

DEVELOPMENT OF HERBICIDE STRATEGIES IN VEGETABLE AND OTHER MINOR CROPS

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Summary The research, development and registration of herbicides is an expensive and lengthy process. To support this cost manufacturers must concentrate on markets where large volumes of sales are assured. Typically products are developed for broad acre markets such as cereal and legume crops. Vegetables and other crops with relatively small areas of production are of low priority and are often ignored by herbicide manufacturers.

In Tasmanian agriculture a large number of relatively minor crops are grown. Of these the most important include potatoes, processing peas, green beans, brassicas, carrots, opium poppies, pyrethrum, onions and plantation eucalypts. All of these crops have major weed problems and control is generally a complex and expensive process.

To identify and register new herbicide strategies in situations such as found in Tasmania, industry must contribute to the research and development (R&D) process. This is occurring with great success through direct industry funding of projects or funding via R&D corporations. This approach ensures that end users (industry contributors) adopt results from these projects and ensures researchers remain in close contact with the needs of growers.

Examples of this process include projects currently in progress evaluating herbicide options in poppies and beans.

INTRODUCTION

Before herbicide manufacturers can consider developing a product for a particular market a number of issues need to be considered. On a global level it costs a minimum of \$A125 million from discovery of a new active ingredient until the first registration is obtained, generally in the northern hemisphere. Following this the cost to obtain a first registration in Australia is at least \$A250 000. Additional registrations for new crops or usages average about another \$A100 000. Manufacturers need to receive more than \$A500 000 annual turnover to make such registrations worthwhile.

Consequently priority crops in Australia are wheat, cotton, field legumes and canola. Registrations outside these crops are generally only pursued by the manufacturer once good profits are secured in the priority crops and then only when a major slice of market share can be assured. For minor crops returns are low and risks are high.

In Tasmania all our major crops (potatoes, processing peas, opium poppies, green beans, brassicas, carrots, onions, pyrethrum, plantation eucalypts) are relatively minor on a national basis. However, the value of these crops and the magnitude of weed competition means that, to Tasmanian farmers, the problems of weed control are often greater than for their mainland counterparts who are growing major crops such as wheat or canola.

Farmers and associated industries (e.g. vegetable and poppy processors) must take direct action to ensure herbicides, or alternative weed management strategies, are developed. Three related strategies are outlined here that have been adopted successfully in Tasmania.

METHODS AND DISCUSSION

Herbicide strategies in poppies Weed control in this crop is expensive, some weeds are not adequately managed, and in some cases unacceptable crop damage occurs. This is a problem for farmers and is a priority for the poppy contracting companies to address. For the past ten years one of these two companies (Tasmanian Alkaloids) has contracted Serve-Ag to find cheaper, more efficacious options that are less damaging to the crop than the currently used products. Funding in this crop could only be provided from one organization (Tasmanian Alkaloids). With an area planted of about 10 000 ha, product turnover does not make development of herbicides in poppies an attractive proposition without a large slice of market share.

The current industry standard is based on two post-emergence herbicide applications, the first a mixture of asulam and ethofumesate. This is followed with a mixture of diquat and diclofop methyl. On many occasions additional herbicide applications are needed before and/or after these treatments. Total cost for herbicides often exceeds \$A200 per hectare.

Priority for work in this crop was established by the industry with direct funding from Tasmanian Alkaloids to develop new herbicides into this crop. During the last five years two additional herbicides (diflufenican and fluroxypyr) have been registered. These products were already registered for use in other crops in Australia. A new adjuvant has also been developed which replaces the need for diclofop methyl. This reduces costs and the amount of active ingredient used in poppies.

Perhaps the most significant development in poppy weed control is about to reach commercialization with the imminent registration of clomazone. This product will be registered for a number of crops in Australia with poppies being one of the more important crops on the initial label. Clomazone is used for pre-emergence weed control in a number of crops overseas. However, the registration in poppies will be the first time the product has been used for post-emergence weed control. It is thought that in most cases the cost of weed control in poppies will be reduced from \$A200 to under \$A100 ha⁻¹ where clomazone is used.

Herbicide strategies in beans Work in this crop was prompted by repeated calls from Tasmanian farmers to find a solution to the weed amaranthus (*Amaranthus powellii* S.Wats.). This weed is spreading rapidly and prevents viable bean cropping of an increasing number of paddocks. The area of green beans grown in Tasmania (about 1500 ha) or nationally (about 5000 ha) is not large. This situation is not a priority for herbicide manufacturers even though industry places extremely high priority on control.

In this situation contribution from bean processors (Simplot and McCain) and from farmers were used as a basis for HRDC (Horticultural Research and Development Corporation) funding. In addition a number of manufacturers, that had products worthy of inclusion in this work, were asked to contribute small amounts of money. This project was further enhanced by inclusion of support from the navy bean industry via Bean Growers Australia in Kingaroy. Navy beans like green beans are *Phaseolus vulgaris* and respond in a similar manner to herbicides and weed competition. Navy beans contribute about an extra 7000 ha to potential herbicide markets. Combination of these two crops was a logical step to provide more resources and priority to the project.

This allowed the conduct of 'bean' trials in Victoria, New South Wales and Queensland as well as the core of work in Tasmania. At this stage a number of new strategies have been identified and registration submissions for at least two products have already been submitted.

Combining data from multiple crops In some minor crops, the cost of data generation for each crop can be minimized by working on a number of crops concurrently. In most cases the same weeds can be found in a range of crops. Thus weed efficacy data can be transposed from one crop to another. This allows more flexibility in the conduct of trials in each crop as collection of crop tolerance and residue data become the primary focus. These trials also provide good data on control of a number of different weed species.

There are two major benefits in this approach. Firstly, more cost effective collection of data and secondly, the inclusion of more than one crop in a product registration submission. The latter provides a greater market for the manufacturer while minimizing registration fees.

Examples of products that are being developed in Tasmania in this way include clomazone and dimethenamid. In the case of clomazone the product is currently being developed in poppies, potatoes, beans, pumpkins and kabocha. It is also being investigated in peas, pyrethrum and other crops. Dimethenamid is likely to be registered in beans, pumpkins and kabocha, with potential in a number of other crops.

Although none of our crops offer a market of more than about 10 000 ha, products such as clomazone could soon be used on various crops totalling up to 25 000 ha.

CONCLUSIONS

The principle of user pays is becoming more and more directly applicable to the development of herbicides for use in agriculture. In crops which are minor on a global or national scale end users have even greater challenges. Resources must be provided by farmers and other industry interests and maximized where applicable by contributions from manufacturers and government funding (through R&D corporations). The linking of data across similar crops or in similar weed situations is also important. Apart from the advantages in resource utilization and economics, these approaches ensure ownership of R&D work and maximize industry adoption.

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