



VEGEnotes

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Weed Management

Australian vegetable production is characterised by a diversity of crop types, grown in intensive rotations, across the wide range of environments Australia has to offer.

Basic strategies used to manage weeds are adapted and integrated to suit the different production systems. The overall aim is to develop a system that combines all of the appropriate weed control options.



*Fat Hen (*chenopodium album*) is a common weed of vegetable crops.*

Weed management systems employ combinations of physical, ecological, biological, chemical and genetic methods to obtain effective and economical weed control, with minimal effect on non-target species and the environment.

History has shown weed populations can adapt to weed management systems that rely on few or single control options. Thus, the adoption, and continued development, of weed management programs incorporating a diverse range of management methods is essential for cropping systems to remain productive.

Herbicides

Herbicides are currently the predominant control option for weeds in intensive vegetable production. In a number of vegetable crops, such as capsicums and cucurbits (pumpkins, melons etc.), there are few, if any, suitable herbicides registered for broadleaf weed control.

Even in some of the more significant vegetable crops, such as potatoes, the availability of new herbicide technology is limited, which has created a number of weed management issues.

On a global scale, companies are primarily interested in the major crop markets such as: cereals, rice, soybeans, corn, cotton, canola, grapevines, pome fruit and potatoes. In Australia, crops such as cereals, canola, pulses and cotton have a strong influence on development decisions.

To develop new herbicides, companies are faced with increasing costs to satisfy the data requirements prior to registration. Companies cannot justify the expense to develop products for most intensive horticultural uses.

The Bottom Line

- **Weed management requires a combination of physical, ecological biological, chemical and genetic control methods.**
- **Herbicides for vegetable weed management are limited.**
- **Intensive horticulture in Australia needs to be proactive and seek new technologies from non-traditional sources.**
- **Research is delivering new weed management options for Australian vegetable growers.**

Thus, smaller more intensive crops are often overlooked in relation to chemical development.

Historically, herbicides were the compounds every company wanted to discover. However, the advent of genetically modified (GM) crops that could tolerate very cheap, patent-expired herbicides, required companies to change their strategic direction.

Insecticides, fungicides and plant growth regulators also increased in importance to companies. As a result, chemical companies previously targeting herbicide development diversified into the seed business, so as to remain viable. The development pipeline for herbicides has also been quite low in recent times, in comparison to fungicides and insecticides.

Intensive horticulture in Australia needs to be proactive in identifying suitable products and raising the priority of development programs for new agricultural chemicals to control pests, diseases and weeds. It also needs to seek out new, potentially beneficial, technologies from non-traditional sources.

Current Research

Serve-Ag Research is currently conducting valuable weed management research for the Australian vegetable industry. Weed management projects have been completed in crops such as:

- pumpkins;
- green beans;
- sweetcorn;
- lettuce;
- processing peas;
- potatoes;
- brassicas;
- processing tomatoes;
- Kabocha;
- carrots; and
- capsicums.

The principle aim of these projects has been to develop new herbicides for these crops, to address specific weed management issues. The work is principally funded by Horticulture Australia Ltd, with voluntary contributions and in-kind support from a number of herbicide manufacturers.

All the projects are conducted nationally with replicated trials in key production regions throughout Australia.

Some of the herbicides developed in these projects are now becoming commercially available to growers throughout Australia.

New Herbicide Registrations

Trial information collected as part of these projects was used to gain registration of the herbicide Command in a range of horticultural crops including potatoes, green beans and cucurbits.

This was a significant achievement for the Australian vegetable industry, particularly as it is the only herbicide registered for broadleaf weed control in cucurbit crops.



Baron 40 WP trial site.

Left: Wild radish in transplanted broccoli. Right: Transplanted broccoli treated with Baron 40 WP.

The commercial availability of Command also provides an alternative chemical mode of action in crops such as beans and potatoes. This product can also be used as part of an integrated control strategy for weeds such as black nightshade (*Solanum nigrum*) in potatoes, which are typically very difficult to successfully control. Furthermore, Command is also particularly active on other problem weeds such as hogweed (*Polygonum aviculare*) and potato weed (*Galinsoga parviflora*), for which few chemicals are registered.

Serve-Ag Research is currently working on further herbicide development projects including:

- A new active dimethenamid-p for registration in crops (including processing peas, green beans, sweet corn and pumpkins) for the management of a range of grass weeds and broadleaf weeds, including Amaranthus (*Amaranthus spp.*).

Grower scale trials conducted with this product have shown very promising results. These include significantly reduced costs of handweeding in pumpkins and control of amaranthus in beans; and reducing the need for post emergent herbicide application, which can reduce yield and quality.

- Bioefficacy trials on Baron 40 WP, which is a new formulation of oxyflourfen (Goal®). Baron 40 WP can be applied over the top of brassica seedlings to control wild radish and other weeds.

The bottom line for the Australian vegetable industry is that while it may be a slow and expensive process, registration of new herbicides, employing new actives and environmentally sound practices, are being successfully obtained through current research.

This is resulting in the development of more efficient and effective weed management strategies for sustainable Australian vegetable production.



Top: Grass weeds in sweetcorn.

Bottom: Control of grass weeds in sweetcorn with dimethenamid-p.

Novel weed management ideas

New crop protection products do not necessarily need to be agricultural chemicals, they can be new technologies for weed control.

Generally, these technologies do not require the extensive data needed for herbicide registration. As a result, smaller companies can develop these technologies as the financial development 'hurdle' is lower.

One example is degradable mulch being developed in the UK by Terraseed. This is a great example of a practical solution to weed management and is an alternative to heavy agricultural chemical reliance.

This system involves the crop seed being impregnated between a layer of paper and plastic. The plastic is laid in the field on beds and then watered using overhead or drip irrigation. The paper absorbs the water and the crop seed germinates through slits in the plastic.

Weeds are physically prevented from growing through the plastic and, furthermore, the mulch has additional benefits, such as ensuring even crop germination, retaining soil moisture and preventing soil contamination of crops. Also, mulch is fully biodegradable: the remaining mulch can be cultivated into the soil following harvest.



Kabocha planted into mulch.

Another novel alternative to chemical weed management is the use of mulches such as cereals. Cereal mulch is grown, then killed off and rolled. Crops such as cucurbits and brassicas are then planted into the stubble. The mulch provides effective suppression of weeds throughout the growing season.

Cereals such as wheat and ryecorn are very effective mulches for controlling weeds, possibly due to alleopathic effects (compounds released from the cereals which inhibit weed germination). The ability of cereal crops and stubble to suppress weed emergence is well documented. Banded applications of herbicides and cereal mulches can be used to further improve the weed control in the planted row, as soil disturbance at planting stimulates weed germination.

The use of mulches requires some changes in crop management. For example, the decaying cereal stubble can affect soil nitrogen levels and some insect pests populations may build up in the mulch.

AHR CropScience has worked for several years on the use of mulches as part of an integrated crop management program, and the final report on this work is available from Horticulture Australia Ltd.

The future of weed management

The challenge facing Australian vegetable producers is to develop weed prevention and management strategies that are: effective and profitable (in both the short and long term); sustainable and safe for the community and the environment; and adaptable for individual land management situations.

The three main issues facing agriculture are a dynamic and expanding weed flora, environmental and ecological sustainability and the integration and adoption of weed management systems.

To be able to tackle these issues there is a need for an increased understanding of the biology and ecology of weeds, advances in and integration of control methods, as well as greater use of emerging technologies.

References

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