



Department of  
Primary Industries

# Weed control in winter crops 2020

NSW DPI MANAGEMENT GUIDE



Greg Brooke, Colin McMaster and Penny Heuston

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**Illustrations:** originals by Alison Chambers and Dianne Gardoll, formerly NSW DPI. Redrawn by Michel Dignand.

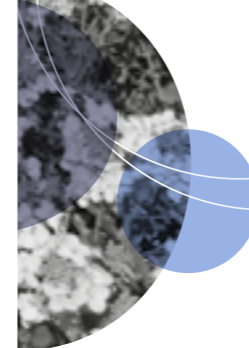
The Pulse Crop Growth Stages diagrams are reproduced with the permission of Di Holding and Annabel Bowcher, formerly CRC for Australian Weed Management.

This publication is a companion to the following guide available in 2020 from your local NSW Department of Primary Industries office: *Winter crop variety sowing guide 2020* (publication due mid April 2020).



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# What's new in 2020

## Accolade® 250 SC Fungicide – new product and registration

Accolade® 250 SC (250 g/L azoxystrobin) is the first registration of an azoxystrobin product for tank-mixing with either tebuconazole or epoxiconazole to control most foliar diseases in wheat and barley (refer to Table 41 and Table 51).

## Condor® Herbicide – new product

Condor® (10 g/L pyraflufen-ethyl + 375 g/L MCPA as the potassium salt) is registered for controlling broadleaf weeds in wheat, barley and oats. It has a post emergent application to seedling weeds. A unique formulation that combines the fast action of pyraflufen-ethyl (Group G) plus the systemic action of MCPA (Group I). This provides two modes of action for improved control and resistance management.

## CRUCIAL® replaces Weedmaster® Argo®

CRUCIAL® is a 600 g/L triple salt, triple surfactant liquid formulation, making it compatible and effective. It has the full range of registrations from both the Weedmaster® DST and Weedmaster® ARGO labels.

## ForageMax® – new registration

ForageMax® (100 g/L halauxifen +50 g/L aminopyralid) is now registered for use in 4–8 leaf canola for controlling certain broadleaf weeds.

## Frequency®

Frequency® Herbicide – A post-emergent, Group H herbicide from BASF to control broadleaf weeds in wheat, durum & barley, with versatility in tank mixing options to tailor solutions for specific weed sizes, spectrums and resistance issues.

## Luximax® Herbicide

Luximax® (750 g/L cinmethylin). A pre-emergent herbicide with a unique mode of action (Group Z) for use in wheat offering a high level of residual control of annual ryegrass (including biotypes resistant to existing mode of action groups including Group K).

## Pyresta® Xtreme® LV replaces Pyresta®

Pyresta® Xtreme® LV (2.1 g/L pyraflufen-ethyl + 600 g/L 2,4-D). A low volatile 2,4-D herbicide for improving in the brownout in a range of broadleaf and grass weeds when mixed with glyphosate-based products.

## Sledge® – new registration

Sledge® (25 g/L pyraflufen-ethyl) replaces Ecopar® (20 g/L pyraflufen-ethyl) when used before sowing a winter crop, starting a winter fallow, or fallow (see Table 13). The label has been updated with information for controlling additional weeds such as hellebore, wild radish, sow thistle and cotton volunteers.

## Terbyne® Xtreme® 875 WG Herbicide – new registration

Terbyne® Xtreme® 875 WG (875 g/kg terbuthylazine) is now approved for application to fallows before planting mung bean, soybean, barley, oats and wheat. Refer to the label for plantback details.

# Effective weed control in winter crops

Effective weed control in winter crops is a vital part of successful and profitable crop production. Yield losses from weeds can vary enormously from being almost negligible to a complete loss.

Weeds lower crop yields by competing for soil moisture, nutrients, space and light and can carry diseases that attack crops. This competition reduces grain yield and quality, and can impede harvesting.

Some weeds can restrict cropping options as herbicides for control are sometimes limited. Thoroughly investigate which weed species are likely to germinate in a paddock before sowing crops with limited herbicide control options.

Weed control is a numbers game. Growers should aim to reduce numbers and keep them low with an ongoing program. An integrated weed management system, combining all the available methods, is the key to successful weed control.

**Crop rotation** A well-managed rotation in each paddock (alternating pastures, broadleaf and cereal crops) is a useful technique to control weeds. For example, grass weeds are more easily and cheaply controlled chemically in broadleaf crops, whereas broadleaf weeds are much easier to control in cereal crops. In parts of northern NSW, alternating summer and winter crops is a time-honoured strategy for weed control. Good crop rotations can substantially reduce the cost of chemical weed control.

**Haymaking or silage-making** in crops and pastures can effectively reduce the weed burden.

**Pasture management** techniques such as pasture topping by mowing or using herbicides, spray grazing, strategic heavy grazing or burning can all be part of your weed control program. Cleaning grasses out of legume pastures in winter is a common practice, which involves spraying grasses such as barley grass and vulpia out of pastures to stop seed set, improve nitrogen build-up and reduce root diseases in the subsequent cereal crops.

**Good agronomic practices** such as using weed-free seed, sowing on time with optimal plant populations and adequate nutrition all contribute to good weed control management. Be extremely vigilant with new weed incursions, not allowing them to set seed. Some crops and varieties are more competitive against weeds than others. All weeds growing in a field should be controlled before the crop emerges. Large weeds that have not been controlled before, or by, sowing prove most difficult and often impossible to manage with in-crop herbicides.

**Timely cultivation** is a valuable method for killing weeds and preparing seedbeds. Some growers use varying combinations of mechanical and chemical weed control to manage their fallows or stubbles.

**Harvest weed-seed management** is now considered imperative in both delaying and dealing with herbicide-resistant weed populations. See the [Grains Research and Development Corporation](http://www.grdc.com.au/) (<http://www.grdc.com.au/>) website for further information.

**In-crop weed control** – a wide range of pre-emergent and early post-emergent herbicides are available. Weeds should be removed from crops as early as possible and no later than six weeks after sowing to minimise yield losses. Yield responses will depend on weed species, weed and crop density and seasonal conditions. The growth stages of both weed and crop, as well as the effects of environmental conditions on plant stress and herbicide efficacy must be considered before spraying. Tolerance to herbicides varies between cereals and between the varieties of each cereal. Read herbicide labels carefully for these details and information on the best conditions for spraying.

## USEFUL RESOURCES

[The Cotton Field Awareness Map](https://crop.satamap.com.au/) (<https://crop.satamap.com.au/>) is intended to help minimise off-target damage from downwind pesticide application, particularly during fallow spraying.

See [Reducing herbicide spray drift](#) for further information.

## HERBICIDE RESISTANCE

in weeds is an increasing problem in NSW and one to which growers must remain alert. It is one of the biggest agronomic threats to cropping sustainability. However, good crop and pasture rotation, rotating herbicide groups and combining chemical and non-chemical weed control methods can help manage the problem. Each table throughout this guide lists the mode of action group for each herbicide (see [Herbicide resistance management on page 58](#)).

# Weed glossary

amaranth	<i>Amaranthus</i> spp.	New Zealand spinach	<i>Tetragonia tetragonoides</i>
amsinckia	<i>Amsinckia</i> spp.	Noogoora burr	<i>Xanthium occidentale</i>
annual ground cherry	<i>Physalis angulata</i>	nut grass	<i>Cyperus rotundus</i>
annual ryegrass (Wimmera)	<i>Lolium rigidum</i>	oxalis/soursob	<i>Oxalis</i> spp.
barley grass	<i>Hordeum leporinum</i>	paradoxa grass	<i>Phalaris paradoxa</i>
barnyard grass	<i>Echinochloa crus-galli</i>	Paterson's curse	<i>Echium plantagineum</i>
Bathurst burr	<i>Xanthium spinosum</i>	peachvine/cowvine	<i>Ipomea lonchophylla</i>
bedstraw	<i>Galium tricornutum</i>	peppergrass	<i>Lepidium</i> spp.
bellvine	<i>Ipomoea plebeia</i>	phalaris (annual)	<i>Phalaris minor</i> ; <i>Phalaris paradoxa</i>
bifora	<i>bifora</i> spp.	phalaris (perennial)	<i>Phalaris aquatica</i>
black bindweed/ climbing buckwheat	<i>Fallopia convolvulus</i>	pigweed	<i>Portulacca oleracea</i>
blackberry nightshade	<i>Solanum nigrum</i>	plantain	<i>Plantago</i> spp.
bladder ketmia	<i>Hibiscus trionum</i>	potato weed	<i>Solanum</i> spp.
Boggabri weed	<i>Amaranthus mitchelli</i>	prickly/wild lettuce	<i>Lactuca</i> spp.
brome grass	<i>Bromus</i> spp.	red root amaranth	<i>Amaranthus retroflexus</i>
buchan weed	<i>Hirschfeldia incana</i>	rough poppy	<i>Papaver hybridum</i>
button grass	<i>Dactyloctenium radulans</i>	saffron thistle	<i>Carthamus lanatus</i>
caltrop (yellow vine)	<i>Tribulus terrestris</i>	scotch thistle	<i>Onopordum acanthium</i>
canary grass	<i>Phalaris canariensis</i>	shepherd's purse	<i>Capsella bursa-pastoris</i>
capeweed	<i>Arctotheca calendula</i>	skeleton weed	<i>Chondrilla juncea</i>
charlock	<i>Sinapis arvensis</i>	slender thistle	<i>Carduus pycnocephalus</i>
cleavers	<i>Galium aparine</i>	sorrel	<i>Rumex acetosella</i>
clovers	<i>Trifolium</i> spp.	soursob/oxalis	<i>Oxalis pes-caprae</i>
common barbgrass	<i>Monerma cylindrica</i>	sowthistle/milk thistle	<i>Sonchus</i> spp.
common chickweed	<i>Stellaria media</i>	spear/black thistle	<i>Cirsium vulgare</i>
corn gromwell/sheep weed/ white iron weed	<i>Buglossoides arvense</i>	spiny emex/doublegee	<i>Emex australis</i>
couch	<i>Cynodon dactylon</i>	spurge	<i>Euphorbia</i> spp.
cowvine	<i>Ipomoea lonchophylla</i>	St Barnaby thistle	<i>Centaurea solstitialis</i>
crassula/stonecrop	<i>Crassula</i> spp.	star thistle	<i>Centaurea calcitrapa</i>
cudweed	<i>Gnaphalium</i> spp.	stinging nettle	<i>Urtica</i> spp.
datura (thornapple)	<i>Datura</i> spp.	stink grass/black grass	<i>Eragrostis cilianensis</i>
deadnettle	<i>Lamium amplexicaule</i>	stinking goosefoot	<i>Chenopodium</i> spp.
docks	<i>Rumex</i> spp.	storksbill/Erodium	<i>Erodium</i> spp.
erodium/storksbill	<i>Erodium</i> spp.	sweet summer grass	<i>Digitaria</i> spp.
false castor oil	<i>Datura stromonium</i>	toad rush	<i>Juncus bufonius</i>
fat hen	<i>Chenopodium album</i>	turnip weed	<i>Rapistrum rugosum</i>
feathertop Rhodes grass	<i>Chloris virgata</i>	variegated thistle	<i>Silybum marianum</i>
fleabane	<i>Conyza</i> spp.	vetch	<i>Vicia</i> spp.
fumitory	<i>Fumaria</i> spp.	vulpia/silver grass	<i>Vulpia bromoides</i> , <i>Vulpia myuros</i>
great brome	<i>Bromus diandrus</i>	wild oat	<i>Avena fatua</i> , <i>Avena ludoviciana</i>
heliotrope (white/common)	<i>Heliotropium europaeum</i>	wild radish	<i>Raphanus raphanistrum</i>
Hexham scent	<i>Melilotus indicus</i>	wild turnip	<i>Brassica tournefortii</i>
hoary cress	<i>Cardaria draba</i>	winter grass	<i>Poa annua</i>
horehound	<i>Marrubium vulgare</i>	wireweed/hogweed	<i>Polygonum aviculare</i>
Johnson grass	<i>Sorghum halepense</i>		
lesser swine cress	<i>Coronopus didymus</i>		
liverseed grass	<i>Urochloa panicoides</i>		
marshmallow	<i>Malva parviflora</i>		
medics	<i>medicago</i> spp.		
melon camel/afghan	<i>Citrullus lanatus</i>		
melon paddy/prickly	<i>Cucumis myriocarpus</i>		
Mexican poppy	<i>Argemone ochroleuca</i>		
mintweed	<i>Salvia reflexa</i>		
mouse-ear chickweed	<i>cerastium</i> spp.		
mustards	<i>Sisymbrium</i> spp.		



# Cereal growth stages – the Zadoks scale

A decimal scale describing cereal crop growth stages is now widely used.

This scale, called the Zadoks decimal code, describes the principal growth stages, labelled 0 to 9:

Each primary growth stage is further subdivided into secondary stages extending the scale from 00 to 99.

The first number represents the growth stage and the second the numbers of plant parts, e. g. Z12 indicates a young plant with only two leaves fully unfolded, commonly referred to as the 2-leaf stage.

A series of pairs of numbers can be used to further describe the growth stage. For example Z14/21 indicates the main tiller with four fully unfolded leaves, commonly referred to as the 4-leaf stage, but this plant has one more tiller. Note that additional tillers are counted separately from the main tiller.

The Zadoks scale is based on the individual plant, not the general appearance of a crop. Therefore, to use the scale, a representative selection of plants should be examined from a paddock.

Growth terms used elsewhere in this guide, extracted from registered labels, and their Zadoks equivalents are:

**3-leaf:** Three fully unfolded leaves on main shoot only. Zadoks 13.

**5-leaf:** Five fully unfolded leaves on main shoot only. Zadoks 15.

**Tillering – Tiller formation period.**

Plants past seedling stage and before stem elongation. Zadoks 21 to Z29.

**Jointing:** Crop becoming erect or booting up to the stage when the flag leaf is just visible. Zadoks 31 to Z37.

**Boot:** Head plainly felt in stem before head emergence. Zadoks 40 to Z45.

**PRINCIPAL GROWTH STAGES**

- 0 – Germination
- 1 – Seedling growth
- 2 – Tillering
- 3 – Stem elongation
- 4 – Booting
- 5 – Ear emergence
- 6 – Flowering
- 7 – Milk development
- 8 – Dough development
- 9 – Ripening

The main stages of interest to cereal producers applying herbicides are:

- 1. Seedling growth
- 2. Tillering
- 3. Stem elongation
- 4. Booting

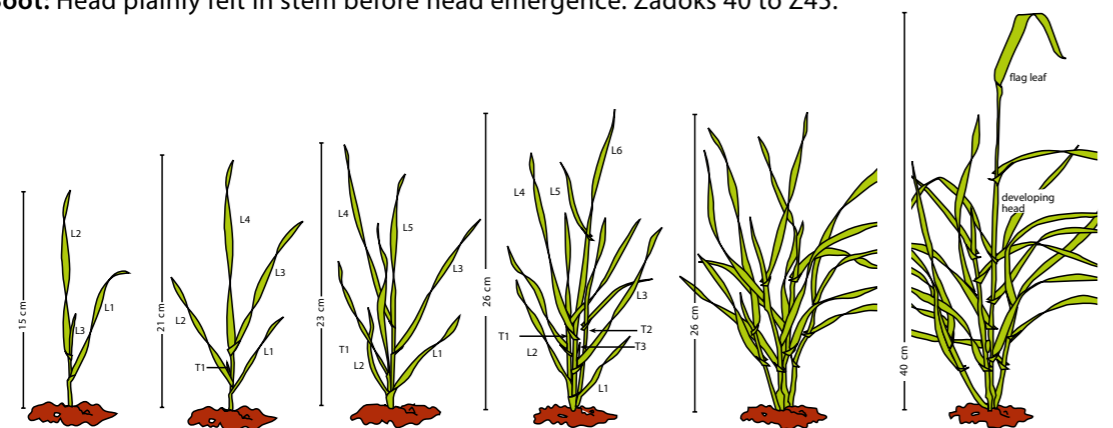


Figure 1. Growth stages of cereal crops

Crop growth stage					
2 leaf stage Two leaves (L) have unfolded; third leaf present, yet to fully expand.	Start of tillering First tiller (T1) appears from between a lower leaf and the main shoot. Usually 3 or 4 leaves are on the main tiller.	Tillering Tillers come from the base where leaves join the stem and continue forming, usually until there are 5 leaves on the main shoot. Secondary roots developing.	Fully tillered Usually no more tillers form after the very young head starts forming in the main tiller. Tillering completed when first node detected at base of main stem.	Start of jointing Jointing or node formation starts at the end of tillering. Small swellings – joints – form at the bottom of the main tiller. Heads continue developing and can be seen by dissecting a stem.	Early to mid booting The last leaf to form – the flag leaf – appears on top of the extended stem. The developing head can be felt as a swelling in the stem.
Zadoks scale					
2 leaves unfolded (Z12).	4 leaves unfolded (Z14). Main shoot and 1 tiller (Z21).	5 leaves on main shoot or stem (Z15). Main shoot and 1 tiller (Z21).	6 leaves on the main shoot or stem (Z16). Main shoot and three or more tillers and onwards (Z23–30).	First node formed at base of main tiller (Z31).	Z40–45.

## Using the growth stages of cereal crops to time herbicide applications

The recommended timing for applying each herbicide is indicated in the chemical control tables in this guide.

The terms 'early tillering' and 'late tillering' are not definitive and are commonly used in a very general sense. The number of fully emerged main shoot or stem leaves, together with the number of tillers when there is more than one, is the only accurate measure of the growth stage of a cereal plant. See the diagrams, and Cereal growth stages – Zadoks on page 4.

Table 1. Growth stages for herbicide application

Product	Chemical	Cereal growth stage – Zadoks scale							
		2 leaf 12	3 leaf 13	4 leaf 14	5 leaf – early till 15–21	Mid till 25	Late till 29	Full till – jointing 30–36	Booting 40–49
2,4-DB									
2,4-D ester	2,4-D LV ester								
Achieve® WG	Tralkoxydim								
Agtryne® MA	Terbutryn + MCPA								
Amicide® Advance 700	2,4-D amine								
Aptitude®	Metribuzin + carfentrazone-ethyl								
Associate®	Metsulfuron-methyl								
Atlantis® OD	Mesosulfuron-methyl				wheat only				
Axial® Xtra	Pinoxaden + cloquintocet-mexyl								Up to Z49
Broadside®	Bromoxynil + MCPA + dicamba								
Bromicide® 200	Bromoxynil				low rate only at 3–5 leaf stage				
Bromicide® MA	Bromoxynil + MCPA								
Broadstrike™	Flumetsulam								
Chlorsulfuron 750 WG	Chlorsulfuron								
Condor®	MCPA + pyraflufen-ethyl				Wheat and oats only. Low rate only at 2-leaf stage				
Decision®	Diclofop-methyl + sethoxydim								
Diuron 900 WG	Diuron				to Z14				
Eclipse® 100 SC	Metosulam							1st node	
Ecopar®	Pyraflufen-ethyl								
Eliminar®C	Bromoxynil + picolinafen								
FallowBoss® Tordon®	Picloram + 2,4-D + aminopyralid								
Flight® EC	MCPA + picolinafen + bromoxynil								
Frequency	Topramezone								
Hotshot®	Aminopyralid + fluroxypyr							1st node	
Hussar® OD	Iodosulfuron-methyl-sodium								
Igran® 500 Flowable	Terbutryn								
Intervix®	Imazamox + imazapyr								
Jaguar®	Bromoxynil + diflufenican								
Kamba® 750	Dicamba								
Kamba® M	MCPA + dicamba								
Lontrel™ Advanced	Clopyralid								
LVE MCPA 570	MCPA 570 g/L								
Sulfosulfuron 750 WG	Sulfosulfuron				wheat and triticale only, 1st–2nd tiller stage				
OnDuty®	Imazapic + imazapyr								
Paradigm®	Florasulam + halauxifen								DO NOT apply after full flag leaf emergence (Z 39) for oats; and DO NOT apply after first awns are visible. (Z 49) for wheat, barley and triticale
Paragon®	MCPA + picolinafen								
Pixxaro®	Fluroxypyr + halauxifen								flag leaf
Precept®	MCPA + pyrasulfotole								
Rexade®	Pyroxulam + halauxifen								Wheat and triticale only (not durums) 1st node
Starane® Advanced	Fluroxypyr								
Stinger®	Aminopyralid + metsulfuron-methyl								1st node
Talinor®	Bicyclopyrone + bromoxynil + cloquintocet-mexyl								to Z32
Tigrex®	MCPA + diflufenican								
Topik® 240 EC	Clodinafop-propargyl								wheat only
Triathlon®	MCPA + bromoxynil + diflufenican								3 leaf to fully-tillered Z13–Z30
Trooper® 242	Picloram + MCPA								
Velocity®	Pyrasulfotole + bromoxynil								
Vortex®	Florasulam + 2,4-D ester								2nd node

Recommended and preferred timing  
Less preferred timing

The recommended application timing has been determined after significant research by the marketing company, aiming to minimise crop damage and maximise yield. Pay attention to two vital stages of crop development: at 3–5-leaf stage or when tillering starts; and at the start of jointing.

**In many cereal crops:**  
3 leaf (on main stem) stage is before tillering.  
5 leaf (on main stem) stage coincides with early tillering.  
6–7 leaf (on main stem) stage coincides with mid to fully tillered stage.  
Jointing or node formation indicates the start of the reproductive phase in the crop, and tillering can be said to be complete, i.e. fully tillered.

# Using herbicides successfully

Annual weeds typically compete most with cereals and broadleaf crops when the crops are in their earlier growth stages e.g. tillering in cereals. Weeds should be removed no later than six weeks after sowing to minimise losses, however, only rarely are selective herbicides completely non-toxic to the crop. Early post-emergence control nearly always results in higher yields than treatments applied after tillering in cereals or branching in broadleaf crops.

Points to remember for successfully using herbicides:

- Plan the operation: check paddock sizes, tank capacities, water availability and supply.
- Carefully check crop and weed growth stages before deciding upon a specific post-emergent herbicide. Use the diagrams in [Cereal growth stages – the Zadoks scale on page 4](#). Read the label: check to make sure the chemical will do the job; note any mixing instructions, especially when tank mixing two chemicals. This document is a guide ; it cannot tell you all the information you need to know.
- Follow the recommendations on the label.
- Conditions inhibiting plant cell growth, e.g. stress from drought, waterlogging, poor nutrition, high or low temperatures, low light intensity and disease or insect attack can inhibit good herbicide uptake and movement.
- Use good quality water, preferably from a rainwater tank. Bore, hard, dirty or muddy water needs special additives or conditioners to improve results with certain herbicides. See [Water quality for herbicide application on page 15](#).
- Use good equipment checked frequently for performance and output – see [Boomspray calibration on page 20](#).
- Check boom height with spray pattern operation for full target coverage.
- Check accuracy of boom width marking equipment.
- Check wind speed:
  - a light breeze helps herbicide penetration into crops.
  - Do not spray in strong wind; there could be spray drift onto sensitive crops and pastures, roadways, dams, trees, watercourses or public places. Note: All chemicals can drift – see [Reducing herbicide spray drift on page 24](#).
- Do not spray if rain is imminent or when heavy dew or frost is present. See [Rainfastness – stock withholding periods – harvest withholding periods on page 12](#) for rainfast periods.
- Calculate the amount of herbicide required for each paddock and tank load. Add surfactant where recommended. See [Boomspray calibration on page 20](#).
- Select the appropriate nozzle type for the application, see [Nozzle selection for post-emergent herbicides and fungicides on page 27](#). Beware of compromising nozzle types when tank mixing herbicides with fungicides or insecticides.
- Keep a record of each spray operation. Forms are available online from several sources.

## Identifying cereal seedlings

It is extremely important to accurately identify cereal plants before applying a herbicide for weed control. Cereal seedlings are identified by looking at four important characteristics. This involves taking a close look at the junction of the leaf blade and the leaf sheath (a hand lens is useful).

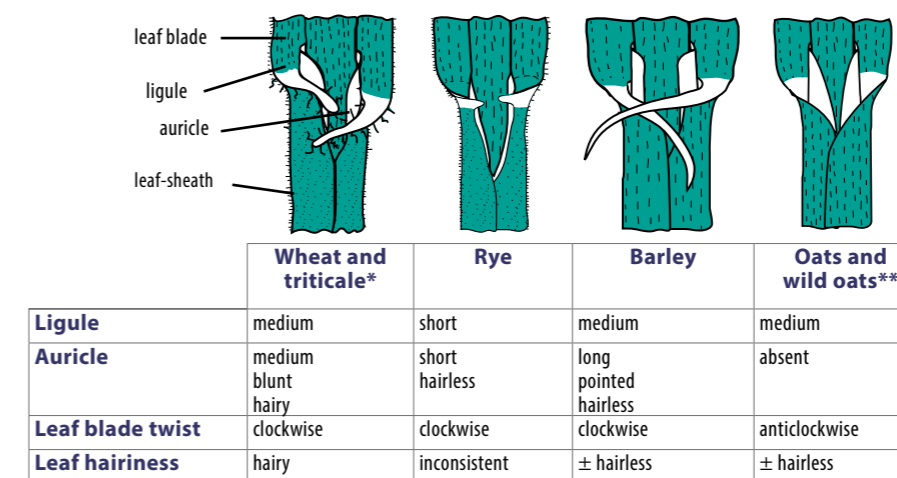


Figure 2. Cereal seedlings

**Important characteristics are underlined.**

- \* Wheat and triticale are difficult to distinguish by vegetative characters. It is possible to distinguish them during early growth by uprooting the seedling and observing the grain shell. Wheat grain shells are a light colour, and oval. Triticale grain shells are darker and longer.
- \*\* Oats cannot be distinguished from wild oats during vegetative growth.





Table 3. Guidelines for crop rotations – In-crop herbicides

Herbicide group	Associate® 1		Amicide® Advance 700 2 4b		Arcade® 3a		Atlantis® OD 4		Atrazine 900 WG 21		Balance® 750 WG 6		Boxer® Gold 2b		Broadstrike® 11		Chlorsulfuron 750 WG 14		Countdown® 22		Eclipse® 100 SC 23		Fequency® 34		Hotshot® 20		Hussar® OD		Intervix®		Logran® B-Power® 3 16				
	B	I	J	B	C	C	J&K	B	B	B	J	B	H	I	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B				
Soil pH 1:5 soil:water suspension method	pH 5.6–8.5																																		
Specific details																																			
Barley	6w		9mo		10w 7		3 12–6 13 mo	3 12–9 13 mo	9mo	9mo	18mo				6w		9mo	10mo 15 25	–	–	–	–													
Canola	9mo		9mo		9mo 9		6 12–9 13 mo	9 12–12 13 mo	12mo	22mo	–				4mo		9mo	34mo	12mo	12mo	12mo	24mo													
Canola (Clearfield)	10d		–		–		–	–	–	–	–			9mo		–	0d	–	–	–	–														
Cereal rye	6w		–		–		0d	0d	3mo	3mo	18mo			9mo		–	34mo	–	–	–	–														
Chickpea	9mo		9mo		–		3 12–6 13 mo	3 12–9 13 mo	–	–	–			4mo		9mo	10mo	12mo	12mo	12mo	24mo														
Cotton			12mo		7mo 9		6 12–9 13 mo	–	–	–	–			4mo		12mo	34mo	15mo	15mo	18mo	24mo														
Faba bean	9mo		11mo		9mo 8		6 12–9 13 mo	9 12–12 13 mo	12mo	22mo	–			4mo		9mo	10mo	12mo	–	–	24mo														
Field pea	9mo		9mo		9mo 8		3 12–6 13 mo	3 12–9 13 mo	12mo	22mo	–			4mo		9mo	10mo	12mo	–	–	24mo														
Lentils	9mo		11mo		21mo 10		6 12–9 13 mo	9 12–12 13 mo	–	–	–			4mo		21mo	34mo	–	–	–	–														
Linseed	9mo		–		–		–	–	12mo	22mo	–			9mo		–	34mo	12mo	–	–	24mo														
Lucerne	9mo		9–21mo 5		9mo 9		3 12–6 13 mo	3 12–9 13 mo	12mo	22mo	–			9mo		9mo	10mo	12mo	–	–	24mo														
Lupins	9mo		9mo		–		6 12–9 13 mo	9 12–12 13 mo	12mo	22mo	–			4mo		9mo	10mo	12mo	–	–	24mo														
Maize	14mo		12mo		10w 7		0d	0d	18mo	26mo	–			6w		–	34mo	15mo	15mo	18mo	24mo														
Medic	9mo		21mo		21mo 10		0d	0d	12mo	22mo	–			9mo		21mo	10mo 15	12mo	–	–	24mo														
Millet			–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Millet (Japanese)	14mo		–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Millet (Panorama)	14mo		–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Millet (white French)	14mo		–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Mungbean			12mo		7mo 8		–	–	–	–	–			4mo		12mo	34mo	15mo	15mo	18mo															
Navy bean			–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Oats	9mo		9mo		10w 7		3 12–6 13 mo	3 12–9 13 mo	6mo	9mo	18mo			9mo		9mo	10mo 15	–	–	–	–														
Pigeon pea			–		–		–	–	–	–	–			9mo		–	34mo	–	–	–	–														
Safflower	9mo		–		–		–	–	12mo	22mo	–			4mo		–	34mo	–	–	–	–														
Sorghum	14mo		12mo		7mo 8		6 12–9 13 mo	–	18mo	26mo	–			9mo		12mo	34mo	15mo	15mo	18mo	24mo														
Soybean	14mo		12mo		7mo 8		0d	0d	18mo	26mo	–			9mo		12mo	34mo	15mo	15mo	18mo	24mo														
Sub-clover	9mo		9–21mo 5		21mo 10		3 12–6 13 mo	3 12–9 13 mo	12mo	22mo	–			9mo		9mo	10mo 15	12mo	–	–	24mo														
Sunflower	14mo		12mo		7mo 8		6 12–9 13 mo	–	18mo	26 mo	–			4mo		12mo	34mo	18mo	18mo	–	–														
Triticale	6w		9mo		–		0d	0d	0mo	0mo	0mo			9mo		9mo	10mo 15	–	–	–	–														
Vetch			9mo		9mo 8		6 12–9 13 mo	9 12–12 13 mo	–	–	–			9mo		9mo	10mo	–	–	–	–														
Wheat (Clearfield)			–		–		–	–	–	–	–			9mo		–	0d	–	–	–	–														
Wheat	10d		1d		10w 7		0d	0d	0mo	0mo	0mo			6w 33		1d	10mo 15	–	–	–	9mo 33														

KEY: d = days, w = weeks, mo = months

- 1 For pH 8.6 and above tolerance of crops (grown through to maturity) should be determined on a small scale, in the previous season, before sowing into larger areas.
- 2 When applied to dry soils, at least 15 mm of rain must fall before plantback period starts.
- 3 Additional rainfall/soil moisture requirements need to be observed – see label.
- 4 Rainfall of less than 250 mm following Atlantis® OD use will result in extended re-cropping intervals for winter crops sown the following season. Patchy rain with extended dry periods may also extend this period. Rainfall of less than 500 mm may result in extended re-cropping periods for summer crops in the following year. Use in soil above pH 8.5 is not recommended.
- 5 pH < 8.0 (under conditions of good seasonal rainfall) = 9 months, pH > 8.0 = 21 months.
- 6 Prolonged dry periods or cold conditions may result in extended re-cropping intervals, even if rainfall exceeds the required amount. Use on soils with pH less than 7.0 may result in extend recropping intervals. Cultivation is recommended before recropping.

- 7 100 mm minimum rainfall total between herbicide application and planting subsequent crop.
- 8 250 mm minimum rainfall total between herbicide application and planting subsequent crop.
- 9 350 mm minimum rainfall total between herbicide application and planting subsequent crop.
- 10 500 mm minimum rainfall total between herbicide application and planting subsequent crop.
- 11 For SNSW a minimum of 25 mm (preferably 50 mm) and NNSW a minimum of 50 mm (preferably 100 mm) must fall over the warmer months of the year. On shallow, duplex, low O.M. soils of less than 30 cm, do not plant until 2 years after application.
- 12 25 g/ha.
- 13 50 g/ha.
- 14 Chlorsulfuron 750 WG is not recommended on soils of pH 8.6 and above.
- 15 Additional requirements need to be met for certain non clearfield cereals – see label.
- 16 Where triasulfuron is applied at lower rates with trifluralin or post-emergent additional requirements need to be considered – see label.

Table 3. Guidelines for crop rotations – In-crop herbicides (continued)

Herbicide group	Lontrel® Advanced (600 g/L) 20		LV Ester 680 (680 g/L) 2 20		Luximax® 4b		Sulfosulfuron 750 WG 3		On Duty®		Precept®		Prometryn 900 DF 4b		Raptor® 25		Rexade® 27		Sakura® 850 WG		Simazine 900 DF 26		Spinnaker® 700 WG 27		Starane® Advanced 2b		Fallowboss® Tordon® 28		Velocity® 29			
	I	I	Z	B	B	B	B	B	B	B	I&H	I&H	C	B	B&I	K	C	B	I	I	H + C	H + C	H + C	H + C	H + C	H + C	H + C	H + C	H + C			
Soil pH 1:5 soil:water suspension method							pH < 6.5		pH 6.5–8.5		All soils		All soils		pH < 6.5		Alkaline															
Specific details									20 g/ha		40 g/ha		1.0 L/ha 250 mm 30		2.0 L/ha 250 mm 30		2.0 L/ha 250 mm 30		2.0 L/ha 500 mm		100 g/ha											
Barley			9mo		12mo	22mo	8mo 15	8mo 15	3w	3w	3w	3w			8mo	9mo																
Canola			9mo		10mo	22mo	34mo	34 mo	9mo	9mo	9mo	–			8mo	9mo																
Canola (Clearfield)			9mo		–	0d	0d	0d	9mo	9mo	9mo	–			–	–																
Cereal rye			–		–	10mo	34mo	34mo	–	–	–	–			–	–																
Chickpea			9mo		10mo	22mo	0mo	0mo	9mo	–	9mo	–			8mo	9mo																
Cotton			3mo		–	–	34mo	34mo	14mo	–	14mo	–			8mo	5mo																
Faba bean			9mo		12mo	22mo	0mo	0mo	9mo	–	9mo	–			8mo	9mo																
Field pea			9mo		10mo	22mo	0mo	0mo	9mo	9mo	9mo	–			8mo	9mo																
Lentils			9mo		10mo	22mo	34mo	34mo	9mo	–	9mo	21mo			8mo	9mo																
Linseed			–		–	–	34mo	34mo	–	–	–	–			–	–																
Lucerne			–		–	–	8mo	8mo	9mo	9mo	9mo	–			8mo	21mo																
Lupins			–		10mo	–	8mo	8mo	9mo	9mo	9mo	–			–	9mo																

Table 4. Rainfastness – stock withholding periods – harvest withholding periods

This table lists:

- **Rainfastness.** The time interval required between herbicide application and rainfall. Avoid applying herbicide when rain is imminent. However, certain herbicides may not be affected by some rain during or after spraying. The table suggests the time needed between spraying and rainfall for each herbicide to be effective.
- **Stock grazing or fodder production withholding periods.** This is the number of days you must wait after spraying before allowing stock to graze the area, to ensure the animal produce is free of pesticide residues. Check latest MRL data with individual companies for produce to be sold on export market.
- **Harvest withholding periods.** This is the number of days you must wait after spraying before harvesting grain, to ensure that grain is free of pesticide residues.

Herbicide	Rainfastness – hours	Stock withholding period – days/weeks	Harvest withholding period – days
2,4-D amine /2,4-D ester	6	7 days	Not required when used as directed.
2,4-DB	24	7 days	Not stated.
Achieve® WG	0.5	14 days	Not stated.
Agtryne® MA	6	7 days	Not stated.
Alliance®	Nil – see label	1 day, horses 7 days – see label	Not required when used as directed.
Associate®	2	Not required when used as directed. Linseed/safflower 7 days	Not required when used as directed.
Arcade®	Rain during and after application assists incorporation and activation	10 weeks	Not required when used as directed.
Atlantis® OD	8	28 days	56
Atrazine 900 WG	Rain required after application for best results	Canola (pre-emergent) 105 days Canola (post-emergent) 42 days	Not required when used as directed.
Avadex® Xtra	Light rain during or after spraying will not affect results	Cereals and grazing canola 12 weeks, pulses 13 weeks. Observe additional 28 day slaughter interval as per label.	Not required when used as directed.
Axial® 100 EC	0.5	21 days	Not required when used as directed.
Balance® 750 WG	Light rain during or after spraying will not affect results	Chickpea 6 weeks; fallow 8 weeks	Not required when used as directed.
Basta®	6	8 weeks post fallow spray	Not required when used as directed.
Bladex®	8	Don't graze treated immature crops or cut for stockfood.	Not required when used as directed.
Boxer Gold®	Rain during or after application assists incorporation and activation	Do not graze or cut for stock feed for 10 weeks.	Not required when used as directed.
Broadside®	3	14 days	Not stated.
Broadstrike®	4	Cereals, field pea, vetch, chickpea and lentil 28 days	Field pea, chickpea and lentil not required when used as directed; cereals 28
Brodal® Options	4	14 days	Not required when used as directed.
Bromicide® 200	3	Do not graze treated crops/areas for cut for stockfood for 8 weeks after application.	Not required when used as directed.
Bromicide® MA	4	8 weeks	Not required when used as directed.
Chlorsulfuron 750 WG	4	Nil	Not required when used as directed.
Condor®	6	14 days after application	Not required when used as directed.
Countdown®	Light rain during or after application will not affect results	10 weeks	Not required when used as directed.
CRUCIAL®	1	Wheat 5 days. All other uses not required when used as directed.	Wheat 5, canola 5, legumes 7. Other uses not required when used as directed.
Decision®	2	49 days	Not required when used as directed.
Diuron 900 WG	Do not apply if greater than 50 mm rainfall is expected	Pulses 35 days, other crops not required.	Not required when used as directed.
Dual Gold®	Do not apply if heavy rains or storms that are likely to cause run-off are forecast within 2 days of application	Canola 70 days; cereals 56 days	Not required when used as directed.
Eclipse® 100 SC	2	Cereals 14 days; lupin 28 days	Not required when used as directed.
Elantra® Xtreme®	3	4 weeks	Canola 77, field pea 63; Chickpea, faba bean, lentil 84; Lupin 42.
Eliminar® C	Do not apply if heavy rain is expected within 4 hrs	6 weeks	Not required when used as directed.
Factor® WG	0.5	Grazing 14 days	Not required when used as directed.
Fallowboss® Tordon®	4	28 days	Not required when used as directed.
Flight® EC	4	42 days	Not required when used as directed.
Frequency®	Do not apply if rain is expected within 2 hours. Do not apply if heavy rain or storms are forecast within 3 days.	Do not graze or cut for stock food for 6 weeks after application.	Not required when used as directed.
Fusilade® Forte	1	Linseed, canola 21 days; lupin, faba bean, field pea, chickpea 49 days	Canola, lupin, linseed 119; faba bean 35; field pea, chickpea 49
Garlon® 600	1	Not required when used as directed.	Not required when used as directed.
Gramoxone® 360 Pro	Light rain after spraying will not affect results	Horses 7 days; all other stock 1 day	7 for pulse crops
Grazon® Extra	1	Not required when used as directed.	Not required when used as directed.
Gundy 240	Rain assists soil incorporation and activation	28 days	Not required when used as directed.
Hammer® 400EC	1	14 days	Not required when used as directed.
Hotshot®	1	7 days	Not required when used as directed.
Hussar® OD	8	28 days	Not required when used as directed.

Table 4. Rainfastness – stock withholding periods – harvest withholding periods (continued)

Herbicide	Rainfastness – hours	Stock withholding period – days/weeks	Harvest withholding period – days
Igran®	6	7 cereals	7 cereals
Intervix®	2	4 weeks for Clearfield wheat and barley; 5 weeks for Clearfield canola.	Not required when used as directed.
Jaguar®	4	14 days	Not required when used as directed.
Kamba® 750	4	7 days	Not required when used as directed.
Logran® B-power	Not stated.	pre-emergent 49 days; post-emergent 14 days	Not required when used as directed.
Lontrel® Advanced	3	cereals, canola 7 days	Cereals 70; canola, not required when used as directed.
Luminex®	Do not apply if heavy rains or storms are forecast within 3 days. Rain during and after application assists incorporation and activation.	Do not graze or cut for stock food for 7 weeks after application.	Not required when used as directed.
MCPA	6	7 days	Not required when used as directed.
Sulfosulfuron 750 WG	Immediate rainfall may affect results.	Not required when used as directed.	Not required when used as directed.
OnDuty®	2	wheat 28 days, canola 42 days	Not required when used as directed.
Paradigm®	3	14 days	Not required when used as directed.
Paragon®	4	42 days	Not required when used as directed.
Pendimethalin 440EC	Light rain after application does not generally affect results and assists soil incorporation.	Not required when used as directed.	Not required when used as directed.
Pixxaro™	1	14 days	Not required when used as directed.
Precept®	2	wheat, oats, triticale, cereal rye 14 days; barley 28 days	Not required when used as directed.
Prometryn 900 DF	–	9 weeks	Not stated.
Pyresta® Xtreme®	6	grazing 7 days	Not required when used as directed.
Raptor®	2	field pea 42 days	Not required when used as directed.
Reglone®	Light rain during or after spraying will not affect results.	Horses 7 days; all other stock 1 day	Canola 4; lentil, chickpea 2; faba bean, field pea not required.
Rexade®	6	4 weeks	Not required when used as directed.
Sakura®	2	42 days	Not required when used as directed.
Sencor®	6	14 days	Not required when used as directed.
Sharpen® WG	1	After application do not graze or cut for stockfood for: Pulses – 7 days; lucerne – 4 weeks; wheat, barley, triticale – 14 days; other crops 5 weeks. Do not allow livestock to graze treated weds.	Pulses: do not harvest grain for 7 days after application. Wheat, barley and triticale: not required when used as directed. Other crops: Not required when used as directed. Refer also to tankmix products.
Shogun®	1	Vetch 3 days	Faba bean 49; safflower 140; chickpea, field pea, lentil 84; lupin 105; canola, linseed 112 Faba bean 161
Simazine 900 DF	On firm seedbeds light rain after use usually enhances activity.	Chickpea 63 days; faba bean 56 days; canola 105 days	Not required when used as directed.
Sledge®	2	7 days	Not required when used as directed.
Spinnaker® 700 WDG	2	14 days	Not required when used as directed.
Spray.Seed® 250	Light rain during or after spraying will not affect results.	Horses 7 days; all other stock 1 day	Not stated.
Starane® Advanced	1	7 days	Not stated.
Status®	1	21 days	Canola; chickpea, faba bean, field pea, lentil, lupin not required when used as directed.
Stinger®	1–48	21 days	Not required when used as directed.
Talinor™	2	6 weeks	Not required when used as directed.
Terbyne® Xtreme®	Not stated.	Canola and pulses 6 weeks; cereals 8 weeks	Not required when used as directed.
Terrain™	Dry weather post application can reduce efficacy; heavy rainfall after application can cause crop damage.	30 g/ha 2 weeks; chickpea, faba bean and field pea 12 weeks; wheat 6 weeks, when tank mixed with TrifluX 12 weeks.	Not required when used as directed.
Tigrex®	4	7 days refer to label for grazing precautions.	Not required when used as directed.
Topik® 240 EC	2	28 days	Not required when used as directed.
Triathlon®	4	14 days	Not required when used as directed.
Triflur® X	Light rain during or after spraying will not affect results.	Not required when used as directed.	Not stated.
Trifolamine®	4	7 days	Not stated.
Trooper® 242	4	7 days	Not required when used as directed.
Valor®	Do not apply for residual weed control until the start of summer rains when significant soil wetting has occurred or the soil has been irrigated and more rain or irrigation is expected within 3 weeks. Do not apply if heavy rains or storms that are likely to cause runoff are forecast within 3 days.	Wheat, barley, oats, lupins, chickpeas, field peas, lentils – 2 weeks; Soybeans, mungbeans, pigeon pea and navy bean – 6 weeks; Maize, sorghum, and peanut – 8 weeks.	Not required when used as directed.
Velocity®	2	6 weeks	Not required when used as directed.
Verdict® 520	1	Medic, clover 7 days; lucerne 21 days; vetch, canola, lupin, chickpea, faba bean, field pea, 28 days.	Not required when used as directed.
Vortex®	Do not apply if rain is likely to occur within 3 hours or if heavy rain that is likely to produce runoff is forecast within 48 hours.	7 days.	Not required when used as directed.
Weedmaster® DST®	6	Not required when used as directed.	Not required when used as directed.

N/A Not applicable, as it is a pre-emergent treatment.

Using herbicides successfully



# Harvest aid or salvage spraying winter crops

Salvage spraying or pre-harvest desiccation is required in some years to desiccate weeds and assist timely harvesting of winter crops. Situations do arise due to late establishing weeds combined with wet and prolonged springs or harvest periods, where salvage spraying may be necessary.

Weeds such as skeleton weed, bindweed, melons, sowthistle, prickly lettuce, fat hen and New Zealand spinach can interfere with harvesting whilst weed seeds such as saffron thistle, rough poppy, Mexican poppy and black/field bindweed can contaminate grain.

Table 5. Herbicides for harvest aid or salvage spraying

Chemical	2,4-D LV ester 680 g/L	2,4-D amine 700 g/L	Glyphosate 470 g/L	Metsulfuron-methyl 600g/kg + glyphosate 540 g/L	Diquat 200 g/L	Diquat 200 g/L	Paraquat 360 g/L	Glyphosate 570 g/L	Saflufenacil 700 g/kg
Herbicide product	LV Ester 680	Amicide® Advance 700	Weedmaster® DST®	Associate® + CRUCIAL®	Reglone®	Reglone®	Gramoxone® 360 Pro	Roundup® Ultra Max	Sharpen® WG
Use	Harvest aid/salvage spray	Harvest aid/Salvage spray	Preharvest cutting application	Desiccation	Pre-harvest crop desiccation	Pre-harvest weed control	In-crop spraytopping	Harvest aid/weed control	Harvest aid/weed control
Crop	Winter cereals	Winter cereals	Hay/silage, wheat, canola, field pea, faba bean, adzuki bean, chickpea, cowpea, lentil, mung bean and soybean	Chickpea	Canola, linseed, peas, faba bean, lentil, chickpea, lupin	Wheat	Field pea, lupin, chickpea, faba bean, lentil and vetch	Wheat, adzuki beans, chickpeas, cowpea, faba beans, field pea, lentils, mung beans, soybeans, canola	Barley feed and malt, field pea, faba bean, chickpea, lentil, lupin, triticale, wheat
Rate	1.7 L/ha	1.1–1.5 L/ha	Wheat, canola and hay/silage 1.4–4.1 L/ha. Adzuki, chickpea, cowpea, faba bean, field pea, lentil, mung bean, soybean 780 mL – 2.1 L/ha. or chickpea 580 mL – 2.1 L/ha + 5 g/ha of Associate®.	5 g/ha Associate® + 0.45–0.95 L/ha CRUCIAL®	Canola 1.5–3 L/ha; linseed, peas, faba bean, lentil, chickpea, lupin 2–3 L/ha	1, 2 or 3 L/ha	280 or 560 mL/ha (+ adjuvant)	Wheat: 0.85–3.4 L/ha Adzuki beans, chickpeas, cowpea, faba beans, field pea, lentils, mung beans, soybeans: 0.645–1.7 L/ha Canola: 1.2–3.4 L/ha	34 g/ha + glyphosate paraquat plus 1% Hasten™ in 100 L
Weeds	Desiccate broadleaf weeds	Desiccate broadleaf weeds	Annual weeds	Registered	Not applicable	Not stated	Annual ryegrass	Annual weeds	
Spraying timing	After the dough stage	After the dough stage	Refer to label	At or after crop maturity	Refer to label	Refer to label	When ryegrass is at the optimum timing. When the last ryegrass seedheads have emerged. Refer to label.	Refer to label.	See label. Timing varies with crop type
Harvest WHP	Nil when used as directed	Nil when used as directed	Refer to label	Canola and wheat 5 days; sorghum and legumes 7 days	Canola 4 days; peas, lupin, linseed not stated; lentil, chickpea, faba bean 2 days	Nil	7 days	5 days	7 days for winter pulses; 14 days for winter cereals
Application	Ground/aerial	Ground/aerial	Ground/aerial	Not stated	Ground/Aerial	Ground/Aerial	Ground	Not stated	Ground only
Comments	Beware of sensitive crops nearby	Beware of sensitive crops nearby	–	Not to be applied on crops to be used for seed or sprouting	–	–	Reduction in crop yield may occur if the crop is less advanced relative to the ryegrass	<b>DO NOT</b> use on crops intended for seed or sprouting. Where wheat is grown in rotation with any herbicide tolerant crop, management should be consistent with implementing any management plan for herbicide tolerant crops.	Coarse droplets

**WARNING — When spraying use extreme caution and carefully consider the possibility of spray drift onto susceptible plants – e.g. cotton, canola, lucerne, grapevines, horticultural crops, belah and kurrajong trees.**

**IMPORTANT NOTE: Before using these products for this use check registration.**

# Water quality for herbicide application

Good quality water is important when mixing and spraying herbicides. It should be clean and of good irrigation quality. Poor quality water can reduce the effectiveness of some herbicides and damage spray equipment.

## Effects of water quality

Water quality depends on the source of the water (rain-fed tank, dam, river, bore or aquifer) and the season (e.g. heavy rain, drought). There are several characteristics of water quality which affect chemical performance.

**Dirt:** Dirty water has very small soil particles (clay and silt) suspended in it. These soil particles can absorb and bind the chemical's active ingredient and reduce its effectiveness. This applies especially to glyphosate, paraquat and diquat.

Dirt can also block nozzles, lines and filters and reduce the sprayer's overall performance and life. As a guide, water is considered dirty when it is difficult to see a 10¢ coin in the bottom of a household bucket of water.

**Water hardness:** Water is termed hard when it has a high percentage of dissolved minerals such as calcium, manganese or magnesium. Hard water won't lather with soap and can cause some chemicals to precipitate. Susceptible chemicals often have agents added to overcome this problem.

Formulations of 2,4-DB are particularly sensitive to hard water (>400 ppm CaCO<sub>3</sub> equivalent). Other herbicides such as glyphosate, 2,4-D amine and MCPA amine, Lontrel® Advanced and Tigrex® can also be affected.

Hard water can affect chemicals in the following ways:

- Causes some chemicals to precipitate.
- Can affect the wetting, emulsification and dispersion properties of some surfactants.

**Water pH:** pH is a measure of acidity and alkalinity that ranges between 1 and 14. A pH of 7 is neutral, less than 7 acid and more than 7 is alkaline. Most natural waters have a pH of 6.5–8.

In highly alkaline water (pH >8) many chemicals undergo a process called alkaline hydrolysis. This process causes the active ingredient to break down into other compounds that can reduce the pesticide's effectiveness over time. This is one reason why spray mixes should not be left in spray tanks overnight.

Very acid water can also affect the stability and physical properties of some chemical formulations.

**Dissolved salts:** The total amount of mineral salts dissolved in water is usually measured by the water's electrical conductivity (EC).

The EC of bores and dams depends largely on the salt levels in the rock and soil that surrounds them. During a drought, water salinity increases.

Very salty water can cause equipment blockages and is more resistant to pH changes.

**Organic matter:** Water containing a lot of organic matter, such as leaves or algae, can block nozzles, lines and filters. Algae can also react with some chemicals, reducing their effectiveness.

**Temperature:** Very hot or cold water can affect the performance of some chemicals.

Acknowledgement: Extracts from *Spray Sense Bulletin* No.12 T. Burfitt, S. Hardy and T. Somers (1996).

## DID YOU KNOW?

Some poor results with herbicides could be due to water quality problems.

As a guide, water is considered dirty when it is difficult to see a 10¢ coin in the bottom of a household bucket of water.

## IMPROVING WATER QUALITY

Water needs to be tested to see whether it will affect chemical performance. There are commercial products available to reduce pH (e.g. Primabuff®, and LI 700 and Hotup®), soften hard water and clear dirty water. To reduce the effects of very salty water, you might need to mix water from several sources.

Table 6. Herbicide tolerance to water qualities

Herbicide	Water quality				
	Muddy	Saline	Hard	Alkaline (>pH 8)	Acidic (<pH 5)
2,4-DB	–	–	X	NR	–
2,4-D or MCPA amine	✓	✓	X	NR	–
2,4-D or MCPA ester	✓	Test	Test	✓	✓
Associate®	✓	✓	✓	Marginal	X
Brodal®	–	✓	✓	X	–
Dicamba	✓	✓	NR	NR	–
Diuron	✓	Test	✓	✓	–
Diuron + 2,4-D amine	✓	Test	X	NR	–
Diuron + MCPA amine	✓	Test	X	NR	–
Fusilade® Forte	✓	✓	✓	NR	X
Chlorsulfuron 750 WG®	✓	✓	✓	Marginal	X
Glyphosate	X	✓	X	–	✓
Gramoxone® 360 Pro	X	✓	✓	✓	✓
Logran® B-Power	✓	✓	✓	Marginal	X
Lontrel® Advanced	✓	✓	X	X	–
Simazine	✓	X	✓	NR	–
Spray.Seed®	X	✓	✓	✓	✓
Elantra® Xtreme®	✓	✓	✓	✓	✓
Tigrex®	✓	X	X	NR	–
Trifluralin	–	✓	✓	✓	✓
Valor®	✓	✓	–	X	✓
Verdict®	✓	✓	✓	NR	✓

### Key

- ✓ OK.
- X Do not use.
- NR Not recommended but use quickly if there is no alternative.
- Test Mix herbicides and water in proportion and observe any instability.
- Marginal Not ideal, but acceptable.



# Using adjuvants, surfactants and oils with herbicides

Herbicides often need help to spread across the leaf and penetrate the leaf surface of weed targets to give the best results.

Some herbicides have enough adjuvant and don't need additional surfactants to perform well. However, some do and this is usually detailed on the herbicide label.

An adjuvant is any additive to a herbicide that is intended to improve the effectiveness of the herbicide. There are many products that have been developed to help herbicides to contact the weed target, then remain and penetrate the weed leaf. Always read the herbicide label before opening the container and follow the information printed there.

The APVMA classes adjuvants into two categories:

1. adjuvants that enhance product efficacy
2. adjuvants that improve the ease of application.

## Adjuvants that enhance product efficacy

**Wetters/spreaders** (enhance adhesion to, and spray droplet spreading on, target surfaces by reducing the surface tension of the pesticide formulation and improving coverage) such as:

- **non-ionic surfactants** – non-reactive, i.e. they do not have a negative charge or a positive charge; they remain on the leaf once dry and allow rewetting after rain, permitting additional pesticide uptake
- anionic surfactants – negative charge
- cationic surfactants – positive charge
- amphoteric surfactants
- organo-silicate surfactants
- acidified surfactants.

**Stickers** (increase pesticide adhesion to target surfaces) could be:

- latex-based
- pyrrolidone-based.
- terpene/pinolene

**Penetrants** (improve active ingredient transfer from the target surface to interior tissues), which might include:

- mineral oil
- vegetable oil
- esterified vegetable oil
- organo-silicate surfactants
- acidified surfactants.

**Extenders** (enhance the amount of time the active ingredient remains toxic by increasing resistance to environmental degradation), which might be:

- ammonium sulfate
- menthene-based.

**Humectants** (increases the density/drying time of an aqueous spray deposit), which could be:

- glycerol
- propylene glycol
- diethyl glycol.

## Adjuvants that make application easier

**Acidifying/buffering agents** (adjust the pH of alkaline or acidic water to minimise the pesticide decomposing through alkaline hydrolysis).

**Anti-foaming/de-foaming agents** (reduces or suppresses foam formation in the spray tank to prevent overflow): dimethopolysiloxane.

**Compatibility agents** (allows mixing agrochemicals by preventing antagonism between different ingredients in the spray solution) such as: ammonium sulfate.

**Drift control agents** (alter the viscoelastic properties of the spray solution yielding a coarser spray with greater mean droplet sizes):

- polyacrylamides
- polysaccharides.

**Dyes** (commonly used for spot or boom spraying herbicides to detect missed spots or to avoid duplication).

**Water conditioners** (prevents a reaction between hard water ions in spray solutions and suppresses precipitate or salt formation): ammonium sulfate.

### GO TO PAGE:

Table 7 on page 17 lists some of the available adjuvants.

### FACTORS AFFECTING ADJUVANT USE:

1. Crop safety – adding an adjuvant can reduce herbicide selectivity and thereby increase crop damage. This is not an issue for fallow and pre-emergent herbicides.
2. Effectiveness or activity – adjuvants are usually added to increase the effectiveness of herbicides. However, using the wrong type or rate can reduce effectiveness, such as decreasing herbicide retention on leaves.
3. Water hardness – hard water can lead to poor mixing with the chemical. This particularly occurs with emulsifiable concentrates. High levels of calcium and magnesium ions bind with amine formulations causing them to be less soluble and therefore less effective.
4. Water temperature – low water temperature can lead to gelling in the tank. High concentration herbicides might not mix and surfactants could perform poorly.

Table 7. Some adjuvants in common use

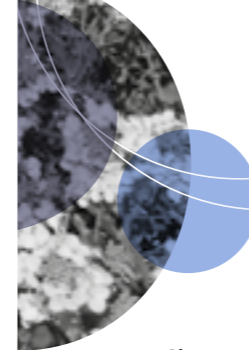
Trade name	Constituent	Company	Claim
<b>Spray oil</b>			
Banjo®	725 g/L methyl esters of canola oil	Nufarm	Wetting/spreading/penetrating agent for use with certain post-emergent herbicides.
Adigor™	440 g/L methyl esters of canola oil, fatty acids solvent, 222 g/L liquid hydrocarbons	Syngenta	Adjuvant for use with Axial® Xtra and other selective and non-selective herbicides as per label directions.
Uptake® Spraying Oil	582 g/L paraffinic oil + 208 g/L non-ionic surfactants	Corteva Agriscience	Spreading/wetting agent for many selective herbicides e.g. Topik®, Verdict® 520.
Hotwire® Spraying Oil	598 g/L paraffinic oil + 210 g/L non-ionic surfactants	Adama	Spreading/wetting agent for many selective herbicides.
Bonza®	471 g/L paraffin oil	Nufarm	Spreading/wetting agent for certain herbicides.
Hasten™	704 g/L fatty acid esters of canola oil + surfactant >15%	Victorian Chemical Co.	Wetting/spreading/penetrating agent for certain post-emergent herbicides.
Activoil®	704 g/L fatty acid esters of canola oil.	SST Products	Improves penetration. Used with certain post-emergent herbicides.
Supa Stik® Oil	840 g/L canola oil	Agrichem	Improves droplet deposition, uptake. Used with non and selective herbicides.
Protec® Plus	700 g/L canola oil extract	Grevillia Ag	Improves droplet deposition, uptake. Used with non and selective herbicides.
Codacide® Organic	860 g/L vegetable oil	Microcide	Suitable for use with certain non-selective herbicides.
Ad-Here™	970 g/L mineral oil	Victorian Chemical Co.	Adjuvant for Select®, Verdict®, Sertin®186 EC, Express®.
Supercharge® Elite	471 g/L paraffin oil	Nufarm	A specially formulated blend of paraffin oil to enhance the wetting, spreading and uptake of systemic herbicides through waxy leaf surfaces.
Amplify®	432 g/L mineral oil	Adama	
<b>Surfactant</b>			
Agral® 600	600 g/L non-ionic surfactant	Syngenta	Wetting/spreading agent, for most selective and non selective herbicides.
Wetter TX®	1040 g/L non-ionic surfactant	Nufarm	Used with Roundup® when treating certain grasses.
BS1000®/Deltawet® 1000	1000 g/L alkoxyated alcohol	Nufarm/Tasman Chemicals	Wetting/spreading agent, for most non and selective herbicides.
Hot-up®	340 g/L non-ionic + 190 g/L mineral oil + 140 g/L ammonium sulfate	Victorian Chemical Co	Wetting, penetrating, reduce antagonism of non-selective herbicides.
Activator®	900 g/L non-ionic surfactant	Nufarm	Wetting agent. Used with most non and selective herbicides.
Wetter 1000	1003 g/L non-ionic ethoxylates	Chemag	Wetting/spreading agent, for most non and selective herbicides.
Wetspray® 1000	1000 g/L non-ionic surfactant	Adama	Wetting spreading agent, for most non and selective herbicides.
Agri-Wett® 77	377 g/L nonylphenol ethylene	Agrichem	Wetting/spreading agent, for most non and selective herbicides.
Bond® Adjuvant	450 g/L synthetic latex + 100 g/L non-ionic surfactant	Nufarm	Used when the addition of a sticker, spreader and deposit agent is required.
<b>Compatibility agent</b>			
Liase®/Liquid Assist	417 g/L ammonium sulfate	Nufarm/Rutec	Minimise antagonism. For use with glyphosate herbicides.
Response®/Enhazar®	425 g/L ammonium sulfate	Landmark/Western Stock Distributors	Minimise antagonism. For use with glyphosate herbicides.
Alltask Benefit®	425 g/L ammonium sulfate	Landmark	Minimise antagonism. For use with glyphosate herbicides.
Liquid Boost®	417 g/L ammonium sulfate	Rygel Australia	Minimise antagonism. For use with glyphosate herbicides.
Bonus®	250 g/L ammonium sulfate + 188.5 g/L alkylethoxyphosphate	Nufarm	Designed for use with Nufarm Credit® broadhactare only.
<b>Acidifying/buffering agents</b>			
LI 700®/Delta Lipro® 700	350 g/L soyal phospholipids + 350 g/L propionic acid	Nufarm/Tasman Chemicals	Wetter, spreader, acidifier, compatible with most herbicides except sulfonyleureas.
Primabuff®	266.2 g/L nonoxinol-9 375.1 g/L phosphoric acid derivatives	Nufarm	Penetrant, buffering, acidifying, compatibility aid, used with certain non-selectives.
Agri-Buffer®	430 g/L phosphate esters, 100 g/L polyalkylene oxide	Agrichem	Wetter, spreader, acidifier, compatible with most herbicides.

## Tips for tankmixing herbicides

- Tank-mixing herbicides is a common practice to improve weed control and broaden the target weed spectrum. There could also be some advantages that help to avoid herbicide resistance problems.
- Many tank-mixes are included on registered herbicide labels.
- Generally, provided herbicides are registered for a particular use, they may be tank-mixed if they are compatible and label mixing instructions are followed.
- Note that some herbicides, although being physically compatible, can be antagonistic to weed control. This information is usually outlined on herbicide labels under compatibility. Ratios for tank-mixing, crop safety, herbicide efficacy and special use of adjuvants, also need to be considered.
- The order in which herbicides are mixed is also important – the following mixing sequence is usually followed:
  1. Water conditioning agents (if required – e.g. LI 700, Liase® or Primabuff®).
  2. Water dispersible granules (WG)/dry flowable products (including those in water-soluble bags first).
  3. Wettable powders (WP).
  4. Flowables or suspension concentrates (e.g. atrazine–simazine liquids).
  5. Emulsifiable concentrates (EC) (e.g. Trifluralin, Topik® 240 EC, Kamba®, Bromicide® MA).
  6. Water-soluble concentrates (e.g. glyphosate, Amicide® Advance 700, Spray. Seed® 250, Gramoxone® 360 Pro).
  7. Surfactants and oils (e.g. BS1000®, Hasten®).
  8. Soluble fertilisers.

Table 8. Directory of herbicide manufacturers/distributors

Distributor/Manufacturer	Contact	Contact
Adama Australia	Suite 1, Level 4 Bldg B, 207 Pacific Highway, St Leonards NSW 2065	Technical inquiries: 1800 423 262
BASF Australia Ltd	Level 12, 28 Freshwater Place Southbank Vic 3006 Web: <a href="http://agro.basf.com.au">agro.basf.com.au</a>	1800 558 399
Bayer CropScience Pty Ltd	8 Redfern Road, Hawthorn East, Vic 3123. Ph: (03) 9248 6888 Fax: (03) 9248 6800. Web: <a href="http://www.bayercropscience.com.au">www.bayercropscience.com.au</a>	Technical Enquiries 1800 804 479
Crop Care Australasia Pty Ltd	PO Box 84, Morningside Qld 4170. Ph: 1800 111 454 Fax: (07) 3909 2000. Web: <a href="http://www.cropcare.com.au">www.cropcare.com.au</a>	Customer Service 1800 111 454
Corteva Agriscience	Level 9, 67 Albert Ave, Chatswood, NSW 2067 Locked Bag 2002, Chatswood, NSW, 2057 Web: <a href="http://www.corteva.com.au">www.corteva.com.au</a>	Customer Service 1800 700 096
Nufarm Australia Ltd	103–105 Pipe Road, Laverton North, Vic 3026. Ph: (03) 9282 1000 Fax: (03) 9282 1022. Web: <a href="http://www.nufarm.com.au">www.nufarm.com.au</a>	Technical Enquiries 1800 683 704
Sipcam Pacific Australia Pty Ltd.	Level 1, 191 Malop St Geelong Vic 3220	Customer Service: 1300 130 633
Sumitomo Chemical Aust Pty Ltd	PO Box 60, Epping NSW 1710 Web: <a href="http://www.sumitomo-chem.com.au">www.sumitomo-chem.com.au</a>	Customer Service: (02) 8752 9000
Syngenta Crop Protection Pty Ltd	Level 1, 2–4 Lyon Park Road, North Ryde NSW 2113. Ph: 02 88768444 Web: <a href="http://www.syngenta.com.au">www.syngenta.com.au</a>	Syngenta Product Technical Advice Line 1800 067 108



# Cleaning and decontaminating boomsprays

Cleaning and decontaminating spray equipment for herbicide application is essential. Many crops and pastures have been severely damaged or destroyed by failing to ensure that spray equipment was thoroughly cleaned before use.

With the advent of crops such as canola and pulse crops in the rotation, and with more emphasis on legume-based pastures, decontaminating spray units must be carried out to ensure that there is no possibility of crop or pasture damage.

Labels usually detail decontamination and cleaning procedures for each product.

Table 9. Decontaminating boomsprays

Herbicide	Rate of agent/100 L water	Instructions for cleaning and decontamination
Weedmaster® DST®, CRUCIAL®, glyphosate, Raptor®, Spinnaker® 700 WG, Precept®, Velocity®, Intervix®, Sharpen® WG, Gundy 240.	Clean Water (*Nufarm tank and equipment cleaner), Absolute Boomer®	Rinse thoroughly several times with clean water before use.
Phenoxy type, salt or amine formulations (2,4-D amine, MCPA amine, 2,4-DB, dicamba).	2 L household ammonia (*Nufarm tank and equipment cleaner)	Thoroughly agitate and flush a small amount of solution through the system and let stand in sprayer overnight. Flush and rinse with clean water several times before use.
Phenoxy type, ester formulations 2,4-D ester, MCPA ester, Paragon®, Flight® EC, Tigrex®.	125 g powdered detergent (*Nufarm Tank and Equipment Cleaner)	Rinse the inside and outside of the tank and flush a small amount through the system for 15–20 minutes. Let stand for at least two hours or preferably overnight. Flush and rinse before use.
Atrazine 900 WG, simazine.	125 g powdered detergent (*Nufarm Tank and Equipment Cleaner), Absolute Boomer®	Rinse with clean water before and after using the solution.
Sulfonylurea herbicides, Chlorsulfuron 750 WG, Associate®, Logran® B-Power, Hussar® OD, Atlantis® OD, Stinger®.	300 mL fresh household chlorine bleach containing 4% chlorine or 300 mL BC-45 Spray Equipment Cleaning Agent (*Nufarm Tank and Equipment Cleaner) per 100 L water with agitation. Absolute Boomer® or CC49®	<ol style="list-style-type: none"> <li>1. Drain and flush the tank, hoses and boom with clean water for 10 minutes.</li> <li>2. Fill the tank with clean water and add the chlorine bleach. Flush the boom and allow to stand for 15 minutes, then drain.</li> <li>3. Repeat Step 2.</li> <li>4. Nozzles, screens and filters should be removed and cleaned separately.</li> </ol>
Broadstrike®, Eclipse® 100 SC, ForageMax®, Garlon® 600, Grazon® Extra, Hotshot®, Lontrel® Advanced, Paradigm®, Pixxaro®, Rexade®.	500 mL alkali liquid detergent DynamoMatic®, Surf®, Omo® or 500 g of the powder equivalent such as Surf®, Omo®, 1 L Absolute Boomer®	<p>Flush the system, then quarter-fill the tank with water and add the detergent. Start the pump and circulate for at least 15 minutes. Drain the whole system.</p> <p>Remove and clean the filters, screens and nozzles with clean water and allow to drain.</p>
Herbicides for grass control in broadleaf crops and pastures such as Verdict® (520 g/L).	500 mL alkali liquid detergent such as Surf®, Omo®, DynamoMatic®, or 500 g of the powder equivalent. 1 L Absolute Boomer®	<p>If broadleaf herbicides, particularly sulfonylureas (such as Chlorsulfuron 750 WG), have been used in the spray equipment at any time prior to grass herbicides such as Verdict®, particular care should be taken to follow the directions for cleaning and decontamination on the label of the relevant broadleaf herbicide.</p> <p>Before spraying cereals, maize, sorghum or other sensitive crops, wash the tank and rinse after use. Completely drain the tank and wash filters, screens and nozzles. Drain and repeat the procedure twice.</p> <p>To decontaminate, wash and rinse the system as above, quarter-fill the tank, add the detergent and circulate through the system for at least 15 minutes.</p> <p>Drain the whole system. Remove filters, screens and nozzles and clean separately.</p> <p>Finally, flush the system with clean water and allow to drain.</p>

**WARNING:** Grass control herbicides such as Verdict®, Fusilade® Forte, Shogun®, Select®, Elantra® Xtreme® can be extremely damaging to winter and summer cereals. Likewise spraytank contamination of small quantities of sulfonylurea herbicides such as Chlorsulfuron 750 WG and Logran B-Power® can be extremely damaging to crops like canola, pulse crops and legume pastures.

\*Nufarm Tank and Equipment Cleaner can also be used to decontaminate spraying equipment.  
**NOTE:** Rinse water should be discharged into a designated disposal area, or if this is unavailable, onto unused land away from surface water, water bodies, gardens, shelter belts and other environmentally sensitive areas.

# Boomspray calibration

Boomsprays need to be calibrated regularly to work efficiently and economically.

Regular calibration ensures the right amount of chemical will be applied to the target without costly wastage.

The following template will enable you to calculate how much chemical and water to use.

In the template, enter the requested information such as spray tank capacity, chemical rate and ground speed in the space provided in the right hand column. You will need this information to perform the calculations. The numbers in the black 'golfballs' tell you the figures needed to perform the calculations. For example, to work out your water application rate, you need to know your total spray output, your effective spray width and your actual ground speed. The 'golfball' numbers in the formula show you where to get these figures.

## General information

Item of equipment to be calibrated.	
Spray tank capacity (litres).	L <b>5</b>
Area to be sprayed (hectares).	ha <b>7</b>
Chemical used.	

## Recording

What is the minimum water application rate – if any (from the chemical label)?	L/ha
Select the correct chemical application rate from the label.	L/ha <b>4</b>
Select an appropriate ground speed.	gear rpm
Record spray operation pressure.	bar or kPa
Record nozzle type and size in the spray unit. Check the rated 'water output' using the manufacturer's nozzle charts.	type size .....mL/min
Rated output	
Record minimum boom height above target for these nozzles.	cm

## Measuring

Record the output from every nozzle for 1 minute.	Total spray output (add all nozzles)
1..... 2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10..... 11..... 12..... 13..... 14..... 15..... 16..... 17..... 18..... 19..... 20..... 21..... 22..... 23..... 24.....	L/min <b>1</b>
Replace any nozzles that vary 10% or more from the manufacturer's correct nozzle output. (Nozzles with both higher and lower outputs must be replaced.)	
Record actual effective spray width in metres by measuring the distance across the outside nozzles and adding the distance between two adjacent nozzles.	m <b>2</b>

## Calculating

Actual ground speed*	$\frac{\text{Distance covered (m)} \times 3.6}{\text{Time taken (seconds)}} = \frac{( ) \times 3.6}{( )} = \dots\dots\dots \text{km/hr } \mathbf{3}$
----------------------	--

'3.6' in the calculation is a conversion factor to convert metres to kilometres (metres ÷ 1000) and seconds to hours (seconds ÷ 3600):  $D/1000 \div S/3600 = D/1000 \times 3600/S = D/S \times 3600/100 = D/S \times 3.6$ .

\*To calculate your actual ground speed:

- Measure a set distance, for example 100 metres.
- Make sure that the spraying conditions are like those in the area that you will be spraying.
- Record how long it takes using the appropriate gears and revs.

Now you can calculate the water application rate, how much chemical you will need to mix in each tank and how many tank loads you will need to do the whole job. Follow the steps below:

1. Copy the answers you worked out on the previous page into the boxes below. You will need these numbers to do the calculations on this page. (The numbers in black circles (e.g. **2**) tell you the step where the answer is on the previous page.

Total spray output ..... litres/minute <b>1</b>	Effective spray width ..... metres <b>2</b>	Actual ground speed ..... km/hr <b>3</b>
---	---	--

2. Work out the water application rate by using the numbers you have recorded above. Put these numbers in the correct place in the calculation below.

Water application rate	$\frac{\mathbf{1} \times 600}{\mathbf{2} \times \mathbf{3}} = \frac{( ) \times 600}{( ) \times ( )} = \frac{(\dots\dots\dots)}{(\dots\dots\dots)} = \dots\dots\dots \text{litres/ha } \mathbf{6}$
------------------------	---

'600' in the calculation is a conversion factor to convert litres per minute to litres per hour (minutes × 60), and kilometres to metres (km × 1000), then square metres (m × km × 1000 = m<sup>2</sup>) to hectares (m<sup>2</sup> ÷ 10000):  $60 \div 1000/10000 = 60 \div 1/10 = 60 \times 10 = 600$ .

Does this water application rate meet the chemical label requirements? (See Part B above)  Yes  No

If not, how could you change this rate to meet this requirement?

3. Now that you know the water application rate you can calculate how much chemical you need to mix in each tank.

Chemical application rate ..... litres/ha <b>4</b>	Spray tank capacity ..... litres <b>5</b>
--	---

How much chemical to mix in each tank?	$\frac{\mathbf{4} \text{ (L/ha)} \times \mathbf{5} \text{ (L)}}{\mathbf{6} \text{ (L/ha)}} = \frac{( ) \times ( )}{( )} = \dots\dots\dots \text{litres}$
--	--

4. Finally, you can now work out how many tank loads you will need to do the job.

Spray mix needed for the job	$\frac{\mathbf{7} \text{ (ha)} \times \mathbf{6} \text{ (L/ha)}}{( ) \times ( )} = \dots\dots\dots \text{litres } \mathbf{8}$
Number of tanks needed	$\frac{\mathbf{8} \text{ (L)}}{\mathbf{5} \text{ (L)}} = \frac{( )}{( )} = \dots\dots\dots \text{tanks}$

(To crosscheck your calculations:

Number of tanks × Volume of chemical per tank = Area to be sprayed × Chemical rate)

Source: SMARTtrain Calibration and Records Supplement 2010.



# Managing your legal responsibilities in applying pesticides

## Pesticides Act

The Pesticides Act 1999 is the primary legislative instrument controlling the use of pesticides in NSW and is administered by the Environment Protection Authority (EPA). The underlying principle of the Pesticides Act is that pesticides must only be used for the purpose described on the product label and all the instructions on the label must be followed. Consequently, all label directions must be read by, or explained to, the user before each use of the pesticide.

All pesticide users should take reasonable care to protect their own health and the health of others when using a pesticide. They should also make every reasonable attempt to prevent damage occurring from the use of a pesticide, such as off-target drift onto sensitive areas or harm to endangered or protected species.

A Regulation was gazetted in 2009 renewing the requirement for all commercial pesticide users, i.e. all farmers and spray contractors, to keep records of their pesticide application. A form that captures all the information required by the Regulation, together with notes on how to fill it in, is included in this guide.

A self-carboning record book is available from DPI. Call 1800 138 351 to order your copy of the SMARTtrain spray record book. Other websites, including [Croplands](https://www.croplands.com.au), have record forms. More information on your spray record responsibilities is available on the [Environment Protection Authority](https://www.epa.nsw.gov.au) website. The EPA also has a [spray record form](#) you can download and use.

The 2009 Regulation requires all commercial pesticide users to be trained in pesticide application.

Trained aerial applicators, pest control operators and fumigators are recognised as satisfying the requirements of the Regulation. Apart from these groups, all commercial users must have a prescribed qualification. Only domestic use, such as home gardens, is excluded, provided the pesticide is a specific domestic/home garden product. Covered by the Regulation is pest control by/on:

- public authorities, e.g. State Rail
- golf courses, sporting fields and bowling greens
- agricultural, horticultural, aquacultural and forestry operations
- businesses, educational institutions, and hospitals.

Growers are recommended to undertake the SMARTtrain course, Chemical Application, or the standard ChemCert course, both of which cover the higher AQF3 competencies. For growers with literacy and/or numeracy problems, the lower level AQF2 competency will provide a minimum qualification that satisfies the Regulation.

## Hazardous Chemicals legislation

Many registered pesticides are classified as hazardous chemicals. Even those that are not classified as hazardous pose some risk to the health of those who use them or are exposed to them.

The Work Health and Safety Act 2011 (WHS), and the Hazardous Chemical section of the Work Health and Safety Regulation 2011, detail legal requirements of suppliers, workers and persons conducting businesses or undertakings in the workplace for hazardous chemicals management. The Act and accompanying Regulation are intended to protect workers from both the short- and long-term health effects of exposure to hazardous chemicals and to improve current health and safety practices by:

- providing health and safety information to workers (including a list or register of all hazardous chemicals and an SDS (Safety Data Sheet) for each hazardous chemical)
- consultation with, and training, workers
- minimising the risks from hazardous chemicals exposure
- health surveillance (if warranted by the risk assessment in respect of organophosphates).

Both storage and use are covered by the WHS legislation.

Storage limits have changed. Premises storing large quantities require both the storage shed and the entrances to the premises to display placards. If very large quantities are stored – which would be rare on-farm – a manifest, site plan and written emergency plan are required. Consult your local WorkCover office for advice.

### GO TO WEB PAGES:

EPA has a [spray record form](https://www.epa.nsw.gov.au/resources/pesticides/130814PestFmEg.pdf) ([epa.nsw.gov.au/resources/pesticides/130814PestFmEg.pdf](https://www.epa.nsw.gov.au/resources/pesticides/130814PestFmEg.pdf))

[Croplands](https://www.croplands.com.au/Products/Application-Tools/Record-Keeping/Spraywise-Log-Book#.W77HDHszayo) (<https://www.croplands.com.au/Products/Application-Tools/Record-Keeping/Spraywise-Log-Book#.W77HDHszayo>)

[Environment Protection Authority](https://www.epa.nsw.gov.au/pesticides/pestrecords.htm) ([epa.nsw.gov.au/pesticides/pestrecords.htm](https://www.epa.nsw.gov.au/pesticides/pestrecords.htm))

### RECORD MUST BE:

- made within 24 hours of application
- written in legible English
- kept for three years
- Pesticide users must be trained

### TRAINING

The minimum prescribed training qualification is the AQF2 unit of competency, 'Apply chemicals under supervision', although owner-applicators are encouraged to train and be assessed in the two higher AQF3 competencies, 'Prepare and apply chemicals' and 'Transport, handle and store chemicals'.

WorkCover NSW's Code of Practice for safely using and storing chemicals (including pesticides and herbicides) in agriculture is an approved industry code of practice and provides practical guidance for farm chemical users to comply with this legislation.

## How to complete your Pesticide Application Record Sheet

The application record form includes more than the Pesticide Regulation requires, so compulsory information is in italics below each heading.

**Property/holding:** Attaching a property map or line drawing, showing adjoining sensitive areas, with paddocks and other features clearly identified can be helpful. Fill in the residential address.

**Applicator details:** The person applying the pesticide must fill in their contact details. If the applicator is not the owner, e.g. a contractor or employee, then the owner's details must also be completed. In the case of a contractor, one copy of the record should be kept by the applicator and another given to the owner.

**Sensitive area identification:** If there are sensitive areas, either on the property or on land adjoining, these should be identified in advance, and marked on the sensitive areas diagram, together with any precautions or special instructions. When using a contractor or giving the job to an employee, this section should be filled in and given to the person doing the application BEFORE the job starts. The property map with sensitive areas marked should be shown to them, and the job fully discussed.

**Paddock identification:** Identify the paddocks/blocks and order of treatment (if there is more than one) in the 'paddock' row of the form. This should be filled in before starting application, along with the residential address. If using a contractor or employee, this information should also be given to them BEFORE they start the job. Applicators using GPS systems could include a GPS reading as well as the paddock number/name.

**Crop/animal identification:** The left hand side of the Crop/situation section of the table is for crops, pastures and plants (non-crop, e.g. bushland and fallow), the right hand side for animals. As a minimum, identify the host (crop/situation) and the weed. It would be helpful to provide as much detail about the weed as possible, e.g. 4 leaf. Additional details such as crop variety and growth stage are often important for quality assurance schemes, but could also be necessary to positively identify the area treated as required by the Regulation.

**Product details:** Transcribe the product name and rate or dose from the label, including all products and additives included in tank mixes. If the use pattern is on a permit, include the permit number, expiry date and label details. A permit rate or dose might vary from the label. Water rate might come from the label, or from your standard practice or calibration. The total litres (L) or kilograms (kg) can be calculated when the application is finished.

**Withholding periods (WHP):** Labels often have a number of different withholding periods. They may be different harvest WHP for different crops, grazing WHP or Export Slaughter Interval (ESI). All WHP's are the minimum number of days after treatment before harvest, grazing or livestock slaughter for export markets can take place.

**Equipment details:** As a minimum, you have to fill in what equipment you used. Specifying the setting used for the application can help positive identification, e.g. nozzle type and angle; pressure. The nozzle type will usually include the angle. With pressure, the reading should be as close to the nozzle as possible. Other details e.g. date of calibration and water quality, are useful as a reminder for future use, or as a check on your set-up should you have a treatment failure. Water quality is important for herbicide efficacy. At the most basic level, water quality can be described in terms of its source, e.g. rainwater, dam water, bore water.

**Weather:** As a minimum, you have to record wind speed and direction. It is better to measure with instruments than estimate. Record any changes during application. You must also record the time when you started, and the time when you finished. You will need to record weather information for all equipment that distributes pesticide through the air.

Rainfall should be recorded for the 24 hours before and the 24 hours after application, unless a different figure is given in the restraints or critical comments sections of the label. Rainfall before or after application can affect efficacy.

Temperature and relative humidity should also be recorded, particularly if either or both are referred to in the restraints or critical comments sections of the label. Temperature and relative humidity can affect efficacy, increase the risk of off-target drift or could damage the host (e.g. phytotoxicity) or a combination of all three.

### RECORDS MUST INCLUDE:

- the full product name
- a description of the crop or situation
- the rate of application and quantity applied
- a description of the equipment used
- the address of the property, identification of the area treated and order of paddocks treated
- the date and time of the application (including start and finish)
- the name, address, and contact details of the applicator and of the employer or owner if an employee or contractor is the applicator
- the estimated wind speed and direction (including any significant changes during application)
- other weather conditions specified on label as being relevant (e.g. temperature, rainfall, relative humidity).

# Reducing herbicide spray drift

Spraying during the night and early morning is common, especially for reaching the target and to minimise the amount reaching off-target areas. This results in:

- maximum pesticide effectiveness
- reduced damage and/or contamination to off-target crops and areas.
- In areas where a range of agricultural enterprises co-exist, conflicts can arise, particularly from pesticide use. All pesticides are capable of drift.

People have a moral and legal responsibility to prevent pesticides from drifting and contaminating or damaging neighbours' crops and sensitive areas.

Some labels now carry spray drift management instructions including buffer zones. Read and follow all label instructions.

## How to minimise spray drift problems

### Before spraying

- Always check for susceptible crops in the area, e.g. broad leaf crops such as grape vines, cotton, oilseeds or pulse crops if using a broadleaf herbicide, and sensitive areas such as houses, schools and riparian areas.
- Notify neighbours of your spraying intentions.
- Under the Records Regulation of the Pesticides Act it is essential that weather and relevant spray details are recorded. Forms are available from the [DPI website](#).

### During spraying

- Always monitor meteorological conditions carefully and understand their effect on drift hazard.
- Do not spray if conditions are not suitable, and stop spraying if conditions change and become unsuitable.
- Record weather conditions (especially temperature and relative humidity), wind speed and direction, herbicide and water rates, and operating details for each paddock.
- Supervise all spraying, even when a contractor is employed. Provide a map marking the areas to be sprayed, buffers to be observed, sensitive crops and areas.
- Spray when temperature is less than 28 °C.
- Minimise spray release height. (Lowest possible boom height).
- Use the largest droplets that will give adequate spray coverage. Where droplet size is mentioned on the label, follow the label instructions.
- Always use the least-volatile formulation of herbicide available.
- Maintain a down-wind buffer that could be in-crop, e.g. keep a boom width from the downwind edge of the field. Where buffer zones are mentioned on the label, follow label instructions.
- If sensitive crops are in the area, use the least damaging herbicide.

## How many types of drift are there?

Sprayed herbicides can drift as droplets, as vapours or as particles.

Droplet drift is the easiest to control because, under good spraying conditions, droplets are carried down by air turbulence and gravity to collect on plant surfaces. Droplet drift is the most common cause of off-target damage from herbicide application. For example, spraying fallows with glyphosate under the wrong conditions often leads to severe damage to nearby establishing crops.

Particle drift occurs when water and other herbicide carriers evaporate quickly from the droplet leaving tiny particles of concentrated herbicide. This can occur with herbicide formulations other than esters. Instances of this form of drift have damaged susceptible crops up to 30 km from the source.

Vapour drift is confined to volatile herbicides such as 2,4-D ester. Vapours can arise directly from the spray or evaporation from the herbicide-sprayed surfaces. Using 2,4-D ester in summer can lead to vapour drift damage to highly susceptible crops such as tomatoes, sunflowers, soybeans, cotton and grapes. This can occur hours after the herbicide has been applied.

### GO TO WEB PAGES:

The Cotton Map website [fact sheet on temperature inversions](#) ([www.cottonmap.com.au/Content/documents/Temperature%20Inversions.pdf](http://www.cottonmap.com.au/Content/documents/Temperature%20Inversions.pdf))

[GRDC website page on inversions and spraying](#) (<https://grdc.com.au/Resources/Factsheets/2014/08/Surface-temperature-inversions-and-spraying>)

[Weather for pesticide spraying](#) (<http://www.bom.gov.au/info/leaflets/Pesticide-Spraying.pdf>).

[Practical tips for spraying](#) ([www.grdc.com.au/GRDC-FS-SprayPracticalTips](http://www.grdc.com.au/GRDC-FS-SprayPracticalTips))

[Weather essentials for pesticide application](#) (<https://grdc.com.au/resources-and-publications/all-publications/link.aspx/2015/05/weather-essentials-for-pesticide-application>)

[Weatherwise](#) (<http://www.weatherzone.com.au/models/meteogramdrill.jsp>)

[Spraywise](#) ([www.spraywisedecisions.com.au](http://www.spraywisedecisions.com.au))

[DPI website](#) ([https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/186390/legal-responsibilities-in-applying-pesticides-F.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/186390/legal-responsibilities-in-applying-pesticides-F.pdf)).

Vapours and minute particles float in the airstream and are poorly collected on catching surfaces. They can be carried for many kilometres in thermal updraughts before being deposited.

Sensitive crops may be up to 10,000 times more sensitive than the crop being sprayed. Even small quantities of drifting herbicide can cause severe damage to highly sensitive plants.

## What factors affect the risk of herbicide spray drift?

Any herbicide can drift. The drift hazard, or off-target potential of a herbicide in a particular situation depends on the following factors:

- Volatility of the formulation applied. Volatility refers to the likelihood that the herbicide will evaporate and become a gas. Esters volatilise (evaporate) more readily than amine formulations.
- Proximity of crops susceptible to the particular herbicide being applied, and their growth stage. For example, cotton is most sensitive to Group I herbicides in the seedling stage.
- Method of application and equipment used. Aerial application releases spray at ~3 m above the target and uses relatively low application volumes, while ground rigs have lower release heights and generally higher application volumes, and a range of nozzle types. Misters produce large numbers of very fine droplets that use wind to carry them to their target.
- Amount of active ingredient (herbicide) applied – the more herbicide applied per hectare the greater amount available to drift or volatilise.
- Efficiency of droplet capture – bare soil does not have anything to catch drifting droplets compared with crops, erect pasture species and standing stubbles.
- Weather conditions during and shortly after application.

## Use a low volatile formulation

Many ester formulations are highly volatile when compared with the non-volatile amine, sodium salt and acid formulations. Some low volatile ester formulations could have a proportion of high volatile esters present, so caution should be exercised when using these products.

## The compromise between minimising drift and achieving ideal coverage

A significant part of minimising spray drift is equipment selected to reduce the number of small droplets produced. However, this in turn can affect target coverage, and therefore the possible effectiveness of the pesticide application.

This aspect of spraying needs to be carefully considered when planning to spray.

As the number of smaller droplets decreases, so does the coverage of the spray. The water rate might need to be increased to compensate for coverage.

## Reduce spray release height

- Operate the boom at the minimum practical height. Drift hazard doubles as nozzle height doubles. If possible, angle nozzles forward 30° to allow a lower boom height with double overlap. Lower heights however, can lead to more striping, as the boom sways and dips below the optimum height.
- 110° nozzles produce a higher percentage of fine droplets than 80° nozzles. However, they allow a lower boom height while maintaining the required double overlap.
- Operate within the pressure range recommended by the nozzle manufacturer. Driftable fine droplet production increases as the operating pressure is increased. Lower volumes such as 30–40 L/ha produce a higher percentage of fine droplets than higher spray volumes at the same pressure and nozzle design.

Aircraft application has an inherently greater risk than ground rig application due to a number of factors, including lower volume application, small droplet sizes, height of application, and turning and wing-tip vortices. An aircraft should not be used to apply herbicide in areas where highly susceptible crops are growing nearby.

## Size of the area treated

When large areas are treated, relatively large amounts of active herbicide is applied and off-target risks increase due to the length of time taken to apply the herbicide. Conditions such as temperature, humidity and wind direction can fluctuate during spraying.

Applying volatile formulations to large areas increases the chances of vapour drift damage to susceptible crops and pastures.



## What is your 'capture surface'?

Targets vary in their ability to collect or capture spray droplets. Well grown, leafy crops are efficient droplet collectors. Turbulent airflow normally carries spray droplets down into the crop within a very short distance of the nozzle.

Fallow paddocks or seedling crops are poor catching surfaces. Drift hazard is far greater when applying herbicide in these situations or adjacent to these poor capture surfaces.

When assessing drift hazard the type of catching surface between the sprayed area and susceptible crops should always be considered in conjunction with the characteristics of the target area.

## Weather conditions to watch out for

### Midday turbulence

- Updraughts during the heat of the day cause rapidly shifting wind directions. Spraying should usually stop by 11.00 am during the summer months.

### High temperatures

- Avoid spraying when temperatures exceed 28 °C.

### Humidity

Avoid spraying under low relative humidity conditions i.e. when Delta T (the difference between wet and dry thermometers) exceeds 10 °C. Spraying when Delta T is between 8–10 °C is considered high risk.

High humidity extends droplet life and can greatly increase the drift hazard from fine droplets under inversion conditions. This results from an increased life of droplets smaller than 100 microns.

### Wind

Avoid spraying under calm conditions.

Ideal safe wind speed is 7–10 km an hour. Leaves and twigs are in constant motion – a light breeze.

11–14 kph (moderate breeze) is suitable for spraying if using low drift nozzles or higher volumes application (80–120 L/ha). Small branches move, dust is raised and loose paper moving – a moderate breeze.

## Surface inversions

### What are surface inversions?

Surface inversions are layers of the atmosphere at the earth's surface in which temperature increases with height. This is the opposite (inverse) of the normal temperature decrease with height.

### Hazards of surface inversions

Surface inversions strongly suppress airborne pesticide (and similar) dispersion.

Surface inversions can cause airborne pesticides to:

- remain at high concentrations for long periods over and close to the target
- travel close to the surface for many kilometres in light breezes
- move downslope and concentrate into low-lying regions
- be transported often in unpredictable directions.

### Radiation inversions – the most hazardous

Surface inversions usually begin to occur near sunset after heat energy through infrared radiation upward into space causes the ground to cool. That radiation passes through clear air with little effect. As the ground cools, the air in contact with the ground begins to cool directly through conduction leading to the lowest layer of air being cooler than higher layers. This is referred to as radiation cooling.

Inversions caused by radiation cooling – called radiation inversions – are the most hazardous to pesticide applications because they are the most likely to severely restrict dispersion and promote transport (drift) at high concentrations of the airborne pesticides.

Radiation inversions occur most nights. Only when winds are strong enough to completely mix the lowest layers of the atmosphere and/or cloud cover severely restricts surface heating and cooling is there a chance that surface radiation inversions won't form overnight.

## Nozzle selection for post-emergent herbicides and fungicides

### Overview

Nozzle selection for applying post-emergent herbicides and fungicides to cereals should primarily focus on reducing the risk of spray drift without compromising efficacy. Drift or loss is a significant issue facing the industry and spray applicators not only have a moral but a legal obligation to adopt drift management best practice. Applying fungicides and herbicides in late season requires consideration for coverage and penetration issues that are usually not required for pre-emergent or summer/fallow applications.

Fungi typically target specific plant parts such as stems, leaves, and heads or pods. These locations must be adequately covered by droplets for the fungicide to work, and this requires special approaches regarding what nozzle to use. Likewise, some weeds might need to be selectively targeted within the crop canopy, potentially a far trickier proposition than knockdown applications.

For many years the standard maxim was to spray these products with fine droplets because they were assumed to give the best coverage. But after many years of spray application research around the world, the current recommendation is to avoid fine droplets in preference to a coarse, directed spray applied at higher water volumes than what might be considered 'normal' application rates.

### The problem with fine drops

In principle, fine drops should mean greater coverage, that is if they actually land on the target and don't blow away or evaporate. However, small droplets travel slowly and have little inertia/momentum so are easily displaced by wind and turbulence.

Incidentally, the logic of increasing the spray pressure to force fine drops into the canopy is wrong. The acceleration of small droplets lasts only milliseconds and has no impact on the overall travel time of the droplet to the target. Spraying at high pressure not only increases the wear rate of nozzles, it also produces finer sprays with a corresponding increase in drift potential.

### Coarse droplets are the go

Coarser spray provide just as much coverage as long as water volume is sufficient (>80 L/ha). In terms of coverage, the droplet density (or number of drops/cm) is more important than droplet size, and adequate densities (efficacy) can be achieved with nozzles that produce coarse spray qualities.

Coarser droplets also maintain their original direction of travel for longer and, in the case of TwinJets (or double outlet nozzles), can cover the forward and backward sides of the target more effectively.

### What nozzle?

TeeJet recommends 110° TwinJets (or dual pattern nozzles) for both post-emergent herbicides and fungicides. Choices include the Turbo TwinJet (TTJ), the Air Induction Turbo TwinJet (AITTJ) or the Air Induction Dual Pattern AI3070, a nozzle specifically designed for fungicide application in cereal crops. Double outlet nozzle bodies and caps are also available for growers who might want to mount two conventional nozzles on the one nozzle body.

The final choice will depend on the product being applied, travel speeds (or application volume), crop density and the applicator's pre-spray drift risk assessment (weather conditions, location of susceptible crops etc.).

### Conclusions






Use high application volumes unless the label specifically recommends against it. Higher volumes improve both coverage and spray penetration – the single most important variable for post-emergent herbicides and fungicides.

Avoid very fine sprays as they can lead to excessive spray drift and evaporation.

Use TwinJets that produce coarser droplets that maintain their original direction of travel for longer and therefore cover the leading and trailing sides of the target more effectively.

Always try to select and operate a nozzle around its mid pressure range (e.g. AITTJ60 at 3–4 bar)

As always, any application requirements on the product label must be adhered to.

<b>Turbo TwinJet (TTJ60)</b>	<b>Air Induction Turbo TwinJet (AITTJ60)</b>	<b>Air Induction Dual Flat Spray (AI3070)</b>	<b>Double outlet nozzle body or cap</b>
<ul style="list-style-type: none"><li>• Front flat spray 30° from vertical</li><li>• Rear flat spray 30° from vertical</li><li>• Medium–coarse</li><li>• 1.5–6 bar</li><li>• Ideal pressure 2–4 bar</li><li>• 02 to 04 capacities</li><li>• Drift control – good</li></ul>	<ul style="list-style-type: none"><li>• Front flat spray 30° from vertical</li><li>• Rear flat spray 30° from vertical</li><li>• Coarse–very coarse</li><li>• 2–6 bar</li><li>• Ideal pressure 3–4 bar</li><li>• 02 to 04 capacities</li><li>• Drift control – excellent</li></ul>	<ul style="list-style-type: none"><li>• Front flat spray 30° from vertical</li><li>• Rear flat spray 70° from vertical</li><li>• Medium–very coarse</li><li>• 1.5–6 bar</li><li>• Ideal Pressure 2–4 bar</li><li>• 015 to 05 capacities</li><li>• Drift control – excellent</li></ul>	<ul style="list-style-type: none"><li>• If using Turbo TeeJets (TT), 60°, 90° or 120° included angle</li><li>• Drift control, drop size, pressure range – varies</li></ul>
			 

Source: Peter Alexander, TeeJet Australasia Pty Ltd.



Radiation inversions also form over sloping terrain when air in contact with the ground is cooled by terrestrial radiation. The cooled layer remains quite shallow over the slope and is typically only 2–10 m deep, because gravity continually pulls it downward causing drainage winds. Drainage-wind advection (horizontal convection) of cool air away from the slope and over or into lower lying regions can initiate a drainage inversion or intensify an existing radiation inversion. Drainage inversions, once formed, have similar attributes to radiation inversions. Drainage winds can transport airborne pesticides long distances downhill, over flat terrain toward the lowest lying regions and into valleys.

Radiation and drainage inversions have caused substantial damage in the northern river valleys to cotton crops and to vineyards in the Murray Valley.

Radiation and drainage inversions typically begin in the evening at about sunset as the ground surface cools and the air in contact with the surface loses sufficient heat by conduction to become colder than the air immediately above. With continued overnight cooling, inversions usually intensify and deepen up to the time of the overnight minimum temperature.

### How to anticipate and recognise radiation inversions

The potential for inversions to occur and to adversely hold high concentrations of airborne pesticides near the surface should always be anticipated between sunset and up to an hour or two after sunrise; unless one or more of the following conditions occur:

- There is continuous overcast, low and heavy cloud.
- There is continuous rain.
- Wind speed remains above 11 km/hr for the whole period between sunset and sunrise. Be mindful that established inversions can sometimes still occur when winds are in excess of 11 km/hr.

Source: APVMA. For more information on inversions, go to:

- the Cotton Map website [fact sheet on temperature inversions](#)
- the GRDC website [page on inversions and spraying](#)
- the Bureau of Meteorology (BOM) fact sheet: [Weather for pesticide spraying](#).

**WARNING: never spray during a low-level inversion**

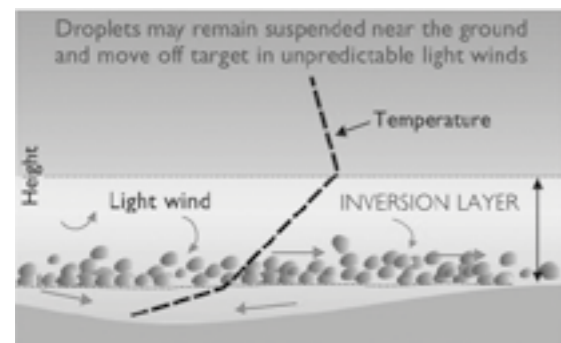


Figure 3. The relationship of air temperature and relative humidity to values of Delta T.

Source: Bureau of Meteorology.

### Where to find helpful meteorological information

Real time data needs to be collected in the paddock at the time of spraying. This can be done with:

- Handheld units that measure temperature, Delta T and wind speed
- on-farm weather stations – some can now be accessed by mobile phone.

### Hourly data

Forecasts are available from a number of websites for Delta T, wind speed etc. usually in three-hour blocks.

Hourly data from the Bureau of Meteorology (BOM) weather stations including temperature, Delta T, wind speed and direction is available for the previous 72 hours from BOM. This data can help in planning spray activities and is useful for developing an understanding of the current daily patterns of meteorological conditions.

### Meteograms™

Meteograms™ provide seven-day forecasts of:

- Temperature
- relative humidity
- Delta T
- Rainfall
- wind speed
- wind direction.

Meteograms™ are very helpful in planning spray programs for periods of lowest drift risk and highest pesticide efficacy.

Meteograms™ are mostly available by subscription. Some examples can be found at [Weatherwise](#)), or [Spraywise](#).

### Night spraying

Spraying during the night and early morning is common, especially during the warmer summer months where controlling fallow weeds is an important agronomic practice. Spraying at night increased with the introduction of GPS guidance. The main reason for night spraying is because, in many cases, Delta T conditions less than 8–10 are more common at night or in the early part of the morning, and the risk of physical drift from high wind is lower.

However, the risk of inversions is nearly always greater at night or in the early morning. Spraying during inversion conditions has resulted in large off-target damage in recent seasons, particularly to sensitive crops such as cotton and grapes.

### Important considerations when spraying at night

- As a result of the APVMA's spray drift initiative, labels will increasingly include the restraint, 'DO NOT apply during surface temperature inversions conditions at the application site.' Any restraint is an absolute prohibition. Since surface inversion conditions are prevalent at night, night spraying should be avoided unless the applicator can demonstrate an inversion was not present.
- Plan ahead by checking local forecast conditions and meteograms.
- Continuously check for inversions before and during spraying. If they are present DO NOT spray. Observe dust habits behind ground rigs and/or use smoke generators to help identify inversion conditions.
- Only spray with nozzles that produce coarse or very coarse droplets. This may mean spraying slower rather than faster. Coarse droplets will still provide effective control when spraying summer weeds.
- Use adjuvants that minimise fine droplets.
- Ensure boom height is not operated higher than necessary.
- Be aware of local off target risks, such as sensitive crops etc.
- Night spraying therefore carries some inherently high risks that spray applicators should be continuously monitoring and managing.

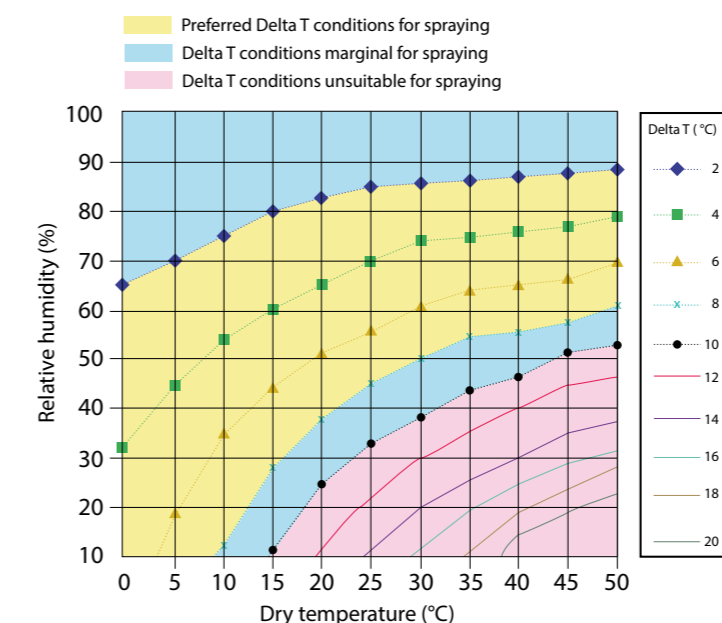


Figure 4. The relationship of air temperature and relative humidity to values of Delta T.

Source: Bureau of Meteorology.

# Herbicides for control and suppression

Table 10. Herbicides for fallow commencement and/or maintenance – Grass weed control

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazapic 240 g/L Gundy 240 Pre-emergent <sup>5</sup>	Paraquat 360 g/L Gramoxone <sup>®</sup> 360 Pro	Paraquat 135 g/L + diquat 115 g/L Spray.Seed <sup>®</sup> 250	Amitrole 250 g/L + paraquat 125 g/L Alliance <sup>®</sup>	Glyphosate 570 g/L Roundup Ultra <sup>®</sup> Max	Glyphosate 600 g/L CRUCIAL <sup>®</sup>	Glyphosate 470 g/L Weedmaster <sup>®</sup> DST <sup>®</sup>	Propaquizafop 100 g/L Shogun <sup>®</sup>	Pyraflufen-ethyl 2.1 g/L + 2,4-D 600 g/L Pyresta <sup>®</sup> Xtreme <sup>®</sup>
Grass weeds	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
annual phalaris	-	0.8-1.67	1.2-2.4	-	0.625-0.95	0.75	0.38-1.5	-	0.5 <sup>7</sup>
annual ryegrass	-	0.83-1.67	1.0-3.2	3.0-4.0	0.95-1.25	0.9	1.15-1.5	-	-
barley grass	-	0.83-1.67	1.0-3.2	3.0-4.0	0.625-0.95	0.6	0.38-1.5	-	0.5 <sup>7</sup>
barnyard grass	0.15-0.2	0.83-1.67	1.2-2.4	3.0-4.0	0.625-1.3	1.2	0.76-1.5	0.45-0.6 L/ha	-
blowaway grass	0.15-0.2	-	-	-	-	-	-	-	-
brome grass	-	0.83-1.67	1.0-3.2	3.0-4.0	0.95-1.25	0.75	0.96-1.5	-	0.25-0.5 <sup>7</sup>
button grass	0.15-0.2	-	-	-	0.625-1.3	0.75	0.76-1.5	-	-
cereals – volunteer	-	0.83-1.67	1.0-3.2	3.0-4.0	0.625-0.95	0.6	0.38-1.5	0.2-0.25 L/ha	-
couch	-	-	-	-	1.2-1.9 <sup>2</sup>	1.8	1.15-2.3 <sup>2</sup>	-	-
feathertop Rhodes	-	-	-	-	-	-	0.5-0.9 L/ha	-	-
Johnson grass	-	-	-	-	1.2-1.9	3.6	1.15-2.3	0.45-0.9 L/ha	-
liverseed grass	0.15-0.2	0.83-1.67	1.2-2.4	-	0.625-1.3	0.6	0.76-1.5	0.6-0.9 L/ha	-
native millet	-	-	-	-	0.625-1.3	0.6	0.76-1.5	-	-
nut grass	-	-	-	-	1.9 + 1.9 <sup>3</sup>	1.8	2.3 + 2.3 <sup>3</sup>	-	-
phalaris – perennial	-	-	-	-	1.2-1.9	-	1.44-1.9	-	-
pigeon grass	-	-	-	-	-	0.9	-	-	-
pigweed	0.15-0.2	-	-	-	-	0.6	-	-	-
sorghum – volunteer	-	-	-	-	0.425-1.3	0.6	0.76-1.5	0.3-0.6 L/ha	-
spiny burgrass	-	-	-	-	-	1.2	-	-	-
stinkgrass	0.15-0.2	-	1.2-2.4	-	0.425-1.3	0.6	0.76-1.5	-	-
summer grass	-	-	-	-	0.425-1.3	0.6	0.38-1.5	-	-
sweet summer grass	-	-	-	-	-	0.6	0.57-1.5	-	-
vulpia	-	0.83-1.67	1.0-3.2	-	0.95-1.25 <sup>1</sup>	0.9 <sup>4</sup>	1.15-1.5	-	0.5 <sup>7</sup>
wild oats	-	0.83-1.67	1.0-3.2	3.0-4.0	0.625-0.95	0.6	0.38-1.15	-	0.5 <sup>7</sup>
windmill grass	-	-	-	-	-	0.6	-	-	-
winter grass	-	0.83-1.67	-	-	0.95-1.25	0.75	0.96-1.5	-	-
Yorkshire fog	-	-	-	-	1.2-1.9	0.9	-	-	-
Rec. water vol L/ha boom	50 min	100-200	50-200	50-200	80 max	50-80 <sup>8</sup>	25-100	50-150	60-150
Wheat plantback	4 months	1 hr	1 hr	0 hr e	1 hr	6 hr	6 hr	28 days	1-3d <sup>7</sup>
Herbicide group	B (Boom only)	L	L	L + Q	M	M	M	A	G + I

Key: d = days; hr = hour; min = minutes

- <sup>1</sup> When treating dense populations, use higher rate, add Wetter TX<sup>®</sup> and water volumes > 70 L/ha.
- <sup>2</sup> Best in conjunction with multiple applications and/or cultivation.
- <sup>3</sup> See label for program.
- <sup>4</sup> Minimum water rate of 70 L/ha and appropriate nozzles. See label.

- <sup>5</sup> Fallow residual pre-emergent herbicide. Apply to paddock at least 4 months before planting wheat, barley, chickpea. 200 mm rainfall required for plantback. See Table 4 on page 12. Best applied to dry soil surface prior to weeds germinating. Northern NSW only.
- <sup>6</sup> Adjuvant required to be added at label rates for all applications.
- <sup>7</sup> Add glyphosate, see label.
- <sup>8</sup> Multiple tank mixes a minimum water volume of 50 L/ha is recommended, and 80 L/ha for other broadacre uses.

Table 11. Herbicides for fallow commencement and/or maintenance – Broadleaf weed control – Part 1 (page 1 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Glufosinate-ammonium 200 g/L Basta <sup>®</sup>	Tribenuron-methyl 750 g/kg Express <sup>®</sup>	Oxyfluorfen 240 g/L Striker <sup>®</sup>	Carfentrazone ethyl 400 g/L Hammer <sup>®</sup> 400EC 400 EC	Pyraflufen-ethyl 2.1 g/L + 2,4D ethylhexyl ester) 600 g/L Pyresta <sup>®</sup> Xtreme <sup>®</sup>	Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8 g/L Grazon <sup>®</sup> Extra	Dicamba 750 g/L Kamba <sup>®</sup> 750	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hoisthot <sup>®</sup>	Paraquat 135 g/L + diquat 115 g/L Spray.Seed <sup>®</sup> 250	Amitrole 250 g/L + paraquat 125 g/L Alliance <sup>®</sup>	Glyphosate 570 g/L Roundup Ultra <sup>®</sup> Max	Glyphosate 470 g/L Weedmaster <sup>®</sup> DST <sup>®</sup>	Pyraflufen-ethyl 2.1 g/L Sledge <sup>®</sup>
Broadleaf weeds	(litres)	(grams)	(millilitres)	(millilitres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)
amaranthus	2-5	25	75	-	-	-	0.215-0.375 <sup>2</sup>	-	-	3.0-4.0	-	-	-
amsinckia	-	-	75	-	0.25-0.5 <sup>6</sup>	-	-	-	-	-	-	-	-
blackberry nightshade	-	-	75	-	-	0.2-0.4 (S) <sup>2</sup>	0.215-0.375	-	-	-	-	-	-
black bindweed	1.8-5.0 <sup>3</sup>	25 <sup>2</sup>	-	-	-	0.185	0.185	0.5 <sup>6</sup>	-	-	1.2-1.9	-	-
bladder ketmia	3.0-5.0	-	75	-	-	-	-	-	1.6-2.4	3.0-4.0	0.625-1.3	0.76-1.15 <sup>10</sup>	-
Boggabri weed	-	-	-	-	-	-	-	-	1.6-2.4	-	0.425-1.3	0.38-1.45	-
burs – Bathurst	-	-	-	-	0.5-0.9 <sup>6</sup> <sup>20</sup>	-	0.215-0.375	-	1.6-2.4	-	1.2-1.9	0.76-2.3	-
burs – Noogoora	-	-	-	-	0.5-0.9 <sup>6</sup> <sup>20</sup>	-	0.215-0.375	-	1.6-2.4	-	0.625-1.3	0.76-1.15 <sup>10</sup>	-
caltrop/yellow vine	3.0-5.0	25	75	-	-	-	0.215-0.375	-	1.6-2.4	-	0.425-1.3	0.38-1.15	50-100
canola – volunteer	-	-	-	-	-	-	-	-	-	3.0-4.0 <sup>9</sup>	-	-	50-100
capeweed	-	-	75	15-45	0.25-0.5 <sup>6</sup>	-	0.105-0.16 <sup>2</sup> <sup>20</sup>	-	1.2-3.2	3.0-4.0	0.95-1.25	0.96-1.5	50-100
charlock	-	-	-	-	-	-	-	-	1.2-3.2	-	-	-	-
chickpea – volunteer	-	-	-	-	0.25-0.5 <sup>6</sup>	-	-	-	-	-	-	-	-
chickweed	-	-	75	15-45	-	-	-	-	-	-	-	-	-
clover	-	-	-	-	-	0.135 <sup>20</sup>	-	-	1.2-3.2 <sup>11</sup>	-	-	-	-
corn growwell	-	-	-	-	-	-	-	-	1.2-3.2	-	-	-	-
cudweed	-	-	-	-	-	-	-	-	-	-	-	-	-
datura (thornapple)	20 <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	0.76-1.15	-
deadnettle	2.0-5.0	25 <sup>2</sup>	75 <sup>20</sup>	-	0.25-0.5 <sup>6</sup>	-	0.215-0.375	-	1.6-2.4	-	0.625-1.3	0.76-1.15 <sup>10</sup>	50-100
docks	-	-	-	-	0.5 <sup>6</sup> <sup>20</sup>	-	0.185	-	-	-	1.2-1.9	0.575-1.5	-
erodium (storksbill)	1.5-4.0	-	-	15-45	0.25-0.5 <sup>6</sup>	-	0.185	-	1.2-3.2 <sup>2</sup>	3.0-4.0	1.2-1.9	-	50-100
fat hen	3.0-5.0	-	75	-	-	-	0.185	-	1.6-2.4	-	1.2-1.9	-	50-100
field pea – volunteer	-	-	-	-	-	-	-	-	1.2-1.8 <sup>11</sup>	3.0-4.0	-	-	-
fleabane	3.0-5.0	-	-	-	-	-	-	-	-	3.0-4.0	1.15 <sup>12</sup> <sup>13</sup>	-	-
Rec water vol L/ha boom	100 L	>50	30-200	50-150	60-150	50 min	50 min	80 min	50-200	50-200	80 max	25-100	70-150
Wheat plantback	14 days	3 days	24 hour	0 hour	1-3 days	2-4 months	1-14 days	4 months <sup>17</sup>	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	N	B	G	G	G + I	I	I	I	L	L + Q	M	M	G

- <sup>2</sup> Add glyphosate as per label for control.
- <sup>3</sup> Curled dock only.
- <sup>4</sup> Hammer<sup>®</sup> 400EC 400 EC also available in 240 g/L, see label for rates.
- <sup>5</sup> Add glyphosate – see label.
- <sup>6</sup> Includes Roundup-Ready<sup>®</sup> canola.
- <sup>7</sup> Before stem elongation. After this add Amicide<sup>®</sup> Advance 700 for control. See label.
- <sup>8</sup> Add 5 g/ha Associate<sup>®</sup> or 0.5 L/ha dicamba for control.
- <sup>9</sup> A minimum of 1.1 L/ha CRUCIAL<sup>®</sup> + 0.65 mL-1.1 L/ha Amicide<sup>®</sup> Advance 700.
- <sup>10</sup> A minimum of 1.1 L/ha CRUCIAL<sup>®</sup> + 0.65 mL-1.1 L/ha Amicide<sup>®</sup> Advance 700 + followed by 1.6-2.0 L/ha Shirquat<sup>®</sup>.
- <sup>11</sup> Northern NSW only.
- <sup>12</sup> Always add non-ionic surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
- <sup>13</sup> Always apply with recommended label rates of glyphosate. Addition of Striker<sup>®</sup> will improve knockdown and increase speed of control.
- <sup>14</sup> Always apply with recommended label rates of knockdown herbicides.
- <sup>15</sup> Always add with recommended rate of glyphosate at no less than coarse to very coarse droplets.
- <sup>16</sup> Tankmix Roundup<sup>®</sup> CT + adjuvant for control. Caution: check minimum recropping periods in Table 2 on page 8.
- <sup>17</sup> Observe plantback period with broadleaf crops. Northern NSW only.
- <sup>18</sup> Observe plantback periods – see Table 2 on page 8.
- <sup>19</sup> Add wetting agent when water volume is above 100 L/ha.
- <sup>20</sup> Weedmaster DST/glyphosate or Revolver<sup>®</sup> as required.
- <sup>21</sup> Apply as a tankmix with Raze<sup>®</sup> or other glyphosate product. Apply when weeds are actively growing and at the 2-6 leaf growth stage. Adding hot-up or Hasten may be beneficial when applying Sledge with a glyphosate product.
- <sup>22</sup> Seedlings only.
- <sup>23</sup> Southern NSW only.
- <sup>24</sup> Good control will be achieved on small and medium sized plants only in non-crop situation.
- <sup>25</sup> Suppression only.

Table 11. Herbicides for fallow commencement and/or maintenance – Broadleaf weed control – Part 1 (continued, page 2 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Glufosinate- ammonium 200 g/L Basta®	Tribenuron- methyl 750 g/kg Express®	Oxyfluorfen 240 g/L Striker®	Carfentrazone ethyl 400 g/L Hammer® 400EC 400 EC	Pyraflufen-ethyl 2.1 g/L + 2.4D ethylhexyl ester) 600 g/L Pyresta® Xtreme®	Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8 g/L Grazon® Extra	Dicamba 750 g/L Kamba® 750	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hotshot®	Paraquat 135 g/L + diquat 115 g/L Spray.Seed® 250	Amitrole 250 g/L + paraquat 125 g/L Alliance®	Glyphosate 570 g/L Roundup Ultra® Max	Glyphosate 470 g/L Weedmaster® DST®	Pyraflufen-ethyl 25 g/L Sledge®
<b>Broadleaf weeds</b>	(litres)	(grams)	(millilitres)	(millilitres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)
fumitory	-	-	-	-	-	-	-	-	1.2-3.2	-	-	0.76-1.15	-
ground cherry-annual	-	-	-	-	-	-	-	-	-	-	0.625-1.3	0.76-1.15 <sup>(4)</sup>	-
heliotrope – white	-	-	-	-	-	-	-	-	-	-	-	-	50-100
Hexham scent	-	-	-	-	-	-	0.185	-	1.6-2.4	-	-	-	-
hoary cress	-	-	-	-	-	-	0.185 <sup>(1)</sup>	-	-	-	1.2-1.9	1.15	-
horehound	-	-	-	-	-	-	0.215-0.375	-	1.2-3.2	-	-	-	-
lucerne (established)	-	-	-	-	-	-	-	-	-	-	-	-	-
lupin – volunteer	-	-	-	-	-	-	-	-	-	-	-	-	-
marshmallow	-	-	-	-	-	-	-	-	1.2-1.8 <sup>(1)</sup>	-	-	-	-
medic	1.0-5.0	30	75 <sup>(1)</sup>	15-45	0.5-0.9 <sup>(6)</sup>	-	0.105-0.16 <sup>(2)</sup>	-	1.2-1.8	3.0-4.0	-	-	50-100
melons	-	-	-	-	0.2-0.4 <sup>(2)</sup>	-	-	-	1.2-3.2 <sup>(1)</sup>	3.0-4.0	-	-	-
Mexican poppy	-	-	-	-	-	-	-	-	1.6-2.4	-	0.625-1.3 <sup>(7)</sup>	0.74-1.5 <sup>(7)</sup>	80-160
mustards	-	-	-	-	-	-	-	-	-	-	0.625-1.3	0.76-1.15 <sup>(6)</sup>	-
New Zealand spinach	2.0-5.0	20	75	-	0.5 <sup>(6)</sup>	-	0.185	-	1.2-3.2	3.0-4.0	0.95-1.25	0.38-1.5	-
Parthenium weed	-	-	-	-	-	-	0.215-0.375	-	1.6-2.4	-	0.625-1.3	0.76-1.15	-
Pateron's curse	1.0-3.0	-	37.5	15-45	0.25-0.5 <sup>(6)</sup>	-	0.105-0.16 <sup>(2)</sup>	-	-	-	0.95-1.25	1.15-1.5	-
peachvine (cowvine)	-	-	-	-	0.2-0.4 <sup>(2)</sup>	-	-	-	-	-	-	-	-
peppergrass	-	-	-	-	-	-	-	-	-	-	-	-	-
pigweed	3.0-5.0	20 <sup>(2)</sup>	75 <sup>(2)</sup>	-	0.5-0.9 <sup>(6)</sup>	-	-	0.5 <sup>(6)</sup>	-	-	0.625-1.3	0.38-1.5 <sup>(10)</sup>	-
plantain	-	-	-	-	-	-	-	-	-	-	1.2-1.9	-	-
potato weed	2.0-5.0	-	75 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
prickly lettuce	3.0-5.0	20 <sup>(2)</sup> or 30	75	-	-	-	0.105-0.160 <sup>(2)</sup>	-	-	3.0-4.0	0.625-1.3	0.76-1.15 <sup>(10)</sup>	50-100
Rec water vol L/ha boom	100 L	>50	30-200	50-150	60-150	50 min	50 min	80 min	50-200	50-200	80 max	25-100	70-150
Wheat plantback	14 days	3 days	24 hour	0 hour	1-3 days	2-4 months	1-14 days	4 months <sup>(1)</sup>	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	N	B	G	G	G+1	I	I	I	L	L+Q	M	M	G

- 1 Add 0.57 L/ha Amicide Advance 700.
- 2 Add glyphosate as per label for control.
- 3 Hammer® 400EC 400 EC also available in 240 g/L, see label for rates.
- 4 Add glyphosate – see label.
- 5 Add Garlon® 600 at 80-160 mL/ha for prickly/paddy melons or 120-160 mL/ha for Afghan/camel melons.
- 6 Use glyphosate alone for camel melon only.
- 7 Before stem elongation. After this add Amicide® Advance 700 for control. See label.
- 8 Add 5 g/ha Associate® or 0.5 L/ha dicamba for control.
- 9 Small flowered mallow.
- 10 Observe plantback period with broadleaf crops. Northern NSW only.
- 11 Observe plantback periods – see Table 2 on page 8.
- 12 Add wetting agent when water volume is above 100 L/ha.
- 13 Add Weedmaster® DST at 0.385-0.575 L/ha or Weedmaster® DUO at 0.5-0.7 L/ha.
- 14 Apply as a tankmix with Raze® or other glyphosate product. Apply when weeds are actively growing and at the 2-6 leaf growth stage. Adding hot-up or Hasten may be beneficial when applying Sledge with a glyphosate product. Seedlings only.
- 15 Suppression only.

Table 11. Herbicides for fallow commencement and/or maintenance – Broadleaf weed control – Part 1 (continued, page 3 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Glufosinate- ammonium 200 g/L Basta®	Tribenuron- methyl 750 g/kg Express®	Oxyfluorfen 240 g/L Striker®	Carfentrazone ethyl 400 g/L Hammer® 400EC 400 EC	Pyraflufen-ethyl 2.1 g/L + 2.4D ethylhexyl ester) 600 g/L Pyresta® Xtreme®	Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8 g/L Grazon® Extra	Dicamba 750 g/L Kamba® 750	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hotshot®	Paraquat 135 g/L + diquat 115 g/L Spray.Seed® 250	Amitrole 250 g/L + paraquat 125 g/L Alliance®	Glyphosate 570 g/L Roundup Ultra® Max	Glyphosate 470 g/L Weedmaster® DST®	Pyraflufen-ethyl 25 g/L Sledge®
<b>Broadleaf weeds</b>	(litres)	(grams)	(millilitres)	(millilitres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)
radish – wild	5.0	-	75 <sup>(2)</sup>	15-45	0.25-0.5 <sup>(6)</sup>	-	-	-	1.2-3.2	3.0-4.0	0.95-1.25	1.15-1.5	50-100
rough poppy	-	-	-	-	-	-	-	-	1.2-3.2	-	-	-	-
safron thistle	1.5-5.0	-	-	-	-	-	0.185 <sup>(1)</sup>	-	1.2-3.2	-	0.95-1.25	0.76-1.5	-
shepherd's purse	-	-	75	-	-	-	-	-	1.2-3.2	-	-	-	-
skeleton weed	-	-	-	-	-	-	-	-	-	-	-	-	-
slender thistle	-	-	-	-	-	-	-	-	-	-	-	-	-
sorrel	-	-	-	-	-	-	0.28 <sup>(1)</sup>	-	-	-	1.2-1.9	-	-
soursob	-	-	-	-	-	-	-	-	-	3.0-4.0	0.95	1.15	-
sowthistle	2.0-5.0	25	75	-	0.5 <sup>(6)</sup>	0.2-0.4 <sup>(2)</sup>	-	-	-	3.0-4.0	0.425-1.3	0.575-1.5	50-100
spear thistle	-	-	-	-	-	-	0.215-0.375	-	-	3.0-4.0	0.95-1.25	0.75-1.15	-
spiny emex	2.0-5.0	-	-	15-45	-	-	0.215-0.375	-	1.2-3.2	-	-	-	-
spurge	-	-	-	-	-	-	-	-	-	-	-	-	-
stagger weed	2.0-5.0	-	-	-	-	-	-	-	-	-	-	-	-
star thistle	-	-	-	-	-	-	0.215-0.375	-	-	-	-	-	-
stinging nettle	-	-	75 <sup>(2)</sup>	-	-	-	-	-	1.2-3.2	-	1.6	0.76-1.15	-
stinking goosefoot	-	-	-	-	-	-	-	-	-	-	0.625-1.3	0.76-1.15	-
sub. clover	-	-	-	-	0.5 <sup>(6)</sup>	-	0.135 <sup>(6)</sup>	-	1.2-3.2 <sup>(1)</sup>	-	1.2-1.9 <sup>(3)</sup>	-	50-100
sunflower	-	-	-	-	-	-	0.185	-	-	-	0.575-1.5	-	-
turnip weed	3.0-5.0	20	75	-	0.25-0.5 <sup>(6)</sup>	-	-	-	1.2-3.2	-	0.625-1.3	0.76-1.15 <sup>(10)</sup>	-
variegated thistle	2.5-5.0	-	-	-	-	-	0.185	-	-	3.0-4.0	0.95-1.25	0.575-1.5	-
vetch	-	-	-	-	-	-	0.185	-	1.2-3.2	-	-	-	-
wild turnip	-	-	75	-	0.25-0.5 <sup>(6)</sup>	-	-	-	1.2-3.2	-	0.95-1.25	0.76-1.5 <sup>(10)</sup>	-
wireweed	1.5-5.0	-	75	-	-	-	0.185 or 105-160 <sup>(1)</sup>	-	1.2-3.2	3.0-4.0	0.625-1.3	0.76-1.15 <sup>(10)</sup>	50-100
Rec water vol L/ha boom	100 L	>50	30-200	50-150	60-150	50 min	50 min	80 min	50-200	50-200	80 max	25-100	70-150
Wheat plantback	14 days	3 days	24 hour	0 hour	1-3 days	2-4 months	1-14 days	4 months <sup>(1)</sup>	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	N	B	G	G	G+1	I	I	I	L	L+Q	M	M	G

- 1 Add 0.57 L/ha Amicide Advance 700.
- 2 Add glyphosate as per label for control.
- 3 Tankmix with dicamba for improved control.
- 4 Hammer® 400EC 400 EC also available in 240 g/L, see label for rates.
- 5 Add glyphosate – see label.
- 6 Before stem elongation. After this add Amicide® Advance 700 for control. See label.
- 7 Add 5 g/ha Associate® or 0.5 L/ha dicamba for control.
- 8 Add Striker®/Spark® at 75 mL/ha for control.
- 9 Northern NSW only.
- 10 Observe plantback period with broadleaf crops. Northern NSW only.
- 11 Always add non-ionic surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
- 12 Always apply with recommended label rates of glyphosate. Addition of Striker® will improve knockdown and increase speed of control.
- 13 Always apply with recommended label rates of knockdown herbicides.
- 14 Always add with recommended rate of glyphosate at no less than coarse to very coarse droplets.
- 15 Tankmix Roundup® CT + adjuvant for control. Caution: check minimum recropping periods in Table 2 on page 8.
- 16 Observe plantback period with broadleaf crops. Northern NSW only.
- 17 Observe plantback periods – see Table 2 on page 8.
- 18 Add wetting agent when water volume is above 100 L/ha.
- 19 Add Weedmaster® DST at 0.385-0.575 L/ha or Weedmaster® DUO at 0.5-0.7 L/ha.
- 20 Apply as a tankmix with Raze® or other glyphosate product. Apply when weeds are actively growing and at the 2-6 leaf growth stage. Adding hot-up or Hasten may be beneficial when applying Sledge with a glyphosate product. Seedlings only.
- 21 Suppression only.



Table 12. Herbicides for fallow commencement and/or maintenance – Broadleaf weed control – Part 2 (page 1 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metsulfuron- methyl 600 g/kg Associate <sup>1</sup>	Aminopyralid 375 g/kg + metsulfuron 300 g/kg Stinger <sup>17</sup>	Imazapic 240 g/L Gundy 240 Pre-emergent NNSW only	Bromoxynil 200 g/L Bromicide <sup>20</sup>	2,4-D amine 700 g/L Amicide <sup>2</sup> Advance 700	2,4-D LV ester 680 g/L Estericide <sup>2</sup> Xtra 680	2,4-D amine 300 g/L + picloram 75 g/L + aminopyralid 7.5 g/L FallowBoss <sup>2</sup> Tordon <sup>2</sup>	Fluroxypyr 333 g/L Starane <sup>1</sup> Advanced	Triclopyr 600 g/L Garlon <sup>16</sup> 600	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro <sup>4</sup>	Isoxaflutole 750 g/kg Balance <sup>2</sup> 750 WG
<b>Broadleaf weeds</b>	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(litres)	(grams)
African turnip weed	–	10	–	–	–	–	–	–	–	–	–
amaranthus	–	–	0.15–0.2	–	0.745–1.15 <sup>2</sup>	0.210–0.8	–	–	–	–	–
amsinckia	5 or 7	–	–	–	–	–	–	–	–	–	–
barley grass	–	–	–	–	0.515–0.745 <sup>2</sup>	–	–	–	–	–	–
blackberry nightshade	–	–	–	–	–	–	–	–	–	–	–
black bindweed	–	14	–	1.5 <sup>7</sup>	–	–	–	0.3 <sup>6</sup>	–	–	100 (S)
bladder ketmia	–	–	–	–	0.745–1.15 <sup>2</sup>	–	–	0.3 <sup>6</sup>	–	–	–
Bogabri weed	–	14	0.15–0.2	–	–	–	–	–	–	–	–
burs – Bathurst	–	–	–	–	0.515–0.745 <sup>2</sup>	0.21–0.8	–	0.45	–	–	–
burs – Noogoora	–	–	–	–	0.745–1.15 <sup>2</sup>	0.62–0.8	–	0.45	–	–	–
calltrop/yellow vine	–	–	0.15–0.2	–	0.28–0.815 <sup>2</sup>	0.9–1.3 <sup>6</sup>	–	0.3 <sup>6</sup>	–	–	–
canola – volunteer	–	–	–	–	0.88 or 1.2 <sup>2</sup>	0.21–0.8	–	–	–	–	–
capeweed	–	–	–	–	0.39–0.515 <sup>2</sup>	0.21–0.8	–	–	–	–	–
charlock	5	–	–	–	–	–	–	–	–	–	–
chicory	–	10	–	–	–	–	–	–	–	–	–
chickpea – volunteer	5	–	–	–	–	–	–	–	–	–	–
chickweed	5	–	–	–	–	–	–	–	–	–	–
clover	5	10	–	–	0.515–0.745 <sup>2</sup>	0.21–0.8	–	–	–	–	–
corn growwell	–	–	–	–	–	–	–	–	–	–	–
cutweed	–	–	–	–	–	–	–	–	–	–	–
datura (thornapple)	–	–	–	–	0.515–0.745 <sup>2</sup>	0.21–0.8	–	0.45	–	–	–
deadnettle	5	10	–	–	0.21–0.8	0.21–0.8	–	–	–	–	–
docks	5 or 7	10–14	–	–	0.39–0.515 <sup>2</sup>	0.21–0.8	–	–	–	–	0.3
erodium (storksbill)	–	–	–	–	0.515–0.745 <sup>2</sup>	0.21–0.8	–	–	–	–	–
fabo bean volunteer	–	–	–	–	–	–	–	–	–	–	–
fat hen	–	–	–	–	0.745–1.15w	0.21–0.8	–	–	–	–	–
feathertop Rhodes grass	–	–	–	–	–	–	–	–	–	–	–
Rec water vol L/ha boom	30 min	50–100	50 min	50–200	50–250	30–100	50–100	50 min	80 min	10 weeks + 100 mm rain	100
Wheat plantback	10 days	4 months	4 months	Not stated	1–7 days	1–7 days	1–7 days	7 days	7 days	1 month north and south NSW	50 min
Herbicide group	B	I + B	B	C	I	I	I	I	I	I	H

- Fluroxypyr also available in 400 g/L. See label for rates.
- Must also add a minimum of 1.1 L/ha CRUCIAL<sup>®</sup>.
- Bronco, higher rate bromoxynil 400 g/L; black bindweed 750 mL (2), peachvine 700 mL – 1.1 L; wheat plantback is nil.
- Pixxaro<sup>®</sup> rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
- Add glyphosate for control.
- 1.5 L/ha or 1–1.5 L/ha + glyphosate.
- See label for rates for controlling Roundup Ready<sup>®</sup> canola volunteers.
- Must be tank mixed with a knock down herbicide such as Roundup Power Max Credit broadacre herbicide plus Bonus, Roundup CT, Glyphosate CT, Nuquat 250, or Spray/Seed/Revolver<sup>®</sup>. See label for rates.
- For fallow control, see label for tankmix options with glyphosate products. Add wetting agent as required. Not before undersowing pasture legumes.
- Fallow residual pre-emergent herbicide. Apply to paddock at least 4 months before planting wheat, barley and chickpea. See Table 2 on page 8. Best applied to dry soil surface before weeds germinate. Northern NSW only. Requires 200 mm rainfall before planting.
- Add Uptake<sup>®</sup> spraying oil at 0.5 L/100 L of spray. When mixing with Roundup<sup>®</sup> CT to control grasses refer to Roundup<sup>®</sup> CT label.
- Add Uptake<sup>®</sup> spraying oil at 0.5 L/100 L water. Do not use oils when tankmixing with Roundup<sup>®</sup> CT. See label for melon species, size and chemical rate.
- Add glyphosate (480) at label rates.
- Add wetting agent as per label.
- Suppression.

Table 12. Herbicides for fallow commencement and/or maintenance – Broadleaf weed control – Part 2 (continued, page 2 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metsulfuron- methyl 600 g/kg Associate <sup>1</sup>	Aminopyralid 375 g/kg + metsulfuron 300 g/kg Stinger <sup>17</sup>	Imazapic 240 g/L Gundy 240 Pre-emergent NNSW only	Bromoxynil 200 g/L Bromicide <sup>20</sup>	2,4-D amine 700 g/L Amicide <sup>2</sup> Advance 700	2,4-D LV ester 680 g/L Estericide <sup>2</sup> Xtra 680	2,4-D amine 300 g/L + picloram 75 g/L + aminopyralid 7.5 g/L FallowBoss <sup>2</sup> Tordon <sup>2</sup>	Fluroxypyr 333 g/L Starane <sup>1</sup> Advanced	Triclopyr 600 g/L Garlon <sup>16</sup> 600	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro <sup>4</sup>	Isoxaflutole 750 g/kg Balance <sup>2</sup> 750 WG
<b>Broadleaf weeds</b>	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(litres)	(grams)
field pea – volunteer	7	–	–	–	0.39–0.515w	–	–	–	–	–	–
fleabane	–	–	–	–	0.65–1.1wti	–	–	–	–	–	–
fumitory	5	–	–	–	0.28–0.815w	0.21–0.8	–	–	–	–	100
ground cherry – annual	–	–	–	–	0.745–1.15w	–	–	0.45	–	–	–
heliotrope – white	–	–	–	–	–	–	–	–	–	–	–
Hexham scent	–	–	–	–	–	0.21–0.8	–	–	–	–	–
hoary cress	–	–	–	–	–	0.21–0.8	–	–	–	–	–
horehound	–	–	–	–	0.515–0.745w	0.21–0.8	–	–	–	–	–
lucerne (established)	–	–	–	–	–	–	–	–	–	–	–
lupin – volunteer	5	–	–	–	0.39–0.515w	0.21–0.8	–	–	–	–	–
marshmallow	–	–	–	–	0.515–0.745w	–	–	0.6	–	–	–
medic	5	10	–	–	0.39–0.515w	–	–	–	–	–	–
melons	–	–	–	–	0.745–1.15w	0.21–0.8	–	–	–	–	–
Mexican poppy	–	–	–	–	0.745–1.15w	0.21–0.8	–	–	–	–	–
mintweed	–	–	0.15–0.2	–	–	0.21–0.8	–	–	80–160j	–	–
mustards	5	10	–	–	0.28–0.815w	0.21–0.8	–	–	–	–	–
New Zealand spinach	–	14	–	–	0.28–0.815w	0.21–0.8	–	–	–	–	–
parthenium weed	–	10–14	–	–	–	–	–	–	–	–	–
Paterson's curse	5 or 7	–	–	–	0.39–0.515w	0.21–0.8	–	–	–	–	–
peachvine (cowvine)	–	–	0.15–0.2	1.4–2.1	–	–	–	0.3 y	–	–	–
peppercress	–	–	–	–	–	–	–	–	–	–	–
pligweed	–	10–14	–	–	–	–	–	–	–	–	–
potato weed	–	–	–	–	0.745–1.15w	–	–	–	–	–	–
prickly lettuce	–	–	–	–	0.39–0.515w	–	–	–	–	–	–
radish – wild	–	–	–	–	0.28–0.815 <sup>2</sup>	–	–	–	–	–	–
rough poppy	5	–	–	–	–	0.21–0.8	–	–	–	–	–
safron thistle	–	–	–	–	0.39–0.515 <sup>2</sup>	0.21–0.8	–	–	–	–	–
Rec water vol L/ha boom	30 min	50–100	50 min	50–200	50–250	30–100	50–100	50 min	7 days	80 min	50 min
Wheat plantback	10 days	4 months	4 months	Not stated	1–7 days	1–7 days	1–7 days	7 days	7 days	1 month north and south NSW	10 weeks + 100 mm rain
Herbicide group	B	I + B	B	C	I	I	I	I	I	I	H

- Fluroxypyr also available in 400 g/L. See label for rates.
- Must also add a minimum of 1.1 L/ha CRUCIAL<sup>®</sup>.
- Bronco, higher rate bromoxynil 400 g/L; black bindweed 750 mL (u), peachvine 700 mL – 1.1 L; wheat plantback is nil.
- Pixxaro<sup>®</sup> rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
- Must also add a minimum of 1.1 L/ha CRUCIAL<sup>®</sup>, followed by 1.6–2.0 L/ha Shirquat<sup>®</sup> within 7–10 days of the first application.
- Add glyphosate for control.
- 1.5 L/ha or 1–1.5 L/ha + glyphosate.
- See label for appropriate rate given weed size and season consideration. Minimum water rate 70 L/ha.
- Add 1.5–2.25 L/ha (Glyphosate 480)
- Must be tank mixed with a knock down herbicide such as Roundup Power Max Credit broadacre herbicide plus Bonus, Roundup CT, Glyphosate CT, Nuquat 250, or Spray/Seed/Revolver<sup>®</sup>. See label for rates.
- For fallow control, see label for tankmix options with glyphosate products. Add wetting agent as required. Not before undersowing pasture legumes.
- Fallow residual pre-emergent herbicide. Apply to paddock at least 4 months before planting wheat, barley and chickpea. See Table 2. Best applied to dry soil surface before weeds germinate. Northern NSW only. Requires 200 mm rainfall before planting.
- Add Uptake<sup>®</sup> spraying oil at 0.5 L/100 L of spray. When mixing with Roundup<sup>®</sup> CT to control grasses refer to Roundup<sup>®</sup> CT label.
- Add Uptake<sup>®</sup> spraying oil at 0.5 L/100 L water. Do not use oils when tankmixing with Roundup<sup>®</sup> CT. See label for melon species, size and chemical rate.
- Add glyphosate (480) at label rates.
- Add wetting agent as per label.
- Suppression.





Table 13. Herbicides for presowing seedbed weed control – Salvage seedbed preparation (continued page 2 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Tribenuron- methyl 750 g/kg Express® 25	Metoslam 100 g/L Eclipse® 100 SC	Cafentrazone- ethyl 240 g/L Hammer® 400EC 400EC	Saflufenacil 700 g/kg Sharpen® WG 26 25	Oxyfluorfen 240 g/L Striker® 27	Flumioxazin 500 g/kg Terrain™ 28	Pyraflufen-ethyl 2.1 g/L + 2.4-D LV ester 421 g/L Pyrestia® Xtreme® 29	Pyraflufen-ethyl 25 g/L Sledge® 30	Fluroxypyr 333 g/L Starane® Advanced 31 31	Dicamba 750 g/L Kamba® 750 32	Paraquat 135 g + diquat + 115 g/L Spray-Seed® 250 33	Paraquat 360 g/L Gramoxone® 360 PRO 34 35	Amitrole 250 g/L + paraquat 125 g/L Alliance® 36	Glyphosate 570 g/L Roundup Ultra® Max 37	Glyphosate 470 g/L Weedmaster® DST® 38	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® 39
<b>Crop type</b>	W,B,O	WC	AC	W,B,O,CH, FP,FB,L,LE	AC	AC <i>not durum</i>	AC	WC	CH,WC,C	AC	AC	AC	WC,C,FP,L	AC	AC	WC,C
<b>aircraft (A) or ground (B)</b>	AB	AB	B	B	AB	B	B	B	AB	AB				AB	AB	B
<b>Weeds controlled</b>																
cowine																
deadnettle	25 or 25 7				75 38		0.25–0.5 7	0.05–0.1			0.8–3.2	0.835–1.1		0.425–1.3		0.2–0.3
dock							0.5 7			0.105–0.16 3				1.2–1.9	0.76–1.9	
erodium/storksbill			25–75	26–34		30 7	0.25–0.5 7 8	0.05–0.1			0.8–3.2	0.835–1.1 19	2.0–2.8	1.2–1.9	1.44–1.9	
faba bean –volunteer																
false castor oil																
fleabane				17–34												
fieldpea –volunteer										0.105–0.16 3						
fumitory											0.8–3.2	0.835–1.1	2.0–2.8	0.32–0.95 20	0.76–1.5 20	
goosefoot																
heliotrope			17–26					0.05–0.1								
khaki weed			26–34													
lesser swine cress							0.5 6 7			0.105–0.16 3	0.8–3.2	0.835–1.1	1.5–2.8 8	0.95–1.25	1.15–1.5	
lupin –volunteer					75											
marshmallow			25–75	17–26	37.5	30 7	0.25–0.5 7	0.05–0.1	0.6		0.8–1.8 10		2.0–2.8	0.32–0.95 20	0.76–1.5 20	0.3
medics	30	50	17–26	17–26		30 7				0.105–0.16 3	1.2–1.8 10		2.0–2.8			
melons																
Mexican poppy											0.8–2.4	0.835–1.1		0.625–0.95		0.3
Muskweed				17–34												
mustards				17–34						0.105–0.16 3	0.8–3.2	0.835–1.1		0.95–1.25	1.15–1.5	
New Zealand spinach	20									0.185	0.8–2.4			0.625–1.3		
Noogoora burr																
Paterson's curse			25–75	17–26	37.5	30 7	0.25–0.5 7			0.105–0.16 3	0.8–2.4		2.0–2.8	0.95–1.25	0.76–1.5	
peppercress																
phalaris–perennial																
prickly lettuce	30 or 20 7			17–26				0.05–0.1	0.6 12	0.105–0.16 3	0.8–2.4	0.835–1.1	2.0–2.8	0.625–1.3		
radish –wild		35 1	25–75	26–34	75 39	30 7		0.05–0.1			0.8–3.2		1.5–2.8	0.95–1.25	1.15–1.5	
red root amaranth																
rough poppy																
saffron thistle																
scotch thistle										0.185				0.95–1.25	1.15–1.5	
shepherd's purse				26–34	75	30 7				0.105–0.16 4						
sorrel																
soursob																
Water vol L/ha boom	50 min	50–100	50–150	80–250	30–200	80 min	60–150	70–150	50 min	50 min	50–200	1 hour	2.0–2.8	80 max	25–100	80 min
Wheat plantback	3 days	7	7	1 hour	1 day	0	1–3 days 38	1 hour	7 days	1–14 days	1 hour	1 hour	0 hr 13	1 hour	24 hour	1 month
Herbicide group	B	B	G	G	G	G	G+1	G	I	I	L	L	L+Q	M	M	I

Table 13. Herbicides for presowing seedbed weed control – Salvage seedbed preparation (continued page 3 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Tribenuron- methyl 750 g/kg Express® 25	Metoslam 100 g/L Eclipse® 100 SC	Cafentrazone- ethyl 240 g/L Hammer® 400EC 400EC	Saflufenacil 700 g/kg Sharpen® WG 26 25	Oxyfluorfen 240 g/L Striker® 27	Flumioxazin 500 g/kg Terrain™ 28	Pyraflufen-ethyl 2.1 g/L + 2.4-D LV ester 421 g/L Pyrestia® Xtreme® 29	Pyraflufen-ethyl 25 g/L Sledge® 30	Fluroxypyr 333 g/L Starane® Advanced 31 31	Dicamba 750 g/L Kamba® 750 32	Paraquat 135 g + diquat + 115 g/L Spray-Seed® 250 33	Paraquat 360 g/L Gramoxone® 360 PRO 34 35	Amitrole 250 g/L + paraquat 125 g/L Alliance® 36	Glyphosate 570 g/L Roundup Ultra® Max 37	Glyphosate 470 g/L Weedmaster® DST® 38	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® 39
<b>Crop type</b>	W,B,O	WC	AC	W,B,O,CH, FP,FB,L,LE	AC	AC <i>not durum</i>	AC	WC	CH,WC,C	AC	AC	AC	WC,C,FP,L	AC	AC	WC,C
<b>aircraft (A) or ground (B)</b>	AB	AB	B	B	AB	B	B	B	AB	AB				AB	AB	B
<b>Weeds controlled</b>																
sowthistle	25			17–26	75	30 7	0.5 7	0.05–0.1	0.6 12	0.105–0.16 3	0.8–2.4	0.835–1.1	2.0–2.8	0.425–1.3		0.3
spear thistle																
spiny emex			25–75	17–26		30 7			0.9 10	0.185	0.8–3.2	0.835–1.1	2.0–2.8	0.95–1.25	0.76–1.5	
stinging nettle				17–26	75 39						0.8–3.2					
sub. clover			25–75	9–26		30 (5) 7	0.5 7			0.135	0.8–3.2a		2.0–2.8	1.2–1.9	1.15–1.5	
sunflower																
toad rush																
turnip weed	20	35 17		17–26	75		0.25–0.5 7			0.105–0.16 3	0.8–2.4	0.835–1.1	1.5–2.8	0.625–1.3		
variegated thistle										0.185	0.8–2.4	0.835–1.1	2.0–2.8	0.95–1.25	0.76–1.5	
vetch										0.185	1.8–3.2					
vulpia							0.5u				0.6–3.2	0.835–1.1		0.95–1.25	0.76–1.5	
wild oats				9–26							0.6–2.4	0.42	1.5–2.8	0.625–0.95	0.38–1.15	
wild turnip		35 17		17–26	75		0.25–0.5 7				0.8–3.2	0.835–1.1		0.95–1.25	0.76–1.5	
winter grass																
wireweed				26–34	75	30 7		0.1–0.2 41	0.8 12	0.185	0.8–3.2	0.835–1.1	2.0–2.8	0.625–1.3		
Water vol L/ha boom	50 min	50–100	50–150	80–250	30–200	80 min	60–150	70–150	50 min	50 min	50–200	1 hour	2.0–2.8	80 max	25–100	80 min
Wheat plantback	3 days	7	7	1 hour	1 day	0	1–3 days 38	1 hour	7 days	1–14 days	1 hour	1 hour	0 hr 13	1 hour	24 hour	1 month
Herbicide group	B	B	G	G	G	G	G+1	G	I	I	L	L	L+Q	M	M	I

- Acid 400–800 mL glyphosate 450 for control.
- Fluroxypyr is also available in 200 g/L and 400 g/L. See label for rates.
- Acid Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha..
- Acid 0.62–0.765 L/ha Weedmaster® DST or 0.765–1.0 L/ha Weedmaster® DUO.
- Curled dock only.
- Indian hedge mustard only.
- Acid glyphosate for control, see label.
- Long storksbill only.
- See label for controlling RR canola.
- Wheat and barley only. See label.
- Add 0.6 L/ha glyphosate 450 for control.
- Add 5 g/ha Associate® for control.
- Hammer® 400EC also available in 400 g/L. See label for rates.
- Tankmix with glyphosate for best results.
- See appropriate glyphosate label.
- See label for tankmix options in minimum till situations.
- Acid Uptake® spraying oil at 0.5 L/100 L of spray. Plantback for wheat, barley and chickpea is 7 days for rates up to 1.5 L/ha.
- Observe plantback with broadleaf crops. See Table 2 on page 8.
- Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine). Use lower rates for full soil disturbance and rates greater than 1 L/ha for minimum soil disturbance at seeding. See label. Add wetting agent where water volume is above
- Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine). Sharpen® requires the addition of glyphosate to control annual ryegrass, barley grass, brome grass, and needs paraquat to control rye grass and brome grass. See labels.
- Use lower rates for full soil disturbance and higher rates for minimum soil disturbance at seeding. See label. Gramoxone 360 Pro contains no wetting agent. See label for recommendations.
- Lower rates on small weeds and full soil disturbance. No surfactant required. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine). See Table 2 on page 8 for other crops, note rainfall required.
- Seedlings only.
- Suppression only.

## Herbicides for control and suppression



Table 14. Herbicides for pre-emergent and post-sowing pre-emergent weed control (page 1 of 4)

	Chlorsulfuron 750 g/kg	Butafenacil 200 g/kg + triasulfuron 520 g/kg	Sulfosulfuron 750 g/kg	Trifluralin 480 g/L	Imazapic 525 g/kg + imazapyr 175 g/kg	Pendimethalin 440 g/L	Flumioxazin 500 g/L	
Rate per hectare	Chlorsulfuron 750 WG <sup>15</sup>	Logran® B-Power <sup>14</sup>	Sulfosulfuron 750 WG <sup>15</sup>	Triflur X® <sup>12</sup>	Sentry™ Imidazolinone herbicide tolerant wheat (single gene) and barley & canola	Pendimethalin 440 EC <sup>5 16</sup>	Terrain™ <sup>23 24</sup>	KP/PW
Incorporation	PSI	PSI	PSI	PSI	IBS	PSI	IBS (KP/PW)	IBS (KP/PW)
Crop type	TW	W only	TW only	AC not O	B, C, W <sup>25</sup>	B, W, FP, CH, C, L	W not durum	FB, CH, FP,
Aircraft (A) boom (B)	AB	B	AB	B	B	AB	B	B
Weeds controlled	(grams)	(grams)	(grams)	(litres)	(grams)	(litres)	(grams)	(grams)
amsinckia	15	50	–	1.5–3.0 (S) (IBS) <sup>9</sup>	–	–	–	–
annual phalaris	20 <sup>2</sup>	50 <sup>7</sup>	25 <sup>2</sup>	0.8 or 1.5–3.0 (IBS) <sup>9</sup>	40–50 (S)	–	120 W <sup>22</sup>	–
annual ryegrass	15 or 20	50 <sup>7</sup>	25 <sup>2</sup>	0.8 or 1.5–3.0 (IBS) <sup>9</sup>	40–50 (S)	1.35–2.25	120 W <sup>22</sup>	–
barley grass	20 <sup>2</sup>	–	25 (S)	1.5–3.0 (S) (IBS) <sup>9</sup>	40–50	–	–	–
bedstraw	–	–	–	–	–	–	–	–
bifora	–	–	–	–	–	–	–	180 (S)
black bindweed	–	50	–	–	–	–	120 W (S)	180 (S)
brome grass	20(S)	–	25 (S)	1.5–3.0 (S) (IBS) <sup>9</sup>	40–50	–	–	–
caltrop	–	–	–	1.5–3.0 (S) (IBS) <sup>9</sup>	–	–	–	–
canola – volunteer	–	–	–	–	–	–	120 W (S)	180 (S)
capeweed	20	50 <sup>7</sup>	–	–	40–50 (S)	–	120 W (S)	180 (S)
cereals – volunteer	–	–	–	–	40–50 (S) <sup>27</sup>	–	–	–
cleavers	–	–	–	–	–	–	–	–
common chickweed	–	–	–	–	–	–	120 W (S)	180 (S)
corn gromwell	20	50	–	1.5–3.0 (IBS) <sup>9</sup>	–	–	120 W <sup>22</sup>	–
crassula	–	50	–	–	–	–	120 W (S)	180 (S)
deadnettle	15 or 20	50	–	1.5–3.0 (S) (IBS) <sup>9</sup>	–	–	–	–
dock	20	–	–	–	–	–	–	–
erodium	–	–	–	–	40–50 (S)	–	–	–
faba bean – volunteer	–	50 <sup>7</sup>	–	–	–	–	–	–
field pea – volunteer	–	50 <sup>7</sup>	–	–	–	–	–	–
flaxleaf fleabane	–	–	–	–	–	–	–	180 (S)
fumitory	15 or 20	50	25 <sup>2</sup>	1.5–3.0 (IBS) <sup>9</sup>	40–50 (S)	–	–	180 (S)
Indian hedge mustard	–	–	–	–	–	–	120 W (S)	180 (S)
lesser swine cress	–	50	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–	–
Mexican poppy	–	50 (S)	–	–	–	–	–	–
mintweed	20	–	–	–	–	–	–	–
mustards	15	50	–	–	40–50	–	–	–
New Zealand spinach	–	50	–	–	–	–	120 W (S)	180 (S)
Paterson's curse	15	50	–	–	40–50 (S)	–	–	–
Water vol L/ha boom	30 min	50–100	40–100	70–450	70 min	50–200	80 min	–
Wheat plantback	0 day	0 day 1 day durum	0 day	0 day (IBS) or 1–4 wks	8 months	0 day	0 day	–
Herbicide group	Group B products. All will severely damage undersown or volunteer legumes			D	B	D	G	G

- <sup>2</sup> Add trifluralin for control, see label.
- <sup>5</sup> Pendimethalin also available in 330 g/L. See label for rates.
- <sup>7</sup> Logran® B-Power gives knock-down control of small (up to 2 leaf) emerged weeds. Add Hasten™ or non-ionic wetter for knockdown.
- <sup>9</sup> Alternatively apply 1.5–2.0 L/ha Triflur X + 1.6–2.0 L/ha Avadex® Xtra for control. When adding Avadex® Xtra incorporate within 6 hours.
- <sup>12</sup> Not on oats. In conventional systems, apply 1–4 weeks before sowing and incorporate within 4 hours. In no-till systems and IBS incorporate within 24 hours. For best results incorporate as close to application as practically possible. Sow 5 cm deep. Triflur X® can be used with wheat, barley and triticale in no-till systems at 1.5–3.0 L/ha incorporated by sowing with narrow points and press wheels (see label).
- <sup>13</sup> Apply to level seedbed. Incorporate by sowing. Not before undersowing pasture legumes. Only use before sowing wheat or triticale.
- <sup>14</sup> Apply to level seedbed. Incorporate by sowing. Wheat only. Not before undersowing legumes.
- <sup>15</sup> Apply to bare soil prior to or at sowing, and incorporate by sowing. Not where legumes undersown. Rain required within 7–10 days for best results.
- <sup>16</sup> Read label as rates differ with location, crop type, soil type and incorporation method.
- <sup>17</sup> Use 1.6 L rate for conventional cultivation and either incorporate before sowing or incorporate with full disturbance by sowing. Use 2.3 L rate for direct drill and incorporate by sowing. See label. Sow cereal seed to minimum 5 cm depth.
- <sup>27</sup> Other than imidazolinone herbicide-tolerant varieties.

- <sup>23</sup> Terrain™ can be tank mixed with TriflurX for PSI application in wheat only situations to broaden weed spectrum.
- <sup>24</sup> See label for critical comments around rainfall considerations, speed of sowing, seeding depth, soil type, stubble cover.
- <sup>25</sup> Plus Triflur X® at 2 L/ha plus Avadex® Xtra at 3.2 L/ha.
- (S) Suppression only.

Herbicides that can be used with undersown legume pastures.

- Crop usage**
- |    |            |    |                |
|----|------------|----|----------------|
| AC | All crops  | L  | Lupins         |
| W  | Wheat      | LE | Lentils        |
| CH | Chickpea   | T  | Triticale      |
| C  | Canola     | O  | Oats           |
| FB | Faba beans | B  | Barley         |
| FP | Field pea  | WC | Winter cereals |

- Incorporation**
- |              |   |
|--------------|---|
| PSI          | Pre-sowing incorporated.  |
| IBS          | Incorporated by sowing.   |
| PSPE         | Post-sowing pre-emergent.   |
| KP/PW        | knife point press wheel (Wheat, barley, triticale and canola)                     |
| Conventional | Wheat, barley, triticale, chickpea, faba bean, lupin, linseed, canola, safflower. |

Table 14. Herbicides for pre-emergent and post-sowing pre-emergent weed control (continued, page 2 of 4)

	Cinmethylin 750 g/L	Prosulfocarb 800 g/L + S-metolachlor 120 g/L	Prosulfocarb 800 g/L	Prosulfocarb 800 g/L	Pyroxasulfone 850 g/kg	Triallate 500 g/L		S-Metolachlor 960 g/L	Clopyralid 600 g/L
Rate per hectare	Luximax® <sup>31</sup>	Boxer® Gold	Arcade®	Countdown®	Sakura® 850 WG <sup>18</sup>	Avadex® Xtra		Dual Gold® <sup>20</sup>	Lontrel® Advanced <sup>6 22</sup>
Incorporation	IBS (KP/PW)	IBS	IBS	IBS	IBS	PSI	PSI	IBS	PSPE
Crop type	W	W, B, FP, CH, L, LE, FB	W, B	B, W	W, T	AC not O	AC not O	B, O	WC, C
Aircraft (A) boom (B)	B	B	B	B	B	B	B	B	AB
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	1.5–2.5 <sup>3</sup> (S)	–	–	–	–	–	–	–
annual phalaris	–	1.5–2.5 <sup>3</sup>	–	2.5 <sup>24</sup>	118	–	11	–	–
annual ryegrass	0.5	1.5–2.5 <sup>3</sup> or 2.5	2.5 (S) 3.0	2.5	118	–	3.0 or 11	0.375–0.5 (S)	–
barley grass	–	1.5–2.5 (S) <sup>3</sup> or 2.5 (S)	–	–	118	–	11 (S)	–	–
bedstraw	–	–	–	–	–	–	–	–	–
bifora	–	–	–	–	–	–	–	–	–
black bindweed	–	–	–	–	–	–	–	–	–
brome grass	(S)	1.5–2.5 <sup>3</sup> (S)	–	2.5 (S) <sup>24</sup>	118 (S)	–	–	–	–
caltrop	–	–	–	–	–	–	11 (S)	–	–
canola – volunteer	–	–	–	–	–	–	–	–	–
capeweed	–	–	–	–	–	–	–	–	0.15–0.3 <sup>10 20</sup>
cereals – volunteer	–	–	–	–	–	–	–	–	–
cleavers	–	–	–	–	–	–	–	–	–
common chickweed	–	–	–	–	–	–	–	–	–
crassula	–	1.5–2.5 <sup>3</sup> or 2.5	–	2.5 <sup>24</sup>	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	11	–	–
deadnettle	–	1.5–2.5 <sup>3</sup> (S)	–	2.5 (S) <sup>24</sup>	–	–	11 (S)	–	–
dock	–	–	–	–	–	–	–	–	–
erodium	–	–	–	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–	–	–	–
flaxleaf fleabane	–	–	–	–	–	–	–	–	–
fumitory	–	1.5–2.5 <sup>3</sup>	–	2.5 <sup>24</sup>	–	–	11	–	–
Indian hedge mustard	–	–	–	–	–	–	–	–	–
lesser swine cress	–	–	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–	–	–	–
mintweed	–	–	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	–	–	–
New Zealand spinach	–	–	–	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–	–	–	–
Water vol L/ha boom	70–150	50 min	50 min <sup>25</sup>	50 min	50–100	30–100	–	60 min	50 min
Wheat plantback	0 day	0 day	0 day	0 day	0 day	0 day	–	0 day	NA
Herbicide group	Z	J + K	J	J	K	J	–	K	I

- <sup>3</sup> Add 0.8–1.5 L/ha Triflur® 480 for control.
- <sup>6</sup> Also available as Lontrel® 750 SG (750 g/kg).
- <sup>10</sup> Wheat, barley, oats and triticale only, or Lontrel Advanced 75 mL plus Diuron 500 g/L at 300 mL/ha. This rate should only be used in tank mixture with Diuron.
- <sup>11</sup> Tank mix 1.6–2.4 L/ha Avadex® Xtra + 1.5–2 L/ha Triflur X®
- <sup>18</sup> Apply and incorporate by sowing as soon as possible and no longer than 3 days after application.
- <sup>19</sup> Use 1.6 L/ha rate for conventional seeding systems and 3.0–3.2 L/ha rate for use in KP/PW situations only.
- <sup>20</sup> Apply to moist seedbed. Use lower rates on light soils. Sufficient rain is required within 10 days after spraying if spraying PSPE. See label.
- <sup>22</sup> Observe plantback with both cereal and broadleaf crops. Lontrel® can bind tightly to stubble. See Table 2 on page 8.
- <sup>24</sup> Add Trilogy® 600 1.2 L/ha.
- <sup>25</sup> Canola only, PSPE to 3-leaf stage.
- <sup>31</sup> Ensure seed is planted well below the treated band (min 3 cm sowing depth). Avoid throwing treated soil into adjacent crop rows when sowing with knife point and press weehles
- (S) Suppression only.

- Crop usage**
- |    |            |    |                |
|----|------------|----|----------------|
| AC | All crops  | L  | Lupins         |
| W  | Wheat      | LE | Lentils        |
| CH | Chickpea   | T  | Triticale      |
| C  | Canola     | O  | Oats           |
| FB | Faba beans | B  | Barley         |
| FP | Field pea  | WC | Winter cereals |

- Incorporation**
- |              |   |
|--------------|---|
| PSI          | Pre-sowing incorporated.  |
| IBS          | Incorporated by sowing.   |
| PSPE         | Post-sowing pre-emergent.   |
| KP/PW        | knife point press wheel (Wheat, barley, triticale and canola)                     |
| Conventional | Wheat, barley, triticale, chickpea, faba bean, lupin, linseed, canola, safflower. |

Table 14. Herbicides for pre-emergent and post-sowing pre-emergent weed control (continued, page 3 of 4)

	Chlorsulfuron 750 g/kg	Butafenacil 200 g/kg + triasulfuron 520 g/kg	Sulfosulfuron 750 g/kg	Trifluralin 480 g/L	Imazapic 525 g/kg + imazapyr 175 g/kg	Pendimethalin 440 g/L	Flumioxazin 500 g/L	
<b>Rate per hectare</b> Various trade names sometimes available under these concentrations. See specific labels for details.	Chlorsulfuron 750 WG 15	Logran® B-Power 14	Sulfosulfuron 750 WG 15 Wheat and triticale only	Triflur X® 12	Sentry™ Imidazolinone herbicide tolerant wheat (single gene) and barley & canola	Pendimethalin 440 EC 5 16	Terrain™ 28 29 KP/PW 120 g 180 g	
<b>Incorporation</b>	PSI IBS	PSI IBS	PSI IBS	PSI IBS	IBS	PSI IBS	IBS (KP/PW) IBS (KP/PW)	
<b>Crop type</b>	TW	W only	TW only	AC not O	B, C, W 25	B, W, FP, CH, C, L	W not durum FB, CH, FP,	
<b>Aircraft (A) boom (B)</b>	AB	B	AB	B	B	AB	B	
<b>Weeds controlled</b>	(grams)	(grams)	(grams)	(litres)	(grams)	(litres)	(grams)	(grams)
peppercress	–	–	–	–	–	–	–	–
phalaris – perennial	–	–	–	–	–	–	120 W 22	–
prickly lettuce	–	–	–	–	–	–	120 W (S)	180 (S)
rough poppy	15 or 20	50	–	1.5–3.0 (IBS) 9	–	–	120 W 22	180 (S)
radish – wild	–	50 7(S)	–	–	40–50	–	–	–
saffron thistle	20 (S)	–	–	–	–	–	–	–
Scotch thistle	–	–	–	–	–	–	–	–
shepherd's purse	15 or 20	50	–	–	–	–	–	–
skeleton weed	–	50(S)	–	–	–	–	–	–
slender celery	–	–	–	–	–	–	–	180 (S)
sorrel	–	–	–	–	–	–	–	–
soursob	15	50	–	–	–	–	–	–
sowthistle	–	50 7	–	–	–	–	120 W (S)	180 (S)
spear thistle	–	–	–	–	–	–	–	–
spiny emex	20	50 7	–	1.5–3.0 (S) (IBS)	–	–	–	–
stinging nettle	–	–	–	–	–	–	–	–
sub. clover	–	50 7	–	–	40–50(S)	–	–	–
three-horn bedstraw	–	–	–	–	–	–	120 W (S)	180 (S)
toad rush	–	–	–	–	–	–	120 W (S)	180 (S)
turnip weed	–	50	–	–	–	–	–	–
variegated thistle	–	50 (S)	–	–	–	–	–	–
vetch	–	50	–	–	–	–	–	–
vulpia	–	–	–	1.5–3.0 (S) (IBS)	–	1.5–2.25 (S)	120 W 22	–
wild lettuce	–	50	–	–	–	–	–	–
wild oats	–	50 7	25 1	1.5–3.0 (S) (IBS) 1	40–50 (S)	1.35–2.25 (S)	120 W 22	–
wild radish	–	–	–	–	–	–	120 W (S)	180 (S)
wild turnip	15	50	25	–	–	–	–	–
winter grass	–	–	–	1.5–3.0 (IBS)	–	–	120 W 22	–
wireweed	15 or 20	50	25 2	0.8 or 1.5–3.0 (IBS)	40–50	1.35–2.25	120 W (S)	180 (S)
<b>Water vol L/ha boom</b>	30 min	50–100	40–100	70–450	70 min	50–200	80 min	–
<b>Wheat plantback</b>	0 day	0 day 1 day durum	0 day	0 day (IBS) or 1–4 wks	8 months	0 day	0 day	–
<b>Herbicide group</b>	Group B products. All will severely damage undersown or volunteer legumes			D	B	D	G	G

- 1 Add Avadex® Xtra for control.
- 2 Add trifluralin for control, see label.
- 5 Pendimethalin also available in 330 g/L. See label for rates.
- 7 Logran® B-Power gives knock-down control of small (up to 2 leaf) emerged weeds. Add Hasten™ or non-ionic wetter for knockdown.
- 9 Alternatively apply 1.5–2.0 L/ha Triflur X® + 1.6–2.0 L/ha Avadex® Xtra for control. When adding Avadex® Xtra incorporate within 6 hours.
- 12 Not on oats. In conventional systems, apply 1–4 weeks before sowing and incorporate within 4 hours. In no-till systems and IBS incorporate within 24 hours. For best results incorporate as close to application as practically possible. Sow 5 cm deep. Triflur X® can be used with wheat, barley and triticale in no-till systems at 1.5–3.0 L/ha incorporated by sowing with narrow points and press wheels (see label).
- 13 Apply to level seedbed. Incorporate by sowing. Not before undersowing pasture legumes. Only use before sowing wheat or triticale.
- 14 Apply to level seedbed. Incorporate by sowing. Wheat only. Not before undersowing legumes.
- 15 Apply to bare soil prior to or at sowing, and incorporate by sowing. Not where legumes undersown. Rain required within 7–10 days for best results.
- 16 Read label as rates differ with location, crop type, soil type and incorporation method.
- 17 Use 1.6 L rate for conventional cultivation and either incorporate before sowing or incorporate with full disturbance by sowing. Use 2.3 L rate for direct drill and incorporate by sowing. See label. Sow cereal seed to minimum 5 cm depth.

- 28 Terrain™ can be tank mixed with TriflurX for PSI application in wheat only situations to broaden weed spectrum.
- 29 See label for critical comments around rainfall considerations, speed of sowing, seeding depth, soil type, stubble cover.
- (S) Suppression only.

Herbicides that can be used with undersown legume pastures.

**Crop usage**

AC All Crops	L Lupins
W Wheat	LE Lentils
CH Chickpea	T Triticale
C Canola	O Oats
FB Faba beans	B Barley
FP Field pea	WC Winter cereals

**Incorporation**

PSI Pre-sowing incorporated.
IBS Incorporated by sowing.
PSPE Post-sowing pre-emergent.
KP/PW knife point press wheel (Wheat, barley, triticale and canola)
Conventional Wheat, barley, triticale, chickpea, faba bean, lupin, linseed, canola, safflower.

Table 14. Herbicides for pre-emergent and post-sowing pre-emergent weed control (continued, page 4 of 4)

	Cinmethylin 750 g/L	Prosulfocarb 800 g/L + S-metolachlor 120 g/L	Prosulfocarb 800 g/L	Prosulfocarb 800 g/L	Pyroxasulfone 850 g/kg	Triallate 500 g/L		S-Metolachlor 960 g/L	Clopyralid 600 g/L
<b>Rate per hectare</b> Various trade names sometimes available under these concentrations. See specific labels for details.	Luximax® 31 Wheat not durum	Boxer® Gold	Arcade®	Countdown®	Sakura® 850 WG 18 Wheat and triticale only, not durum	Avadex® Xtra Conventional 18 KP/PW		Dual Gold® 20	Lontrel® Advanced 6 22
<b>Incorporation</b>	IBS (KP/PW)	IBS PSPE	IBS	IBS	IBS	PSI IBS	PSI IBS	IBS PSPE	PSPE
<b>Crop type</b>	W	W, B, FP, CH, L, LE, FB	W, B	B, W	W, T	AC not O	AC not O	B, O	WC, C
<b>Aircraft (A) boom (B)</b>	B	B	B	B	B	B	B	B	AB
<b>Weeds controlled</b>	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)
peppercress	–	–	–	–	–	–	–	–	–
phalaris – perennial	–	–	–	2.5 24	–	11	–	–	–
prickly lettuce	–	–	–	–	–	–	–	–	–
rough poppy	–	1.5–2.5 3 (S)	–	2.5 (S) 24	–	11	–	–	–
radish – wild	–	–	–	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–	–	–	–
Scotch thistle	–	–	–	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–	–	–	–
slender celery	–	–	–	–	–	–	–	–	–
sorrel	–	–	–	–	–	–	–	–	–
soursob	–	–	–	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–	–	–	–
spear thistle	–	–	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	–	–	–
stinging nettle	–	–	–	–	–	–	–	–	–
sub. clover	–	–	–	–	–	–	–	–	–
three-horn bedstraw	–	–	–	–	–	–	–	–	–
toad rush	–	1.5–2.5	–	2.5 24	118	–	–	0.15–0.25	–
turnip weed	–	–	–	–	–	–	–	–	–
variegated thistle	–	–	–	–	–	–	–	–	–
vetch	–	–	–	–	–	–	–	–	–
vulpia	–	2.5	–	–	118	1.6	–	–	–
wild lettuce	–	–	–	–	–	–	–	–	–
wild oats	(S)	1.5–2.5 3	–	2.5 24 26	118 (S)	–	3.2 or 11	–	–
wild radish	–	–	–	–	–	–	–	–	–
wild turnip	–	–	–	–	–	2	–	–	–
winter grass	–	–	–	–	–	11	–	–	–
wireweed	–	1.5–2.5 3	–	2.5 24	–	11	–	–	–
<b>Water vol L/ha boom</b>	70–150	50 min	50 min 25	50 min	50–100	30–100	–	60 min	50 min
<b>Wheat plantback</b>	0 day	0 day	0 day	0 day	0 day	0 day	–	0 day	NA
<b>Herbicide group</b>	Z	J + K	J	J	K	J	–	K	I

- 2 Add trifluralin for control, see label.
- 3 Add 0.8–1.5 L/ha Triflur X® 480 for control.
- 6 Also available as Lontrel® 750 SG (750 g/kg).
- 11 Tank mix 1.6–2.4 L/ha Avadex® Xtra + 1.5–2 L/ha Triflur X®.
- 17 Use 1.6 L rate for conventional cultivation and either incorporate before sowing or incorporate with full disturbance by sowing. Use 2.3 L rate for direct drill and incorporate by sowing. See label. Sow cereal seed to minimum 5 cm depth.
- 18 Apply and incorporate by sowing as soon as possible and no longer than 3 days after application.
- 19 Use 1.6 L/ha rate for conventional seeding systems and 3.0–3.2 L/ha rate for use in KP/PW situations only.
- 20 Apply to moist seedbed. Use lower rates on light soils. Sufficient rain is required within 10 days after spraying if spraying PSPE. See label.
- 24 Add Trilogy® 600 1.2 L/ha.
- 25 Greater than 70 L water rate recommended in stubble situations.
- 26 Surfact germinators only.
- 22 Observe plantback with both cereal and broadleaf crops. Lontrel® can bind tightly to stubble. See Table 2 on page 8.
- 24 Add Trilogy® 600 1.2 L/ha.
- (S) Suppression only.

**Crop usage**

AC All crops	LE Lentils
W Wheat	T Triticale
CH Chickpea	O Oats
C Canola	B Barley
FB Faba beans	WC Winter cereals
FP Field pea	
L Lupins	

**Incorporation**

PSI Pre-sowing incorporated.
IBS Incorporated by sowing.
PSPE Post-sowing pre-emergent.
KP/PW knife point press wheel (Wheat, barley, triticale and canola)
Conventional Wheat, barley, triticale, chickpea, faba bean, lupin, linseed, canola, safflower.

Table 15. Herbicides for weed control for wheat and barley – Early post-emergence – Part 1 (page 1 of 4)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike® 20	Metsulfuron-methyl 600 g/kg Associate® 4, 23	Chlorosulfuron 750 g/kg Chlorosulfuron 750 WG 23	Sulfosulfuron 750 g/kg 25 Wheat & triticale only	Bromoxynil 250 g/L + picolifanate 25 g/L Eliminar® C 40	Metribuzin 480 g/kg Sencor® 480 SC	Bromoxynil 200 g/L Bromicide® 200	Terbutryn f lowable 500 g/L Igran® 500 Flowable 27	Metribuzin 375 g/kg + carfentrazone- ethyl 90 g/kg Aptitude®	Bromoxynil 175 g/L present as the octanoate + bicyclopyrone 37.5 g/L + cloquintocet-mexyl 9.4 g/L Talinor®	Produlfo carb 800 g/L Arcade®	Topramezone 60 g/L + cloquintocet-mexyl 60 g/L Frequency®
<b>Apply at crop growth stage</b>	3 leaf–start of jointing (wheat) Mid till– start of jointing (barley)	3 leaf to flag leaf just visible	2 leaf–early till early till	Emergence– early till	3 leaf–fully tilled	3 leaf–8 weeks	3 leaf–fully tilled	3 leaf–early tillering	3 leaf–mid tillering	2 leaf–1st node	1–3 leaf	Rate varies with tank mixture & weed species.
<b>Zadoks code</b>	13–31, 21–31	13–37	12–23	11–22	12–29	Z13–8 weeks	13–30	13–21	13–25	Z12–32	Z11–25	40 41
<b>Weeds controlled</b>	(grams)	(grams)	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)
amsinckia	25	5 or 7	15	25	0.75	–	1.4–2.0	0.55–0.85	–	–	–	–
annual ryegrass	–	–	15 or 25 21	–	–	–	–	–	–	–	3 (S) 43	–
barley grass	–	–	–	25 (S)	–	–	–	–	–	–	–	–
bedstraw	–	–	–	–	1.0 (S)	–	1.4–2.0	–	100	0.5–1.0 (S)	–	–
black bindweed	–	–	20	–	1.4–2.0	–	–	–	–	–	–	–
brome grass	–	–	–	20–25 (S)	–	–	–	–	–	–	–	–
buchan weed	–	–	–	20 44	–	–	–	–	–	–	–	–
canola – volunteer	25 (S) 7	–	–	–	0.5–1.0	–	–	–	–	0.5–1.0	–	–
capeweed	25 7	–	–	–	0.5–1.0	–	1.4–2.0	0.55–0.85	100	0.5–1.0	–	0.2 40
charlock	25	5	15	–	0.5–1.0	–	–	0.55–0.85 2	–	0.5–1.0	–	0.2 40
chickpea – volunteer	–	5	–	–	–	–	–	–	–	–	–	–
clover	–	5	–	–	–	–	–	–	100	–	–	–
corn growwell	–	–	20	–	0.5–0.75	–	–	–	–	–	–	–
deadnettle	25 (S) 7	5	15 or 20	–	0.5–0.75	–	1.4–2.0	0.55–0.85 3	–	0.5–0.75	–	0.2 40 41
dock	–	5 or 7	–	–	1.0 (S)	–	–	–	–	–	–	–
erodium	–	–	–	–	0.5 (S)	–	–	–	–	0.5–1.0	–	–
faba bean – volunteer	–	–	–	–	–	–	–	–	–	0.5–0.75	–	–
field pea – volunteer	–	7	–	20	0.75 (S)	–	–	–	–	0.5–0.75	–	–
fumitory	–	5	20	–	0.75–1.0 (S)	–	2.0	0.55–0.85	100	0.5–0.75	–	0.2 40 41
lesser swinecress	–	–	–	–	–	–	1.4–2.0	–	–	–	–	–
lupin – volunteer	25	5	–	–	0.5–1.0	–	–	–	–	0.5–0.75	–	–
marshmallow	–	–	–	–	–	–	–	–	100	–	–	–
mexican poppy	–	5	–	–	–	–	–	–	–	–	–	–
Recom water L/ha	50–150	50 min	30 min	40–100	50 min	50–100	50–200	50–100	50–150	75–150	70	80–150
Herbicide group	B	B	B	B	C + F	C	C	C	C + G	C + H	J	H

- 1 No more than 3 leaves of annual ryegrass. Use more than 50 L/ha water.
- 2 Tank mix with LVE MCPA or 0.3 L/ha 2,4-D (as amine) 500 g/L for control.
- 3 Can be mixed with MCPA amine or terbuthryn.
- 4 See label for tankmix of Broadstrike® and other herbicides for control.
- 5 Tankmix of Igran® 500 Flowable and Ken-Gran 750 WG can be used for control. See label.
- 6 Not Clearfield canola volunteers.
- 7 Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliolate leaf stage. Add Uptake® spraying oil or wetting agent for wheat and undersowns or wetting agent only for barley.
- 8 Do not apply Eliminar® C if frosts are imminent. See label for tank mix options for wild radish.
- 9 Add surfactant.
- 10 Not on barley before 2-leaf stage. Add wetting agent. Not preferred recommendation for barley.
- 11 Wheat and triticale only. Add Bonza® at 1–2 L/100 L spray volume. Not for use with undersown legumes. Note: Plant–backs on label. Don't use on flood or furrow irrigations or soils with pH >8.5.
- 12 Not on undersown medics, Persian or Berseem clover. Avoid spraying when temperatures above 20 °C.
- 13 Do not apply Eliminar® C if frosts are imminent. See label for tank mix options for wild radish.
- 14 Add surfactant.
- 15 Not on barley before 2-leaf stage. Add wetting agent. Not preferred recommendation for barley.
- 16 Wheat and triticale only. Add Bonza® at 1–2 L/100 L spray volume. Not for use with undersown legumes. Note: Plant–backs on label. Don't use on flood or furrow irrigations or soils with pH >8.5.
- 17 Not on undersown medics, Persian or Berseem clover. Avoid spraying when temperatures above 20 °C.

Table 15. Herbicides for weed control for wheat and barley – Early post-emergence – Part 1 (continued, page 2 of 4)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike® 20	Metsulfuron-methyl 600 g/kg Associate® 4, 23	Chlorosulfuron 750 g/kg Chlorosulfuron 750 WG 23	Sulfosulfuron 750 g/kg Sulfosulfuron 750 WG only	Bromoxynil 250 g/L + picolifanate 25 g/L Eliminar® C 40	Metribuzin 480 g/kg Sencor® 480 SC	Bromoxynil 200 g/L Bromicide® 200	Terbutryn f lowable 500 g/L Igran® 500 Flowable 27	Metribuzin 375 g/kg + carfentrazone- ethyl 90 g/kg Aptitude®	Bromoxynil 175 g/L present as the octanoate + bicyclopyrone 37.5 g/L + cloquintocet-mexyl 9.4 g/L Talinor®	Produlfo carb 800 g/L Arcade®	Topramezone 60 g/L + cloquintocet-mexyl 60 g/L Frequency®
<b>Apply at crop growth stage</b>	3 leaf–start of jointing (wheat) Mid till– start of jointing (barley)	3 leaf to flag leaf just visible	2 leaf–early till early till	Emergence– early till	3 leaf–fully tilled	3 leaf–8 weeks	3 leaf–fully tilled	3 leaf–early tillering	3 leaf–mid tillering	2 leaf–1st node	1–3 leaf	Rate varies with tank mixture & weed species.
<b>Zadoks code</b>	13–31, 21–31	13–37	12–23	11–22	12–29	Z13–8 weeks	13–30	13–21	13–25	Z12–32	Z11–25	40 41
<b>Weeds controlled</b>	(grams)	(grams)	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)
mintweed	–	–	20	–	–	–	–	–	–	–	–	–
mustards	25	5	15	25	0.5–1.0	–	2.0	0.55–0.85 2 3 9	100	–	–	–
Paterson's curse	25 (S) 7	5 or 7	15	–	0.5–0.75	–	2.0	0.55–0.85	–	0.5–0.75	–	–
peppercress	25	–	–	–	–	–	1.4–2.0	–	–	–	–	–
radish – wild	25 (S) 7	–	15 or 20	20	0.5–1.0	–	2.0	–	100	–	–	0.2 40 41
rough poppy	–	5	20	–	0.5–0.75	–	–	–	–	–	–	–
saffron thistle	–	–	–	–	1.0	–	1.4–2.0	–	–	0.5–1.0	–	–
shepherd's purse	25	7 (S)	20	–	0.5–1.0	–	1.4–2.0	–	100	0.5–0.75	–	0.2 40 41
skeleton weed	–	5	–	–	1.0 (S)	–	–	–	–	–	–	–
sorrel	–	5	20	–	1.0 (S)	–	–	–	–	–	–	–
sour sob	–	5	20	–	–	–	–	–	–	–	–	–
sowthistle	–	5	–	–	1.0 (S)	–	–	–	–	0.5–0.75	–	0.2 40 41
spiny emex	25 (S) 7	5 or 7	–	–	0.5–0.75	–	2.0	0.55–0.85 2	–	0.5–0.75	–	–
sunflower – volunteer	–	7	–	–	–	–	–	–	–	–	–	–
toad rush	–	–	–	–	1.0 (S)	–	–	–	100	–	–	–
toad rush weed	–	–	15	–	0.5–1.0	–	2.0	0.55–0.85 2 3 9	100	0.5–1.0	–	0.2 40 41
variegated thistle	–	–	–	–	1.0	–	1.4–2.0	–	–	–	–	–
vetch	–	–	–	–	1.0 (S)	–	–	0.6 3	–	0.5–0.75	–	0.2 40
vulpia	–	–	–	25	–	–	–	–	–	–	–	–
wild lettuce	–	–	–	–	1.0 (S)	–	–	–	100	–	–	–
wild oats	–	–	–	25 (S)	–	–	–	–	–	–	–	–
wild turnip	25	5	15	20	0.5–1.0	–	2.0	0.55–0.85 2 3 9	100	–	–	0.2 40 41
wireweed	–	5 or 7	20	–	1.0	–	2.0	–	–	–	–	–
Recom water L/ha	50–150	50 min	30 min	40–100	50 min	50–100	50–200	50–100	50–150	75–150	70	80–150
Herbicide group	B	B	B	B	C + F	C	C	C	C + G	C + H	J	H

- 20 Tank mix with LVE MCPA or 0.3 L/ha 2,4-D (as amine) 500 g/L for control.
- 21 Can be mixed with MCPA amine or terbuthryn.
- 22 See label for tankmix of Broadstrike® and other herbicides for control.
- 23 Tankmix of Igran® 500 Flowable and Ken-Gran 750 WG can be used for control. See label.
- 24 Application of Sencor® to barley on soils with pH >7.0 will result in severe crop damage.
- 25 Toad rush should be sprayed at the 2–4 leaf stage. Spray after rain when soil moisture is plentiful and soil is moist to the surface. Take advantage of dew on soil surface.
- 26 Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliolate leaf stage. Add Uptake® spraying oil or wetting agent for wheat and undersowns or wetting agent only for barley.
- 27 Do not apply Eliminar® C if frosts are imminent. See label for tank mix options for wild radish.
- 28 Add surfactant.
- 29 Not on barley before 2-leaf stage. Add wetting agent. Not preferred recommendation for barley.
- 30 Wheat and triticale only. Add Bonza® at 1–2 L/100 L spray volume. Not for use with undersown legumes. Note: Plant–backs on label. Don't use on flood or furrow irrigations or soils with pH >8.5.
- 31 Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliolate leaf stage. Add Uptake® spraying oil or wetting agent for wheat and undersowns or wetting agent only for barley.
- 32 Do not apply Eliminar® C if frosts are imminent. See label for tank mix options for wild radish.
- 33 Add surfactant.
- 34 Not on barley before 2-leaf stage. Add wetting agent. Not preferred recommendation for barley.
- 35 Wheat and triticale only. Add Bonza® at 1–2 L/100 L spray volume. Not for use with undersown legumes. Note: Plant–backs on label. Don't use on flood or furrow irrigations or soils with pH >8.5.
- 36 Not on undersown medics, Persian or Berseem clover. Avoid spraying when temperatures above 20 °C.
- 37 Avoid spraying when temperatures exceed 18 °C. Do not use on undersown medics or lucerne.
- 38 Suppression of seed set only applied from 2-leaf to 2 tillers (G12–22).
- 39 Suppression only.
- 40 Herbicides that can be used with undersown legume pastures.



Table 15. Herbicides for weed control for wheat and barley – Early post-emergence – Part 1 (continued, page 3 of 4)

	Bromoxynil 280 g/L + MCPA + 280 g/L Bronco® MA-X 29	MCPA 340 g/L + dicamba 80 g/L Kamba® M 30	MCPA 750 g/L Agritone® 750	MCPA 570 g/L LVE MCPA 570 29	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 31	MCPA 250 g/L + diflufenican 25 g/L Tigrex® 32	Pyrasulfotole 37.5 g/L + bromoxynil 210 g/L Velocity® 33	Pyrasulfotole 25 g/L + MCPA 125 g/L Precept® 34	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® 35
<b>Rate per hectare</b> Various trade names sometimes available under these concentrations. See specific labels for details.									
<b>Apply at crop growth stage</b>	3 leaf-fully tillered	Early tillering-fully tillered	5 leaf-before booting	3-5 leaf	Early tillering-fully tillered	3-5 leaf-late tillering	2 leaf-1st node	3 leaf-1st node (wheat) 5 leaf-1st node (barley)	3 leaf to flag leaf
<b>Zadoks code</b>	13-30	21-30	15-37	13-15	22-30	13-30	12-31	13-31; 15-31	13-39
<b>Weeds controlled</b>	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
ansinckia	1.0-1.43	-	0.33 16	-	-	-	0.6-1.0	1.5-2.0	-
annual phalaris	-	-	-	-	-	-	-	-	-
annual ryegrass	-	-	-	-	-	-	-	-	-
barley grass	-	-	-	-	-	-	-	-	-
bedstraw	-	-	-	-	-	-	0.67-1.0	1.5-2.0	-
black bindweed	-	1.7	0.97-1.35 16	-	1.0	-	0.5-1.0	-	0.4-0.6
brome grass	-	-	-	-	-	-	-	-	-
buchan weed	-	-	-	-	-	-	-	-	-
canola - volunteer	-	-	-	-	-	0.5 8	0.5-1.0 8	1.5-2.0	-
capeweed	1.0-1.43	1.0-1.7	1.45 16 or 16	-	-	0.5-1.0	0.5-1.0	1.0 3	-
charlock	1.0-1.43	1.0-1.7	0.66 16 or 16	0.44	-	0.5-1.0	-	-	-
cereals - volunteer	-	-	-	-	-	-	-	-	-
chickpea - volunteer	-	-	-	-	-	-	0.5-1.0 (S)	1.0 3	-
cleavers	-	-	-	-	-	-	-	-	-
clover	1.0-1.43	1.7	0.33 16	-	-	-	-	1.0 3, 6	0.3
corn growwell	-	-	0.33 16	-	-	1.0	0.5-1.0	1.0-2.0	-
common barbigrass	-	-	-	-	-	-	-	-	-
deadnettle	-	-	1.45 16 or 16	-	-	1.0	0.5-1.0	1.0-2.0	0.2-0.3
dock	-	1.0-1.7	-	-	-	1.0 (S)	-	-	-
erodium	-	-	0.33 16	-	-	1.0 (S) 5	-	-	-
faba bean - volunteer	-	-	-	-	-	-	0.5	1.0 3	-
field pea - volunteer	-	-	-	-	-	-	0.5 (S)-1.0	1.0-2.0 or 1.0 3	-
fumitory	1.0-1.43 17	-	0.93 16	-	-	0.75	0.5-1.0	1.0-2.0	0.3
lentil	-	-	-	-	-	-	-	-	-
lesser swinecress	-	-	-	-	-	-	-	-	-
lupin - volunteer	-	-	0.46-0.96 16	-	-	-	0.5-1.0	1.0-2.0	-
medics	-	-	-	-	-	-	0.5 (S)-1.0	1.0-2.0	-
Mexican poppy	1.0-1.43 17	-	-	-	-	-	-	-	0.2-0.3
mintweed	1.0-1.43	1.7	1.35 16	-	-	-	-	-	-
mustards	1.0-1.43	1.0-1.7	0.66 16 or 16	-	1.0	0.5-1.0	0.5-1.0	1.0-2.0	-
New Zealand spinach	-	1.7	-	-	1.0 (S)	-	-	-	-
Paterson's curse	1.0-1.43	-	0.66-0.96 16	-	-	1.0 (S)	0.5-1.0	1.0-2.0	-
peppercress	-	-	-	-	-	1.0 (S)	-	-	-
radish - wild	1.0-1.43	1.0-1.7	0.66 16 or 16	-	1.0	0.5-1.0 10	0.5-1.0	1.0-2.0	-
rough poppy	1.0-1.43	-	0.46-0.96 16	-	-	1.0 (S)	-	-	-
saffron thistle	1.0-1.43	1.7	0.66-1.35 16	-	1.0	1.0	0.67-1.0	-	-
shepherd's purse	1.0-1.43	-	-	-	-	0.5-1.0	0.5-1.0	-	-
skeleton weed	-	-	0.96-1.35 16	-	1.0	1.0 (S)	-	-	-
Recom water L/ha	50-200	50 min	20-100	30-120	50 min	50 min	50-150	50-100	80
Herbicide group	C + I	I	I	I	I	I + F	H + C	H + I	I

Table 15. Herbicides for weed control for wheat and barley – Early post-emergence – Part 1 (continued, page 4 of 4)

	Bromoxynil 280 g/L + MCPA + 280 g/L Bronco® MA-X 29	MCPA 340 g/L + dicamba 80 g/L Kamba® M 30	MCPA 750 g/L Agritone® 750	MCPA 570 g/L LVE MCPA 570 29	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 31	MCPA 250 g/L + diflufenican 25 g/L Tigrex® 32	Pyrasulfotole 37.5 g/L + bromoxynil 210 g/L Velocity® 33	Pyrasulfotole 25 g/L + MCPA 125 g/L Precept® 34	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® 35
<b>Rate per hectare</b> Various trade names sometimes available under these concentrations. See specific labels for details.									
<b>Apply at crop growth stage</b>	3 leaf-fully tillered	Early tillering-fully tillered	5 leaf-before booting	3-5 leaf	Early tillering-fully tillered	3-5 leaf-late tillering	2 leaf-1st node	3 leaf-1st node (wheat) 5 leaf-1st node (barley)	3 leaf to flag leaf
<b>Zadoks code</b>	13-30	21-30	15-37	13-15	22-30	13-30	12-31	13-31; 15-31	13-39
<b>Weeds controlled</b>	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
slender thistle	1.0-1.43	-	0.66-1.35 16	-	-	-	-	-	-
sorrel	-	1.0-1.7	-	-	-	-	-	-	-
soursoy	-	-	-	-	-	-	-	-	-
sowthistle	1.0-1.5 16	-	-	-	-	-	0.5-1.0	1.0-2.0	0.4
spear/black thistle	-	-	0.96-1.35 16	-	1.0	1.0 (S)	-	-	-
spiny emex	1.0-1.43 17	1.0-1.7	0.33 16	-	1.0	1.0 (S)	0.5-1.0	1.5-2.0 (S)	-
St Barnaby thistle	-	-	-	-	-	-	-	-	-
sunflower - volunteer	-	-	0.69-1.0 16	-	-	-	-	-	-
toad rush	-	-	-	-	-	1.0	-	-	-
turnip weed	1.0-1.43	1.0-1.7	0.66 16 or 16	-	1.0	0.5-1.0	0.5-1.0	1.0-2.0	-
variegated thistle	1.0-1.43 16	1.7	0.66-1.35 16	-	1.0	1.0 (S)	-	-	-
vetch	-	1.0	-	-	-	1.0 (S)	0.5-1.0 (S)	1.0 3	-
vulpia	-	-	-	-	-	-	-	-	-
wild lettuce	-	-	-	-	-	0.5-1.0	0.5-1.0	1.0-2.0	-
wild oats	-	-	-	-	-	-	-	-	-
wild turnip	1.0-1.43	1.0-1.7	0.66 16 or 16	0.44	1.0	0.5-1.0	0.5-1.0	1.0-2.0	-
wireweed	1.0-1.43 16	1.0-1.7	-	0.75 (S)	1.0 (S)	0.5 (S)-1.0	0.5 (S)-1.0	1.0-2.0	-
Recom water L/ha	50-200	50 min	20-100	30-120	50 min	50 min	50-150	50-100	80
Herbicide group	C + I	I	I	I	I	I + F	H + C	H + I	I

- 3 Add Lontrel® Advanced for control. See label for rates.  
5 Long storksbill only (Erodium botrys).  
6 Sub-clover only.  
8 See label for rates for controlling RR Canola.  
10 Tankmix 350-500 mL/ha Tigrex® plus LVE MCPA for control.  
13 Refer to the herbicide label for chemical rates, safe crop growth stages and recommended weed size for control. Apply 460mL rate after crop has reached 5 leaf stage, higher rates only after the first node can be felt at the base of a tiller and before swelling of the head can be felt in a tiller.  
15 Plus 0.35-0.5 T-Rex®. See label for crop and weed stage and appropriate rate.  
16 Northern NSW only: 1.0 L/ha up to 4-leaf stage of weed, 1.5 L/ha 4-8 leaf stage.  
17 1.0 L/ha Bronco MA-X for weeds of 3-leaf stage and up to 50 mm diameter; 1.43 L/ha for weeds up to 5-leaf stage and up to 75 mm diameter
- 16 Plants up to 4-leaf stage but not more than 3.5 cm diameter 1.0 L/ha. Plants up to 6-leaf but not more than 5 cm diameter 1.43 L/ha  
16 Small weeds 330 mL/ha + 500 mL/ha (crop at 3-5 leaf stage) Nufarm 280 g/ha Diurex® WG. Read label for critical comments. See label for crop stage, weed size and chemical rate. Barley: Use only from 5-leaf stage to flag-leaf just visible (Z15-37). Maximum rate in barley 1.4 L/ha.  
20 1.4 L/ha can be used at 3-leaf stage.  
20 Damage can occur if crop not actively growing. Do not apply after the fully-tillered stage.  
21 Do not plant susceptible crops within 12 months of applying the product.  
22 Can be used on undersown sub-clover and some other clovers. See label. Not on lucerne or annual medics. Application should be made from the third to the eighth trifoliate leaf stage. Application prior to the 3 trifoliate leaf stage may result in damage to clover.
- 33 Add Hasten® 1% v/v, Supercharge® 0.75% v/v or Uptake® 0.5% v/v. Note recropping intervals on label. For best results apply in warmer temperature and high light intensity and > 1hr of daylight left after application.  
34 Spray grade liquid ammonium sulfate or Hasten® (1% v/v) must be used with Precept®. Do not use non-ionic-surfactants. Note recropping intervals on label. For best results apply in warmer temperature and high light intensity and > 1hr of daylight left after application.  
35 Non-clearfield varieties only.  
36 Plus Hotshot® 500 mL/ha + LVE MCPA.  
37 Add Uptake® spraying oil 500ml/100L water  
(S) Suppression only.

Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (page 1 of 4)

Rate per hectare Various trade names sometimes available under these concen- trations. See specific labels for details.	Metosulam 100 g/L Eclipse® 100 SC 31	Bromoxynil 250 g/L + diflufenican 25 g/L Jaguar® 32	Terbutryn 275 g/L + MCPA 160 g/L Agtryne® MA	Bromoxynil 140 g/L + MCPA 280 g/L + dicamba 40 g/L Broadside®	Fluroxypyr 333 g/L Starane® Advanced 33	Clopyralid 600 g/L Lontrel® Advanced	2,4-DB 500 g/L 4)	Buttress® 34	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot® 35	Dicamba 750 g/L Kamba® 750 37 38
Apply at crop growth stage	2 leaf–1st node	2 leaf–fully tillered	3–5 leaf	3 leaf–fully tillered	3 leaf– flag leaf	2 leaf– booting	5 leaf–before booting	3 leaf–1st node	5 leaf–early tillering	
Zadoks code	12–31	12–29	13–15	13–30	13–39	12–31	15–33	13–31	15–22	
Weeds controlled	(millilitres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	
amsinckia	50	0.75	1.0	0.75–1.4	–	–	–	–	–	
annual phalaris	–	–	–	–	–	–	–	–	–	
annual ryegrass	–	–	–	–	–	–	–	–	–	
barley grass	–	–	–	–	–	–	–	–	–	
bedstraw	50 (S) 18	1.0 (S)	–	–	0.3	–	–	–	–	
black bindweed	–	0.5–1.0	–	1.0–1.4	0.3–0.45	–	–	0.5–0.75 5	0.185	
brome grass	–	–	–	–	–	–	–	–	–	
buchan weed	–	–	–	–	–	–	–	–	–	
canola – volunteer	50 14	0.5–0.75 24	–	1.4	–	–	–	–	–	
capeweed	35–50 18	0.5–1.0	1.0	0.75–1.4	–	0.075 6	2.1–3.2	–	0.105 19	
charlock	–	0.5–0.75	1.0	–	–	–	2.1–3.2	–	0.105 19	
cereals – volunteer	–	–	–	–	–	–	–	–	–	
chickpea – volunteer	35–50 18	–	–	–	–	0.125 8	–	0.75 5	–	
cleavers	–	–	–	–	0.6	–	–	–	–	
climbing buckwheat	–	–	–	–	–	–	–	–	–	
clover	50 (S) 13 18	–	–	–	–	0.075	–	–	0.185	
corn gromwell	–	0.5–0.75	1.0	1.0–1.4	–	–	–	–	–	
common barbglass	–	–	–	–	–	–	–	–	–	
deadnettle	–	0.5–0.75	1.5	–	0.9	–	–	0.5–0.75 3 5	0.135–0.185 12	
dock	–	1.0 (S)	–	0.75–1.4	–	–	2.1–3.2 21	–	0.185	
erodium	–	0.5 (S)	–	–	–	–	–	–	–	
faba bean – volunteer	35–50 18	–	–	–	–	0.125 8	–	0.5–0.75 6	–	
field pea – volunteer	50 (S) 18	0.75 (S)	–	–	–	0.075 6	–	0.5–0.75 6	0.115	
fumitory	–	0.75–1.0 (S)	1.0	1.0–1.4	–	–	2.1–3.2	–	–	
lentil – volunteer	–	–	–	–	–	–	–	–	–	
lesser swinecress	–	1.1	–	–	–	–	–	–	–	
lupin – volunteer	35–50 18	0.5–1 (S)	–	–	0.9	0.125 6	–	0.5 7	–	
medics	50 (S) 18	–	–	–	–	0.075	–	–	0.115	
melons	–	–	–	–	–	–	–	–	–	
Recom water L/ha	50–100	50 min	50–100	50 min	50 min	50 min	110 min	80 min	50 min	
Herbicide group	B	C + F	C + I	C + I	I	I	I	I	I	

- 1 Add MCPA for control.
- 2 Add 5 g of metsulfuron-methyl (600 g/kg) and non-ionic wetter at 100 mL/100 L of water. See label.
- 3 Add LVE MCPA. See label.
- 4 Add LVE MCPA. See label.
- 5 Northern NSW only.
- 6 500 mL (southern NSW), 750 mL (northern NSW).
- 7 Southern NSW only.
- 8 See label for tankmix options.
- 9 Tankmix 0.135–0.185 L/ha Kamba® 750 with 5–7 g/ha Associate®.
- 10 Sub-clover only.
- 11 Not Clearfield canola volunteers.
- 12 Tankmix 0.185 L/ha Kamba® 750 with Agritone® 750 OR with 0.5 L/ha Amicide Advance 700.
- 13 Add partner herbicide for control, see label.

Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (continued, page 2 of 4)

Rate per hectare Various trade names sometimes available under these concen- trations. See specific labels for details.	Metosulam 100 g/L Eclipse® 100 SC 31	Bromoxynil 250 g/L + diflufenican 25 g/L Jaguar® 32	Terbutryn 275 g/L + MCPA 160 g/L Agtryne® MA	Bromoxynil 140 g/L + MCPA 280 g/L + dicamba 40 g/L Broadside®	Fluroxypyr 333 g/L Starane® Advanced 33	Clopyralid 600 g/L Lontrel® Advanced	2,4-DB 500 g/L 4)	Buttress® 34	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot® 35	Dicamba 750 g/L Kamba® 750 37 38
Apply at crop growth stage	2 leaf–1st node	2 leaf–fully tillered	3–5 leaf	3 leaf–fully tillered	3 leaf– flag leaf	2 leaf– booting	5 leaf–before booting	3 leaf–1st node	5 leaf–early tillering	
Zadoks code	12–31	12–29	13–15	13–30	13–39	12–31	15–33	13–31	15–22	
Weeds controlled	(millilitres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	
Mexican poppy	–	–	–	–	–	–	2.1–3.2	–	–	
mintweed	–	1.0 (S)	–	–	–	–	–	–	0.185 17	
mustards	50	0.5–1.0	1.0	0.75–1.4	0.3–0.9 8	–	2.1–3.2	–	0.185 17	
New Zealand spinach	–	–	–	–	–	–	–	–	0.185	
Paterson's curse	–	0.5–0.75	1.0	–	–	–	2.1–3.2	–	–	
peppercress	–	1.1	–	–	–	–	–	–	–	
radish – wild	50	0.5–1.0 22	–	0.75–1.4	0.3–0.9 8	–	–	–	0.105 19	
rough poppy	–	0.5–0.75	1.0	–	–	–	–	–	–	
safflower volunteer	–	–	–	–	–	–	–	–	–	
saffron thistle	35–50 18	1.0	–	–	–	0.025 10 6	2.1–3.2	–	0.185 17	
shepherd's purse	–	1.0	–	–	0.3–0.9 8	–	2.1–3.2	–	–	
skeleton weed	–	1.0 (S)	–	–	–	0.25 1	–	–	–	
slender thistle	35–50 18	–	–	–	–	0.025 10	2.1–3.2	–	–	
sorrel	–	1.0(S)	–	–	–	–	–	–	0.185 17	
soursob	–	–	–	–	–	–	–	–	–	
sowthistle	35–50 18	1.0 (S)	–	–	0.6	–	2.1–3.2	0.5–0.75 3 4 5	–	
spear/black thistle	35–50 18	–	–	–	–	0.025 10	2.1–3.2	–	–	
spiny emex	–	0.5–0.75	1.5	0.75–1.4	0.9	–	2.1–3.2	0.5–0.75 4 5	0.185	
St Barnaby thistle	35–50 18	–	–	–	–	–	–	–	–	
sunflower – volunteer	–	–	–	–	–	–	–	–	0.185	
toad rush	–	1.0 (S)	1.5	–	–	–	–	–	–	
turnip weed	35–50	0.5–0.75	1.0	–	0.3–0.9 8	–	2.1–3.2	–	0.185 17	
variegated thistle	35–50 18	1.0	–	–	–	0.025 10	2.1–3.2	0.5–0.75 4 5	0.185	
vetch	35–50 18	1.0 (S)	–	–	–	0.05 8	–	0.5–0.75 6	0.185	
vulpia	–	–	–	–	–	–	–	–	–	
wild lettuce	35–50 18	1.0 (S)	–	–	0.6	0.075 9	2.1–3.2	0.75 5	–	
wild oats	–	–	–	–	–	–	–	–	–	
wild turnip	50	0.5–0.75	1.0	–	0.3–0.9 8	–	2.1–3.2	–	0.185 17	
wireweed	–	1.0	1.5	0.75–1.0	0.9	–	2.1–3.2	0.5–0.75 3 5	0.185	
Recom water L/ha	50–100	50 min	50–100	50 min	50 min	50 min	110 min	80 min	50 min	
Herbicide group	B	C + F	C + I	C + I	I	I	I	I	I	

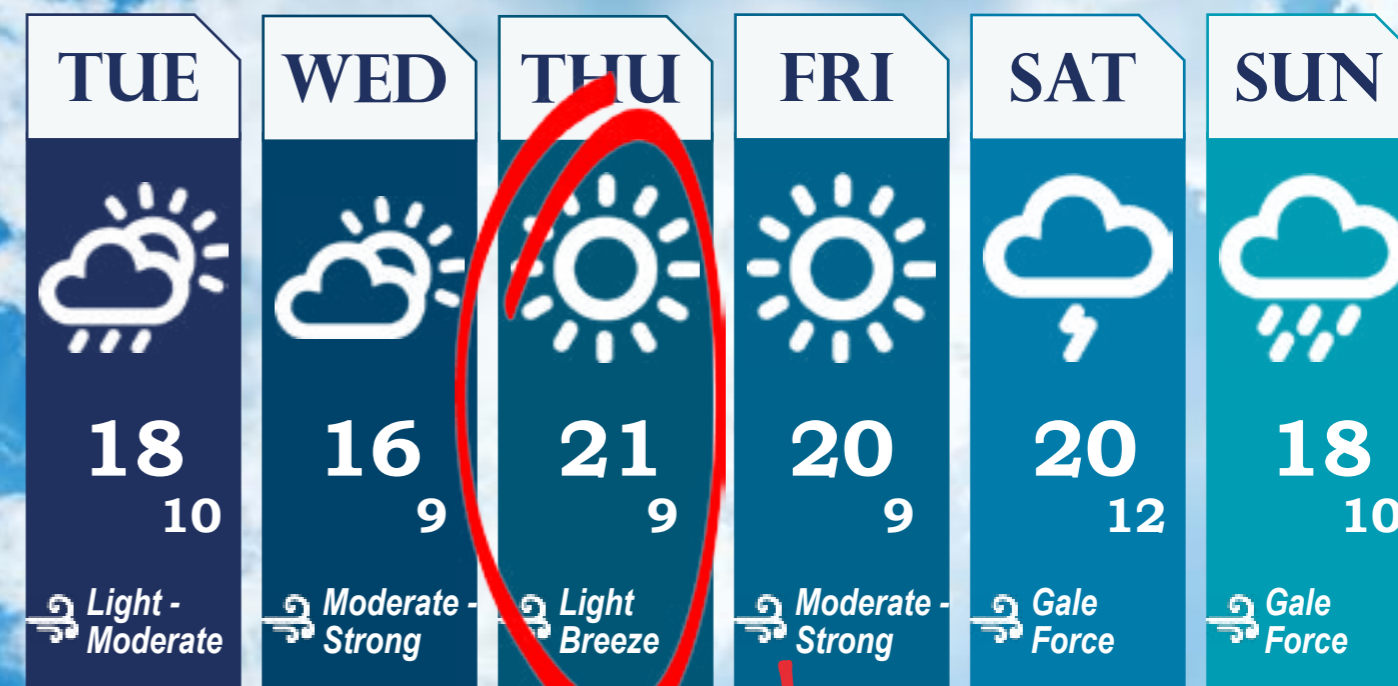
- 18 Tankmix with Agritone® 750.
- 19 Seedlings only.
- 20 Tankmix 500 mL/ha Jaguar® with LVE MCPA for control.
- 21 See label for controlling Roudup Ready canola volunteers.
- 22 Apply with 0.5 L Uptake® spraying oil/100 L water. Can be tankmixed with LVE MCPA to broaden weed control.
- 23 Can be used on undersown sub-clover and lucerne. Not annual medics. Application should be made from the first to the eighth trifoliate leaf stage.
- 33 Can be tankmixed with Associate®, LVE MCPA or Agritone 750 to broaden weed spectrum.
- 34 Boom only. Good quality water essential.
- 35 Add BS1000® (when mixed with metsulfuron-methyl).
- 37 Damage can occur if crop not actively growing or crop after mid-tillering stage. Small weeds.
- 40 2,4-DB is not safe on woolly pod vetch, berseem and red clovers. (S) Suppression only.

Herbicides that can be used with undersown legume pastures.





**New chemistry  
New thinking  
New Paradigm**  
with the flexibility that you  
have always wanted



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**When You've Only  
Got One Chance**

## Paradigm®

Arylex® active

**HERBICIDE**

Paradigm® Arylex® active Herbicide delivers a low dose, wide spectrum solution for the control of broadleaf weeds.

Widely compatible with the ability to safely go across wheat, barley, oats and triticale. Paradigm fits easily into your spray programme.

Increase your productivity with less downtime due to tank clean out, changing the spray mix or worrying about compatibilities.

Get some precious time back and make life easier.

Shift to the new Paradigm Arylex active.

For more information 1800 700 096

## Rexade®

Arylex® active

**HERBICIDE**

The ONE herbicide for wheat that:

- Controls Wild Oats, Brome grass and Phalaris
- Suppresses 3 other grass weeds
- Controls more than 24 broadleaf weeds
- Compatible with many broadleaf herbicides
- Allows freedom in winter crop rotations
- Comes in a user friendly GoDRI™ formulation

Giving you the opportunity to spray once and have the job done.

Registered for use on triticale and wheat, except durum varieties.

**For more information 1800 700 096**



Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (continued, page 3 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Florasulam 200 g/kg + halauxifen 200 g/kg	Florasulam 6.25 g/L + 2,4-D LV ester 300 g/L	MCPA (ethyl hexyl ester) 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L	Picolinafen 50 g/L + MCPA 500 g/L	Picolinafen 35 g/L + bromoxynil 210 g/L + MCPA 350 g/L	Pyraflufen-ethyl 20 g/L	Pyroxulam 150 g/kg + halauxifen 50 g/kg	2,4-D amine 700 g/kg	MCPA 375 g/L + pyraflufen-ethyl 10 g/L
Apply at crop growth stage	3 leaf–flag leaf	5 leaf–flag leaf start	3 leaf–1st node	3–5 leaf	3 leaf–before late tillering	2 leaf–late tillering	3 leaf–1st node	5 leaf–early tillering	2 leaf–end of tillering
Zadoks code	13–39	15–37	13–30	13–15	13–28	12–29	13–31	15–22	12–29
Weeds controlled	(grams)	(millilitres)	(litres)	(litres)	(millilitres)	(litres)	(grams)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–	100	–	–
annual ryegrass	–	–	–	–	–	–	100 (S)	–	–
barley grass	–	–	–	–	–	–	100 (S)	–	–
bedstraw	25 <sup>25</sup>	820	–	–	–	0.4–0.8 <sup>9</sup>	100	–	0.8–1.6
black bindweed	–	–	–	–	–	–	100 <sup>2</sup>	–	–
brome grass	–	–	–	–	–	–	100	–	–
buchan weed	–	–	–	–	–	–	–	–	–
canola – volunteer	25 <sup>25</sup> <sup>14</sup>	820	0.5	0.25 <sup>24</sup>	360	0.4–0.8 <sup>9</sup> <sup>24</sup>	100 <sup>36</sup>	–	0.8–1.6
capeweed	25 (S) <sup>25</sup> ; <sup>26</sup>	–	0.5–1.0	0.25–0.5	360–720	0.4–0.8 <sup>9</sup>	100 <sup>2</sup>	–	0.8–1.6
charlock	25 <sup>25</sup>	–	0.5–1.0	0.25–0.5	360–720	–	–	0.5	–
cereals – volunteer	–	–	–	–	–	–	–	–	–
chickpea – volunteer	25 <sup>25</sup> <sup>5</sup>	820	–	–	–	0.4 <sup>11</sup>	100	–	–
cleavers	25	–	–	–	–	–	–	–	–
climbing buckwheat	–	820 (S) <sup>8</sup>	–	–	–	–	100 <sup>2</sup>	–	–
clover	25 <sup>25</sup>	–	–	–	–	0.4 <sup>11</sup> <sup>13</sup>	100	–	–
corn gromwell	–	–	1.0	0.5	720	–	–	–	–
common barbrgrass	–	–	–	–	–	–	–	–	–
deadnettle	25	–	1.0	0.5 (S)	720 (S)	0.4 <sup>11</sup>	100	–	–
dock	–	–	1.0 (S)	–	–	–	–	–	–
erodium	–	–	1.0 (S)	–	–	0.4–0.8 <sup>9</sup>	–	–	0.8–1.6
faba bean – volunteer	25 <sup>25</sup> <sup>5</sup>	820	–	–	–	0.4 <sup>11</sup>	100	–	–
field pea – volunteer	25 <sup>25</sup>	820	–	–	–	–	100	–	–
fumitory	25	–	0.75 <sup>27</sup>	0.5 (S)	540–720 (S) <sup>28</sup>	0.4 <sup>11</sup>	100	0.5 <sup>29</sup>	–
lentil – volunteer	25 <sup>25</sup>	820	–	–	–	–	–	–	–
lesser swinecress	–	–	–	–	–	–	–	–	–
lupin – volunteer	25 <sup>25</sup>	820	1.0 (S)	0.5 (S)	720 (S) <sup>9</sup>	0.4–0.8 <sup>9</sup>	100	–	0.8–1.6
medics	25 <sup>25</sup>	–	–	–	–	0.4 <sup>11</sup>	100	–	–
melons	–	–	–	–	–	–	–	0.5 <sup>29</sup>	–
Recom water L/ha	80–100	80–100 L/ha	50–100 L/ha	50 min	50–150	70–150	80–100	50–250	70–150
Herbicide group	I + B	B + I	F + C + I	F + I	C + F + I	G	B + I	I	G + I

- <sup>2</sup> See label for weed size and tank mix options.
- <sup>5</sup> Northern NSW only.
- <sup>8</sup> See label for tankmix options.
- <sup>9</sup> Add Agritone 750 or 330 mL/ha Agroxone® 750 for control.
- <sup>11</sup> Add Agritone 750 + 5 g/ha Esteem® WDG, or 330 mL/ha Agroxone® 750 + 5 g/ha Esteem® WDG.
- <sup>13</sup> Sub-clover only.

- <sup>14</sup> Not Clearfield canola volunteers.
- <sup>15</sup> Colyledon sowthistle 4-leaf up to 10 cm + 500 mL Hotshot + LVE MCPA.
- <sup>16</sup> Colyledon sowthistle 4-leaf up to 8 cm + LVE MCPA.
- <sup>23</sup> Always use BS1000® or Chemwet® 1000 at 250/100 L spray volume.
- <sup>24</sup> See label for controlling RR Canola volunteers.
- <sup>25</sup> Add LVE MCPA (see label for rates).
- <sup>26</sup> Add 50 mL Lontrel® Advanced for improved control.

Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (continued, page 4 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Florasulam 200 g/kg + halauxifen 200 g/kg	Florasulam 6.25 g/L + 2,4-D LV ester 300 g/L	MCPA (ethyl hexyl ester) 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L	Picolinafen 50 g/L + MCPA 500 g/L	Picolinafen 35 g/L + bromoxynil 210 g/L + MCPA 350 g/L	Pyraflufen-ethyl 20 g/L	Pyroxulam 150 g/kg + halauxifen 50 g/kg	2,4-D amine 700 g/kg	MCPA 375 g/L + pyraflufen-ethyl 10 g/L
Apply at crop growth stage	3 leaf–flag leaf	5 leaf–flag leaf start	3 leaf–1st node	3–5 leaf	3 leaf–before late tillering	2 leaf–late tillering	3 leaf–1st node	5 leaf–early tillering	2 leaf–end of tillering
Zadoks code	13–39	15–37	13–30	13–15	13–28	12–29	13–31	15–22	12–29
Weeds controlled	(grams)	(millilitres)	(litres)	(litres)	(millilitres)	(litres)	(grams)	(litres)	(litres)
Mexican poppy	25	–	–	–	–	–	–	–	–
mintweed	–	–	–	–	–	–	–	–	–
mustards	25 <sup>25</sup>	820	0.5–1.0	0.25–0.5	360–720	0.4–0.8 <sup>9</sup>	100 <sup>2</sup>	0.2–0.5	0.8–1.6
New Zealand spinach	–	–	–	–	–	–	–	–	–
Paterson's curse	–	–	1.0 (S)	–	–	0.4 <sup>11</sup>	–	–	–
peppercress	–	–	1.0 (S)	–	–	–	–	–	–
radish – wild	25 <sup>25</sup>	820	0.5–1.0	0.25–0.5	360–720	0.3–0.8 <sup>9</sup>	100 <sup>2</sup>	–	0.8–1.6
rough poppy	–	–	1.0 (S)	–	–	–	–	–	–
safflower volunteer	–	–	–	–	–	–	–	0.5	–
saffron thistle	–	–	1.0	0.5	720	–	–	0.5	–
shepherd's purse	25 <sup>25</sup>	–	0.5–1.0	0.25–0.5	360–720	–	–	–	–
skeleton weed	–	–	1.0 (S)	–	–	–	–	–	–
slender thistle	–	–	–	–	–	–	–	–	–
sorrel	–	–	–	–	–	0.4 <sup>11</sup>	–	–	–
soursob	–	–	–	–	–	0.4 <sup>11</sup>	–	–	–
sowthistle	25 <sup>25</sup>	–	1.0 (S)	0.5 (S)	720 (S)	0.4 <sup>11</sup>	100 <sup>15</sup> <sup>16</sup>	–	–
spear/black thistle	–	–	–	–	–	–	–	0.5	–
spiny emex	25 (S) <sup>25</sup>	820	1.0 (S)	0.5 (S)	720 (S)	0.4 <sup>11</sup>	100 <sup>2</sup>	–	–
St Barnaby thistle	–	–	–	–	–	–	–	–	–
sunflower – volunteer	–	–	–	–	–	–	–	0.5 <sup>30</sup>	–
toad rush	25 (S)	–	1.0	0.5	720	–	–	–	–
turnip weed	25 <sup>25</sup>	600 <sup>5</sup> <sup>41</sup>	0.5–1.0	0.25–0.5	360–720	0.4 <sup>11</sup>	100	0.5	–
variegated thistle	–	820 (S) <sup>8</sup>	1.0 (S)	–	–	–	–	0.5	–
vetch	25 <sup>25</sup>	820	1.0 (S)	–	–	–	100	–	–
vulpia	–	–	–	–	–	–	100 (S)	–	–
wild lettuce	–	–	0.5–1.0	0.25–0.5	360–720	0.4–0.8 <sup>9</sup>	100 <sup>2</sup>	–	0.8–1.6
wild oats	–	–	–	–	–	–	100	–	–
wild turnip	25 <sup>25</sup>	820 <sup>5</sup> <sup>41</sup>	0.5–1.0	0.25–0.5	360–720	0.4–0.8 <sup>9</sup>	–	0.2–0.5	0.8–1.6
wireweed	–	–	0.75 (S)	–	–	0.4 <sup>11</sup>	100 <sup>25</sup>	–	–
Recom water L/ha	80–100	80–100 L/ha	50–100 L/ha	50 min	50–150	70–150	80–100	50–250	70–150
Herbicide group	I + B	B + I	F + C + I	F + I	C + F + I	G	B + I	I	G + I

- <sup>27</sup> Denseflower fumitory.
- <sup>28</sup> White fumitory.
- <sup>29</sup> Afghan or camel melon.
- <sup>30</sup> Seedlings.
- <sup>36</sup> Excluding Clearfield® varieties.
- <sup>38</sup> Always add Uptake® spraying oil at 500 mL/100 L water, unless tankmixing with Associate®. When tankmixing with Associate® add a non-ionic wetter at 200 mL/200 L.

- <sup>39</sup> Do not use 0.5 L/ha rate on crops younger than 5 leaf. Do not apply rates higher than 0.25 L/ha to crops in the 3-leaf stage.
- <sup>41</sup> Adjuvants: always use Uptake® spraying oil (500 mL/100 L water).
- (S) Suppression only.

Table 17. Herbicides for weed control for wheat and barley – Early post-emergence – Part 3 (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Tralkoxydim 400 g/kg Achieve® WG 11	Clofinafop propagyl 240 g/L + cloquintocet- mexyl 60 g/L Topik® 240 EC 12	Diclofop- methyl 200 g/L + sethoxydim 20 g/L Decision® 13	Pinoxaden 100 g/L + cloquintocet- mexyl 25 g/L Axial® Xtra 14	Fenoxaprop-p-ethyl 13.6 g/L + diclofop-methyl 200 g/L + sethoxydim 20 g/L Cheetah® Gold 15	Fenoxypop-p-ethyl 69 g/L + cloquintocet- mexyl 34.5 g/L Foxtrot® 16
		Wheat only				
Apply at crop growth stage	2 leaf–early tillering	2 leaf–late jointing	2 leaf–1 tiller	2 leaf–1st awns visible	2 leaf–2 tiller	2 leaf–mid tillering
Zadoks code	12–22	12–37	12–21	12–49	12–22	12–24
Weeds controlled	(grams)	(millilitres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–
annual phalaris	380–500 (S)	85–160	–	0.2–0.25	1.0 (S)	0.635–0.8
annual ryegrass	380–500	160–210	1.0	0.25–0.3 (S)	1.0	–
barley grass	–	–	–	–	–	–
bedstraw	–	–	–	–	–	–
black bindweed	–	–	–	–	–	–
brome grass	–	–	–	–	–	–
buchan weed	–	–	–	–	–	–
canola – volunteer	–	–	–	–	–	–
capeweed	–	–	–	–	–	–
cereals – volunteer	–	–	–	–	–	–
charlock	–	–	–	–	–	–
chickpea – volunteer	–	–	–	–	–	–
cleavers	–	–	–	–	–	–
clover	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–
common barbgrass	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–
dock	–	–	–	–	–	–
erodium	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–
fumitory	–	–	–	–	–	–
lesser swinecress	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–
medics	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–
mintweed	–	–	–	–	–	–
mustards	–	–	–	–	–	–
New Zealand spinach	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–
pepper cress	–	–	–	–	–	–
radish – wild	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–
slender thistle	–	–	–	–	–	–
sorrel	–	–	–	–	–	–
soursob	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–
spear/black thistle	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–
St Barnaby thistle	–	–	–	–	–	–
sunflower – volunteer	–	–	–	–	–	–
toad rush	–	–	–	–	–	–
turnip weed	–	–	–	–	–	–
variegated thistle	–	–	–	–	–	–
vetch	–	–	–	–	–	–
vulpia	–	–	–	–	–	–
wild lettuce	–	–	–	–	–	–
wild oats	300–500	65–125 2	–	0.15–0.2	1.0	0.475–0.635
wild turnip	–	–	–	–	–	–
Rec water L/ha boom	50–150	50–110	50–150	50 min	50–150	50–100
Herbicide group	A	A	A	A	A	A

- 1 Excluding Clearfield varieties.
- 2 Sub clover only
- 3 Sub-clover only.
- 4 See label for critical comments on post-emergent use. Do not apply Boxer Gold post-emergent to crops that have been treated with a pre-emergent or split application of Boxer gold.
- 5 Not Clearfield canola. See label for controlling RR Canola volunteers.
- 6 Intervix® requires the addition of 0.5% Hasten oil.
- 7 Phalaris paradoxa only.
- 8 1–3 leaf annual ryegrass.

- 9 Wheat: apply 4–7 weeks after sowing when wheat at 3 leaf–5 tiller stage. Barley: apply 4 leaf–5 tiller stage. See Critical Comments on label for use in barley, as barley can be sensitive to Hussar® OD under certain conditions. Weeds young and actively growing. Use only on varieties listed on label. Do not use where group 'B' resistance is likely to be a problem or where a group B herbicide has been applied to the current crop. Not compatible with zinc foliar fertilisers.
- 10 Check label for Clearfield limitations.
- 11 Add 0.75 or 1 L Supercharge® or Amplify®/100 L.
- 12 Add 0.5 L Uptake® or Hasten® oil at 100 L water.
- 13 When Decision® is being applied alone add Uptake® at or Hasten® at 1% v/v. See label for further details.

Table 17. Herbicides for weed control for wheat and barley – Early post-emergence – Part 3 (continued, page 2 of 2)

Imazamox 33 g/L + imazapyr 15 g/L Intervix® 6 10 15	Imazapic 525 g/kg + imazapyr 175 g/kg Sentry® 20	Sulfosulfuron 750 g/kg Sulfosulfuron 750 WG 17	Iodosulfuron- methyl-sodium 100 g/L Hussar® OD 9	Mesosulfuron- methyl 30 g/L Atlantis® OD 19	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg Stinger® 18	S-metolachlor 120 g/L + prosulfacarb 800 g/L Boxer Gold® 4	pyroxulam 150 g/kg + halauxifen 50 g/kg Rexade® Arylex® 22
Clearfield wheat and barley only	Imidazolinone herbicide- tolerant wheat (single gene) and barley	Wheat only	Wheat and barley only	Wheat only	Not durum		Triticale and wheat but NOT durum
3 leaf–1st node wheat 5 leaf–1st node barley	4 leaf–flag leaf	Emergence–early tillering	3 leaf– 5-tillers	Not before 3 leaf	3 leaf–1st node	Up to mid tillering	3 leaf–first node
13–31	14–37	11–22	13–25	>13	13–31	00–25	13–31
(millilitres)	(grams)	(grams)	(millilitres)	(litres)	(grams)	(litres)	(grams)
–	40	25	–	–	–	–	–
–	40	–	100 7	0.33	–	–	100
600–750	–	–	75–100	0.33 (S)	–	2.5 3	100 (S)
375–750	40	25 (S)	–	0.33 (S)	–	–	100 (S)
600–750 (S)	40	–	100 (S)	–	–	–	100
–	–	–	75 (S)	–	14	–	–
375–750	40	20–25 (S)	–	0.33 (S)	–	–	100
–	40 21	20 5	–	–	–	–	100 1
–	–	–	–	–	–	–	–
375–750	40 21	–	–	–	–	–	–
–	–	–	75	–	–	–	–
–	–	–	–	–	10	–	100
–	–	–	–	–	–	–	–
600–750 8	40	–	75	–	10	–	100 2
–	40	–	75 (S)	–	–	–	–
–	40	–	75	–	10	–	100
–	–	–	–	–	10 or 14	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	10	–	100
–	–	20	75 (S)	–	–	–	100
600-750	40	–	75	–	–	–	100 (S)
–	–	–	–	–	–	–	–
–	–	–	75	–	–	–	100 (S)
–	–	–	75	–	10	–	100
–	–	–	–	–	–	–	–
375–750	20	25 (S)	75	–	10	–	–
–	–	–	–	–	10	–	–
–	40	–	100	–	–	–	–
–	–	–	–	–	–	–	–
–	20	20	100	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	100 (S)	–	–	–	–
–	–	–	–	–	–	–	–
600–750 (S)	–	–	100	–	10 or 14	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	10 or 14	–	–
–	40	–	75 (S)	–	–	–	–
–	–	–	75	–	10	–	100
–	–	–	–	–	–	–	–
–	–	–	75 (S) 1	–	–	–	100 (S)
600–750 (S)	–	25	–	–	–	–	–
–	–	–	–	–	10 or 14	–	–
375–750	40	25 (S)	100	0.33	–	–	100
375–750	–	20	–	–	10	–	–
70 min	70–100	40–100	50–80	50–80	70–100	100 min	80–150
B	B	B	B	B	I + B	J + K	B + I

- 14 Always add 500 mL Adigor® spray adjuvant/100 L of water. Use the lower rate when weeds are actively growing without stress, are small and in low density. DO NOT apply later than the first awns visible stage (Zadoks 49).
- 15 Must be mixed with either Uptake® at 0.5% v/v or Hasten™ at 1% v/v.
- 16 Not for use in 1 gene wheat such as Clearfield JNZ or Clearfield STL. Always add Supercharge® at 0.5 L/100L.
- 17 Add Bonza® at 1–2 L/100 L of spray. Spray small weeds (see label). Not on undersown legumes. good soil moisture required for effective results.
- 18 See label for weed sizes and tank mix options. Add wetting agent e.g. BS1000 at 100 mL/100 L water.

- 19 Must always be applied with a non-ionic wetting agent (e.g. BS1000® at 0.25% v/v). Must not be mixed with zinc based foliar fertilisers as a loss of efficiency can occur. Brome grass suppression can be improved by using Hasten® at 1% v/v.
- 20 Use on Clearfield System wheat varieties only; apply to crops in the 4 L to start of flagleaf stage. Apply early post-emergent to actively growing grass weeds (3 leaf to 2 tiller stage) and broadleaf weeds (2–6 leaf stage).
- 21 Other than imidazolinone herbicide-tolerant varieties.
- 22 Always use BS 1000 or Chemwet 1000 at 250 mL/100L. (S) Suppression only.

     Herbicides that can be used with undersown legume pastures.

Table 18. Herbicides for weed control for wheat and barley – Late post-emergence (page 1 of 2)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L Axial® Xtra 7	Flumetsulam 800 g/kg Broadstrike® 8	Low volatile 2,4-D ester 680 g/L Estericide® Xtra 680	2,4-D amine 700 g/L Amicide® Advance 700 9	2,4-DB 500 g/L Buttress® 10	MCPA 750 g/L Agritone® 750 11	MCPA 570 g/L LVE MCPA 570 12	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 13	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid + 7.5 g/L FallowBoss® Tordon® 14	Clopyralid 600 g/L Lontrel® Advanced 4	Fluroxypyr 250 g/L + haloxifen 16.25 g/L Pixxaro® 15	200 g/kg halauxifen -methyl + 200 g/kg florasulam Paradigm®
Apply at crop growth stage	2 leaf-awn peep	Flowering-early dough	1st node-before booting	Fully tillered-booting	5 leaf-before booting	5 leaf-booting	5 leaf-flag leaf	Early tillering-fully tillered	Mid tillering-start of jointing	2 leaf-booting	3 leaf-flag leaf	1st leaf-first awns visible
Zadoks code	12-49	61-83	31-37	30-43	15-33	15-37	15-39	22-30	23-31	12-45	13-39	13-49
Weeds controlled	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
am-sinckia	-	-	-	0.98	-	0.33 17	-	-	-	-	-	-
annual ryegrass	-	-	-	-	-	-	-	-	-	-	-	-
annual phalaris	-	-	-	-	-	-	-	-	-	-	-	-
black bindweed	-	-	-	-	-	0.97-1.35	-	1.0 5	0.3	-	0.4-0.6	-
capeweed	-	-	0.53-0.8	0.98-1.5	2.1-3.2	1.45 or 0.33 17	1.49 5	-	-	0.15	-	28 (S)
canola - volunteer	-	-	0.9-1.25	0.9-1.25	-	-	-	-	-	-	-	-
charlock	-	-	0.41	0.5-1.5	2.1-3.2	0.66 or 0.33 17	0.44-1.4	-	-	-	-	-
chickpea - volunteer	-	-	-	-	-	-	-	-	-	-	-	25 16
clover	-	-	0.62-0.8	1.1	-	-	-	-	-	-	0.3	25
corn gromwell	-	-	0.8	-	-	0.33 17	-	-	-	-	-	-
deadnettle	-	-	0.8	-	-	1.45 or 0.33 17	-	-	-	-	-	-
erodium	-	-	0.8	-	-	0.33 17	-	-	-	-	-	25
fleabane	-	-	-	1.5 6	-	-	-	-	-	-	0.3	25
fumitory	-	-	0.8	0.5-1.5	2.1-3.2	0.93	0.965	-	-	-	0.3	25
marshmallow	-	-	-	-	-	-	-	-	-	-	-	25
medic	-	-	-	-	-	-	-	-	-	-	0.2-0.3	25
Mexican poppy	-	-	0.8	-	2.1-3.2	-	-	-	-	-	-	-
mintweed	-	-	0.8	0.98	-	1.35	-	-	0.3 2	-	-	-
mustards	-	-	0.41-0.8	0.5-0.98	2.1-3.2	0.66 or 0.33 17	0.49-0.88	1.0	0.3 2	-	-	25
New Zealand spinach	-	-	0.8	0.98-1.5	-	-	-	1.0 (S)	0.3	-	-	-
Pateron's curse	25	25	0.8	0.98-1.5	2.1-3.2	0.66-0.96 5	1.49 5	-	0.3 2	-	-	25 16
radish - wild	-	-	0.41-0.8	0.715-1.5	-	0.66 or 0.33 17	0.965-1.4	1.0	-	-	-	-
rough poppy	-	-	0.41-0.8	0.98	-	0.46-0.96	-	-	-	-	-	-
safron thistle	-	-	0.41-0.8	0.5-1.5	2.1-3.2	0.66-1.35	0.965-1.66 5	1.0	0.3	-	-	-
scotch thistle	-	-	-	-	-	-	0.615-1.49 5	-	-	-	-	-
shepherd's purse	-	-	0.8	0.98-1.5	2.1-3.2	-	-	-	-	-	-	25
skeleton weed	-	-	0.8	0.98-1.5	-	0.96-1.35	0.965-1.4	1.0	-	-	-	-
slender thistle	-	-	0.8	0.715-1.5	2.1-3.2	0.66-1.35	1.84 5	-	-	-	-	-
sorrel	-	-	-	1.25-1.5	-	-	-	-	-	-	-	-
sowthistle	-	-	-	1.5	2.1-3.2	-	-	1.0	0.3	-	0.4	25
spear thistle	-	-	-	0.5-1.45	2.1-3.2	0.96-1.35	1.31-1.84 5	-	-	-	-	-
Recom water L/ha boom	50 min	100 min	30-100	50-250	110 min	30-120	30-120	50 min	50-100	50 min	80 min	80-100
Herbicide group	A	B	I	I	I	I	I	I	I	I	I	I B

Table 18. Herbicides for weed control for wheat and barley – Late post-emergence (continued, page 2 of 2)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L Axial® Xtra 7	Flumetsulam 800 g/kg Broadstrike® 8	Low volatile 2,4-D ester 680 g/L Estericide® Xtra 680	2,4-D amine 700 g/L Amicide® Advance 700 9	2,4-DB 500 g/L Buttress® 10	MCPA 750 g/L Agritone® 750 11	MCPA 570 g/L LVE MCPA 570 12	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 13	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid + 7.5 g/L FallowBoss® Tordon® 14	Clopyralid 600 g/L Lontrel® Advanced 4	Fluroxypyr 250 g/L + haloxifen 16.25 g/L Pixxaro® 15	200 g/kg halauxifen -methyl + 200 g/kg florasulam Paradigm®
Apply at crop growth stage	2 leaf-awn peep	Flowering-early dough	1st node-before booting	Fully tillered-booting	5 leaf-before booting	5 leaf-booting	5 leaf-flag leaf	Early tillering-fully tillered	Mid tillering-start of jointing	2 leaf-booting	3 leaf-flag leaf	1st leaf-first awns visible
Zadoks code	12-49	61-83	31-37	30-43	15-33	15-37	15-39	22-30	23-31	12-45	13-39	13-49
Weeds controlled	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
spiny emex	-	-	-	1.25	2.1-3.2	0.33 17	-	1.0	0.3	-	-	25 (S)
St Barnaby thistle	-	-	-	-	-	0.69-1.0	-	-	0.3 2	-	-	-
sunflower	-	-	0.41-0.8	0.5-1.25	-	-	-	-	-	-	-	25
toadrush	-	-	-	-	-	-	-	-	-	-	-	25
turnip weed	25	25	0.41-0.8	0.5-0.98	2.1-3.2	0.66 or 0.33 17	0.615-0.965	1.0	0.3 2	-	-	25
variegated thistle	-	-	0.41-0.8	0.5-1.5	2.1-3.2	0.66-1.35	0.735-0.965	1.0	0.3 2	-	-	25
vetch	-	-	-	0.98-1.25	-	-	-	-	-	0.05	-	-
wild oats	0.2	-	-	-	-	-	-	-	-	-	-	-
wild turnip	-	-	0.41-0.8	0.5-1.5	2.1-3.2	0.66 or 0.33 17	0.44-1.31	0.735-0.965	-	-	-	25
wireweed	-	-	0.8	-	2.1-3.2	-	-	1.0 (S)	0.3 2 (S)	-	-	-
Recom water L/ha boom	50 min	100 min	30-100	50-250	110 min	30-120	30-120	50 min	50-100	50 min	80 min	80-100
Herbicide group	A	B	I	I	I	I	I	I	I	I	I	I B

- 2 Tank mix with 0.375 mL/ha 2,4-D Amine 625 for control.
- 3 Preferred option for northern NSW only.
- 4 Also available as Lontrel® 750 SG (750 g/kg).
- 5 Top rate for barley is 1.4 L/ha.
- 6 Fleabane up to 6 leaf rosette stage. Apply in 70-100 L water.
- 7 For spray topping wild oats. Zadoks 30-47. Always add 500 mL of Adigor®/100 L. Do not apply Axial® Xtra more than once per crop. 5th NSW 150-200 mL Axial® Xtra, Nth NSW 200 mL.
- 8 Salvage spray to prevent seed set in flowering wild radish and turnip weed. Spray least-mature weeds from early flowering to early pod set of most mature weeds, and crop from flowering to early dough stage. Add Uptake® oil (wheat or wetter (barley)). Can be used on undersown lucerne, clovers and annual medics.
- 9 Maximum rate on wheat 1.5 L/ha, barley 1.25 L/ha.
- 10 Boom only, good quality water essential.
- 11 Undersown legumes tolerant to lower rates - see label. Not on medics or lucerne.
- 12 See label for crop stage, weed size and chemical rate. Barley: Use only from 5 leaf stage to flag-leaf just visible (Z15-37). Maximum rate in barley 1.4 L/ha.
- 13 Do not plant susceptible crops within 12 months of applying the product.
- 14 Do not plant susceptible crops within 12 months of applying the product.
- 15 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.
- 16 Add Uptake® spraying oil (500 mL/100 L water).
- 17 Small weeds 330 mL/ha + 280 g Diurex® WG. Read table for critical comments.
- 18 Suppression only.

Herbicides that can be used with undersown legume pastures.



# Herbicide resistance management

Rotate herbicide groups • Avoid spraying dense weed infestations

## Why is herbicide resistance a problem?

If herbicide resistance develops, growers will have to use herbicides from different chemical groups or different control methods to control the weed. These options might be more expensive or less effective. Once developed, herbicide resistance will persist for many years.

## Understanding herbicides

### Watch your paddocks

- Keep accurate records.
- Monitor weed populations and record results of herbicides used.
- If herbicide resistance is suspected, prevent weed seed set.
- If a herbicide does not work, find out why.
- Check that weed survival is not due to spraying error.
- Conduct your own paddock tests to confirm herbicide failure and what herbicides are still effective.
- Have a herbicide resistance test carried out on seed from suspected plants – testing for resistance to other herbicide (MOA) groups.
- Do not introduce or spread resistant weeds in contaminated grain or hay.
- Resistance can develop from fence lines and irrigation channels. Closely monitor and test for resistance in these areas.

## Herbicide resistance testing

The best investment a grain grower can make is to test any weedy outbreak that is suspected of having herbicide resistance. It provides valuable information about the herbicides that don't work, but more importantly, the herbicides that are effective. An approximate cost of a broad spectrum test is \$600–700. This would include at least 6–7 herbicides. This cost is insignificant compared with a widespread spray failure over 200 ha that costs \$30/ha in herbicides (\$6,000 in wasted herbicide), not including crop yield losses and the blow out in weed seed for future years.

There are two types of tests available; a quick test and a seed test.

### Quick test

Live seedlings are sent away for re-potting and spraying. Once the plants have fully recovered they are sprayed with your chosen herbicides. Results are usually reported 4–8 weeks after arriving at the testing facility. This is usually too late to enable re-treatment of the 'suspect' patches, but does provide early knowledge about the nature of the problem and what is likely to work in the future. One disadvantage of the quick test is it cannot test for pre-emergence herbicides, as the plants are already emerged.

### Seed test

Seed is sent and often involves breaking seed dormancy upon arrival. It is a useful test if you require pre-emergence herbicides to be tested for resistance. The turnover time is approximately four months and results are usually sent to clients in April (if seed was sent in December). This will allow ample time to decide what herbicides to use for the next crop.

## Which herbicides should I test?

Ideally test any and every herbicide that you might wish to use in the future for the target weed species (there are a few exceptions – read on). Any application of herbicide that results in survivors setting seed will classify as some selection pressure for resistance. Be sure to include some herbicides that you have not yet used.

There are two reasons for this; firstly you may have developed cross resistance, i.e. confirmed resistance without a history of it being used, or new crop rotations in the future will allow the use of new herbicide groups. A good mixture of 'fop' and 'dim' herbicides is recommended and if you intend to use Axial® Xtra ('den' herbicide) include it. If ARG (annual ryegrass) is your key weed and you grow wheat, pulse or a Clearfield crop it is worthwhile including a sulfonylurea herbicide (e.g. Chlorsulfuron 740 WG or Associate®) and an imidazolinone herbicide (e.g.

## HERBICIDE RESISTANCE

### Definition

Herbicide resistance is the inherent ability of a weed to survive a herbicide rate that would normally control it. This is not the same phenomenon as poor herbicide performance.

### What is MOA?

Herbicides act by interfering with specific processes in plants. This is known as the herbicide's mode of action (MOA).

Spinnaker®, Raptor®). Testing for trifluralin or Avadex® resistance would only be required if you have a history of using them for at least 10 applications in that paddock of concern.

Lastly, never under-estimate the number of glyphosate applications these weeds could have received. As a cautious measure, including glyphosate as a test herbicide is a wise choice, especially for ARG.

There are many cases of glyphosate-resistant ARG in NSW. Although there is a chance of discovering glyphosate resistant weeds, resistance testing might discover concerning or low levels of survival following glyphosate application. If this occurs, it could be the precursor for glyphosate resistance development.

There are two testing services:

Plant Science Consulting	Charles Sturt University Herbicide Resistance Testing Service
Mobile: 0400 664 460	Phone: (02) 6933 4001; mobile: 0427 296 641
Fax: (08) 8342 4606	Fax: (02) 6933 2924
Email: info@plantscienceconsulting.com.au	Email: jbroster@csu.edu.au
Postal Address: 22 Linley Avenue, Prospect SA 5082	Postal Address: Herbicide Resistance Testing, School of Agricultural and Wine Sciences, Charles Sturt University, Locked Bag 588, Wagga Wagga, NSW 2678
Website: www.plantscienceconsulting.com	Website: www.csu.edu.au/research/grahamcentre and follow the quick link on the right hand side of the page to herbicide resistance.
Seed Test? Yes	Seed Test? Yes
Quick Test? Yes	Quick Test? No

## Aim to:

- Reduce weed numbers by preventing seed set.
- Avoid spraying dense weed infestations and begin a cropping phase with low weed numbers.
- Use as many different control options (chemical and non-chemical) as possible in both crop and pasture phases.

## When using herbicides:

- Rotate herbicides from different groups.
- Reduce reliance on high-risk herbicides (Groups A and B).
- Make every herbicide application count – use the rate that kills.
- Use the 'double knock' herbicide option; before sowing – glyphosate followed by paraquat + diquat.

Table 19. Weed control options for crop and pasture phases

Pasture phase		Cropping phase	
Chemical	Non-chemical	Chemical	Non-chemical
Spray topping	Competitive pasture	Crop topping	Competitive crop
Winter cleaning	Make silage or hay	Pre-sow knockdown	Timely cultivation
Chemical Fallow	Cultivated fallow	Selective spraytop	Green manure crop
Selective herbicides	Grazing	Selective herbicides	Later sowing
		Lower risk herbicides	Silage or hay crops
		Rotating modes of action	Collect or burn weed seeds

## Mode of action groups (at 14 February 2019)

Produced courtesy Croplife Australia Limited, Level 1, Maddocks House, 40 Macquarie Street, Barton ACT 2600. Phone (02) 62732733 Website www.croplife.org.au Email info@croplife.org.au

Table 20. High resistance risk

Chemical family	Active constituent (first registered trade name)
<b>GROUP A: Inhibitors of acetyl coA carboxylase (inhibitors of fat synthesis/ACC'ase inhibitors)</b>	
Aryloxyphenoxypropionates: (Fops):	clodinafop (Topik® 240 EC), cyhalofop (Barnstorm®), diclofop (Cheetah® Gold*, Decision**, Hoegrass**), fenoxaprop (Cheetah® Gold*, Wildcat*), fluazifop (Fusilade®, Fusion**), haloxyfop (Verdict®), propaquizafop (Shogun®), quizalofop (Targa®)
Cyclohexanediones: (Dims):	butoxydim (Falcon®, Fusion®), clethodim (Select®), profoxydim (Aura®), sethoxydim (Cheetah® Gold*, Decision**), tralkoxydim (Achieve® WG)
Phenylpyrazoles: (Dens):	pinoxaden (Axial® Xtra)
<b>GROUP B: Inhibitors of acetolactate synthase (ALS inhibitors)</b>	
Sulfonylureas: (SUs):	azimsulfuron (Gulliver®), bensulfuron (Londax®), chlorsulfuron (Glean®), ethoxysulfuron (Hero®), formasulfuron (Tribute®), halosulfuron (Sempra®), iodosulfuron (Hussar®), mesosulfuron (Atlantis®), metsulfuron (Associate®, Harmony** M, Trounce**), Ultimate Brushweed** Herbicide, StingerTM*), prosulfuron (Casper®), rimsulfuron (Titus®), sulfometuron (Oust®, Eucmix Pre Plant**), sulfosulfuron (Sulfosulfuron 750 WG), thifensulfuron (Harmony** M), triasulfuron, (Logran® B-Power**), tribenuron (Express®), trifloxysulfuron (Envoke®, Krismat**)
Imidazolinones: (Imis):	imazamox (Raptor®, Intervix**), imazapic (Bobcat® i-Maxx**, OnDuty**) imazapyr (Arsenal Super**, OnDuty**, Intervix**, Lightning**), imazethapyr (Spinnaker®, Lightning**)
Triazolopyrimidines: (Sulfonamides):	flumetsulam (Broadstrike®), florasulam (Paradigm**, Vortex®, X-Pand®), metosulam (Eclipse®), pyroxulam (Rexade®, Crusader®)
Pyrimidinylthiobenzoates:	bispyribac (Nominee®), pyriithiobac (Staple®)

\* This product contains more than one active constituent

Table 21. Moderate resistance risk

Chemical family	Active constituent (first registered trade name)
<b>GROUP C Inhibitors of photosynthesis at photosystem II (PS II inhibitors)</b>	
Triazines:	ametryn (Amigan <sup>®</sup> , Primatol Z <sup>®</sup> , Gesapax <sup>®</sup> Combi <sup>®</sup> , Krismat <sup>®</sup> ), atrazine (Atrazine 900 WG, Gesapax <sup>®</sup> Combi <sup>®</sup> , Primextra <sup>®</sup> Gold <sup>®</sup> ), cyanazine (Bladex <sup>®</sup> ), prometryn (Gesagard <sup>®</sup> , Cotogard <sup>®</sup> , Prometryn <sup>®</sup> ), propazine (Agaprop <sup>®</sup> ), simazine (Simazine 900 DF), terbutylazine (Terbyne <sup>®</sup> ), terbutryn (Amigan <sup>®</sup> , Igran <sup>®</sup> 500 Flowable, Agtryne <sup>®</sup> MA <sup>®</sup> )
Triazinones:	hexazinone (Velpar <sup>®</sup> L, Velpar <sup>®</sup> K4 <sup>®</sup> , Bobcat <sup>®</sup> i-Maxx <sup>®</sup> ), metribuzin (Sencor <sup>®</sup> , Aptitude <sup>®</sup> )
Uracils:	bromacil (Hyvar <sup>®</sup> , Krovar <sup>®</sup> ), terbacil (Sinbar <sup>®</sup> , Eucmix Pre Plant <sup>®</sup> )
Pyridazinones:	chlorigazon (Pyramin <sup>®</sup> )
Phenylcarbamates:	phenmedipham (Betanal <sup>®</sup> )
Ureas:	diuron (Karmex <sup>®</sup> , Krovar <sup>®</sup> , Diuron 900 WG), fluometuron (Cotoran <sup>®</sup> , Cotogard <sup>®</sup> , Bandit <sup>®</sup> ), linuron (Afalon <sup>®</sup> ), methabenzthiazuron (Tribunil <sup>®</sup> ), siduron (Tupersan <sup>®</sup> ), tebuthiuron (Graslan <sup>®</sup> )
Amides:	propanil (Stam <sup>®</sup> )
Nitriles:	bromoxynil (Buctril <sup>®</sup> , Buctril <sup>®</sup> MA <sup>®</sup> , Barrel <sup>®</sup> , Talinor <sup>®</sup> , Jaguar <sup>®</sup> , Velocity <sup>®</sup> , Flight <sup>®</sup> , Triathlon <sup>®</sup> , Eliminar <sup>®</sup> C <sup>®</sup> ), ioxynil (Totril <sup>®</sup> , Actril <sup>®</sup> DS <sup>®</sup> )
Benzothiadiazinones:	bentazone (Basagran <sup>®</sup> , Basagran <sup>®</sup> M60 <sup>®</sup> , Lawnweeder Plus <sup>®</sup> )
<b>GROUP D Inhibitors of microtubule assembly</b>	
Dinitroanilines (DNAs):	oryzalin (Surflan <sup>®</sup> , Rout <sup>®</sup> ), pendimethalin (Pendimethalin 440 EC), prodiamine (Barricade <sup>®</sup> ), trifluralin (Treflan <sup>®</sup> , Jetti Duo <sup>®</sup> )
Benzoic acids:	chlorthal (Dacthal <sup>®</sup> , Prothal <sup>®</sup> )
Benzamides:	propyzamide (Kerb <sup>®</sup> )
Pyridines:	dithiopyr (Dimension <sup>®</sup> )
<b>GROUP E Inhibitors of mitosis / microtubule polymerisation</b>	
Carbamates:	carbetamide (Carbetamex <sup>®</sup> ), chlorpropham (Chlorpropham <sup>®</sup> )
<b>GROUP F Bleachers: Inhibitors of carotenoid biosynthesis at the phytoene desaturase step (PDS inhibitors)</b>	
Pyridinecarboxamide	diflufenican (Brodal <sup>®</sup> , Jaguar <sup>®</sup> , Tigrex <sup>®</sup> , Spearhead <sup>®</sup> , Triathlon <sup>®</sup> , Yates Pathweeder <sup>®</sup> ), picolinafen (Paragon <sup>®</sup> , Flight <sup>®</sup> , Eliminar <sup>®</sup> C <sup>®</sup> )
Pyridazinones:	norflurazon (Solicam <sup>®</sup> )
<b>GROUP G Inhibitors of protoporphyrinogen oxidase (PPOs)</b>	
Diphenylethers:	acifluorfen (Blazer <sup>®</sup> ), oxyfluorfen (Striker <sup>®</sup> , Rout <sup>®</sup> , Yates Pathweeder <sup>®</sup> )
N-phenylphthalimides:	flumioxazin (Terrain <sup>™</sup> )
Oxadiazoles:	oxadiargyl (Raft <sup>®</sup> ), oxadiazon (Ronstar <sup>®</sup> )
Triazolinones:	carfentrazone (Affinity <sup>®</sup> , Broadway <sup>®</sup> , Aptitude <sup>®</sup> , Silverado <sup>®</sup> )
Pyrimidindiones:	butafenacil (Logran <sup>®</sup> B-Power <sup>®</sup> , Resolva <sup>®</sup> ), saflufenacil (Sharpen <sup>®</sup> WG)
Phenylpyrazole:	pyraflufen (Pyresta <sup>®</sup> Xtreme <sup>®</sup> , Condor <sup>®</sup> )
<b>GROUP H Bleachers: Inhibitors of 4-hydroxyphenyl-pyruvate dioxygenase (HPPDs)</b>	
Pyrazoles:	benzofenap (Taipan <sup>®</sup> ), pyrasulfotole (Precept <sup>®</sup> , Velocity <sup>®</sup> ), bicyclopyron (Talinor <sup>®</sup> , Frequency <sup>®</sup> )
Isoxazoles:	isoxaflutole (Balance <sup>®</sup> 750 WG, Palmero <sup>®</sup> )
Triketone:	bicyclopyrone (Talinor <sup>®</sup> )
<b>GROUP I Disruptors of plant cell growth (synthetic auxins)</b>	
Phenoxyacetic acids (Phenoxy):	2,4-D (Amicide <sup>®</sup> , Actril DS <sup>®</sup> , Pyresta <sup>®</sup> , FallowBoss <sup>®</sup> Tordon <sup>®</sup> ), 2,4-DB (Trifolamine <sup>®</sup> ), dichlorprop (Lantana 600 <sup>®</sup> ), MCPA (MCPA, LVE MCPA 570, Buctril <sup>®</sup> MA <sup>®</sup> , Banvel M <sup>®</sup> , Kamba <sup>®</sup> M, Paragon <sup>®</sup> , Tigrex <sup>®</sup> , Barrel <sup>®</sup> , Tordon <sup>®</sup> 242, Basagran <sup>®</sup> M60 <sup>®</sup> , Spearhead <sup>®</sup> , Agtryne <sup>®</sup> MA <sup>®</sup> , Precept <sup>®</sup> , Flight <sup>®</sup> , Triathlon <sup>®</sup> , Multiweed <sup>®</sup> ), Condor <sup>®</sup> , MCPB (Legumine <sup>®</sup> ), mecoprop (Methar Tri-Kombi <sup>®</sup> , Multiweed <sup>®</sup> , Mecopropamine <sup>®</sup> , Mecoban <sup>®</sup> )
Benzoic acids:	dicamba (Barrel <sup>®</sup> , Methar Tri-Kombi <sup>®</sup> , Banvel <sup>®</sup> , Banvel M <sup>®</sup> , Casper <sup>®</sup> , Mecoban <sup>®</sup> )
Pyridine carboxylic acids (Pyridines):	aminopyralid (Hotshot <sup>®</sup> , Grazon Extra <sup>®</sup> , FallowBoss <sup>®</sup> Tordon <sup>®</sup> , ForageMax <sup>®</sup> , Stinger <sup>®</sup> ), clopyralid (Lontrel <sup>®</sup> , Spearhead <sup>®</sup> ), fluroxypyr (Starane <sup>®</sup> , Hotshot <sup>®</sup> , Pixxaro <sup>®</sup> ), halauxifen (Paradigm <sup>®</sup> ), picloram (FallowBoss <sup>®</sup> Tordon <sup>®</sup> , Tordon 242 <sup>®</sup> , Grazon <sup>®</sup> Extra <sup>®</sup> , Trinoc <sup>®</sup> ), triclopyr (Garlon <sup>®</sup> 600, Grazon <sup>®</sup> Extra <sup>®</sup> , Ultimate Brushweed <sup>®</sup> Herbicide, Tough Roundup <sup>®</sup> Weedkiller)
Quinoline carboxylic acids:	quinclorac (Drive <sup>®</sup> )
Arylpicolinate:	halauxifen (ForageMax <sup>®</sup> , Paradigm <sup>®</sup> , Pixxaro <sup>®</sup> , Rexade <sup>®</sup> ), florprouxifen (Ubeniq <sup>®</sup> with Rinskor <sup>®</sup> active)
<b>GROUP J Inhibitors of fat synthesis (Not ACCase inhibitors)</b>	
Chloroacetic acids:	2,2-DPA (Dalapon <sup>®</sup> ), flupropanate (Frenock <sup>®</sup> )
Thiocarbamates:	EPTC (Eptam <sup>®</sup> ), molinate (Ordram <sup>®</sup> ), pebulate (Tillam <sup>®</sup> ), prosulfocarb (Boxer <sup>®</sup> Gold <sup>®</sup> , Arcade), thiobencarb (Saturn <sup>®</sup> ), triallate (Avadex <sup>®</sup> , Jerri Duo <sup>®</sup> ), vernolate (Vernam <sup>®</sup> )
Phosphorodithioates:	bensulide (Prefar <sup>®</sup> )
Benzofurans:	ethofumesate (Tramat <sup>®</sup> )
<b>GROUP K Inhibitors of cell division / Inhibitors of very long chain fatty acids (VLCFA inhibitors)</b>	
Acetamides:	napropamide (Devrinol <sup>®</sup> )
Chloroacetamides:	dimethenamid (Frontier <sup>®</sup> -P, Outlook <sup>®</sup> ), metolachlor (Boxer <sup>®</sup> Gold <sup>®</sup> , Dual <sup>®</sup> Gold, Primextra <sup>®</sup> Gold <sup>®</sup> ), propachlor (Ramrod <sup>®</sup> , Prothal <sup>®</sup> ), metazachlor (Butisan <sup>®</sup> )
Isoxazolines:	pyroxasulfone (Sakura <sup>®</sup> )
<b>GROUP L Inhibitors of photosynthesis at photosystem I (PSI inhibitors)</b>	
Bipyridyls:	diquat (Reglone <sup>®</sup> , Spray Seed <sup>®</sup> ), paraquat (Gramoxone <sup>®</sup> 360 Pro, Spray Seed <sup>®</sup> , Alliance <sup>®</sup> )
<b>GROUP M Inhibitors of EPSP synthase</b>	
Glycines:	glyphosate (Roundup <sup>®</sup> , Trounce <sup>®</sup> , Illico <sup>®</sup> , Arsenal Super <sup>®</sup> , Broadway <sup>®</sup> , Resolva <sup>®</sup> , Tough Roundup <sup>®</sup> Weedkiller)

Chemical family	Active constituent (first registered trade name)
<b>GROUP N Inhibitors of glutamine synthetase</b>	
Phosphinic acids:	glufosinate (Liberty <sup>®</sup> )
<b>GROUP O Inhibitors of cell wall (cellulose) synthesis</b>	
Nitriles:	dichlobenil (Casoron <sup>®</sup> )
Benzamides:	isoxaben (Gallery <sup>®</sup> , X-Pand <sup>®</sup> )
Alkylazines:	indaziflam (Spectacle <sup>®</sup> )
<b>GROUP P Inhibitors of auxin transport</b>	
Phthalamates:	naptalam (Alanap-L <sup>®</sup> )
<b>GROUP Q Bleachers: Inhibitors of carotenoid biosynthesis unknown target</b>	
Triazoles:	amitrole (Amitrole <sup>®</sup> , Illico <sup>®</sup> , Alliance <sup>®</sup> )
Isoxazolidinones:	clomazone (Command <sup>®</sup> )
<b>GROUP R Inhibitors of dihydropteroate synthase (DHP inhibitors)</b>	
Carbamates:	asulam (Asulox <sup>®</sup> )
<b>GROUP Z Herbicides with unknown and probably diverse sites of action</b>	
Arylaminoacetic acids:	flamprop (Oat Master)
Dicarboxylic acids:	endothal (Endothal <sup>®</sup> )
Organoarsenicals:	DSMA (disodium methylarsonate) (Methar <sup>®</sup> , Trinoc <sup>®</sup> ), MSMA (Daconate <sup>®</sup> )
Cineoles:	cinmethylin (Luximax <sup>®</sup> )

\* This product contains more than one active constituent

This strategy is a guide only and does not endorse particular products, groups of products or cultural methods in terms of their performance. Always follow the product label for specific use instructions. While all effort has been taken with the information supplied in this document no responsibility, actual or implied, is taken for the day to day accuracy of product or active constituent specific information. Readers should check with the Australian regulator's (APVMA) product database for contemporary information on products and actives. The data base can be sourced through [www.apvma.gov.au](http://www.apvma.gov.au). The information given in this strategy is provided in good faith and without any liability for loss or damage suffered as a result of its application and use.

Advice given in this strategy is valid as at 14 February 2019. All previous versions of this strategy are now invalid. Phone: 02 6273 2733  
Email: [info@croplifeaustralia.org.au](mailto:info@croplifeaustralia.org.au) Website: [www.croplife.org.au](http://www.croplife.org.au)

## Surveys for herbicide resistant grass weeds in southern Australia

### Key points

- Herbicide resistance is common in annual ryegrass in most cropping regions of southern Australia
- Trifluralin and Clethodim resistance are increasing
- Resistance to herbicides is also present in wild oats and brome grass
- Glyphosate resistance occurs where there is intensive use of glyphosate and few or no other weed control tactics
- Some alternatives to glyphosate will control glyphosate-resistant annual ryegrass on fence lines.

Random surveys of weed populations across southern Australia have identified considerable levels of herbicide resistance in annual ryegrass. There are variations across regions, with trifluralin beginning to emerge as an issue (Table 22). These regional variations reflect differences in cropping practices and hence herbicide use patterns. Of particular concern is the increase in clethodim (Select<sup>®</sup>) resistance and was reported in 35% of samples (Table 23). More emphasis should be aimed at crop competition and HR annual ryegrass weed seed capture/destruction at harvest to maintain or extend the life of clethodim and other effective post-emergence herbicides.

The incidence of multiple resistance within annual ryegrass is concerning. Approximately 85% of samples tested had resistance to at least two herbicide modes of action. In 21% of cases resistance to four herbicide groups has developed in 2018 (Table 24).

Wild oats management previously relied on post-emergence herbicides. Consequently there is a high frequency of resistance to 'fops', 'dims', and 'den' chemistry (Table 25). More pre-emergence herbicides are being used in NSW cropping systems to combat these issues with wild oats. Effective crop competition in combination with effective pre- and post-emergence herbicide should prolong the effective life of these herbicides.

Herbicide resistance in winter broad-leaf species is steadily increasing. In 2013, a population of wild radish was confirmed resistant to 2,4-D amine (Group I) in central NSW. There are other populations of this weed resistant to Group B in southern NSW. Fleabane is glyphosate resistant and is located over all of NSW due to its wind-borne seed (see Table 27 below). As at 2016, there are populations of paraquat-resistant fleabane in southern NSW. Another weed spread by wind, sowthistle, has been reported as glyphosate resistant in 2014 and is currently confined to northern NSW. However, Group B resistance is present in this species. Two brassica species, Indian hedge mustard and charlock are reported to have Group B resistance in NSW.

### Glyphosate resistance in annual ryegrass

There are now 858 confirmed sites with glyphosate resistant annual ryegrass in Australia. These come from four states and a variety of situations (Table 5). Glyphosate resistant annual ryegrass occurs when populations are treated intensively with glyphosate, where no other herbicides are applied and where there is little or no tillage. Relying solely on glyphosate for weed control is the greatest risk factor for glyphosate resistant weeds.

Table 22. Percentage of samples resistant or developing resistance to each herbicide group.

	2014	2015	2016	2017	2018
A (fops)	84	97	87	75	92
A (dms)	14	24	15	20	40
A (dens)	69	84	55	75	94
B	70	84	92	85	84
C	0.4	0	4	0	0
D	2	5	6	9	24

Source: John Broster, CSU Herbicide Resistance Testing Service. Access the [2018 report](https://cdn.csu.edu.au/___data/assets/pdf_file/0011/3122210/2018-report.pdf) (https://cdn.csu.edu.au/\_\_\_data/assets/pdf\_file/0011/3122210/2018-report.pdf)

Table 23. Results for ryegrass samples showing percentage resistant (Res) or developing resistance (DR) to individual Group A herbicides.

	Tested	Res	DR	%	Susc
<b>'fops'</b>					
Hoegrass	21	19	0	90	2
Verdict	9	8	0	89	1
Topik	9	8	1	100	0
Elantra Xtreme	2	2	0	100	0
<b>'dms'</b>					
Select	112	26	13	35	73
Achieve WG	13	13	0	100	0
Factor	6	0	0	0	6
<b>'fop' &amp; 'dim'</b>					
Decision	7	6	1	100	0
<b>'den'</b>					
Axial	32	28	2	94	2

Source: John Broster, CSU Herbicide Resistance Testing Service. Access the [2018 report](https://cdn.csu.edu.au/___data/assets/pdf_file/0011/3122210/2018-report.pdf) (https://cdn.csu.edu.au/\_\_\_data/assets/pdf\_file/0011/3122210/2018-report.pdf)

Table 24. Results of annual ryegrass samples cross resistance screening showing percentage of samples resistant or developing resistance to different groups.

No. of Groups	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)
5	0	0	0	0	0	0
4	0.5	0	0	0	0	21.0
3	10.8	11.1	37.7	15.9	25.6	47.4
2	68.6	50.0	52.8	54.5	46.2	15.8
1	16.8	28.6	7.5	25.0	25.6	15.8
0	3.2	10.3	1.9	4.5	2.6	0
Samples	185	143	53	44	39	19

Source: John Broster, CSU Herbicide Resistance Testing Service. Table 5 in the [2018 report](https://cdn.csu.edu.au/___data/assets/pdf_file/0011/3122210/2018-report.pdf) (https://cdn.csu.edu.au/\_\_\_data/assets/pdf\_file/0011/3122210/2018-report.pdf)

Table 25. Percentage of wild oat samples found to be resistant since 2011 (number tested in brackets)

	2014 % (no.)	2015 % (no.)	2016 % (no.)	2017 % (no.)	2018 % (no.)
'fops'	78 (53)	69 (55)	78 (37)	75 (28)	76 (29)
'dms'	10 (61)	2 (56)	6 (35)	9 (33)	6 (34)
'dens'	47 (30)	27 (29)	16 (25)	17 (23)	36 (25)
B	20 (54)	8 (51)	21 (33)	11 (27)	9 (36)
Z	11 (9)	47 (15)	43 (7)	17 (6)	6 (18)

Source: John Broster, CSU Herbicide Resistance Testing Service. Access the [2018 report](https://cdn.csu.edu.au/___data/assets/pdf_file/0011/3122210/2018-report.pdf) (https://cdn.csu.edu.au/\_\_\_data/assets/pdf\_file/0011/3122210/2018-report.pdf)

Table 26. Situations containing glyphosate resistant annual ryegrass

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	39	NSW
	Winter grains	550	NSW, Vic, SA, WA
	Summer grains	1	NSW
	Irrigated crops	1	SA
Horticulture	Tree crops	14	NSW, SA
	Vine crops	26	SA, WA
	Vegetables	2	Vic
Other	Driveway	6	NSW, Vic, SA, WA
	Fence line/crop margin	92	NSW, Vic, SA, WA
	Around buildings	2	NSW
	Irrigation channel/drain	14	NSW, Vic, S
	Airstrip	1	SA
	Railway	2	NSW, WA
	Roadside	100	NSW, SA, WA

Source: Preston C. *The Australian Glyphosate Sustainability Working Group* (http://www.glyphosateresistance.org.au/).

Table 27. Glyphosate resistant fleabane across Australia

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	16	NSW, Qld
	Vineyard	1	SA
Other	Around buildings	1	NSW
	Irrigation channel/drain	10	NSW
	Railway	3	NSW
	Roadside	33	SA, NSW, QLD, Vic

Source: Preston C. *The Australian Glyphosate Sustainability Working Group* (http://www.glyphosateresistance.org.au/).

# Notes



Table 28. Herbicides for weed control for oats – Early post-emergence – Part 1 (page 1 of 2)

	Metosulam 100 g/L	Chlorsulfuron 750 g/kg	Bromoxynil 200 g/L	Bromoxynil 280 g/L + MCPA 280 g/L	Bromoxynil 140 g/L+ MCPA 280 g/L+ dicamba + 40 g/L	Pyraflufen-ethyl 20 g/L	Pyrasulfotole 25 g/L + MCPA 125 g/L
Rate per hectare	Eclipse® 100 SC 19	Chlorsulfuron 750 WG 21	Bromicide®200 22	Bronco®MA-X 23	Broadside®	Ecopar® 24	Precept® 25
Apply at crop growth stage	2 leaf–1st node	2 leaf–early tillering	3 leaf–fully tillered	3 leaf– fully tillered	3 leaf– fully tillered	2 leaf–late tillering	3 leaf–1st node
Zadoks code	12–31	12–23	13–30	13–30	13–30	12–29	13–31
Weeds controlled	(millilitres)	(grams)	(litres)	(litres)	(litres)	(millilitres)	(litres)
amsinckia	50	15	1.4–2.0	1.0–1.43	0.75–1.4	–	1.5–2.0
annual ryegrass	–	20 or 25 1	–	–	–	–	–
bedstraw	50 (S) 16	–	1.4–2.0 16	–	–	400–800 14	1.5–2.0
black bindweed	–	20 21	1.4–2.0	–	1.0–1.4	–	–
canola – volunteer	50 6 16	–	–	–	1.4	400–800 14	1.0–2.0 18
capeweed	35–50 16	–	1.4–2.0	1.0–1.43	0.75–1.4	400–800 14	1.0 11
charlock	–	15	–	1.0–1.43	–	–	–
cleavers	–	–	–	–	–	–	–
clover	50 (S) 10	–	–	–	–	–	1.0 11 15
corn gromwell	–	20	1.4–2.0	1.4–2.0	1.0–1.4	–	1.0–2.0
deadnettle	–	15 or 20	–	–	–	–	1.5–2.0
dock – seedlings	–	–	–	–	0.75–1.4	–	–
faba bean – volunteer	35–50 16	–	–	–	–	–	1.0 11
field pea – volunteer	50 (S)	–	–	–	–	–	1.0–2.0 11
fumitory	–	20	2.0	1.0–1.43	1.0–1.4	–	1.0–2.0
lupin – volunteer	35–50 16	–	–	–	–	400–800 14	1.0–2.0
Mexican poppy	–	–	2.0	1.0–1.43	–	–	–
mintweed	–	20	–	1.0–1.43	–	–	–
mustards	50	15	2.0	1.0–1.43	0.75–1.4	400–800 14	1.0 12
New Zealand spinach	–	–	–	–	–	–	–
Paterson's curse	–	15	2.0	1.0–1.43	–	–	1.0–2.0
radish – wild	50	15 or 20	2.0	1.0–1.43	0.75–1.4	300– 800 14	1.0–2.0
rough poppy	–	20	–	1.0–1.43	–	–	–
saffron thistle	35–50 16	–	1.4–2.0	1.0–1.43	–	–	–
shepherd's purse	–	20	1.4–2.0	1.0–1.43	–	–	–
skeleton weed	–	–	–	–	–	–	–
slender thistle	35–50 16	–	–	1.0–1.43	–	–	–
sorrel	–	–	–	–	–	–	–
soursob	–	20	–	–	–	–	–
sowthistle	35–50 16	–	–	1.0–1.5 8	–	–	1.0–2.0
spear/black thistle	–	–	–	–	–	–	–
spiny emex	–	–	2.0	–	0.75–1.4	–	1.5–2.0 (S)
toad rush	–	–	–	1.0–1.43	–	–	–
turnip weed	50 16	15	2.0	1.0–1.43	–	–	1.0–2.0
variegated thistle	35–50 16	–	1.4–2.0	1.0–1.43	–	–	–
vetch	35–50 16	–	–	–	–	–	1.0 11
wild lettuce	35–50 16	–	–	–	–	400–800 14	1.0–2.0
wild oats	–	–	–	–	–	–	–
wild turnip	50	15	2.0	1.0–1.43	–	400–800 14	1.0–2.0
wireweed	–	20	2.0	1.0–1.43 3	0.75–1.4	–	1.0–2.0
Rec water L/ha boom	50–100	30 min	50–200	50–200	50 min	50 min	50–100
Herbicide group	B	B	C	C + I	C + I	G	H + I

- 1 No more than 3 leaves of annual ryegrass. Use more than 50 L/ha water.
- 2 Tankmix Kamba® 750 with Agritone® 750.
- 3 500 mL (southern NSW), 750 mL (northern NSW).
- 4 Northern NSW only.
- 5 Tankmix with MCPA.
- 6 Not Clearfield canola volunteers.
- 7 Tankmix 350–500 mL/ha Tigrex® plus LVE MCPA for control.
- 8 Northern NSW only.
- 9 Southern NSW only.
- 10 Sub-clover only.
- 11 Add Lontrel® Advanced for control. See label for rates.
- 12 Indian hedge mustard only.
- 13 Wireweed ; on red soils of low fertility use the higher rate.
- 14 Add MCPA amine or 330 mL/ha Agroxone® 750 for control.
- 15 Sub-clover only.
- 16 Add partner herbicide for control. See label.
- 17 Fluroxypyr also available in 200 g/L and 400 g/L. See label for rates.
- 18 See label for controlling RR Canola volunteers.
- 19 Apply with 0.5 L Uptake® spraying oil/100 L water. Can be tankmixed with LVE MCPA for improved control. See label.
- 20 Can be used on undersown sub-clover and some other clovers. See label. Not on lucerne or annual medics. Application should be made from the third to the eighth trifoliate leaf stage.
- 21 Moist soils or rain within 7 days enhances results. Add wetter

Table 28. Herbicides for weed control for oats – Early post-emergence – Part 1 (continued, page 2 of 2)

	MCPA 375 g/L + pyraflufen-ethyl 10 g/L	Dicamba 750 g/L	MCPA 340 g/L + dicamba 80 g/L	Fluroxypyr 333 g/L	Aminopyralid 10 g/L + fluroxypyr 140 g/L	MCPA 250 g/L + diflufenican 25 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L
Rate per hectare	Condor® Wheat and oats only	Kamba® 750 26	Kamba® M	Starane® Advanced 17 27	Hotshot®	Tigrex® 20	Pixxaro® 28
Apply at crop growth stage	2 leaf– end of tillering	5 leaf–early tillering	Early tillering– fully tillered	3 leaf–flag leaf	3 leaf–1st node	3 to 5 leaf–late tillering	3 leaf– flag leaf
Zadoks code	12–29	15–22	21–30	13–39	13–31	13–30	13–39
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–
bedstraw	0.8–1.6	–	–	0.3	–	–	–
black bindweed	–	0.185	1.7	0.3–0.45 14	0.5–0.75 4	–	0.4–0.6
canola – volunteer	0.8–1.6	–	–	–	–	0.5 18	–
capeweed	0.8–1.6	0.105 2	1.0–1.7	–	–	0.5–1.0	–
charlock	–	0.105 2	1.0–1.7	–	–	0.5–1.0	–
cleavers	–	–	–	0.6	–	–	–
clover	–	0.185	1.7	–	–	–	0.3
corn gromwell	–	–	–	–	–	1.0	–
deadnettle	–	–	–	0.9 14	0.5–0.75 4 5	1.0	0.2–0.3
dock – seedlings	–	0.185	1.0–1.7	–	–	1.0 (S)	–
faba bean – volunteer	–	–	–	–	0.5–0.75 3	–	–
field pea – volunteer	–	–	–	–	0.5–0.75 3	–	–
fumitory	–	–	–	–	–	0.75	0.3
lupin – volunteer	0.8–1.6	–	–	0.9	0.5 9	1.0 (S)	–
Mexican poppy	–	–	–	–	–	–	0.2–0.3
mintweed	–	0.185 29	1.7	–	–	–	–
mustards	0.8–1.6	0.105 2	1.0–1.7	0.3–0.9 14	–	0.5–1.0	–
New Zealand spinach	–	0.185	1.7	–	–	–	–
Paterson's curse	–	–	–	–	–	1.0 (S)	–
radish – wild	0.8–1.6	0.105 2 29	1.0–1.7	0.3–0.9 14	–	0.5–1.0 7	–
rough poppy	–	–	–	–	–	1.0 (S)	–
saffron thistle	–	–	1.7	–	–	1.0	–
shepherd's purse	–	–	–	0.3–0.9 14	–	0.5–1.0	–
skeleton weed	–	–	–	–	–	1.0 (S)	–
slender thistle	–	–	–	–	–	–	–
sorrel	–	0.185 29	1.0	–	–	–	–
soursob	–	–	–	–	–	–	–
sowthistle	–	–	–	0.6	0.5–0.75 4 14	1.0 (S)	0.4
spear/black thistle	–	–	–	–	–	–	–
spiny emex	–	0.105 2	1.0–1.7	0.3–0.9 14	0.5–0.75 4 14	1.0 (S)	–
toad rush	–	–	–	–	–	1.0	–
turnip weed	–	0.105 2	1.0–1.7	0.3–0.9 14	–	0.5–1.0	–
variegated thistle	–	0.185	1.7	–	0.5–0.75 4 14	1.0 (S)	–
vetch	–	0.105 2	1.0–1.7	–	0.5–0.75 3	1.0 (S)	–
wild lettuce	0.8–1.6	–	–	0.3–0.6	0.5–0.75 4	0.5–1.0	–
wild oats	–	–	–	–	–	–	–
wild turnip	0.8–1.6	0.105 2	1.0–1.7	0.3–0.9 14	–	0.5–1.0	–
wireweed	–	0.105 2	1.0–1.7	0.9 14	–	0.75 (S)	–
Rec water L/ha boom	70–150	50 min	50 min	50 min	80 min	50 min	80 min
Herbicide group	G + I	I	I	I	I	I + F	I

- 22 Not on undersown medics. Avoid spraying when temperatures are above 20 °C. Aerial application can be unsatisfactory.
- 23 1.0 L/ha can be used from 3 leaf stage, 1.43 L/ha from 5 leaf to fully tillered stage 1.0 L/ha for weeds up to 6 leaf stage but not more than 50 mm diameter.
- 24 Add Uptake® spraying oil (500 L/100 L water).
- 25 Spray grade liquid ammonium sulfate, Hasten™ (1% v/v), Supercharge® (0.75% v/v) or Uptake® (0.5% v/v) must be used with Precept®. Do not use non-ionic surfactants. Note recropping intervals on label. For best results apply in warmer temperatures and high light intensity and > 1 hour of daylight left after application.
- 26 Damage can occur if crop not actively growing or at right stage. Small weeds.
- 27 Can be tankmixed with Eclipse®, MCPA LVE or Agritone® 750 to broaden weed spectrum. Do not use metsulfuron-methyl mixes in oats.
- 28 Add Uptake® spraying oil (500 mL/100 L water).
- 29 Tank mix Kamba® 750 with Agritone® 750 OR 0.5 L/ha Amicide® Advance 700.
- (S) Suppression only.

     Herbicides that can be used with undersown legume pastures.

Table 29. Herbicides for weed control for oats – Early post-emergence – Part 2 (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike® <sup>17</sup>	Diuron 900 g/kg Diuron 900 WG <sup>16</sup>	Terbutryn flowable 500 g Igran® 500 Flowable <sup>5 18</sup>	Terbutryn 275 g + MCPA 160 g Agtryne® MA <sup>19</sup>	Picolinafen 50 g + MCPA 500 g Paragon® <sup>20</sup>	Picolinafen 35 g + MCPA 350 g/L + bromoxynil 210 g Flight® EC <sup>21</sup>
Apply at crop growth stage	Mid tillering–start of jointing	2–4 leaf to early tillering	3 leaf–early tillering	3–5 leaf	3–5 leaf	3 leaf–late tillering
Zadoks code	23–31	12–22	13–21	13–15	13–15	13–28
Weeds controlled	(grams)	(kilograms)	(litres)	(litres)	(litres)	(litres)
amsinckia	25	0.9	0.55–0.85	1.0	–	–
annual ryegrass	–	–	–	–	–	–
black bindweed	–	–	11	–	–	–
canola – volunteer	25 6	–	–	–	0.25 10	0.36
capeweed	25 12	0.5	0.55–0.85	1.0	0.25–0.5	0.36–0.72
charlock	25	0.5	0.55–0.85 2	1.0	0.25–0.5	0.36–0.72
chickpea volunteer	–	–	–	–	–	–
clover	–	–	–	–	–	–
corn gromwell	–	–	0.55–0.85	1.0	0.5	0.72
deadnettle	25 (S) 12	–	0.55–0.85	1.5	0.5 (S)	0.72 (S)
dock	–	–	–	–	–	–
field pea – volunteer	–	–	11	–	–	–
fleabane	–	–	–	–	–	–
fumitory	12	–	0.55–0.85	1.0	0.5 (S)	0.54–0.72 (S)
lupin – volunteer	25	–	–	–	0.5 (S)	0.72 (S) 14
marshmallow	25 (S) 13	–	–	–	–	–
medic	–	–	–	–	–	–
Mexican poppy	–	–	11	–	–	–
mintweed	–	–	–	–	–	–
mustards	25	0.5	0.55–0.85 2 11	1.0	0.25–0.5	0.36–0.72
New Zealand spinach	25 (S)	–	–	–	–	–
Paterson’s curse	25 (S) 12	–	0.55–0.85	1.0	–	–
prickly/wild lettuce	–	–	–	–	0.25–0.5	0.36–0.72
radish – wild	25 (S) 12	–	11	–	0.25–0.5	0.36–0.72
rough poppy	–	0.5	–	1.0	–	–
saffron thistle	–	0.5	–	–	0.5	0.72
shepherd’s purse	25	–	11	–	0.25–0.5	0.36–0.72
skeleton weed	–	–	–	–	–	–
slender thistle	–	–	–	–	–	–
sorrel	–	–	–	–	–	–
soursob	–	–	–	–	–	–
sowthistle	–	–	–	–	0.5 (S)	0.72 (S)
spear thistle	–	–	–	–	–	–
spiny emex	25 (S) 12	0.5	0.55–0.85 2	1.5	0.5 (S)	0.72 (S)
toad rush	–	–	0.55–0.85	1.5	0.5	0.72
turnip weed	15–25	–	0.55–0.85 2 11	1.0	0.25–0.5	0.36–0.72
variegated thistle	–	–	–	–	–	–
vetch	–	–	–	–	–	–
wild oats	–	–	–	–	–	–
wild turnip	25	0.5	0.55–0.85 2 11	1.0	0.25–0.5	0.36–0.72
wireweed	–	–	–	1.5	–	–
Rec water L/ha boom	50–150	50–100	50–100	50–100	50 min	50–150
Herbicide group	B	C	C	C + I	F + I	C + I + F

- 2 Tank mix with MCPA or 0.3 L 2,4-D amine 500 g/L for control.
- 5 Do not apply to Avon, Saia, Cassia or Barmah varieties of oats. Consult agronomist before using on other varieties.
- 6 Not Clearfield canola volunteers.
- 10 See label for controlling RR canola volunteers.
- 11 Tankmix of Igran® 500 Flowable and Ken-Gran 750 WG can be used for control. See label.
- 12 See label for tankmix of Broadstrike® and other herbicides for control. See label.
- 13 Tankmix with MCPA for control.
- 14 Angustifolius (narrow leaf) lupins only.
- 16 See label for tank mix options

- 17 Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliolate leaf stage. Use only wetting agent such as BS1000® with oats.
- 18 Avoid spraying when temperatures exceed 18 °C. Do not use on undersown medics, lucerne or white clover. See variety safety caution on label.
- 19 See oat variety sensitivities on label and Table 28.
- 20 Do not use 0.5 L/ha rate on crops younger than 5 leaf. Do not apply rates higher than 0.25 L/ha to crops in the 3 leaf stage.
- 21 Slight transient yellowing may occur in oats.
- (S) Suppression only.

Herbicides that can be used with undersown legume pastures.

Table 29. Herbicides for weed control for oats – Early post-emergence – Part 2 (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 <sup>22</sup>	MCPA 750 g/L Agritone® 750	MCPA 570 g/L LVE MCPA 570 <sup>23</sup>	Clopyralid 600 g/L Lontrel® Advanced <sup>8 24</sup>	2,4-DB 500 g/L <sup>25</sup> Buttress® <sup>7 9</sup>	200 g/kg halauxifen-methyl + 200 g/kg florasulam Paradigm® <sup>26</sup>
Apply at crop growth stage	Early tillering– fully tillered	5 leaf–early tillering	3–5 leaf	2 leaf–booting	5 leaf–before booting	1st node–full flat leaf emergence
Zadoks code	22–30	15–37	13–15	12–40	15–33	13–39
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
amsinckia	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–
black bindweed	1.0	–	–	–	–	–
canola – volunteer	–	–	–	–	–	–
capeweed	–	–	–	0.15 2	2.1–3.2	–
charlock	–	–	0.44	–	2.1–3.2	–
chickpea volunteer	–	–	–	–	–	25 (S)
clover	–	–	–	0.075–0.1 15	–	–
corn gromwell	–	–	–	–	–	25
deadnettle	–	–	–	–	–	–
dock	–	–	–	–	–	–
field pea – volunteer	–	–	–	0.075 4	–	–
fleabane	–	–	–	–	–	25
fumitory	–	–	–	–	2.1–3.2	25
lupin – volunteer	–	–	–	0.125 4	–	–
marshmallow	–	–	–	–	–	25
medic	–	–	–	–	–	25
Mexican poppy	–	–	–	–	–	25
mintweed	–	–	–	–	–	–
mustards	1.0	0.46–0.66	–	–	2.1–3.2	25
New Zealand spinach	1.0 (S)	–	–	–	–	–
Paterson’s curse	–	–	–	–	2.1–3.2	–
prickly/wild lettuce	–	–	–	0.075 4	2.1–3.2	–
radish – wild	1.0	0.46–0.66	–	–	–	25
rough poppy	–	–	–	–	–	–
saffron thistle	1.0	–	–	0.025	2.1–3.2	–
shepherd’s purse	–	–	–	–	2.1–3.2	25
skeleton weed	1.0	–	–	0.25 3	–	–
slender thistle	–	–	–	0.025	2.1–3.2	–
sorrel	–	–	–	–	–	–
soursob	–	–	–	–	–	–
sowthistle	1.0	–	–	–	2.1–3.2	25
spear thistle	–	–	–	0.025	2.1–3.2	–
spiny emex	1.0	–	–	–	2.1–3.2	25(S)
toad rush	–	–	–	–	–	25
turnip weed	1.0	0.46–0.66	–	–	2.1–3.2	25
variegated thistle	1.0	–	–	0.025	2.1–3.2	–
vetch	–	–	–	–	–	25
wild oats	–	–	–	–	–	–
wild turnip	1.0	0.46–0.66	0.44	–	2.1–3.2	25
wireweed	1.0 (S)	–	–	–	2.1–3.2	–
Rec water L/ha boom	50 min	30–120	30–120	50 min	110 min	80–100
Herbicide group	I	I	I	I	I	I + B

- 2 Tank mix with MCPA or 0.3 L 2,4-D amine 500 g/L for control.
- 3 Add MCPA for control. Refer to label.
- 4 See label for tankmix options.
- 7 Boomspray only. Good quality water essential.
- 8 Also available as Lontrel® 750 SG (750 g/kg).
- 9 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.
- 15 Sub-clover only.

- 22 Do not plant susceptible crops within 12 months of applying the product.
- 23 Max rate between 3–5 leaf stage 0.44 L/ha
- 24 Lontrel® should not be used in oats destined for export hay.
- 26 Add Uptake® spraying oil (500 mL/100 L water).
- 2& (S) Suppression only.

Herbicides that can be used with undersown legume pastures.

Herbicides for control and suppression

Table 30. Herbicides for weed control for oats – Late post-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike®	2,4-D amine 700 g/L Amicide® Advance 700	2,4-DB 500 g/L Buttress®	MCPA 750 g/L Agritone® 750	MCPA LVE 570 g/L LVE MCPA 570	Picloram 26 g/L + MCPA 420 g/L Trooper® 242	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L FallowBoss® Tordon®	Florasulam 200 g/kg + halauxifen 200 g/kg Paradigm®	Fluroxypur 250 g/L + halauxifen 16.25 g/L Pixxaro®
Apply at crop growth stage	Flowering-early dough	Fully tillered-booting	5 leaf-before booting	Fully tillered-booting	5 leaf-early flag	Early tillering-fully tillered	1st node-full flag leaf emergence	1st node-full flag leaf emergence	3 leaf to flag leaf
Zadoks code	61-83	30-37	15-33	30-37	15-38	22-30	31-39	31-39	13-39
Weeds controlled	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)
amsinckia	0.98	-	-	-	-	-	-	-	-
annual ryegrass	-	-	-	-	-	-	-	-	-
bedstraw	-	-	-	-	-	-	-	25 (1)	0.4
black bindweed	-	-	-	0.97-1.35	-	1.0 (2)	0.3	-	0.4-0.6
canola (volunteer)	-	-	-	-	-	-	-	25 (2)	-
capeweed	-	0.98-1.15	2.1-3.2	1.45	1.45	-	-	25 (5)	-
charlock	-	0.5-1.15	2.1-3.2	0.66	0.44-1.4	-	-	-	-
chickpea volunteer	-	-	-	-	-	-	-	25	-
clover	-	1.1	-	-	-	-	-	25 (1)	0.3
corn gromwell	-	-	-	-	-	-	-	-	-
deadnettle	-	-	-	1.45	-	-	-	25	0.2-0.3
field pea (volunteer)	-	-	-	-	-	-	-	25 (1)	-
fumitory	-	0.5-1.15	2.1-3.2	0.93	0.965	-	-	25	0.3
marshmallow	-	-	-	-	-	-	-	25 (5)	-
medic	-	-	-	-	-	-	-	25 (3)	-
Mexican poppy	-	-	2.1-3.2	-	-	-	-	25	0.2-0.3
mintweed	-	0.8-0.98	-	1.35	-	-	-	0.3 (1)	-
mustards	-	0.2-1.15	2.1-3.2	0.66	0.49-0.88	1.0	0.3 (1)	25 (1)	-
New Zealand spinach	-	0.98-1.15	-	-	-	1.0 (5)	0.3	-	-
Paterson's curse	25	0.98-1.15	2.1-3.2	0.66-0.96	1.4	-	-	-	-
prickly lettuce	-	-	-	-	-	-	-	25 (1)	0.4
radish - wild	25	0.715-1.15	-	0.46-0.66	0.965-1.4	1.0	0.3 (1)	25 (1)	-
rough poppy	-	0.98	-	0.46-0.96	-	-	-	-	-
safron thistle	-	0.5-1.15	2.1-3.2	0.66-1.35	0.965-1.4	1.0	0.3	-	-
scotch thistle	-	-	-	-	0.615-1.4	-	-	-	-
shepherd's purse	-	0.98-1.15	2.1-3.2	-	-	-	-	25 (1)	-
skeleton weed	-	0.98-1.15	-	0.96-1.35	0.965-1.4	1.0	-	-	-
slender thistle	-	0.715-1.15	2.1-3.2	0.66-1.35	1.4	-	-	-	-
sorrel	-	0.715	-	-	-	-	-	-	-
sowthistle	-	-	2.1-3.2	-	-	1.0	0.3	-	0.4
spear thistle	-	-	2.1-3.2	0.96-1.35	1.31-1.4	-	-	-	-
spiny emex	-	-	2.1-3.2	-	-	1.0	0.3	25 (5) (1)	-
Recom water L/ha boom	100 min	30-120	110 min	30-120	30-120	50 min	50 min	80-100	80 min
Herbicide group	B	I	I	I	I	I	I	B + I	I

Table 30. Herbicides for weed control for oats – Late post-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike®	2,4-D amine 700 g/L Amicide® Advance 700	2,4-DB 500 g/L Buttress®	MCPA 750 g/L Agritone® 750	MCPA LVE 570 g/L LVE MCPA 570	Picloram 26 g/L + MCPA 420 g/L Trooper® 242	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L FallowBoss® Tordon®	Florasulam 200 g/kg + halauxifen 200 g/kg Paradigm®	Fluroxypur 250 g/L + halauxifen 16.25 g/L Pixxaro®
Apply at crop growth stage	Flowering-early dough	Fully tillered-booting	5 leaf-before booting	Fully tillered-booting	5 leaf-early flag	Early tillering-fully tillered	1st node-full flag leaf emergence	1st node-full flag leaf emergence	3 leaf to flag leaf
Zadoks code	61-83	30-37	15-33	30-37	15-38	22-30	31-39	31-39	13-39
Weeds controlled	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)
toad rush	-	-	-	-	-	-	-	25 (5) (1)	-
turnip weed	25	0.5-0.98	2.1-3.2	0.66	0.615-0.965	1.0	0.3 (1)	25 (1)	-
variegated thistle	-	0.5-1.15	2.1-3.2	0.66-1.35	0.735-0.965	1.0	0.3 (1)	-	-
vetch	-	-	-	-	-	-	-	25	-
wild oats	-	-	-	-	-	-	-	-	-
wild turnip	-	0.2-1.15	2.1-3.2	0.66	0.44-1.31	1.0	-	25 (1)	-
wireweed	-	-	2.1-3.2	-	-	1.0 (5)	0.3 (5)	-	-
Recom water L/ha boom	100 min	30-120	110 min	30-120	30-120	50 min	50 min	80-100	80 min
Herbicide group	B	I	I	I	I	I	I	B + I	I

- 1 Tank mix with 375 mL/ha 2,4-D amine 625 for control.
- 2 Preferred option for northern NSW only.
- 3 See label for tankmix options with tRex® for improved control in wild radish.
- 4 Salvage spray to prevent seed set in wild radish and turnip weed. Spray least-mature weeds from early flowering to early pod set of most mature weeds, and crop from flowering to early dough stage. Add wetter only in oats. Can be used on undersown lucerne, clovers and annual medics.

- 5 Maximum rate on oats 1.15 L/ha, max rate is 1.15 L/ha
- 6 Boomspray only. Good quality water is essential.
- 7 Undersown sub-clovers may be slightly retarded. Do not apply to undersown medics or lucerne. See label for comments regarding weed size and application rate.
- 8 Undersown legumes tolerant to lower rates – see label. Not on medics or lucerne. Top rate for oats is 1.4 L/ha.
- 9 Do not plant susceptible crops within 12 months of applying the product.

- 10 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.
- 11 Add MCPA, see label for details.
- 12 Clearfield varieties, add MCPA see label for rates.
- 13 Add Uptake® spraying oil (500 mL/100 L water).
- 14 Suppression only.

Herbicides that can be used with undersown legume pastures.



Table 31. Herbicides for weed control for cereal rye and triticale – Early post-emergence – Part 1 (page 1 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See labels for details.	Fenoxaprop-p-ethyl 69 g/L + cloquintocet- mexyl 34.5 g/L Foxtrot®	Chlorsulfuron 750 g/kg Chlorsulfuron 750 WG 15	Metsulfuron-methyl 600 g/kg Associate® 15	Bromoxynil 200 g/L Bromicide® 200 17	Terbutryn 500 g/L Igran® 500 Flowable 18 Triticale only	Florasulam 200 g/kg + halauxifen 200 g/kg Paradigm® 11 Triticale only	Bromoxynil 250 g/L + diflufenican + 25 g/L Jaguar® 15
Apply at crop growth stage	2–5 leaf	2 leaf– early tillering	3 leaf– jointing	3 leaf–fully tillered	3 leaf– early tillering	3 leaf–flag leaf emergence	2 leaf–fully tillered
Zadoks code	12–15	12–23	13–35	13–30	13–21	13–49	12–29
Weed controlled	(litres)	(grams)	(grams)	(litres)	(litres)	(grams)	(litres)
amsinckia	–	15	5 or 7	1.4–2.0	0.55–0.85	–	0.75
annual ryegrass	–	20 or 25 1	–	–	–	–	–
annual phalaris	0.635–0.8	–	–	–	–	–	–
bedstraw	–	–	–	1.4–2.0	–	–	1.0 (S)
black bindweed	–	20	–	1.4–2.0	–	–	0.5–1.0
capeweed	–	–	–	1.4–2.0	0.55–0.85	25(S)	0.5–1.0
canola – volunteer	–	–	–	–	–	–	0.5–0.75 4
charlock	–	15	5	–	0.55–0.85 2	–	0.5–0.75
chickpea – volunteer	–	–	–	–	–	25 31 32	–
cleavers	–	–	–	–	–	–	–
climbing buckwheat	–	–	–	–	–	–	–
clover	–	–	5	–	–	25	–
corn gromwell	–	20	–	1.4–2.0	0.55–0.85	–	0.5–0.75
deadnettle	–	15 or 20	5	–	0.55–0.85	25	0.5–0.75
dock – seedling	–	–	–	–	–	–	1.0 (S)
faba bean – volunteer	–	–	–	–	–	–	–
field pea – volunteer	–	–	7	–	–	–	0.75 (S)
fleabane	–	–	–	–	–	–	–
fumitory	–	20	5	2.0	0.55–0.85	25	0.75–1.0 (S)
lentil – volunteer	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–
marshmallow	–	–	–	–	–	–	–
medic	–	–	5	–	–	25 31	–
Mexican poppy	–	–	–	2.0	–	25	–
mintweed	–	20	–	–	–	–	1.0 (S)
mustards	–	15	5	2.0	0.55–0.85 2	25	0.5–1.0
New Zealand spinach	–	–	–	–	–	–	–
Paterson’s curse	–	15	5 or 7	2.0	0.55–0.85	–	0.5–0.75
prickly lettuce	–	–	–	–	–	–	1.0 (S)
radish – wild	–	15 or 20	–	2.0	–	25	0.5–1.0 6
rough poppy	–	20	5	–	–	–	0.5–0.75
saffron thistle	–	–	–	1.4–2.0	–	–	1.0
shepherd’s purse	–	20	5	1.4–2.0	–	25	1.0
skeleton weed	–	–	7 (S)	–	–	–	1.0 (S)
slender thistle	–	–	–	–	–	–	–
sorrel	–	–	5	–	–	–	1.0 (S)
soursob	–	20	5	–	–	–	–
sowthistle	–	–	5	–	–	25	–
spiny emex	–	–	5 or 7	2.0	0.55–0.85 2	25(S)	0.5–0.75
toad rush	–	–	–	–	0.55–0.85	25	1.0 (S)
turnip weed	–	15	5	2.0	0.55–0.85 2	25	0.5–0.75
variegated thistle	–	–	–	1.4–2.0	–	–	1.0
vetch – volunteer	–	–	–	–	–	25 11	–
wild oats	0.475–0.635	–	–	–	–	–	–
wild turnip	–	15	5	2.0	0.55–0.85 2	25	0.5–0.75
wireweed	–	20	5 or 7	2.0	–	–	1.0
Rec water L/ha boom	50–100	30 min	50 min	50–200	50–100	80–100	50 min
Herbicide group	A	B	B	C	C	B + I	C + F

- 1 No more than 3 leaves of annual ryegrass. Use more than 50 L/ha water.
- 2 Tankmix with MCPA or 0.3 L/ha 2,4-D amine 500 g/L for control.
- 3 Add MCPA or 330 mL/ha Agroxone® 750 for control.
- 4 Add MCPA + 5 g/ha Esteem® WDG or 330 mL/ha Agroxone® 750 + 5 g/ha Esteem® WDG.
- 5 Tankmix 500 mL/ha Jaguar® with 200–400 mL/ha LVE MCPA (500 g/L) for control.
- 6 Northern NSW only.

- 7 Sub-clover only.
- 8 See label for controlling RR canola volunteers.
- 9 Add MCPA (See label for rates).
- 10 Moist soil or rain within 7 days improves results. Add wetter.
- 11 Add surfactant.
- 12 Not on undersown medics. Avoid spraying when temperatures above 20 °C. Aerial application can be unsatisfactory.

Table 31. Herbicides for weed control for cereal rye and triticale – Early post-emergence – Part 1 (continued, page 2 of 3)

Rate per hectare Various trade names some- times available under these concentrations. See labels for details.	Bromoxynil 280 g/L + MCPA 280 g/L Bronco®MA-X 20	Bromoxynil 140 g/L + MCPA 280 g/L + dicamba 40 g/L Broadside®	Picolinafen + MCPA 50 g/L + 500 g/L Paragon® 21	Picolinafen 35 g/L + MCPA 350 g/L + bromoxynil 210 g/L Flight® EC	Pyraflufen -ethyl 20 g/L Ecopar® Triticale only	Dicamba 750 g/L Kamba® 750	MCPA 340 g/L + dicamba 80 g/L Kamba® M 23
Apply at crop growth stage	5 leaf– fully tillered	3 leaf–fully tillered	3–5 leaf	3 leaf–late tillering	2 leaf–late tillering	5 leaf–early tillering	Early– fully tillered
Zadoks code	15–30	13–30	13–15	13–28	12–29	15–22	21–30
Weed controlled	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	1.0–1.43	0.75–1.0	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–	–
bedstraw	–	–	–	–	0.4–0.8 4	–	–
black bindweed	1.0–1.43	1.0–1.4	–	–	–	0.185	1.7
capeweed	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.4–0.8 4	0.105 3	1.0–1.7
canola – volunteer	–	1.4	0.25 9	0.36	0.4–0.8 4 9	–	–
charlock	1.0–1.43	–	0.25–0.5	0.36–0.72	–	0.105 3	1.0–1.7
chickpea – volunteer	–	–	–	–	–	–	–
cleavers	–	–	–	–	–	–	–
climbing buckwheat	–	–	–	–	–	–	–
clover	–	–	–	–	0.4 5 6	0.185	1.7
corn gromwell	1.0–1.43	1.0–1.4	0.5	0.72	–	–	–
deadnettle	–	–	0.5 (S)	0.72 (S)	0.4 5	–	–
dock – seedling	–	0.75–1.0	–	–	–	0.105 3	1.0–1.7
faba bean – volunteer	–	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–	–
fleabane	–	–	–	–	–	–	–
fumitory	1.0–1.43	1.0–1.4	0.5 (S)	0.54–0.72 (S)	0.4 5	–	–
lentil – volunteer	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–
marshmallow	–	–	–	–	–	–	–
medic	–	–	–	–	0.4 5	–	–
Mexican poppy	1.0–1.43	–	–	–	–	–	–
mintweed	1.0–1.43	–	–	–	–	0.185 3	1.7
mustards	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.4–0.8 4	0.105 3	1.0–1.7
New Zealand spinach	–	–	–	–	–	0.185	1.7
Paterson’s curse	1.0–1.43	–	–	–	0.4 5	–	–
prickly lettuce	–	–	0.25–0.5	0.36–0.72	0.4–0.8 4	–	–
radish – wild	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.3–0.48 4	0.105 3	1.0–1.7
rough poppy	1.0–1.43	–	–	–	–	–	–
saffron thistle	1.0–1.43	–	0.5	0.72	–	0.185 3	1.7
shepherd’s purse	1.0–1.43	–	0.25–0.5	0.36–0.72	–	–	–
skeleton weed	–	–	–	–	–	–	–
slender thistle	1.0–1.43	–	–	–	–	–	–
sorrel	–	–	–	–	0.4 5	0.185 3	1.0–1.7
soursob	–	–	–	–	0.4 5	–	–
sowthistle	1.0–1.43 7	–	0.5(S)	0.72 (S)	0.4 5	–	–
spiny emex	1.0–1.43	0.75–1.0	0.5(S)	0.72 (S)	0.4 5	0.185	1.0–1.7
toad rush	–	–	0.5	0.72	–	–	–
turnip weed	1.0–1.43	–	0.25–0.5	0.36–0.72	0.4 5	0.105 3	1.0–1.7
variegated thistle	1.0–1.43	–	–	–	–	0.185	1.7
vetch – volunteer	–	–	–	–	–	0.105 3	–
wild oats	–	–	–	–	–	–	–
wild turnip	1.0–1.43	–	0.25–0.5	0.36–0.72	0.4–0.8 4	0.105 3	1.0–1.7
wireweed	1.0–1.43	0.75–1.0	–	–	0.4 5	0.185 3	1.0–1.7
Rec water L/ha boom	50–200	50 min	50 min	50–150	70–150	50 min	50 min
Herbicide group	C + I	C + I	F + I	C + F + I	G	I	I

- 13 Avoid spraying when temperatures exceed 18 °C. Do not use on undersown lucerne and medics.
- 14 Can be used on clover and lucerne. Not on annual medics. Application should be made from first to eighth trifoliate leaf stage.
- 15 1.0 L/ha can be used from 3 leaf stage, 1.43 L/ha from 5 leaf to fully tillered stage.

- 16 Do not use 0.5 L/ha rate on crops younger than 5 leaf. Do not apply rates higher than 0.25 L/ha to crops in the 3 leaf stage.
- 17 Add Uptake® spraying oil (500 mL/100 L water).
- 18 (S) Suppression only.


 Herbicides that can be used with undersown legume pastures.

Table 31. Herbicides for weed control for cereal rye and triticale – Early post-emergence – Part 1 (continued, page 3 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See labels for details.	Picloram 26 g/L + MCPA 420 g/L	MCPA LVE 570 g/L	Fluroxypyr 333 g/L	MCPA (ethyl hexyl ester) 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg	Florasulam 6.25 g/L + 2,4-D LV ester 300 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L
Trooper® 242 24 Triticale only	LVE MCPA 570 25	Starane® Advanced 26	Triathlon®	Paradigm® 27 Triticale only	Vortex® 29 Triticale only	Pixxaro® 30	
Apply at crop growth stage	Early tillering – fully tillered	3–5 leaf	3 leaf – flag leaf	3 leaf – fully tillered	3 leaf – flag leaf	7 leaf – 2nd node	3 leaf to flag leaf
Zadoks code	22–30	13–15	13–39	13–30	13–49	17–32	13–39
Weed controlled	(litres)	(litres)	(litres)	(litres)	(grams)	(millilitres)	(litres)
amsinckia	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–	–
bedstraw	–	–	0.3	–	25 11	820	0.4
black bindweed	1.0	–	0.3–0.4	–	–	–	0.4–0.6
capeweed	–	–	–	0.5–1.0	25 (S) 11 13	–	–
canola – volunteer	–	–	–	–	25 11 12	820	–
charlock	–	0.44	–	0.5–1.0	–	–	–
chickpea – volunteer	–	–	–	–	–	820 (600–820 mL) 7	–
cleavers	–	–	0.6	–	–	–	–
climbing buckwheat	–	–	–	–	–	820 (S) 29	–
clover	–	–	–	–	25 11	–	0.3
corn gromwell	–	–	–	–	–	–	–
deadnettle	–	–	0.9	–	25	–	0.2–0.3
dock – seedling	–	–	–	1.0 (S)	–	–	–
faba bean – volunteer	–	–	–	–	–	820 (600–820 mL) 7	–
field pea – volunteer	–	–	–	–	25 11	820	–
fleabane	–	–	–	–	25 11	–	–
fumitory	–	–	–	–	25	–	0.3
lentil – volunteer	–	–	–	–	–	820	–
lupin – volunteer	–	–	–	–	–	820	–
marshmallow	–	–	–	–	25	–	–
medic	–	–	–	–	–	–	0.3
Mexican poppy	–	–	–	–	25	–	0.2–0.3
mintweed	–	–	–	–	–	–	–
mustards	1.0	–	–	0.5–1.0 14	25 11	820	–
New Zealand spinach	1.0 (S)	–	–	–	–	–	–
Paterson’s curse	–	–	–	1.0 (S)	–	–	–
prickly lettuce	–	–	0.3	0.5–1.0	–	–	0.4
radish – wild	1.0	–	–	0.5–1.0	25 11	820	–
rough poppy	–	–	–	1.0 (S)	25	–	–
saffron thistle	1.0	–	–	–	–	–	–
shepherd’s purse	–	–	–	0.5–1.0	25 11	–	–
skeleton weed	1.0	–	–	1.0 (S)	–	–	–
slender thistle	–	–	–	–	–	–	–
sorrel	–	–	–	–	–	–	–
soursob	–	–	–	–	–	–	–
sowthistle	1.0	–	0.6	1.0 (S)	25 11	–	0.4
spiny emex	1.0	–	0.9	1.0 (S)	25(S) 11	–	–
toad rush	–	–	–	–	25 (S)	–	–
turnip weed	1.0	–	–	0.5–1.0	25 11	–	–
variegated thistle	1.0	–	–	1.0 (S)	–	820 (S) 29	–
vetch –volunteer	–	–	–	–	–	820	–
wild oats	–	–	–	–	–	–	–
wild turnip	1.0	0.44	–	0.5–1.0	25 11	820 (600–820 mL) 7	–
wireweed	1.0 (S)	–	0.9	0.75 (S)	–	–	–
Rec water L/ha boom	50 min	30–120	50 min	50–100	80–100	80–100	80 min
Herbicide group	I	I	I	F + C + I	I + B	I + B	I

23 Tankmix Kamba® 750 with 0.465 L/ha Agritone® 750.

24 Northern NSW only.

11 Add MCPA (See label for rates).

13 Add 50 mL/ha Lontrel® Advanced for improved control.

14 Indian hedge mustard.

24 Do not plant susceptible crops within 12 months of applying the product.

25 Maximum rate at 3–5 leaf crop stage 0.44 L/ha.

26 Can be tankmixed with Associate®, LVE MCPA and MCPA amine to broaden weed control.

27 Always add Uptake® spraying oil at 500 mL/100 L water, unless tankmixing with Associate®. When tankmixing with Associate® add a non-ionic wetter at 200 mL/200 L.

28 See label for tankmix options.

29 Addition of Uptake® spraying oil at 500 mL/100 L required.

30 Add Uptake® spraying oil (500 mL/100 L water).

31 Add Uptake® spraying oil (500 mL/100 L water).

32 Apply before Z43 (boot stage) if tank-mixed with Statesman™720 + Uptake® spraying oil.

33 Tank mix Kamba® 750 with Agritone® 750 or 0.5 L/ha Amicide® Advance 700

(S) Suppression only.

# Notes

Table 32. Herbicides for weed control for cereal rye and triticale – Early post-emergence – Part 2 (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metosulam 100 g/L Eclipse® 100 SC	Flumetsulam 800 g/kg Broadstrike®	Pyrasulfotole 37.5 g/L + bromoxynil 10 g/L Velocity®	Pyrasulfotole 25 g/L + MCPA 125 g/L Precept®	Dicamba 750 g/kg Kamba®750	Clopyralid 600 g/L Lontrel® Advanced	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot®	Tigrex®	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg Stinger®	Pyroxulam 150 g/kg + halauxifen 50 g/kg Rexade®	Florasulam 6.25 g/L + 2,4-D (ethyl)hexyl ester) 300 g/L Vortex®
Apply at crop growth stage	2 leaf–1st node	Mid till–start of jointing	2 leaf–full till	3 leaf–1st node	5 leaf–fully tillered	2 leaf–boot	3 leaf–1st node	3–5 leaf to late tillering	3 leaf–1st node	3 leaf–1st node	5 leaf–2nd node visible
Zadoks code	12–31	23–31	12–30	13–31	15–30	12–40	13–31	13–30	13–31	13–31	15–32
Weeds controlled	(millilitres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)	(grams)	(litres)
ansinckia	50	25	0.6–1.0	1.5–2.0	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	100 (S)	–	–
annual phalaris	–	–	–	–	–	–	–	–	100	–	–
bedstraw	50 (S)	–	0.67–1.0	1.5–2.0	–	–	–	–	100	–	0.82 (S)
black bindweed	–	–	0.5–1.0	–	0.185	–	0.5–0.75 (7)	–	–	–	0.82 (S)
canola – volunteer	50 (10)	25 (10)	0.5–1.0 (2)	1.0–2.0	–	–	–	0.5 (2)	100 (S)	–	0.82 (S)
capeweed	35–50 (20)	25	0.5–1.0	1.0 (5)	0.185 (3)	0.075–0.15	–	0.5–1.0	100 (2)	–	0.82 (S)
charlock	–	25	–	–	–	–	–	0.5–1.0	–	–	–
chickpea – volunteer	35–50 (20)	–	0.5–1.0 (S)	1.0 (5)	–	0.125	0.75 (7)	–	10 (1)	–	0.82 (S)
chickweed	–	–	–	–	0.185 (3)	–	–	–	–	–	–
cleavers	–	–	–	–	–	–	–	–	–	–	–
clover	50 (S)	–	–	1.0 (5)	0.185	0.075 (8)	–	–	10 (1)	–	–
common barbigrass	–	–	–	–	–	–	–	–	–	–	–
corn growwell	–	–	0.5–1.0	1.0–2.0	–	–	–	–	–	–	–
deadnettle	–	–	0.5–1.0	1.0–2.0	–	–	–	–	–	–	–
dock	–	–	–	–	0.185	–	–	–	–	–	–
faba bean – volunteer	35–50 (20)	–	0.5–1.0	1.0 (5)	–	0.125	0.5–0.75 (2)	–	–	–	0.82 (S)
fat hen	–	–	–	–	0.185	–	–	–	–	–	–
field pea – volunteer	35–50 (20)	–	0.5 (S) 0.67–1.0	1.0–2.0 (5)	–	0.075	0.5–0.75 (2)	–	–	–	0.82 (S)
fumitory	–	25 (9)	0.5–1.0	1.0–2.0	–	–	–	0.75	–	–	–
Indian hedge mustard	–	–	–	–	–	–	–	–	–	–	–
lentil – volunteer	–	–	–	–	–	–	–	–	–	–	–
lupin – volunteer	35–50 (20)	25 (9)	0.5–1.0	1.0–2.0	–	0.125	0.5 (9)	1.0 (S)	–	–	0.82 (S)
Mexican poppy	–	–	–	–	–	–	–	–	–	–	0.82 (S)
mintweed	–	–	–	–	0.185 (3)	–	–	–	–	–	–
mustards	50	25	0.5–1.0	1.0 (7)	0.185 (3)	–	–	0.5–1.0	–	–	–
New Zealand spinach	–	25 (S)	–	–	–	–	–	–	10 (1)	–	–
Paterson's curse	–	25 (S)	0.5–1.0	1.0–2.0	–	–	–	1.0 (S)	–	–	–
peppercress	–	25	–	–	–	–	–	1.0 (S)	–	–	–
prickly lettuce	35–50 (S)	–	0.5–1.0	1.0–2.0	–	–	0.75 (7)	0.5–1.0	–	–	–
radish – wild	50	25 (S)	0.5–1.0	1.0–2.0	–	–	–	0.5–1.0 (2)	100 (2)	–	0.82 (S)
rough poppy	–	–	–	–	–	–	–	1.0 (S)	–	–	–
Rec water L/ha boom	50–100	50–150	50–150	50–100	50 min	50 min	80 min	50 min	70–200	50–100	80–100
Herbicide group	B	B	H + C	H + I	I	I	I	I + F	I + B	B	B + I

Table 32. Herbicides for weed control for cereal rye and triticale – Early post-emergence – Part 2 (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metosulam 100 SC Eclipse® 100 SC	Flumetsulam 800 g/kg Broadstrike®	Pyrasulfotole 37.5 g/L + bromoxynil 10 g/L Velocity®	Pyrasulfotole 25 g/L + MCPA 125 g/L Precept®	Dicamba 750 g/kg Kamba®750	Clopyralid 600 g/L Lontrel® Advanced	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot®	Tigrex®	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg Stinger®	Pyroxulam 150 g/kg + halauxifen 50 g/kg Rexade®	Florasulam 6.25 g/L + 2,4-D (ethyl)hexyl ester) 300 g/L Vortex®
Apply at crop growth stage	2 leaf–1st node	Mid till–start of jointing	2 leaf–full till	3 leaf–1st node	5 leaf–fully tillered	2 leaf–boot	3 leaf–1st node	3–5 leaf to late tillering	3 leaf–1st node	3 leaf–1st node	5 leaf–2nd node visible
Zadoks code	12–31	23–31	12–30	13–31	15–30	12–40	13–31	13–30	13–31	13–31	15–32
Weeds controlled	(millilitres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)	(grams)	(litres)
safron thistle	35–50 (S)	–	0.67–1.0	–	0.185 (3)	Tankmix (4)	–	1.0	–	–	–
Scotch thistle	–	–	–	–	0.185	–	–	–	–	–	–
shepherd's purse	–	25	0.5–1.0	–	–	–	–	0.5–1.0	–	–	–
skeleton weed	–	–	–	–	–	0.25 (6)	–	1.0 (S)	–	–	–
slender thistle	35–50 (S)	–	–	–	–	Tankmix (4)	–	–	–	–	–
sorrel	–	–	–	–	0.185 (3)	–	–	–	–	–	–
soursob	–	–	–	–	–	–	–	–	–	–	–
sow thistle	35–50 (S)	–	0.5–1.0	0.5–1.0	–	–	0.5–0.75 (7) or (4)	1.0 (S)	–	100 (2)	–
spear/black thistle	35–50 (S)	–	–	–	–	Tankmix (4)	–	–	–	–	–
spiny emex	–	25 (S)	0.75–1.0 (S)	0.75–1.0 (S)	0.185	–	0.5–0.75 (7)	1.0 (S)	10 or 14 (1)	100 (2)	0.82 (S)
sunflower	–	–	–	–	0.185	0.05	0.5–0.75 (2)	–	–	–	0.82 (S)
toad rush	–	–	–	–	–	–	–	–	–	–	–
turnip weed	35–50 (S)	–	0.5–1.0	1.0–2.0	0.185 (3)	–	–	0.5–1.0	100	–	0.82
variegated thistle	35–50 (S)	–	–	–	0.185	Tankmix (4)	0.5–0.75 (7)	1.0 (S)	–	–	0.82 (S)
vetch	35–50 (20)	–	0.5–1.0 (S)	1.0 (5)	0.185	–	0.5–0.75 (2)	–	–	–	0.82 (S)
wild oats	–	–	–	–	–	–	–	–	–	–	–
wild turnip	35–50	25	0.5–1.0	1.0–2.0	–	–	–	0.5–1.0	10 (1)	–	0.82 (S)
wireweed	–	–	0.5 (S) 0.67–1.0	1.0–2.0	0.185	–	0.5–0.75 (4)	0.75 (S)	10 or 14 (1)	100	–
Rec water L/ha boom	50–100	50–150	50–150	50–100	50 min	50 min	80 min	50 min	70–200	50–100	80–100
Herbicide group	B	B	H + C	H + I	I	I	I	I + F	I + B	B	B + I

- See label for weed size and tank mix options.
  - 500 mL (southern NSW), 750 mL (northern NSW).
  - Always use BS1000® or Chemwet® 1000 at 250/100 L spray volume.
  - Add 5 g metsulfuron-methyl (600 g/kg) and non-ionic wetter at 100 mL/100 L of water.
  - Add Agritone® 750 for control. Refer to label for details.
  - Indian hedge mustard only.
  - Southern NSW only.
  - See label for tankmix of Broadstrike® and other herbicides for control.
  - Not Clearfield canola volunteers.
  - Add LVE MCPA. See label.
  - Excluding Clearfield® varieties.
  - Clopyralid also available in 750 SG. See label for rates.
  - Add Uptake® spray oil at 50 mL/100 L water.
  - Add Lontrel® 750 SG for control. See label for rates.
  - Northern NSW only.
- Sub-clover only.
  - Add partner herbicide for control. See label.
  - Mix 25 mL/ha Lontrel® Advanced with 1 L/ha MCPA Amine (500 g/L) for control.
  - See label for controlling RR canola volunteers.
  - Refer to label for weed size and tank mix options.
  - Apply with 0.5 L Uptake® spraying oil/100 L water. Can be tankmixed with LVE MCPA for improved control. See label.
  - Safe on undersown lucerne, medic, sub-clover, after the 2–3 trifoliolate leaf stage. Use Uptake® spraying oil on wetting agents such as BS1000® with triticale and cereal rye.
  - Conventional/triazine tolerant varieties only.
  - Add Hasten™ (1% v/v). Note recropping intervals on label. For best results apply in warmer temperatures and high light intensity and > 1 hr of daylight left after application.
- Spray grade liquid ammonium sulfate, Hasten™ (1% v/v), Supercharge® (0.75% v/v) or Uptake® (0.5% v/v) must be used with Precept®. Note recropping intervals on label. For best results apply in warmer temperatures and high light intensity and > 1 hr of daylight left after application.
  - See Kamba® 750 label for tank mix options!
  - Lontrel® also available as soluble granule 750 g/kg formulation.
  - Add BS1000® (when mixing with metsulfuron-methyl).
  - Can be used on undersown sub-clover and other clovers. See label. Not on lucerne or annual medics. Application should be made from the third to eighth trifoliolate leaf stage.
  - Always add BS1000 at 250 mL/100 L or an alternative (see the section 'use of surfactant/wetting agent' in the general instructions on the label.
  - 185 mL/ha Kamba® 750 + Agritone® 750 or 185 mL/ha + 500 mL/ha Amicide® Advance 700.
  - Suppression only.

## Herbicides for control and suppression



Table 33. Herbicides for weed control for cereal rye and triticale – Late post-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike®	Low volatile 2,4-D ester 680 g/L Estericide® Xtra 680	2,4-D amine 700 g/L Amicide® Advance 700	2,4-DB 500 g/L Buttress®	MCPA 750 g/L Agritone® 750 Triticale only	MCPA LVE 570 g/L LVE MCPA 570	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 Triticale only	Picloram 75 g/L + 2,4-D + aminopyralid 7.5 g/L FallowBoss® Tordon® Triticale only	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® Triticale only	Florasulam 200 g/kg + halauxifen 200 g/kg Paradigm® Triticale only
Apply at crop growth stage	Flowering to early dough	1st node–before booting	1st node–booting	5 leaf–before booting	1st node–before booting	5 leaf–boot	Early tillering–full tillering	Mid tillering–start of jointing	3 leaf to flag leaf	1st node–first awns visible
Zadoks code	61–83	31–37	31–43	15–33	31–37	15–37	22–30	23–31	13–39	13–49
Weeds controlled	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
ansinckia	–	–	0.98	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	–	–
black bindweed	–	–	–	–	0.46–1.45	–	–	–	0.4–0.6	–
capeweed	–	0.53–0.8	0.98–1.5	2.1–3.2	0.46–1.45	1.4	–	–	–	25(S)
canola – volunteer	–	0.9–1.25	–	–	–	–	–	–	–	–
charlock	–	0.41	0.5–1.25	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
chickpea volunteer	–	–	–	–	–	–	–	–	–	25 (1)
clover	–	0.62–0.8	1.1	–	–	–	–	–	0.3	25
corn growwell	–	0.8	–	–	–	–	–	–	–	–
deadnettle	–	0.8	–	–	–	–	–	–	0.2–0.3	25
fleabane	–	–	1.5	–	–	–	–	–	0.3 (1)	25
fumitory	–	0.8	0.5–1.5 (3)	2.1–3.2	–	0.965	–	–	0.3	25
marshmallow	–	–	–	1.0–3.2	–	–	–	–	0.3	25
medic	–	–	–	–	–	–	–	–	–	25 (1)
Mexican poppy	–	0.8	1.25	2.1–3.2	–	–	–	–	0.2–0.3	25
mintweed	–	0.8	0.8–0.98	–	0.46–1.45	–	–	–	–	–
mustards	–	0.41–0.8	0.2–1.25	2.1–3.2	0.46–1.45	0.49–0.88	1.0	0.3 (1)	–	25
New Zealand spinach	–	0.8	0.98–1.5	–	–	–	1.0 (S)	–	–	–
Paterson's curse	25	0.8	0.98–1.5	2.1–3.2	0.46–1.45	1.4	–	–	–	–
prickly lettuce	–	–	–	2.1–3.2	–	–	–	–	–	–
radish – wild	25	0.41–0.8	0.715–1.5	–	0.46–1.45	0.965–1.4 (2)	1.0	0.3 (1)	–	25
rough poppy	–	0.41–0.8	0.98	2.1–3.2	0.46–1.45	–	–	–	–	–
saffron thistle	–	0.41–0.8	0.5–1.5	2.1–3.2	0.46–1.45	0.965–1.4	1.0	–	–	–
Scotch thistle	–	–	–	–	–	0.615–1.4	–	–	–	–
Recom water L/ha boom	50 min	30–100	30–120	110 min	30–120	30–120	50 min	50 min	80 min	80–100
Herbicide group/mode	B	I	I	I	I	I	I	I	I	B, I

**NOTE:** All the above herbicides will damage undersown legumes except 2,4-DB, which has not been fully tested on all lucerne varieties and may cause unacceptable damage. 2,4-DB is safe for use on sub-clover and medics. 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.

- 1 Tank mix with 0.375 L/ha 2,4-D amine (625 g/L) for control.
- 2 See label for tankmix options with TRex® for improved control in wild radish.

3 Rate depends on fumitory species – see label.

4 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.

5 Salvage spray to prevent seed set in wild radish and turnip weed. Spray least-mature weeds from early flowering to early pod set of most mature weeds, and crop from flowering to early dough stage. Add Uptake® oil or wetter. Can be used on undersown lucerne clovers and annual medics.

6 Boom only. Good quality water essential.

7 Undersown sub-clovers may be slightly retarded. Do not apply to undersown medics or lucerne. See label for comments regarding weed size and application rate.

8 Undersown legumes tolerant to lower rates – see label. Not on medics or lucerne. Top rate for cereal rye and triticale is 1.4 L/ha.

9 Do not plant susceptible crops within 12 months of applying the product.

10 Add Uptake® spraying oil (500 mL/100 L water).

(5) Suppression only.

Table 33. Herbicides for weed control for cereal rye and triticale – Late post-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg Broadstrike®	Low volatile 2,4-D ester 680 g/L Estericide® Xtra 680	2,4-D amine 700 g/L Amicide® Advance 700	2,4-DB 500 g/L Buttress®	MCPA 750 g/L Agritone® 750 Triticale only	MCPA LVE 570 g/L LVE MCPA 570	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 Triticale only	Picloram 75 g/L + 2,4-D + aminopyralid 7.5 g/L FallowBoss® Tordon® Triticale only	Fluroxypyr 250 g/L + halauxifen 16.25 g/L Pixxaro® Triticale only	Florasulam 200 g/kg + halauxifen 200 g/kg Paradigm® Triticale only
Apply at crop growth stage	Flowering to early dough	1st node–before booting	1st node–booting	5 leaf–before booting	1st node–before booting	5 leaf–boot	Early tillering–full tillering	Mid tillering–start of jointing	3 leaf to flag leaf	1st node–first awns visible
Zadoks code	61–83	31–37	31–43	15–33	31–37	15–37	22–30	23–31	13–39	13–49
Weeds controlled	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
shepherd's purse	–	0.8	0.98–1.5	2.1–3.2	–	–	–	–	–	25
skeleton weed	–	0.8	0.98–1.5	–	0.965–1.4	0.44–1.4	1.0	–	–	–
slender thistle	–	0.8	0.715–1.5	2.1–3.2	1.4	0.44–1.4	–	–	–	–
sorrel	–	–	1.25–1.5	–	–	–	–	–	–	–
sowthistle	–	–	1.25–1.5	2.1–3.2	–	–	1.0	–	0.4	25
spear thistle	–	–	0.5–1.45	2.1–3.2	1.31–1.4	0.44–1.4	–	–	–	–
spiny emex	–	–	1.25	2.1–3.2	–	–	1.0	0.3	–	25(S)
toadrush	–	–	–	–	–	–	–	–	–	25
turnip weed	25	0.41–0.8	0.5–0.98	2.1–3.2	0.615–0.965	0.44–1.4	1.0	0.3 (1)	–	25
variegated thistle	–	0.41–0.8	0.5–1.5	2.1–3.2	0.735–0.965	0.44–1.4	1.0	0.3 (1)	–	25
vetch	–	–	1.25	–	–	–	–	–	–	25
wild oats	–	–	–	–	–	–	–	–	–	–
wild turnip	–	0.41–0.8	0.2–1.25	2.1–3.2	0.44–1.31	0.44–1.4	1.0	–	–	25
wireweed	–	0.8	–	2.1–3.2	–	–	1.0 (S)	–	–	–
Recom water L/ha boom	50 min	30–100	30–120	110 min	30–120	30–120	50 min	50 min	80 min	80–100
Herbicide group/mode	B	I	I	I	I	I	I	I	I	B, I

**NOTE:** All the above herbicides will damage undersown legumes except 2,4-DB, which has not been fully tested on all lucerne varieties and may cause unacceptable damage. 2,4-DB is safe for use on sub-clover and medics. 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.

- 1 Tank mix with 0.375 L/ha 2,4-D amine (625 g/L) for control.
- 2 See label for tankmix options with TRex® for improved control in wild radish.
- 3 Rate depends on fumitory species – see label.

4 2,4-DB is not safe on woolly pod vetch, berseem and red clovers.

5 Salvage spray to prevent seed set in wild radish and turnip weed. Spray least-mature weeds from early flowering to early pod set of most mature weeds, and crop from flowering to early dough stage. Add Uptake® oil or wetter. Can be used on undersown lucerne clovers and annual medics.

6 Boom only. Good quality water essential.

7 Undersown sub-clovers may be slightly retarded. Do not apply to undersown medics or lucerne. See label for comments regarding weed size and application rate.

8 Undersown legumes tolerant to lower rates – see label. Not on medics or lucerne.

9 Do not plant susceptible crops within 12 months of applying the product.

10 Add Uptake® spraying oil (500 mL/100 L water).

(5) Suppression only.

Table 34. Herbicides for weed control for canola – Pre-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Terbuthylazine 875 g/kg Terbyne® Xtreme® Triazine tolerant (TT) canola only		Simazine 900 g/kg Simazine 900 DF Triazine tolerant (TT) canola only	Atrazine 900 g/kg Atrazine 900 WG 7	Trifluralin 480 g/L Triflur® X 8	Propyzamide 500 g/kg Rustler®
Incorporation/growth stage application	IBS	PSPE 6	PSI, IBS PSPE	PSI, IBS PSPE	PSI IBS	IBS
Weeds controlled	(kilograms)		(kilograms)	(kilograms)	(litres)	(litres)
amsinckia	–	–	–	–	–	–
annual phalaris	0.86–1.2 (S)	0.86–1.2 (S)	–	–	1.2–1.7 or 1.5–3.0 (IBS) or 2	1.0
annual ryegrass	0.86–1.2 (S)	0.86–1.2 (S)	1.1–2.2 (S)	1.1–2.2 (S)	1.2–1.7 or 1.5–3.0 (IBS) 2	1.0
barley grass	–	–	1.1–2.2 (S)	1.1–2.2 (S)	1.5–3.0 (S) (IBS) 2	1.0
bedstraw	–	–	–	–	–	–
brome grass	–	–	1.1–2.2 (S)	1.1–2.2 (S)	1.5–3.0 (S) (IBS) 2	1.0
capeweed	–	–	1.1–2.2	1.1–2.2	–	–
cereals – volunteer	–	–	–	–	–	–
charlock	–	–	1.1–2.2	1.1–2.2	–	–
common barbgrass	–	–	–	–	–	–
corn gromwell	0.86–1.2	0.86–1.2	1.1–2.2	1.1–2.2	1.5–3.0 (IBS) 2	–
deadnettle	0.86–1.2	0.86–1.2	–	–	1.5–3.0 (S) (IBS)	–
Erodium/storksbill	–	–	1.1–2.2	–	–	–
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–
fumitory	–	–	1.1–2.2	1.1–2.2	1.2–1.7 (S) or 1.5–3.0 (IBS) 2	–
lupin – volunteer	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–
medics – volunteer	0.86–1.2	0.86–1.2	–	–	–	–
mustards	0.86–1.2	0.86–1.2 4	1.1–2.2	1.1–2.2	–	–
Paterson's curse	–	–	1.1–2.2	1.1–2.2	–	–
saffron thistle	–	–	–	–	–	–
scotch thistle	–	–	–	–	–	–
shepherd's purse	0.86–1.2	0.86–1.2	1.1–2.2	1.1–2.2	–	–
skeleton weed	–	–	–	–	–	–
sowthistle	0.86–1.2	–	–	–	–	–
spiny emex	1.0–1.4 (S)	0.86–1.2 (S)	1.1–2.2	1.1–2.2	1.5–3.0 (S) (IBS) 2	–
sub. clover	–	–	–	1.1–2.2	–	–
toadrush	0.86–1.2	0.86–1.2	–	–	–	–
turnips – wild	0.86–1.2	0.86–1.2	1.1–2.2	1.1–2.2	–	–
variegated thistle	–	–	–	–	–	–
vulpia	–	–	1.1–2.2	1.1–2.2	1.5–3.0 (IBS) 2	1.0
wild oats	0.86–1.2 (S)	0.86–1.2 (S)	1.1–2.2 (S)	1.1–2.2	1.2–1.7 (S) or 1.5–3.0 (IBS) 2	1.0
wild radish	0.86–1.2 (S)	0.86–1.2 (S)	1.1–2.2 (S)	1.1–2.2 (S)	–	–
winter grass	–	–	–	–	–	1.0
wireweed	0.86–1.2	0.86–1.2	–	–	1.2–1.7 or 1.5–3.0 (IBS) 2	–
Rec water L/ha boom	50 min		100	50–100	70–450	not stated
Herbicide group	C		C	C	D	D

- 1 Add trifluralin for mixed infestations of wild oats, annual phalaris and annual ryegrass or wireweed. See Avadex Xtra® and trifluralin labels.
- 2 Alternatively apply 1.5–2.0 L/ha Triflur® X + 1.6–2.4 L/ha Avadex® Xtra for control using IBS incorporation. When adding Avadex® Xtra incorporate within 6 hours.
- 3 3.0 L/ha and 3.2 L/ha rates are for use in KP/PW situations only.
- 4 Indian hedge mustard only.
- 5 Tank mix 1.6–2.4 L/ha + 1.5–2 L/ha Triflur® X
- 6 Terbyne® can be used IBS or PSPE. Use the lower rate on light soils and the high rate on heavier soils. Sufficient rain is necessary within 2–3 weeks after application.

- 7 Use on triazine-tolerant varieties only. Can be applied pre-emergence or post-sowing pre-emergence. Rates depend on soil type. See label for rates and use pattern.
- 8 Light soils 1.2 L/ha, medium soils 1.5 L/ha and heavy soils 1.7 L/ha. Apply and incorporate up to just before sowing. For IBS situations incorporate within 24 hours of application. For best results in PSI and IBS incorporate as soon as practical after application.
- 9 Other than imidazolinone herbicide-tolerant varieties.
- 10 Southern NSW only. Apply up to 24 hours before sowing. Incorporate well. Canola seed can be placed within the treated band. Use lower rate on lighter soils and higher rate on heavier soils.

Table 34. Herbicides for weed control for canola – Pre-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazapic 525 g/kg + imazapyr 175 g/kg Sentry™ Imidazolinone herbicide-tolerant canola	Pendimethalin 440 g/L Pendimethalin 440 EC 9	Tri-allate 500 g/L Avadex® Xtra Conventional 11 KP/PW 12		S-metolachlor 960 g/L Dual® Gold 13	Metazachlor 500g/L Butisan®
Incorporation/growth stage application	IBS	PSI IBS	PSI IBS	PSI IBS	IBS PSPE	IBS
Weeds controlled	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–
annual phalaris	40–50 (S)	–	1	5	–	–
annual ryegrass	40–50 (S)	1.35–2.25	1	3.0 or 5	–	1.5–1.8
barley grass	40–50	–	–	5 (S)	–	1.8
bedstraw	–	–	–	–	–	–
brome grass	40–50	–	–	3 (S)	–	1.8
capeweed	40–50 (S)	–	–	–	–	1.8
cereals – volunteer	40–50 (S) 1b	–	–	–	–	–
charlock	–	–	–	–	–	–
common barbgrass	–	–	–	–	–	–
corn gromwell	–	–	–	5 (S)	–	–
deadnettle	–	–	–	5 (S)	–	1.8
Erodium/storksbill	40–50 (S)	–	–	–	–	1.8
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–
fumitory	40–50 (S)	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–
medics – volunteer	–	–	–	–	–	–
mustards	–	–	–	5	–	–
Paterson's curse	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–
scotch thistle	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	1.8
skeleton weed	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–
sub. clover	–	–	–	–	–	–
toadrush	–	–	–	5	0.15–0.25	1.8
turnips – wild	–	–	–	5	–	–
variegated thistle	–	–	–	–	–	–
vulpia	–	1.5–2.25 (S)	–	–	–	–
wild oats	40–50 (S)	1.35–2.25 (S)	1.6 1	3.2 or 5	–	1.8
wild radish	–	–	–	–	–	–
winter grass	–	–	–	5	–	–
wireweed	40–50	1.35–2.25	1	5	–	1.8
Rec water L/ha boom	70–100	50–200	30–100		60 min	80–250
Herbicide group	B	D	J		K	K

- 11 Use 1.6 L/ha rate for conventional seeding systems and 3.0–3.2 L/ha rate for use in KP/PW situations only.
- 12 Apply at or immediately after planting and before crops and weeds emerge. Apply to moist soil.
- (S) Suppression.

**Incorporation**  
 PSI Pre-sowing incorporated.  
 IBS Incorporated by sowing.  
 PSPE Post-sowing pre-emergence.  
 KP/PW Knife point press wheel (Wheat, barley, triticale and canola)  
 Conventional: Wheat, barley, triticale, chickpea, faba bean, lupin, linseed, canola, safflower.

Table 35. Herbicides for weed control for canola – Early post-emergence (page 1 of 2)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Propanilfop 100 g/L	Clethodim 240 g/L	Butoxydim 250 g/kg	Fluazifop-P 128 g/L	Haloxifop-R 520 g/L	Quizalofop-p-ethyl 200 g/L	Halauxifen 100 g/L + aminopyralid 50 g/L
Shogun® 11	Status® 1 12	Factor® WG 13	Fusilade® Forte	Verdict® 520 14	Elantra® Xtreme® 15	ForageMax® 16	
Apply at crop growth stage	Any time until 16 weeks before harvest	Before budding	Not before 4 leaf 20	Not after 6 leaf	2 leaf and before bud formation	Not before 5 leaf	4–8 leaf
Weeds controlled	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–
annual phalaris	–	0.15–0.5 6	80 8	0.41	0.05–0.1	–	–
annual ryegrass	0.45	0.15–0.5	80 8	0.41	0.075–0.1	0.15 or 0.19	–
barley grass	0.2	0.175–0.5	80 8	0.41	0.05–0.1	0.125	–
bedstraw	–	–	–	–	–	–	–
brome grass	0.3	0.175–0.5	80 8	–	0.05–0.1	0.15 or 0.19	–
capeweed	–	–	–	–	–	–	100
cereals – volunteer	0.2 5	0.2–0.5 7	80 8	0.41	0.05–0.1	0.125	–
charlock	–	–	–	–	–	–	–
chickpea – volunteer	–	–	–	–	–	–	100
corn gromwell	–	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–	100
field pea – volunteer	–	–	–	–	–	–	–
fumitory	–	–	–	–	–	–	100
lupin – volunteer	–	–	–	–	–	–	100
Mexican poppy	–	–	–	–	–	–	100
medics – volunteer	–	–	–	–	–	–	100
mustards	–	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–	–
scotch thistle	–	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–	100
skeleton weed	–	–	–	–	–	–	–
spear thistle	–	–	–	–	–	–	100
spiny emex	–	–	–	–	–	–	–
sub. clover	–	–	–	–	–	–	–
toadrush	–	–	–	–	–	–	–
turnips – wild	–	–	–	–	–	–	–
variegated thistle	–	–	–	–	–	–	100
vulpia	–	0.25–0.5 (S)	–	–	–	–	–
wild mustard	–	–	–	–	–	–	–
wild oats	0.25	0.175–0.5	80 6	0.41	0.0375–0.1 9	0.065 or 0.125	–
wild radish	–	–	–	–	–	–	–
winter grass	–	–	–	–	–	–	–
wireweed	–	–	–	–	–	–	–
Rec water L/ha boom	50 min	50 min	50–100	50–100	50–150	50–150	
Herbicide group	A	A	A	A	A	A	

- 1 Status® is registered to a higher maximum rate of 500 mL/ha, however under certain scenarios significant crop damage may occur at this maximum rate. See label.
- 2 See label for tankmix options.
- 3 Use 0.0375–0.075 L/ha in southern and central NSW and 0.05–0.1 L/ha in northern NSW.
- 4 Indian hedge mustard only.
- 5 Volunteer triticale 0.25 L/ha.
- 6 Use higher rate on *Phalaris paradoxa*.
- 7 Use higher rate on volunteer barley.
- 8 Add an effective rate of a 'fop' herbicide containing fluazifop, haloxyfop, propaquizafop or quizalofop for control. See label.

- 9 Canary grass only.
- 10 plus Hasten® or Kwickin™ at 0.5 L/100 L spray volume
- 11 Always add either BS1000® at 250 mL/100 L spray or Hasten® or Kwickin™ at 500 mL/100 L spray.
- 12 Add 1 L Hasten® or Kwickin™ or 0.5 L Uptake® oil /100 L spray
- 13 Add Supercharge® Elite at 1 L/100 L, or aerial application 1 L/ha. Canola may be sensitive to Factor®. See label.
- 14 Add Uptake® spraying oil at 0.5 L/100 L water. Use a minimum of 250 mL/ha Uptake®. Use wetter only when tank mixing with broadleaf herbicides except Lontrel® Advanced.
- 15 Add non-ionic surfactant at 200 mL/100 L or non-ionic surfactant at 100 mL/100 L + mineral spray oil at 1 L/100 L or Hasten® at 1 L/100 L. See label.

Table 35. Herbicides for weed control for canola – Early post-emergence (continued, page 2 of 2)

Rate per hectare Various trade names some- times available under these concentrations. See specific labels for details.	Imazamox 33 g/L + imazapyr 15 g/L	Imazapic 525 g/kg + imazapyr 175 g/kg	Atrazine 900 g/kg	Terbuthylazine 875 g/kg	Clopyralid 600 g/L	Glyphosate 540 g/L
Intervix® 16 Clearfield canola only	Sentry™ Imidazolinone herbicide-tolerant canola	Atrazine 900 WG 17 Triazine tolerant (TT) canola only	Terbyne® Xtreme® 18 Triazine tolerant (TT) canola only	Lontrel® Advanced	Roundup Ready® PL herbicide 19 Roundup Ready® canola only	
Apply at crop growth stage	2–6 leaf only	2–6 leaf		Early post-emergent	2–8 leaf	Cotyledon to 6 leaf (before bud formation)
Weeds controlled	(litres)	(grams)	(kilograms)	(kilograms)	(litres)	(litres)
amsinckia	–	40–55	–	–	–	–
annual phalaris	–	40–55	–	0.6–1.2(S)	–	1.15 9
annual ryegrass	0.6–0.75 2	40–55 (S)	0.5–1.1	0.6–1.2(S)	–	1.15
barley grass	0.6–0.75 2	40–55	–	–	–	1.15
bedstraw	0.6–0.75 (S) 2	40–55	–	–	–	–
brome grass	0.6–0.75 2	40–55	–	–	–	1.15
capeweed	0.3–0.75 2	–	–	–	0.15	1.15
cereals – volunteer	–	40–55 21	–	–	–	1.15
charlock	0.6–0.75 2	–	–	–	–	–
chickpea – volunteer	–	–	–	–	0.125	1.15 22
corn gromwell	–	40–55	–	–	–	–
deadnettle	–	40–55	–	0.6–1.2	–	–
field pea – volunteer	0.3–0.75 2	–	–	–	0.075	1.15 22
fumitory	0.6–0.75 2 10	40–55	–	–	–	–
lupin – volunteer	0.3–0.75 2	–	–	–	0.125	1.15 22
Mexican poppy	–	–	–	–	–	–
medics – volunteer	0.3–0.75 2	40–55 (S)	–	–	0.075	1.15 22
mustards	0.3–0.75 2 4	20	0.5–1.1	–	–	–
Paterson's curse	–	40–55	–	–	–	1.15
saffron thistle	–	–	–	–	0.15	1.15
scotch thistle	–	–	–	–	–	1.15
shepherd's purse	–	20	–	–	–	–
skeleton weed	–	–	–	–	0.15	–
spear thistle	–	–	–	–	–	1.15
spiny emex	0.6–0.75 (S) 2	–	–	0.6–1.2(S)	–	–
sub-clover	0.3–0.75 2	40–55	–	–	0.075	1.15 22
toadrush	–	40–55	–	–	–	–
turnips – wild	0.3–0.5	20	0.5–1.1	–	–	1.15
variegated thistle	–	–	–	–	–	1.15
vulpia	0.6–0.75 (S) 2	40–55 (S)	–	–	–	1.15
wild mustard	–	–	–	–	–	1.15
wild oats	0.6–0.75 2	40–55	–	0.6–1.2 (S)	–	1.15
wild radish	0.3–0.575 2	20	0.5–1.1	0.6–1.2	–	1.15
winter grass	–	–	–	–	–	1.15
wireweed	–	–	–	–	–	–
Rec water L/ha boom	70 min	70–100	50–100	50 min	50 min	50–80
Herbicide group	B	B	C	C	I	M

- 16 Add Supercharge® at 0.5 L/100 L spray solution. Tank mixes of Intervix® and Transit® are possible. See label.
- 17 Use on triazine-tolerant varieties only. Can be used prior to crop 3 leaf stage and small weeds. Add surfactant. See label for use pattern. DO NOT apply this product on raised beds or where furrows have been created in soil for the purposes of holding or channelling water.
- 18 Always add Hasten™ at 1% v/v. Do not add any other herbicide or adjuvant.
- 19 No additional surfactant required. Sequential application must be at least 14 days apart. See label. No tank mixtures recommended. Be familiar with the Roundup Ready® canola resistance management plan before using. See label for tank mixes with clopyralid.

- 20 Apply no later than the end of leaf development and prior to commencement of stem elongation. Do not apply at flowering stage of crop.
- 21 Other than imidazolinone herbicide-tolerant varieties.
- 22 Two applications of Roundup Ready® PL herbicide provide higher levels of control than a single application.
- 23 Add Uptake® spraying oil at 1.0 L/ha.
- (S) Suppression.



Table 36. Herbicides for weed control for safflower

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Pre-sowing			Early post-emergence		
	Trifluralin 480 g/L Triflur® X 5	Pendimethalin 440 g/L Pendimethalin 440 EC 6	Tri-allate 500 g/L Avadex® Xtra 7	Diclofop-methyl 375 g/L Diclofop-methyl 500 EC 8	Propaquizafop 100 g/L Shogun® 9	Metsulfuron-methyl 600 g/kg Associate® 4
Incorporation/growth stage application	PSI IBS	PSI IBS	PSI IBS	-	Up until 20 weeks before harvest	4-6 leaf
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
annual phalaris	1.2-1.7	-	-	-	-	-
annual ryegrass	1.2-1.7	1.5-2.25	-	1.0	0.45	-
barley grass	-	-	-	-	0.2	-
brome grass	-	-	-	-	0.3	-
cereals	-	-	-	-	0.2 3	-
common barbgrass	-	-	-	1.25	-	-
deadnettle	-	-	-	-	-	5.0
field pea - volunteer	-	-	-	-	-	7.0
fumitory	1.2-1.7 (S)	-	-	-	-	5.0
medics - volunteer	-	-	-	-	-	5.0
mustards	-	-	-	-	-	5.0
shepherd's purse	-	-	-	-	-	5.0
skeleton weed	-	-	-	-	-	7.0 (S)
subterranean clover	-	-	-	-	-	5.0
wild oats	1.2-1.7 1	1.5-2.25 (S)	1.6 2	1.5-2.0	0.25	-
wireweed	1.2-1.7	1.5-2.25	-	-	-	5.0-7.0
Rec water L/ha boom	70-450	50-200	40-100	50-150	30-150	50 min
Herbicide group/mode	D	D	J	A	A	B

- 1 Tankmix with Avadex® Xtra for improved control.
  - 2 Preferred option for northern NSW only.
  - 3 0.25 L/ha for volunteer triticale.
  - 4 Sironaria, Saffola, Sirothora varieties only.
  - 5 Apply between 4 weeks and just before sowing and incorporate. See label. Apply 1.2 L/ha on light soils and between 1.5-1.7 L/ha on medium-heavy soils.
  - 6 In northern NSW, double incorporate at rate of 1.9-2.5 L/ha. In southern NSW incorporate by sowing at rate of 1.5-2.25 L/ha. See label.
  - 7 Apply and incorporate immediately prior to sowing or up to 3 weeks before sowing.
  - 8 Add wetting agent.
  - 9 Always add either BS1000® at 250 mL/100 L spray or Hasten™ or Kwickin™ at 500 mL/100 L water.
- Incorporation**  
PSI Pre-sowing incorporated.  
IBS Incorporated by sowing.

Table 37. Herbicides for weed control for linseed and linola - pre-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Trifluralin 480 g/L Triflur® X 3 Not linola	Tri-allate 500 g/L Avadex® Xtra 4 Not linola
Incorporation/growth stage application	PSI IBS	PSI IBS
Weeds controlled	(litres)	(litres)
annual phalaris	1.2-1.7	-
annual ryegrass	1.2-1.7	-
fumitory	1.2-1.7	-
wild oats	1.2-1.7 1	1.6 2
wireweed	1.2-1.7	-
Rec water L/ha boom	70-450	30-100
Herbicide group	D	J

- 1 Refer to label for details.
- 2 Preferred option for northern NSW only.
- 3 Light soils 1.2 L/ha. Medium soils 1.5 L/ha. Heavy soils 1.7 L/ha. Spray 2-4 weeks before sowing. Sowing depth should be 1.3 to 2.5cm. Deeper sowing may result in some stand reduction.
- 4 Apply and incorporate 1-3 weeks before sowing. See label. Can be tankmixed with trifluralin for control of mixed infestations of wild phalaris, ryegrass and wireweed.

**Incorporation**  
PSI Pre-sowing incorporated.  
IBS Incorporated by sowing.

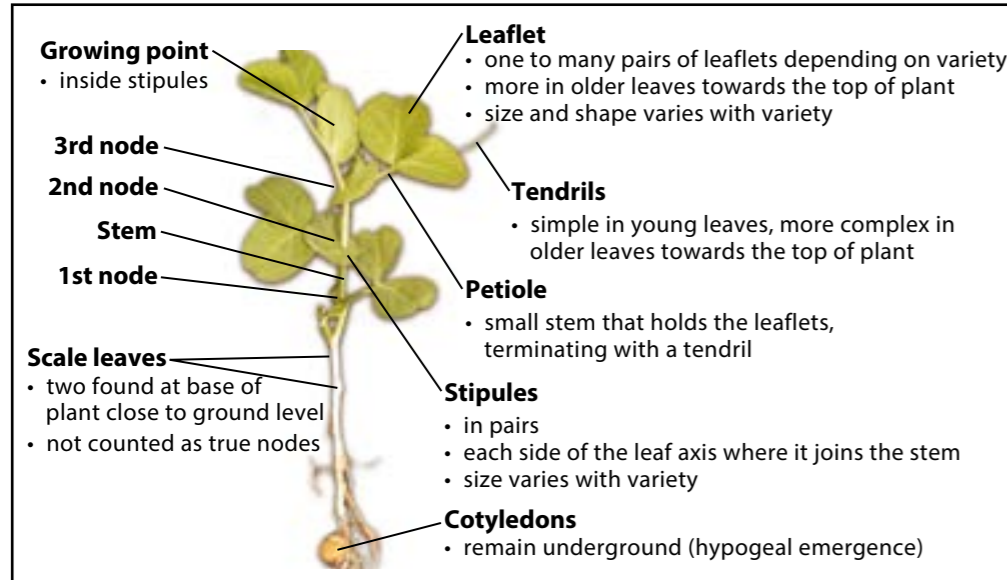
Table 38. Herbicides for weed control for linseed and linola - early post-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Fluazifop-P 128 g/L Fusilade® Forte Not linola	Propaquizafop 100 g/L Shogun® 5 Not linola	Fluazifop-R 520 g/L Verdict® 520 6 Not linola	Butoxydim 250 g/kg Factor® WG 7 Not linola	Diclofop-methyl 375 g/L Diclofop-methyl 500 EC 8 Not linola	Bromoxynil 200 g/L Bromicide® 200 Not linola	Bromoxynil 280 g/L + MCPA 80 g/L Bronco®MA-X 10 Not linola	MCPA 750 g/L Agritome® 750 11 Not linola	Picloram 26 g/L + MCPA 420 g/L Trooper® 242 12 Not linola	Metsulfuron-methyl 600 g/kg Associate® 13 Not linola
Incorporation/growth stage application	Any time until 17 weeks before harvest	Up until 16 weeks before harvest	2-8 leaf	Not before 4 leaf	3-6 weeks after sowing	5-15 cm high	5-15 cm high	10-15 cm high and well before budding	8-20 cm high	4 true leaf - pre-budding
Weeds controlled	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
amsinckia	-	-	-	-	-	1.4-2.0	1.0-1.43	-	-	5-7
annual phalaris	0.41	-	0.05-0.1	80-180 4	-	-	-	-	-	-
annual ryegrass	0.41	0.45	0.075-0.1	80-180 4	1.0	-	-	-	-	-
barley grass	0.41	0.2	0.05-0.1	80-180 4	-	-	-	-	-	-
black bindweed	-	-	-	-	-	-	1.0-1.43	-	0.67-0.84	-
brome grass	-	0.3	0.05-0.1	80-180 4	-	-	-	-	-	-
capeweed	-	-	-	-	-	1.4-2.0	1.0-1.43	-	-	-
cereals	0.41	0.2 2	0.05-0.1	80-180 4	-	-	-	-	-	-
charlock	-	-	-	-	-	-	1.0-1.43	0.66	-	5
Chicopea (volunteer)	-	-	-	-	-	-	-	-	-	5
corn gromwell	-	-	-	-	-	-	1.0-1.43	-	-	5
deadnettle	-	-	-	-	-	-	-	-	-	5
faba bean	-	-	-	-	-	-	-	-	-	5
fumitory	-	-	-	-	-	2.0	1.0-1.43	-	-	5
lupins	-	-	-	-	-	-	-	-	-	5
medic	-	-	-	-	-	-	-	-	-	5
Mexican poppy	-	-	-	-	-	2.0	1.0-1.43	-	-	-
mustards	-	-	-	-	-	2.0	1.0-1.43	0.66	0.67-0.84 (S)	5
New Zealand spinach	-	-	-	-	-	-	-	-	0.67-0.84 (S)	-
Pateison's curse	-	-	-	-	-	2.0	1.0-1.43	0.66-0.96	-	5-7
radish - wild	-	-	-	-	-	2.0	1.0-1.43	0.66	0.67-0.84	-
rough poppy	-	-	-	-	-	2.0	1.0-1.43	0.46-0.73	-	5
saffron thistle	-	-	-	-	-	1.4-2.0	1.0-1.43	0.66-0.73	0.67-0.84	-
shepherd's purse	-	-	-	-	-	-	1.0-1.43	-	-	5
skeleton weed	-	-	-	-	-	-	-	0.66-0.73	0.67-0.84	7
slender thistle	-	-	-	-	-	-	-	-	-	5
sorrel	-	-	-	-	-	-	-	-	-	7
soursob	-	-	-	-	-	-	-	-	-	5
spiny emex	-	-	-	-	-	2.0	1.0-1.43	-	0.67-0.84	-
tump weed	-	-	-	-	-	-	1.0-1.43	0.66	-	-
variegated thistle	-	-	-	-	-	-	1.0-1.43	0.66-0.73	0.67-0.84	-
wild oats	0.41	0.25	0.0375-0.1 2	80-180 4	1.5-2.0	-	-	-	-	-
wild turnip	-	-	-	-	-	2.0	1.0-1.43	0.66	0.67-0.84	-
wireweed	-	-	-	-	-	2.0	1.0-1.43 4	-	0.67-0.84 (S)	-
Rec water L/ha boom	50-100	50-150	40-400	50-100	50-150	50-200	220	170 min	50 min	50 min
Herbicide group	A	A	A	A	A	C	C + I	I	I	B

- 1 Add an effective 'top' herbicide for control. See label.
  - 2 0.25 L/ha for volunteer triticale.
  - 3 Use 0.0375-0.1 L/ha in southern and central NSW and 0.05-0.1 L/ha in northern NSW.
  - 4 Wireweed: on red soils of low fertility use the higher rate.
  - 5 Always add either BS1000® at 250 mL/100 L spray, or Hasten™ or Kwickin™ at 0.5 L/100 L spray. Can be tankmixed to broaden grass weed spectrum and improve control. See label.
  - 6 Add Uptake® spraying oil at 0.5 L/100 L water. Use a minimum 250 mL/ha Uptake® or 1 L other oils + wetter per 100 L spray.
  - 7 Add Supercharge® at 1 L/100 L, or aerial application 1 L/ha. Canola may be sensitive to Factor®. See label.
  - 8 Can be used on undersown legumes. Add wetting agent. Do not spray over 25°C.
  - 9 Can be used on undersown legumes except medics. Apply when weeds are less than six leaves, crop 5-15 cm high. Some damage possible. Boom only. Avoid application when temperature > 20°C or if likely to be within a few days.
  - 10 Slight crop damage - leaf burning can occur. Spray when 5-15 cm high. Boom only.
  - 11 Apply 170 L water/ha min.
  - 12 Not if legumes to follow crop - one year.
  - 13 Add wetting agent.
  - (S) Suppression only
- Incorporation**  
PSI Pre-sowing incorporated.  
IBS Incorporated by sowing.  
undersown legume

**Herbicides for control and suppression**

# Pulse crop growth stages



All pulse species have the same basic structure based on a main stem, which can be divided into basic units known as nodes. Two scale leaves appear first and the nodes, where they occur, are not counted as true nodes. A node is made up of a petiole that has stipules where it joins the stem, and leaflets along its length. In some species it terminates in a simple or more complex tendril.

Figure 5. Field pea – conventional leaf type (*Pisum sativum*) e.g. PBA Percy<sup>®</sup>, Sturt

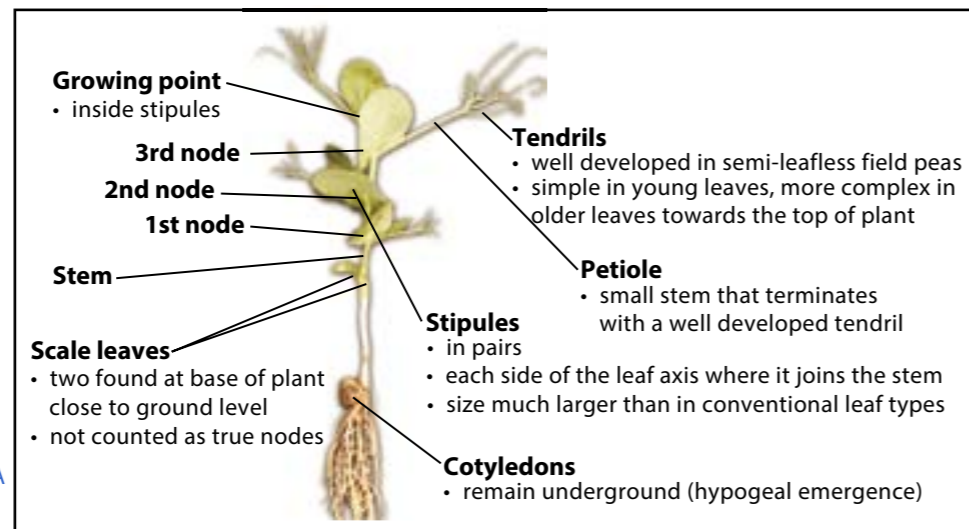


Figure 6. Field pea – semi-leafless leaf type (*Pisum sativum*) e.g. PBA Butler<sup>®</sup>, PBA Oura<sup>®</sup>, PBA Wharton<sup>®</sup>, Morgan.

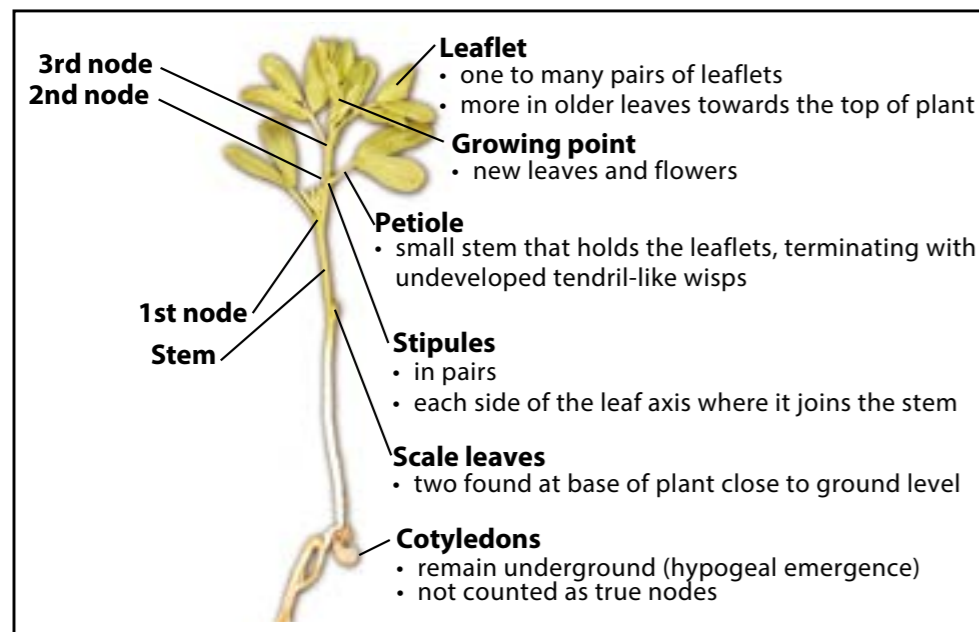


Figure 7. Lentil (*Lens culinaris*)

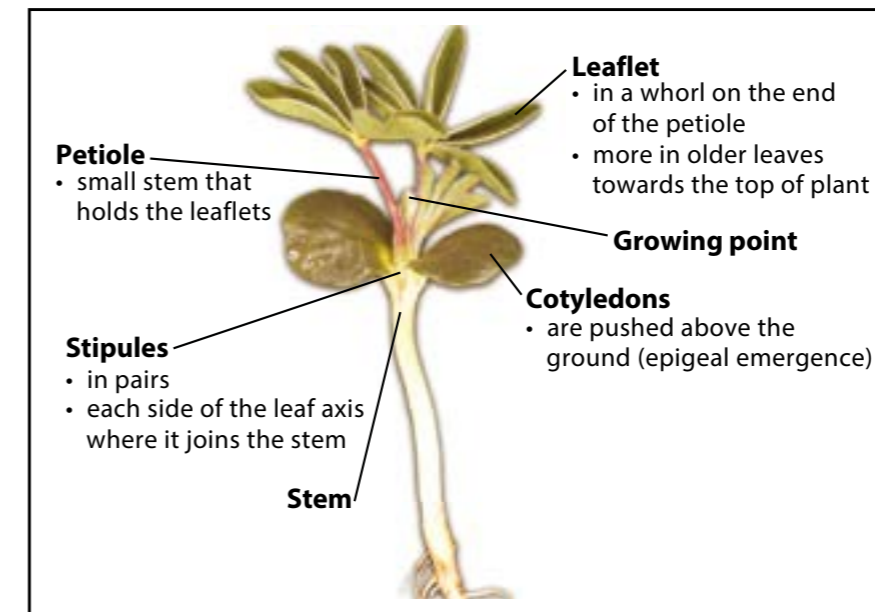


Figure 8. Lupin – albus (*Lupinus albus*) pictured and narrow-leaved (*L. angustifolius*)

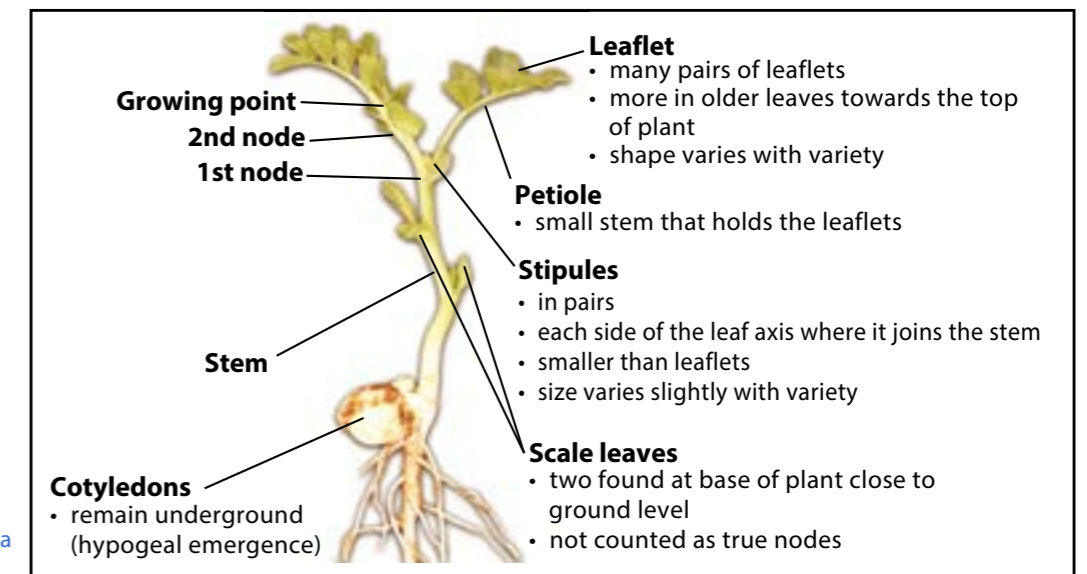


Figure 9. Chickpea (*Cicer arietinum*)

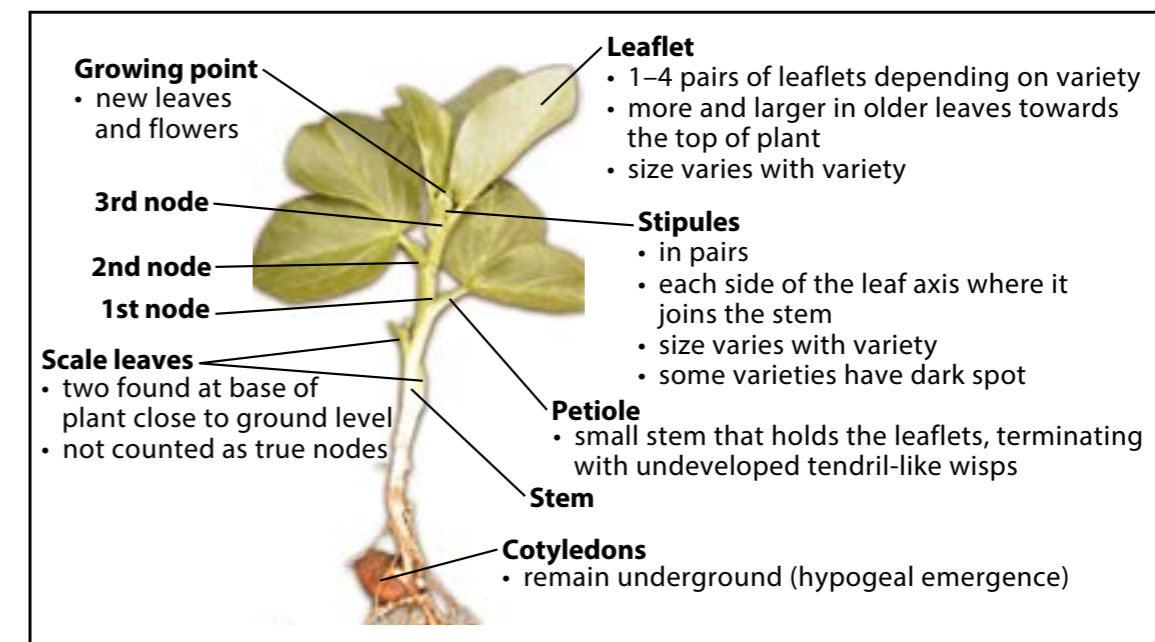


Figure 10. Faba bean (*Vicia faba*)

Table 39. Herbicides for weed control for chickpea pre-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Dimethenamid-P 720 g/L	Terbutylazine 875 g/kg	Metribuzin 480 g/L	Prometryn 900 g/kg	Cyanazine 900 g/kg	Propyzamide 500 g/L	Flumioxazin 500 g/kg
Outlook® <sup>13</sup>	Terbyne® Xtreme® <sup>14 5</sup>	Sencor® 480 <sup>4 15</sup>	Prometryn 900 DF <sup>16</sup>	Bladex® <sup>17</sup>	Rustler® <sup>17</sup>	Terrain®	
Incorporation/growth stage application	IBS KP/PW	IBS PSPE	PSPE	PSPE	PSI, IBS PSPE	IBS	IBS KP/PW
Weeds controlled	(litres)	(kilograms)	(litres)	(kilograms)	(kilograms)	(litres)	(grams)
amsinckia	–	–	0.28–0.58	–	–	–	–
annual phalaris	–	0.86–1.2	0.6–0.86 (S)	–	–	1–2	–
annual ryegrass	1.0	0.86–1.2 (S)	0.6–0.86 (S)	–	–	1.7 or 2.2	–
barley grass	–	–	–	–	–	1.7 or 2.2 (S)	–
brome grass	–	–	–	–	–	1.7 or 2.2 (S) <sup>8</sup>	–
capeweed	–	–	0.28–0.58	–	–	1.7 or 2.2	180 (S)
cereals	–	–	–	–	–	–	–
cockspur – Maltese	–	–	–	–	–	–	–
corn gromwell	–	0.86–1.2	0.6–0.86	–	–	–	–
crassula	–	–	–	–	–	1.7 or 2.2	180 (S)
deadnettle	–	0.86–1.2	0.6–0.86	0.28–0.58	0.83 <sup>7</sup>	1.7 or 2.2	–
fumitory	–	–	–	–	–	1.7 or 2.2 (S)	180 (S)
goosefoot – purple	–	–	–	–	0.83 <sup>7</sup>	–	–
lettuce – wild	–	0.86–1.2	0.6–0.86	–	0.83 <sup>7</sup>	1.7 or 2.2	–
medic	–	0.86–1.2	0.6–0.86	–	–	–	–
mustards	–	0.86–1.2 <sup>12</sup>	0.6–0.86 <sup>12</sup>	0.28–0.58	0.83 <sup>7</sup>	1.7 or 2.2	–
Paterson's curse	–	–	–	–	–	–	–
radish – wild	–	0.86–1.2(S)	0.6–0.86 (S)	0.28–0.58	–	–	180 (S)
rough poppy	–	–	–	0.28–0.58	–	1.7 or 2.2	180 (S)
saffron thistle	–	–	–	–	–	–	–
shepherds purse	–	0.86–1.2	0.6–0.86	0.28–0.58	0.83 <sup>7</sup>	–	–
sowthistle	–	0.86–1.2	0.6–0.86	0.28–0.58	–	1.7 or 2.2	180 (S)
spear thistle	–	–	–	–	–	–	–
spiny emex	–	0.86–1.2 (S)	0.6–0.86 (S)	0.28–0.58	–	1.7 or 2.2	–
stonecrop	–	–	–	–	–	–	–
toad rush	–	0.86–1.2	0.6–0.86	0.28–0.58	–	–	180 (S)
turnip weed	–	0.86–1.2	0.6–0.86	–	0.83 <sup>7</sup>	1.7 or 2.2	–
vulpia	–	0.86–1.2 (S)	0.6–0.86	–	–	1–2	–
wild oats	–	0.86–1.2 (S)	0.6–0.86 (S)	–	–	1–2	–
wild turnip	–	0.86–1.2	0.6–0.86	0.28–0.58	–	1.7 or 2.2	–
winter grass	–	–	–	0.28–0.58	–	1–2	–
wireweed	–	0.86–1.2	0.6–0.86	–	0.83 <sup>7</sup>	1.7 or 2.2 (S)	180 (S)
Rec water L/ha boom	70–120	50 min	50 min	50–100	50–100	80–200	not stated
Herbicide group/mode	K	C	C	C	C	D	G

- <sup>1</sup> Add 0.7 L/ha trifluralin for mixed infestations of wild oats.
- <sup>2</sup> Rate varies with soil texture. Refer to label.
- <sup>3</sup> Preferred option northern NSW only.
- <sup>4</sup> Metribuzin also available as 750 g/kg formulation, see label for rates.
- <sup>5</sup> Use low rate when applying immediately prior to sowing, and higher rate when applying to dry soil before the planting rain.
- <sup>7</sup> Tank mix with 830 g/ha simazine 900 DF for control.
- <sup>8</sup> Great brome only.
- <sup>9</sup> Simazine is also available in a liquid formulation.
- <sup>10</sup> Tankmix with 0.8 L/ha 480 g/L trifluralin for control and apply and incorporate presowing. Trifluralin must be applied PSI or IBS.
- <sup>11</sup> Tankmix with 1.5 L simazine (500 g/L) per ha..
- <sup>12</sup> Indian hedge mustard.

- <sup>13</sup> Outlook® has demonstrated annual ryegrass control in low weed populations only (<100 plant/m<sup>2</sup>). Use in higher weed populations will only give suppression. Apply as late as possible before sowing and sow with a knifepoint and presswheel seeder before weeds germinate. Do not use with disc openers/planting equipment. See label.
- <sup>14</sup> Terbyne® can be used IBS or PSPE. Use the lower rate on light soils and the higher rate on heavier soils.
- <sup>15</sup> Only spray post-sowing pre-emergence. Chickpea southern NSW only. Chickpea sown at least 5 cm deep. Rate depends on soil type – lower rate on light soils, higher rate on heavy soils. See label.
- <sup>16</sup> Apply immediately post-planting with simazine. For reliable results significant rain 20–30 mm is necessary within 2–3 weeks of sowing.
- <sup>17</sup> Incorporate by sowing (IBS) when weeds are at the pre-emergent stage. Use rates towards the higher end of the range on heavy soils, if conditions are not optimal or where a heavy grass population expected

Table 39. Herbicides for weed control for chickpea pre-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Prosulfocarb 800 g/L + S-metolachlor 120 g/L	Simazine 900 g/kg	Diuron 900 g/kg	Trifluralin 480 g/L	Pendimethalin 440 g/L	Isoxaflutole 750 g/kg	Tri-alleate 500 g/L
Boxer Gold®	Simazine 900 DF <sup>9 18</sup>	Diuron 900 WG	Triflur® X <sup>19</sup>	Pendimethalin 440 EC 2)	Balance® 750 WG <sup>21</sup>	Avadex® Xtra <sup>22</sup>	
Incorporation/growth stage application	IBS	PSI, IBS PSPE	IBS PSPE	PSI IBS	PSI IBS	PSPE	PSI IBS
Weeds controlled	(litres)	(grams)	(kilograms)	(litres)	(litres)	(grams)	(litres)
amsinckia	–	–	–	–	–	–	–
annual phalaris	–	–	–	1.2–1.7 <sup>6</sup>	–	–	<sup>1</sup>
annual ryegrass	2.5	0.8–1.1 <sup>10</sup>	–	1.2–1.7 <sup>6</sup>	1.5–2.25	–	<sup>1</sup>
barley grass	–	0.8–1.1 <sup>10</sup>	–	–	–	–	–
brome grass	–	0.8–1.1 <sup>10</sup> (S)	–	–	–	–	–
capeweed	–	0.8–1.1 <sup>10</sup>	0.83–1.1	0.55–0.83	–	100	–
cereals	–	–	–	–	–	–	–
cockspur – Maltese	–	–	–	–	–	–	–
corn gromwell	–	0.8–1.1 <sup>10</sup>	–	–	–	–	–
crassula	–	–	0.83–1.1	0.55–0.83	–	100	–
deadnettle	–	–	–	–	–	100 <sup>11</sup>	–
fumitory	–	0.8–1.1 <sup>10</sup>	–	–	1.2–1.7 <sup>6</sup> (S)	–	–
goosefoot – purple	–	–	–	–	–	–	–
lettuce – wild	–	0.8–1.1 (S)	–	–	–	100	–
medic	–	–	–	–	–	100	–
mustards	–	0.8–1.1 <sup>10</sup>	–	–	–	100	–
Paterson's curse	–	–	–	–	–	–	–
radish – wild	–	–	0.83–1.1	0.55–0.83	–	100	–
rough poppy	–	0.8–1.1	–	–	–	–	–
saffron thistle	–	–	–	–	–	100 <sup>11</sup> (S)	–
shepherds purse	–	0.8–1.1 (S)	–	–	–	–	–
sowthistle	–	0.8–1.1	–	–	–	100	–
spear thistle	–	–	–	–	–	100 <sup>11</sup>	–
spiny emex	–	–	0.83–1.1	0.55–0.83	–	100 <sup>11</sup> (S)	–
stonecrop	2.5	–	–	–	–	–	–
toad rush	2.5	–	0.83–1.1	0.55–0.83	–	–	–
turnip weed	–	0.8–1.1	–	–	–	100	–
vulpia	2.5	–	–	–	–	1.5–2.25 (S)	100 <sup>11</sup>
wild oats	–	0.8–1.1 <sup>10</sup> (S)	–	–	1.2–1.7 <sup>2 6</sup>	1.5–2.25 (S)	–
wild turnip	–	0.8–1.1 <sup>10</sup>	0.83–1.1	0.55–0.83	–	–	–
winter grass	–	–	–	1.2–1.7 <sup>6</sup>	–	–	–
wireweed	–	0.8–1.1 <sup>10</sup>	–	–	1.2–1.7 <sup>6</sup>	1.5–2.25	100 <sup>11</sup> (S)
Rec water L/ha boom	50 min	50–100	50–100	50–100	70–450	50–200	50 min
Herbicide group/mode	J + K	C	C	C	D	D	H

- <sup>18</sup> Apply immediately post-sowing. 20–30 mm rainfall is required within 2–3 weeks for incorporation. Lower rates on alkaline soils, higher rates on red soils. Can be tankmixed with trifluralin (pre-sow), Balance® 750 WG or prometryn (Gesagard®) to broaden weed control. Simazine also available as 600 g/L formulation in Simazine 900 DF applied at slightly lower rates – see label.
- <sup>19</sup> Light soils 1.2–1.5 L/ha. Medium-heavy soils 1.5–1.7 L/ha. Can sow in band. Apply and incorporate from 4 weeks up to just before sowing.
- <sup>20</sup> In northern NSW incorporate twice at rate of 1.9–2.25 L/ha. In southern NSW incorporate by sowing process (IBS) at rate of 1.5–2.25 L/ha. See label.
- <sup>21</sup> Apply immediately post-sowing. Not on sandy soils with less than 10% clay. Use only where following crops in rotation are cereals or maize. Can be tankmixed with simazine to broaden weed control.

- <sup>22</sup> Apply and incorporate immediately prior to sowing or up to 3 weeks before sowing. See Label. Can be tankmixed with trifluralin. (S) Suppression only.
- Incorporation**
- |       |                           |
|-------|---------------------------|
| PSI   | Pre-sowing incorporated.  |
| IBS   | Incorporated by sowing.   |
| PSPE  | Post-sowing pre-emergence |
| KP/PW | Knife point press wheel.  |



Table 40. Herbicides for weed control for chickpea post-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Fluazifop-P 128 g/L	Haloxyfop-R 520 g/L	Butoxydim 250 g/kg	Quizalofop-p-ethyl 200 g/L	Clethodim 240 g/L	Propaquizafop 100 g/L	Flumetsulam 800 g/kg
	Fusilade® Forte	Verdict® 520 ⑤	Factor® WG ⑥	Elantra® Xtreme® ⑦	Status® ⑧	Shogun® ⑨	Broadstrike® ⑩
Apply at crop growth stage	Up until 7 weeks before harvest	2 leaf to before flowering	–	Not before 5 leaf and up until 12 weeks before harvest	Not beyond full flower	Up until 12 weeks before harvest	4–6 leaf
Weeds controlled	(litres)	(litres)	(grams)	(litres)	(litres)	(litres)	(grams)
amsinckia	–	–	–	–	–	–	25
annual phalaris	–	0.05–0.1	80–180	–	0.15–0.5 ④	–	–
annual ryegrass	–	0.075–0.1	80–180	0.15 or 0.19	0.15–0.5	0.45	–
barley grass	–	0.05–0.1	80–180	0.125	0.175–0.5	0.2	–
brome grass	0.5	0.05–0.1	80–180	0.15 or 0.19	0.175–0.5	0.3	–
capeweed	–	–	–	–	–	–	–
cereals	–	0.05–0.1	80–180	0.125	0.2–0.5 ②	0.2 ③	–
cockspur – Maltese	–	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–	–
fumitory	–	–	–	–	–	–	–
goosefoot – purple	–	–	–	–	–	–	–
lettuce – wild	–	–	–	–	–	–	–
medic	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	25
Paterson's curse	–	–	–	–	–	–	–
radish – wild	–	–	–	–	–	–	25 (S)
rough poppy	–	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–	25
sowthistle	–	–	–	–	–	–	–
spear thistle	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	–
toad rush	–	–	–	–	–	–	–
turnip weed	–	–	–	–	–	–	25
vulpia	–	–	–	–	0.25–0.5 (S)	–	–
wild oats	–	0.0375–0.1 ①	80–180	0.065 or 0.125	0.175–0.5	0.25	–
wild turnip	–	–	–	–	–	–	25
winter grass	–	–	–	–	–	–	–
wireweed	–	–	–	–	–	–	–
Rec water L/ha boom	50–100	50–150	50 min	50–150	50 min	30–150	50–150
Herbicide group/mode	A	A	A	A	A	A	B

- ① Use 0.0375–0.1 L/ha in southern and central NSW and 0.05–0.1 L/ha in northern NSW.
- ② Use higher rate on volunteer barley.
- ③ Volunteer triticale 0.25 L/ha.
- ④ Use higher rate on *Phalaris paradoxa*
- ⑤ Add Uptake® spraying oil at 0.5 L/100 L water, Use a minimum of 250 mL/ha Uptake® or 1 L other oils + wetter per 100 L water.
- ⑥ Factor® has good activity on barley grass and wild oats but weaker on brome grass and volunteer cereals. Adding a 'fop herbicide is recommended. See label.
- ⑦ Add non-ionic surfactant at 200 mL/100 L or non-ionic surfactant at 100 mL/100 L + mineral spray oil at 1 L/100 L or Hasten™ at 1 L/100 L. See label.

- ⑧ Add 1 L Hasten® or Kwickin™ or 0.5 L Uptake® oil/100 L spray. Use lower rates on small actively growing weeds.
  - ⑨ Always add BS1000® at 250 mL/100 L spray or Hasten™ or Kwickin™ at 500 mL/100 L spray. Can be tankmixed to broaden and improve grass control. See label.
  - ⑩ DO NOT use any spray additives or tankmix any other chemicals. May cause transient crop yellowing, reddening and height suppression. Flowering may be delayed resulting in yield suppression. Crop stage 4–6 branches. See label.
- (S) Suppression only.

Table 41. Herbicides for weed control for field pea – Pre-sowing, pre-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Dimethenamid-P 720 g/L	Terbuthylazine 875 g/kg	Cyanazine 900 g/kg	Prosulfocarb 800 g/L + S-metolachlor 120 g/L	Trifluralin 480 g/L	Pendimethalin 440 g/L	Triallate 500 g/L	Propyzamide 500 g/L	Flumioxazin 500 g/kg
	Outlook® ⑧	Terbyne® Xtreme® ⑨	Bladex® ⑩	Boxer Gold®	Triflur® X ⑪	Pendimethalin 440 EC ⑫	Avadex® Xtra ⑬	Rustler® ⑭	Terrain®
Incorporation	IBS KP/PW	IBS PSPE	PSI, IBS	IBS	PSI, IBS	PSI, IBS	PSI, IBS	IBS	IBS KP/PW
Weeds controlled	(litres)	(kilograms)	(kilograms)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
amsinckia	–	–	–	–	–	–	–	–	–
annual phalaris	–	0.86–1.2(S)	0.6–0.86(S)	–	1.2–1.7	–	–	1–2	–
annual ryegrass	1.0	0.86–1.2(S)	0.6–0.86(S)	1.7 or 2.2 ⑥	2.5	1.2–1.7	1.5–2.25	1–2	–
barley grass	–	–	–	1.7 or 2.2 (S)	–	–	–	1–2	–
blackberry nightshade	–	–	–	(S)	–	–	–	–	–
brome grass	–	–	–	–	–	–	–	1–2	–
capeweed	–	–	–	1.7 or 2.2	–	–	–	–	180 (S)
charlock	–	–	–	–	–	–	–	–	–
chickweed	–	–	–	1.7 or 2.2	–	–	–	–	–
corn gromwell	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–
cotula – common	–	–	–	–	–	–	–	–	–
crassula	–	–	–	1.7 or 2.2	–	–	–	–	180 (S)
deadnettle	–	0.86–1.2	0.6–0.86	1.7 or 2.2	–	–	–	–	–
fat hen	–	–	–	(S)	–	–	–	–	–
fumitory	–	–	–	1.7 or 2.2 (S)	–	1.2–1.7	–	–	180 (S)
great brome	–	–	–	(S)	–	–	–	–	–
mintweed	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–
mouse-ear chickweed	–	–	–	(S)	–	–	–	–	–
mustards	–	0.86–1.2 ⑦	0.6–0.86	1.7 or 2.2	–	–	–	–	–
ox tongue	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–	–	–	–
prickly lettuce	–	0.86–1.2	0.6–0.86	1.7 or 2.2	–	–	–	–	–
radish – wild	–	0.86–1.2(S)	0.6–0.86(S)	1.7 or 2.2 (S)	–	–	–	–	180 (S)
rough poppy	–	–	–	1.7 or 2.2	–	–	–	–	180 (S)
shepherd's purse	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–
silver grass	–	–	–	–	2.5	–	–	–	–
sowthistle	–	–	0.6–0.86	1.7 or 2.2	–	–	–	–	180 (S)
spiny emex	–	0.86–1.2(S)	0.6–0.86(S)	1.7 or 2.2	–	–	–	–	–
stinging nettle	–	–	–	1.7 or 2.2	–	–	–	–	–
stone crop	–	–	–	–	2.5	–	–	–	–
toad rush	–	0.86–1.2	0.6–0.86	–	2.5	–	–	–	180 (S)
turnip weed	–	0.86–1.2	0.6–0.86	1.7 or 2.2	–	–	–	–	–
vulpia	–	0.86–1.2(S)	–	–	–	1.5–2.25 (S)	–	1–2	–
wild gooseberry	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–
wild oats	–	0.86–1.2 (S)	0.6–0.86 (S)	–	–	1.2–1.7 ①	1.5–2.25 (S)	1.6 ②	1–2
wild turnip	–	0.86–1.2	0.6–0.86	1.7 or 2.2	–	–	–	–	–
winter grass	–	–	–	–	–	1.2–1.7	–	–	1–2
wireweed	–	0.86–1.2	0.6–0.86	1.7 or 2.2 (S) ③	–	1.2–1.7	1.5–2.25	–	180 (S)
Rec water L/ha boom	70–120	50 min	–	80–200	50 min	70–450	50–200	30–100	not stated
Herbicide group	K	C	C	J + K	D	D	J	D	G

- ① Refer to label for details.
- ② Preferred option for northern NSW only.
- ③ Apply and incorporate immediately before or up to 3 weeks before sowing. See label. Can be tankmixed with trifluralin for control of mixed infestations of ryegrass, wild phalaris and wireweed.
- ④ Eight weeks suppression of grass weeds. For full control of grass weeds a follow up spray with a grass herbicide may be required.
- ⑤ A follow up treatment with another product may be needed for control of wild radish under high weed pressure or rainfall conditions.
- ⑥ Add trifluralin or pendimethalin.
- ⑦ Indian hedge mustard.
- ⑧ Outlook® has demonstrated annual ryegrass control in low weed populations only (<100 plant/m<sup>2</sup>). Use in higher weed populations will only give suppression. Apply as late as possible before sowing and sow with a knife point and presswheel seeder before weeds germinate. Do not use with disc openers/planting equipment. See label.

- ⑨ Terbyne® can be used IBS or PSPE. Use the lower rate on light soils and the high rate on heavier soils. Sufficient rain is necessary within 2–3 weeks after application.
  - ⑩ Use higher rate on heavier soil types. Pre-sowing application: apply between 14 days before and up to sowing.
  - ⑪ Spray and incorporate 0–4 weeks before sowing. See label. Apply 1.2 L/ha on light soils and 1.5–1.7 L/ha on medium to heavy soils.
  - ⑫ Sow seed under chemical band. See label. Lower rates where double incorporation and southern NSW only.
  - ⑬ Incorporate by sowing (IBS) when weeds are at the pre-emergent stage. Use rates towards the higher end of the range on heavy soils, if conditions are not optimal or where a heavy grass population expected
- (S) Suppression only.
- Incorporation**
- PSI Pre-sowing incorporated.
  - IBS Incorporated by sowing.
  - PSPE Post-sowing pre-emergence.
  - KP/PW Knife point press wheel. only



Table 43. Herbicides for weed control for field pea – Early post-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Quizalofop-p-ethyl 200 g/L Elantra® Xtreme® <sup>9</sup>	Clethodim 240 g/L Status® <sup>10</sup>	Propaquizafop 100 g/L Shogun® <sup>11</sup>	Haloxifop-R 520 g/L Verdict® 520 <sup>12</sup>	Butroxydim 250 g/kg Factor® WG <sup>13</sup>	Fluazifop-p 128 g/L Fusilade® Forte	Imazethapyr 700 g/kg Spinner® 700 WDG <sup>7</sup>
Apply at crop growth stage	Up until 9 weeks before harvest	Not beyond full flowering	Up until 12 weeks before harvest	2nd node to before flowering	–	Any time, until 7 weeks before harvest	–
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(grams)
amsinckia	–	–	–	–	–	–	–
annual phalaris	–	0.15–0.5 <sup>5</sup>	–	0.05–0.1	80–180	0.41	–
annual ryegrass	0.15 or 0.19	0.15–0.5	0.2–0.3	0.075–0.1	80–180	0.41	–
barley grass	0.125	0.175–0.5	0.2–0.3	0.05–0.1	80–180	0.41	–
brome grass	0.15 or 0.19	0.175–0.5	0.2–0.3	0.05–0.1	80–180	0.5	–
capeweed	–	–	–	–	–	–	–
cereals	0.125	0.2–0.5 <sup>4</sup>	0.2–0.3 <sup>2</sup>	0.05–0.1	80–180	0.41	–
charlock	–	–	–	–	–	–	–
chickweed	–	–	–	–	–	–	–
crassula/stonecrop	–	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	–
cotula – common	–	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–	70
dock	–	–	–	–	–	–	–
fat hen	–	–	–	–	–	–	–
fumitory	–	–	–	–	–	–	–
heliotrope	–	–	–	–	–	–	–
marshmallow	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	70 <sup>6</sup>
nettle (stinging)	–	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–	–
radish – wild	–	–	–	–	–	–	–
rough poppy	–	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–	–
sorrell	–	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	–
storksbill	–	–	–	–	–	–	–
toad rush	–	–	–	–	–	–	70
turnip weed	–	–	–	–	–	–	–
variegated thistle	–	–	–	–	–	–	–
wild lettuce	–	–	–	–	–	–	–
wild oats	0.065 or 0.125	0.175–0.5	0.2–0.3	0.0375–0.1 <sup>3</sup>	80–180	0.41	–
wild turnip	–	–	–	–	–	–	–
winter grass	–	–	–	–	–	–	–
wireweed	–	–	–	–	–	–	70 <sup>20</sup>
Rec water L/ha boom	50–150	50 min	30–150	50–150	50 min	50–100	50–100
Herbicide group	A	A	A	A	A	A	B

- <sup>1</sup> See label for tank mix options.
- <sup>2</sup> Volunteer triticale 250 mL/ha.
- <sup>3</sup> Use 0.0375–0.1 L/ha in southern and central NSW and 0.05–0.1 L/ha in northern NSW.
- <sup>4</sup> Use high rate for volunteer barley.
- <sup>5</sup> Use high rate on *Phalaris paradoxa*
- <sup>6</sup> Indian hedge mustard.
- <sup>7</sup> Alma, Dun, Dundale, Wirrega varieties only. Weeds cotyledon to 3-leaf stage. Add non-ionic surfactant at 200 mL per 100 L water. See Table 2 on page 8 for recropping intervals.

- <sup>8</sup> Add 125–150 mL Brodal® options.
- <sup>9</sup> Add non-ionic surfactant at 200 mL/100 L or non-ionic surfactant at 100 mL/100 L + mineral spray oil at 1 L/100 L or Hasten™ at 1 L/100 L. See label.
- <sup>10</sup> Add 1 L Hasten™ or Kwickin™ or 0.5 L Uptake® oil/100 L spray.
- <sup>11</sup> Always add either BS1000® at 250 mL/100 L spray or Hasten™ or Kwickin™ at 500 mL/100 L spray. Can be tankmixed to broaden grass spectrum and improve control. See label.
- <sup>12</sup> Add Uptake® spraying oil at 0.5 L/100 L. Use wetter only, when tankmixing with broadleaf herbicides. Products also available containing 130 g/L haloxifop-R formulation (Assett®).

Table 43. Herbicides for weed control for field pea – Early post-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazamox 700 g/kg Raptor® <sup>15</sup>	Flumetsulam 800 g/kg Broadstrike® <sup>16</sup>	Metribuzin 480 g/L Sencor® 480 SC <sup>17</sup>	Cyanazine 900 g/kg Bladex® <sup>18</sup>	Diflufenican 500 g/L Brodal® Options <sup>19</sup>	MCPA 750 g/L Agritone® 750 <sup>14</sup>
Apply at crop growth stage	Not after 4th node	2–6 nodes	Before 3rd node	After 2nd node but before flowering	3rd node to flowering	3rd node to before flowering
Weeds controlled	(grams)	(grams)	(litres)	(kilograms)	(litres)	(litres)
amsinckia	–	25	0.28–0.58	–	0.2 (S)	–
annual phalaris	–	–	–	–	–	–
annual ryegrass	–	–	0.28–0.58 (S)	0.85–1.1	–	–
barley grass	45	–	–	(S)	–	–
brome grass	45 (S)	–	–	–	–	–
capeweed	45	–	0.28–0.58	–	0.2	–
cereals	–	–	0.28–0.58	–	0.2 (S)	–
charlock	45	25	–	0.85–1.1	–	0.08–0.1 <sup>4</sup>
chickweed	–	–	0.28–0.58	0.85–1.1	0.2	–
crassula/stonecrop	–	–	–	–	0.2	–
corn gromwell	–	–	0.28–0.58	0.85–1.1	0.2 (S)	–
cotula – common	–	–	0.28–0.58	–	0.2 (S)	–
deadnettle	–	–	0.28–0.58	–	0.2	–
dock	45	–	0.28–0.58	0.85–1.1	0.2	–
fat hen	–	–	0.28–0.58	0.85–1.1(S)	–	–
fumitory	45	–	–	–	–	–
heliotrope	–	–	–	–	0.2 (S)	–
marshmallow	–	–	–	–	0.2	–
mustards	–	25	–	0.85–1.1	0.15–0.2	–
nettle (stinging)	–	–	–	–	0.2	–
Paterson's curse	45	–	0.28–0.58	0.85–1.1	0.2	–
radish – wild	–	25 (S)	–	–	0.2 (S)	–
rough poppy	–	–	–	0.85–1.1	0.2	–
shepherd's purse	45 (S)	25	0.28–0.58	0.85–1.1 (S)	0.2	–
skeleton weed	–	–	0.28–0.58	0.85–1.1	0.2 (S)	–
sorrell	45 (S)	–	0.28–0.58	–	0.2 (S)	–
sowthistle	–	–	–	0.85–1.1	0.2 (S)	–
spiny emex	–	–	0.28–0.58	0.85–1.1	–	–
storksbill	45 (S)	–	0.28–0.58	0.85–1.1	–	–
toad rush	–	–	0.28–0.58	–	0.2 (S)	–
turnip weed	45	25	–	0.85–1.1	0.2	–
variegated thistle	–	–	–	–	–	–
wild lettuce	–	–	–	–	0.2	–
wild oats	45	–	–	–	–	–
wild turnip	45	25	0.28–0.58	0.85 or 1.1	0.15–0.2	–
winter grass	–	–	0.28–0.58	–	–	–
wireweed	45 (S)	–	0.28–0.58	0.85–1.1 (S)	0.2 (S)	–
Rec water L/ha boom	50 min	50–150	50–100	80–200	70–100	30–120
Herbicide group	B	B	C	C	F	I

- <sup>13</sup> Factor® has good activity on barley grass and wild oats but weaker on brome grass and volunteer cereals. Adding a 'fop herbicide is recommended. See label.
- <sup>14</sup> May delay crop maturity. Apply early post-emergence after the 3rd node stage and before the start of flowering. Weeds 4–6 leaf stage.
- <sup>15</sup> Apply to Alma, Excell or Parafield varieties. Contact BASF for current information on varieties to which Raptor® can be applied.
- <sup>16</sup> Do not add any spray additives. May cause yellowing, reduced height and delayed flowering.

- <sup>17</sup> Do not tank mix with other herbicides for field pea. Check label for suitable rate and influence of variety and disease. Best results with moist soil surface. Two sunny days before spraying improves crop tolerance. See label.
- <sup>18</sup> Not on Wirrega field pea post-emergent. Use higher rate on larger weeds.
- <sup>19</sup> Apply before crop canopy obscures weeds. Caution on alkaline soils.
- <sup>20</sup> Surviving plants will generally be retarded and will not compete with crop.
- (S) Suppression only.



Table 44. Herbicides for weed control for lupin – pre-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Dimethenamid-P 720 g/L		Terbutylazine 875 g/kg		Simazine 900 g/kg		Simazine 500 g/L		Trifluralin 480 g/L	Pendimethalin 440 g/L	Prosulfocarb 800 g/L + S metolachlor 120 g/L	Tri-Allate 500 g/L	Propyzamide 500 g/L
	Outlook® 6	Terbyne® Xtreme® 7	Light soils Simazine 900 DF 1 2 8	Loam soils Simazine 900 DF 1 2 8	Loam soils Simazine 900 DF 1 2 8	Light soils Simazine 500 1 2 8	Loam soils Simazine 500 1 2 8	Loam soils Simazine 500 1 2 8	Triflur® X 10	Pendimethalin 440 EC B	Boxer Gold®	Avadex® Xtra 2 7	Rustler® B
<b>Incorporation</b>	IBS	PSPF	PSPF	PSPF	PSPF	PSPF	PSPF	PSPF	IBS, PSI	IBS, PSI	IBS	IBS, PSI	IBS
<b>Weeds controlled</b>	(litres)	(kilograms)	(kilograms)	(kilograms)	(kilograms)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–	–	–	–	–	–	–
annual phalaris	–	0.86–1.2	0.6–0.86 (S)	–	–	–	–	–	1.2–1.7	–	–	–	–
annual ryegrass	1.0	0.86–1.2	0.6–0.86 (S)	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	1.2–1.7	1.5	2.5	–	1–2
barley grass	–	–	–	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	1–2
brome grass	–	–	–	0.8–1.1 (S)	1.3–2.2 (S)	1.5–2.0 (S)	2.5–4.0 (S)	2.5–4.0 (S)	–	–	–	–	1–2
capeweed	–	–	–	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	–
cereals	–	–	–	–	–	–	–	–	–	–	–	–	–
charlock	–	–	–	–	–	–	–	–	–	–	–	–	–
crassula	–	–	–	–	–	–	–	–	–	–	2.5	–	–
corn gromwell	–	0.86–1.2	0.6–0.86	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	–
deadnettle	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–	–	–	–	–
fumitory	–	–	–	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	1.2–1.7 (S)	–	–	–	–
mustards	–	0.86–1.2	0.6–0.86 (S)	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–	–	–	–	–	–	–	–
radish–wild	–	0.86–1.2 (S)	0.6–0.86 (S)	–	–	–	–	–	–	–	–	–	–
rough poppy	–	–	–	–	–	–	–	–	–	–	–	–	–
shepherd's purse	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–	–	–	–	–
silvergrass	–	–	–	–	–	–	–	–	–	1.5 B	2.5	–	–
skeleton weed	–	–	–	–	–	–	–	–	–	–	–	–	–
sowthistle	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–	–	–	–	–
spiny emex	–	0.86–1.2 (S)	0.6–0.86 (S)	–	–	–	–	–	–	–	–	–	–
toadrush	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–	–	–	–	–
turnip weed	–	0.86–1.2	0.6–0.86	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	–
vulpia	–	–	–	–	–	–	–	–	–	–	–	–	–
wild lettuce	–	0.86–1.2	0.6–0.86	–	–	–	–	–	–	–	–	–	–
wild oats	–	0.86–1.2 (S)	0.6–0.86 (S)	0.8–1.1 (S)	1.3–2.2 (S)	1.5–2.0 (S)	2.5–4.0 (S)	2.5–4.0 (S)	1.2–1.7 B	1.5 (S) B	–	1.6 A	1–2
wild turnip	–	0.86–1.2	0.6–0.86	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	2.5–4.0	–	–	–	–	–
winter grass	–	–	–	–	–	–	–	–	1.2–1.7	–	–	–	1–2
wireweed	–	0.86–1.2	0.6–0.86	0.8–1.1	1.3–2.2	–	–	–	1.2–1.7	1.5 B	–	–	–
Rec water L/ha boom	70–120	50 min	50–100	50–100	50–100	50–100	50–100	50–100	70–450	50–200	50 min	30–100	not stated
Herbicide group	K	C	C	C	C	C	C	C	D	D	J, K	J	D

- 1 Simazine and Brodal® can be tankmixed.
- 2 Trifluralin, Avadex® Xtra can be tankmixed.
- 3 Refer to label.
- 4 Preferred option northern NSW only.
- 5 Indian hedge mustard.
- 6 Outlook® has demonstrated annual ryegrass control in low weed populations only (<100 plant/m<sup>2</sup>). Use in higher weed populations will only give suppression. Apply as late as possible before sowing and sow with a knife point and press wheel seeder before weeds germinate. Do not use with disc openers/planting equipment. See label.
- 7 Terbyne® can be used IBS or PSPF. Use the lower rate on light soils and the high rate on heavier soils. Sufficient rain is necessary within 2–3 weeks after application.
- 8 Apply to level seedbed within 2 days after sowing.
- 9 Light soils 1.2 L/ha. Medium–heavy soils 1.5–1.7 L/ha. Can sow in band. Apply and incorporate from 4 weeks up to just before sowing.
- 10 Apply and incorporate immediately prior to or up to 3 weeks before sowing.
- 11 Incorporate by sowing (IBS) when weeds are at the pre-emergent stage. Use rates towards the higher end of the range on heavy soils, if conditions are not optimal or where a heavy grass population expected
- 12 Suppression only.

**Incorporation**

- PSI Pre-sowing incorporated.
- IBS Incorporated by sowing.
- PSPF Post-sowing pre-emergence.
- KP/PW Knife point press wheel only

Table 45. Herbicides for weed control for lupin – post-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details. Apply at crop growth stage	Diclofop-methyl 375 g/L Diclofop-methyl 500 EC 6	Fluazifop-P 128 g/L Fusilade® Forte 5	Haloxyfop-R Verdict® 520 9	Quiafop-P-ethyl Elantra® Xtreme® 10	Butoxydim Factor® WG 2 11	Clethodim Status® 7	Propaquizafop 100 g/L Shogun® 8	Metosulam 100 g/L Eclipse® 100 SC 7 9	Diflufenican 500 g/L Brodal® Options 16	Paraquat 360 g/L Gramoxone® 360 Pro (+ appropriate adjuvant) 17
<b>Weeds controlled</b>	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(millilitres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–	–	0.2 (S)	–
annual phalaris	–	0.41–0.82	0.05–0.1	–	80–180	0.15–0.5 6	–	–	–	–
annual ryegrass	1.0	0.41–0.82	0.075–0.1	0.15 or 0.19	80–180	0.15–0.5	0.45	–	–	0.28–0.56
barley grass	–	–	0.05–0.1	0.125	80–180	0.175–0.5	0.2	–	–	–
brome grass	–	0.41–0.82	0.05–0.1	0.15 or 0.19	80–180	0.175–0.5	0.3	–	–	–
capeweed	–	–	–	–	–	–	–	–	0.2 (S)	–
cereals	–	0.41–0.82	0.05–0.1	0.125	80–180	0.2–0.5 4	0.2 1	–	–	–
charlock	–	–	–	–	–	–	–	–	0.2	–
corn gromwell	–	–	–	–	–	–	–	–	0.2 (S)	–
deadnettle	–	–	–	–	–	–	–	–	0.2	–
fumitory	–	–	–	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	–	–	0.15–0.2	–
Paterson's curse	–	–	–	–	–	–	–	–	0.2 (S)	–
radish–wild	–	–	–	–	–	–	–	–	0.2	–
rough poppy	–	–	–	–	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	–	–	0.2 (S)	–
toadrush	–	–	–	–	–	–	–	–	0.2	–
turnip weed	–	–	–	–	–	–	–	–	–	–
vulpia	–	–	–	–	–	–	–	–	–	–
wild lettuce	–	–	–	–	–	–	–	–	0.2	–
wild oats	1.5–2.0	0.41–0.82	0.0375–0.1 3	0.065 or 0.125	80–180	0.175–0.5	0.25	–	–	–
wild turnip	–	–	–	–	–	–	–	–	–	–
winter grass	–	–	–	–	–	–	–	–	–	–
wireweed	–	–	–	–	–	–	–	–	–	–
Rec water L/ha boom	50–150	50–100	50–150	50–150	50 min	50 min	30–150	50–100	70–100	50–100
Herbicide group	A	A	A	A	A	A	A	B	F	L

- 1 0.25 L/ha for volunteer triticale.
- 2 See label for tank mix options.
- 3 Use 0.0375–0.075 L/ha in central and southern NSW and 0.05–0.1 L/ha in northern NSW.
- 4 Use high rate for volunteer barley.
- 5 Use the lower rate when grass weeds are actively growing at 2–5 leaf stage before tillering starts. Use the higher rate when grass weeds are growing actively at 5 leaf to early tillering.
- 6 Use higher rate on *Phalaris paradoxa*.
- 7 Jindalee, Kiev, Quillock and Wonga varieties. Do not apply past 8-leaf in Wonga.
- 8 1.25 L/ha controls common bargrass. Add wetting agent.
- 9 Add 0.5 L Uptake® spraying oil/100 L water. Use a minimum of 250 mL/ha or other oils at 1 L + wetter/100 L water.
- 10 Add non-ionic surfactant at 200 mL/100 L or non-ionic surfactant at 100 mL/100 L + mineral spray oil at 1 L/100 L or Hasten™ at 1 L/100 L. See label.
- 11 Factor® has good activity on barley grass and wild oats but weaker on brome grass and volunteer cereals. Adding a 'fop herbicide is recommended. See label.
- 12 Add 1 L Hasten® or Kwicken™ or 0.5 L Uptake® oil/100 L spray. Use lower rates on small actively growing weeds.
- 13 Always add either B51000® at 250 mL/100 L water or Hasten™ or Kwicken™ at 500 mL/100 L of spray.
- 14 Apply at 2–10 leaf stage of lupin and weeds up to 8 leaf stage. Do not apply with crop oils, surfactants or wetters. At least 10 days should elapse between application of Eclipse® and grass herbicide. Not on Merrit after 8 leaf stage.
- 15 Narrow leaf lupin only. Apply at 2–6 leaf stage of crop and 2–8 leaf stage of wild radish. (capeweed 2–4 leaf stage) Not in northern NSW.
- 16 Apply from 2 leaf stage of crop and before the start of primary flowering. Young weeds actively growing 4–6 weeks after sowing (up to 4 leaf stage).
- 17 Spraytop ryegrass to reduce seedset when most of the ryegrass heads have emerged and are flowering or just past flowering. 7 days WHP. Ensure crop has reached physiologically mature stage to avoid yield loss.
- 18 Suppression only.

Table 46. Herbicides for weed control for faba bean and lentil – pre-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazethapyr 700 g/kg Spinnaker® 700 WDG 10 Faba bean only	Terbuthylazine 875 g/kg Terbyne® Xtreme® 11	Simazine 900 g/kg Simazine 900 DF 12 Faba bean only	Cyanazine 900 g/kg Bladex® 13	Prosulfocarb 800 g/L + S- metolachlor 120 g/L Boxer Gold®	Flumioxazin 500 g/kg Terrain® Faba bean only
Incorporation	PSPE	IBS PSPE	PSI, IBS, PSPE	PSI, IBS	IBS	IBS KP/PW
Weeds controlled	(grams)	(kilograms)	(kilograms)	(kilograms)	(litres)	(grams)
amsinckia	70–100	–	–	–	–	–
annual phalaris	–	0.86–1.2 (S)	0.6–0.86 (S)	1.1–1.4	–	–
annual ryegrass	70 6	0.86–1.2 (S)	0.6–0.86 (S)	1.1–1.4 9	1.7–2.2	2.5
barley grass	70 6	–	–	1.1–1.4	1.7–2.2 (S)	–
brome grass	–	–	–	1.1–1.4	1.7–2.2 (S) 4	–
capeweed	70–100	–	–	1.1–1.4	1.7–2.2	–
canola – volunteer	–	–	–	1.1–1.4 5	–	–
cereals	–	–	–	–	–	–
corn gromwell	–	0.86–1.2	0.6–0.86	1.1–1.4	–	–
crassula	–	–	–	–	1.7–2.2	–
deadnettle	70	0.86–1.2	0.6–0.86	1.1–1.4	1.7–2.2	–
erodium	–	–	–	–	–	–
fumitory	–	–	–	1.1–1.4	1.7–2.2 (S)	–
goosefoot – purple	–	–	–	–	–	–
lettuce – prickly	70–100	0.86–1.2	0.6–0.86	–	1.7–2.2	–
medics	–	0.86–1.2	0.6–0.86	1.1–1.4	–	–
mustards	70 t	0.86–1.2 8	0.6–0.86 8	1.1–1.4	1.7–2.2	–
Paterson's curse	70	–	–	–	–	–
radish – wild	70 7 (S)	0.86–1.2 (S)	0.6–0.86 (S)	–	1.7–2.2 (S)	–
rough poppy	–	–	–	–	1.7–2.2	–
saffron thistle	–	–	–	1.1–1.4	–	–
shepherds purse	70	0.86–1.2	0.6–0.86	–	–	–
silvergrass	–	–	–	–	2.5	–
soursob	–	–	–	1.1–1.4	–	–
sowthistle	–	0.86–1.2	0.6–0.86	–	1.7–2.2	–
spiny emex	70	0.86–1.2 (S)	0.6–0.86 (S)	–	1.7–2.2	–
stonecrop	–	–	–	–	2.5	–
toad rush	70	0.86–1.2	0.6–0.86	–	–	2.5
turnip weed	70	0.86–1.2	0.6–0.86	–	1.7–2.2	–
vulpia	–	–	–	–	–	–
wild oats	70 6	0.86–1.2	0.6–0.86 (S)	1.1–1.4 (S)	–	–
wild turnip	–	0.86–1.2	0.6–0.86	–	1.7–2.2	–
winter grass	–	–	–	–	–	–
wireweed	70	0.86–1.2	0.6–0.86	1.1–1.4	1.7–2.2 (S)	–
Rec water L/ha boom	50–100	50 min	–	50–100	80–200	50 min
Herbicide group/mode	B	C	C	C	J + K	G

- 1 Refer to label for details.
- 2 Metribuzin also available as 750 g/kg formulation, see label for rates.
- 3 Apply and incorporate immediately prior to sowing or up to 3 weeks before sowing. See label. Can be tankmixed with trifluralin to control mixed infestations of ryegrass, wild phalaris and wireweed.
- 4 Great brome only.
- 5 Not TT canola volunteers.
- 6 Eight weeks suppression of grass weeds. For full control a specific grass herbicide may be required.

- 7 Adequate control may not be obtained under high weed pressure or high rainfall.
- 8 Indian hedge mustard.
- 9 See label for tank mix options.
- 10 Apply post-sowing pre-emergent to weed-free seedbed. Note recropping intervals on Table 2 on page 8. Check label.
- 11 Terbyne® can be used IBS or PSPE. Use the lower rate on light soils and the high rate on heavier soils. Sufficient rain is necessary within 2–3 weeks after application.

Table 46. Herbicides for weed control for faba bean and lentil – pre-emergence (continued, page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metribuzin 480 g/L Sencor® 480 2 14 Faba bean only	Diuron 900 g/kg Diuron 900 WG	Trifluralin 480 g/L Triflur® X 15 Lentil only	Pendimethalin 440 g/L Pendimethalin 440 EC 16	Triallate 500 g/L Avadex® Xtra 17 Faba bean only	Propyzamide 500 g/L Rustler®
Incorporation	PSPE	IBS PSPE	PSI, IBS	PSI, IBS	PSI, IBS	IBS
Weeds controlled	(litres)	(kilograms)	(litres)	(litres)	(litres)	(litres)
amsinckia	0.28–0.58	–	–	–	–	–
annual phalaris	–	–	0.8–1.2	–	1 1	1–2
annual ryegrass	–	–	0.8–1.2	1.5–2.25	1 1	1–2
barley grass	–	–	–	–	–	1–2
brome grass	–	–	–	–	–	1–2
capeweed	0.28–0.58	0.83–1.1	0.55–0.83	–	–	–
canola – volunteer	–	–	–	–	–	–
cereals	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–
crassula	–	0.83–1.1	0.55–0.83	–	–	–
deadnettle	0.28–0.58	–	–	–	–	–
erodium	–	0.83–1.1	0.55–0.83	–	–	–
fumitory	–	–	–	–	–	–
goosefoot – purple	–	–	–	–	–	–
lettuce – prickly	–	–	–	–	–	–
medics	–	–	–	–	–	–
mustards	0.28–0.58	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–
radish – wild	0.28–0.58	0.83–1.1	0.55–0.83	–	–	–
rough poppy	0.28–0.58	–	–	–	–	–
saffron thistle	–	–	–	–	–	–
shepherds purse	0.28–0.58	–	–	–	–	–
silvergrass	–	–	–	–	–	–
soursob	–	–	–	–	–	–
sowthistle	0.28–0.58	–	–	–	–	–
spiny emex	0.28–0.58	0.83–1.1	0.55–0.83	–	–	–
stonecrop	–	–	–	–	–	–
toad rush	0.28–0.58	0.83–1.1	0.55–0.83	–	–	–
turnip weed	–	–	–	–	–	–
vulpia	–	–	–	1.5–2.25 (S)	–	1–2
wild oats	–	–	0.8–1.2 1	1.5–2.25 (S)	1.6	1–2
wild turnip	0.28–0.58	0.83–1.1	0.55–0.83	–	–	–
winter grass	0.28–0.58	–	–	–	–	1–2
wireweed	0.28–0.58	–	0.8–1.2	1.5–2.25	1 1	–
Rec water L/ha boom	50–100	–	–	70–450	50–200	30–100
Herbicide group/mode	C	C	C	D	D	J

- 12 Apply either pre-seeding or immediately post-sowing. Sow crop at least 5 cm deep. Use lower rates on light-textured soils.
- 13 Use higher rates on heavier soil types. Post-emergent application will cause crop damage.
- 14 Spray post-sowing pre-emergence. Rate depends on soil type
- 15 Light soils 0.8 L/ha. Medium-heavy soils 1.2 L/ha. Can sow in band. Apply and incorporate 1–4 weeks before sowing.
- 16 In northern NSW double incorporate at 1.9–2.5 L/ha. In southern NSW incorporate by sowing (IBS) at 1.5–2.25 L/ha. See label.
- (S) Suppression only.

- Incorporation**
- PSI Pre-sowing incorporated.
  - IBS Incorporated by sowing.
  - PSPE Post-sowing pre-emergence.

Table 47. Herbicides for weed control for faba bean and lentil – post-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Fluazifop-P 128 g/L	Haloxypop-R 520 g/L	Quizalofop-p-ethyl 200 g/L	Butoxydim 250 g/kg	Clethodim 240 g/L	Propaquizafop 100 g/L	Flumetsulam 800 g/kg	Diflufenican 500 g/L
Apply at crop growth stage	Fusilade® Forte Faba bean only	Verdict® 520 6	Elantra® Xtreme® 7	Factor® WG 8	Status® 9	Shogun® 10	Broadstrike® Lentil only	Brodal® Options 11 Lentil only
Weeds controlled	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(grams)	(litres)
amsinckia	-	-	-	-	-	-	25	0.2 (S)
annual phalaris	0.41	0.05-0.1	-	80-180	0.15-0.5 5	-	-	-
annual ryegrass	0.41	0.075-0.1	0.15 or 0.19	80-180	0.15-0.5	0.45	-	-
barley grass	0.41	0.05-0.1	0.125	80-180	0.175-0.5	0.2	-	-
brome grass	0.5	0.05-0.1	0.15 or 0.19	80-180	0.175-0.5	0.3	-	-
capeweed	-	-	-	-	-	-	-	0.2 (S)
canola – volunteer	-	-	-	-	-	-	25 1	-
cereals	0.41	0.05-0.1	0.125	80-180	0.2-0.5 3	0.2 4	-	-
corn gromwell	-	-	-	-	-	-	-	0.2 (S)
deadnettle	-	-	-	-	-	-	-	0.2
fumitory	-	-	-	-	-	-	-	-
goosefoot – purple	-	-	-	-	-	-	-	-
lettuce – prickly	-	-	-	-	-	-	-	0.2
medics	-	-	-	-	-	-	-	-
mustards	-	-	-	-	-	-	25	0.15-0.2
Paterson's curse	-	-	-	-	-	-	-	0.2 (S)
radish – wild	-	-	-	-	-	-	25 (S)	0.2
rough poppy	-	-	-	-	-	-	-	0.2 (S)
saffron thistle	-	-	-	-	-	-	-	-
shepherds purse	-	-	-	-	-	-	25	0.2 (S)
soursob	-	-	-	-	-	-	-	-
sowthistle	-	-	-	-	-	-	-	-
spiny emex	-	-	-	-	-	-	-	-
toad rush	-	-	-	-	-	-	-	0.2 (S)
turnip weed	-	-	-	-	-	-	25	0.2
vulpia	-	-	-	-	0.25-0.5 (S)	-	-	-
wild oats	0.41	0.0375-0.1 2	0.065 or 0.125	80-180	0.175-0.5	0.25	-	-
wild turnip	-	-	-	-	-	-	25	0.15-0.2
winter grass	-	-	-	-	-	-	-	-
wireweed	-	-	-	-	-	-	-	0.2 (S)
Rec water L/ha boom	50-100	50-150	50-150	50 min	50 min	30-150	50-150	70-100
Herbicide group/mode	A	A	A	A	A	A	B	F

- 1 Not Clearfield canola volunteers.
- 2 Use 0.0375-0.075 L/ha in southern and central NSW and 0.05-0.1 L/ha in northern NSW.
- 3 Use higher rate on volunteer barley.
- 4 Volunteer triticale 0.25 L/ha.
- 5 Use higher rate on Phalaris paradoxa.
- 6 Add Uptake® spraying oil at 0.5 L/100 L water. Use a minimum of 250 mL/ha Uptake® or other oils at 1 L + wetter/100 L spray. Asset® (130 g/L product) also available.
- 7 Add non-ionic surfactant at 200 mL/100 L or non-ionic surfactant at 10 mL/100 L + mineral spray oil at 1 L/100 L or Hasten™ at 1 L/100 L. See label.

- 8 Factor® has good activity on barley grass and wild oats but weaker on brome grass and volunteer cereals. Adding a fop herbicide is recommended. See label.
- 9 Add 1 L Hasten® or Kwicken™ or 0.5 L Uptake® oil/100 L spray. Use lower rate on small actively growing weeds. Do not apply to lentil after the 7 node early-branching crop stage.
- 10 Always add either BS1000® at 250 mL/100 L water or Hasten™ or Kwicken™ at 500 mL/100 L spray. Can be tankmixed to broaden grass spectrum and improve control. See label.
- 11 Avoid spray overlap. Not on Northfield variety.

Table 48. Canola and pulse foliar fungicides – 2020

Example foliar fungicide trade name and manufacturer	Active ingredient	Harvest withholding period (WHP) – weeks/days		Rate to apply per hectare (L/ha or kg/ha)	Cost of product per litre (\$)	Size of pack (kg or L – range of pack sizes)	Canola	Chickpea	Field pea	Faba bean	Lupin
		Harvest	Grazing								
Spin Flo® – Nufarm	carbendazim (500 g/L) q	28 days	28 days	500 mL	21.05	5-20 L	-	Botrytis grey mould	-	Chocolate spot	-
Bravo® Weather Stik – Syngenta	chlorothalonil (720 g/L)	14 days	14 days	1.4-2.3 L	17.45	10-1200 L	-	Ascochyta blight	-	Chocolate spot, rust	Anthracoise (PER82209, expiry 30/11/21)
Barrack® 720 – Crop Care	chlorothalonil (720 g/L)	14 days	14 days 3	1.4-2.3 L (faba bean) 1-2 L for chickpea	13.70	5-1000 L	-	Ascochyta blight	-	Chocolate spot, rust	Anthracoise (PER82209, expiry 30/11/21)
Unite® 720 – Nufarm	chlorothalonil (900 g/kg)	14 days	14 days 3	1.0-2.0 L (chickpea)	21.65	5-1000 L	-	Ascochyta blight	-	Chocolate spot, rust	Anthracoise (PER82209, expiry 30/11/21)
Echo® 900 Fungicide – Sipcam	chlorothalonil (900 g/kg)	14 days	14 days 3	1.2-1.9 kg (faba bean) 0.8-1.6 kg (chickpea)	18.30	1-20 kg	-	Ascochyta blight	-	Chocolate spot, rust	Anthracoise (PER82209, expiry 30/11/21)
Rovral® Liquid – FMC	iprodione (250 g/L)	42 days	42 days	2.0 L	11.30	5-60 L	Sclerotinia stem rot	Ascochyta blight, botrytis grey mould, rust	-	Ascochyta blight, chocolate spot, Cercospora, rust	Anthracoise, botrytis grey mould
Dithane® Rainshield Neo Tec Fungicide – Corteva Agriscience	mancozeb (750 g/kg)	28 days	14 days	1.0-2.2 kg	38.25	5-20 L	-	Ascochyta blight, botrytis grey mould, rust	-	Chocolate spot	Brown leaf spot
Fortress® 500 – Nufarm	procyimdone (500 g/L) w	Canola not required	9 weeks	1.0 L (canola)	81.95	5-20 L	-	Sclerotinia stem rot	-	-	-
Sumiscler® Broadacre – Sumitomo	procyimdone (500 g/L) w	Faba bean 9 days	Not stated	0.5 L (faba bean) 0.1-0.2 L/100kg seed (lupins)	59.95	5-20 L	Blackleg, sclerotinia stem rot	Blackleg, sclerotinia stem rot	-	-	-
Prostaro® 420 SC – Bayer CropScience	prothioconazole (210 g/L) + tebuconazole (210 g/L)	Not required	14 days	375-450 mL	152.90	1-20 L	Blackleg, sclerotinia stem rot	Blackleg, sclerotinia stem rot	-	-	-
Aviator® Xpro™ – Bayer	prothioconazole (150 g/L) + bixafen (75 g/L)	Not required	Canola 28 days Chickpea, Field pea and faba bean all 35 days	550-650 mL; sclerotinia stem rot 550-800 mL Chickpea Ascochyta blight 400-600 mL Faba bean chocolate spot, rust 600 mL Ascochyta blight, Cercospora 400-600 mL Field pea black spot complex 600 mL	15.40	5-110 L	Blackleg, sclerotinia stem rot	Blackleg, sclerotinia stem rot	-	-	-
Miravis® Fungicide – Syngenta	pydiflumetofen (200 g/L)	Not required	6 weeks	300-450 mL 4 450-600 mL	27.40	1-1000 L	Sclerotinia stem rot	Botrytis grey mould, ascochyta blight	-	-	-
Orius® 430 SC Fungicide – Adama	tebuconazole (430 g/L)	3 days Field peas PER13752 21 days Faba beans	3 days Field peas PER13752 14 days Faba beans	145 mL	15.40	5-110 L	Blackleg, sclerotinia stem rot	Powdery mildew	-	-	-
Veritas® Fungicide – Adama	tebuconazole (200 g/L) + azoxystrobin (120 g/L)	Canola, not required Pulses 28 days	Canola 14 days Pulses 28 days	Canola sclerotinia stem rot 1.0 L; Pulses 0.75-1.0 L Faba bean rust and Cercospora 300 mL	27.40	1-1000 L	Sclerotinia stem rot	Botrytis grey mould, ascochyta blight	-	-	-

1 Health warnings are in place for potential effects on male fertility.  
 2 Health warnings are in place for women of child bearing age.  
 3 Do not feed to livestock producing milk for human consumption.  
 4 When combined with use of a seed treatment or in-furrow fungicide treatment  
 Prices quoted are GST Inclusive at 30 January 2020 and approximate only.  
 Prices will vary depending on pack size purchased.





Table 49. Cereal foliar fungicides – 2020 currently registered products (NSW) – winter cereals (page 1 of 3)

Trade names sometimes available under these active ingredients and concentrations. See specific labels for details.

Active and concentration	Examples of commercial trade names		WHP (weeks) W – wheat B – barley		Adjuvant (as per label)	Diseases controlled										Registered for aerial application
	Product	Manufacturer	Grazing	Harvest		Cost/L	Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	
Azoxystrobin 250 g/L	Accolade®	Sipcam	3	6	\$31.13 (only for Accolade not mixing partners which are applied at label rates)	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat)	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat and barley)	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat)	–	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat)	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat)	160–320 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (wheat) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat)	160 mL \$4.95 + 430 g/L tebuconazole fungicide or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (barley) ⑤	320–640 mL \$4.95–9.96 + 430 g/L tebuconazole fungicide (barley) or 320–640 mL \$9.96–19.92 + 125g/L epoxiconazole (wheat & barley) \$14.96–29.93	Yes	
Azoxystrobin 200 g/L + cyproconazole 80 g/L	Amistar® Xtra	Syngenta	3	6	\$37.41	400–800 mL (wheat) \$14.96–29.93	400–800 mL (wheat) \$14.96–29.93	400–800 mL (wheat) & 200–800 mL (barley) \$7.48–29.93	–	–	–	400–800 mL (wheat) \$14.96–29.93	200–800 mL (barley) \$7.48–29.93	400–800 mL (wheat & barley) \$14.96–29.93	Yes	
Azoxystrobin 80 g/L + Epiconazole 31.25 g/L	Tazer® Xpert™	Nufarm	3	6	\$18.56	1000–2000 mL (wheat) \$18.56–37.13 or 500 mL + Banjo® at 1% v/v (wheat) & barley \$9.28–18.56	1000–2000 mL (wheat) \$18.56–37.13 or 500 mL + Banjo® at 1% v/v (wheat) & barley \$9.28–18.56	1000–2000 mL (wheat & barley) \$18.56–37.13 or 500 mL (wheat) + Banjo® at 1% v/v (wheat) & barley \$9.28–18.56	–	1000 mL (wheat) \$18.56 or 500 mL/ha + Banjo® at 1% v/v (wheat) \$9.28	1000–2000 mL (wheat) \$18.56–37.13	1000–2000 mL (wheat) \$18.56–37.13	1000–2000 mL (barley) \$18.56–37.13 or 500–1000 mL + Banjo® 1% at v/v (barley) only \$9.28–18.56	1000–2000 mL (wheat & barley) \$18.56–37.13	Yes	
Azoxystrobin 75 g/L + Epiconazole 75 g/L	Radial®	Adama Australia	6 + ESI	6	\$29.26	420–840 mL (wheat) \$12.29–24.58	420–840 mL (wheat) \$12.29–24.58	420–840 mL (wheat & barley) \$12.29–24.58	–	420–840 mL (wheat) \$12.29–24.58	420–840 mL (wheat) \$12.29–24.58	420–840 mL (wheat) \$12.29–24.58	420–840 mL (barley) \$12.29–24.58	420–840 mL (wheat & barley) \$12.29–24.58	Yes	
Azoxystrobin 200 g/L + Benzovindiflupyr 40 g/L + propiconazole 250 g/L	Veritas®	Adama Australia	3 + ESI	6	\$27.42	315 mL or 630 mL (wheat) \$8.64 or \$17.27	315 mL or 630 mL (wheat & barley) \$8.64 or \$17.27	315 mL (wheat & barley) \$21.45	–	315 mL or 630 mL (wheat) \$8.64 or \$17.27	315 mL or 630 mL (wheat) \$8.64 or \$17.27	315 mL or 630 mL (wheat) \$8.64 or \$17.27	315 mL (barley) \$8.64 or \$17.27	315 mL or 630 mL (wheat & barley) \$8.64 or \$17.27	Yes	
Benzovindiflupyr 40 g/L + propiconazole 250 g/L	Eliatus® Ace	Syngenta	10 days	NR	\$42.90	500 mL (wheat) \$21.45	500 mL (wheat & barley) \$21.45	500 mL (wheat & barley) \$21.45	–	500 mL (wheat) \$21.45	500 mL (wheat) \$21.45	500 mL (wheat) \$21.45	500 mL (barley) \$21.45	500 mL (wheat & barley) \$21.45	Yes	
Epoxiconazole 125 g/L	Opus® 125	BASF	6 + ESI	6	\$25.67	250–500 mL (wheat) \$6.42–12.83	–	500 mL (wheat) 250–500 mL (barley) \$6.42–12.83	–	–	–	–	250 mL (wheat) \$6.42	250 mL (wheat & barley) \$6.42	Yes	

Table 49. Cereal foliar fungicides – 2020 currently registered products (NSW) – winter cereals (continued, page 2 of 3)

Active and concentration	Examples of commercial trade names		WHP (weeks) W – wheat B – barley		Adjuvant (as per label)	Diseases controlled										Registered for aerial application
	Product	Manufacturer	Grazing	Harvest		Cost/L	Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	
Fenbuconazole 240 g/L	Indar®	Corteva Agrosience	2 + ESI	NR	500 mL/100 L Uptake® Spraying Oil	150–300 mL (wheat)	–	–	–	–	–	–	–	–	–	No
Flutriafol 250 g/L	Various	–	7-W 10-B	7-W 10-B	\$19.80	250–500 mL (wheat) \$4.95–9.90	–	250–500 mL (wheat) \$4.95–9.90	–	250–500 mL (wheat) \$4.95–9.90	250–500 mL (wheat) \$4.95–9.90	–	–	–	250–500 mL (barley) \$4.95–9.90	Yes
Flutriafol 500 g/L	Jubilee® Loaded Intake®Combi Sapphire	Adama Australia Nufarm	7-W 10-B	7-W 10-B	\$41.84	200 mL/100 L BS1000®	–	125–250 mL (wheat) \$5.23–10.46	–	125–250 mL (wheat) \$5.23–10.46	125–250 mL (wheat) \$5.23–10.46	–	–	–	125–250 mL (barley) \$5.23–10.46	Yes
Propiconazole 250 g/L	Tilt®250 EC	Syngenta	1	4	\$14.45	250–500 mL (wheat) \$3.61–7.22	500 mL (wheat & oats) \$7.22	150–500 mL (wheat) \$7.22	250–500 mL (oats) \$3.61–7.22	250–500 mL (wheat & oats) \$3.61–7.22	150–500 mL (wheat) \$2.17–7.22	250–500 mL (wheat) \$3.61–7.22	500 mL (barley) \$7.22	250–500 mL (wheat & barley) \$2.17–7.22	Yes	
Propiconazole 435 g/L	ProfiMax®	Corteva Agro-Science	1	4	\$29.70	145 mL or 285 mL (wheat) \$4.31 or 8.46	285 mL (wheat & oats) \$8.46	85–285 mL (wheat) \$2.58–8.46	145–285 mL (oats) \$4.31–8.46	145–285 mL (wheat & oats) \$4.31–8.46	145–285 mL (wheat) \$4.31–8.46	145–285 mL (wheat) \$4.31–8.46	285 mL (barley) \$8.46	85–285 mL (wheat & barley) \$2.58–8.46	Yes	
Propiconazole 500 g/L	Throttle®500	Nufarm	1	4	\$24.75	150–500 mL (wheat) \$3.09–6.19	250 mL (wheat & oats) \$6.19	75–250 mL (wheat) 250 mL (barley) \$1.86–6.19	125–250 mL (oats) \$3.09–6.19	125–250 mL (wheat & oats) \$3.09–6.19	75–250 mL (wheat) \$1.86–6.19	125–250 mL (wheat) \$3.09–6.19	125–250 mL (barley) \$3.09–6.19	75–250 mL (wheat & barley) \$1.86–6.19	Yes	
Propiconazole 250 g/L + cyproconazole 80 g/L	Tilt® Xtra (discontinued product)	Syngenta	3 + ESI	6	\$39.19	250–500 mL (wheat) \$9.80–19.59	500 mL (wheat) \$19.59	150–500 mL (wheat) 500 mL (barley) \$5.88–19.59	–	250–500 mL (wheat) \$9.80–19.59	150–500 mL (wheat) \$5.88–19.59	250–500 mL (wheat) \$9.80–19.59	250 mL (barley) \$9.80	150–500 mL (wheat & barley) \$5.88–19.59	Yes	
Propiconazole 250 g/L + tebuconazole 250 g/L	Cogito®	Syngenta	2	5	\$29.96	125–250 mL (wheat) \$3.74–7.49	250 mL (oats) \$3.74–7.49	125–250 mL (wheat & barley) \$3.74–7.49	125–250 mL (oats) \$3.74–7.49	125–250 mL (wheat & oats) \$3.74–7.49	125–250 mL (wheat) \$3.74–7.49	125–250 mL (wheat) \$3.74–7.49	125–250 mL (barley) \$7.49	125–250 mL (wheat & barley) \$3.74–7.49	Yes	
Prothioconazole 210 g/L + tebuconazole 210 g/L	Aviator® Xpro	Bayer CropScience	4	NR	\$59.95	300–500 mL/ha (wheat) \$17.97–29.98	–	400–500 mL/ha (barley) \$23.98–29.98	300–500 mL (wheat) \$17.97–29.98	300–500 mL (wheat) \$17.97–29.98	300–500 mL (wheat) \$17.97–29.98	300–500 mL (wheat) \$17.97–29.98	300–500 mL (barley) \$17.97–29.98	300–500 mL/ha (barley) \$17.97–29.98	Yes	
Prothioconazole 210 g/L + tebuconazole 210 g/L	Prostaro® 420 SCI	Bayer CropScience	2	5	\$81.97	150–300 mL (wheat & triticale) 300 mL (oats) \$12.30–24.59	150–300 mL (wheat) 300 mL (oats) \$12.30–24.59	150–300 mL (wheat & barley) 300 mL (oats) \$12.30–24.59	300 mL (oats) \$24.59	–	150–300 mL (wheat, oats) \$12.30–24.59	150–300 mL (wheat) \$12.30–24.59	150–300 mL (barley) \$12.30–24.59	150–300 mL (wheat & barley) \$12.30–24.59	Yes	

- ① Indicative costs only; significantly lower prices are often obtained for bulk purchases of commonly used products.
- ② Body of table shows rate mL/ha, g/ha and associated cost \$/ha for registered products.
- ③ Prostaro® 420 is registered for the control of Fusarium head blight. Suppression only.
- ④ Various formulations and active ingredient concentrations of propiconazole and tebuconazole are available.
- ⑤ Export slaughter interval applies. Do not slaughter animals destined for export within 7 days of consumption of treated cereal forage or straw.
- ⑥ Net form of net blotch only.

Tazer®Expert™ is registered for control of septorial leaf blotch in oats. Prostaro® 420 is registered for the control of Fusarium head blight.

Growers applying a foliar fungicide to control rust or other diseases need to observe the withholding period (WHP). Fungicides applied late, closer to harvest, may produce an excessive, illegal residue if applied within the WHP. For most of the fungicides registered to control diseases in winter cereals, the maximum residue limit (MRL) is set very low, at the limit of detection. A residue above the MRL is illegal under the Pesticides Act 1959 and renders the offender liable to prosecution and a fine. Excessive residues also put Australia's export trade at risk. If it is necessary to apply a fungicide late, select a product with a short WHP.

Table 49. Cereal foliar fungicides – 2020 currently registered products (NSW) – winter cereals (continued, page 3 of 3)

Active and concentration	Examples of commercial trade names		WHP (weeks) W – wheat B – barley		Cost/L	Adjuvant (as per label)	Diseases controlled										Registered for aerial application
	Product	Manufacturer	Grazing	Harvest			Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	Powdery mildew	
Pyraclostrobin 85 g/L + epoxiconazole 62.5 g/L	Opera®	BASF	3 + ES1	NR	\$35.05	Non-ionic surfactant (not specified)	500 mL (wheat) \$17.53	500 mL (wheat) \$17.53	500–1000 mL (wheat) \$17.53–35.05	500 mL (wheat) \$17.53	500 mL (barley) \$17.53	500 mL (barley) \$17.53	500–1000 mL (barley) \$17.53–35.05	500 mL (wheat) 500–1000 mL (barley) \$17.53–35.05	Yes		
Tebuconazole 430 g/L	Various	–	2	5	\$15.38	Adding mineral crop oil at 1% might improve performance. Read the product label.	145–290 mL (wheat) \$2.23–4.46	145 mL (wheat & oats) \$2.23	145–290 mL (oats) \$2.23–4.46	145–290 mL (wheat) \$2.23–4.46	145 mL (barley) \$2.23	145 mL (barley) \$2.23	145–290 mL (wheat) \$2.23–4.46	145–290 mL (barley) \$2.23–4.46	Yes		
Tebuconazole 45 g/kg + sulfur 700 g/kg	Unicorn 745 WG	Sulphur Mills Aust. Limited	2	5	–	–	1370 g or 2750 g (wheat)	1370 g or 2750 g (wheat)	1370 g or 2750 g (wheat & oats)	1370 g or 2750 g (wheat)	1370 g (barley)	1370 g (barley)	1370 g or 2750 g (wheat)	1370 g or 2750 g (barley)	No		
Triadimefon 125 g/L	Triadimefon 125	Genfarm	Not stated, see footnote 12	4	\$17.16	Not required	500 mL or 1000 mL (wheat) \$8.58 or \$17.16	–	–	–	1000 mL (barley) \$17.16	1000 mL (barley) \$17.16	–	1000 mL (barley) \$17.16	Yes		
Triadimefon 500 g/kg	Triadimefon 500	Genfarm	Not stated, 11	4	\$23.27	Not required	–	–	–	125–250 g (wheat – southern NSW only) \$2.91–5.82	–	–	–	250 g (barley) \$2.91–5.82	Yes		

- 1 Indicative costs only: significantly lower prices are often obtained for bulk purchases of commonly used products.
- 2 Body of table shows rate mL/ha, g/ha and associated cost \$/ha for registered products.
- 6 Net form of net blotch only.
- 7 Rate on barley is 200–800 mL.
- 8 Suppression only.
- 9 Various formulations and active ingredient concentrations of propiconazole and tebuconazole are available.
- 10 Do not mix leaves treated with this product with feed intended for animal consumption.
- 11 Feed treated with this product must not be used for animal consumption, poultry feed or mixed with animal feed.
- 12 Export slaughter interval applies. Do not slaughter animals destined for export within 7 days of consumption of treated cereal forage or straw. Not required when used as directed.

Growers applying a foliar fungicide to control rust or other diseases need to observe the withholding period (WHP). Fungicides applied late, closer to harvest, may produce an excessive, illegal residue if applied within the WHP. For most of the fungicides registered to control diseases in winter cereals, the maximum residue limit (MRL) is set very low, at the limit of detection. A residue above the MRL is illegal under the *Pesticides Act 1999* and renders the offender liable to prosecution and a fine. Excessive residues also put Australia's export trade at risk. If it is necessary to apply a fungicide late, select a product with a short WHP.

Table 50. Common retail prices of chemicals used on winter crops (page 1 of 2)

Product name	Chemical name	Company	Price/L or kg	Commonly used rate	Cost/ha
Amistar® Xtra	Azoxystrobin 250 g/L + cyproconazole	Syngenta	136.08	0.4 L	54.43
Achieve®	Tralkoxydim 400 g/kg	Crop Care	62.50	0.4 kg	25.00
Agritone® 750	MCPA 750 g/L	Nufarm	10.25	0.46 L	4.71
Agtryne® MA	Terbutryn 275 g/L + MCPA 160 g/L	Crop Care	15.60	1.0 L	15.60
Alliance®	Paraquat 125 g/L + amitrole 250 g/L	Crop Care	15.50	2.0 L	31.00
Amicide® Advance 700	2,4-D amine 700 g/L	Nufarm	7.10	0.8 L	5.68
Arcade®	Prosulfocarb 800 g/L	Syngenta	11.05	3.0 L	33.15
Associate®	Metsulfuron-methyl 600 g/kg	Nufarm	90.00	5 g	0.45
Atlantis® OD	Mesosulfuron-methyl 30 g/L	Bayer CropScience	88.00	0.33 L	29.04
Atrazine 900 WDG	Atrazine 900 g/kg	Titan	8.00	1.1 kg	8.80
Avadex® Xtra	Tri-allate 500 g/L	Nufarm	10.29	1.6 L	16.46
Axial® Xtra	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L	Syngenta	150.70	0.2 L	30.14
Balance® 750 WG	Isoxaflutole 750 g/kg	Bayer CropScience	146.00	0.1 kg	14.60
Bladex®	Cyanazine 900 g/kg	Agnova	59.00	1.5 L	88.50
Boxer® Gold	Prosulfocarb 800 g/L + S-metolachlor 120 g/L	Syngenta	10.80	2.5 L	27.00
Broadside®	MCPA 280 g/L + bromoxynil 140 g/L + dicamba 40 g/L	Nufarm	19.87	0.75 L	14.90
Broadstrike®	Flumetsulam 800 g/kg	Corteva	400.00	25 g	10.00
Brodal® Options	Diflufenican 500 g/L	Bayer CropScience	43.04	0.15 L	6.46
Bromicide® 200	Bromoxynil 200 g/L	Nufarm	17.50	1.4 L	24.50
Bromoxynil MA	Bromoxynil 200 g/L + MCPA 200 g/L	Various	14.25	1.4 L	19.95
Bronco® MA-X	bromoxynil 280 g/L + MCPA 280 g/L	Adama	13.30	1.0 L	13.30
Butisan®	Metazachlor 500 g/L	BASF	22.50	1.8 L	40.50
Buttress®	2,4-DB 500 g/L	Crop Care/Nufarm	19.00	2.1 L	39.90
Cheetah® Gold	Diclofop-methyl 200 g/L + sethoxydim 20 g/L + fenoxaprop-P-ethyl 13.6 g/L	Sipcam	23.48	1 L	23.48
Chlorsulfuron 750 WG	Chlorsulfuron 750 g/kg	FMC	75.00	20 g	1.50
Countdown®	Prosulfocarb 800 g/L	Adama	11.50	2.5 L	28.75
CRUCIAL®	Glyphosate 600 g/L	Nufarm	8.50	1.2L	10.20
Decision®	Diclofop-methyl 200 g/L + sethoxydim 20 g/L	Sipcam	18.78	1 L	18.78
Diuron 900 WDG	Diuron 900 g/kg	Adama	13.00	0.5 kg	6.50
Dual Gold®	S-metolachlor 960 g/L	Syngenta	13.25	0.2 L	2.65
Eclipse® 100SC	Metosulam 100 g/L	Bayer CropScience	218.33	0.05 L	10.92
Ecopar®	Pyraflufen-ethyl 20 g/L	Sipcam	250.00	0.4 L	10.00
Elantra® Xtreme	Quizalofop-P-ethyl 200 g/L	Sipcam	19.70	0.25 L	4.93
Estercide® Xtra 680	2, 4-D 680g/L present as the 2-ethylhexyl ester	Nufarm	8.75	0.8L	7.00
Express®	Tribenuron-methyl 750 g/L	DuPont	230.00	25 g	5.75
Factor® WG	Butoxydim 250 g/kg	CropCare	145.00	130 g	18.85
FallowBoss® Tordon®	Picloram + 2,4-D	Corteva Agriscience	15.10	0.3 L	4.53
Flight® EC	Picolinafen 35 g/L + bromoxynil 210 g/L + MCPA 350 g/L	Nufarm	37.00	0.41 L	15.17
ForageMax®	Halaxifen 100 g/L + 50 g/L aminopyralid	Corteva	400.00	100 mL	40.00
Foxtrot®	Fenoxaprop-P-ethyl 69g/L + 34.5 g/L cloquintocet-mexyl	FMC	29.50	635 mL	18.43
Frequency®	Topramezone 60 g/L + cloquintocet-mexyl 60 g/L	BASF	–	0.2 L	–
Fusilade® Forte	Fluazifop-P 212 g/L	Syngenta	18.00	0.12 L	2.16
Garlon™ 600	Triclopyr 600 g/L	Corteva	18.05	0.12L	2.17
GoalTender™	Oxyfluorfen 480 g/L	Corteva	36.00	0.0375 L	1.35
Gramoxone® 360 Pro	Paraquat 360 g/L	Syngenta	7.69	1.0 L	7.69
Grazon® Extra	Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8 g/L	Corteva Agriscience	47.20	0.3 L	14.16
Gundy 240	Imazapic 240 g/L	Kenso	24.00	0.175 L	4.20
Hammer® 400EC	Carfentrazone-ethyl 400 g/L	FMC	300.00	0.050 L	15.00
Hotshot®	Aminopyralid 10 g/L + fluroxypyr 140 g/L	Corteva Agriscience	21.71	0.5 L	10.86
Hussar® OD	Iodosulfuron-methyl-sodium 100 g/L	Bayer CropScience	297.00	0.1 L	29.70
Igran® 500 Flowable	Terbutryn 500 g/L	Nufarm	14.50	0.85 L	12.33
Intervix®	Imazamox 33 g/L + imazapyr 15 g/L	BASF	29.50	0.5 L	14.75
Jaguar®	Bromoxynil 250 g/L + diflufenican 25 g/L	Bayer CropScience	13.95	0.75 L	10.46
Kamba® 750	Dicamba 750 g/L	Nufarm	24.00	0.18 L	4.32
Kamba® M	MCPA 340 g/L + 80 g/L dicamba	Nufarm	13.30	1 L	13.30
Logran® B-Power	Triasulfuron 520 g/kg + butafenacil 200 g/kg	Syngenta	228.00	50 g	11.40
Lontrel® Advanced	Clopyralid 600 g/kg	Corteva Agriscience	42.05	0.15 L	6.31
Luximax®	Cinmethylin 750 g/L	BASF	78.00	0.5L	39.00
LV Ester 680	2,4-D LV ester 680 g/L	Crop Care	8.50	0.8L	6.80
MCPA LVE	MCPA LVE 570 g/L	Various	11.05	0.7 L	7.73
Outlook®	Dimethenamid 720 g/L-P	BASF	59.40	1 L	59.40
Paradigm®	Halaxifen-methyl 200 g/kg + florasulam 200 g/kg	Corteva Agriscience	500.00	25 g	12.50

Table 50. Common retail prices of chemicals used on winter crops (continued, page 2 of 2)

Product name	Chemical name	Company	Price/L or kg	Commonly used rate	Cost/ha
Paragon®	Picolinafen 50 g/L + MCPA 500 g/L	Nufarm	27.10	0.25 L	6.78
Pendimethalin® 440 EC	Pendimethalin 440 g/L	FMC	11.54	1.4 L	16.16
Pixxaro®	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	Corteva Agriscience	42.50	0.3 L	12.75
Precept®	Pyrasulfotole 50 g/L + MCPA 125 g/L	Bayer CropScience	16.54	0.5 L	8.27
Prometryn 900 DF	Prometryn 900 g/kg	Nufarm	17.27	830 g	14.33
Pyresta® Extreme	Pyraflufen-Ethyl 2.1 g/L + 2,4-D LV ester 600 g/L	Sipcam	14.79	0.5 L	7.40
Raptor®	Imazamox 700 g/kg	BASF	820.00	45 g	36.90
Reglone®	Diquat 200 g/L	Syngenta	17.68	2.0 L	35.36
Rexade®	Pyroxulam 150 g/kg+ halauxifen 50 g/kg	Corteva Agriscience	330.00	100 g	33.00
Roundup® Ultra Max™	Glyphosate 570 g/L	Bayer CropScience	8.22	0.25 L	10.28
Rustler®	Propyzamide 500 g/L	FMC	26.00	1.0 L	26.00
Sakura® 850 WG	Pyroxasulfone 850 g/kg	Bayer CropScience	339.87	118 g	40.10
Sencor® 480	Metribuzin 750 g/kg	Bayer CropScience	62.00	0.28 kg	17.36
Sentry®	525 g/kg IMAZAPIC 175 g/kg IMAZAPYR	Nufarm	220.00	40 g	8.80
Sharpen™ WG	Saflufenacil 700 g/kg	BASF	529.40	17 g	9.00
Simanex® 900 WG	Simazine 900 g/kg	Various	8.73	1.1 kg	9.61
Sledge®	Pyraflufen-ethyl 25 g/L	Sipcam	85.00	0.1 L	8.50
Spinnaker® 700 WDG	Imazethapyr 700 g/kg	BASF	119.00	70 g	8.33
Spray.Seed® 250	Paraquat 135 g/L + diquat 115 g/L	Syngenta	11.40	1.6 L	18.24
Starane® Advanced	Fluroxypyr 333 g/L	Corteva Agriscience	29.50	0.45 L	13.28
Status®	Clethodim 240 g/L	Sumitomo Chemical	13.75	0.3 L	4.13
Stinger®	Aminopyralid 375 g/kg + metsulfuron-methyl 300 g/kg	Corteva Agriscience	285.00	10 g	2.85
Striker®	Oxyfluorfen 240g/L	Nufarm	18.00	75 mL	13.50
Talinor®	Bicyclopyrone + bromoxynil + cloquintocet-mexyl	Syngenta	25.75	0.5 L	12.88
Terbyne® Xtreme® 875 WG	Terbutylazine 875 g/kg	Sipcam	20.20	1.2 kg	24.24
Terrain™	Flumioxazin 500 g/kg	Nufarm	183.33	30 g	5.50
Tigrex®	MCPA 250 g/L + diflufenican 25 g/L	Bayer CropScience	10.94	0.5 L	5.47
Topik 240 EC	Cloquintocet-mexyl 60 g/L + clodinafop-propargyl 240 g/L	Syngenta	38.00	85 mL	3.23
Triathlon®	MCPA 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L	Adama Australia	17.50	750 L	13.13
Triflur® X	Trifluralin 480 g/L	Nufarm	7.27	0.8 L	5.82
Trooper™ 242	Picloram 26 g/L + MCPA 420 g/L	Nufarm	8.50	1.0 L	8.50
Velocity®	Pyrasulfotole 37.5 g/L + bromoxynil 210 g/L	Bayer CropScience	31.50	0.5 L	15.75
Verdict® 520	Haloxypfop-R 520 g/L	Corteva Agriscience	49.00	0.05 L	2.45
Vortex®	Florasulam 6.25 g/L + 2,4-D LV ester 300 g/L	Adama Australia	14.44	280 mL	4.04
Weedmaster® DST®	470 g/L glyphosate (present as the potassium and mono-ammonium salts)	Nufarm	5.55	1.5 L	8.33

Table 51. Common retail prices of adjuvants used on winter crops

Product name	Chemical name	Company	Price/L or kg (Ex GST) (\$)	Commonly used rate/ha	Cost (\$/ha)
Agral 600®	Wetting agent	Syngenta	7.45	0.35 L/100 L	2.61
BS1000®	Wetting agent	Nufarm	6.25	0.25 L/100 L	1.56
Bonza®	Wetting/spreading	Nufarm	7.70	1.0 L/100L	7.70
Hasten®	Crop oil + surfactant	Vic Chemical Co	5.50	1.0 L/100 L	5.50
Liase®	Ammonium sulfate	Nufarm	2.75	2.0 L/100 L	5.50
LI 700®	Surfactant/penetrant	Nufarm	6.00	0.25 L/100 L	1.50
Uptake® spraying oil	Crop oil + surfactants	Corteva Agriscience	6.80	0.4 L/100 L	2.72
Wetter TX®	Surfactant	Nufarm	8.75	0.2 L/100 L	1.75

Prices are only an average retail (excluding GST) and are only a guide. They will vary according to location, availability and quantity purchased.



*“John,  
did you hear  
that scream?”*

*“Yeah,  
I think the ryegrass &  
its weedy mates heard  
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is coming.”*

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