PESKY POLYMERIA - THE PERENNIAL PROBLEM

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Background

Polymeria longifolia (Polymeria take-all or Peak Downs curse) is a native Australian species. It is one of the 'take-all' weeds, so named because of the 'perennial, rhizomatous habit' of many of these weeds, their ability to form 'dense competitive infestations that smother the ground' and that they 'take all' the nutrient and water resources available in the soil (Sindel pers. comm.). It has long narrow grey/green leaves with pink/mauve, yellow-centred flowers. It forms a dense rhizomatous root system which appears to be largely resistant to chemical and cultivation treatment (McMillan 1988).

Polymeria take-all was ranked as the tenth worst weed in New South Wales cotton growing areas in the 1988/89 season (Charles 1991). It appeared to be increasing in abundance at this time. Control measures for Polymeria take-all were far from satisfactory and progress towards such measures had been slow due to a lack of research effort (McMillan 1988). Our research aimed to survey the distribution, spread and potential for control of Polymeria take-all, and to elucidate the reasons for the success of this weed by examining aspects of its biology and ecology in the cotton farming system.

What we did

As part of an ongoing research program we report in this paper on two aspects of the work.

1. A mail survey of 96 cotton consultants and agronomists was undertaken in 1996. This two-page survey asked questions about Polymeria take-all. Some of the information obtained from the 60 respondents is presented here.

2. A glasshouse pot trial was undertaken in which plant material (fragments) were removed from the field and replanted. The number of new shoots arising gave an indication of the ability of this plant to grow from variously sized fragments.

What we found

Mail survey

The worst weeds (Table 1)

The importance of Polymeria take-all amongst cotton weeds was unknown. This was evaluated by a survey question asking consultants to list the five worst weeds they encountered in cotton crops in the 1995/96 season. The results are presented in Table 1.

1. Polymeria take-all was the fourth worst weed overall. Its increase in importance since the 1988/89 season (Charles 1991) may be explained in three ways. Either this weed had increased in area and level of infestation during this time, the importance of this weed was elevated in the minds of people because the survey dealt specifically with Polymeria take-all, or it may have been due to specific seasonal conditions in 1995/96 which favoured the weed.

2. Nutgrass and Noogoora burr have continued to be the major weed problems in the industry.

Table 1. The worst weeds encountered in cotton crops in the 1995/96 season.

Weed	Common name	Score (out of 5)[A]	Rank	Rank Charles (1991)
Cyperus spp.	Nutgrass	2.11	1	2
Xanthium occidentale	Noogoora burr	1.89	2	1
Ipomoea lonchophylla	Peach vine	1.66	3	5
Polymeria longifolia	Polymeria take-all	1.16	4	10
Hibiscus trionum	Bladder ketmia	1.00	5	6
Datura spp.	Thornapple/Castor oil	0.88	6	7
Xanthium spinosum	Bathurst burr	0.75	7 (equal)	3
Sesbania cannabina	Sesbania pea	0.75	7 (equal)	11
Salvia reflexa	Mint weed	0.63	9	13
Tribulus spp.	Yellow vine/Caltrop	0.61	10	8

[A] The weeds were ranked from 1 to 5 (1 being the worst). Scores were allocated to each weed ie. a score of 5 was given to the worst weed, through to a score of 1 to the fifth worst weed. The score above is the average score across all respondents.

The Polymeria problem

There were little data on the problem that Polymeria take-all caused in cotton. Survey information pertaining to infestation areas and control costs has been presented below.

1. Actual infestations covered at least 4,150 ha. This was approximately 2% of the total cotton production area during the 1995/96 season.

2. At least 35,770 ha had infestations covering part of the field area. The spread of these infestations to other clean areas within these fields is a very real possibility, particularly with cultivation. If the weed spreads over the total field area, this would represent a 8.5 fold increase in the problem.

3. The additional weed control cost for the treatment of Polymeria take-all (over and above other weeds) averaged $36/ha, but ranged anywhere from $12 to $100/ha.

Polymeria take-all is a small but increasing weed problem which costs a significant amount of money in the attempts to control it.

Control methods (Table 2)

The results of various methods of management of Polymeria take-all were investigated (Table 2). In addition, successful and unsuccessful herbicides were noted (overleaf).

1. Herbicide application resulted in a decrease in Polymeria take-all in only 37% of cases and no change in the problem in another 58% of cases. Some 5% actually indicated an increase in Polymeria take-all after using herbicides.

2. Cultivation was not successful in reducing Polymeria take-all, rather 53% of respondents indicated an increase after cultivation. Another 32% indicated no change after cultivation.

3. Hand chipping did not result in a decrease of the weed in general. This was similar to the action of herbicides and cultivation.

While cultivation actually results in an increase in Polymeria take-all in the majority of situations, respondents also had limited success in reducing the problem with herbicides.

Table 2. The overall result of control methods of Polymeria take-all.

Control method	Result of control method on weed occurrence (Percentage of respondents who used each method) Decrease	No change	Increase
Herbicides	36.8	57.9	5.3
Cultivation	14.7	32.4	52.9
Hand chipping	20.0	80.0	-

4. Two questions indicated that any herbicide that was safe to use in cotton crops did not reduce Polymeria take-all infestations. The most successful herbicides reported were 2,4-D amine, fluroxypyr (300g/l)*, glyphosate and 2,4-D ester (14-17% of respondents). Conversely, 2,4-D amine, fluroxypyr (300g/l) and glyphosate were also the most unsuccessful herbicides used. This indicates that the action of herbicides on Polymeria take-all is very variable.

*[Starane^R is the trade name for fluroxypyr (300g/l), manufactured by Dow AgroSciences.]

Glasshouse trial (Table 3)

This trial determined the potential for vegetative fragments and seeds of Polymeria take-all to produce new shoots or seedlings (Table 3).

1. In general, the more intact a plant was, the more shoots were produced. Fragments of rhizomes or shoots alone (plant fragments 1-6) did not produce as many shoots (0 - 4.2 shoots/pot) as the more intact shoot and rhizome fragments (plant fragments 7-9, 3.6 - 4.8 shoots/pot). At least one freshly harvested seed emerged in each pot.

2. Although the number of shoots increased as the number of rhizome nodes/pot increased (plant fragments 1-4), the average number of shoots produced/node did not.

3. Some transplanted shoots gave rise to new shoots or resprouted on old shoots (plant fragment 6).

4. Small plant fragment sizes ie. 1-node rhizomes and 5 cm shoots, did not give rise to new shoots at all.

Table 3. The number of new shoots, resprouted shoots or seedlings that emerged from transplanted Polymeria take-all fragments and seeds after 85 days (harvest). There were four pot replicates for each plant fragment treatment and shoot number has been expressed ± the standard error of the mean.

Plant fragment or seed	Number of fragments/pot	Shoot or seedling number
1. Rhizome with 1 node	3	0 ± 0
2. Rhizome with 2 nodes	3	1.6 ± 0.4
3. Rhizome with 3 nodes	3	2.4 ± 0.9
4. Rhizome with 4 nodes	3	4.2 ± 1.0
5. 5 cm shoot only	3	0 ± 0
6. 15 cm shoot only	3	3.4 ± 0.5
7. 5 cm shoot and 5 cm rhizome	3	3.6 ± 0.4
8. 15 cm shoot and 15 cm rhizome	3	4.8 ± 0.5
9. Untrimmed shoot and over 15 cm rhizome	3	4.3 ± 0.9
10. Seed	5	1.8 ± 0.4

Our studies have shown that Polymeria take-all is able to reproduce vegetatively, as well as by seed, particularly in this case where there were suitable moisture and temperature conditions for transplant and regrowth. Anecdotal evidence suggests that cultivation only slightly disturbs the plant and does not cut it up into small fragments. In this situation, it is likely that cultivation performed shortly before rainfall or irrigation events may result in plants being transplanted and increased reshooting.

Conclusions

The perennial, rhizomatous habit of Polymeria take-all makes it a very difficult weed to control in cotton. Survey respondents indicated that Polymeria take-all was the fourth worst weed overall in the 1995/96 season. Actual infestations of the weed covered at least 4,150 ha and cost between $12 and $100/ha to treat, in addition to other weed control costs. Cultivation resulted in an increase in Polymeria take-all infestations while respondents had limited success in reducing the problem with herbicides. There were no herbicides compatible with cotton that were found to reduce the weed. Polymeria take-all is able to reproduce vegetatively and may simply be transplanted by cultivation equipment when conditions for regrowth are suitable.

References

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