Summer spraying near vines

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Summer weed control is necessary to conserve soil moisture and nutrients Unfortunately many growers farm in locations where there are sensitive crops such as grapevines growing nearby.

Grapevines are extremely sensitive to phenoxy herbicides and can be damaged by very low levels of off-target drift of these chemicals. Widespread damage to grapevines can result from a single operator spraying in inappropriate conditions.

History has shown that significant summer rainfall events are frequently followed by an increase in off-target damage to grapevines as dryland farmers spray weeds that germinate on those rains to protect their moisture and nutrient reserves.

Spray drift can cause physical damage or contamination; you don't have to see physical damage for financial loss to occur. It is not uncommon for 2,4-D to show up in grapes when tested even though there was no physical damage to the vines.

Alternatives

There are several alternative chemicals that are not as volatile as 2,4-D and therefore potentially cause less off-target damage (see Table 1).

In general, the APVMA restriction on use of 2,4-D high-volatility ester (HVE) products between September 1 and April 30 has not disadvantaged users, since the price, application rates and efficacy of 2,4-D low-volatility ester (LVE) products are similar to those of HVE formulations. 2,4-D amine treatments are similar in cost, or slightly cheaper, than 2,4-D LVE treatments.

In situations where drift is a concern it appears that farmers would not be disadvantaged significantly by changing from 2,4-D LVE to 2,4-D amine, though there may be some efficacy or compatibility advantages from using 2,4-D LVE.

Garlon is a cost-effective treatment for melons but has similar volatility to 2,4-D LVE. It can be tank-mixed with glyphosate to broaden the weed control spectrum.

Brinkworth farmer Jonathon Hancock plans to use 2,4-D this summer. "We'll probably use 2,4-D Ester 680 mixed with glyphosate for summer spraying if it's another wet summer. We use it because it's effective on a large range of summer weeds, though we add Garlon when melons are present. We are aware of the drift issues but 680 is meant to be lower risk than the earlier formulations and we use minidrift nozzles which have a coarse droplet size that is not prone to drift. We also take note of the weather and don't spray if conditions are adverse."

Buffers

There is increasing pressure on spray drift management. Wherever possible, a buffer zone between contrasting land uses is desirable and can help alleviate impacts of chemical use such as noise, dust and smell.

Buffers are an important tool in minimising off-target damage. A buffer can be a separation distance, a vegetative barrier or an artificial barrier. Vegetated or artificial barriers are just two options of a suite of measures to minimise the potential conflict between intensive agricultural activities and sensitive receptors. (See Table 2.)

Buffers are not a substitute for good spray management practices.

Benefits of vegetative buffer belts include productivity gains from improved crop and livestock shelter, reduced noise and dust levels and, hopefully, reduced complaints from concerned neighbours. Other potential benefits of vegetative buffers include lowering water tables and increasing aesthetic values. Buffers are not a substitute for good spray management practices.

Spray timing

Spraying of summer weeds, to conserve soil moisture and nutrients is an integral part of SA cropping systems. GPS and guidance systems allow farmers to spray accurately at night and this practice has been commonly adopted for summer weed spraying. The atmospheric conditions that prevail at night, particularly the likely presence of temperature inversions, mean farmers have to be very careful with night spraying, especially near sensitive areas such as grape-growing regions.

BRINKWORTH FARMERS JON AND TIM HANCOCK PLAN TO USE 2,4-D THIS SUMMER.

Spraying should be done during the day wherever possible. The risk of drift under temperature inversions is reduced during the day because vertical mixing of the air makes temperature inversions unlikely.

At night there is a high risk of conditions that can trap and move chemical far from the target area, so spray during the day when you have checked the conditions are favourable. Spraying should not be undertaken from 1½ hours before sunset until 1½ hours after sunrise unless there is no temperature inversion. The risk of temperature inversion is very low when there is full cloud cover and/or the wind speed is continuously greater than 11 kph.

Wind speed

For best coverage and low risk of drift wind speed must be steady – measured at between three and 15 kph at the application site – and be blowing away from vineyards and other sensitive areas including residential properties and waterways. It is important to measure wind conditions before you start spraying and monitor any changes that occur while spraying. Do not spray in calm or variable wind conditions. If the wind stops blowing; **stop spraying immediately.**

TABLE 1. RELATIVE COSTS OF SUMMER WEED CONTROL (2009 COSTS)

Weed	Product	Rate (L/ha)	Cost of product/L ($)	Cost of product/ha ($)	Comment
Caltrop	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L) Glyphosate (450 g/L) Spray.Seed®	1.6-2.5 1.6-2.2 1.5 1.6	8.00 7.10 12.50 13.25	12.80-20.00 11.36-15.62 18.75* 21.20	Use higher rate on larger plants. Use higher rate on larger plants. Add Pulse®* to improve result. Plants may regrow if rain after treating.
Melon – bitter or Afghan	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L) Glyphosate (450 g/L) Garlon 600®	2.5 1.1-2.2 0.8-1.6 0.12-0.16	8.00 7.10 12.50 32.50	20.00 7.81-15.62 10.00-20.00 3.90-5.20	Inconsistent control – surviving plants stunted. Use higher rate on larger plants. Use higher rate on larger plants. Use higher rate on plants >20 cm diameter.
Melons – paddy or prickly paddy	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L) Garlon 600®	2.5 1.6-2.2 0.08-0.16	8.00 7.10 32.50	20.00 11.36-15.62 2.60-5.20	Inconsistent control – surviving plants stunted. Use higher rate on larger plants. Use higher rate on plants >20 cm diameter.
Potato weed	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L) Spray.Seed®	2.5 2.2 1.2-1.6	8.00 7.10 13.25	20.00 15.62 15.90-21.20	Useful suppression. Useful suppression. Use higher rate on older and larger plants.
Stinkwort	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L)	1.6-2.5 1.6-2.2	8.00 7.10	12.80-20.00 11.36-15.62	Use higher rate on larger plants. Use higher rate on larger plants.
Wireweed	2,4-D LV ester (680 g/L) 2,4-D amine (625 g/L)	1.8 1.6-2.4	8.00 7.10	14.40 11.36-17.04	Use lower rate on plants <30cm. Use lower rate on plants <30cm.

HERBICIDE RECOMMENDATIONS, RATES AND COMMENTS TAKEN FROM "SUMMER WEED CONTROL" FACT SHEET BY GRAHAM FROMM (AGDEX 100/640, FEB 2001).

* PULSE® PENETRANT APPROX $37/L. WOULD ADD APPROX. $7.40/HA TO COST OF THIS TREATMENT.

SPRAY OILS WOULD ADD ABOUT $2/HA TO COST OF TREATMENT.

SOURCE: DAVID STEPHENSON, PIRSA RURAL CHEMICALS PROGRAM

TABLE 2. SUGGESTED MINIMUM DISTANCES BETWEEN LOCATIONS OF 2,4-D USE AND NEAREST GRAPEVINES OR HOUSING

Spray drift risk	Volatility	Active constituent[1]	May 1 to August 31[2] Dormant vines and susceptible crops	September 1 to April 30[2] Vines and other susceptible crops
High	High	Ethyl, butyl and iso-butyl esters of 2,4-D	Not less than 1.5 km*	**DO NOT use during this period**
Moderate	Low	Butoxy ethyl, iso-octyl and ethyl hexyl ester formulations of 2,4-D and MCPA. Triclopyr	Not less than 100 m*	Not less than 1 km*
Low	Very Low	Amine, potassium and sodium salts of 2,4-D, MCPA, MCPB and 2,4-DB. Clopyralid, dicamba, fluroxypyr and picloram	Not less than 20 m*	Not less than 100 m*

TAKEN FROM THE 'AVOID SPRAY DRIFT' LEAFLET PRODUCED BY PIRSA RURAL CHEMICALS PROGRAM

*SUGGESTED MINIMUM DISTANCES, USING GOOD CHEMICAL MANAGEMENT TO MINIMISE DRIFT AND CONSISTENT WINDS BLOWING AWAY FROM AREA(S) OF RISK.

(1) TRADE NAMES FOR SOME ACTIVE CONSTITUENTS ARE TOO NUMEROUS TO LIST IN THIS PUBLICATION. ALL HERBICIDE LABELS MUST DISPLAY BOTH THE TRADE NAME AND ACTIVE CONSTITUENT(S) ON THE FRONT PANEL. **READ THE LABEL** TO DETERMINE WHETHER THE PRODUCT CONTAINS AN ACTIVE CONSTITUENT THAT IS LISTED IN THE TABLE ABOVE.

(2) THESE DATES APPROXIMATE THE BEGINNING AND END OF THE ACTIVE GROWING SEASON FOR GRAPEVINES, DURING WHICH THEY ARE MOST SUSCEPTIBLE TO HERBICIDE DAMAGE. DIFFERENCES IN VARIETY, GEOGRAPHICAL AREA AND SEASONAL CONDITIONS CAN INFLUENCE THE TIMING OF BUD INITIATION AND LEAF DROP. IF UNSURE, SEEK REGIONAL ADVICE.

Droplet size

Nozzle types and operating pressures that produce a coarse spray quality or larger should be used. Smaller than coarse spray quality should not be used for application of any herbicide.

An extremely coarse spray quality is recommended where a glyphosate, MCPA or 2,4-D product is used. Standard flat fan nozzles produce fine droplets and are **not** suitable. Air induction nozzles are best as they produce coarse droplets over a wide area. Low-drift nozzles 03 size or larger are also suitable. Using an appropriate pressure range for the equipment being used is also important to maintain droplet size.

When using smaller than extremely coarse spray quality with products other than 2,4-D and an adjuvant is required, select a product such as LI 700 surfactant or similar that does not increase drift potential.

To achieve the best coverage and minimise drift potential, booms should be no higher than is required to achieve a double overlap at the top of the stubble – typically 50 cm above the top of the weeds for a 110° nozzle at 50 cm boom spacing. Travel speed should be no more than 18 kph when spraying.

High volatile ester formulations of 2,4-D cannot be used over summer. Do not use 2,4-D ethyl, butyl or iso-butyl ester formulations, e.g. 2,4-D Ester 800, for any application, including spot-spraying, from September 1 to April 30.

Non-volatile alternatives

Use only non-volatile herbicides near grape growing areas. 2,4-D amine has very low volatility so farmers should be able to use amine products safely near grape growing regions provided care is exercised.

OPERATING THE RIGHT NOZZLES AT THE CORRECT PRESSURE IS THE FIRST STEP TOWARDS REDUCING THE RISK OF OFF-SITE DAMAGE FROM SPRAY DRIFT.

There is still a risk to grapevines from droplet drift of 2,4-D amine so care must be taken to keep the chemical in the target area. Over summer, low volatility esters should not be used **within a kilometre** of grape vines or other sensitive areas due to the potential for vapour drift. Spraying should occur when the current and forecast temperature is below 28ºC to reduce the chance of vapour drift of low volatility esters.

Monitoring and records

Monitoring doesn't prevent spray drift but helps ensure operators notice any changes in weather during spraying. Monitor and record on-site weather conditions (wind speed, wind direction, temperature, relative humidity) at the start of the job, at least every time the sprayer stops for re-filling and when the paddock is finished. In addition to the formal monitoring, watch for changes in weather conditions and stop spraying immediately if a temperature inversion develops or if conditions become unsuitable for any other reason.

Avoiding spray drift is important, and not only for those growing crops that might be damaged by it.

Inversion layers

Avoid spraying if inversion conditions are likely.

Spraying herbicides during temperature inversion conditions has been the main cause of long-distance pesticide damage to other crops and to the environment and many new agricultural chemical product labels specifically forbid spraying during temperature inversion conditions.

Chemical users can be prosecuted if they do not comply with this and other label provisions.

The protective no-spray zones now being added to many product labels are not designed to protect against the typically longer range damage that can result from spraying during inversions. Consequently, it is important for growers and other pesticide users to understand how to recognise temperature inversions and to

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suspend spraying if an inversion develops.

The air temperature is normally warmest at the earth's surface and steadily reduces as you go up into the atmosphere. An inversion layer occurs when this is reversed and the temperature increases with height.

Hot air is less dense (lighter) than cold air, so under normal conditions the warm air at the surface slowly rises, taking any air pollutants with it. This helps disperse the pollutants so they are undetectable to humans and not a nuisance to immediate neighbours. However, if a layer of warm air forms over cooler air near the Earth's surface it forms a blocking or inversion layer that prevents the rise and dispersion of the cold air and any pollutants in it. This is most likely to occur in low or no-wind conditions.

The potential for inversions to occur and to hold high concentrations of airborne pesticides near the surface should always be anticipated between sunset and up to an hour or two after sunrise unless one or more of the following conditions occur:

- continuous overcast, low and heavy cloud
- continuous rain
- Wind speed remains above 11 kph for the whole period between sunset and sunrise. Be mindful that established inversions can still occur when winds are in excess of 11 km/h (based on Pasquill Stability Classes 19611).

The occurrence of any of these three conditions does not rule out the occurrence of a surface inversion but does

indicate conditions not normally favourable to the drift of airborne pesticides.

Surface inversions may exist overnight without visual clues but some useful visual indicators are:

- Cumulus clouds that have built up during the day tend to collapse toward evening
- Mist, fog, dew and frost occur
- Smoke or dust hangs in the air and/or moves laterally in a concentrated package.

Other clues include:

- There is a large difference between the observed maximum temperature and the night-time temperature
- Wind speed in the evening and at night are considerably less than during the day
- Cool off-slope breezes develop in the evening
- The clarity of remotely generated sounds increases at night
- Aromas become more distinct at night than during the day.

Avoiding spray drift is important, and not only for those growing crops that might be damaged by it. The more chemical that lands on the target the more cost effective the spraying is and the higher the efficacy rate, which means money saved.

Growers have a legal responsibility to prevent sprays drifting from the target area, so eliminating drift also removes the risk of legal action arising from damage caused by drift.

IT IS IMPORTANT TO SPRAY ONLY WHEN CONDITIONS ARE RIGHT AND STOP AS SOON AS THERE IS ANY SIGNIFICANT RISK OF THE CHEMICAL DRIFTING OFF SITE AND ONTO SUSCEPTIBLE CROPS, WHICH CAN BE SEVERAL KILOMETRES AWAY.