MANAGING POLYMERIA TAKEALL

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Summary

Polymeria takeall, or Peak Downs curse, is a deep rooted, rhizomatous, perennial weed which spreads from seeds and rhizomes. It tolerates cultivation and can be spread by cultivation. In-crop it can best be managed with repeated, heavy applications of glyphosate on actively growing polymeria, applied through well constructed shields. Good crop agronomy is also important, resulting is competitive, strong cotton. Polymeria in fallow can be controlled with glyphosate on actively growing patches and with Starane in autumn. Heavy rates of Arsenal may be useful on waste areas.

Background

While many cotton growers don't have polymeria takeall and may not even be sure what it is, for those growers who have the problem, the weed can be most frustrating. Polymeria looks fairly innocuous and grows relatively slowly. It spreads slowly and may be ignored for many seasons, but once it becomes established, polymeria competes strongly with cotton and resists most management approaches. Cotton generally establishes poorly in established polymeria patches, often resulting in islands of solid green (polymeria) amongst cotton rows. If unchecked, these islands can easily grow to 50 or 100 m across. Eventually polymeria can spread from small patches to cover a significant proportion of a field. On one field at Twynam North, the area of polymeria increased by approximately 1% per year over an 8 year period, rising from 5.6% of the field in 1988 to 14% in 1996. No cotton grew in these patches. In 1996 this represented a yield loss of 158 bales or $94 000 on this field alone.

Polymeria, also known as Peak Downs curse, is native to Australia, occurring through much of the Queensland and New South Wales cotton growing areas, and so is present in many cotton fields even before they are developed. It is a deep rooted, rhizomatous perennial weed which can be almost impossible to manage. It spreads both from seedlings and rhizomes.

Cultivation

Like all weeds in cotton, polymeria takeall has been regularly subjected to cultivation operations ranging from light inter-row cultivation in moist fields, through to deep cultivation under dry conditions. Unfortunately, polymeria is not controlled by cultivation. Cultivation in dry conditions may set polymeria back, but even deep ripping in dry conditions is ineffective in controlling polymeria. Cultivation in moist conditions can spread polymeria, as polymeria can establish and grow from small pieces of rhizome spread by the cultivator. Cultivators may also carry polymeria into new fields.

Polymeria's tolerance to cultivation is probably due to its deep rooting habit, with rhizomes penetrating well over a metre into the soil. Cultivation (even deep cultivation) is at best only trimming surface growth, allowing plants to re-establish from rhizomes below the cultivated zone.

Herbicides

A range of herbicides has been used on polymeria over a number of seasons with mixed but generally poor results.

In the late 80's Max M^c^Millan published results for polymeria control in cotton and in fallow as shown in Tables 1 & 2. None of the herbicides used showed any effect on polymeria in cotton. 2,4-D, MCPA and Starane had some effect in fallow. However, the observation period was short, not adequately allowing regrowth of the weed (following weed growth on trial plots over years is difficult and sometimes impossible, but is desirable when evaluating control of a perennial weed such as polymeria.)

Table 1. Polymeria control in cotton.

Treatment	Visual assessment of density[1] 39 DAT[2]
Untreated	4.6
Zoliar 2.5kg	2.6
Ronstar 4L	3.0
Probe 2.7 kg	3.8
Goal 4L	4.6
Bladex 3.5L	4.8
	n.s.

DAT[2] days after treatment
n.s. no statistically significant differences
s.e.d. standard error of the differences between two means

Table 2. Polymeria control in fallow.

Treatment	Visual assessment of density[1] 65 DAT[2]
Untreated	9.0
2,4-D Amine 1L	7.8
2,4-D Amine 2L	5.6
2,4-DP 1.7L	8.8
2,4-D Amine 1L + Ally 10g	8.4
MCPA Amine 1L	7.8
MCPA Amine 2L	5.8
Basta 3L	9.4
Starane 1L	4.6
Starane 2L	3.8
s.e.d.	1.1

Visual density[1] is a percentage rating from 0 (no live polymeria) to 10 (100% of plot covered in live plants).

Terry Haynes at Auscott Midkin achieved very good control of polymeria with a mixture of Roundup and Dicamba in the early 90's, but this result was not repeated on other patches. In 1994 Terry looked at a range of herbicides and combinations including Starane, Roundup, Arsenal, 2,4-D and Dicamba. He found the most satisfactory result from Starane at 2.5 L/ha in autumn. However, although Starane controlled polymeria in small patches, larger patches persisted in spite of repeated Starane applications.

I commenced trials on polymeria on Twynam North in 1995. My first trial in fallow showed no long-term effect from Starane, Roundup and 2,4-D combinations (Table 3). Similarly, commercial areas sprayed that autumn with 2,4-D showed good brown-out effects, but no long-term benefit from 2,4-D.

Table 3. In-fallow polymeria control experiment in 1995/1996

Treatment	Visual assessment of density	
	104 DAT	340 DAT
Untreated	4.1	5.1
2,4-D Amine 4L	2.7	4.9
Roundup 4L	2.6	6.4
Starane 2L	3.1	6.0
Roundup 1.5L + 2,4-D Amine 2 L	3.8	4.3
Roundup 3L + 2,4-D Amine 2 L	3.5	6.3
Roundup 1.5L + 2,4-D Ester 1.5 L	2.9	5.2
Roundup 2L + Goal 75 mL	6.2	6.7
Roundup 1.5L + Starane 1L	3.4	3.6
	n.s.	

A different range of fallow herbicides showed better results, with Starane and Arsenal giving the best results (Table 4). However, heavy rates of these herbicides failed to completely control polymeria, with fresh shoots emerging even after 6 L/ha of Arsenal.

Table 4. In-fallow polymeria control experiment in 1996/1997

Treatment	Visual assessment of density		Treatment	Visual assessment of density	
	97 DAT	376 DAT		97 DAT	376 DAT
Untreated	10.0	9.0	Glean 20g	4.8	4.7
Arsenal 2L	2.1	1.7	Glean 60g	9.4	10.0
Arsenal 6L	0.8	0.1	Ally 10g	7.1	3.6
Starane 2L	4.2	6.4	Ally 30g	7.0	7.6
Starane 6L	3.0	3.5	Express 30g	7.8	7.6
Garlon 100 mL	8.3	7.6	Express 90g	6.4	5.4
Garlon 300 mL	5.6	7.3	s.e.d.	3.7	4.4

Arsenal and repeated applications of Roundup and Staple were trialed in-crop, with Arsenal giving the best result, although Roundup gave some control, with control improving with repeated applications (Table 5). Staple had no effect on polymeria takeall.

Table 5. In-cotton polymeria experiment in 1996/97 using over-the-top applications.

Treatment	Application date(s)		Visual assessment of density
	20 Dec	15 Jan	63 DAFT*
Untreated			10.0
Roundup CT	2.4 L		8.0
Roundup CT		2.4 L	5.7
Roundup CT	2.4 L	2.4 L	4.7
Staple		240 g	10.0
Staple	120 g	120 g	9.3
Arsenal	500 mL		5.0
Arsenal	1 L		4.7
Arsenal	2 L		1.7
		s.e.d.	0.9

DAFT* - days after first treatment (20 Dec)

While Arsenal gave the best in-crop control of polymeria, the level of control achieved did not justify the loss of production associated with in-crop use of this herbicide. The result on a commercial field where Arsenal was spot-sprayed on polymeria patches confirmed this finding. Arsenal at 2 L/ha did not adequately control polymeria, but did kill cotton in the sprayed areas for several subsequent seasons. By the time the Arsenal broke down sufficiently for cotton to grow, the polymeria re-established. Nevertheless, heavy rates of Arsenal may be useful for removing polymeria patches from waste areas.

A combination of Roundup and Stomp was applied to a strip of polymeria in spring 1997, giving a very good kill. This, together with the previous Roundup result prompted two trials looking at higher herbicide rates and repeated applications.

Table 6. In-crop polymeria control experiment in 1997/98 using directed spray applications

Treatment (applied 17 Jan)	Visual assessment of density	
	19 DAT	60 DAT
Untreated	10.0	10.0
Roundup CT 8L	3.3	3.7
Stomp 8L	10.0	10.0
Roundup CT 4L & Stomp 4L	6.3	4.3
Roundup CT 8L & Stomp 8L	3.3	4.7
Roundup CT 16L & Stomp 16L	0.7	1.7
s.e.d.	1.2	1.2

The results (Table 6) showed that Stomp had no effect on polymeria, but that very high rates of Roundup were effective in controlling polymeria in cotton. Split applications were also effective, with the best result from a split application of Roundup CT at 4 L/ha in November and January (Table 7). The planting application (24 Oct) had little visual effect on polymeria and appeared to reduce over all control.

Table 7. In-crop polymeria control experiment in 1997/98 using directed spray applications

Treatment	Application date(s)			Visual assessment of density	
	24 Oct	20 Nov	17 Jan	104 DAFT	364 DAFT
Untreated				9.7	7.5
Roundup CT	4L			10.0	8.5
Roundup CT	8L			10.0	8.5
Roundup CT		4L	4L	4.3	2.2
Roundup CT	4L	4L	4L	5.3	4.3
Roundup CT	8L	8L	4L	3.3	3.7
			s.e.d.	1.0	1.7

Aside from the direct effect on polymeria, the Roundup treatments had an added benefit it that cotton established on sprayed plots and was estimated to yield around 5 bales/ha on the best treatments. This result was in marked contrast to previous seasons when no cotton lint was produced on polymeria patches. The additional yield on these plots easily justified the expense of the herbicide application. The degree of polymeria control with Roundup were primarily limited by the need to apply the herbicide as a shielded spray, leaving unsprayed polymeria in the cotton row.

Higher rates of Roundup with repeated applications were examined over the last two seasons on a back-to-back field (Table 8). One of the main difficulties encountered in these seasons was unacceptable damage to the cotton due to imprecise application of the high herbicide rates through a shielded, hand-held sprayer. Nevertheless, good in-crop control of polymeria was achieved, with weed density on the best treatments greatly reduced over the period. Overall, polymeria density was substantially reduced on the trial area over the 2 seasons, with some evidence of Roundup translocating well beyond the treated areas. Best control was achieved with two applications of Roundup CT Xtra at 6 L/ha, with applications in January and February. Control was comparatively poorer with three herbicide applications, apparently due to increased crop damage and a subsequent reduction in crop competition with the additional application.

Table 8. In-crop polymeria control using repeated shielded applications of Roundup in 1998/2000.

Treatment	Application date(s)			Visual assessment of density		
	Dec	Jan	Feb	64 DAFT	372 DAFT	483 DAFT
Untreated				7.0	6.2	9.4
Roundup CT Xtra			3 L	7.6	3.8	4.3
Roundup CT Xtra		3 L	3 L	8.0	5.8	6.7
Roundup CT Xtra	3 L	3 L	3 L	5.4	4.8	4.9
Roundup CT Xtra			6 L	7.2	4.3	4.5
Roundup CT Xtra		6 L	6 L	3.2	2.6	2.5
Roundup CT Xtra	6 L	6 L	6 L	4.5	5.6	4.8
Roundup CT Xtra			12 L	10.0	3.9	2.8
Roundup CT Xtra		12 L	12 L	4.3	3.1	3.2
Roundup CT Xtra	12 L	12 L	12 L	4.3	5.0	4.1
			s.e.d.	1.1	2.6	1.9

On the basis of these experiments, glyphosate was applied to polymeria patches on commercial fields, with applications at planting and shielded applications in crop. While the results have not be outstanding, there has been a general reduction in polymeria density on treated fields and cotton was picked from polymeria patches where there previously was no cotton. The main lessons have been:

- Polymeria must be actively growing. Results have been generally poor from applications to polymeria in cool spring conditions.
- At-planting applications of glyphosate have enabled cotton to establish in polymeria patches.
- In-crop glyphosate applications must be through well constructed shielded sprayers with competent operators. High rates of glyphosate can cause unacceptable damage to cotton when poorly applied.
- Spot-spraying is the preferred in-crop option, minimising the risk of accidental damage to cotton.

- Attention to crop agronomy is important to enable satisfactory cotton establishment and growth in polymeria patches.

Given the success in managing polymeria with Roundup in-crop, two glasshouse experiments were conducted to determine whether Roundup efficacy could be enhanced by an adjuvant. With total plant coverage and good growing conditions, polymeria was well controlled by Roundup CT Xtra at 3 L/ha (Table 9). Of the adjuvants, Pulse at 1% gave the best result, but it was no better than strait Roundup. Control was reduced by adding Bond adjuvant.

A range of Pulse rates was used in a second experiment (Table 10). Increasing Pulse above 1% did not improve polymeria control and in this experiment some polymeria regrowth was recorded on pots treated with Roundup and Pulse. Similarly, doubling the Roundup rate did not improve polymeria control. However, higher adjuvant rates did improve control with both Bond and Turbo P. Future experiments will examine these and some alternative adjuvants.

Tables 9 & 10. Polymeria control with Roundup CT Xtra plus adjuvant

Treatment	Regrowth* kg/ha
Untreated	5080
Roundup CTXtra @ 3 L	294
Roundup CTXtra @ 3 L + 1% Pulse	0
Roundup CTXtra @ 3 L + 1% Turbo P	898
Roundup CTXtra @ 3 L + 1% Bond	3425
s.e.d.	1147

Regrowth* - from 31 to 164 days after treatment

Treatment	Regrowth* kg/ha
Untreated	6718
Roundup CTXtra @ 3 L	208
Roundup CTXtra @ 3 L + 0.2% Pulse	426
Roundup CTXtra @ 3 L + 1% Pulse	104
Roundup CTXtra @ 3 L + 5% Pulse	145
Roundup CTXtra @ 6 L + 1% Pulse	544
Roundup CTXtra @ 3 L + 5% Turbo P	0
Roundup CTXtra @ 3 L + 5% Bond	292
s.e.d.	1788

Regrowth* - from 42 to 126 days after treatment

An additional experiment was established on a waste area to examine the effect of treatments over a number of seasons, without cultivation etc. potentially re-contaminating treated plots. At this point heavy Roundup, Starane and Grazon treatments all look effective (Table 11). Much better information should come from this experiment over the next couple of seasons.

Table 11. In-fallow polymeria experiment 1999/2002.

Treatment	Visual assessment of density 21 March (102 DAFT)
Untreated	4.9
Roundup CT Xtra 6 L/ha (Sept)	4.4
Roundup CT Xtra 6 L/ha (Sep & Dec)	3.6
Roundup CT Xtra 6 L/ha (Nov & Jan)	3.0
Roundup CT Xtra 18 L/ha (Nov)	0.0
Starane 2 L/ha (Dec & Feb)	0.0
Grazon 2 L/ha (Dec & Feb)	0.0
s.e.d.	1.7