# Weed control in vines - some experimental results and views

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**Summary**

**Weed management in vines in North-East Victoria is discussed with reference to results from two experiments at Milawa. The implication of weed resistance and herbicides for spiny weeds is discussed.**

## Weed management in vineyards in North-East Victoria

There are many combinations of management options used in vineyards. For example, in the King River Valley, most vineyards have permanent swards inter-row, with under-vine strips treated in Aug/Sept with glyphosate (Roundup) plus diuron plus simazine. In the Rutherglen area inter-rows are sown to a cover crop in winter and cultivated in summer. Under-vine strips are treated as in the King Valley. At Milawa, Brown Brothers commonly use a range of herbicides for summer weed control across the whole row.

In all areas glyphosate may be used for perennial grass control before canopy fall or fluzaifop (Fusilade) at any stage during summer.

## Weed control experiments at Milawa

Two weed control experiments were conducted in vines at Brown Brothers vineyard, Milawa during the 1988/89 and 1989/90 seasons. One was conducted in a planting of new vines (Shiraz) and another in established vines. The experiments are a co-operative project between Brown Brothers and the Department of Agriculture and Rural Affairs.

### *New vines experiment*

Treatments included single herbicides or mixtures applied in September just after planting, weed mat (full width or under-vine), plastic (full width in 1988, replaced by under-vine only in 1989) and straw under-vine with slashing or Flandor (oryzalin and simazine) inter-row. Also, in 1989 several split treatments were included - knockdown or residual herbicide in early spring, followed by residual in late spring, to extend control (Table 1). The dominant weed was barnyard grass (*Echinochloa crus-galli* (L.) Beauv.) with couch (*Cynodon dactylon* (L.) Pers), water couch (*Paspalum paspaloidis* (Michx.) Scribn.) and various broad leaf weeds.

Weed control and vine responses fell basically into 3 groups (Table 1).

a) Herbicides that gave relatively poor weed control. For these treatments total length of vine canes after the first years growth was about 900 to 1200 mm and grape yield after the second season was about 0.5 to 0.9 tonnes $ha^{-1}$. Several treatments in this group included chlorthal (Dacthal), metolaclor (Dual), napropamide (Devrinol), oxadiazon (Ronstar) and mixtures of various products at half standard rates of each. Although some of these herbicides controlled some weed species well, they did not provide an adequate level of control of weeds over-all.

Chlorsulfuron (Glean) at 20 gm $ha^{-1}$ was also used in 1988 but discontinued due to severe damage. Norflurazon (Solicam) was also used and discontinued due to slight damage.

b) Herbicides that gave good over-all control fell into the second group. These treatments resulted in cane growth between 1000 and 1500 mm and yields between 1.1 and 1.30 t $ha^{-1}$. Effective herbicides were oryzalin and isoxabon (Snapshot), oryzalin (Surflan) alone or with metolachlor (Dual) or chlorthal at full rates, oryzalin followed by simazine or Snapshot and Snapshot in late spring after a knockdown herbicide

**Table 1. Results from weed control experiment in new vines, Milawa 1988-90**

| Treatments applied | Weed control ratings*(1) April 1989 BYG*(1) | CW*(1) | Nov 1989 All spp. | Autumn 1990 BYG*(1) | BL's*(1) | Vine cane lengths (mm) April 1989 | Grape yield 1989/90 (t/ha) |
|---|---|---|---|---|---|---|---|
| Unsprayed, unslashed | (Dense barnyard grass, couch and water couch occurred | | | | | - | 0.35 |
| Unsprayed, slashed (I) | in controls. Also, light to moderate populations of capeweed, milk thistle, pepper cress, clover and others ) | | | | | - | 0.40 |
| Surflan 6.8 L | F/G | PG | F/G | G/VG | F | 1367 | 1.15 |
| Dacthal 13 kg | F | F | F | P | P | 1221 | 0.48 |
| Snapshot 6 kg | G | VG | G | VG | G | 1321 | 1.30 |
| Casoron 80 kg | P | F/G | G | P | G | 1433 | 1.15 |
| Surf. 6.8 L, sim. 4 L (Nov)*(2) | F/G | F | F | G | E | 1290 | 1.25 |
| Surf. 6.8 L, S'shot 6 kg (Nov)*(2) | F/G | F | F/G | G | G | 1502 | 1.35 |
| Spray-seed, sim. 4 L (Nov)*(3) | F | F | F/G | F | F/G | 958 | 0.35 |
| Spray-seed, S'shot 6 kg (Nov)*(3) | F | F | G | G | G | 1031 | 0.55 |
| Weed mat, full width | VG | VG | G/VG | F | G | 2275 | 3.40 |
| Weed mat (U), Surf 6.8 (I)*(1)*(4) | VG | VG | G | F/G | G | 2179 | 2.90 |
| Weed mat (U), slashed (I)*(4) | G | F/G | G | F/G | G | 1550 | 1.90 |
| Weed mat (U), Flandor 8.4 L (I)*(4) | VG | VG | VG | VG | G | 2042 | 2.40 |
| Straw (U), slashed (I)*(4) | VG | VG | G | VG | G | 1522 | 2.40 |
| Straw (U), Flandor 8.4 L (I)*(4) | VG | VG | VG | VG | G | 2509 | 3.70 |
| Plastic, full width | VG | VG | VG | G | G | 3252 | 4.31 |
| LSD (P = 0.05) | | | | | | 273 | - |

*(1) BYG = barnyard grass; CW = capeweed; BL's = broadleaf weeds; U = undervine; I = inter-row; P = poor control; F = fair; G = good; VG = very good

*(2) Surflan alone was applied in 1988, the sequence of Surflan in September and Simazine or Snapshot in November was applied only in 1989

*(3) The sequence of Spray seed, followed by residuals in Nov. was applied in 1989. Dacthal alone was applied in 1988.

*(4) Weed rating for "under" vine only.

**Table 2. Results from weed control experiment in established vines, Milawa, 1988-90**

| Treatments applied (1988-1989) | Rating of weed control*(1) Nov '88 | Apr '89 | Nov '89 | Feb '90 | Grape yield (t/ha) '88 | '89 | Pruning weight June 1989 kg/6 vines |
|---|---|---|---|---|---|---|---|
| Goal 4 L (Sept) | P | F | F | P/F | 30 | 21 | 4.7 |
| Goal 4 L (Sept), simazine 4 L (Nov) | P | F | F | G | 34 | 28 | 8.5 |
| Flandor 8.4 L (Sept) | G | G | G/VG | G | 22 | 36 | 6.9 |
| Flandor 8.4 L (Sept), Fland 8.4 L (Nov) | G | VG | VG | VG | 37 | 39 | 9.7 |
| Flandor 8.4 L (Sept), sim. 4 L (Nov) | G | G | G/VG | G | 34 | 31 | 8.6 |
| Flandor 8.4 L (Sept) Casoron 80 kg(Nov) | G | VG | VG | VG | 35 | 36 | 10.7 |
| Flandor 8.4 L (Sept), Devrinol 6 kg(Nov) | G | VG | G/VG | G/VG | 32 | 30 | 8.0 |
| Simazine 4 L (Sept) | P/F | P | F/G | P | 26 | 27 | 6.5 |
| Simazine 4 L (Sept), Flandor 8.4 L (Nov) | P/F | P | F/G | F | 23 | 20 | 5.8 |
| Simazine 4 L (Sept), simazine (Nov) | P/F | P/F | G | F | 29 | 33 | 7.9 |
| Simazine 4 L (Sept), Casoron 80 kg(Nov) | P/F | F | G | F | 27 | 29 | 8.7 |
| Simazine 4 L(Sept), Devrinol 6 kg (Nov) | P/F | P | G | P | 26 | 30 | 8.9 |
| Diuron 4 L (Sept) | F | F | G | F | 23 | 24 | 6.3 |
| Diuron 4 L (Sept), Flandor 8.4 L | F | F | G/VG | VG | 28 | 31 | 9.5 |
| Diuron 4 L (Sept), simazine (Nov) | F | F | G/VG | G | 34 | 28 | 8.3 |
| Spray-Seed (Sept), Flandor 8.4 L (Nov) | - | P | G | F | 17 | 27 | 6.7 |
| Spray-Seed (Sept), Casoron 80 kg (Nov) | - | F | G/VG | P | 21 | 26 | 6.6 |
| Spray-Seed (Sept), Devrinol 6 L (Nov) | - | P | G/VG | F | 28 | 30 | 8.2 |
| Spray-Seed (Sept), Ronstar 4 kg (Nov) | - | P | G/VG | F | 24 | 28 | 6.8 |
| Spray-Seed (Sept), Solicam 5 kg (Nov) | - | F | G | F/G | 25 | 29 | 5.8 |
| Spray-Seed (Sept), Snapshot 6 kg (Nov) | - | P | G | F | 18 | 22 | 5.1 |
| Weed mat | VG | VG | VG | VG | 28 | 32 | 9.7 |
| Straw (U), slashed (1)*(2) | | | | | | | |
| LSD (P = 0.05) | | | | | | | |

*(1) Weed population was predominantly heavy barnyard grass with small amounts of some other species.
*(2) Rating in undervine area only.

treatment.

c) Weed mat or plastic full width, or under-vine with slashing or Flandor 8.4 L inter-row resulted in cane lengths and yields considerably higher than those obtained with herbicides. Plastic sheet produced cane growth 5 times that of the better chemicals and a yield of 4.31 t $ha^{-1}$ of grapes, more than three times that of the herbicides. The effectiveness of the mulch treatments would be due partly to the good weed control near young vines, but possibly also to differences in soil moisture and temperature.

The plastic was fairly easily damaged by equipment passing over it, and the straw also was moved by the operation of inter-row mowing. Weed mat was only slightly damaged over the two years.

Mulch treatments were expensive (Table 3). Their economic value would depend on how long they last. Plastic sheet appears more easily damaged than Weed mat and would probably not last as long. Baled cereal straw was expensive, and due to decomposition the straw would probably need to be renewed fairly often.

The response of vines to differing moisture and temperature conditions under the various mulches, and with herbicides would probably vary with districts. Irrigation systems could also have a bearing (overhead sprinklers are used at Brown Brothers).

Significant weed growth occurred on the weed mat in this experiment both by shoots and roots (particularly couch) penetrating the mat. This did not occur in the experiment on established vines, probably due to use of weed mat with a close weave.

**Table 3. Comparison of costs for selected treatments from Milawa experiments**

| Treatment | Costs per year and establishment cost ($ $ha^{-1}$) |
|---|---|
| Flandor 8.4 L | 100 $yr^{-1}$ |
| Surflan 6.8 L | 160 $yr^{-1}$ |
| simazine 4 L | 40 $yr^{-1}$ |
| Casoron 80 kg | 650 $yr^{-1}$ |
| Weed-mat, full width | 600 $yr^{-1}$ over 10 yrs (5500 establishment cost) |
| Weed-mat (U), slash (I) | 270 $yr^{-1}$ over 10 yrs (2300 establishment cost) |
| Weed-mat (U), Fland. (I) | 350 $yr^{-1}$ over 10 yrs (2400 establishment cost) |
| Straw (U), slash (I) | 850 $yr^{-1}$ over 2 yrs (1670 establishment cost) |
| Straw (U), Fland (I) | 950 $yr^{-1}$ over 2 yrs (1800 establishment cost) |
| Plastic, full width | 2300 $yr^{-1}$ over 2 yrs (4500 establishment cost) |

Figures do not include labour charges.
Straw mulch costs will vary depending on thickness of straw and cost paid/bale (the above based on ½ bale/vine @ $2/bale).

*Established vines experiment*

Herbicides were applied in spring in 1988 and again in 1989 to six vine plots. Treatments were either a single residual herbicide applied in September or a sequence of two residual herbicide applications, one in September and one in November, or a residual applied in November after existing weed growth had been sprayed with a knockdown herbicide, paraquat-diquat (Spray-seed) or paraquat (Gramoxone). Herbicide treatments were applied to both the under-vine and inter-row areas. The vines were irrigated overhead.

Effects of treatments were assessed by measuring grape yield (two years), pruning weights (June 1989) and observation of the weed control obtained. Heavy barnyard grass (BYG) was the dominant weed, with patches of couch and small amounts of some other

**Table 4. Herbicides for control of spiny weeds in vines**

| Product | Registration status | Spiny weeds controlled* | Chemical type |
|---|---|---|---|
| Goal® (oxyfluorfen) | All states, to dormant vines, min. 3 years old | SBG, Cal | Residual; applied generally to bare soil; not cultivated after application |
| Flandor® (oryzalin and simazine) | NSW, Vic, Tas WA, vines min. 3 yrs | SBG, Cal | Residual, applied to bare soil |
| Casoron® (dichlorbenil) | All states, 4 wks planting after | Wide range of annuals. Should be effective onpiny species | Granules of residual chemical, spread on soil surface, watered after |
| Diuron | All states, vines min. 3 years | SBG, (SE and BB not included in vines but in cotton | Residual, applied to bare soil |
| Surflan (oryzalin) | All states, from planting | SBG, (Cal variable control) | Residual, applied to bare soil |
| Trifluralin | Vic, SA, WA, Tas, Qld, All stages | SBG, Cal | Residual, applied to bare soil, requires incorporation |
| Glyphosate (Roundup®) (Squadron®) | All states, vines 3 yrs min for spraying, any stage for wiper application (Roundup only) | SBG, Cal, SE | Non residual, translocated. Avoid contact with vine foliage. |
| Paraquat (Gramaxone®) | All states | Annual weeds | Non residual, contact, avoid contact with vine foliage. |
| Paraquat and diquat (Spray-seed®) | All states, all ages | Annual weeds | Non residual, contact, avoid contact with vine foliage. |
| Amitrole | All states | General weed control | Short residual, translocated, avoid contact with vine foliage |
| Fusilade (fluazifop) | All states | SBG | Non residual, translocated. Selective in vines. |
| Dalapon | All states min 4 yrs. | Most grasses (SBG not mentioned specifically) | Very short residual, translocated avoid vine foliage contact |
| Simazine | Qld, vines min.3 yrs. Other states 1 yr. | Species registration in vines not clear, registered on SEin lupins in WA, effective in fieldon all species | Residual, apply to bare soil |
| Solicam (norfluazon) | Registration pending | SBG, Cal, Se | Residual |
| Snapshot (oryzalin & isoxabon) | Registration possible | - | Residual |
| Ronstar (oxadiazon) | Registration possible | - | Residual |
| Dacthal (chlorthal) | Registration possible | SBG, Cal, SE | Residual |

* spiny weeds considered include spiny burr grass (SBG), Caltrop (Cal), Spring emex (SE) and Bathurst burr (BB)

species. Weed populations and vine vigour varied across the site which made interpretation of results difficult, but some trends are apparent (Table 2).

Of the single herbicide treatments Flandor gave good weed control and the highest yield giving a total of 58 tonnes $ha^{-1}$ over the two harvests. Goal, simazine and napropamide were poor to fair with total yields ranging from 47 to 53 tonnes. Weed control with the latter three treatments was poorer in 1988, possibly due to dry surface soil for two weeks after application.

Double applications of residuals provided better weed control and higher yields. Sequences of the same chemical (e.g. Flandor/ Flandor, simazine/simazine) were more effective than different chemicals. Flandor after Flandor provided a total yield of 76 tonnes compared with 58 with Flandor alone. However, there are possible problems with this type of herbicide use in developing herbicide resistance to weeds.

Residuals applied in November after a knockdown herbicide gave poor results in 1988, due mainly to a poor result with the knockdown herbicide (Spray-seed 4 L). BYG growth was fairly thick and spray did not penetrate to plant bases, and re-growth occurred. In 1989 the knockdown was better, but relatively poor control with residuals may indicate re-growth did occur. Solicam was the most effective of the herbicides used after the knock-down herbicide.

Weed mat gave very good control of weeds. Few grew through the mat which was a different brand with a tighter weave than that used in the new vines experiment where a considerable number of weeds sent both roots and shoots through mat. Damage to mat by equipment or wind was minimal.

Straw was also reasonably effective, but yields were lower at 48 tonnes for both years (compare responses to those in new vines). Straw was damaged to some extent by mowing inter-row and weeds grew in gaps in 1989/90.

## Herbicide resistance in weeds

Any weed control treatment is likely to "select out" or favour the growth of plants resistant to that treatment. These plants may be resistant species, or resistant individuals in an otherwise susceptible species. This is a real issue that needs to be considered in weed management. For example, many wheat cropping farmers now have problems with herbicide resistant ryegrass that is causing considerable problems.

The main ways to help avoid problems are:-

- use a range of different herbicides in a weed control program, preferably from different chemical groups and with different modes of action. There are a variety of herbicides registered that control weeds with spiny seeds in vines (Table 4)
- use other methods of control e.g. even a hoe to chip out surviving weeds if needed.