BROADAL® OPTIONS

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Always read and adhere to label directions on the product container. BBA261/1102 The Hopkins Part.

Bayer CropScience

BROADAL® OPTIONS

TECHNICAL GUIDE

For control of certain broadleaf weeds in lupins, field peas and lentils

Bayer CropScience

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INTRODUCTION

Brodal Options is an integral part of growing top quality, high-yielding lupin and field pea crops. The excellent knockdown potency and residual control of its active ingredient, diflufenican, make Brodal Options very effective in managing difficult cruciferous weeds. A robust re-formulation providing more consistent results under the extremes of field conditions, Brodal Options also provides greater flexibility and efficacy when applied in mixtures.

PRODUCT FORMULATION

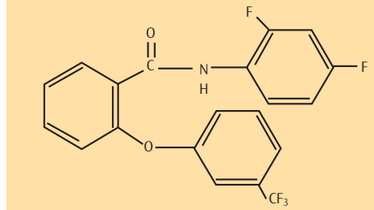
Active ingredient

Trade name: Brodal Options Selective Herbicide

Active constituent: 500 g/L diflufenican

Chemical name: N-(2,4-difluorophenyl)-2-(3-trifluoromethylphenoxy) Pyrimidine-3-carboximide

Structural formula



Formulation type

Formulation: Suspension concentrate (SC)

Physical properties

Appearance: Viscous, light-brown liquid suspension

Density: 1.186 SG @ 20°C

Odour: Non-aromatic

Boiling point: Greater than 100°C

Flammability: Non-flammable

Flashpoint: Non-flammable

Corrosiveness: Non-corrosive to glass and epon-lined metal. The spraying solution is non-corrosive to brass and other metals.

Miscibility: Miscible with most water quality types available for spraying. Avoid muddy water, or water with high organic matter.

Stability: Stable for a minimum of two years if stored in the unopened original container, in a suitable storage area out of direct sunlight and extremes of temperatures.

Solubility: 0.05 mg/L water @ 25°C

Poison schedule: Exempt from scheduling

Hazchem code: Not applicable. Not classified as a dangerous good for transport by road or rail.

BIOLOGICAL PROPERTIES

Mode of action

Activity

Diflufenican is a potent and specific inhibitor of phytoene dehydrogenase, a key enzyme of carotenoid biosynthesis. The yellow carotenoid pigments perform several functions in plants, including promoting the absorption of light for photosynthesis. They also protect the plant from photo-oxidation caused by a surplus of light energy accumulated by chloroplasts. In their absence, chloroplast development and chlorophyll biosynthesis are inhibited. Since carotenoids are synthesised in the apical meristems (growing points), these areas are the preferential target for diflufenican.

Uptake and translocation

Following application, the foliage of the weeds absorbs diflufenican. However, good coverage is essential, because the translocation of the product is limited. Diflufenican should be applied to young, actively-growing weeds. Weed tolerance to the herbicide increases rapidly with age.

Pre-emergent

Following application, diflufenican forms a continuous film on the soil surface. This film is resistant to leaching and persists through the vegetative stage of the crop. As weeds germinate and pass through this residual layer (the top few millimetres of soil), they absorb the herbicide through both shoots and roots. The herbicide is then diffused into the meristematic tissues. Good coverage of the soil surface and rainfall after application are desirable to achieve optimum residual activity.

Weeds germinating deeper in the soil profile are less likely to be controlled, since the roots are outside the herbicide layer.

Post-emergent

When diflufenican is applied post-emergence, it primarily affects new and developing leaf tissue. Old leaf tissue may eventually die as a result of photosynthetic inhibition in the new leaves.

Weeds at an advanced stage of growth at the time of treatment will show the symptoms, but may not be adequately controlled.

Diflufenican is not readily translocated in the phloem from leaves to meristematic tissues and roots. However, because of its very high potency on phytoene dehydrogenase and its metabolic persistence in plants, very little diflufenican is required to accumulate at the target site.

Sufficient diflufenican may be phloem-mobile to exert phytotoxicity. In addition, a direct interception of spray deposit can occur at the meristematic regions, particularly in dicot species. Such tissues are relatively exposed and this 'contact' activity with subsequent short distance diffusion will certainly contribute to overall phytotoxicity. Diflufenican also has limited xylem mobility and, in species where the root systems are near the soil surface and in contact with the diflufenican, accumulation through root uptake and subsequent translocation via the xylem will further increase phytotoxicity.

Symptoms

Herbicide action is exerted mainly on new and developing plant tissues. The quickest effect is obtained after pre-emergent or early post-emergent treatment on young seedlings. The red-purple colour of the foliage often observed after application is a result of stress caused by the absence of carotenoids. Later on, the seedlings suffer from necrosis and die.

Typically, the major weed symptom is bleaching of the new tissue from the growing point. Leaves that were present at application will also show signs of tissue bleaching. This chlorosis is generally evident 7–14 days after application. Weed death will usually take 4 weeks, but this may vary depending on growing conditions.

Resistant weeds warning

GROUP **F** HERBICIDE

Brodal Options Selective Herbicide is a member of the nicotinanalide group of herbicides. Brodal Options is a herbicide which inhibits carotenoid biosynthesis. For weed resistance management, Brodal Options is a Group **F** herbicide. Some naturally-occurring weed biotypes resistant to Brodal Options, and other herbicides which inhibit production of carotenoid biosynthesis, may exist through normal genetic variability in any weed population. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. These resistant weeds will not be controlled by Brodal Options. Since occurrence of resistant weeds is difficult to detect prior to use, Bayer CropScience Pty Ltd accepts no liability for any losses that may result from the failure of Brodal Options to control resistant weeds.

EFFECTS ON FLORA AND FAUNA

Tests have been performed with diflufenican on a number of different animal species using various routes of administration. Results obtained were as follows:

Acute toxicity

Species	Tests	Results
Rat	Oral LD_{50}	>2000 mg/kg
Rabbit	Oral LD_{50}	>5000 mg/kg
Dog	Oral LD_{50}	>5000 mg/kg
Rat	Dermal LD_{50}	>2000 mg/kg
Rat	Inhalation LC_{50} (4 hrs)	>2.34 mg/L
Rat	Intraperitoneal LD_{50}	>2000 mg/kg
Rabbit	Dermal irritation	Negative
Rabbit	Ocular irritation	Negative
Guinea pig	Dermal sensitisation	Negative
Mallard duck	Acute oral LD_{50}	>4000 mg/kg
Bobwhite quail	Acute oral LD_{50}	>2150 mg/kg
Rainbow trout	LC_{50} 96-hour	56–100 mg/kg
Carp	LC_{50} 96-hour	105 mg/L
Daphnia	LC_{50} 48-hour	No effect at 10 mg/L
Algae	Growth inhibition 96-hour	No effect at 10 mg/L
Honeybee	Contact/ingestion toxicity	Non-toxic
Earthworm	Acute toxicity	Non-toxic
Soil microbial processes	Incorporation into soil	Negligible effect @ 10 ppm

The previous information indicates that Brodal Options is of low toxicity to animals, birds, fish, honeybees, earthworms, soil and aquatic organisms. When Brodal Options is used as directed, it presents very little danger to the environment.

BEHAVIOUR IN THE ENVIRONMENT

In crops

The metabolism of diflufenican has been studied in crops after pre- and post-emergent treatment in the greenhouse.

A maximum of 2% of diflufenican applied pre-emergent was taken up, translocated and metabolised (5 metabolites have been detected in addition to the parent compound, but estimated levels remain well below diflufenican itself).

In crops, diflufenican is rapidly metabolised to carbon dioxide via nicotinamide and nicotinic acid.

In water and light

Diflufenican was shown to be rather stable under hydrolysis and photolysis (half-life of about 100 days). Under laboratory conditions, diflufenican was shown to be slowly degraded in anaerobic aquatic systems (half-life of about 1 year).

In soil

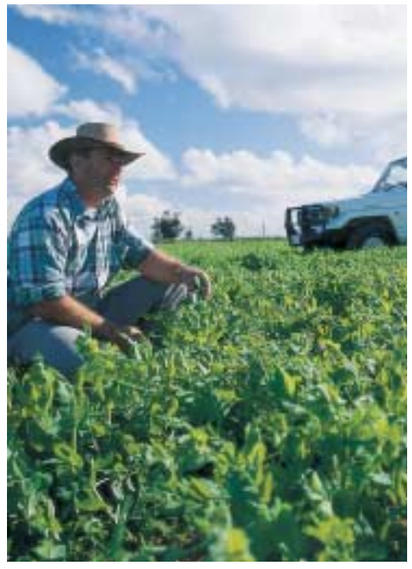
Diflufenican is strongly bound to soil particles, and no mobility has been detected on soil columns in the laboratory. Under field conditions, both lysimeter and field studies have shown that the leaching of diflufenican and its metabolites does not occur to any significant extent.

This was confirmed by field studies conducted in the UK and Belgium where, after 5 years of cultivation, any remaining diflufenican was present in the 0–10 cm layer (without ploughing) or spread fairly evenly in the 25–30 cm layer (with ploughing).

In aerobic conditions, diflufenican was tested for its degradation in both the laboratory and field. The degradation proceeds via the metabolites 2-(3-trifluoromethylphenoxy) nicotinamide and 2-(3-trifluoromethylphenoxy) nicotinic acid to bound residues and carbon dioxide. The obtained values of half-lives varied from 9 weeks up to 50 weeks, with typical values of 200 days for soil dissipation conducted in-field.

The biological persistence is dependent on the bio-availability of the residue, corresponding to the herbicide concentration in the soil solution. The bio-availability of diflufenican residues in the soil tends to be low, typically around 2–3% of the residual amount.

In conclusion, the degradation and mobility studies under both field and laboratory conditions show that the rate-limiting step in the degradation of diflufenican prevents any significant build-up of metabolities. Under normal use conditions, neither diflufenican nor its metabolites would be expected to pose a threat to groundwater.



BRODAL OPTIONS: IMPROVED WEED CONTROL

Brodal has long been recognised as the leading herbicide for the control of broadleaf weeds in lupins, field peas and lentils. The key strength of Brodal has been the high level of control of cruciferous weeds, residual activity and excellent crop safety.
Brodal Options provides improved efficacy on broadleaf weeds while retaining the same residual protection and crop safety.

Brodal Options is the culmination of years of development by Bayer CropScience in the continual quest to provide better products for Australian farmers.

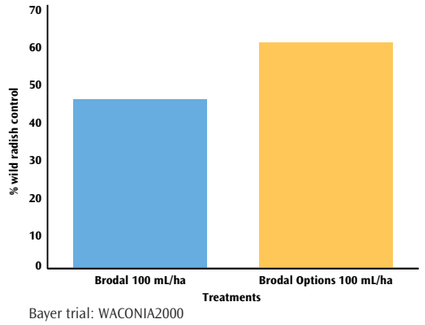
The goal was to produce a formulation of Brodal that provides more consistent results in the tough conditions of Australian broadacre farming. After intensive trialling of new formulations, Brodal Options was selected as the successor to the current Brodal formulation.

Trials showed that Brodal Options applied under challenging environmental conditions and on large weeds provided significantly improved results compared to the old formulation.

The wild radish sprayed in these trials were outside the label recommendations for Brodal Options, and were selected on the basis of illustrating the improved performance of Brodal Option, particularly when applied to large weeds. The data clearly shows that Brodal Options applied alone or in mixes with other herbicides provides additional weed control. An average increase in efficacy of 17% was demonstrated in the trials below.

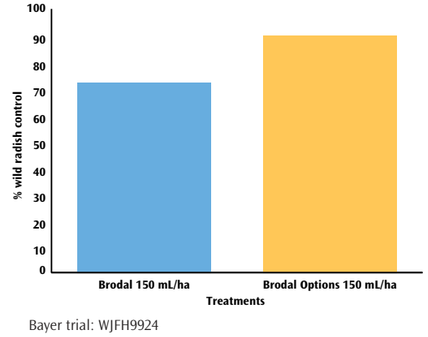
New Brodal Options provides more consistent and reliable results in the field for more effective broadleaf weed control in lupins.

(Fig. 1) Wild radish (8lf) control in lupins



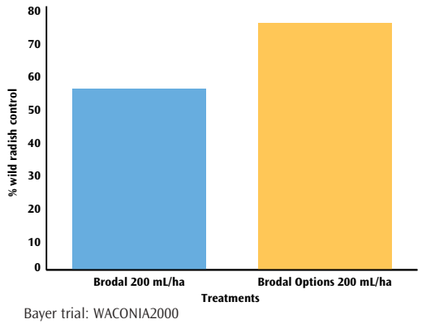
Bayer trial: WACONIA2000

(Fig. 2) Wild radish (6–8lf) control in lupins



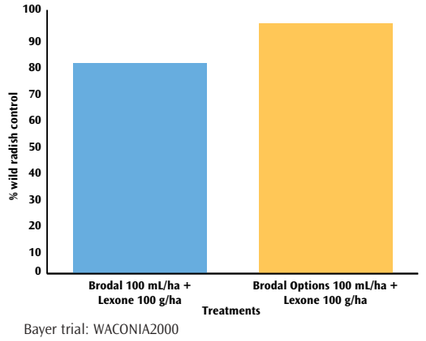
Bayer trial: WJFH9924

(Fig. 3) Wild radish (8lf) control in lupins



Bayer trial: WACONIA2000

(Fig. 4) Wild radish (8lf) control in lupins



Bayer trial: WACONIA2000

EFFICACY: CRUCIFEROUS WEEDS

Brodal Options is the leading herbicide for the control of cruciferous weeds in lupins, field peas and lentils.

Wild radish – the pest

Wild radish (*Rhaphanus raphanistrum*), represents one of the greatest threats in broadacre cropping because it competes very effectively with the crop. If management of the weed is ignored or control is poor, it will remain a major problem for continuing seasons.

The reasons for this include:

- Populations are widespread across the key broadacre cropping areas.
- Germinations can be spread over a 6 to 10 week period following sowing, often occurring after a herbicide application.
- When wild radish emerges with the crop it is extremely competitive, significantly reducing the crop yield potential.
- Plant populations reaching maturity can produce up to 40,000 seeds/m^2, which can lead to crop harvest contamination issues and further weed problems in the following crops.
- Seeds have a relatively long lifespan, more than 6 years below 10 cm of soil, so continued emergence is likely in the following seasons.

For all these reasons, continual management from one season to the next is critical.

Wild radish control

The key objective of the management strategy for wild radish is to ensure that a minimal number of plants are allowed to set seed.

This can be achieved in two ways:

- Through weed control at the start of the season, whereby the majority of weeds are eliminated.
- Spray-topping any remaining weeds near the end of the season will reduce seed-set.

Control of all wild radish germinations with one pass of a herbicide application with no residual activity is very difficult, unless it occurs late in the crop. Unfortunately such a late application is also likely to result in the crop already having lost much of its yield potential.

Brodal Options plays a vital role in the first stage of wild radish control.

As Brodal Options is active against both emerged wild radish, through its foliar activity, and emerging weeds, through its residual activity, it is recognised as the most useful herbicide for controlling wild radish populations in broadleaf crops.

Spraying early is the key

Brodal Options is registered at different rates for controlling wild radish of different ages.

(Fig. 5) Efficacy of Brodal Options on wild radish at differing rates and weed stages

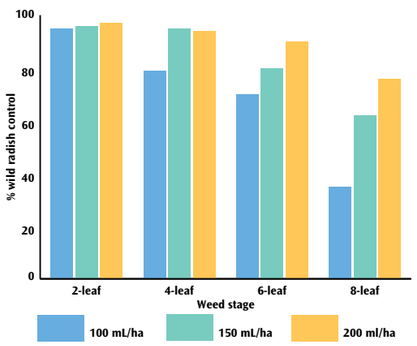
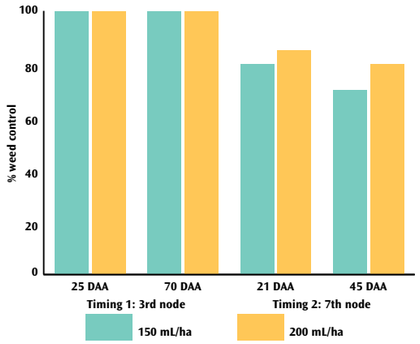


Figure 5 shows that all rates perform very effectively at the 2-leaf stage. However as the weeds progress to the 4- and 6-leaf stages, higher rates of Brodal Options are required for adequate control. Once wild radish reaches the 8-leaf stage, even the highest rate of Brodal Options shows reduced efficacy.

Indian hedge mustard

As with wild radish, earlier control of indian hedge mustard requires lower rates.

(Fig. 6) Indian hedge mustard control at 2 timings using Brodal Options in field peas



The graph above shows that at the earlier application timing both the 150 and 200 mL/ha rate gave excellent control, but when the application timing was delayed even high rates failed to provide satisfactory control.

Cruciferous weeds – general

Other cruciferous weeds, such as those below, represent significant weed problems for the same reasons as wild radish, but are not as widely spread across the broadacre cropping regions as wild radish. Cooler areas with higher moisture levels and heavier soil types are more likely to see these weeds become more apparent:

- Turnip weed
- Wild turnip (Charlock)
- Hedge mustard
- Indian hedge mustard

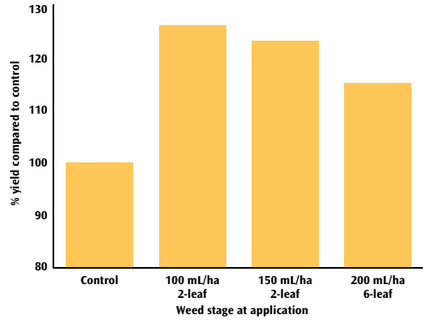
Wild radish has the ability to grow in these areas as well as those areas with sandier and drier profiles.

Impact on yield

Generally the majority of wild radish plants will emerge with 2 to 3 weeks of sowing. The period from emergence to the 2–3-leaf stage of wild radish is when it is most competitive with the crop.

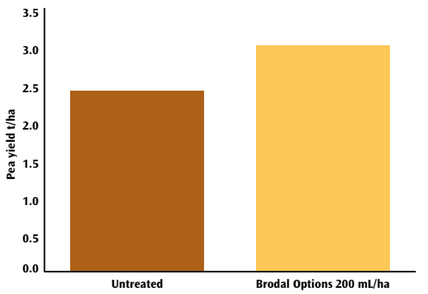
Research has demonstrated that removing cruciferous weeds, such as wild radish, in the early growth stages of the crop will have the greatest impact on improving crop yields.

(Fig. 7) Yield increase with early application of Brodal Options in lupins



(Ref: Wubin 1994, Moora 1994, Lake Varley 1994, Watheroo 1995)

(Fig. 8) Early Brodal Options application increased field pea yields



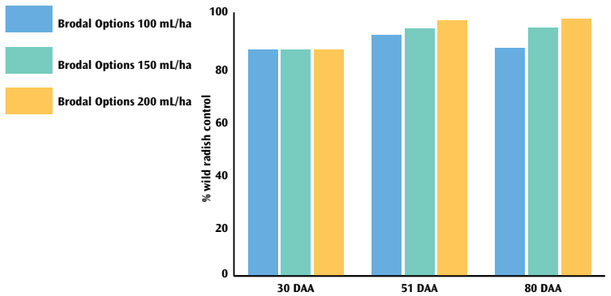
(Source: Department of Agriculture 1987)

Early elimination of cruciferous weeds with Brodal Options can result in significant yield increases in both lupins and field peas.

Residual herbicide activity

As Brodal Options is also active against the cruciferous weeds as a pre-emergent herbicide, it offers growers the additional benefit of controlling wild radish plants still to emerge.

(Fig. 9) Residual herbicide behaviour of Brodal Options sprayed on 2–4-leaf wild radish



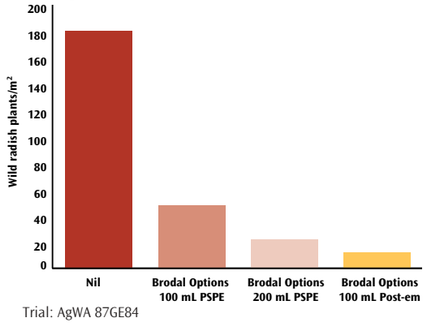
Reference: Lake Varley, WA. Brodal Options lupin trial: 1994 (CH/SL)

As illustrated, Brodal Options applied at the higher rates remains active for up to 8 weeks. This residual control is extremely valuable in the overall management program of wild radish and other cruciferous weeds.

Post-emergent versus pre-emergent

The previous graph indicates that an initial pre-emergent application of Brodal Options could suffice for season-long control. Environmental factors can influence residual performance, whereas a post-emergent application combines knockdown and residual control of wild radish.

(Fig. 10) Brodal Options – PSPE vs post-emergent for the control of wild radish



Trial: AgWA 87GE84

Trials show that a 100 mL/ha post-emergent application is more effective than 200 mL/ha used PSPE (post-sowing, pre-emergent) where weed densities are high.

Factors influencing the level of residual control

Brodal Options is best applied as a post-emergent application because the residual performance of Brodal Options can often be hampered by adverse conditions.

For example:

- Non-wetting sand can dry out rapidly on the surface, inactivating the product.
- Organic material and clay can bind tightly with Brodal Options, making it unavailable for weed uptake.
- Traffic through the paddock or large clods and stones will provide breaks in the residual film, allowing weeds to escape
- High levels of trash will bind Brodal Options before it reaches the soil surface and result in residual gaps, particularly in header trails.
- Low water rates and poor application can result in reduced coverage, resulting in a reduction of the residual barrier allowing weeds to escape.
- Wind erosion on light sandy soils removes topsoil and the Brodal Options residual film, providing no barrier to weed germinations.

Note: The combination of the light soils and dry conditions in Western Australia can often influence the residual longevity of Brodal Options.

It is important that these limiting factors be managed where possible, and always considered when applying Brodal Options.

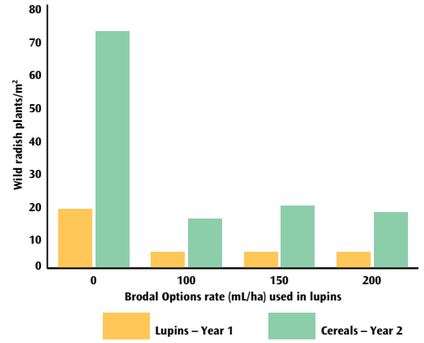
If escapes do occur, growers should go back and control those weeds before they have a chance to set seed.

Reduce weed-seed carry-over

Department of Agriculture trials in WA have demonstrated that the use of Brodal Options for wild radish control in the lupin phase of the rotation reduces the weed burden in the following cereal crop. This allows farmers to adopt a management strategy which reduces the impact of wild radish on crops over a period of time. The effect of the previous season's Brodal Options treatment is evident in the wild radish populations and yield of the subsequent wheat crop.

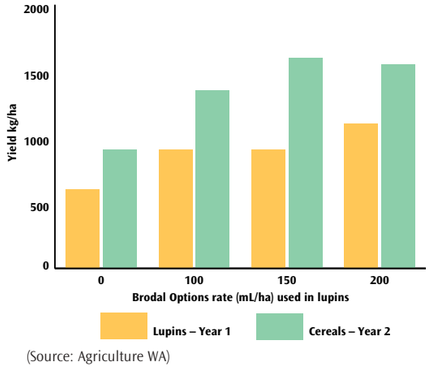
The graph below (Fig. 11) clearly demonstrates the reduction of wild radish density in cereals through Brodal Options use in lupins the previous season.

(Fig. 11) Improved wild radish control through Brodal Options use in lupins



(Source: Agriculture WA)

(Fig. 12) Increased grain yield through wild radish control in lupins



(Source: Agriculture WA)

The trial results shown in Figures 11 & 12 clearly illustrate:

- the destructive effect that wild radish (if not adequately controlled) can have on lupin yields;
- the reduction of the wild radish population (compared to untreated) in a subsequent cereal crop, following efficient weed control in the legume phase; and
- the yield increase in that cereal crop.

Lupin seed viability

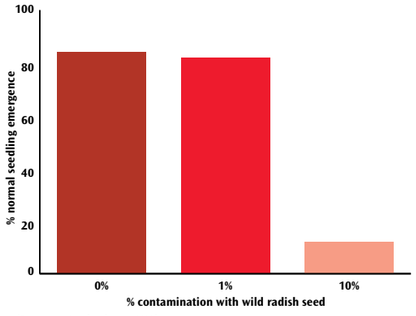
Agriculture WA research has shown that storing lupin seed contaminated with green wild radish seed will reduce the viability of the lupin seed.

As little as 10% contamination can render lupin seed worthless for the following season's crop.

Contamination of lupins with wild radish seed also incurs costs in the form of dockages or seed cleaning.

The use of Brodal Options to control wild radish in lupin crops eliminates weed-seed contamination in the stored seed.

(Fig. 13) Reduced lupin seed viability from wild radish contamination



(Source: Agriculture WA)

COMPATIBILITY MATRIX

Herbicide use guide for narrowleaf lupin crops in WA only

This is designed as a "mix and match" guide to broadleaf weed control in lupins. To use this table, select the crop-stage column that corresponds to your situation. Then select the row that best describes your weed situation. These will intersect in a cell showing a colour and symbol. Please refer to the notes and important information on application and rates that correspond to that particular colour and symbol.

	Crop stage					
	2-leaf	4-leaf	6-leaf	8-leaf	10-leaf	Bud emergence
Wild radish (<2-leaf)	♣	♣	♣	♣		
Wild radish (<4-leaf)	▲	▲	▲	▲		
Wild radish (<6-leaf)	■	■	■	■		
		■	■	■	■	
Wild radish (<8-leaf)			●	●	●	●
Wild radish (80% 2-leaf + 20% 4-leaf)	▲	▲	▲	▲		
		▲	▲	▲	▲	
Wild radish (50% 2-leaf + 50% 6-leaf)	■	■	■	■		
		■	■	■	■	
Wild radish (20% 4-leaf + 80% 8-leaf)			●	●	●	●
Wild radish (2–4-leaf)		◆	◆	◆	◆	
Capeweed (2–4-leaf)			◆	◆	◆	◆
Wild radish (6–8-leaf)			♥	♥	♥	♥
Capeweed (6–8-leaf)						
Wild radish (2–4-leaf)		✤	✤	✤	✤	
Doublegee (2–4-leaf)			✤	✤	✤	✤
Wild radish (6–8-leaf)			★	★	★	★
Doublegee (6–8-leaf)						
Wild radish (2–4-leaf)		❖	❖	❖	❖	
Capeweed (2–4-leaf)			❖	❖	❖	❖
Doublegee (2–4-leaf)						
Wild radish (6–8-leaf)			✔	✔	✔	✔
Capeweed (6–8-leaf)						
Doublegee (6–8-leaf)						

NB: Please note that this table is designed as a reference guide only. Always consult individual product label recommendations and agronomic advice prior to use.

Note: If Sencor 480 SC is your product of choice for mixtures with Brodal Options, the conversions are:

Lexone 100 g/ha = Sencor 480 SC 160 mL/ha

Lexone 150 g/ha = Sencor 480 SC 235 mL/ha

IMPORTANT INFORMATION: Brodal Options alone

Check the lupin crop for signs of stress prior to applying herbicides, particularly triazine stress (burnt leaf tips) and the fungal disease brown spot.

If the weed population is high, ensure good application and higher water rates (50 L/ha).

Prolonged dry and/or non-wetting soils can reduce efficacy, so a revision of the rate selection may be needed. Seek agronomic advice in these situations.

IMPORTANT INFORMATION: Brodal Options and simazine

DO NOT apply any herbicide until the crop has recovered if signs of stress are evident.

DO NOT apply this mixture to Myallie lupins if atrazine was used as a pre-emergent herbicide.

Check the lupin crop for signs of stress prior to applying herbicides, particularly triazine stress (burnt leaf tips) and the fungal disease brown spot.

If the weed population is high, ensure good application and higher water rates (50 L/ha).

Brodal and simazine will provide some control of grassweeds in addition to broadleaf weed control.

IMPORTANT INFORMATION: Brodal Options and metribuzin

DO NOT apply any herbicide until the crop has recovered if signs of stress are evident.

DO NOT apply to lupin crops prior to the 6-leaf growth stage.

DO NOT apply this mixture to Myallie lupins if atrazine was used as a pre-emergent spray.

DO NOT apply this mixture to Wonga, Tanjil, Danja or Albus lupin varieties.

DO NOT apply this mixture in areas south of the Great Eastern Highway.

Check the lupin crop for any signs of stress prior to applying this mixture, particularly triazine stress (burnt leaf tips) and brown spot.

This mixture can cause crop damage, however crops will recover with no loss of yield when directions for use are followed correctly.

Increased water rates are very important with this mixture because of larger weeds and increased crop canopy. The minimum application volume for this mixture is 50 L/ha.

Brodal Options alone

♣ Brodal Options applied at 100 mL/ha will provide good levels of weed control. If the weed population is high, ensure good application and higher water rates (50 L/ha). Higher rates of Brodal Options will provide longer residual control.

▲ Brodal Options applied at 150 mL/ha will provide good levels of weed control. If the weed population is high, ensure good application and higher water rates (50 L/ha). Higher rates of Brodal Options will provide longer residual control.

■ Brodal Options applied at 200 mL/ha will provide good levels of weed control. If the weed population is high, ensure good application and higher water rates (50 L/ha). Brodal Options applied at 200 mL/ha will ensure maximum residual control.

Brodal Options and simazine

▲ Apply Brodal Options at 100 mL/ha plus simazine at rates up to 1.0 L/ha. This mixture will provide good levels of wild radish control, however residual control will be less than that of Brodal Options applied at 150 mL/ha alone.

■ Apply Brodal Options at 150 mL/ha plus simazine at rates up to 1.0 L/ha. This mixture will provide good levels of wild radish control, however residual control will be less than that of Brodal Options applied at 200 mL/ha alone.

◆ Apply Brodal Options at 100 mL/ha plus simazine at rates up to 1.0 L/ha. This mixture will provide good levels of wild radish control, however residual control will be less than that of Brodal Options applied at 150 mL/ha alone. Capeweed control with this mixture is superior to that of Brodal Options alone. Capeweed control should exceed 90% if the weeds are no greater than 4-leaf and free from stress.

❖ Apply Brodal Options at 150 mL/ha plus simazine at rates up to 1.0 L/ha. This mixture will provide good levels of wild radish control, however residual control will be less than that of Brodal Options applied at 200 mL/ha alone. Doublegee control with this mixture can be variable if doublegees are 4-leaf or greater. Doublegee control should exceed 80% if the weeds are no greater than 4-leaf and free from stress.

❖ Apply Brodal Options at 150 mL/ha plus simazine at rates up to 1.0 L/ha. This mixture will provide good levels of wild radish control, however residual control will be less than that of Brodal Options applied at 200 mL/ha alone. Capeweed control with this mixture is superior to that of Brodal Options alone. Capeweed control should exceed 90% if the weeds are no greater than 4-leaf and free from stress. Doublegee control with this mixture can be variable if doublegees are 4-leaf or greater. Doublegee control should exceed 80% if the weeds are no greater than 4-leaf and free from stress.

Brodal Options and metribuzin

● Apply Brodal Options at 150 mL/ha plus Lexone 100 g/ha to control large wild radish. Wild radish biomass reductions of 90% can be expected if weeds are 8-leaf or smaller. Efficacy on larger weeds can be variable and application coverage is the key to success.

◆ Apply Brodal Options at 100 mL/ha plus Lexone 100 g/ha to improve efficacy on capeweed. Expect very good control of capeweed at 4-leaf or smaller. Larger capeweed may recover.

♥ Apply Brodal Options at 100 mL/ha plus Lexone 150 g/ha to improve efficacy on capeweed. Control of large capeweed can be variable, however the higher rate of Lexone gives greater reliability to this mixture. Expect very good control of capeweed at 4-leaf or smaller. If wild radish are greater than 8-leaf, the rate of Brodal Options may need to be increased to 150 mL/ha and some weeds can be expected to survive.

★ Apply Brodal Options at 100 mL/ha plus Lexone 100 g/ha to improve efficacy on doublegee. Expect very good control of doublegees that are 4-leaf or smaller. Larger doublegee can recover, but generally seed-set is reduced significantly.

✤ Apply Brodal Options at 100 mL/ha plus Lexone 150 g/ha to improve efficacy on doublegee. Expect good control of doublegees that are 4-leaf or smaller. Larger doublegee can recover, but generally seed-set is reduced significantly. Biomass reduction in the order of 75% of large doublegees can be expected. If wild radish are larger than 8-leaf, the rate of Brodal Options may need to be increased to 150 mL/ha.

DO NOT use Brodal Options 150 mL/ha + Lexone 150 g/ha on lupin crops younger than 8-leaf growth stage.

❖ If doublegee and capeweed are the dominant weed species, then apply Brodal Options 100 mL/ha plus Lexone 150 g/ha to improve efficacy. Expect good control of doublegee and capeweed that are 4-leaf or smaller. Larger doublegee can re-grow, but generally seed-set is reduced significantly. If wild radish is the dominant weed, apply Brodal Options 100 mL/ha plus Lexone 100 g/ha.

✔ If doublegee and capeweed are the dominant weed species, then apply Brodal Options 100 mL/ha plus Lexone 150 g/ha to improve efficacy. Expect good control of doublegee and capeweed that are 4-leaf or smaller. Larger doublegee can re-grow, but generally seed-set is reduced significantly. If wild radish is the dominant weed and past the 8-leaf stage, then apply Brodal Options 150 mL/ha plus Lexone 150 g/ha.

DO NOT use Brodal Options 150 mL/ha + Lexone 150 g/ha on lupin crops younger than the 8-leaf growth stage.

DIRECTIONS FOR USE

Crop	Weeds controlled	State	Weed stage	Rate/ha	Critical comments
Field peas, lupins, clover-based pasture, lentils	Wild radish (*Raphanus raphanistrum*)	WA only	Up to 2-leaf and not more than 60 mm in diameter	100 mL	**CROP STAGE** Sow crop evenly to a depth of 20 to 50 mm. **LUPINS:** **Post-emergence of crop** Apply post-emergence from the 2-leaf to the 6-leaf crop stage (40 to 100 mm high). **Post-sowing, pre-emergence of crop (Not WA)** Apply in a tank-mix with the recommended rate of post-sowing pre-emergence treatment of simazine. (Brodal Options should not be incorporated). **FIELD PEAS:** Apply early post-emergence after the third-node stage and before the start of flowering. **Warning:** Field peas grown on high pH soils in the presence of free lime may be less tolerant of Brodal Options. **LENTILS:** Apply early post-emergence after the third-node stage of the crop. **Warning:** Some lentil varieties may be more sensitive than others. DO NOT apply to Northfield variety. Avoid spray overlap. **CLOVER-BASED PASTURE:** Apply post-emergence, not before the 3-trifoliate-leaf stage **Warning:** Some species and varieties of clover may be more sensitive than others. Refer to legume tolerance table in the general instructions. DO NOT apply to medics or yellow serradella. **APPLICATION AND WEED CONTROL** Apply when weeds are actively growing. For optimum results, apply 4 to 6 weeks after sowing. Application beyond 8 weeks post-sowing may result in reduced levels of weed control. In most situations, the rate specified for each weed size will give satisfactory control. Under certain conditions such as: • high crop and weed density, • late season germinations, • abnormal weed growth (including early flowering); higher rates of product (up to the maximum rate of application specified for that weed) may be required.
			Up to 4-leaf and not more than 180 mm in diameter	150 mL	
			Up to 6-leaf and not more than 180 mm in diameter	200 mL	
		NSW, Vic, Tas, SA only	Up to 4-leaf and not more than 120 mm in diameter		
	Hedge mustard (*Sisymbrium officinale*) Indian hedge mustard (*Sisymbrium orientale*) Wild turnip (*Brassica tournefortii*)	WA only	Up to 2-leaf and not more than 60 mm in diameter	100 mL	
		NSW, Vic, Tas, SA, WA only	Up to 4-leaf and not more than 120 mm in diameter	150 mL	
			Up to 6-leaf and not more than 180 mm in diameter	200 mL	
	Turnip weed (*Rapistrum rugosum*)	NSW, Vic, Tas, SA, WA only	Up to 4-leaf and not more than 120 mm in diameter		
	Charlock (wild mustard) (*Sinapis arvensis*) Deadnettle (*Lamium amplexicaule*)	NSW, Vic, Tas, SA only			
	Prickly lettuce (*Lactuca serriola*)		Up to 2-leaf and not more than 60 mm in diameter		
	Pheasant's eye (*Adonis microcarpa*)	SA only			
Field peas	Prickly lettuce (*Lactuca serriola*)	NSW, Vic, Tas, SA only	4-leaf	125 mL plus 125 mL MCPA amine (500g/L)	
			6-leaf	150 mL plus 150 mL MCPA amine (500g/L)	
	Charlock (wild mustard) (*Sinapis arvensis*)		4-leaf	125 plus 125 mL MCPA amine (500g/L)	
			6–8-leaf	150 mL plus 150 mL MCPA amine (500g/L)	

DIRECTIONS FOR USE

Crop	Weeds controlled	State	Weed stage	Rate/ha	Critical comments
Field peas, lupins, clover-based pasture, lentils	Capeweed (*Arctotheca calendula*), crassula (*Crassula* spp.), corn gromwell (*Buglossoides arvense*), marshmallow (*Malva parviflora*), shepherd's purse (*Capsella bursa-pastoris*)	NSW, Vic Tas, SA, WA only	Up to 4-leaf and not more than 120 mm in diameter	200 mL	Brodal Options will not effectively control: • regrowth of suppressed weeds, • transplanted weeds, • regrowth from rhizomes or roots, • weeds growing under stress from previous herbicide applications. The level of effective residual control may be reduced where: • rates lower than 200 mL/ha are used, • dry conditions prevail, • poor coverage of the soil surface is achieved, • the crop is planted in non-wetting sand, • soils have a high content of clay or organic matter. Where weeds are present at application, good spray coverage of the weeds is important. Apply before weeds are obscured by the crop canopy. Weed control may be reduced in areas where trash or burnt straw from the previous harvest is dense, such as in header trails. Best results will be obtained if good soil moisture exists at and after application.
	Chickweed (*Stellaria media*), hyssop loosestrife (*Lythrum hyssopifolia*), mouse-eared chickweed (*Cerastium glomeratum*), night-scented stock (*Matthiola longipetala*), skeleton weed (*Chondrilla juncea*), speedwell (*Veronica hederifolia*)	NSW, Vic, Tas, SA only			
	Amsinckia (*Amsinckia* spp.), wireweed (*Polygonum aviculare*)	NSW, Vic, Tas, SA only	Up to 2-leaf and not more than 60 mm in diameter		
	Paterson's curse (Salvation Jane) (*Echium plantagineum*), rough poppy (*Papaver hybridum*)	NSW, Vic, SA only			
	Sorrel (*Rumex acetosella*), toad rush (*Juncus bufonius*)	NSW, Vic, Tas, SA only			
	Stinging nettle (*Urtica urens*)	NSW only	Cotyledon stage		
Oilseed poppy	Charlock (*S. arvensis*) Hedge mustard (*S. officinale*) Indian hedge mustard (*S. orientale*) Wild radish (*R. raphanistrum*) Wild turnip (*B. tournefortii*)	Tas only	Early post-emergence up to the 4-leaf stage and not more than 120 mm in diameter	150 mL (4–6-leaf crop stage) and/or 200 mL (6–10-leaf crop stage)	**CROP STAGE** Brodal Options may be mixed with Reglone® or Asulox® based on recommendations from poppy contracting companies. DO NOT use in mixtures with Tramat®. **APPLICATION AND WEED CONTROL** See comments on field peas, lupins and clover-based pasture

Restraints

DO NOT apply if crop or weeds are stressed due to dry or excessively moist conditions.
DO NOT apply to crops under stress due to pre-emergent herbicide, root disease, insect damage, nutrient deficiency, excessively moist or dry conditions, or extremes of pH.
DO NOT apply to frost-affected crops or if frosts are imminent.
DO NOT apply if heavy rain is expected within 4 hours.

Withholding period

Not required when used as directed.

APPLICATION

Application parameters

The following settings are examples which will ensure excellent coverage of exposed weeds:

Water rate	50 L/ha	75 L/ha	75 L/ha
Nozzle	Hardi No. 10 or equivalent	Hardi No. 12 or equivalent	Hardi No. 14 or equivalent
Speed	10 KpH	10 KpH	12 KpH
Pressure	240 KpA (2.4 bar)	220 KpA (2.2 bar)	210 KpA (2.1 bar)

Aerial: Brodal Options is not recommended for aerial application.

Application equipment

Brodal Options should be applied using correctly calibrated ground boom-spraying equipment fitted with hydraulic fan nozzles.
Ground: A minimum of 50 litres of water per hectare should be used. However, for optimum results, water rates of 70–100 L/ha are recommended. Increase the water volume where weed infestation is heavy or the crop cover is dense. Complete coverage of weeds is essential. Higher water volumes (up to 100 L/ha) will ensure improved activity of the product on the weeds, but may increase the symptoms on the crop.

Coverage

Because of the limited translocation of Brodal Options, good spray coverage of weed foliage is essential. Good even coverage of the soil is required for effective residual control. Use of water rates less than 50 L/ha is likely to give inadequate coverage of weeds and soil. Water rates should be increased above 50 L/ha when treating higher density weed infestations.

Surface trash

Residual weed control may be reduced in areas where trash or burnt straw from previous harvesting is dense, such as in header trails. Weed density is usually greatest in these areas, so careful rate selection and application are important to achieve acceptable control in heavily trashed areas.

Crop effect

Following application some transient crop yellowing may occur. Subsequent development of the crop and yield will be unaffected. This effect may increase if the crop is suffering from any stress as a result of very wet or very dry conditions, nutrient deficiency, frosts, insect damage or pre-emergent herbicides.

Climatic effects

Brodal Options should not be applied if rainfall is expected within 4 hours of application. Best results will be obtained if good soil moisture exists at and after application. The level of residual weed control may be reduced in very dry or excessively wet soil conditions.

Cold conditions

Very cold temperatures may cause plants to become stressed or dormant, and chemical uptake is reduced. The speed of activity of Brodal Options is consequently reduced. If these conditions are associated with an advanced weed growth stage and reduced chemical rates, weed control may be inadequate.
The secret to achieving good weed control is to treat weeds while they are small.

Germination

It is not necessary to wait for a full germination of weeds prior to application. Best results will be achieved with early application on young weeds. Remember that Brodal Options gives up to 8 weeks of residual control.

Poor pre-emergent herbicide incorporation

In WA it is recommended that post-emergent applications of Brodal Options should be applied following a standard pre-emergent herbicide application. If the pre-emergent herbicide is not incorporated correctly, it is likely that weeds will emerge with the crop. It is important to treat these weeds to avoid early crop competition.

Mixing

Stir product or invert container several times before use. Half-fill the spray tank with clean water and add the correct amount of Brodal Options. Complete filling and ensure thorough mixing before commencing spraying.

TIMING

Recommended timing

Lupins WA

Brodal Options can be applied post-emergent to the crop following a standard pre-emergent simazine treatment. For optimal weed control Brodal Options should be applied post-emergent between the 2 and 6-leaf stage of the crop (usually 4–6 weeks post-sowing). Where a staggered germination of lupins occurs, it is important that the Brodal Options application is not delayed more than is necessary. Lupins are most sensitive to Brodal Options when the cotyledons are emerging and opening.

Lupins NSW, Vic, SA, Tas

Brodal Options can be applied either post-sowing pre-emergent to the crop in combination with simazine, or at the post-emergent stage (4–6 weeks post-sowing for best results) of the crop following pre-emergent simazine treatment.
DO NOT incorporate Brodal Options.

Field peas

Brodal Options should be applied post-emergent. The crop should be at the 3-node stage prior to application. Brodal Options can be applied up to the flowering stage, however, for optimal weed control Brodal Options should be applied early (4–6 weeks post-sowing) when weeds are small and actively growing.

Lentils

Brodal Options should be applied post-emergent after the 3rd leaf-node stage of the crop. Optimal weed control will be achieved if Brodal Options is applied early (4–6 weeks post-sowing). DO NOT apply to Northfield varieties.

COMPATIBILITY

Brodal Options is physically compatible with most currently registered grass herbicides as two-way tank-mixtures.

Brodal Options	Compatible Product
Up to 150 mL	Simazine (500 g/L product) up to 1.0 L/ha.
All rates	Dimethoate formulations, Lexone®, Sencor®, Hallmark® 50EC, Dominex 100EC®, Karate®, Decis® Forte 25EC, Talstar® and Le-Mat® 290 SC.

Warning: For tank-mixtures with grass herbicides, use the recommended rates for both herbicides as well as the surfactant recommendations of the grass herbicide. Read the label for the grass herbicide before mixing and using the tank-mixtures.

DO NOT use crop oils with Brodal Options or Brodal Options/grass herbicide tank-mixtures. Applications to lupins and field peas under stressed conditions may cause significant damage to the crop.

Mixtures of Brodal Options and Verdict® applied to lupins or field peas can cause damage which may result in yield losses. Consult your local Bayer CropScience representative or the relevant grass herbicide manufacturer for advice on the application and timing of tank-mixtures.

It may be economically more sensible to apply Brodal Options and the grass herbicide separately.

The Brodal Options should be applied early on young weeds to provide good knockdown and residual control. Grasses can be controlled with a grass herbicide once all grasses have emerged.

Tank-mixes with simazine should be applied post-emergent to lupins crops only. Increased crop effects may be experienced with the tank-mix.

DO NOT apply tank-mixtures to clover.

DO NOT use crop oils.

DO NOT apply these mixtures to crops suffering any form of stress. Stress can be caused by disease, insect or herbicide damage, nutrient deficiencies or waterlogged conditions.

As formulations of other manufacturers' products are beyond the control of Bayer CropScience, all mixtures should be tested prior to mixing commercial quantities.

CROP SAFETY

Clover tolerance table

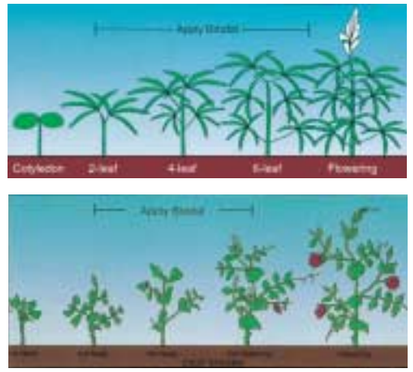
Variety	Effect on vegetative growth
Arrowleaf (Zulu)	Moderate
Balansa (Paradana)	Moderate
Persian (Kyambro)	Minimal
Strawberry (Palestine)	Moderate
Subterranean (Clare)	Moderate
Subterranean (Junee)	Moderate
Subterranean (Karridale)	Moderate
Subterranean (Larissa)	Moderate
Subterranean (Mt Barker)	Moderate
Subterranean (Seaton Park)	Minimal
Subterranean (Trikkala)	Minimal
Subterranean (Woogenellup)	Moderate
White (Haifa)	Moderate
Reduction in growth –	**Minimal (0–20%), Moderate (20–50%)**

The following varieties of subterranean clover have been tested for effects on seed yield: Seaton Park, Trikkala and Woogenellup. Some reduction in seed yield may occur with Trikkala.

Brodal Options forms a barrier on the soil surface to provide residual control of wild radish seedlings. This barrier is resistant to leaching but is effectively inactivated by cultivation. For this reason, the use of Brodal Options in field peas and lupins presents no plant-back risk to following cereal crops or legume-based pastures.

Apply Brodal Options early with confidence

Brodal Options can be applied pre- or post-emergent (see state recommendations) to lupin crops, and early post-emergent to field pea and lentil crops with a high degree of crop selectivity. After application, some transient crop discolouration may occur. This usually appears as yellow or white bleaching on the leaves. New growth and subsequent yield will be unaffected.



Lupin tolerance data (WA only)

	Belara	Kalya	Merrit	Myallie	Tallerack
Untreated	96 (6)	95 (6)	95 (6)	96 (5)	96 (6)
Simazine 2 L	99 (8)	98 (8)	98 (7)	99 (6)	97 (8)
Atrazine 2 L	90 (5)	94 (5)	96 (5)	99 (5)	94 (5)
Brodal Options 100 mL*	99 (1)	94 (1)	N/D	N/D	106 (1)
Brodal Options 200 mL*	102 (9)	96 (9)	100 (8)	100 (6)	101 (9)
Brodal Options/Lexone 60 mL/60 g*	92 (1)	102 (1)	103 (2)	97 (2)	102 (2)
Brodal Options/Lexone 100 mL/100 g*	94 (8)	96 (7)	98 (6)	105 (4)	102 (7)
Eclipse 10 g*	97 (7)	91 (7)	90 (6)	95 (6)	101 (7)

	Quilinock	Tanjil	Wodjil	Gungurru	Wonga
Untreated	N/D	100 (4)	74 (1)	100 (1)	100 (1)
Simazine 2 L	100 (2)	96 (5)	100 (2)	100 (2)	100 (2)
Atrazine 2 L	97 (1)	87 (2)	80 (2)	N/D	N/D
Brodal Options 100 mL*	N/D	103 (1)	N/D	99 (1)	93 (1)
Brodal Options 200 mL*	95 (2)	101 (6)	89 (2)	102 (3)	101 (3)
Brodal Options/Lexone 60 mL/60 g*	N/D	N/D	101 (1)	N/D	N/D
Brodal Options/Lexone 100 mL/100 g*	96 (2)	91 (6)	57 (1)	93 (3)	91 (3)
Eclipse 10 g*	97 (2)	89 (4)	80 (2)	91 (1)	85 (1)

( ) Indicates the number of trials

N/D – No Data available

*Treatments follow pre-emergent application of simazine 500 g/L @ 2 L/ha

(Trial data: AgWA 97WH22, 98WH69, 98WH70, 98GS103, 99MW37, 99WH72, 99WH74, HD00AUSK02G, HD00AUSK02C, Agritech tolerance screen 1999)

GENERAL INSTRUCTIONS

Protection of wildlife, fish, crustaceans and the environment

DO NOT contaminate streams, rivers or waterways with the chemical or used containers.

DO NOT apply under meteorological conditions or from spraying equipment which could be expected to cause drift onto nearby plants, adjacent crops, crop-land or pastures.

Storage and disposal

Keep out of reach of children. Store in the closed, original container in a dry, well-ventilated area, as cool as possible.

DO NOT store for prolonged periods in direct sunlight. Store in a locked room or place away from children, animals, food, feedstuffs, seed and fertilisers. Triple or (preferably) pressure-rinse containers before disposal. Add rinsings to the spray tank.

DO NOT dispose of undiluted chemicals on-site. Break, crush, or puncture and bury empty containers in a local authority landfill. If not available, bury the empty containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, vegetation and roots. Empty containers and product should not be burnt.

SAFETY DIRECTIONS

Avoid contact with eyes and skin. Wash hands after use.

First Aid

If poisoning occurs, contact a doctor or Poisons Information Centre.

Wash sprayer thoroughly after use.

DO NOT contaminate dams, streams, rivers or waterways with the product or used container.

S.T.A.R. PROGRAM

The S.T.A.R. program is a simple set of guidelines designed to optimise herbicide results, and to minimise failures. The basic principles apply to all herbicides. While it is impossible in any dynamic and changing biological system to guarantee anything, following the S.T.A.R. program can reduce the risk of herbicide failure. The program's aim is to promote understanding and management of the four major factors which influence herbicide effectiveness.

STRESS

Stress can lower a herbicide's effectiveness

Before using chemicals, ask:

- Is the soil waterlogged?
- When did it last rain?
- Are there insect pests present?
- Have there been frosts?
- Are nutrients sufficient?

TIMING

Early spraying returns greater yields

Spraying at the optimum time:

- Gives greater effectiveness
- Minimises weed competition
- Maximises yield
- Helps achieve better spray penetration and coverage

APPLICATION

Correct application ensures optimum results

Aim for maximum coverage:

- Check and clean equipment
- Change nozzles regularly
- Follow directions on water volume, and spraying speed
- Spray when weeds are young
- Don't mix products which are not recommended

RATE

Cutting rates does not save money

Using recommended rates:

- Gives maximum effectiveness and consistency
- Increases the speed of weed control
- Helps overcome possible unknown stress, timing or application problems
- Maximises yield response

QUESTIONS AND ANSWERS

Most commonly asked questions about Brodal Options:

1. How does Brodal Options act as both a pre-emergent and a post-emergent herbicide?
As a pre-emergent, Brodal Options (diflufenican) is strongly bound to organic and soil colloids, forming a continuous layer on the surface of the soil which is resistant to leaching. As the shoots of germinating weeds pass through this layer, they come into contact with it and absorb the product. The more even the distribution of the herbicide on the soil, the better the contact. Residual control will be more effective where a combination of higher rates, adequate soil moisture and complete soil surface coverage is achieved.
Diflufenican also enters the young roots developing superficially in the treated layer. Weeds germinating on or very near the soil surface can therefore receive diflufenican via both shoots and roots and are generally very susceptible.

As a post-emergent herbicide, diflufenican penetrates foliar tissues. There is also contact action on buds and young leaves, particularly those of broadleaf weeds.

2. Will Brodal Options cause any plant-back problems in subsequent cereal crops or legume-based pastures?
NO. Although the barrier of diflufenican on the soil surface is resistant to leaching, providing up to eight weeks' residual weed control, it is effectively broken up by cultivation.

3. What symptoms will weeds exhibit after being affected by Brodal Options?
The first symptoms are extensive bleaching or whitening of new growth. Diflufenican is a major inhibitor of phytoene dehydrogenase, a key enzyme of carotenoid biosynthesis. The yellow carotenoid pigments perform several functions in plants, particularly in the absorption of light for photosynthesis. They also protect the plant from photo-oxidation caused by the surplus of light energy accumulated by chloroplasts. Diflufenican destroys these pigments, thereby inhibiting chloroplast development and chlorophyll biosynthesis.
The red-purple colour of the foliage, often observed after application, is the result of stress caused by the absence of carotenoids. Soon after, the seedlings exhibit necrosis and die.

4. Why do some plants seem to keep growing for a period of time following application of Brodal Options?
Diflufenican cannot directly destroy existing carotenoids in mature tissues. The photosynthesis process can therefore still continue some time after application. Herbicidal action is exerted mainly on new and developing plant tissues. The quickest effect is obtained after pre- or early post-emergent treatment of young seedlings. This is why application to young weeds is very important to ensuring you get the best result from Brodal Options. Weeds germinating near the soil surface may develop to the cotyledon stage before death occurs

5. What is the optimum application time for Brodal Options in lupin and field pea crops?
Brodal Options is best applied to lupin crops between the 2–6 leaf stage, and under normal growing conditions this usually occurs 4–6 weeks after sowing. Applying Brodal Options earlier (than the lupin 2-leaf stage) can result in transient crop damage (lupins are most sensitive to Brodal Options when the cotyledons are emerging and opening), whilst applications at later crop stages generally correspond with weeds which are too big to be effectively controlled.
In field peas, Brodal Options is best applied at the 3–5-node stage. Under normal growing conditions this generally occurs 4–6 weeks after sowing. Applications to later crop stages usually correspond with larger weeds which are more difficult to control, whilst application to young field pea plants (e.g. 1-node) can damage them.

6. Should I wait for the majority of wild radish to germinate before I apply Brodal Options?
NO. Wild radish is notorious for staggered germinations. As Brodal Options provides both knockdown of existing weeds and residual control of subsequent germinations, it's important to apply Brodal Options early, eliminating existing weed control and maximising yield potential. Invariably, early applications of Brodal Options to weeds (e.g. 2-leaf) will result in a better crop yield potential when compared with crops where weeds are treated later (e.g. 6-leaf).

7. What tank-mix options do I have with Brodal Options?
In many cases the weed spectrum of Brodal Options can be complemented by tank-mixing with flowable formulations of simazine (lupins only), MCPA 500 (field peas only), and metribuzin. Do not apply tank-mixtures to lentils. Care should be taken not to apply Brodal Options in a tank-mix with a grass herbicide to crops suffering from any form of stress. Do not use crop oils when applying Brodal Options and a grass herbicide.
Where crops are under stress, a split application is recommended;
– Apply Brodal Options early to control wild radish and utilise the residual control component.
– Apply the grass herbicide later, after most of the grasses have germinated.
Brodal Options can also be tank-mixed with most commonly used insecticides such as dimethoate, Decis Forte EC and Talstar.

8. What steps should I be taking to avoid the onset of diflufenican-resistant weeds?
Bayer CropScience acknowledges the importance, and supports the adoption, of integrated weed management (IWM) strategies as a means of managing herbicide-resistant weed populations. Maintaining the effectiveness (and ultimately the longevity) of diflufenican is in everyone's interest, given its importance for broadleaf weed control in Australian cropping systems. In this context it is vital to employ a range of different but supportive methods of weed control, rather than rely on any single weed-control technique.
One of the most important strategies in an IWM program is rotating herbicides from different chemical groups. Diflufenican is also formulated in cereal and pasture-based products such as Tigrex® and Jaguar®. For this reason it is important that following or preceding an application of Brodal Options, Tigrex or Jaguar should either not be applied or used in a tank-mix with an additional active ingredient with a different mode of action.
More reliable results are generally gained by using strategic applications of diflufenican at rates which provide good weed control (i.e. recommended label rates), and thereby possibly reducing the frequency of use.
Additional IWM strategies include:
– Ensuring that crops have good vigour (providing natural competition with weeds),
– Integrating grazing animals in cropping rotations,
– Using seed collection and/or destruction units during harvest, and
– Crop-topping certain grain legume crops at the end of the season to reduce weed seed-set.

9. How can Brodal Options be used to maintain lupin seed viability?
Agriculture WA research has shown that storing lupin seed contaminated with green wild radish seed will significantly reduce lupin seed viability. The use of Brodal Options to control wild radish in lupin crops eliminates weed-seed contamination, in turn preventing the reduction in lupin seed viability.

10. What is the rainfast period for Brodal Options?
DO NOT apply Brodal Options if rainfall is expected within 4 hours of application.