

factsheet

On farm solutions

Controlling seed-set in cruciferous weeds in pulses

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Embryo development key to control

The embryo is the key to controlling seed-set in cruciferous weeds, new Weeds CRC research has revealed.

Trials conducted in Western Australia and New South Wales on wild radish (*Raphanus raphanistrum*), charlock (*Sinapis arvensis*) and turnip weed (*Rapistrum rugosum*) - all cruciferous weeds - have shown that control measures can be matched to embryo development to minimise seed-set.

A new rating system (Table 1, next page) identifies four growth stages of cruciferous weeds based on embryo development in the developing seed.

The research found that the highest level of seed-set control (up to 100%) is achieved when herbicides are applied after flowering, and in the 21 days before the embryo develops.

Project: developing and validating best weed management packages for cruciferous weeds

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VET sector resource: RTC3401A *Control weeds*; RTD5402A *Develop a strategy for the management of target pests*

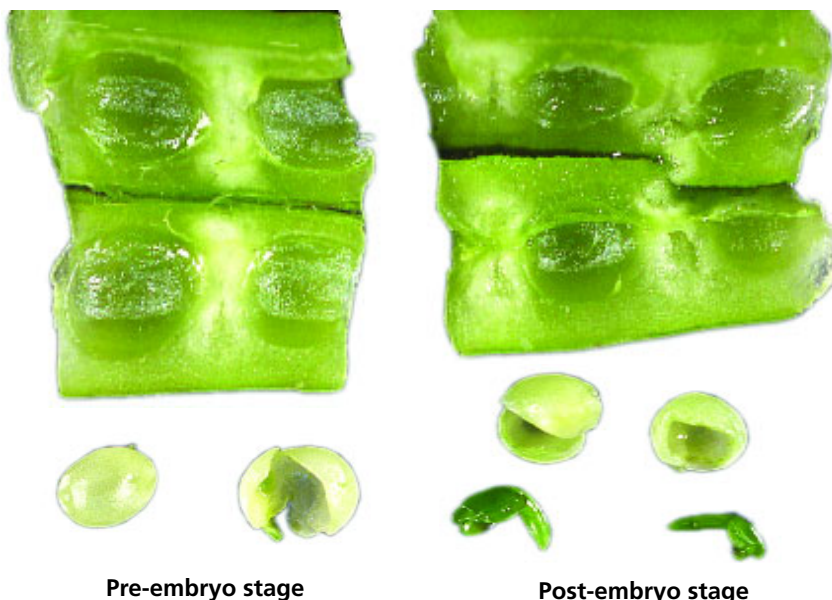


Figure 1 Seed pods of cruciferous weeds should be checked for embryo development every few days after flowering. The green, fleshy interior of the seed - the embryo (seen at right) - develops about 21 days after flowering. The highest level of seed-set control is achieved before the embryo develops.



Figure 2 Wild radish infestation in a lupin crop. Photo: Aik Cheam

Table 1: Stages of cruciferous weed development: a rating system

Timing	Description of growth stage
Pre-embryo The pre-embryo stages last about 21 days from the time of flowering	Stage 1 Early flowering and newly formed thin pods.
	Stage 2 Mid-flowering and pod fill; well-formed pods are still squashy and watery when pressed between the finger and thumb. Seed development at ovule stage with no embryo (green fleshy interior). Squeeze between fingers to obtain a globule of seed - mass of cells, no embryo. Growers can carry out this procedure in the paddock.
Post-embryo The embryo forms about 21 days after flowering	Stage 3 Embryo formed; pods still squashy and watery but newly-formed embryo already present.
	Stage 4 Late flowering and pod development; pods turned woody. Green, well-developed embryos present when pods are crushed.

Why control seed-set?

Cruciferous (or brassicaceous) weeds are some of Australia's worst broadleaf crop weeds.

Prolific seed production and complex seed dormancy results in staggered germination and a long-lasting and large seedbank.

As such, preventing seed-set of surviving weeds is critical to avoid replenishment of the weed seedbank.

Controlling seed-set is also crucial to prevent the spread of herbicide resistant cruciferous weeds, including charlock, turnip weed, African turnip weed (*Sisymbrium thellungii*), Indian hedge mustard (*Sisymbrium orientale*) and wild turnip (*Brassica tournefortii*).

This is particularly vital for wild radish which has developed resistance to multiple herbicide groups in Western Australia and is one of the most widespread and troublesome weeds of cereal and grain legume crops in southern Australia.

In areas without resistant cruciferous weeds, controlling seed-set will help delay the build-up of resistance.

Getting the timing right

Assessment of the growth stage in cruciferous weeds should take place shortly after flowering.

Most of the plants within a population normally start flowering about the same time.

A few days after flowering, follow these steps:

- Remove a few seed pods from at least ten plants
- Split open the pods and check for embryo development within the seeds
- Repeat this procedure every few days
- Make assessments according to the rating system (Table 1) and by comparison with Figure 1.



Figure 3: Turnip weed seed pods (top right) and a turnip weed infested paddock
 Photos: Andrew Storrie

Table 2: Summary of tactics for control of seed-set in cruciferous weeds

Tactic	Lupins	Field peas	Chickpeas
Slashing, mowing, green and brown manuring	Recommended pre-embryo stage but sacrificing crop is necessary	Recommended pre-embryo stage but sacrificing crop is necessary	Recommended pre-embryo stage but sacrificing crop is necessary
Selective spray-topping	Recommended pre-embryo stage	Not recommended	Not recommended
Crop-topping	Not recommended (crop damage occurs)	Not recommended (crop damage occurs)	Not recommended (crop damage occurs)
Weed wiping	A wide range of translocated herbicides are effective but crop damage may occur	A wide range of translocated herbicides are effective but crop damage may occur	A wide range of translocated herbicides are effective but crop damage may occur

Control methods

The Weeds CRC research trialled a variety of integrated weed management tactics for controlling seed-set in cruciferous weeds at both the pre-embryo and post-embryo stages in lupin, field peas and chickpea crops.

Herbicide trials were conducted off-label and can not be reported at this stage.

However, a general summary of the results is provided in Table 2.

Slashing, mowing and green and brown manuring

In the pre-embryo stage, slashing, mowing and green and brown manuring resulted in up to 100% seed reduction in cruciferous weeds.

This will sacrifice the crop but it is a valid means of reducing cruciferous weed seed numbers.

Selective spray-topping

Selective spray-topping is not recommended in field peas or chickpeas as no herbicides are presently available for this purpose.

However, applied pre-embryo, this method provides good control of cruciferous weeds in lupins with minimal crop damage.

Crop-topping

Crop-topping with desiccants is not recommended in field peas, chickpeas or lupins.

However, applied pre-embryo, crop-topping may be effective in crops that finish before the weeds such as might occur in a dry spring.

This will minimise crop yield loss while maximising seed-set control.

However, crop seed treated this way is not recommended for seed or sprouting purposes because of some loss in seedling vigour.

Weed wiping

Pre-embryo and post-embryo weed wiping showed promise with a wide range of translocated herbicides shown to be effective in each of the trialled crops.

However, crop damage needs to be minimised.

This may be solved through engineering solutions of better-designed machines, better machine calibration and development of crops with greater herbicide tolerance.



Figure 4 Flowers of London rocket (*Sisymbrium irio*), another cruciferous weed of Australian agriculture
Photo: Andrew Storrie

For further information visit the Weeds CRC's website: www.weeds.crc.org.au

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Further reading: Cheam, A.H. (2006) *Proceedings of the Wild Radish and other Cruciferous Weeds Symposium*. July 11-12, 2006, Perth.



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