Weed management using herbicides

Herbicide options for in-crop use in pulses are not as extensive as those available for use in cereals and often have quite particular use patterns. It is essential when planning your weed management program to seek advice from your local agronomist on herbicide options. Not only can they help you plan your program they can advise of newly released products and any label changes.

Read the label

Always take care to read the label (or permit when using a chemical under permit rather than full registration) and understand all critical use comments, crop growth stages and any plant back periods for sensitive crops.

See page 4, Table 2.

It is important to understand crop growth stages to ensure herbicides are applied at the optimal stage to minimise crop damage.

See page 49 Appendix 1: Crop growth stages.

Metribuzin in field peas is a good example of a herbicide with specific critical use comments. These include: sowing the crop 3 to 4 cm deep; application after rain when the crop is pre-emergence to 3 node stage; and allowing the soil to settle for 2 to 3 days after sowing when applying post-sowing pre-emergence. Following these recommendations avoids crop damage and maximises chemical effectiveness. Under dry conditions there is no root uptake and weed control results will be poor. Application to dry soil followed by a significant rainfall (10 mm) may result in crop damage, particularly for varieties with a narrow safety margin.

Pre-emergent herbicides

Effective use of pre-emergent herbicides is essential for successful pulse production. Too often weed 'blowouts' occur because a pre-emergent herbicide is not used. Often the pulse crop is blamed rather than the lack of forethought and good management.

The use of trifluralin (Triflur®, Treflan®) or pendimethalin (Stomp®, Rifle®) before sowing can take the pressure off other herbicides reducing ryegrass and wire weed numbers. Both of these chemicals are Group D, different to most grass-selective herbicides used in the cropping system. Their use to control annual ryegrass allows a change in herbicide group. Reducing the weed seed bank and rotating herbicide groups are both important components of an integrated weed management plan. Both trifluralin and pendimethalin can be used in field pea, chickpea and lupin, while pendimethalin should be used in lentils, and trifluralin used with care in faba beans.

Pre-emergent herbicides that control specific broadleaf weeds should be used in a targeted manner depending on the weed present. Herbicides such as metribuzin (Lexone®, Sencor®), simazine (Simagranz®, Gesatop®), cyanazine (Bladex®) - all Group C, isoxaflutole (Balance®) - Group F, and imazethapyr (Spinnaker®) - Group B, can be used on various pulse crops to target specific broadleaf and grass weeds. Check with your local agronomist, herbicide label or weed control handbook in your state.

Research highlight

Control of great brome in lupins

In Western Australia, field trials have demonstrated that the density of great brome can be reduced in a lupin crop below the economic threshold level required for the following wheat crop. This can be achieved using a herbicide mixture of paraquat, diquat and simazine applied seven days after the opening winter rain and fluazifopbutyl when great brome has 3 to 5 leaves.

Cheam (1988); Poole and Gill (1987)

Post-emergent herbicides for grass weeds

Pulse crops can be effectively used as a tool in a weed management program to reduce grass populations. As there are no effective and reliable herbicides to control grass weeds such as *Bromus* spp. in wheat, selective herbicides can be used in lupins to remove such grass weeds. Effective post-emergent herbicides are available to control problem weeds that carry cereal root diseases such as *Vulpia* spp. (silver grass). Unfortunately these herbicides are Group A and have a high 'herbicide resistance' risk. Special care should be taken when managing herbicide resistant grass populations, such as annual ryegrass. If a paddock has a weed population with known resistance to Group A FOPS and/or DIMS and/or Group B herbicides, care should be taken as to which chemical Group is used.

Post-emergent herbicides for broadleaf weeds

Post-emergent herbicides for broadleaf weeds should only be used to 'mop-up' escapes from earlier herbicide applications and late germinating weeds, as a last resort. Don't plan to rely heavily on post-emergent herbicides to control broadleaf weeds. Table 6 gives the range of herbicides available for use on broadleaf weeds in the various pulse crops.

It should be noted that there are no post-emergent herbicides registered for use in faba beans, and field peas have the greatest number of herbicide options.

Research highlight

Tolerance of Albus lupins to herbicides

Albus lupins were found to be less tolerant to some herbicides registered for use in lupins in Western Australia. Yield reductions occurred when simazine was applied at twice the normal use rates before sowing, to the variety Kiev Mutant. Diuron® applied pre-emergent was found to be safe.

Of the post-emergent options only metosulam (Eclipse®) was found to have good crop safety. Diflufenican (Brodal®), simazine plus diflufenican, and metribuzin plus diflufenican all showed crop phytotoxicity at one or more sites, and this was often associated with yield reductions.

Bowran and Borger (1996)

Table 6 Post-emergent herbicides registered for use on broadleaf weeds in pulse crops. This table shows the crops in which the herbicide can be used and the weeds controlled. The (S) following a weed name indicates suppression only. Not all registrations are for all states. **Always check the label.**

Herbicide group		Active ingredient	Trade name	For use in which crop?	Broadleaf weeds controlled
High risk of developing resistance	B	Flumetsulam	Broadstrike®	Chickpea, field pea, lentil	Amsinckia, mustards, wild radish (S), turnip weed, wild turnip
	B	Imazamox	Raptor®	Field pea (limited varieties)	Bedstraw (S), deadnettle, volunteer lupins, Indian hedge mustard, wild radish (S), shepherds purse (S), spiny emex (S), turnip weed, wire weed (S)
	B	Imazethapyr	Spinnaker®	Field pea (limited varieties)	Deadnettle, mustards, Indian hedge mustard, toad rush, wire weed
	B	Metsulam	Eclipse®	Lupin	Wild radish
Moderate risk of developing resistance	C	Cyanazine	Bladex®	Field pea	Capeweed, chickweed, deadnettle, mustards, rough poppy, sow thistle, spiny emex, turnip weed, wild turnip
	F	Diflufenican	Brodal®	Field pea, lentil, lupin	Amsinckia (S), capeweed (S), charlock, chickweed (S), corn gromwell (S), deadnettle, marshmallow (S), mustards, Paterson's curse (S), prickly lettuce, wild radish, rough poppy (S), shepherds purse (S), skeleton weed (S), toad rush (S), turnip weed, wild turnip, wire weed (S)
	C	Metribuzin	Sencor®, Lexone®	Chickpea, faba bean, field pea (check varieties), lentil	Amsinckia, capeweed, charlock, chickweed, corn gromwell, common cotula, deadnettle, fumitory, mustards, wild radish, rough poppy, shepherds purse, sow thistle, spiny emex, toad rush, wild turnip, wire weed
	F	Picolinafen	Sniper®	Field pea, lupin	Capeweed, wild radish
	C	Pyridate	Tough®	Chickpea	Amsinckia, capeweed, corn gromwell, deadnettle, fumitory, wild lettuce, sow thistle, toad rush
Low risk	I	MCPA	various	Field pea	Charlock, mustards, wild radish, turnip weed, wild turnip

This should be taken into account when deciding on which pulse crop to grow, especially if the paddock has a broadleaf weed problem.

Crop growth stages should also be fully understood and checked when applying herbicides post-emergent as significant crop damage and yield loss can occur if used outside the recommended period.

Herbicide safety margins vary. Many of those applied post-emergent in pulses have a narrow safety margin and should be used with care. Avoid any overlap and check the label for variety specific safety margins. Some herbicides, such as Raptor®, are registered for use in certain varieties only. The registered varieties will change as new varieties are tested, so check the label each season.

See page 37 Alternate application methods, Weed wiping and page 49 Appendix 1: Crop growth stages.

Research highlight

Simazine 'Top Ups' enhance broadleaf weed control

Trials in Western Australia have identified the use of simazine 'Top Ups' to enhance the control of broadleaf weeds in lupins. The Top Up is applied early post-emergent and can significantly increase wild radish control as well as increase the performance of other post-emergent herbicides. There may be increased visual crop damage with the use of simazine Top Ups and some post-emergent herbicides.

The 1 L per ha simazine Top Up applied when the lupins were at the 6 to 8 leaf stage resulted in a yield increase of 51% or 527 kg per ha over the basal 2.0 L per ha applied just before sowing. Various post-emergent applications of Brodal® + Lexone® tank mix was very effective on large wild radish plants.

Sermon (1998)

Research highlight

Herbicide mixes to control broadleaf weeds

Many trials were conducted across central west NSW during the 1990s to develop a herbicide strategy for managing hard-to-control broadleaf weeds in lupin, field pea, chickpea and faba bean. The trial work involved the application of registered herbicides alone and in mixes.

In faba bean the mixes metribuzin plus simazine and metribuzin plus simazine plus imazethapyr applied post-sowing pre-emergent gave excellent control of wire weed, mustard and fumitory. Faba bean growers in southern NSW have adopted these mixtures for control of wild radish with great success. Although the 3 way mix is expensive at more than $40 per ha, the spectrum of weeds it controls and it's efficacy makes it an economic weed control tool.

Two-way mixes with either simazine plus metribuzin, or simazine plus imazethapyr are also useful in situations with lower weed pressure and a more specific weed problem. The mix of herbicides gave better weed control than any of the components on their own.

Check plant back periods for rotation crops when using a residual herbicide such as imazethapyr.

Herbicide rates used in a three-way mix in faba bean. Rates and herbicides used will vary with soil type, situation and weed spectrum. Seek local advice. Add chemicals to the tank in the order listed.

Trade name	Active ingredient	Concentration	Rate
Spinnaker®	imazethapyr	700 g per kg	45 g per ha
Lexone®	metribuzin	750 g per kg	280 g per ha
Gesatop®	simazine	500 g per L	1.0 to 2.0 L per ha

Milne, B. (pers. comm.)

Many herbicides have narrow safety margins. Check labels and herbicide guides and avoid spray overlap. The area of faba beans in the foreground on the right was double sprayed with a common grass selective herbicide. Although grasses were well controlled the beans suffered high yield loss. In addition, lack of crop competition allowed uncontrolled broadleaf weeds to set high quantities of seed.

Research highlight

Wild radish seed production and simazine in lupins

It has been shown that simazine can frequently provide inadequate control of wild radish in lupins (Code *et al*. 1987; Walsh and Code 1987; Gilbey 1990). Research in Western Australia demonstrates the effect of inadequate control on wild radish seed production. By removing the competition from other weeds seed production per radish plant in simazine treated lupins increased (40 to 190 seeds per plant) compared to unsprayed lupins (5 to 22 seeds per plant). The control of the other weeds in the lupin crop allowed the wild radish survivors to produce more seeds.

It is therefore essential to check lupin crops for late germinating radish and control these with a post-emergent herbicide to avoid an increase in the wild radish seed bank.

Code and Walsh (1987)

Research highlight

A new herbicide to control wild radish and double gee in chickpeas

The new herbicide Balance® was trialed on chickpeas in Western Australia, alone and tank mixed with simazine in an attempt to control two challenging weeds - wild radish and doublegee. The tankmix gave the best broad spectrum control.

Weed number per m^2 following post-sowing pre-emergent application of Balance® and Balance® plus simazine tank mix.

	Wild radish	Indian hedge mustard	Capeweed	Doublegee
Untreated	6.5	29.5	8	1.9
Balance® 75 g/ha	2.3	0	0	1.3
Balance® 100 g/ha	0.4	0	0	1.8
Balance® 150 g/ha	0.1	0	0	0.5
Balance® 100 g/ha + simazine 1.5 L/ha	0.4	0	0	0.2

Clarke *et al.* (2001)

Managing black oats in field peas

Farmer: Warwick Holding.

Location: Yerong Creek, southern NSW.

Property size: 1200 ha.

Annual rainfall: 500 mm.

Soil type: Mix including red brown earth, grey clay and loams.

Main Enterprises: 100% crop - wheat, canola, field peas and lupins.

Crop topping with Roundup PowerMAX™ is very effective for sterilising seed of ryegrass and also wild oats. This works especially well in field peas because the timing coincides with maturity of the crop so there is little or no yield or quality loss.

Roundup PowerMAX™ can not be applied on seed crops as germination levels of the harvested seed may be reduced. (See photo page 32). For this reason Gramoxone® is used on seed crops. This dries down any late weeds such as thistles and reduces the risk of spreading resistant ryegrass and wild radish to the next crop. Timing is critical to make sure you kill the weed seeds.

Roundup PowerMAX™ being applied to Parafield field peas when all heads of annual ryegrass have emerged and the majority have just flowered. This is used to control weed seed set.

On seed crops, Warwick uses Gramoxone® (paraquat) to crop top annual ryegrass, sterilising its seeds. This application also aids harvest, minimising any green weeds present and bringing harvest forward by up to 10 days and improves his harvest schedule.

case study...

Herbicides for harvest management

Crop topping

Crop topping is the technique of applying a herbicide to a mature crop to sterilise weed seeds. The technique is very useful when managing herbicide resistant weeds, such as annual ryegrass. The timing of the herbicide application is dependent on the growth stage of the weed and can result in yield loss in the crop. This however may be a cheap and effective investment in future weed control. Field peas lend themselves to crop topping of annual ryegrass because they mature relatively early and often little yield loss occurs. The variety Snowpeak is slightly earlier maturing than other field pea varieties, which further minimises the risk of yield loss.

Germination of Excell field pea can be affected by application of Roundup®Max at maturity. The earlier the application the higher the percentage of seeds damaged. For this reason it is not registered for use on seed crops.

Paraquat (Gramoxone®) is registered for use in chickpeas, faba beans, field peas, lentils and lupins for crop topping to reduce seed set of annual ryegrass. In order to successfully reduce seed set of the ryegrass, herbicide should be applied when the seed heads at the bottom of the ryegrass plant have emerged and the majority is at, or just past, flowering but before haying off is evident. Do not harvest for 14 days after application.

Roundup PowerMAX™ is also registered for crop topping, but only in field pea and faba bean. Once again, to be successful in reducing annual ryegrass seed set, timing of application is critical. It should also be noted that (as per the label) crops treated with Roundup PowerMAX™ at maturity should not be used for sowing a new crop, as germination may be reduced.

Take note

Harvest withholding

When planning to crop top always consider harvest withholding periods for herbicides. Always check labels.

Research highlight

Desiccation of lupins to manage wild radish.

Research from WA has shown that desiccation of lupins can successfully eliminate green wild radish material from grain. In a non-desiccated area, where harvesting was delayed until wild radish was dry, lupin yields were reduced by 22% due to shattering. If the lupin crop was desiccated, losses were reduced to between 9 and 12%.

Snowball (1986)

Windrowing or desiccation?

Windrowing (mechanical) and desiccation (chemical) are techniques used to terminate crop growth at the stage when all functions have been completed, known as physiological maturity. The timing of desiccation differs to crop topping, where the application is dependent on the weed growth stage rather than the crop. At crop physiological maturity, seed size and yield have been set, so they are not affected. All pulse species can be desiccated. Windrowing is not recommended in field peas as the windrows are too easily moved by wind.

Windrowing aids even-ripening of faba beans and can reduce seed set of late weeds. A follow-up knockdown herbicide may be required to control weed regrowth.

Windrowing field peas is very risky as they are not anchored at all and are liable to move in even light wind.

Managing herbicide resistant annual ryegrass - a whole farm approach

Farmer: Graham and Michael Sinclair.

Location: Temora, southern NSW.

Property size: 1520 ha.

Annual rainfall: 535 mm.

Soil type: Red brown earth, ranging from sandy loam to clay loam.

Main enterprises: Winter cereals, canola, pulses, 1800 merino and 1st cross ewes, which are joined to produce prime lambs, fattening store lambs (2000 - 3000 lambs a year) and a 40 cow breeding herd. Pastures are lucerne, perennial grass and clover.

In 1995 Graham and Michael first noticed annual ryegrass resistant to the selective grass herbicides used in their cropping program. Since then they have developed an annual ryegrass management plan to suit their farming system.

After looking at the various approaches to control annual ryegrass available at the time, they adopted a number of them in their farming program:

- Hay production - either oats or **high density legume** pastures (see also page 39). The crops are cut early, prior to the ryegrass setting seed and then a non-selective herbicide applied to kill any ryegrass regrowth. Whilst they have had success with this, producing large quantities of hay on a yearly basis is not an economical proposition locally.
- Triazine tolerant canola varieties - use herbicides from different herbicide groups. They have found that they are not totally effective in controlling the ryegrass, with escapes coming through the system and rebuilding seed reserves.
- Pasture management was adjusted to include timely grazing of ryegrass at key periods and spray-topping in spring to control seed set.
- **Field pea production.** Graham and Michael have found that the most successful and profitable method of managing ryegrass in their cropping phase is with field peas. They currently run two main rotations on their farm: lucerne pasture for 3 to 5 years/canola/wheat/canola/wheat/under sown barley; and lucerne pasture for 3 to 5 years/canola/wheat/field peas/wheat/under sown barley. The first rotation is used in the clean paddocks, the second in paddocks with a herbicide resistant annual ryegrass problem.

Growing field peas provides them with four opportunities within the year to control annual ryegrass.

1. The later sowing of field peas allows the use of knockdown herbicides on the multiple germinations of ryegrass prior to sowing (Group M).
2. A high rate of trifluralin (Group D) is applied pre-sowing.
3. Metribuzin (Group C) is applied post-sowing pre-emergent
4. The peas are crop-topped with gramoxone (Group L) when the ryegrass heads are turning, effectively controlling any escapes.

case study...

Windrowing and desiccation have many advantages. Either technique can be used to:

- avoid uneven crop ripening,
- assist the harvest schedule,
- reduce crop lodging or make harvest of lodged crops easier,
- increase harvest speed,
- enhance seed quality, and
- overcome harvest problems caused by late weed growth, particularly in wet finishes.

They can also be used as a weed control option preventing seed set, which is a useful technique for managing herbicide resistant weeds. Desiccation only prevents weed seed set if the seed is at the correct stage at the time of herbicide application. Windrowing requires a post-harvest knockdown to control any regrowth in order to be an effective weed control option.

Reglone® (active constituent 200 g per L diquat, Group L) is the only herbicide registered for desiccation of dry beans, peas and lupin crops. It can be applied by ground rig or by aeroplane. If applying by ground rig ensure the boom is high enough to provide a complete overlap of the flat fan spray pattern. Apply early in the morning after a dew or after rain when the crop is less brittle, minimising shattering of pods by application machinery.

Salvage knockdown in chickpeas

Salvage knockdown is a tool used in chickpeas, which are later maturing than other pulse crops. Late thistles, mustard and turnip weed can be a significant problem at harvest and for subsequent storage. A mixture of glyphosate (490 g per L) and metsulfuron methyl (600 g per L) may be used under a permit for this purpose.

Varietal tolerance to herbicides

There are variations in how different pulse varieties respond to particular herbicides. Trials of many herbicides are done annually across Australia to identify varieties that are safe, those that have a narrow safety margin, and those where the chemical should not be used. The information obtained from these trials is used to develop recommendations in the weed control handbook or guidelines for each state and for special variety exclusions or warnings on herbicide labels. Read all labels carefully to ensure the chemical you are planning to apply is safe on the variety you are growing.

Herbicide application technology

Use of expensive herbicides is pointless if the application technique is poor. Some things to check are discussed below.

Timing of application

Timing of herbicide application with respect to crop growth stage is very important. Many post-emergent herbicides have critical application times to ensure any risk of crop damage is avoided. Take note of label recommendations and seek advice if you are unsure of identifying pulse crop growth stage.

Don't compromise the time of one pesticide application in order to apply two or more at once. The timing of the first fungicide application in the strategic disease management program in chickpeas and faba beans is close, but not always the same as, the post-emergent grass control herbicide. The fungicide often goes on some weeks before the most effective time to apply the grass herbicide. It is important, if combining pesticides into one application, to check not only compatibility, but also that the timing of one or both pesticides is not being compromised.

See page 49 Appendix 1: Crop growth stages.

Spray conditions

Think about conditions when spraying. Should the soil be wet when applying a herbicide post-sowing pre-emergent? Is it too dry and dusty for good results? Is the crop stressed (moisture,frost, waterlogging) and more likely to suffer damage? Are the weeds stressed (moisture,frost, waterlogging)and not likely to be killed?

Water quality

Use high quality water. Water that contains clay and other contaminants can reduce the efficacy of many pesticides. Water pH can also affect herbicide results. Check herbicide labels for specific recommendations and seek advice.

Nozzles

Choose appropriate nozzle type and size for the herbicide you are applying (seek advice). Correct application rate, droplet size, penetration and coverage are essential for good spray results, especially on hard to kill weeds.

Calibrate each nozzle regularly and check spray patterns. Replace worn nozzles to ensure even application.

Research highlight

Row cropping and weed control in lupins in Western Australia

Prototype shielded sprayers for broadacre application are being trialed to enable use of non-selective herbicides to manage herbicide resistant weed populations. This spray technology will also reduce herbicide costs and avoid crop damage. Results from Mingenew, WA have shown that the use of inter-row knockdowns have achieved better lupin yields and less weed infestation than normal agronomic practice.

Adjustable shield designs have allowed more precise matching of shield width and row spacing to eliminate problems of missed strips within the crop row.

Both types of shields have thick curtains slit vertically to reduce spray escape from the rear corners of the shield into the base of the crop.
Photos: Mike Collins

These two versions of 50 cm wide shields were designed for use in 60 cm rows. The 'A' shaped shield has a greater inherent stiffness but the 'slotted bent sheet' is easier to adjust. The 'A' shield is more restricting to weed flow through the shield.

This system consists of a 7 shield sprayer for an 8 row trial combine. Row spacing was 65 cm. The grower is making up a light, 4WD bike towed spray trailer for use in lupins.

Blackwell and Obst (2001); Collins and Roche (2001)

Mixing chemicals

Ensure chemicals are compatible before attempting to mix them. Seek advice on the order chemicals should be added to a tank mix to avoid mixing problems and blockages and use Table 7 as a guide.

Boom height

Make sure the height of your boom will give the correct pattern for the nozzles being used. This is particularly important when desiccating and spray topping as the crop is tall and coverage is important. The boom must be high enough to obtain a full double overlap from the flat-fan nozzles.

Table 7 Recommended order of adding products to a tank mix. Always check the label for compatability.

	Product type	Example
1	water conditioners	LI700
2	water dispersable granules (WG) and dry flowable (DF)	Lexone®DF, Spinnaker®WDG
3	wettable powders (WP)	Dithane®
4	flowables or suspension concentrates	atrazine flowable
5	emulsifiable concentrates (EC)	trifluralin
6	water-soluble concentrates (SC)	glyphosate
7	surfactants and oils	BS1000, DCTrate®
8	soluble fertilisers or trace elements	sodium molybdate

Francis *et al.* (2004).

Herbicide application records

It is best practice (and becoming a legal requirement) to record herbicide (and other pesticide) applications. Record information such as product, application rate, water rate, weather conditions, crop growth stage and target weed population and growth stage. Also note each time the boom is decontaminated. This will reduce the chances of crop damage due to herbicide residues in the boom.

Good application records can be useful in the weed management planning process as well as assisting in determining the reasons why an application did not perform as expected. It may identify why a certain product didn't work, and similarly, why it did.

On farm solution

Managing musk weed in lentils

Farmer group: Rupanyup Wick Wipers.

Location: Rupanyup, The Wimmera, Victoria.

Property size: Large broad acre cropping.

Annual rainfall: 535 mm.

Soil type: Clay loam.

Main Enterprises: Predominantly winter cropping - winter cereals, canola, lentils and chickpeas.

A group of growers around Rupanyup have financed, designed and developed a trailing broad acre wick wiper. The technology has been around for years but not as a boom suitable for covering large areas. Wick-ropes soaked with herbicide are wiped over the weeds after they have grown taller than the crop but before they have set seed.

Some fine tuning has stopped problems such as dripping of herbicide onto the crop. Trials were also conducted to identify the best timing to obtain maximum weed control and the preferred herbicide. See Research Highlight on page 38.

A purpose built broad-acre wick wiper fitted with rope wicks, seven individually controlled sections, and hydraulic height adjustment.

Now the unit has a 28 m boom which, on a smooth block, can cover 400 ha in a days work, travelling at 18 to 20 km per hour. The boom has 7 separate sections which can be operated individually. The boom height can be adjusted on the go from the cab. The boom is generally operated about 10 cm above the crop canopy, which is about 50 cm above ground in lentils.

The unit has a 200 L chemical tank which is adequate as the chemicals are used at a more concentrated rate than for normal application with a spray boom. The Rupanyup group's preferred herbicide mix is Roundup MAX™ and Sprayseed®.

case study...

Alternate application methods

Inter-row application

Wider row spacings have allowed the development of broad acre shielded sprayers for inter-row application of herbicide. Non-selective herbicides can be used in-crop to stop seed set of hard to control weeds and escapes from earlier herbicide applications. The technique is another option for managing populations of herbicide resistant weeds, however equipment setup costs may be prohibitive.

Weed wiping

Using a wick or porous hose, weed wipers apply herbicide (such as glyphosate) by wiping it directly onto the weed. This technique is only useful in situations where the weed grows above the crop canopy. It has been widely developed and implemented in lentil growing areas for hard to control weeds such as musk weed. It is very cost effective as small amounts of herbicide are used and large areas can be covered, up to 400 ha in a day.

On farm solution

'Home-made' weed wiper!

Farmer: Rob McRae.

Location: Wallup, The Wimmera, Victoria.

Property size: 1000 ha.

Annual rainfall: 400 mm.

Soil type: Clay loam.

Main Enterprises: Predominantly winter cropping - winter cereals, canola, lentils and chickpeas.

Rob McRae has added a cheap but effective weed wiper to his current trailing boom, allowing him to effectively control many hard to kill weeds in lentils during the growing season.

A simple bracket holds the bar and porous hose and can be adjusted to various heights above the ground.

A simple and cheap addition to a standard trailing boom allows Rob to weed wipe musk weed and other problem weeds in his lentils.

This weed wiper uses recycled-rubber, porous hose instead of a rope wick to apply chemical. The choice of chemical is limited as some rapidly destroy the porous hose. Gravity, rather than a pump, is used to move chemical along the hose.

case study...

Research highlight

Weed wiping ~ managing musk weed in pulses

Weed wiping has been developed as part of an integrated program for managing musk weed in the Wimmera, Victoria. It involves the application of concentrated herbicides through a rope wick and aims at reducing weed seed set. The research found that timing and coverage were far more important than the actual herbicide used. As strategic weed wiping can prevent weed seed set, it may be a very useful weed management option when herbicide resistant weeds are present. It is a good alternative to crop topping when weeds are sparse and the weed canopy exceeds that of the crop.

Coverage

- Parts of the plant not wiped will set seed. Good coverage is essential for reducing seed set.
- Wiping in both directions achieved best results.
- Coverage was best on isolated plants, and generally poorer on thick swards.
- Coverage is difficult to achieve on weeds that set seed below crop height (eg those suppressed by herbicide).
- Coverage may be less critical where glyphosate is applied to grass weeds prior to flowering.

Timing

Success of any herbicide application will rely on correct timing. The growth stage of the weed at the time of the weed wiping certainly impacted on weed seed production in this trial. The best control of musk weed seed set occurred when the weed was at flowering and early pod set. The degree of control decreased after the weed reached mid pod fill. The seed set of a grass weed such as annual ryegrass was greatly reduced when weed wiping occurred at or prior to the ryegrass flowering.

Seed production and seed viability of musk weed in eight commercial paddocks following glyphosate application with a weed wiper.

Growth stage of musk weed	Seeds per plant Total	Viable	Germination %	Comments
Flowering-early pod fill	134	0	0	Small pods, 50% seed shrivelled
Flowering-early pod fill	292	3	1	Small pods, 50% seed shrivelled
Flowering-very early pod fill	43	9	22	Low seed number, seeds plump but green
Mid pod fill	335	47	14	Plump and shrivelled seeds
Mid pod fill	326	33	10	Plump and shrivelled seeds
Late pod fill	265	56	21	Seeds plump
Late pod fill	489	176	36	Mixture of seed types
Late pod fill	439	97	22	Large pods, green and plump

Stuchbery (2002)