to pull the weeds out into the mid-row. High temperatures help to kill the exposed couch. In cool conditions, the couch is removed from the vineyard. The cultivated areas in the mid-row are sown in autumn with a green manure or pasture crop that competes with couch and kikuyu. Vasse Felix is also looking at options for establishing crops in the cultivated undervine area to help keep the couch under control.

In Langhorne Creek, Temple Bruer has trialled a variety of different cover crops to suppress couch. A mixture of clover and medic worked reasonably well as did rye corn. Next, it intends to trial a low-growing summer cover crop such as soybeans.

Mechanical weeders

After trialling various undervine weeders, Handpicked Wines (which has vineyards in Mornington, Yarra Valley, Tasmania and the Barossa Valley) has come to the realisation that managing couch just using mechanical weeders is very difficult. Any equipment that breaks up the couch tends to spread it; a knife weeder can't get under the dense mat; and a rotary tiller either breaks it up into little bits or gets jammed with the couch runners. Instead, Handpicked Wines is considering using a dodge plough to cut under the dense mat of the couch and flip it over into the mid-row. To prevent the couch from re-establishing, the area will be covered with a cereal mulch in the hope that the allelopathic activity of the cereal will help to manage the couch.

Solarisation

When managing problematic patches of couch in its Eden Valley and Adelaide Hills vineyards, Henschke has had to move away from the composting and straw mulching program it uses to control most weeds and look for alternative options. In areas where couch grass is well established undervine, Henschke has found that high rates of compost and straw mulch actually stimulate couch growth. In these patches, the power of the sun is harnessed to help manage the weeds with a technique called solarisation. Solarisation involves laying clear plastic on the soil surface and leaving it undisturbed for several weeks. Light waves penetrate the clear plastic, directly heating the soil below. Heat is then retained under the plastic through a greenhouse effect. Applying a double layer of clear plastic and/or keeping the soil moist can increase temperatures and the effectiveness of solarisation. Moist weed seeds are more susceptible to thermal killing than dry seeds, and water also increases conductance, allowing heat to be carried down into the soil profile to reach more deeply buried seeds. Henschke lays clear plastic covers over problematic couch patches during summer, holding the plastic in place with pegs and bricks. Tractor access can be impeded by this technique, but after several years, the solarisation activity of the plastic covers successfully reduces couch growth.

Mulch

Like Henschke, Temple Bruer has also tried plastic covers to control couch undervine, but with less success. The shade produced by the large canopies at Temple Bruer reduces the solarisation effect of the plastic covers. Temple Bruer has also trialled Slasher, an organic herbicide, for couch control. When applied in the morning of a hot day, after a good over-

night irrigation and after the morning dew has dried, Slasher provided short-term knockdown control. However, the best control of couch was achieved by spreading compost containing 65% woodchips undervine, with the tannin in wood chips helping to reduce weed growth. Similar results may be achieved by using mulch containing grape marc.

Irrigation management

Movement of the irrigation dripper to the centre of the mid-row has been used by some growers as a tool to manage weeds. Research in New Zealand by Mark Krasnow of Thoughtful Viticulture, as part of herbicide reduction research in the Bragato Research Institute's Vineyard Ecosystems Programme, showed that moving the subsurface irrigation 30 cm into the row and 30 cm below the surface resulted in a reduction in undervine weed growth with no significant reduction in grape yields. Moving the irrigation line away from the undervine area moved the weed growth from a difficult to control area to a much easier to control area. This practice is currently being trialled by a grower in Orange with good success.

Conclusion

Growers across Australia are experimenting with a range of options for controlling kikuyu and couch in vineyards. Regardless of the method chosen, non-chemical control methods do not provide a quick fix for couch and kikuyu challenges in vineyards. Complete eradication of these problem weeds is unlikely, so reducing their prevalence and density in the vineyard will be the expected outcome. Providing competition for the perennial grasses will also have the effect of reducing vine vigour, so winter-active cover crops such as cereal rye or mulches consisting of tannic material are likely to be the preferred option for long-term suppression.

The AWRI has developed a range of resources and a decision tool to support growers seeking non-chemical options for managing a wide range of vineyard weeds. These are accessible from the weed management page on the AWRI website: https://www.awri.com.au/industry_support/viticulture/weed-management/.

For more information or assistance, contact the viticulturists on the AWRI helpdesk team via 08 8313 6600 or helpdesk@awri.com.au.

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Acknowledgements

This project was supported by funding from Landcare Australia.

The AWRI is indebted to the many grapegrowers who took part in the non-chemical weed control interviews. A special thank you is extended to the growers who contributed to this article: Troy Elleker and Melissa Brown (Gemtree Wines), Bart Molony (Vasse Felix), Andrew Butler (Handpicked Wines), Prue Henschke (Henschke) and Barrie Williams (Temple Bruer Wines).

This AWRI's communications are supported by Australia's grapegrowers and winemakers through their investment body Wine Australia, with matching funds from the Australian Government.