Beating the blackberry

J H. Moore
E. B. Hoskins

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By J. H. Moore, Research Officer, Albany Regional Office, and E. B. Hoskins, Agriculture Protection Board, Albany

The blackberry is an aggressive, strongly-growing plant that has spread throughout parts of the south-west of Western Australia.

Although most blackberry infestations on agricultural land have been dramatically reduced since compulsory control measures were introduced 30 years ago, about 3,600 hectares are still infested today.

Recent research has shown that three new herbicides are highly effective against blackberry, and much safer to use than the older ones.

Effective biological control of blackberry may also be possible.
In forests, bulldozers are used to clear paths to blackberry infestations.

A vacant block is an ideal place for blackberry.

**The plant**

The blackberry (*Rubus fruticosus* L. agg.) is an aggregate of many closely related species and hybrids. It is a deciduous perennial shrub, up to 7 metres high, that often forms dense thickets. It is a shallow rooted plant, with about 77 per cent of the root mass within the top 20 centimetres of soil. The remainder is usually no deeper than one metre. Just under half of the mass of the plant is root.

The plant has arching thorned canes which can take root where their tips touch the ground to form new plants. Canes live for two to four years and produce seed from their second year onwards.

Leaves on short stalks alternate along the cane and consist of three to five leaflets on shorter stalks. The serrated leaflets are smooth on top and furry underneath, with a row of spines on the midrib.

The flowers, with five white to pink petals, are about 25 millimetres wide. They develop into spherical to slightly elongated berries that start off green, turn red then purple-black. Flowers are produced from December to May with the main fruit set from January to March. Leaves fall with the onset of cold weather and frost and the plant is semi-dormant over winter. In coastal areas, leaf fall may be only marginal.

New growth appears in September and October. New canes (primocanes) are formed and elongate rapidly whilst older canes (floricanes) start to form buds and flowers.

**Distribution**

Western Australia's major blackberry infestations are south-west of a line joining Bunbury to Albany and in the valleys of the Darling Range. Much of this area is forested, and many infestations are inaccessible.

Blackberry most commonly grows in disturbed areas where exposed soil has allowed seedlings to establish. It is particularly common on eroded creek and river banks and where land has been cleared for timber, agriculture or roads. It rarely establishes from seed in undisturbed forest or improved pasture, however it may invade these areas by vegetative spread.

**Plant spread**

**Seeds**

A square metre of blackberry bush produces about 10,000 seeds. Seeds are spread by running water or in animal and bird droppings. There is little germination in the first year after seed set. About 10 per cent of the seeds produced will germinate in the second spring and fewer in subsequent years.

Seedlings need at least 44 per cent of full sunlight to survive, so they rarely grow in shaded areas or vigorous pastures.

The seedling appears to grow slowly in its first year, reaching a height of five to seven centimetres with three to six leaves. During this period it forms an extensive root system. Most seedlings die during establishment. In Western Australia, it is rare to find more than 10 seedlings per square metre.
Vegetative reproduction

Blackberry canes can root at the tips where they touch the ground and this spreading habit makes it a severe weed problem. This form of local spreading depends on seasonal conditions, grazing and wind damage. It usually takes place in autumn and appears to be dependent on decreasing daylength.

Fragments of root and cane also readily establish to form new plants.

Roots also produce suckers when the top growth has been removed, either mechanically or by herbicides, or where roots have been severed. Suckers usually appear within one or two metres of the parent bush but have been seen up to seven metres away. They can emerge from at least 45 cm deep, making cultural control difficult.

Suckering is particularly pronounced after the application of triclopyr, the active constituent in the herbicides Garlon 480® and Grazon®.

Control

Several methods and chemicals have been used to successfully control blackberry since the 1950s. However, after the introduction of restricted spraying areas in 1979 the main chemical used was 2,4,5-T amine, and results were variable and generally disappointing.

In the late 1970s the Agriculture Protection Board and the Department of Agriculture started a programme to find more effective herbicides for blackberry control.

Field trials were conducted from 1977 to 1980 to compare 2,4,5-T amine with a wide range of herbicides, the most promising of which were Roundup® (active constituent glyphosate) Garlon 480® (triclopyr), and triclopyr plus picloram which is similar to Grazon®. Further trials and large scale demonstrations using these three herbicides started in 1979.

Roundup® trials

In 1979 fifty separate areas of blackberry around Albany were sprayed with Roundup® at rates of between 1 part glyphosate (360 grams per litre active constituent) in 100 parts water (1:100) and 1 part glyphosate (360 g/L a.e) in 200 parts water (1:200) from February to May. Infestations were sprayed using high pressure hand-held spraying pistols.

Two application volumes were applied. The first, designated ‘high volume’, involved spraying the bush until it was thoroughly wetted. For the other ‘low volume’ application, the bush was sprayed as quickly as possible for good coverage but with no run off.

The area where the blackberry grew was scored as ‘wet’ (summer moist and partially shaded land typical of infestations along creeks and in swamps), or ‘open’ (well drained, unshaded land typical of paddock infestations).
All sprayed plants were inspected for regrowth 12 months after spraying. In 1980, 1981, and 1982, twenty-six of the bushes were resprayed with their original treatments and assessed.

Results
Roundup® was more effective when applied in February than later in the year (Figure 1), even after four successive yearly sprayings. The final average volumes of the bushes sprayed in February were 1.3 cubic metres; for the March treatments, 16.3 cubic metres. In contrast, the unsprayed bushes measured more than 100 cubic metres.

The amount of herbicide absorbed by a blackberry bush depends on the concentration of the spray solution, the volume of solution applied and the amount of foliage and cane that is sprayed.

In these trials, the most concentrated spray solutions and the maximum spray volumes provided the best control. Twelve months after the first spraying, the best treatment was the more concentrated 1:100, high volume application.

Figure 2 shows the results after three years of successive spraying with Roundup®. For high volume application, the less concentrated 1:200 mixture applied in February gave nearly the same kill as the 1:100 mixture (which costs twice as much) applied four weeks later.

Application volume is critical because it determines the quantity of herbicide applied to the bush. At least 1:100, high volume application is recommended because it provides reasonable control over the normal range of conditions experienced during blackberry spraying. If lower...
application volumes can only be used, then the concentration of spray solution must be increased.

Low volume spraying with Roundup® provided only marginal control because the herbicide concentration was not increased to compensate. Less grams of active constituent therefore were applied to each bush.

A trial in 1982 tested the effectiveness of low volume spraying with Roundup®. The application volume was measured carefully and the concentration of Roundup® in the spray solution adjusted so that each bush received the same amount of active constituent.

The results in Table 1 show that it is the quantity of Roundup® applied that is important. The volume of spray solution is not significant, even to as low as 150 litres per hectare. More trials are needed to compare low volume applications of Roundup® and other herbicides.

Blackberry growing in 'wet' habitats was just as sensitive to spraying with Roundup® as bushes growing in 'open' habitats. However, individual bushes varied markedly in their responses to spraying. Some died off within a week or two of spraying, while others showed few symptoms until the following spring.

Deformed growth ('witch's brooms') of blackberry and very heavy fruit set are common symptoms which develop in the season after the first spraying with Roundup®. This deformed growth must be thoroughly sprayed, otherwise the blackberry will recover and grow normally in the following season.

**Garlon 480® and Grazon® trials**

Garlon 480® contains 480 g/L active constituent triclopyr, and Grazon® contains a mixture of triclopyr (150 g/L active constituent) and the soil residual herbicide picloram (50 g/L active constituent).

Trials at Albany, Bornholm and Manjimup in 1981 compared Garlon 480® and a mixture of triclopyr and picloram (similar to Grazon®) with the recommended herbicides Roundup® and 2,4,5-T amine plus summer spraying oil.

All the herbicides were applied at a high volume rate of one litre of solution for each 2.5 cubic metres of bush volume or 2.5 square metres of bush area, which ever was the greater. This is equivalent to a spraying volume of about 4,000 L/ha. Bushes on the Manjimup site were burnt after the first spraying.

**Results**

Garlon 480® controls top growth extremely well, but does not kill all the roots away from the crown. This results in a large number of suckers emerging from the roots, particularly in the first year after spraying. The area that the blackberry occupies one year after the first spraying is often greater than before, even though the bush volume has been reduced dramatically.

This effect has also been observed after using picloram and to a lesser extent 2,4,5-T amine.

The new growth is most probably due to small amounts of the herbicide moving to the peripheral roots and stimulating suckering.

Removing the top growth mechanically does not induce the same amount of suckering. Respraying the suckers a year later effectively kills the nearby roots.

Two annual applications of Garlon 480® at concentrations greater than 1 part Garlon 480® in 480 parts of water gave more than 90 per cent control. Doubling the strength to 1:240 only increased control by 5 per cent.

The addition of picloram, a soil-residual and root-absorbed herbicide, to Garlon® considerably reduced suckering from the roots. However after the first year of spraying, a circle of suckers still appeared around each bush where no spray had been applied.

In the trials, Garlon 480® plus picloram completely controlled 62 per cent of bushes after two years of spraying. No other treatment...
in these trials achieved total control of a blackberry bush in that time.

**Costs and effectiveness**

Table 2 shows the relative superiority of Roundup®, Garlon 480® and Garlon 480® plus picloram over 2,4,5-T amine plus summer spraying oil for blackberry control at either the March or April spraying times.

Figure 3 compares the cost of the different chemicals with the expected control after three years of spraying. In most cases, Grazon® will be the most cost effective herbicide for blackberry control. For very large infestations, an initial spraying with Garlon 480® followed by Grazon® in subsequent years could be more cost effective.

The ratio of triclopyr/picloram, now marketed as Grazon®, is slightly different to that tested in this trial. Grazon® was substituted for the Garlon 480®/picloram mix because picloram cannot be bought separately.

**Recommendations**

Table 3 summarises the chemical control recommendations and rates.

Grazon® should be used where damage to other plants associated with the blackberry infestation is of little consequence. Do not let spray drift contact desirable broad-leaf species. It is the most cost effective herbicide tested for blackberry control. A permit is needed for its use in restricted spraying areas.

A strip one to two metres wide should be sprayed around the edge of the infestation to help prevent excessive suckering from the roots. Thorough annual re-spraying for two or three years after the initial spraying will prevent suckers establishing new bushes.

Encouraging grasses to grow on the site will help prevent new infestations forming by shading blackberry seedlings. Burning dead canes in the spring after spraying will help control growth and make follow-up sprayings far easier to apply thoroughly.

Garlon 480® should be used where the soil residual properties of picloram in Grazon® cause concern. The one to two metre buffer strip around infestations should not be sprayed because Garlon 480® is only effectively absorbed through the foliage and canes of the blackberry. Otherwise, application is the same as for Grazon®.

Bushes must be sprayed each year to control suckering. Failure to do so is likely to lead to an infestation larger than the original. Good control can be expected after three to four annual applications.

### Table 1. Effectiveness of two application volumes for Roundup®.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Volume of application L/ha</th>
<th>Roundup concentration</th>
<th>% Control rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>High volume spot sprayer</td>
<td>1500</td>
<td>1:100</td>
<td>95</td>
</tr>
<tr>
<td>Low volume knapsack</td>
<td>150</td>
<td>1:10</td>
<td>95</td>
</tr>
<tr>
<td>Low volume mister</td>
<td>150</td>
<td>1:10</td>
<td>95</td>
</tr>
</tbody>
</table>

### Table 2. Blackberry control after two annual applications of various herbicides.

<table>
<thead>
<tr>
<th>Time of application</th>
<th>Herbicide</th>
<th>Rate of application product: water</th>
<th>% Control (Mar. 1983)</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 81, 82</td>
<td>Garlon 480</td>
<td>1:480</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Garlon 480</td>
<td>1:240</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Garlon 480</td>
<td>1:160</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Garlon + picloram</td>
<td>Note 1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Roundup 2,4,5-T + S.S.O.</td>
<td>1:100</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Roundup 2,4,5-T + S.S.O.</td>
<td>1:80 + 1:100</td>
<td>79</td>
</tr>
<tr>
<td>April 81, 82</td>
<td>Garlon 480</td>
<td>1:480</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Garlon 480</td>
<td>1:240</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Garlon 480</td>
<td>1:160</td>
<td>93</td>
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<td>Note 1</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Roundup 2,4,5-T + S.S.O.</td>
<td>1:100</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Roundup 2,4,5-T + S.S.O.</td>
<td>1:80 + 1:100</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note 1 = Garlon 480 1:480 plus 50 g.a.e. picloram/100 L.
S.S.O. = Summer spraying oil.

### Table 3. Recommended herbicides for blackberry control

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Time of application</th>
<th>Rate of application (product : water)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazon</td>
<td>December to April</td>
<td>1:150</td>
<td>Very dense growth</td>
</tr>
<tr>
<td>Garlon 480</td>
<td>December to April</td>
<td>1:500</td>
<td>Average regrowth in second year or bushes damaged by insects .</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:250</td>
<td>Sparse canes, few leaves</td>
</tr>
<tr>
<td>Roundup</td>
<td>December to April</td>
<td>1:150</td>
<td>Best: January to March</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:80</td>
<td></td>
</tr>
</tbody>
</table>

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Rust fungus attacking 'weedy' species of blackberry in W.A. Early results on its establishment here look promising.

Roundup® is a useful herbicide for blackberry control if adjacent plants are likely to be damaged by the use of hormone-like herbicides, for example for infestations in home gardens or close to vegetables and vineyards.

However, Roundup® is a total herbicide and will kill most plants that are directly sprayed with it, or receive enough spray drift. Blackberry bushes should be sprayed in calm, dry weather. Desirable plants that have been accidentally sprayed can usually be 'saved' by immediately hosing them with water.

For best control, bushes should be sprayed from January to March, around flowering to early fruit set.

The deformed growth and heavy fruit set symptoms in blackberry may develop very slowly after spraying. No apparent effect of the herbicide may appear until the following growing season on some varieties of blackberry.

Bushes must be resprayed each year for three to four years otherwise the small fragment of bush left will quickly regrow. The crowns should be thoroughly sprayed in the second and subsequent treatments. Often blackberries that appear dead from a distance have a few green shoots around the crowns which, if not treated, will recover and regrow.

Roundup® often kills perennial grasses and bracken associated with blackberry. This leaves the ground relatively bare and encourages the growth of blackberry seedlings. Establishing annual species in old blackberry infestations helps control seedlings, while allowing summer applications of Roundup®.

Biological control

In 1983-84, the rust fungus Phragmidium violaceum was severely attacking blackberries in Victoria. Four Western Australian blackberry species and several related commercial berry crops were sent to Victoria to determine whether this rust could control blackberry species here.

Most of the 'weedy' species of blackberry were heavily attacked and none of the commercial species were affected.

This rust has been released throughout the State's blackberry infested areas and early results indicate that it will establish successfully. Its full impact here will not be known for several years until the rust has become fully established.

Acknowledgement

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Bibliography