New herbicides for the control of St John's Wort (*Hypericum perforatum* L.)

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Experiments carried out near Orange in 1988 (Campbell et al., 1991) and near Cassilis in 1989-91 (Watson and Love, 1993) showed that Grazon® (triclopyr + picloram) was the most effective herbicide for killing St John's wort. However, it has the disadvantages of residual effects on legumes regenerating after spraying and high cost. Thus, efforts were made in more recent experiments near Cassilis and Orange, to find a more effective, less costly and less legume-toxic herbicide for spraying St John's wort than Grazon®.

Cassilis

Thirteen herbicide treatments (Table 1) were applied on 27 November 1992 to a dense infestation (70% ground cover) of narrowleaved St John's wort. All treatments, except one, were herbicides alone. The exception was a spray-sow treatment where Roundup CT® (glyphosate) was applied in summer and again in early winter followed by surface-sowing phalaris, cocksfoot, white clover and subterranean clover with fertiliser. Herbicides were applied in 100 L/ha of water with 0.2 L/ha of non-ionic surfactant, from a hand-held gas powered boom spray. Plot size was 4 by 10 m, with 3 replications.

At spraying, St John's wort was growing actively with no signs of moisture stress. It was 30 to 50 cms tall with 15 to 30 flowering stems/m^2. Plants had 50% bright yellow flowers and 50% brown flowers. The soil, on a rocky basalt hill facing west, supported a highly degraded native pasture in association with the wort. Conditions at spraying were fine and sunny (28°C) with a slight breeze and no rain for at least 24 hours after spraying.

Results are shown in Table 1. High rates of Grazon® gave good results, but the high cost and the deleterious effects on the environment of large-scale application of such rates would not be acceptable. Starane® (fluroxypyr) gave promising results when applied alone at 2 L/ha and good results when combined with Grazon®. Starane® did not affect the regeneration of native legumes in 1993. The most effective treatment was Roundup CT® followed by the surface-sowing of pasture species. This technique provides sustainable control over the long term (Campbell, 1986).

Orange

Four rates of each of Starane® and Grazon® (Table 2) were applied on 16 December 1993 and 14 January 1994 to broadleaved St John's wort growing on soil derived from basalt with few rocks. Herbicides were applied in 625 L/ha of water with 0.5 L/ha of a non-ionic surfactant, from a hand-held pneumatic sprayer. Plot size was 4 by 5 m, with 4 replications. The St John's wort had been slashed in September and on 3 previous occasions in 1993.

At spraying in November, the wort was 30 to 40 cms high, growing actively and just starting to flower. At spraying in January, 90% of plants had flowered; 75% had bright yellow flowers and 15% brown flowers. Although conditions had been hot and dry before spraying plants did not appear moisture stressed. On both spraying occasions herbicides were applied in fine sunny conditions with no rain for at least 24 hours after spraying.

In the 2 to 4 months after spraying, Starane® gave a better brown-out and restricted regrowth of St John's wort more than did the same rate of Grazon® (Table 2). In addition, Starane® had little or no effect on the regeneration of subterranean clover after spraying whereas Grazon® had severe effects on regenerating subterranean clover. Subterranean clover germinated in response to good rain in February 1994. Thus, the intervals between spraying and sowing in which the herbicides had time to break down before the clover germinated were 51 days for the December 1993

Table 1. Effect of herbicides on St John's wort at Cassilis, assessed on 4 April 1994, 480 days after spraying.

Herbicide	Active ingredient (%)	Rate of product (L/ha)	Rating[1]
Grazon DS®	40	2.5	0.7
		5.0	2.3
		7.5	3.6
		10.0	4.5
		15.0	4.4
Starane®	20	1.0	1.7
		2.0	3.0
Grazon® +Starane®		1.0 + 1.0	4.0
		2.0 + 2.0	4.3
2,4-D amine	50	6.0	1.7
Banvel M®	42	8.0	1.6
Roundup CT® + pasture	45	3.0 + 3.0	5.0
Control			0

[1] Rating: 0, nil effect; 1, slight brown-out then recovery; 2, moderate brown-out then recovery; 3, strong brown-out then partial recovery; 4, acceptable long-term control; 5, complete control

Table 2. Effect of herbicides on St John's wort and subterranean clover at Orange, assessed on 28 March 1994.

Herbicide	Active ingredient (%)	Rate of product (L/ha)	Brown out (%)	Regrowth[1] (% ground cover)	Ground cover[2] (%)
December 1993 spraying					
Starane®	20	1	100^{a}	8^{bc}	36^{abc}
		2	100^{a}	2^{a}	23^{bc}
		3	100^{a}	1^{a}	31^{abc}
		4	100^{a}	0^{a}	23^{bc}
Grazon DS®	40	1	75^{d}	27^{f}	8^{d}
		2	82^{c}	17^{e}	6^{d}
		3	99^{a}	5^{b}	5^{d}
		4	98^{a}	1^{a}	8^{d}
January 1994 spraying					
Starane®	20	1	99^{a}	12^{cd}	22^{c}
		2	99^{a}	2^{a}	26^{bc}
		3	100^{a}	1^{a}	38^{ab}
		4	100^{a}	2^{a}	41^{a}
Grazon DS®	40	1	50^{e}	9^{cd}	3^{d}
		2	75^{d}	11^{cd}	5^{d}
		3	89^{bc}	9^{cd}	3^{d}
		4	94^{ab}	1^{a}	2^{d}
Control	-	-	27^{f}	13^{de}	5^{d}

[1] Regrowth from crowns; [2] Cover of subterranean clover

Means followed by a common letter do not differ significantly (P=0.05).

mm respectively; mean maximum and minimum daily temperatures were, respectively, 25.5°C, 11.5°C and 27.9°C, 12.1°C .

Discussion

At both Cassilis and Orange, Starane® appeared to be more effective than Grazon® in killing St John's wort. As the recommended retail price of Starane® at Orange in March 1994 ($25/L) was lower than that of Grazon® ($32/L) it has a cost advantage as well. Starane® has other advantages over Grazon® in that it is less toxic to regenerating legumes, is less volatile and less damaging to off-target species, attributes that will be important if Starane® is used for spot spraying, boom spraying or in aerial spray-sow programs for the control of St John's wort in hill country.

These results are indicative only because only 2 rates of Starane® were applied at Cassilis and the Orange experiment has only been under way for 4 months. Thus, further research is needed to test the efficacy of Starane® over the long term and under differing environmental conditions before it could be recommended for general use.

References

Campbell, M.H. (1986). St John's Wort. Agfact P.7.6.1., Agdex 647. NSW Agriculture.

Campbell, M.H., B.R. Milne, J.J. Dellow and H.I. Nicol (1991). Effect of herbicides on St John's wort (*Hypericum perforatum* L.). *Australian Journal of Experimental Agriculture*, **31**: 499-501.

Watson, R.W. and Love, C.O. (1993). The evaluation of herbicides and application techniques for the control of St John's wort (*Hypericum perforatum* L.) in grazing areas of New South Wales. Proceedings 10th Australian Weeds Conference, Brisbane. pp. 186-189.