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Managing glyphosate resistance in New Zealand vineyards

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The resistance problem

Glyphosate-resistant weeds, particularly ryegrass (*Lolium spp.*), have been confirmed in numerous New Zealand vineyards. The first cases of glyphosate resistance were reported in 2013 in the Marlborough and Nelson regions.

Surveys of New Zealand vineyards have found that 39% contained glyphosate-resistant ryegrass.

Recent surveys of 106 vineyards across major wine-growing regions of New Zealand (Marlborough, Waipara, Hawke's Bay and Gisborne) during 2021 and 2022 found that 39% of the surveyed vineyards contained glyphosate-resistant ryegrass. Cases were detected across all regions, including in 58% of vineyards in Marlborough (Buddenhagen *et al*. 2022).

The occurrence of glyphosate resistance is of concern across the horticulture sector as similar selection pressures are also being applied within pipfruit orchards, kiwifruit and other perennial fruit crops.

What is Glyphosate?

Glyphosate is a broad-spectrum systemic herbicide, that has been applied as a post-emergence weed management tool in New Zealand since the 1970s.

Glyphosate (HRAC[1] Group 9 herbicide) is the most widely used herbicide in NZ vineyards. This widespread use has led to the repeated selection of resistant ryegrass (*Lolium* spp.) biotypes[2] in NZ vineyards and in many other parts of the world.

Glyphosate is a preferred herbicide as it effectively kills a very wide range of broad-leaved and grass species, both annuals and perennials. Because glyphosate translocates down into underground structures, there is usually less regrowth than with most other herbicides.

It is also "strongly adsorbed onto soil particles, thus losing activity on contact with the soil, making it suitable for use in preparing ground for sowing crops" (Harrington *et al*. 2016).



Resistant ryegrass in a NZ vineyard.

[1] HRAC – Herbicide Resistance Action Committee
[2] Biotype – a group of organisms having an identical genetic constitution

Impact of glyphosate resistance

The economic impact of glyphosate resistance in New Zealand vineyards is primarily felt through **increased operating costs** and **potential yield losses**, as growers are forced to move away from what was once the most cost-effective weed management tool. Glyphosate resistance in New Zealand vineyards threatens to significantly increase operational costs and reduce profitability due to the necessity of using more expensive, less efficient weed control alternatives.

Economic impacts include:

- **Increased Operating Costs**: Resistance requires switching to more expensive, alternative herbicides which may require more frequent doses, increasing chemical and labour costs.
- **Reduced Productivity**: Without effective control, weeds compete for resources such as water, nutrients and sunlight, potentially causing lower vineyard yields.
- **Intensive Management Requirements**: Vineyard managers may be forced to use more intensive management practices, such as strimming, mulching and mechanical cultivation, which can be more costly, time-consuming, and potentially less sustainable.

The concern around the development of glyphosate resistance on vineyards prompted the winegrowing industry to analyse over a decade of records of growers' spray diary data to understand the trend of glyphosate use in New Zealand vineyards (Gou and Epee, 2024). This analysis showed that growers often applied glyphosate at higher concentrations and rates. These findings highlight the need to increase grower awareness of the risks associated with heavy reliance on glyphosate and the importance of adopting alternative weed management strategies in vineyards.



The wine industry's response to managing glyphosate resistance

The discovery of glyphosate resistance has prompted the wine industry to develop a list of approved chemistry and herbicide resistance management strategies. Management of glyphosate resistance in New Zealand vineyards focuses on reducing the "selection pressure" by diversifying and integrating weed control methods and alternating the use of herbicides with different modes of action (NZPPS, 2021).

One of the key strategies to prevent herbicide resistance is to **rotate herbicides with different modes of action** and, where appropriate, use glyphosate in combination with herbicides that have an alternative mode of action. Rotation should be implemented both within a season and between seasons. Pre-emergent residual herbicides such as indaziflam (Alion®) (Group 29), flumioxazin (Chateau®) (Group 14), or terbuthylazine (Group 5) can be used to prevent weed germination for several months, reducing the need for multiple glyphosate applications.

Growers should avoid relying solely on chemical herbicides for weed management.

Instead, herbicides should be used as part of **an integrated weed management approach that combines chemical tools with innovative and sustainable control strategies**, such as mechanical methods including undervine mowers, offset mowers, or shallow cultivation.

Planting ground cover species like clover or perennial grasses directly under the vines to outcompete weeds is another tool, although under-vine cover crops also compete with the vine. Under-vine mulching is another commonly practiced weed control method. By keeping the sprayed strip as narrow as possible, fewer weeds need to be sprayed, possibly reducing the chances of resistant individuals appearing, but also making it less costly per hectare of crop if more expensive alternative herbicides are used. Irrigation strategies and strategic grazing with sheep during the winter dormancy period to suppress weed growth and reduce seed banks can also be employed. **Monitoring for weed survival post-herbicide application** is also important to ensure good weed control is achieved.

The New Zealand wine industry is proactively managing glyphosate resistance through integrated weed management strategies required by Sustainable Winegrowing NZ (SWNZ) for annual certification. National monitoring of glyphosate use in vineyards has indicated a reduction in applications to vineyard blocks from 35% in 2013/14 to 13% in 2024 (SWNZ, 2024). Despite this, surveys suggest that glyphosate resistance remains widespread within NZ vineyards as resistance has built up due to decades of repeated herbicide use.

The first global case of glyphosate-resistant wild carrot was documented in Marlborough in March 2025, suggesting that selection pressure remains high despite existing management frameworks (Ngow *et al.* 2025).

The industry has identified the need for long-term monitoring of spray practices through annual monitoring of crop protection products used on vineyards. This monitoring ensures that practices align with industry recommendations and best practice guidelines. Where this analysis suggests a deviation from best practice, the industry can respond by releasing educational resources to support growers to mitigate herbicide resistance development. Ongoing vigilance and adoption of best management practices is essential.

Resistant management rules

Sustainable Winegrowing NZ has established a set of rules to manage resistance that members must follow. The following rules apply to herbicides used specifically for the control of glyphosate resistant weeds:

1. **DIMs and Fops (Group 1 herbicides)** [3] A maximum of 1 application per season, with up to 4 applications over any four consecutive seasons, and a total of 6 applications over 11 consecutive seasons. These herbicides must only be used from E-L2 (bud scales opening) through E-L18 (14 leaves separated)[4]. If used in consecutive seasons, applications of Group 1 herbicides must be non-consecutive i.e. there must be at least one application of a product from a different Mode of Action (MOA) group between applications.

2. **Sulfonylureas (Group 2 herbicides)**. A maximum of 1 application in non-consecutive seasons. These herbicide must only be used from E-L41 (after harvest) to E-L2 (bud scales opening).

[3] "Fops" and "Dims" are colloquial nicknames for two major chemical families of herbicides that act as ACCase inhibitors (Acetyl-CoA carboxylase inhibitors), classified as Group 1 herbicides. They are used post-emergence to control grass weeds in broadleaf crops and some cereal crops.

[4] Modified Eichhorn-Lorenz (E-L) system is a standardized, 47-stage phenological scale (1–47) used worldwide to describe grapevine growth from winter dormancy (EL 1) to leaf fall (EL 47).

Key lessons learnt

- Glyphosate resistant ryegrass has been a consequence of decades of repeated glyphosate use.
- Surveys of NZ vineyards found glyphosate-resistant ryegrass in 39% of sites.
- Glyphosate resistance in New Zealand vineyards threatens to significantly increase operational costs and reduce profitability.
- The industry has responded by promoting the management of glyphosate resistance through integrated weed management strategies required by Sustainable Winegrowing NZ (SWNZ) for annual certification.
- Despite these management strategies the problem remains widespread in New Zealand.

Reports and resources

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