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NSW DPI MANAGEMENT GUIDE

Greg Brooke and Colin McMaster

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Department of Primary Industries

Weed control in winter crops 2019

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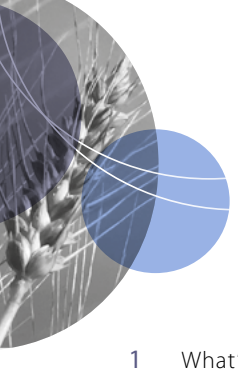

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What's new in 2019

Several new herbicides have been registered in the past 12 months, or have new approved use patterns for winter crops for the 2019 season.

AXIAL® Xtra replaces AXIAL®

AXIAL® XTRA (50 g/L pinoxaden + 12.5 g/L cloquintocet-mexyl) from Syngenta is a new post-emergent grass-selective herbicide for use in wheat and barley that has a built in adjuvant, which means that growers do not need to add ADIGOR®. Syngenta advises that AXIAL® XTRA replaces AXIAL®, delivering faster brownout, improved control, improved compatibility and improving confidence in managing wild oats, phalaris and annual ryegrass. It has a wide window for application, 2-leaf to first awns visible (Z12–49).

Please note that the active ingredient concentration in AXIAL® XTRA is half that of AXIAL® 100 EC, which means that the rate of product per hectare must be doubled to maintain the same rate of active. The older formulation of AXIAL® 100EC will still be available in 2019, but will be phased out during the year.

Kamba® 750 replaces Kamba® 500

Kamba® 750 has replaced Kamba® 500. Product rates have been adjusted in this book to reflect the new, higher active concentration of dicamba in the herbicide.

Rustler® – new registration

Rustler® (propyzamide) now includes pulse registration for chickpea, faba bean, field pea, lentil and lupin crops.

Sledge®

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).

Archer® – increased strength formulation

Archer® (300 g/L clopyralid) liquid has been replaced with Archer® 750 dual salt liquid herbicide (750 g/L clopyralid), adjust application rates according to product being used.

Intercept® – new registration for barley

Intercept® (33 g/L imazamox + 15 g/L imazapyr) is now registered for use in 3-leaf imi-tolerant barley crops.

Roundup Ready® reduced active

The herbicide now has a reduced active load from 640 g/kg to 540 g/L. Ensure you use this product when sowing RR canola.

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/) website for further information.

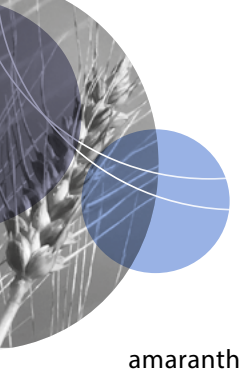
In-crop weed control – a wide range of pre-emergent and early post-emergent herbicides are available. Weeds should be removed from crops as early as possible and no later than six weeks after sowing to minimise yield losses. Yield responses will depend on weed species, weed and crop density and seasonal 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 is intended to minimise off-target damage from downwind pesticide application, particularly during fallow spraying.

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

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.

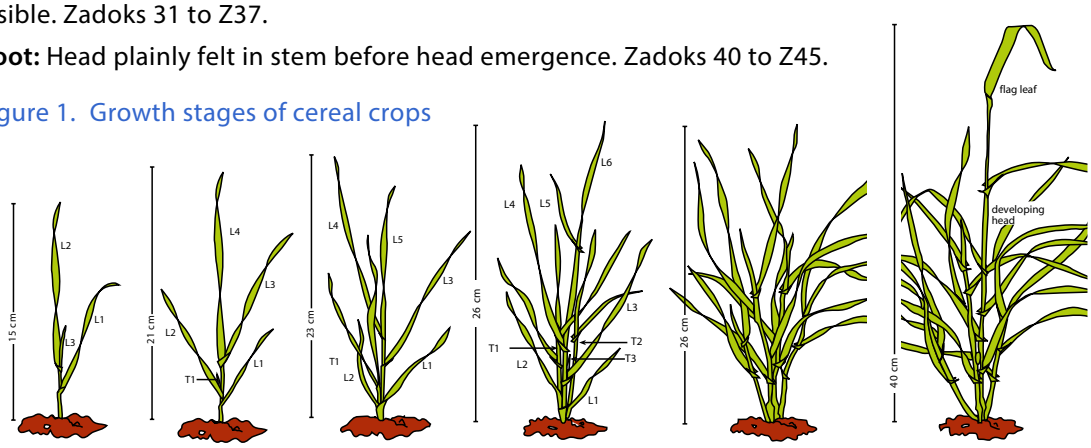
PRINCIPAL GROWTH STAGES

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

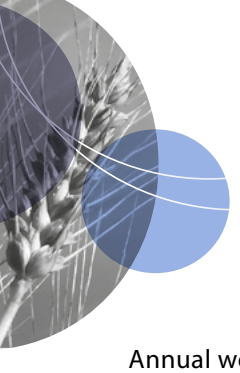
Product	Chemical	Cereal growth stage – Zadoks scale							
		2 leaf	3 leaf	4 leaf	5 leaf–early till	Mid till	Late till	Full till–jointing	Booting
		12	13	14	15–21	25	29	30–36	40–49
2,4-DB									
2,4-D ester	2,4-D LV ester								
Achieve®	Tralkoxydim								
Agritone	MCPA 750 g/L								
Agtryne® MA	Terbutryn + MCPA								
Amicide® Advance 700	2,4-D amine								
Aptitude®	Metribuzin + carfentrazone-ethyl								
Associate®	Metsulfuron-methyl								
Atlantis® OD	Mesosulfuron-methyl		wheat only						
Axial®	Pinoxaden + cloquintocet-mexyl								Up to Z49
Broadside®	Bromoxynil + MCPA + dicamba								
Bromicide®	Bromoxynil		low rate only at 3–5 leaf stage						
Bromicide® MA	Bromoxynil + MCPA								
Broadstrike™	Flumetsulam								
Cheetah® Gold	Diclofop-methyl + sethoxydim + fenoxaprop-p-ethyl								
Decision®	Diclofop-methyl + sethoxydim								
Diurex	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								
Hotshot™	Aminopyralid + fluroxypyr							1st node	
Hussar® OD	Iodosulfuron-methyl-sodium								
Igran®	Terbutryn								
Intervix®	Imazamox + imazapyr								
Jaguar®	Bromoxynil + diflufenican								
Kamba®	Dicamba								
Kamba® M	MCPA + dicamba								
Lontrel™ Advanced	Clopyralid								
LVE Agritone	MCPA 570 g/L								
Mandate®	Clodinafop-propargyl							wheat only	
Monza® (post-em)	Sulfosulfuron			wheat and triticale only, 1st–2nd tiller stage					
Paradigm™	Florasulam + halauxifen		3 leaf to flag leaf emergence						
Paragon®	MCPA + picolinafen								
Picoflex™	Picloram 240 g/L								
Pixxaro™	Fluroxypyr + halauxifen							flag leaf	
Precept®	MCPA + pyrasulfotole								
Rexade®	Pyroxsulam + halauxifen		Wheat and triticale only (not durums)					1st node	
Starane™, Starane™ Advanced	Fluroxypyr								
Stinger™	Aminopyralid + metsulfuron-methyl							1st node	
Tackle® (post-em)	Chlorsulfuron								
Talinor®	Bicyclopyrone + bromoxynil + cloquintocet-mexyl						to Z32		
Tigrex®	MCPA + diflufenican								
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.

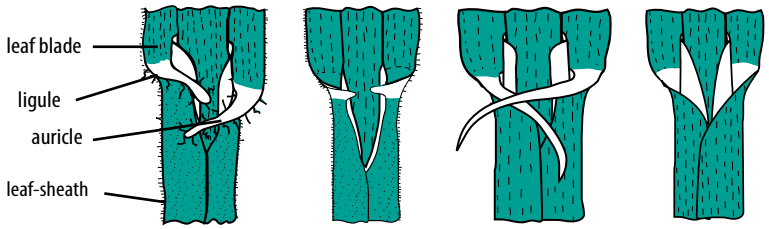
Points to remember for successfully using herbicides:

- 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



	Wheat and triticale*	**Rye**	**Barley**	**Oats and wild oats****
Ligule	medium	short	medium	medium
Auricle	medium blunt hairy	short hairless	long pointed hairless	absent
Leaf blade twist	clockwise	clockwise	clockwise	anticlockwise
Leaf hairiness	hairy	inconsistent	± hairless	± hairless

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 2. Guidelines for crop rotations – Fallow commencement/maintenance and pre-sowing seedbed weed control

The following plantback periods are a guide only based on label recommendations. The time indicated between application and safe crop rotation intervals will depend on a range of factors including rainfall (amount and intensity), soil type (pH, soil biological activity and organic carbon), soil type variability within a paddock, and temperature and herbicide rate. Some crops are more sensitive to various herbicide groups than others. Always take a conservative approach to plantback periods, especially with sensitive or high input crops.

	Associate® 1	Amicide® Advance (700 g/L) 2			Cadence® 2			Eclipse® 100 SC	LV Ester 680 (680 g/L) 2			Express®	Gundy 240	Garlon™	Goal®	Grazon™ Extra 4					Hotshot™ 4		Kamba® 750 2		
Herbicide group	B	I	I	I	I	I	I	B	I	I	I	B	B	I	G	I	I	I	I	I	I	I	I	I	I
Specific details	pH 5.6–8.5 8	<0.5 L/ha	0.5–0.98 L/ha	0.98–1.5 L/ha	140 g/ha	200 g/ha	400 g/ha	9	<0.51 L/ha	0.51–1.0 L/ha	1.0–1.6 L/ha		10 14		11	NNSW 0.2 L/ha	NNSW 0.3 L/ha	NNSW 0.4 L/ha	NNSW 0.6 L/ha	SNSW <0.5 L/ha	NNSW <750 mL/ha	SNSW <500 mL/ha	0.135 L/ha	0.185 L/ha	0.375 L/ha
Crop																									
Barley	6w	1d	1d	3d	1d	7d	14d		1d	1d	3d	3d	4mo	7d		2mo	2mo	4mo	4mo	9mo	4mo	9mo	1d	7d	14d
Canola	9mo	14d	21d	28d	7d	10d	14d		14d	21d	28d	–	–	–		2mo	4mo	4mo	4mo	9mo	4mo	9mo	7d 7	10d 7	14d 7
Canola (Clearfield)	10d	–	–	–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–
Cereal rye	6w	–	–	–	1d	7d	14d		–	–	–	–	–	–		–	–	–	–	–	–	–	1d	7d	14d
Chickpea	9mo	7d	14d	21d	–	21d	28d		7d	14d	21d	–	4mo	7d		4mo	6mo	6mo	6mo	24mo	6mo	20mo	–	21d	28d
Cotton		10d	14d	21d	7d	7d	14d		10d	14d	21d	–	24mo	14d		–	–	–	–	–	9mo	–	7d	7d	14d
Faba bean	9mo	7d	7d	10d	–	–	–		7d	7d	10d	–	–	–		4mo	4mo	6mo	6mo	24mo	6mo	20mo	–	–	–
Field pea	9mo	7d	14d	14d	–	14d	21d		7d	14d	14d	–	–	–		–	–	–	–	24mo	–	20mo	–	14d	21d
Lentils	9mo	7d	7d	10d	–	–	–		7d	7d	10d	–	–	–		–	–	–	–	–	–	–	–	–	–
Linseed	9mo	7d	7d	14d	–	–	–		7d	7d	14d	–	–	–		–	–	–	–	–	–	–	–	–	–
Lucerne	9mo	7d	7d	10d	–	–	–		7d	7d	10d	–	12mo	–		6mo	9mo	9mo	9mo	24mo	6mo	20mo	–	–	–
Lupins	9mo	7d	14d	21d	7d	14d	21d		7d	14d	21d	–	–	–		–	–	–	–	24mo	–	20mo	7d	14d	21d
Maize	14mo	–	–	–	1d	3d	7d		–	–	–	7/21d 3	–	7d		–	–	–	–		–	–	1d	3d	7d
Medic	9mo	7d	7d	10d	7d	14d	21d		7d	7d	10d		–	–		–	–	–	–	24mo	–	20mo	7d	14d	21d
Millet		–	–	–	1d	3d	7d		–	–	–	–	–	–		–	–	–	–	–	–	–	1d	3d	7d
Millet (Japanese)	14mo	–	–	–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–
Millet (Panorama)	14mo	–	–	–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–
Millet (white French)	14mo	–	–	–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–
Mungbean	–	–	–	–	5d	5d	10d		–	–	–	7/21d 3	12mo	–		–	–	–	–	–	5mo	–	5d	5d	10d
Navy bean	–	10d	10d	14d	–	–	–		10d	10d	14d	–	–	–		–	–	–	–	–	–	–	–	–	–
Oats	9mo	3d	3d	7d	1d	7d	14d		3d	3d	7d	3d	–	–		–	–	–	–	–	–	–	1d	7d	14d
Pigeon pea	–	–	–	–	5d	5d	10d		–	–	–	–	–	–		–	–	–	–	–	–	–	5d	5d	10d
Safflower	9mo	7d	14d	21d	14d	21d	28d		7d	14d	21d	–	–	–		–	–	–	–	–	–	–	14d	21d	28d
Sorghum	14mo	3d	7d	10d	1d	3d	7d		3d	7d	10d	7/21d 3	24mo	7d		–	–	–	–	–	3mo	–	1d	3d	7d
Soybean	14mo	14d	14d	21d	5d	5d	10d		14d	14d	21d	7/21d 3	–	7d		–	–	–	–	–	5mo	–	5d	5d	10d
Sub-clover	9mo	7d	7d	10d	7d	14d	21d		7d	7d	10d		–	–		–	–	–	–	24mo	–	20mo	7d	14d	21d
Sunflower	14mo	7d	10d	14d	1d	7d	14d		7d	10d	14d	7/21d 3	24mo	7d		–	–	–	–		5mo	–	1d	7d	14d
Triticale	6w	1d	3d	7d	1d	7d	14d		1d	3d	7d	–	–	–		–	–	–	–	–	–	–	1d	7d	14d
Vetch	–	7d	7d	10d	–	–	–		7d	7d	10d	–	–	–		–	–	–	–	–	–	–	–	–	–
Wheat	10d	1d	3d	7d	1d	7d	14d		1d	3d	7d	3d	4mo	7d		2mo	2mo	4mo	4mo	9mo	4mo	9mo	1d	7d	14d

KEY: hr = hours, 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 prior to the commencement of the plantback period.
3. Express® is broken down in soil, primarily by chemical hydrolysis, but to a lesser degree by microbial degradation. Breakdown is fastest in warm, wet acid soils and slower in cold alkaline soils. For these summer crops, if minimum soil temperatures at planting depth are less than or equal to 15 °C for three consecutive days, then plantback intervals should be extended to 21 days.
4. Black cracking clays. During drought conditions the plantback period may be significantly longer.
7. Plantback refers to rapeseed not canola.
8. Soil pH determined by 1:5 soil:water suspension method.
9. Do not plant susceptible crops until 9 months after application of Eclipse®. Susceptible crops include canola or other brassica crops, field peas, beans, medics, lucerne and sub-clover.
10. Minimum recropping periods are influenced by numerous factors. See label for further information.
11. Goal® herbicide at up to 75 mL/ha may be safely applied 1 day before planting wheat, barley, oats, triticale, canola, lupins, faba beans, field peas, lucerne, clover, medics, ryegrass, phalaris and cocksfoot and 7 days minimum before planting cotton or soybeans, provided minimum tillage planting equipment is used with minimal soil disturbance.
14. Minimum recropping periods are influenced by numerous factors. See label for further information.

Table 2. Guidelines for crop rotations – Fallow commencement/maintenance and pre-sowing seedbed weed control (continued).

	Lontrel™ Advanced 600 g/L [5]						Pixxaro™	Pyresta® [2]		Rexade™ [16]	Starane™ Advanced [6]			Sharpen® WG	Shogun®	Terrain™ 500 WG			Vortex® [21]	Weedmaster® Argo®
Herbicide group	I	I	I	I	I	I	I	GI	GI	BI	I	I	I	G		G	G	G	BI	M
Specific details	NNSW <0.04 L/ha	NNSW 0.0375–0.15 L/ha	NNSW >0.15 L/ha [12]	SNSW <0.15 L/ha	SNSW <0.15–0.25 L/ha	SNSW >0.25 L/ha	400 mL/ha [16]	250–500 mL/ha	900 mL/ha	100 g/ha	0.225 L/ha	0.45 L/ha	0.9 L/ha	17–34 g/ha	200–300 mL/ha	30 g/ha	120 g/ha	180 g/ha	600 –820 mL/ha	[13]
Crop																				
Barley	7d	7d		7d	7d	7d	28d	1d	1d	8mo	7d	7d	7d	1hr	28d	1hr	1mo	2mo	[17]	
Canola	7d	7d		7d	7d	7d	28d	14d	21d	8mo	–	–	–	6w	–	–	9mo	9mo	–	
Canola (Clearfield)	–	–		–	–	–	28d	–	–	–	–	–	–	–	–	–	9mo	9mo	–	
Cereal rye	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Chickpea	3mo	6mo		9mo	12mo	24mo	7mo	7d	14d	8mo	7d	7d	7d	1hr	–	1hr	0mo	0mo	[18]	
Cotton	3mo	6mo		–	–	–	12mo	10d	14d	8mo	14d	14d	28d	6w	–	1hr	0mo	0mo		
Faba bean	–	–		9mo	12mo	24mo	7mo	7d	7d	8mo	–	–	–	1hr	–	1hr	0mo	0mo	[18]	
Field pea		–		9mo	12mo	24mo	7mo	7d	14d	8mo	–	–	–	1hr	–	1hr	0mo	0mo	[18]	
Lentils	–	–		9mo	12mo	24mo	7mo	7d	7d	8mo	–	–	–	1hr	–	1hr	2mo	3mo	[18]	
Linseed	–	–		–	–	–	–	7d	7d	–	–	–	–	–	–	–	–	–	–	
Lucerne	9mo	9mo		–	–	–	7mo	7d	7d	8mo	–	–	–	–	–	–	3mo [19]	4mo [19]	[18]	
Lupins	–	–		9mo	12mo	24mo	–	7d	14d	–	–	–	–	1hr	–	1hr	1mo	2mo	[18]	
Maize	7d	14d		–	–	–	28d	–	–	5mo	7d	7d	7d	1d	–	1hr	–	–	–	
Medic	–	–		9mo	12mo	24mo	7mo	7d	7d	8mo	–	–	–	–	–	–	3mo	4mo	[18]	
Millet	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Millet (Japanese)	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Millet (Panorama)	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Millet (white French)	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Mungbean	–	–		–	–	–	6mo	–	–	5mo	–	–	–	–	–	1hr	–	–	–	
Navy bean	–	–		–	–	–	–	10d	10d	–	–	–	–	–	–	1mo [20]	–	–	–	
Oats	7d	7d		7d	7d	7d	28d	3d	3d	8mo	–	–	–	1hr	28d	1hr	1mo	2mo	–	
Pigeon pea	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Safflower	–	–		–	–	–	–	7d	14d	–	–	–	–	–	–	–	–	–	–	
Sorghum	7d	14d		–	–	–	28d	3d	7d	5mo	7d	7d	7d	1d	–	1hr	–	–	–	
Soybean	3mo	6mo		–	–	–	8mo	14d	14d	8mo	7d	7d	14d	1d	–	1hr	–	–	–	
Sub-clover	–	–		9mo	12mo	24mo	8mo	7d	7d	8mo	–	–	–	1hr	–	–	3mo	4mo	[18]	
Sunflower	3mo	6mo		–	–	–	5mo	7d	10d	5mo	7d	7d	7d	16w	–	1hr	–	–	–	
Triticale	–	–		–	–	–	28d	1d	3d	–	–	–	–	–	–	–	1mo	2mo	–	
Vetch	–	–		9mo	12mo	24mo	7mo	7d	7d	8mo	–	–	–	–	–	–	1nd	1mo	–	
Wheat	7d	7d		7d	7d	7d	28d	1d	3d	–	7d	7d	7d	1hr	28d	1hr	0mo [15]	1mo [15]	–	

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

[2] When applied to dry soils at least 15 mm of rain must fall prior to the commencement of the plantback period.
[5] Additional rainfall requirements need to be observed – see label.
[6] Do not plant susceptible crops, including cotton, pigeon peas and other pulse crops, into irrigated fields with soils containing less than 25% clay content, within 12 months of treatment with Starane™ Advanced.
[12] Susceptible crops should not be sown for at least 2 years when Lontrel™ Advanced at more than 0.15 L/ha has been used in northern Australia.
[13] Do not disturb weeds by cultivation, sowing or grazing for 6 hours of daylight following treatment of annual weeds and 7 days for perennial weeds.
[15] Terrain™ 500 WG: Durum wheat one month for 120 g/ha and 180 g/ha.
[16] Check label for minimum rainfall totals re plantback periods, specifications for north and south of the state and different crops.
[17] The product label states: There is no normal plantback period in days or months.
[18] This susceptible winter crop may be sown in the year following application. Crops include pastures with a lucerne, medic or clover component.
[19] Seedling.
[20] Up to 180 g/ha.
[21] Susceptible winter crops may be sown the year following application. Susceptible crops include: chickpeas, faba beans, field peas, lentils and lupins or pastures with a lucerne, medic or clover component.

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

	Associate® 1	Amicide® Advance (700 g/L) 2 20	Atlantis® OD 4	Atrazine 21	Balance® (NNSW) 6	Boxer® Gold 22	Arcade® 31	Broadstrike™ 11		Cadence® 2 20	Countdown® 32	Eclipse® 100 SC 23	Tackle® 14			Hotshot™ 20	Hussar® OD	Intervix®	Logran® B-Power® 3 16		
Herbicide group	B	I	B	C	C	J&K	J	B		I	J	B	B			I	B	B	B		
Soil pH 1:5 soil:water suspension method	pH 5.6–8.5												< pH 6.5	pH 6.6–7.5	pH 7.6–8.5				pH <6.5	pH 6.6–7.5	pH 7.6–8.5
Specific details								(NNSW)	(SNSW)												
Barley	6 w		9 mo		10 w 7			3 12–6 13 mo	3 12–9 13 mo				9 mo	9 mo	18 mo		9 mo	10 mo 15	–	–	–
Canola	9 mo		9 mo		9 mo 9			6 12–9 13 mo	9 12–12 13 mo				12 mo	22 mo	–		9 mo	34 mo	12 mo	12 mo	12 mo
Canola (Clearfield)	10 d		–		–			–	–				3 mo	3 mo	3 mo		–	0 d	–	–	–
Cereal rye	6 w		–		–			0 d	0 d				3 mo	3 mo	18 mo		–	34 mo	–	–	–
Chickpea	9 mo		9 mo		–			3 12–6 13 mo	3 12–9 13 mo				–	–	–		9 mo	10 mo	12 mo	12 mo	12 mo
Cotton			12 mo		7 mo 9			6 12–9 13 mo	–				–	–	–		12 mo	34 mo	15 mo	15 mo	18 mo
Faba bean	9 mo		11 mo		9 mo 8			6 12–9 13 mo	9 12–12 13 mo				12 mo	22 mo	–		9 mo	10 mo	12 mo	–	–
Field pea	9 mo		9 mo		9 mo 8			3 12–6 13 mo	3 12–9 13 mo				12 mo	22 mo	–		9 mo	10 mo	12 mo	–	–
Lentils	9 mo		11 mo		21 mo 10			6 12–9 13 mo	9 12–12 13 mo				–	–	–		21 mo	34 mo		–	–
Linseed	9 mo		–		–			–	–				12 mo	22 mo	–		–	34 mo	12 mo	–	–
Lucerne	9 mo		9–21 mo 5		9 mo 9			3 12–6 13 mo	3 12–9 13 mo				12 mo	22 mo	–		9 mo	10 mo	12 mo	–	–
Lupins	9 mo		9 mo		–			6 12–9 13 mo	9 12–12 13 mo				12 mo	22 mo	–		9 mo	10 mo	12 mo	–	–
Maize	14 mo		12 mo		10w 7			0 d	0 d				18 mo	26 mo	–		–	34 mo	15 mo	15 mo	18 mo
Medic	9 mo		21 mo		21 mo 10			0 d	0 d				12 mo	22 mo	–		21 mo	10 mo 19	12 mo	–	–
Millet			–		–			–	–				–	–	–		–	34 mo	–	–	–
Millet (Japanese)	14 mo		–		–			–	–				–	–	–		–	34 mo	–	–	–
Millet (Panorama)	14 mo		–		–			–	–				–	–	–		–	34 mo	–	–	–
Millet (white French)	14 mo		–		–			–	–				–	–	–		–	34 mo	–	–	–
Mungbean			12 mo		7 mo 8			–	–				–	–	–		12 mo	34 mo	15 mo	15 mo	18 mo
Navy bean			–		–			–	–				–	–	–		–	34 mo	–	–	–
Oats	9 mo		9 mo		10 w 7			3 12–6 13 mo	3 12–9 13 mo				6 mo	9 mo	18 mo		9 mo	10 mo 15	–	–	–
Pigeon pea			–		–			–	–				–	–	–		–	34 mo	–	–	–
Safflower	9 mo		–		–			–	–				12 mo	22 mo	–		–	34 mo	–	–	–
Sorghum	14 mo		12 mo		7 mo 8			6 12–9 13 mo	–				18 mo	26 mo	–		12 mo	34 mo	15 mo	15 mo	18 mo
Soybean	14 mo		12 mo		7 mo 8			0 d	0 d				18 mo	26 mo	–		12 mo	34 mo	15 mo	15 mo	18 mo
Sub-clover	9 mo		9–21 mo 5		21 mo 10			3 12–6 13 mo	3 12–9 13 mo				12 mo	22 mo	–		9 mo	10 mo 19	12 mo		
Sunflower	14 mo		12 mo		7 mo 8			6 12–9 13 mo	–				18 mo	26 mo	–		12 mo	34 mo	18 mo	18 mo	
Triticale	6 w		9 mo		–			0 d	0 d				0 mo	0 mo	0 mo		9 mo	10 mo 15	–	–	–
Vetch			9 mo		9 mo 8			6 12–9 13 mo	9 12–12 13 mo				–	–	–		9 mo	10 mo	–	–	–
Wheat (Clearfield)			–		–			–	–				–	–	–		–	0 d	–	–	–
Wheat	10 d		1 d		10 w 7			0 d	0 d				0 mo	0 mo	0 mo		1 d	10 mo 15	–	–	–

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 recommnded.
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.

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

		Lontrel™ Advanced (600 g/L) [20]	LV Ester 680 (680 g/L) [2] [20]	Midas®	Monza® [3]		On Duty®		Precept®				Prometryn 900 DF [24]	Raptor® [25]	Sakura® 850 WG	Simazine [26]	Spinnaker® [27]	Starane™ [20]	FallowBoss™ Tordon™ [28]	Velocity® [29]				
Herbicide group		I	I	B	B		B		I&H				C	B	K	C	B	I	I	H + C				
Soil pH 1:5 soil:water suspension method	pH >8.6				pH <6.5	pH 6.5–8.5			All soils	All soils	pH < 6.5	Alkaline									Alkaline or neutral	Alkaline or neutral	pH <6.5	Alkaline or neutral
Specific details							20 g/ha	40 g/ha	1.0 L/ha 250 mm [88]	2.0 L/ha 250 mm [88]	2.0 L/ha 250 mm [88]	2.0 L/ha 500 mm								1.0 L/ha	670 mL/ha 250 mm	1.0 L/ha 250 mm	1.0 L/ha 250 mm	1.0 L/ha 500 mm
Barley	–			10 mo [15]	12 mo	22 mo	8 mo [15]	8 mo [15]	3 w	3 w	3 w	3 w			9 mo					3w	–	–	–	–
Canola	24 mo			34 mo	10 mo	22 mo	34 mo	34 mo	9 mo	9 mo	9 mo	–			9 mo					–	9 m	9 mo	9 mo	–
Canola (Clearfield)	–			0 d	–	–	0 d	0 d	9 mo	9 mo	9 mo	–			–					–	–	–	–	–
Cereal rye	–			34 mo	–	10 mo	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Chickpea	24 mo			10 mo	10 mo	22 mo	8 mo	8 mo	9 mo	–	9 mo	–			9 mo					–	9 mo	9 mo	9 mo	–
Cotton	24 mo			34 mo	–	–	34 mo	34 mo	14 mo	–	14 mo	–			5 mo					–	–	–	–	–
Faba bean	24 mo			10 mo	12 mo	22 mo	8 mo	8 mo	9 mo	–	9 mo	–			9 mo					–	9 mo	–	9 mo	–
Field pea	24 mo			10 mo	10 mo	22 mo	8 mo	8 mo	9 mo	9 mo	9 mo	–			9 mo					–	9 mo	9 mo	9 mo	–
Lentils	–			34 mo	10 mo	22 mo	34 mo	34 mo	9 mo		9 mo	21 mo			9 mo					–	9 mo	–	9 mo	21 mo
Linseed	24 mo			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Lucerne	24 mo			10 mo	–	–	8 mo	8 mo	9 mo	9 mo	9 mo	–			21 mo					–	9 mo	9 mo	9 mo	–
Lupins	24 mo			10 mo	10 mo	–	8 mo	8 mo	9 mo	9 mo	9 mo	–			9 mo					–	9 mo	9 mo	9 mo	–
Maize	24 mo			34 mo	–	–	34 mo	34 mo	–	8 w	–	–			5 mo					8 w	–	–	–	–
Medic	24 mo			10 mo [19]	–	22 mo	8 mo [19]	8 mo [19]	–	–	9 mo	21 mo			21 mo					–	–	9 mo	9 mo	21 mo
Millet	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Millet (Japanese)	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Millet (Panorama)	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Millet (white French)	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Mungbean				34 mo	–	–	34 mo	34 mo	–	14 mo	–	–			5 mo					–	–	–	–	–
Navy bean	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Oats	–			10 mo	10 mo	22 mo	8 mo [15]	8 mo [15]	3 w	3 w	3 w	3 w			21 mo					3 w	–	–	–	–
Pigeon pea	–			34 mo	–	–	34 mo	34 mo	–	–	–	–			–					–	–	–	–	–
Safflower	–			22 mo	–	–	22 mo	22 mo	–	–	–	–			–					–	–	–	–	–
Sorghum	24 mo			34 mo	–	–	34 mo	34 mo	–	8 w	–	–			5 mo					8 w				–
Soybean	24 mo			34 mo	–	–	34 mo	34 mo	14 mo	–	14 mo	–			5 mo					–	–	–	–	–
Sub-clover	24 mo			10 mo [19]	10 mo	–	8 mo [19]	8 mo [19]	–	–	–	–			9 mo					–	–	–	–	–
Sunflower	–			34 mo	–	–	34 mo	34 mo	14 mo	–	14 mo	–			5 mo					–	–	–	–	–
Triticale	–			10 mo [15]	–	–	8 mo [15]	8 mo [15]	3 w	3 w	3 w	3 w			0 d					3 w	–	–	–	–
Vetch	–			10 mo	–	22 mo	8 mo	8 mo	9 mo	9 mo	9 mo				9 mo						9 mo	9 mo	9 mo	–
Wheat (Clearfield)	–			0 d	–	–	0 d	0 d	3 w	3 w	3 w	3 w			–					3 w	–	–	–	–
Wheat	–			10 mo [15]	–	–	8 mo [15]	8 mo [15]	3 w	3 w	3 w	3 w			0–21 mo [17]					3 w	–	–	[30]	–

[13] 50 g/ha.
[14] Tackle 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 (750 750g/kg) is applied at lower rates with trifluralin or post-emergent additional requirements need to be considered – see label.
[17] Wheat (0 months), durum wheat (21 months).
[18] Minimum of 300 mm for summer crops. Minimum 500 mm for cotton, soybean and Sunflower where Precept® rate up to 2.0 L/ha. See Precept® label.
[19] Plantback refers to pasture legumes.
[20] See Table 2 on page 8.
[21] To avoid triazine carryover maximum rates are stated (based on soil pH) – see label for further information.
[22] No plantback restrictions except in the case of a failed crop.
[23] Do not plant susceptible crops until 9 months after application of Eclipse®. Susceptible crops include canola or other brassica crops, field peas, beans, medics, lucerne and sub-clover.
[24] Do not plant crops other than celery, chickpeas, peanuts, sunflowers or carrots in areas within 6 months following application of the product at rates above 1.2 kg/ha.
[25] Plantback varies depending on what situation chemical was used in – see label.
[26] To avoid triazine carryover maximum rates are stated (based on soil pH) – see label for further information.
[27] Plantback varies depending on what situation chemical was used in – see label.
[28] Plantback varies widely with crop type and location i.e. 4–12 months northern NSW or 4–20 months southern NSW see label.
[29] Minimum recropping period, influenced by several factors – see label.
[30] With 250 mm rainfall/irrigation areas with double overlapping could be affected.
[31] No plantback restrictions except in the case of a failed crop.
[32] No plantback restrictions except in the case of a failed crop, at which 9 months for susceptible crops.

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®	0.5	14 days	Not stated.
Agtryne®	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	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®	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	8 weeks	Not required when used as directed.
Bromicide® MA	4	8 weeks	Not required when used as directed.
Cheetah®Gold	4	49 days	Not required when used as directed.
Countdown®	Light rain during or after application will not affect results	10 weeeks	Not required when used as directed.
Decision®	2	49 days	Not required when used as directed.
Diurex	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.
Duet® 250EC	Light rain during or after spraying will not affect results	Not required when used as directed.	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.
EliminarC	Do not apply if heavy rain is expected within 4 hrs	6 weeks	Not required when used as directed.
Factor®	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.
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™ FallowMaster™	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®	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.
Igran®	6	7 cereals	7 cereals
Intervix®	2	5 weeks	Not required when used as directed.
Jaguar®	4	14 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
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.
MCPA	6	7 days	Not required when used as directed.
Midas®	6	28 days	Not required when used as directed.
Monza® (Post)	Immediate rainfall may affect results.	Not required when used as directed.	Not required when used as directed.
Motsa™	1	56 days	Not required when used as directed on chickpea, faba bean, field pea, lentil and lupin; canola
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® Xtra	4	42 days	Not required when used as directed.
Pendimethalin 440EC	Light rain after application does not generally affect results and assists soil incoroporation.	Not required when used as directed.	Not required when used as directed.
Picoflex	4	7 days	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®	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
Simazine	On firm seedbeds light rain after use usually enhances activity.	Chickpea 63 days; faba bean 56 days; canola 105 days	Faba bean 161
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 hours	21 days	Not required when used as directed.
Tackle®	4 Rain assists soil incorporation and activation.	Nil	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®	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®	Not stated	42 days	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, canolalupin, 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® Argo®	1	Not required when used as directed.	7 wheat and pulses, other uses 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.

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 600 g/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® + Weedmaster® Argo®	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® + 0.5–1.1 L/ha Weedmaster® Argo®	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	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	DO NOT 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 $CaCO_3$ 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 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.

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.

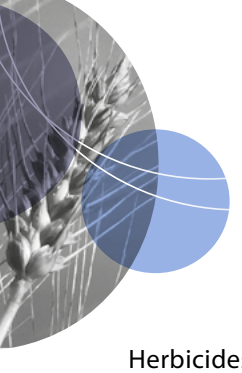
Table 6. Herbicide tolerance to water qualities

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
Tackle®	✓	✓	✓	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		✓	✓	✓	✓
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.

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



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.

GO TO PAGE:
Table 7 on page 17 lists some of the available adjuvants.

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
- terpene/pinolene
- pyrrolidone-based.

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.

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
Spray oil			
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® 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	Dow AgroSciences	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.
Caltex Broadcoat®	861 g/L petroleum oil	Caltex	Adjuvant/wetting agent. Used with certain non-selective herbicides.
Kwickin™/Impel™	704 g/L methyl and ethyl canolate and 196 g/L blend of surfactants, sorbitan esters and vegetable oil ethoxylate	GullfAg/ Nufarm	Improves penetration. Used with certain post-emergent 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.
Intac® Ag Oil	820 g/L canola oil	Nipro Products	Improves droplet deposition, uptake. Used with non and selective 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.
Synertrol® Broadacre	780 g/L emulsified vegetable oil	Organic Crop Protectants	Wetter, spreader and penetrant compatible with most 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 parafin oil to enhance the wetting, spreading and uptake of systemic herbicides through waxy leaf surfaces.
Amplify®	432 g/L mineral oil	Adama	
D-C-Trate®	763 g/L petroleum oil	Caltex	Anti-evaporant/wetting agent used with certain herbicides.
DC Tron™	991 g/L petroleum oil	Caltex	See label.
Surfactant			
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 alkoxylated 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.
Chemwet® 1000	1000 g/L non-ionic ethoxylates	Nufarm	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.
Compatability agent			
Liase®/Liquid Assist	417 g/L ammonium sulfate	Nufarm/Rutec	Minimise antagonism. For use with glyphosate herbicides.
Response®/Enhan-zar®	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® broadhectare only.
Acidifying/buffering agents			
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 sulfonylureas.
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-Buffa®	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®, Kamba®, Bromoxynil).
6. Water-soluble concentrates (e.g. glyphosate, Amicide® Advance 700, Spray. Seed® 250, Gramoxone® 360 Pro).
7. Surfactants and oils (e.g. BS1000®, Hasten™, D-C-Trate®).
8. Soluble fertilisers.

Table 8. Directory of herbicide manufacturers/distributors

Distributor/Manufacturer	Contact	Contact Person
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: agro.basf.com.au	1800 558 399
Bayer CropScience Pty Ltd	8 Redfern Road, Hawthorn East, Vic 3123. Ph: (03) 9248 6888 Fax: (03) 9248 6800. Web: www.bayercropscience.com.au	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: www.cropcare.com.au	Customer Service 1800 111 454
Corteva Agriscience	Locked Bag 502, Frenchs Forest NSW 2086.	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: www.nufarm.com.au	Technical Enquiries 1800 683 704
Sinochem	Level 8/606 St Kilda Road, Melbourne, Vic 3004 Ph: (03) 9520 8888 Web: www.sinochem.com.au	Customer Service 1800 334 096
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: www.sumitomo-chem.com.au	Chris van der Hoven chris.vanderhoven@sumitomo-chem.com.au 1800 060 671
Syngenta Crop Protection Pty Ltd	Level 1, 2–4 Lyon Park Road, North Ryde NSW 2113. Ph: 02 88768444 Web: www.syngenta.com.au	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®, Weedmaster® Argo®, glyphosate, Raptor®, Spinnaker®, Sniper®, Wipe Out® Pro, 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, simazine.	125 g powdered detergent (*Nufarm Tank and Equipment Cleaner), Absolute Boomer®	Rinse with clean water before and after using the solution.
Sulfonylurea herbicides, Tackle®, 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®	1. Drain and flush the tank, hoses and boom with clean water for 10 minutes. 2. Fill the tank with clean water and add the chlorine bleach. Flush the boom and allow to stand for 15 minutes, then drain. 3. Repeat Step 2. 4. Nozzles, screens and filters should be removed and cleaned separately.
Broadstrike™, Eclipse® 100 SC, Lontrel™ Advanced, Grazon™ Extra, Paradigm™, Pixxaro™, Rexade™.	500 mL liquid detergent DynamoMatic®, or 500 g of the powder equivalent such as Surf®, Omo®, 1 L Absolute Boomer®	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. Remove and clean the filters, screens and nozzles with clean water and allow to drain.
Herbicides for grass control in broadleaf crops and pastures such as Verdict™ (520 g/L).	500 mL liquid alkali liquid detergent such as Surf®, Omo®, DynamoMatic®, or 500 g of the powder equivalent. 1 L Absolute Boomer®	If broadleaf herbicides, particularly sulfonylureas (such as Tackle®), 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. 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. 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. Drain the whole system. Remove filters, screens and nozzles and clean separately. Finally, flush the system with clean water and allow to drain.

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 Tackle®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 ❺
Area to be sprayed (hectares).	ha ❼
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 ❹
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. Rated output	type size .....mL/min
Record minimum boom height above target for these nozzles.	cm

Measuring

Record the output from every nozzle for 1 minute. 1..... 2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10..... 11..... 12..... 13..... 14..... 15..... 16..... 17..... 18..... 19..... 20..... 21..... 22..... 23..... 24..... 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.)	Total spray output (add all nozzles) L/min ❶
Record actual effective spray width in metres by measuring the distance across the outside nozzles and adding the distance between two adjacent nozzles.	m ❷

Calculating

Actual ground speed*	**Distance covered (m) × 3.6 / Time taken (seconds)**	( ) × 3.6 / ( )	= ..... **km/hr ❸**

'3.6' in the calculation is a conversion factor to convert metres to kilometres (metres ÷ 1000) and seconds to hours (seconds ÷ 3600): D/1000 ÷ S/3600 = D/1000 × 3600/S = D/S × 3600/100 = D/S × 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. ❷) tell you the step where the answer is on the previous page.

Total spray output	Effective spray width	Actual ground speed
..... **litres/minute ❶**	..... **metres ❷**	..... **km/hr ❸**

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	**❶ × 600 / ❷ × ❸**	( ) × 600 / ( ) × ( ) = (.....) / (.....)	**❻** ..... **litres/ha**

'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^2) to hectares (m^2 ÷ 10000): 60 ÷ 1000/10000 = 60 ÷ 1/10 = 60 × 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 ❹**		**Spray tank capacity** ..... **litres ❺**
How much chemical to mix in each tank?	**❹ (L/ha) × ❺ (L) / ❻ (L/ha)**	( ) × ( ) / ( ) = ... **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	**❼ (ha) × ❻ (L/ha) / ( ) × ( )**	= ..... **litres ❽**
Number of tanks needed	**❽ (L) / ❺ (L)** ( ) / ( )	= ..... **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, have record forms. More information on your spray record responsibilities is available on the Environment Protection Authority 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 (epa.nsw.gov.au/resources/pesticides/130814PestFmEg.pdf)

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

Environment Protection Authority (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)

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)

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).

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)

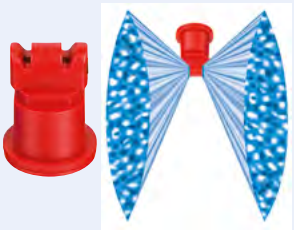
As always, any application requirements on the product label must be adhered to.

Turbo TwinJet (TTJ60)

- Front flat spray 30° from vertical
- Rear flat spray 30° from vertical
- Medium–coarse
- 1.5–6 bar
- Ideal pressure 2–4 bar
- 02 to 04 capacities
- Drift control – good

Air Induction Turbo TwinJet (AITTJ60)

- Front flat spray 30° from vertical
- Rear flat spray 30° from vertical
- Coarse–very coarse
- 2–6 bar
- Ideal pressure 3–4 bar
- 02 to 04 capacities
- Drift control – excellent

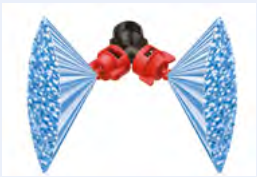


Air Induction Dual Flat Spray (AI3070)

- Front flat spray 30° from vertical
- Rear flat spray 70° from vertical
- Medium–very coarse
- 1.5–6 bar
- Ideal Pressure 2–4 bar
- 015 to 05 capacities
- Drift control – excellent

Double outlet nozzle body or cap

- If using Turbo TeeJets (TT), 60°, 90° or 120° included angle
- Drift control, drop size, pressure range – varies



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

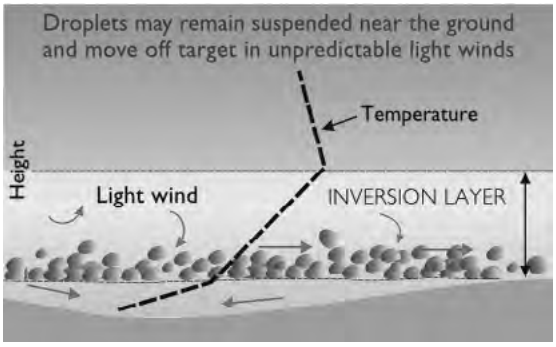


Figure 3. The relationship of air temperature and relative humidity to values of Delta T. Source: Bureau of Meteorology.

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.

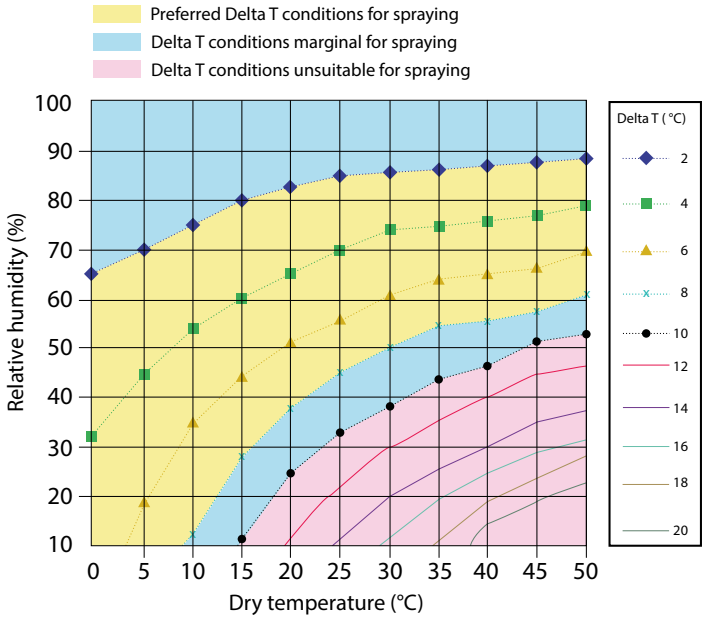


Figure 4. The relationship of air temperature and relative humidity to values of Delta T. Source: Bureau of Meteorology.

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 [5]	Paraquat 360 g/L Gramoxone® 360 Pro	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 540 g/L Weedmaster® Argo®	Glyphosate 470 g/L Weedmaster® DST®	Propaquizafop 100 g/L Shogun® [6]
Grass weeds	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
annual phalaris	–	0.8–1.67	1.2–2.4	–	0.625–0.95	0.33–0.67	0.38–1.5	–
annual ryegrass	–	0.83–1.67	1.0–3.2	3.0–4.0	0.95-1.25	1.0–1.3 [4]	1.15–1.5	–
barley grass	–	0.83–1.67	1.0–3.2	3.0–4.0	0.625–0.95	0.33–1.0	0.38–1.5	–
barnyard grass	0.15–0.2	0.83–1.67	1.2–2.4	3.0–4.0	0.625–1.3	0.67–1.3	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	1.0–1.3	0.96–1.5	–
button grass	0.15–0.2	–	–	–	0.625–1.3	0.67–1.3	0.76–1.5	–
cereals – volunteer	–	0.83–1.67	1.0–3.2	3.0–4.0	0.625–0.95	0.33–1.0	0.38–1.5	0.2–0.25 L/ha
couch	–	–	–	–	1.2–1.9 [2]	1.0–2.0 [2]	1.15–2.3 [2]	–
feathertop Rhodes	–	–	–	–	–	–	–	0.5–0.9 L/ha
Johnson grass	–	–	–	–	1.2–1.9	1.3–2.0	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	0.67–1.3	0.76–1.5	0.6–0.9 L/ha
native millet	–	–	–	–	0.625–1.3	0.67–1.3	0.76–1.5	–
nut grass	–	–	–	–	1.9 + 1.9 [3]	2.0 + 2.0 [3]	2.3 + 2.3 [3]	–
phalaris – perennial	–	–	–	–	1.2–1.9	–	1.44–1.9	–
pigeon grass	–	–	–	–	–	–	–	–
pigweed	0.15–0.2	–	–	–	–	–	–	–
sorghum – volunteer	–	–	–	–	0.425–1.3	0.67–1.3	0.76–1.5	0.3–0.6 L/ha
spiny burrgrass	–	–	–	–	–	–	–	–
stinkgrass	0.15–0.2	–	1.2–2.4	–	0.425–1.3	0.67–1.3	0.76–1.5	–
summer grass	–	–	–	–	0.425–1.3	0.33–1.0	0.38–1.5	–
sweet summer grass	–	–	–	–	–	0.5–1.3	0.57–1.5	–
vulpia	–	0.83–1.67	1.0–3.2	–	0.95-1.25 [1]	1.0–1.3 [4]	1.15–1.5	–
wild oats	–	0.83–1.67	1.0–3.2	3.0–4.0	0.625–0.95	0.33–1.0	0.38–1.15	–
windmill grass	–	–	–	–	–	–	–	–
winter grass	–	0.83–1.67	–	–	0.95-1.25	–	0.96–1.5	–
Yorkshire fog	–	–	–	–	1.2–1.9	–	–	–
Rec. water vol L/ha boom	50 min	100–200	50–200	50–200	80 max	25–100	25–100	50–150
Wheat plantback	4 months	1 hr	1 hr	0 hr [3]	1 hr	6 hr	6 hr	28 days
Herbicide group	B (Boom only)	L	L	L + Q	M	M	M	A

Key: hr = hour; min = minutes

[1] When treating dense populations, use higher rate, add Wetter TX® and water volumes > 70 L/ha.
[2] Best in conjunction with multiple applications and/or cultivation.
[3] See label for program.
[4] Minimum water rate of 70 L/ha and appropriate nozzles. See label.
[5] 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.
[6] Adjuvant required to be added at label rates for all applications.

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg Express® 18	Oxyfluorfen 240 g/L Striker® 19	Carfentrazone ethyl 400 g/L Hammer® 400EC 5 20	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV Ester 421 g/L Pyresta® 21	Triclopyr 300 g/L+ picloram 100 g/L + aminopyralid 8 g/L Grazon™ Extra 22	Dicamba 750 g/L Kamba® 750 23	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hotshot™ 24	Paraquat 135 g/L + diquat 115 g/L Spray.Seed® 250 25	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 ® 27
Broadleaf weeds	**(grams)**	**(millilitres)**	**(millilitres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
amaranthus	25	75	–	–	–	0.215–0.375 2	–	–	3.0–4.0	–	–	–
amsinckia	–	75	–	0.25–0.5 6	–	–	–	–	–	–	–	–
blackberry nightshade	–	75	–	–	0.2–0.4 (S) 2	0.215–0.375	–	–	–	–	–	–
black bindweed	25 2	–	–	–	–	0.185	0.5 6	–	–	1.2–1.9	–	–
bladder ketmia	–	75	–	–	–	–	–	1.6–2.4	3.0–4.0	0.625–1.3	0.76–1.15 10	–
Boggabri weed	–	–	–	–	–	–	–	1.6–2.4	–	0.425–1.3	0.38–1.45	–
burrs – Bathurst	–	–	–	–	–	0.215–0.375	–	1.6–2.4	–	1.2–1.9	0.76–2.3	–
burrs – Noogoora	–	–	–	–	–	0.215–0.375	–	–	–	0.625–1.3	0.76–1.15 10	–
caltrop/yellow vine	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 9	–	–	50–100
capeweed	–	75	15–45	0.25–0.5 6	–	0.105–0.16 2 26	–	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	–	–	–	–	–	–	–	–	–	–	–	–
chickweed	–	75	15–45	0.25–0.5 6	–	–	–	–	–	–	–	–
clover	–	–	–	–	–	0.135 26	–	1.2–3.2 11	–	–	–	–
corn gromwell	–	–	–	–	–	–	–	1.2–3.2	–	–	–	–
cudweed	–	–	–	–	–	–	–	–	–	–	0.76–1.15	–
datura (thornapple)	20 2	–	–	–	–	0.215–0.375	–	1.6–2.4	–	0.625–1.3	0.76–1.15 10	–
deadnettle	25 2	75 28	–	0.25–0.5 6	–	–	–	1.2–3.2	–	0.425–1.3	0.575–1.5	50–100
docks	–	–	–	0.5 6 4	–	0.185	–	–	–	1.2–1.9	–	–
erodium (storksbill)	–	–	15–45	0.25–0.5 6	–	–	–	1.2–3.2 z	3.0–4.0	1.2–1.9	–	50–100
fat hen	–	75	–	–	–	0.185	–	1.6–2.4	–	–	–	50–100
field pea – volunteer	–	–	–	–	–	–	–	1.2–1.8 11	3.0–4.0	–	–	–
fleabane	–	–	–	–	–	–	–	–	3.0–4.0	1.15 12 13	–	–
fumitory	–	–	–	–	–	–	–	1.2–3.2	–	–	0.76–1.15	–
ground cherry–annual	–	–	–	–	–	–	–	–	–	0.625–1.3	0.76–1.15 10	–
Rec water vol L/ha boom	>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	3 days	24 hour	0 hour	1–3 days	2–4 months	1–14 days	4 months 17	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	B	G	G	G + I	I	I	I	L	L + Q	M	M	G

2 Add glyphosate as per label for control.
4 Curled dock only.
5 Hammer® also available in 240 g/L, see label for rates.
6 Add glyphosate – see label.
9 Includes Roundup-Ready® canola.
10 Before stem elongation. After this add Amicide® Advance 700 for control. See label.
11 Add 5 g/ha Associate® or 0.5 L/ha dicamba for control.
12 A minimum of 1.18 L/ha Weedmaster® Argo® + 650 mL–1.1 L/ha Amicide® Advance 700.
13 A minimum of 1.18 L/ha Weedmaster® Argo® + 650 mL–1.1 L/ha Amicide® Advance 700 + followed by 1.6–2.0 L/ha Nuquat®.
17 Northern NSW only.
18 Always add non-ionic surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
19 Always apply with recommended label rates of glyphosate. Addition of Striker® will improve knockdown and increase speed of control.
20 Always apply with recommended label rates of knockdown herbicides.
21 Always add with recommended rate of glyphosate at no less than coarse to very coarse droplets.
22 Tankmix Roundup® CT + adjuvant for control. Caution: check minimum recropping periods in Table 2 on page 8.
23 Observe plantback period with broadleaf crops. Northern NSW only.
24 Observe plantback periods – see Table 2 on page 8.
25 Add wetting agent when water volume is above 100 L/ha.
26 Add Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha.
27 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.
28 Seedlings only.
(S) Suppression only.

Herbicides for control and suppression

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 sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg Express® (18)	Oxyfluorfen 240 g/L Striker® (19)	Carfentrazone ethyl 400 g/L Hammer® 400EC (5) (20)	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV Ester 421 g/L Pyresta® (21)	Triclopyr 300 g/L+ picloram 100 g/L + aminopyralid 8 g/L Grazon™ Extra (22)	Dicamba 750 g/L Kamba® 750 (23)	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hotshot™ (24)	Paraquat 135 g/L + diquat 115 g/L Spray.Seed® 250 (25)	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 ® (27)
Broadleaf weeds	**(grams)**	**(millilitres)**	**(millilitres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
heliotrope – white	–	–	–	–	–	–	–	–	–	–	–	–
Hexham scent	–	–	–	–	–	0.185	–	1.6–2.4	–	–	–	–
hoary cress	–	–	–	–	–	0.185 (1)	–	–	–	1.2–1.9	1.15	–
horehound	–	–	–	–	–	0.215–0.375	–	1.2–3.2	–	–	–	–
lucerne (established)	–	–	–	–	0.3–0.5 (2)	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–	1.2–1.8 (11)	–	–	–	–
marshmallow	–	75 (14) (28)	15–45	0.5–0.9 (6)	–	–	–	1,2–1.8	3.0–4.0	–	–	50–100
medic	30	–	–	0.25–0.5 (6)	–	0.105–0.16 (26)	–	1.2–3.2 (11)	3.0–4.0	–	–	–
melons	–	–	–	–	0.2–0.4 (2)	–	–	1.6–2.4	–	0.625–1.3 (7) (8)	0.74–1.5 (7) (8)	80–160
Mexican poppy	–	–	–	–	–	–	–	–	–	0.625–1.3	0.76–1.15 (15)	–
mustards	–	75	–	0.5 (6) (6)	–	–	–	1.2–3.2	3.0–4.0	0.95–1.25	0.38–1.5	–
New Zealand spinach	20	–	–	–	–	0.185	–	1.6–2.4	–	0.625–1.3	0.76–1.15	–
Parthenium weed	–	–	–	–	–	0.215–0.375	–	–	–	–	–	–
Paterson's curse	–	37.5	15–45	0.25–0.5 (6)	–	0.105–0.16 (26)	–		3.0–4.0	0.95–1.25	1.15–1.5	–
peachvine (cowvine)	–	–	–	–	0.2–0.4 (2)	–	–	–	3.0–4.0	–	–	–
peppercress	–	–	–	–	–	–	–	–	–	–	–	–
pigweed	20 (2)	75 (28)	–	–	–	–	0.5 (6)	–	–	0.625–1.3	0.38–1.5 (10)	–
plantain	–	–	–	–	–	–	–	–	–	1.2–1.9	–	–
potato weed	–	75 (28)	–	–	–	–	–	–	–	–	–	–
prickly lettuce	20 (2) or 30	75	–	–	–	0.105–0.160 (26)	–	–	3.0–4.0	0.625–1.3	0.76–1.15 (10)	50–100
radish – wild	–	75 (28)	15–45	0.25–0.5 (6)	–	–	–	1.2–3.2	3.0–4.0	0.95–1.25	1.15–1.5	–
rough poppy	–	–	–	–	–	–	–	1.2–3.2	–	–	–	–
saffron thistle	–	–	–	–	–	0.185 (1)	–	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 (1)	–	–	–	1.2–1.9	–	–
Rec water vol L/ha boom	>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	3 days	24 hour	0 hour	1–3 days	2–4 months	1–14 days	4 months (17)	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	B	G	G	G + I	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.
(5) Hammer® also available in 240 g/L, see label for rates.
(6) Add glyphosate – see label.
(7) Add Garlon™ 600 at 80–160 mL/ha for prickly/paddy melons or 120–160 mL/ha for Afghan/camel melons.
(8) Use glyphosate alone for camel melon only.
(10) Before stem elongation. After this add Amicide® Advance 700 for control. See label.
(11) Add 5 g/ha Associate® or 0.5 L/ha dicamba for control.
(14) Small flowered mallow.
(15) See label for tank mixes with Amicide®Advance 700
(17) Northern NSW only.
(18) Always add non-ionic surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
(19) Always apply with recommended label rates of glyphosate. Addition of Striker® will improve knockdown and increase speed of control.
(20) Always apply with recommended label rates of knockdown herbicides.
(21) Always add with recommended rate of glyphosate at no less than coarse to very coarse droplets.
(22) Tankmix Roundup® CT + adjuvant for control. Caution: check minimum recropping periods in Table 2 on page 8.
(23) Observe plantback period with broadleaf crops. Northern NSW only.
(24) Observe plantback periods – see Table 2 on page 8.
(25) Add wetting agent when water volume is above 100 L/ha.
(26) Add Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha.
(27) 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.
(28) Seedlings only.
(S) 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 sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg Express® [18]	Oxyfluorfen 240 g/L Striker® [19]	Carfentrazone ethyl 400 g/L Hammer® 400EC [5] [20]	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV Ester 421 g/L Pyresta® [21]	Triclopyr 300 g/L+ picloram 100 g/L + aminopyralid 8 g/L Grazon™ Extra [22]	Dicamba 750 g/L Kamba® 750 [23]	Aminopyralid 10 g/L + fluroxypyr 140 g/L Hotshot™ [24]	Paraquat 135 g/L + diquat 115 g/L Spray.Seed® 250 [25]	Amitrole 250 g/L + paraquat 125 g/L Alliance®	Glyphosate 570 g/L Roundup Ultra® Max	Glyphosate 470 g/L Weedmaster® DST® [26]	Pyraflufen-ethyl 25 g/L Sledge ® [27]
Broadleaf weeds	**(grams)**	**(millilitres)**	**(millilitres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
soursob	–	–	–	–	–	–	–	–	3.0–4.0	0.95	1.15	–
sowthistle	25	75	–	0.5 [6]	0.2–0.4 [2]	–	–	–	3.0–4.0	0.425–1.3	0.575–1.5	–
spear thistle	–	–	–	–	–	0.215–0.375	–	–	3.0–4.0	0.95–1.25	0.75–1.15	–
spiny emex	–	–	15–45	–	–	0.215–0.375	–	1.2–3.2	3.0–4.0	–	–	–
spurge	–	–	–	–	–	–	–	–	–	–	0.76–1.15	–
stagger weed	–	–	–	–	–	–	–	–	–	–	–	–
star thistle	–	–	–	–	–	0.215–0.375	–	–	–	–	–	–
stinging nettle	–	75 [28]	–	–	–	–	–	1.2–3.2	–	[16]	[16]	–
stinking goosefoot	–	–	–	–	–	–	–	–	–	0.625–1.3	0.76–1.15	–
sub. clover	–	–	15–45	0.5 [6]	–	0.135 [6]	–	1.2–3.2 [11]	–	1.2–1.9 [3]	–	50–100
sunflower	–	–	–	–	–	0.185	–	–	–	–	0.575–1.5	–
turnip weed	20	75	–	0.25–0.5 [6]	–	–	–	1.2–3.2	–	0.625–1.3	0.76–1.15 [10]	–
variegated thistle	–	–	–	–	–	0.185	–	–	3.0–4.0	0.95–1.25	0.575–1.5	–
vetch	–	–	–	–	–	0.185	–	1.2–3.2	–	–	–	–
wild turnip	–	–	–	0.25–0.5 [6]	–	–	–	1.2–3.2		0.95–1.25	0.76–1.5 [10]	–
wireweed	–	–	–	–	–	0.28	–	1.2–3.2	3.0–4.0	0.625–1.3	0.76–1.15 [10]	–
wild turnip	–	75	–	0.25–0.5 [6]	–	–	–	1.2–3.2		0.95–1.25	0.76–1.5 [10]	–
wireweed	–	75	–	–	–	0.185	–	1.2–3.2	3.0–4.0	0.625–1.3	0.76–1.15 [10]	50–100
Rec water vol L/ha boom	>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	3 days	24 hour	0 hour	1–3 days	2–4 months	1–14 days	4 months [17]	1 hour	0 hour	1 hour	6 hour	1 hour
Herbicide group	B	G	G	G + I	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.
[5] Hammer® also available in 240 g/L, see label for rates.
[6] Add glyphosate – see label.
[10] Before stem elongation. After this add Amicide® Advance 700 for control. See label.
[11] Add 5 g/ha Associate® or 0.5 L/ha dicamba for control.
[16] Add Goal®/Striker®/Spark® at 75 mL/ha for control.
[17] Northern NSW only.
[18] Always add non-ionic surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
[19] Always apply with recommended label rates of glyphosate. Addition of Striker® will improve knockdown and increase speed of control.
[20] Always apply with recommended label rates of knockdown herbicides.
[21] Always add with recommended rate of glyphosate at no less than coarse to very coarse droplets.
[22] Tankmix Roundup® CT + adjuvant for control. Caution: check minimum recropping periods in Table 2 on page 8.
[23] Observe plantback period with broadleaf crops. Northern NSW only.
[24] Observe plantback periods – see Table 2 on page 8.
[25] Add wetting agent when water volume is above 100 L/ha.
[26] Add Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha.
[27] 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.
[28] Seedlings only.
(S) 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.	Metsulfron-methyl 600 g/kg	Aminopyralid 375 g/kg + metsulfuron 300 g/kg	Imazapic 240 g/L	Bromoxynil 200 g/L	2,4-D amine 700 g/L	2,4-D LV ester 680 g/L	2,4-D amine 300 g/L + picloram 75 g/L + aminopyralid 7.5 g/L	Fluroxypyr 333 g/L	Triclopyr 755 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	Isoxaflutole 750 g/kg
	Associate® 13	Stinger™ 17 18	Gundy 240 Pre-emergent 14 NNSW only	Bromicide® 200 3	Amicide® Advance 700	Estercide® Xtra 680 12	FallowBoss™ Tordon	Starane™ Advanced 1 15	Garlon™ Fallowmaster™ 16	Pixxaro™ 4	Balance®
					Note: Use these herbicides with caution when sensitive crops such as cotton, soybeans, grapes etc. are grown nearby.						
Broadleaf weeds	**(grams)**	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(millilitres)**	**(litres)**	**(grams)**
African turnip weed	–	10	–	–	–	–	–	–	–	–	–
amaranthus	–	–	0.15–0.2	–	0.745–1.15 2	0.210–0.8	–	–	–	–	–
amsinckia	5 or 7	–	–	–	–	–	–	–	–	–	–
barnyard grass	–	–	–	–	–	–	–	–	–	–	100 (S)
blackberry nightshade	–	–	–	–	0.515–0.745 2	–	–	–	–	–	–
black bindweed	–	14	–	1.5 7	–	–	–	0.3 6	–	–	–
bladder ketmia	–	–	–	–	0.745–1.15 2	–	–	0.3 6	–	–	–
Boggabri weed	–	14	0.15–0.2	–	–	–	–	–	–	–	–
burrs – Bathurst	–	–	–	–	0.515–0.745 2	0.21–0.8	–	0.45	–	0.4	–
burrs – Noogoora	–	–	–	–	0.745–1.15 2	–	–	0.45	–	0.4	–
caltrop/yellow vine	–	–	0.15–0.2	–	0.28–0.815 2	0.62–0.8	–	0.3 6	–	–	–
canola – volunteer	–	–	–	–	0.88 or 1.2 2	0.9–1.3 9	–	–	–	–	–
capeweed	–	–	–	–	–	0.21–0.8	–	–	–	–	–
charlock	5	–	–	–	0.39–515 2	0.21–0.8	–	–	–	–	–
chicory	–	10	–	–	–	–	–	–	–	–	–
chickpea – volunteer	5	10	–	–	–	–	–	–	–	–	–
chickweed	5	–	–	–	–	–	–	–	–	–	–
clover	5	10	–	–	0.515–0.745 2	0.21–0.8	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	–	–	–	–	–
cudweed	–	–	–	–	–	–	–	–	–	–	–
datura (thornapple)	–	–	–	–	0.515–0.745 2	0.21–0.8	–	0.45	–	–	–
deadnettle	5	10	–	–	–	0.21–0.8	–	–	–	0.3	–
docks	5 or 7	10–14	–	–	0.39–0.515 2	0.21–0.8	–	–	–	–	–
erodium (storksbill)	–	–	–	–	0.515–0.745 2	0.21–0.8	–	–	–	–	–
faba bean volunteer	–	10	–	–	–	–	–	–	–	–	–
fat hen	–	–	–	–	0.745–1.15 2	0.21–0.8	–	–	–	–	–
feathertop Rhodes grass	–	–	–	–	–	–	–	–	–	–	100
Rec water vol L/ha boom	30 min	50–100	50 min	50–200	50–250	30–100	50–100	50 min	50 min	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

1. Fluroxypyr also available in 400 g/L. See label for rates.
2. Must also add a minimum of 1.18 L/ha Weedmaster® Argo®.
3. Bronco, higher rate bromoxynil 400 g/L: black bindweed 750 mL (7), peachvine 700 mL – 1.1 L; wheat plantback is nil.
4. Pixxaro™ rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
6. Add glyphosate for control.
7. Plus 1–1.5 L/ha glyphosate.
9. See label for rates for controlling Roundup Ready® canola volunteers.
12. 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. See label for rates.
13. For fallow control, see label for tankmix options with glyphosate products. Add wetting agent as required. Not before undersowing pasture legumes.
14. 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.
15. Add Uptake™ spraying oil at 0.5 L/100 L of spray. When mixing with Roundup® CT to control grasses refer to Roundup® CT label.
16. Add Uptake™ spraying oil at 0.5 L/100 L water. Do not use oils when tankmixing with Roundup® CT. See label for melon species, size and chemical rate.
17. Add glyphosate (480) at label rates.
18. Add wetting agent as per label.

(S) 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.	Metsulfron-methyl 600 g/kg	Aminopyralid 375 g/kg + metsulfuron 300 g/kg	Imazapic 240 g/L	Bromoxynil 200 g/L	2,4-D amine 700 g/L	2,4-D LV ester 680 g/L	2,4-D amine 300 g/L + picloram 75 g/L + aminopyralid 7.5 g/L	Fluroxypyr 333 g/L	Triclopyr 755 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	Isoxaflutole 750 g/kg
	Associate® 13	Stinger™ 17 18	Gundy 240 Pre-emergent 14 NNSW only	Bromicide® 200 3	Amicide® Advance 700	Estercide® Xtra 680 12	FallowBoss™ Tordon	Starane™ Advanced 1 15	Garlon™ Fallowmaster™ 16	Pixxaro™ 4	Balance®
					Note: Use these herbicides with caution when sensitive crops such as cotton, soybeans, grapes etc. are grown nearby.						
Broadleaf weeds	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(litres)	(grams)
field pea – volunteer	7	–	–	–	0.39–0.515 2	–	–	–	–	–	–
fleabane	–	–	–	–	0.65–1.1 2 5 8	–	0.7 10	–	–	–	100
fumitory	5	–	–	–	0.28–0.815 2	0.21–0.8	–	–	–	–	–
ground cherry – annual	–	–	–	–	0.745–1.15 2	–	–	0.45	–	0.4	–
heliotrope – white	–	–	–	–	–	–	–	–	–	–	–
Hexham scent	–	–	–	–	–	0.21–0.8	–	–	–	–	–
hoary cress	–	–	–	–	–	0.21–0.8	–	–	–	–	–
horehound	–	–	–	–	0.515–0.745 2	0.21–0.8	–	–	–	–	–
lucerne (established)	–	–	–	–	–	–	–	–	–	–	–
lupin – volunteer	5	–	–	–	0.39–0.515 2	0.21–0.8	–	–	–	–	–
marshmallow	–	–	–	–	0.515–0.745 2	–	–	0.6	–	0.3	–
medic	5	10	–	–	0.39–0.515 2	–	–	–	–	–	–
melons	–	–	–	–	0.745–1.15 2	0.21–0.8	–	–	65–130 16	–	–
Mexican poppy	–	–	–	–	0.745–1.15 2	0.21–0.8	–	–	–	0.3	–
mintweed	–	–	0.15–0.2	–	–	0.21–0.8	–	–	–	–	–
mustards	5	10	–	–	0.28–0.815 2	0.21–0.8	–	–	–	–	–
New Zealand spinach	–	14	–	–	0.28–0.815 2	0.21–0.8	–	–	–	–	–
parthenium weed	–	10–14	–	–	–	–	–	–	–	–	–
Paterson's curse	5 or 7	–	–	–	0.39–0.515 2	0.21–0.8	–	–	–	–	–
peachvine (cowvine)	–	–	0.15–0.2	1.4–2.1	–	–	–	0.3 6	–	–	–
peppercress	–	–	–	–	–	–	–	–	–	–	–
pigweed	–	10–14	0.15–0.2	–	–	–	–	0.3 6	–	0.3	–
potato weed	–	–	–	–	0.745–1.15 2	–	–	–	–	–	–
prickly lettuce	–	–	–	–	0.39–0.515 2	–	–	0.3 6	–	–	–
Rec water vol L/ha boom	30 min	50–100	50 min	50–200	50–250	30–100	50–100	50 min	50 min	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

1. Fluroxypyr also available in 400 g/L. See label for rates.
2. Must also add a minimum of 1.18 L/ha Weedmaster® Argo®.
3. Bronco, higher rate bromoxynil 400 g/L: black bindweed 750 mL (7), peachvine 700 mL – 1.1 L; wheat plantback is nil.
4. Pixxaro™ rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
5. Must also add a minimum of 1.18 L/ha Weedmaster® Argo®, followed by 1.6–2.0 L/ha Nuquat® within 7–10 days of the first application.
6. Add glyphosate for control.
7. Plus 1–1.5 L/ha glyphosate.
8. See label for appropriate rate given weed size and season consideration. Minimum water rate 70 L/ha.
10. Add 1.5 - 2.25 L/ha Ripper™(Glyphosate 480)
12. 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. See label for rates.
13. For fallow control, see label for tankmix options with glyphosate products. Add wetting agent as required. Not before undersowing pasture legumes.
14. 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.
15. Add Uptake™ spraying oil at 0.5 L/100 L of spray. When mixing with Roundup® CT to control grasses refer to Roundup® CT label.
16. Add Uptake™ spraying oil at 0.5 L/100 L water. Do not use oils when tankmixing with Roundup® CT. See label for melon species, size and chemical rate.
17. Add glyphosate (480) at label rates.
18. Add wetting agent as per label.

(S) Suppression.

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metsulfron-methyl 600 g/kg	Aminopyralid 375 g/kg + metsulfuron 300 g/kg	Imazapic 240 g/L	Bromoxynil 200 g/L	2,4-D amine 700 g/L	2,4-D LV ester 680 g/L	2,4-D amine 300 g/L + picloram 75 g/L + aminopyralid 7.5 g/L	Fluroxypyr 333 g/L	Triclopyr 755 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	Isoxaflutole 750 g/kg
	Associate® 13	Stinger™ 17 18	Gundy 240 Pre-emergent 14 NNSW only	Bromicide® 200 3	Amicide® Advance 700	Estercide® Xtra 680 12	FallowBoss™ Tordon	Starane™ Advanced 1 15	Garlon™ Fallowmaster™ 16	Pixxaro™ 4	Balance®
					Note: Use these herbicides with caution when sensitive crops such as cotton, soybeans, grapes etc. are grown nearby.						
Broadleaf weeds	(grams)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(litres)	(grams)
radish – wild	–	–	–	–	0.28–0.815 2	–	–	–	–	–	–
rough poppy	5	–	–	–	–	0.21–0.8	–	–	–	–	–
saffron thistle	–	–	–	–	0.39–0.515 2	0.21–0.8	–	–	–	–	–
salt bush	–	10–14	–	–	–	–	–	–	–	–	–
Scotch thistle	–		–	–	–	–	–	–	–	–	–
shepherd's purse	5		–	–	0.515–0.745 2	0.21–0.8	–	–	–	–	–
skeleton weed	7 (S)		–	–	0.515–0.745 (S) 2	0.21–0.8	–	–	–	–	–
slender celery	–	10	–	–	–	–	–	–	–	–	–
slender thistle	–	–	–	–	–	0.21–0.8	–	–	–	–	–
sorrel	5	–	–	–	0.515–0.745 2	–	–	–	–	–	–
soursob	5	–	–	–	–	–	–	–	–	–	–
sowthistle	5	–	–	–	0.28–0.815 2	–	–	0.3 6	–	0.3	100
spear thistle	–	–	–	–	0.39–0.575 2	0.21–0.8	–	–	–	–	–
spiny emex	5 or 7	10–14	–	–	–	–	–	0.9	–	–	–
spurge	–	–	–	–	–	–	–	–	–	–	–
stagger weed	5	10	–	–	–	–	–	–	–	–	–
star thistle	–	–	–	–	–	0.21–0.8	–	–	–	–	–
stinging nettle	–	–	–	–	–	–	–	–	–	–	–
stinking goosefoot	–	–	–	–	–	0.21–0.8	–	–	–	–	–
sub. clover	5	–	–	–	–	0.21–0.8	–	–	–	–	–
sunflower – volunteer	7	10–14	–	–	0.39–0.515 2	0.21–0.8	–	0.6	–	–	–
turnip weed	5	–	–	–	0.28–0.815 2	0.21–0.8	–	–	–	–	–
variegated thistle	–	–	–	–	0.39–0.515 2	0.21–0.8	–	–	–	–	–
vetch	–	–	–	–	0.515–0.745 2	–	–	–	–	–	–
wild lettuce	–	10–14	–	–	–	–	–	–	–	–	–
wild turnip	5	10	–	–	0.28–0.815 2	–	–	–	–	–	–
wireweed/hogweed	5 or 7	10–14	–	–	0.515–0.745 2	0.21–0.8	0.7	0.3 6	–	–	–
Rec water vol L/ha boom	30 min	50–100	50 min	50–200	50–250	30–100	50–100	50 min	50 min	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

1. Fluroxypyr also available in 400 g/L. See label for rates.
2. Must also add a minimum of 1.18 L/ha Weedmaster® Argo®.
3. Bronco, higher rate bromoxynil 400 g/L: black bindweed 750 mL (7), peachvine 700 mL – 1.1 L; wheat plantback is nil.
4. Pixxaro™ rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
6. Add glyphosate for control.
7. Plus 1–1.5 L/ha glyphosate.
12. 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. See label for rates.
13. For fallow control, see label for tankmix options with glyphosate products. Add wetting agent as required. Not before undersowing pasture legumes.
14. 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.
15. Add Uptake™ spraying oil at 0.5 L/100 L of spray. When mixing with Roundup® CT to control grasses refer to Roundup® CT label.
16. Add Uptake™ spraying oil at 0.5 L/100 L water. Do not use oils when tankmixing with Roundup® CT. See label for melon species, size and chemical rate.
17. Add glyphosate (480) at label rates.
18. Add wetting agent as per label.

(S) Suppression.

Table 13. Herbicides for presowing seedbed weed control – Salvage seedbed preparation (page 1 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg	Metoslam 100 g/L	Cafentrazone-ethyl 240 g/L	Saflufenacil 700 g/kg	Oxyfluorfen 240 g/L	Flumioxazin 500 g/kg	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV ester 421 g/L	Pyraflufen-ethyl 25 g/L	Fluroxypyr 333 g/L	Dicamba 750 g/L	Paraquat 135 g + diquat + 115 g/L	Paraquat 360 g/L	Amitrole 250 g/L + paraquat 125 g/L	Glyphosate 570 g/L	Glyphosate 470 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L
	Express® 25	Eclipse® 100 SC	Hammer® 15 24	Sharpen® WG 26 35	Striker® 27	Terrain™ 28	Pyresta® 29	Sledge® 30	Starane™ Advanced 2 31	Kamba® 750 32	Spray.Seed® 250 33	Gramoxone® 360 PRO 22 36	Alliance®	Roundup Ultra® Max 37	Weedmaster® DST® 34	Pixxaro™ 23
Crop type	W,B,O	AC	AC	W,B,O,CH, FP,FB,L,LE	AC	AC not durum	AC	WC	W, B, CH	AC	AC	AC	WC, C, FP, L	AC	AC	WBO
aircraft (A) or ground (B)	AB	AB	B	B	AB	B	B	B	AB	AB				AB	AB	B
Weeds controlled	(grams)	(millilitres)	(millilitres)	(grams)	(millilitres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	17–34	75	–	0.25–0.5 7	–	–	–	–	–	–	0.625–0.95 20	0.38–1.15 20	–
annual phalaris	–	–	–	–	–	–	–	–	–	–	0.8–2.4	0.835–1.1	–	0.625–0.95	0.76–1.5	–
annual ryegrass	–	–	–	17–34	–	–	0.5 7	0.05–0.1	–	–	0.6–3.2	0.835–1.1	1.5–2.8	0.95–1.25	0.76–1.5	–
barley grass	–	–	–	17–34	37.5	–	0.5 7	0.05–0.1	–	–	0.6–3.2	0.835–1.1	1.5–2.8	0.625–0.95	0.38–1.15	–
bedstraw	–	–	–	–	–	–	–	–	0.6	–	0.8–3.2	–	–	–	–	–
bellvine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
black bindweed	25 7	–	–	17–34	–	–	–	–	0.45 16	0.105–0.16 3	0.8–2.4	–	–	1.2–1.9	–	–
brome grass	–	–	–	17–34	–	–	0.25–0.5 7	–	–	–	0.6–3.2	0.835–1.1	1.5–2.8	0.95–1.25	0.38–1.5	–
caltrop	25	–	–	17–34	75	30 7	–	0.05–0.1	0.3 16	0.105–0.16 3	0.8–2.4	–	–	0.425–1.3	–	–
canola –volunteer	–	–	–	17–34	–	30 7	–	0.05–0.1	–	–	1.8–2.4 9	1.25–1.67 9	1.5–2.8 9	–	–	–
capeweed	–	–	25–75	17–34	75	30 7	0.25–0.5 7	0.05–0.1	–	0.105–0.16 3	0.8–3.2	–	1.5–2.8	0.95–1.25	0.38–1.5	–
chickpea–volunteer	–	–	–	–	–	–	0.9 7	–	–	–	–	–	–	–	–	–
cereals –volunteer	–	–	–	–	–	–	0.25–0.5 7 11	–	–	–	0.6–3.2	0.835–1.1	1.5–2.8	0.625–0.95	0.38–1.15	–
cleavers	–	–	–	–	–	–	–	–	0.6	–	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	–	–	–	–	0.8–3.2	0.835–1.1	–	–	–	–
cowvine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
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	50–200	50–200	80 max	25–100	80 min
Wheat plantback	3 days	17	17	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 + I	G	I	I	L	L	L + Q	M	M	I

1. Add 400–800 mL glyphosate 450 for control.
2. Fluroxypyr is also available in 200 g/L and 400 g/L. See label for rates.
3. Add Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha..
4. Add 0.62-0.765 L/ha Weedmaster® DST or 0.765–1.0 L/ha Weedmaster® DUO.
5. Curled dock only.
6. Indian hedge mustard only.
7. Add glyphosate for control, see label.
8. Long storksbill only.
9. See label for controlling RR canola.
10. For control add 5 g/ha Associate® or 0.5 L/ha dicamba.
11. Wheat and barley only. See label.
12. Add 0.6 L/ha glyphosate 450 for control.
13. See label for other crops.
14. Add 5 g/ha Associate® for control.
15. Hammer® also available in 400 g/L. See label for rates.
16. Tankmix with glyphosate for best results.
17. See appropriate glyphosate label.
18. See label for tankmix options in minimum till situations.
19. Add Reglone® at 0.75–1.5 L/ha.
20. Only registered in conjunction with a full soil disturbance cultivation.
22. Adjuvant required to be added at label rates for all applications.
23. Pixxaro™ rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
24. Always apply with recommended label rates of knockdown herbicides.
25. Always add non ionic-surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
26. Always apply with the recommended rates of knockdown herbicides. Sharpen requires a high quality MSO at 1% e.g. Hasten™. (Canola plantback is 6 weeks.)
27. Always apply with recommended label rates of glyphosate, paraquat or paraquat/diquat mixtures.
28. Always add label rate of tankmix partner plus an adjuvant.
29. Always add recommended rate of glyphosate at no less than coarse to very coarse droplets.
30. 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™ spray adjuvant may be beneficial when applying Sledge® with a glyphosate product.
31. Add 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.
32. Observe plantback with broadleaf crops. See Table 2 on page 8. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
33. 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
34. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
35. 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.
36. 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.
37. Lower rates on small weeds and full soil disturbance. No surfactant required. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
38. See Table 2 on page 8 for other crops, note rainfall required.
39. Seedlings only.

(S) Suppression only.

Crop usage

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

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg	Metoslam 100 g/L	Cafentrazone-ethyl 240 g/L	Saflufenacil 700 g/kg	Oxyfluorfen 240 g/L	Flumioxazin 500 g/kg	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV ester 421 g/L	Pyraflufen-ethyl 25 g/L	Fluroxpyr 333 g/L	Dicamba 750 g/L	Paraquat 135 g + diquat + 115 g/L	Paraquat 360 g/L	Amitrole 250 g/L + paraquat 125 g/L	Glyphosate 570 g/L	Glyphosate 470 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L
	Express® [25]	Eclipse® 100 SC	Hammer® [15] [24]	Sharpen® WG [26] [35]	Striker® [27]	Terrain™ [28]	Pyresta® [29]	Sledge® [30]	Starane™ Advanced [2] [31]	Kamba® 750 [32]	Spray.Seed® 250 [33]	Gramoxone® 360 PRO [22] [36]	Alliance®	Roundup Ultra® Max [37]	Weedmaster® DST® [34]	Pixxaro™ [23]
Crop type	W,B,O	AC	AC	W,B,O,CH, FP,FB,L,LE	AC	AC not durum	AC	WC	W, B, CH	AC	AC	AC	WC, C, FP, L	AC	AC	WBO
aircraft (A) or ground (B)	AB	AB	B	B	AB	B	B	B	AB	AB				AB	AB	B
Weeds controlled	(grams)	(millilitres)	(millilitres)	(grams)	(millilitres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
deadnettle	25 or 25 [7]	–	–	–	75 [39]	–	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 [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	–	–	–	–	–	–	–	–	2.0–2.8	–	–	–
fieldpea –volunteer	–	–	–	–	–	–	–	–	–	0.105–0.16 [3]	–	–	2.0–2.8	0.32–0.95 [20]	–	–
fumitory	–	–	–	–	–	–	–	–	–	–	0.8–3.2	0.835–1.1	–	0.32–0.95 [20]	0.76–1.5 [20]	–
goosefoot	–	–	–	–	–	–	–	–	–	–	–	–	2.0–2.8	0.625–0.95	–	–
heliotrope	–	–	–	17–34	–	–	–	–	–	–	–	–	–	–	–	–
khaki weed	–	–	–	26–34	–	–	–	–+	–	–	–	–	–	–	–	–
lesser swine cress	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
liverseed grass	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
lupin –volunteer	–	–	–	17–34	75	–	–	–	–	–	0.8–1.8 [10]	–	–	0.32–0.95 [20]	0.76–1.5 [20]	–
marshmallow	–	–	25–75	17–34	37.5	30 [7]	–	0.05–0.1	0.6	–	–	–	2.0–2.8	–	–	0.3
medics	30	50	–	17–34	–	30 [7]	0.25–0.5 [7]	–	–	0.105–0.16 [3]	1.2–1.8 [18]	–	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	–	–	0.5 [6] [7]	–	–	0.105–0.16 [3]	0.8–3.2	0.835–1.1	1.5–2.8 [6]	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	17–34	37.5	30 [7]	0.25–0.5 [7]	–	–	0.105–0.16 [3]	–	–	2.0–2.8	0.95–1.25	0.76–1.5	–
peppercress	–	–	–	–	–	–	–	–	–	–	0.8–2.4	–	–	–	–	–
phalaris–perennial	–	–	–	–	–	–	–	–	–	–	–	–	–	1.2–1.9	1.15–1.5	–
prickly lettuce	30 or 20 [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	0.625–1.3	–	–
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	–	–	–	–	–	–	–	–	–	–	0.8–3.2	0.835–1.1	–	–	–	–
saffron thistle	–	–	–	–	–	–	–	–	–	–	0.8–3.2	0.835–1.1	–	0.95–1.25	0.76–1.5	–
scotch thistle	–	–	–	–	–	–	–	–	–	0.185	–	–	–	0.95–1.25	1.15–1.5	–
shepherd's purse	–	–	–	26–34	75	30 [7]	–	–	–	–	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–	–	–	–	–	–	–	–	0.95–1.9 [20]	1.15 [20]	–
sorrel	–	–	–	–	–	–	–	–	–	0.105–0.16 [4]	–	–	–	1.2–1.9	1.15–1.5	–
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	50–200	50–200	80 max	25–100	80 min
Wheat plantback	3 days	[17]	[17]	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 + I	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 sometimes available under these concentrations. See specific labels for details.	Tribenuron-methyl 750 g/kg	Metoslam 100 g/L	Cafentrazone-ethyl 240 g/L	Saflufenacil 700 g/kg	Oxyfluorfen 240 g/L	Flumioxazin 500 g/kg	Pyraflufen-ethyl 2.1 g/L + 2,4-D LV ester 421 g/L	Pyraflufen-ethyl 25 g/L	Fluroxypyr 333 g/L	Dicamba 750 g/L	Paraquat 135 g + diquat + 115 g/L	Paraquat 360 g/L	Amitrole 250 g/L + paraquat 125 g/L	Glyphosate 570 g/L	Glyphosate 470 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L
	Express® 25	Eclipse® 100 SC	Hammer® 15 24	Sharpen® WG 26 35	Striker® 27	Terrain™ 28	Pyresta® 29	Sledge® 30	Starane™ Advanced 2 31	Kamba® 750 32	Spray.Seed® 250 33	Gramoxone® 360 PRO 22 36	Alliance®	Roundup Ultra® Max 37	Weedmaster® DST® 34	Pixxaro™ 23
Crop type	W,B,O	AC	AC	W,B,O,CH, FP,FB,L,LE	AC	AC not durum	AC	WC	W, B, CH	AC	AC	AC	WC, C, FP, L	AC	AC	WBO
aircraft (A) or ground (B)	AB	AB	B	B	AB	B	B	B	AB	AB				AB	AB	B
Weeds controlled	(grams)	(millilitres)	(millilitres)	(grams)	(millilitres)	(grams)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
soursob	–	–	–	–	–	–	–	–	–	–	–	–	2.0–2.8	0.95	1.15 20	–
sowthistle	25	–	–	17–34	75	30 7	0.5 7	–	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	–	–	–	–	–	–	–	–	–	–	–	–	2.0–2.8	0.95–1.25	0.76–1.5	–
spiny emex	–	–	25–75	17–34	–	30 7	–	–	0.9 14	0.185	0.8–3.2	0.835–1.1	2.0–2.8	–	0.38–1.5	–
stinging nettle	–	–	–	17–26	75 39	–	–	–	–	–	0.8–3.2	–	–	–	–	–
sub. clover	–	35 17	25–75	9–26	–	30 (S) 7	0.5 7	–	–	0.135	0.8–3.2 10	–	2.0–2.8	1.2–1.9	1.15–1.5	–
sunflower	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
toad rush	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
turnip weed	20	35 17	–	17–34	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	–	–	–	–	–	–	0.5 7	–	–	–	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	–	–	75	–	0.25–0.5 7	–	–	–	0.8–3.2	0.835–1.1	–	0.95–1.25	0.76–1.5	–
winter grass	–	–	–	–	–	–	–	–	–	–	–	0.835–1.1	–	0.95–1.25	0.76–1.5	–
wireweed	–	–	–	26–34	75	30 7	–	0.1–0.2 21	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	50–200	50–200	80 max	25–100	80 min
Wheat plantback	3 days	17	17	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 + I	G	I	I	L	L	L + Q	M	M	I

1. Add 400–800 mL glyphosate 450 for control.
2. Fluroxypyr is also available in 200 g/L and 400 g/L. See label for rates.
3. Add Weedmaster® DST at 0.385–0.575 L/ha or Weedmaster® DUO at 0.5–0.7 L/ha..
4. Add 0.62-0.765 L/ha Weedmaster® DST or 0.765–1.0 L/ha Weedmaster® DUO.
5. Curled dock only.
6. Indian hedge mustard only.
7. Add glyphosate for control, see label.
8. Long storksbill only.
9. See label for controlling RR canola.
10. For control add 5 g/ha Associate® or 0.5 L/ha dicamba.
11. Wheat and barley only. See label.
12. Add 0.6 L/ha glyphosate 450 for control.
13. See label for other crops.
14. Add 5 g/ha Associate® for control.
15. Hammer® also available in 400 g/L. See label for rates.
16. Tankmix with glyphosate for best results.
17. See appropriate glyphosate label.
18. See label for tankmix options in minimum till situations.
19. Add Reglone® at 0.75–1.5 L/ha.
20. Only registered in conjunction with a full soil disturbance cultivation.
21. White clover, French serradella and snail medic may be damaged.
22. Adjuvant required to be added at label rates for all applications.
23. Pixxaro™ rates listed above + minimum 1.4 L/ha glyphosate (450 g/L IPA).
24. Always apply with recommended label rates of knockdown herbicides.
25. Always add non ionic-surfactant at 100 mL/100 L spray volume. For best results tankmix with recommended label rates of glyphosate.
26. Always apply with the recommended rates of knockdown herbicides. Sharpen requires a high quality MSO at 1% e.g. Hasten™. (Canola plantback is 6 weeks.)
27. Always apply with recommended label rates of glyphosate, paraquat or paraquat/diquat mixtures.
28. Always add label rate of tankmix partner plus an adjuvant.
29. Always add recommended rate of glyphosate at no less than coarse to very coarse droplets.
30. 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™ spray adjuvant may be beneficial when applying Sledge® with a glyphosate product.
31. Add 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.
32. Observe plantback with broadleaf crops. See Table 2 on page 8. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
33. 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
34. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
35. 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.
36. 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.
37. Lower rates on small weeds and full soil disturbance. No surfactant required. Compatible with Amicide® Advance 700 (700 g/L 2,4-D amine).
38. See Table 2 on page 8 for other crops, note rainfall required.
39. Seedlings only.

(S) Suppression only.

Crop usage

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

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Chlorsulfuron 750 g/kg Tackle® [13]	Butafenacil 200 g/kg + triasulfuron 520 g/kg Logran® B-Power [14]	Sulfosulfuron 750 g/kg Monza® [15] Wheat and triticale only	Trifluralin 480 g/L Triflur X® [12]	Imazapic 525 g/kg + imazapyr 175 g/kg Sentry™ Imidazolinone herbicide tolerant wheat (single gene) and barley & canola	Pendimethalin 440 g/L Pendimethalin 440 EC [5] [16]	Flumioxazin 500 g/L Terrain™ [28] [29] KP/PW	
							120 g	180 g
Incorporation	PSI IBS	PSI IBS	PSI IBS	PSI IBS	IBS	PSI IBS	IBS (KP/PW)	IBS (KP/PW)
Crop type	TW	W only	TW only	AC not O	B, C, W [23]	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) [9]		–	–	–
annual phalaris	20 [2]	50 [7]	25 [2]	0.8 or 1.5–3.0 (IBS) [9]	40–50 (S)	–	–	–
annual ryegrass	15 or 20	50 [7]	25 [2]	0.8 or 1.5–3.0 (IBS) [9]	40–50 (S)	1.35–2.25	–	–
barley grass	20 [2]	–	25 (S)	1.5–3.0 (S) (IBS) [9]	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) [9]	40–50	–	–	–
caltrop	–	–	–	1.5–3.0 (S) (IBS) [9]		–	–	–
canola – volunteer	–	–	–	–	–	–	120 W (S)	180 (S)
capeweed	20	50 [7]	–	–	40–50 (S)	–	120 W (S)	180 (S)
cereals – volunteer	–	–	–	–	40–50 (S) [27]	–	–	–
cleavers	–	–	–	–	–	–	–	–
common chickweed	–	–	–	–	–	–	120 W (S)	180 (S)
crassula	–	50	–	–	–	–	120 W (S)	180 (S)
corn gromwell	20	50	–	1.5–3.0 (IBS) [9]	–	–	–	–
deadnettle	15 or 20	50	–	1.5–3.0 (S) (IBS) [9]	–	–	–	–
dock	20	–	–	–	–	–	–	–
erodium	–	–	–	–	40–50 (S)	–	–	–
faba bean – volunteer	–	50 [7]	–	–	–	–	–	–
field pea – volunteer	–	50 [7]	–	–	–	–	–	–
flaxleaf fleabane	–	–	–	–	–	–	–	180 (S)
fumitory	15 or 20	50	25 [2]	1.5–3.0 (IBS) [9]	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)
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

[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.
[27] Other than imidazolinone herbicide-tolerant varieties.
[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 (page 2 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Oryzalin 125 g/L + trifluralin + 125 g/L Duet® 250 EC [17]	Prosulfocarb 800 g/L + S-metolachlor 120 g/L Boxer® Gold	Prosulfocarb 800 g/L Arcade®	Prosulfocarb 800 g/L Countdown®	Pyroxasulfone 850 g/kg Sakura® 850 WG [18] Wheat and triticale only, not durum	Triallate 500 g/L Avadex® Xtra Conventional [19]	Triallate 500 g/L Avadex® Xtra KP/PW	S-Metolachlor 960 g/L Dual Gold® [20]	Clopyralid 600 g/L Lontrel™ Advanced [6] [22]
Incorporation	PSI IBS	IBS PSPE	IBS	IBS	IBS	PSI IBS	PSI IBS	IBS PSPE	PSPE
Crop type	B, W, C	W, B, FP, CH, L, LE, FB	W, B	B, W	W, T	AC not O	AC not O	B, O	W, B, O, T, 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 [3] (S)	–	–	–	–	–	–	–
annual phalaris	1.6 or 2.3	1.5–2.5 [3]	–	2.5 [24]	118	–	[11]	–	–
annual ryegrass	1.6 or 2.3	1.5–2.5 [3] 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) [3] or 2.5 (S)	–	–	118	–	[11] (S)	–	–
bedstraw	–	–	–	–	–	–	–	–	–
bifora	–	–	–	–	–	–	–	–	–
black bindweed	–	–	–	–	–	–	–	–	–
brome grass	–	1.5–2.5 [3] (S)	–	2.5 (S) [24]	118 (S)	–	–	–	–
caltrop	–	–	–	–	–	–	[11] (S)	–	–
canola – volunteer	–	–	–	–	–	–	–	–	–
capeweed	–	–	–	–	–	–	–	–	0.15–0.3 [10] [30]
cereals – volunteer	–	–	–	–	–	–	–	–	–
cleavers	–	–	–	–	–	–	–	–	–
common chickweed	–	–	–	–	–	–	–	–	–
crassula	–	1.5–2.5 [3] or 2.5	–	2.5 [24]	–	–	–	–	–
corn gromwell	–	–	–	–	–	–	[11]	–	–
deadnettle	1.6 or 2.3	1.5–2.5 [3] (S)	–	2.5 (S) [24]	–	–	[11] (S)	–	–
dock	–	–	–	–	–	–	–	–	–
erodium	–	–	–	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–	–	–	–
flaxleaf fleabane	–	–	–	–	–	–	–	–	–
fumitory	1.6 or 2.3 (S)	1.5–2.5 [3]	–	2.5 [24]	–	–	[11]	–	–
Indian hedge mustard	–	–	–	–	–	–	–	–	–
lesser swine cress	–	–	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–	–	–	–
mintweed	–	–	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	–	–	–
New Zealand spinach	–	–	–	–	–	–	–	–	–
Water vol L/ha boom	50–100	50 min	50 min [25]	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	D	J + K	J	J	K	J		K	I

[3] Add 0.8–1.5 L/ha Triflur® 480 for control.
[6] Also available as Lontrel™ 750 SG (750 g/kg).
[10] 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.
[11] Tank mix 1.6–2.4 L/ha Avadex® Xtra + 1.5–2 L/ha Triflur X®
[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.
[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.
[30] Canola only, PSPE to 3-leaf stage.
(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 (page 3 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	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	
	Tackle® [13]	Logran® B-Power [14]	Monza® [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
Incorporation	PSI	PSI	PSI	PSI	IBS	PSI		
	IBS	IBS	IBS	IBS		IBS	IBS (KP/PW)	IBS (KP/PW)
Crop type	TW	W only	TW only	AC not O	B, C, W [23]	B, W, FP, CH, C, L	W	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)
Paterson's curse	15	50	–	–	40–50 (S)	–	–	–
peppercress	–	–	–	–	–	–	–	–
phalaris – annual	–	–	–	–	–	–	–	–
prickly lettuce	–	–	–	–	–	–	120 W (S)	180 (S)
rough poppy	15 or 20	50	–	1.5–3.0 (IBS) [9]	–	–	–	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)	–	–
wild lettuce	–	50	–	–	–	–	–	–
wild oats	–	50 [7]	25 [1]	1.5–3.0 (S) (IBS) [1]	40–50 (S)	1.35–2.25 (S)	–	–
wild radish	–	–	–	–	–	–	120 W (S)	180 (S)
wild turnip	15	50	25	–	–	–	–	–
winter grass	–	–	–	1.5–3.0 (IBS)	–	–	–	–
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)
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

[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 (page 4 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Oryzalin 125 g/L + trifluralin + 125 g/L Duet® 250 EC [17]	Prosulfocarb 800 g/L + S-metolachlor 120 g/L Boxer® Gold	Prosulfocarb 800 g/L Arcade®	Prosulfocarb 800 g/L Countdown®	Pyroxasulfone 850 g/kg Sakura® 850 WG [18] Wheat and triticale only, not durum	Triallate 500 g/L Avadex® Xtra Conventional [19]	Triallate 500 g/L Avadex® Xtra KP/PW	S-Metolachlor 960 g/L Dual Gold® [20]	Clopyralid 600 g/L Lontrel™ Advanced [6] [22]
Incorporation	PSI IBS	IBS PSPE	IBS	IBS	IBS	PSI IBS	PSI IBS	IBS PSPE	PSPE
Crop type	B, W, C	W, B, FP, CH, L, LE, FB	W, B	B, W	W, T	AC not O	AC not O	W, B, O, T, C	W, B, O, T, 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)
Paterson's curse	–	–	–	–	–	–	–	–	–
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	1.6 (S)	1.5–2.5 c or 2.5	–	–	118	1.6	–	–	–
wild lettuce	–	–	–	–	–	–	–	–	–
wild oats	1.6 or 2.3 (S)	1.5–2.5 c [4]	–	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]	–	–
Water vol L/ha boom	50–100	50 min	50 min [25]	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	D	J + K	J	J	K	J	J	K	I

[2] Add trifluralin for control, see label.
[3] Add 0.8–1.5 L/ha Triflur® 480 for control.
[4] Surface germinating only.
[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.
(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 15. Herbicides for weed control for wheat and barley – Early post-emergence – Part 1 (page 1 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg	Metsulfron-methyl 600 g/kg	Chlorsulfuron 750 g/kg	Sulfosulfuron 750 g/kg	Bromoxynil 250 g/L + picolinafen + 25 g/L	Metribuzin 480 g/kg	Bromoxynil 200 g/L	Terbutryn flowable 500 g/L	Metribuzin 375 g/kg + carfentrazone-ethyl 90 g/kg
	Broadstrike™ 20	Associate® 4 23	Tackle® 24	Monza® 25 Wheat & triticale only	Eliminar®C 21	Sencor® 480 SC	Bromicide® 26	Igran® 27	Aptitude®
Apply at crop growth stage	**3 leaf–start of jointing (wheat) Mid till– start of jointing (barley)**	**3 leaf to flag leaf just visible**	**2 leaf–early till**	**Emergence–early till**	**3 leaf–fully tillered**	**3 leaf–8 weeks**	**3 leaf–fully tillered**	**3 leaf–early tillering**	**3 leaf–mid tillering**
Zadoks code	**13–31, 21–31**	**13–37**	**12–23**	**11–22**	**12–29**	**Z13–8 weeks**	**13–30**	**13–21**	**13–25**
Weeds controlled	**(grams)**	**(grams)**	**(grams)**	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
amsinckia	25	5 or 7	15	25	0.75	–	1.4–2.0	0.55–0.85	–
annual phalaris	–	–	–	–	–	–	–	–	–
annual ryegrass	–	–	15 or 25 1	–	–	–	–	–	–
barley grass	–	–	–	25 (S)	–	–	–	–	–
bedstraw	–	–	–	–	1.0 (S)	–	1.4–2.0	–	100
black bindweed	–	–	20	–	–	–	1.4–2.0	9	–
brome grass	–	–	–	20–25 (S)	–	–	–	–	–
buchan weed	25 (S) 7	–	–	–	–	–	–	–	–
canola – volunteer	25 14	–	–	20 14	0.5–1.0	–	–	–	–
capeweed	25 7	–	–	–	0.5–1.0	–	1.4–2.0	0.55–0.85	100
charlock	25	5	15	–	0.5–1.0	–	–	0.55–0.85 2	–
cereals – volunteer	–	–	–	–	–	–	–	–	–
chickpea – volunteer	–	5	–	–	–	–	–	–	–
cleavers	–	–	–	–	–	–	–	–	–
clover	–	5	–	–	–	–	–	–	100
corn gromwell	–	–	20	–	0.5–0.75	–	1.4–2.0	0.55–0.85	–
common barbgrass	–	–	–	–	–	–	–	–	–
deadnettle	25 (S) 7	5	15 or 20	–	0.5–0.75	–	–	0.55–0.85 9	–
dock	–	5 or 7	–	–	1.0 (S)	–	–	–	–
erodium	–	–	–	–	0.5 (S)	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–	–	9	–
field pea – volunteer	–	7	–	20	0.75 (S)	–	–	9	–
fumitory	–	5	20	–	0.75–1.0 (S)	–	2.0	0.55–0.85	100
lesser swinecress	–	–	–	–	–	–	1.4–2.0	–	–
lupin – volunteer	25	5	–	–	0.5 – 1.0	–	–	–	–
marshmallow	–	–	–	–	–	–	–	–	100
medics	–	5	–	–	–	–	–	9	–
Recom water L/ha	50–150	50 min	30 min	40–100	50 min	50–100	50–200	50–100	50–150
Herbicide group	B	B	B	B	C + F	C	C	C	C + G

1 No more than 3 leaves of annual ryegrass. Use more than 50 L/ha water.
2 Tank mix with 0.3 L/ha MCPA 500 g/L or 0.3 L/ha 2,4-D (as amine) 500 g/L for control.
4 Can be mixed with MCPA amine or terbutryn.
7 See label for tankmix of Broadstrike™ and other herbicides for control.
9 Tankmix of Igran® and Ken-Gran 750 WG can be used for control. See label.
14 Not Clearfield canola volunteers.
20 Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliate leaf stage. Add Uptake™ spraying oil or wetting agent for wheat and undersowns or wetting agent only for barley.
21 Do not apply Eliminar®C if frosts are imminent. See label for tank mix options for wild radish.
23 Add surfactant.
24 Not on barley before 2-leaf stage. Add wetting agent. Not preferred Recommendation for barley.
25 Wheat and triticale only. Add D–C–Trate® 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.
26 Not on undersown medics, Persian or Berseem clover. Avoid spraying when temperatures above 20 °C.
27 Avoid spraying when temperatures exceed 18 °C. Do not use on undersown medics or lucerne.
(S) Suppression only.

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 2 of 4)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg	Metsulfron-methyl 600 g/kg	Chlorsulfuron 750 g/kg	Sulfosulfuron 750 g/kg	Bromoxynil 250 g/L + picolinafen + 25 g/L	Metribuzin 480 g/kg	Bromoxynil 200 g/L	Terbutryn flowable 500 g/L	Metribuzin 375 g/kg + carfentrazone-ethyl 90 g/kg
	Broadstrike™ [20]	Associate® [4] [23]	Tackle® [24]	Monza® [25] Wheat & triticale only	Eliminar®C [21]	Sencor® 480 SC	Bromicide® [26]	Igran® [27]	Aptitude®
Apply at crop growth stage	**3 leaf–start of jointing (wheat) Mid till– start of jointing (barley)**	**3 leaf to flag leaf just visible**	**2 leaf–early till**	**Emergence–early till**	**3 leaf–fully tillered**	**3 leaf–8 weeks**	**3 leaf–fully tillered**	**3 leaf–early tillering**	**3 leaf–mid tillering**
Zadoks code	**13–31, 21–31**	**13–37**	**12–23**	**11–22**	**12–29**	**Z13–8 weeks**	**13–30**	**13–21**	**13–25**
Weeds controlled	**(grams)**	**(grams)**	**(grams)**	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
Mexican poppy	–	–	–	–	–	–	2.0	[9]	–
mintweed	–	–	20	–	–	–	–	–	
mustards	25	5	15	25	0.5–1.0	–	2.0	0.55–0.85 [2] [9]	100
New Zealand spinach	–	–	–	–	–	–	–	–	
Paterson's curse	25 (S) [7]	5 or 7	15	–	0.5–0.75	–	2.0	0.55–0.85	
peppercress	25	–	–	–	–	–	1.4–2.0	–	
radish – wild	25 (S) [7]	–	15 or 20	20	0.5–1.0	–	2.0	[9]	100
rough poppy	–	5	20	–	0.5–0.75	–	–	–	
saffron thistle	–	–	–	–	1.0	–	1.4–2.0	–	
shepherd's purse	25	5	20	–	0.5–1.0	–	1.4–2.0	[9]	100
skeleton weed	–	7 (S)	–	–	1.0 (S)	–	–	–	
slender thistle	–	–	–	–	–	–	–	–	
sorrel	–	5	–	–	1.0 (S)	–	–	–	
soursob	–	5	20	–	–	–	–	–	
sowthistle	–	5	–	–	1.0 (S)	–	–	–	
spear/black thistle	–	–	–	–	–	–	–	–	
spiny emex	25 (S) [7]	5 or 7	–	–	0.5–0.75	–	2.0	0.55–0.85 [2]	
St Barnaby thistle	–	–	–	–	–	–	–	–	
sunflower – volunteer	–	7	–	–	–	–	–	[9]	
toad rush	–	–	–	–	1.0 (S)	0.15 [11] [12]	–	0.55–0.85	100
turnip weed	15–25	5	15	–	0.5–1.0	–	2.0	0.55–0.85 [2] [9]	100
variegated thistle	–	–	–	–	1.0	–	1.4–2.0	–	
vetch	–	–	–	–	1.0 (S)	–	–	0.6 [9]	
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] [9]	100
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
Herbicide group	B	B	B	B	C + F	C	C	C	C + G

[2] Tank mix with 0.3 L/ha MCPA 500 g/L or 0.3 L/ha 2,4-D (as amine) 500 g/L for control.
[4] Can be mixed with MCPA amine or terbutryn.
[7] See label for tankmix of Broadstrike™ and other herbicides for control.
[9] Tankmix of Igran® and Ken-Gran 750 WG can be used for control. See label.
[11] Application of Sencor® to barley on soils with pH >7.0 will result in severe crop damage.
[12] 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.
[20] Safe on undersown lucerne, medics and sub-clovers after the 2–3 trifoliate leaf stage. Add Uptake™ spraying oil or wetting agent for wheat and undersowns or wetting agent only for barley.
[21] Do not apply Eliminar®C if frosts are imminent. See label for tank mix options for wild radish.
[23] Add surfactant.
[24] Not on barley before 2-leaf stage. Add wetting agent. Not preferred Recommendation for barley.
[25] Wheat and triticale only. Add D–C–Trate® 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.
[26] Not on undersown medics, Persian or Berseem clover. Avoid spraying when temperatures above 20 °C.
[27] Avoid spraying when temperatures exceed 18 °C. Do not use on undersown medics or lucerne.
(S) Suppression only.

Herbicides that can be used with undersown legume pastures.

Herbicides for control and suppression

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Diuron 900 g/kg + MCPA 750 g/L Diuron® WG + Agritone® 750 [28]	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®	MCPA 570 g/L LVE Agritone® [22]	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™ [38]	Pyroxsulam 150 g/kg + halauxifen 50 g/kg Rexade™ Not durum or barley
Apply at crop growth stage	3–5 leaf	3 leaf–fully tillered	Early tillering–fully tillered	5 leaf–before booting	3 leaf–before booting	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	3 leaf to 1st node
Zadoks code	13–15	13–30	21–30	15–37	13–37	22–30	13–30	12–31	13–31; 15–31	13–39	13–31
Weeds controlled	(grams + litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
amsinckia	280 + 0.33	1.0–1.43	–	[19]	–	–	–	0.6–1.0	1.5–2.0	–	–
annual phalaris	–	–	–	–	–	–	–	–	–	–	100
annual ryegrass	–	–	–	–	–	–	–	–	–	–	100 (S)
barley grass	–	–	–	–	–	–	–	–	–	–	100 (S)
bedstraw	–	–	–	–	–	–	–	0.67–1.0	1.5–2.0	–	100
black bindweed	–	–	1.7	0.97–1.35 [13]	–	1.0	–	0.5–1.0	–	0.4–0.6	–
brome grass	–	–	–	–	–	–	–	–	–	–	100
buchan weed	–	–	–	–	–	–	–	–	–	–	–
canola – volunteer	–	–	–	0.33 [13]	0.44–1.84 [13]	–	0.5 [8]	0.5–1.0 [8]	1.5–2.0	–	100 [35]
capeweed	280 + 0. 33	1.0–1.43	1.0–1.7	1.45 [13] or [19]	0.44–1.84 [13]	–	0.5–1.0	0.5–1.0	1.0 [3]	–	100 [3]
charlock	280 + 0. 33	1.0–1.43	1.0–1.7	0.66 [13] or [19]	0.44–1.84 [13]	–	0.5–1.0	–	–	–	–
cereals – volunteer	–	–	–	–	–	–	–	–	–	–	–
chickpea – volunteer	–	–	–	–	–	–	–	0.5–1.0 (S)	1.0 [3]	–	–
cleavers	–	–	–	–	–	–	–	–	–	–	–
clover	–	–	1.7	–	–	–	–	–	1.0 [3] [6]	0.3	100
corn gromwell	280 + 0. 33	1.0–1.43	–	[19]	–	–	1.0	0.5–1.0	1.0–2.0	–	–
common barbgrass	–	–	–	–	–	–	–	–	–	–	–
deadnettle	280 + 0. 33	–	–	1.45 [13] or [19]	–	–	1.0	0.5–1.0	1.0–2.0	0.2–0.3	–
dock	–	–	1.0–1.7	–	–	–	1.0 (S)	–	–	–	–
erodium	–	–	–	[19]	–	–	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]	–	100
fumitory	–	1.0–1.43 [17]	–	0.93 [13]	0.44–1.84 [13]	–	0.75	0.5–1.0	1.0–2.0	0.3	100
lentil	–	–	–	–	–	–	–	–	–		100
lesser swinecress	–	–	–	–	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	0.46–0.96 [13]	–	–	1.0 (S)	0.5–1.0	1.0–2.0	–	100
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 [13]	–	–	–	–	–	–	–
mustards	280 + 0. 33	1.0–1.43	1.0–1.7	0.66 [13] or [19]	0.44–1.84 [13]	1.0	0.5–1.0	0.5–1.0	1.0–2.0	–	100 [37]
Recom water L/ha	20–100	50–200	50 min	20–100	30–120	50 min	50 min	50–150	50–100	80	80–100
Herbicide group	C + I	C + I	I	I	I	I	I + F	H + C	H + I	I	B + 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.
[13] See critical comments on label in 'Directions for Use', showing varying rate according to weed size.
[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
[19] Small weeds 300 mL/ha + 280 g Diurex WG. Read lable for critical comments.
[22] 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.
[28] Use only on moist soils. This is a tank mix.
[29] 1.4 L/ha can be used at 3-leaf stage.
[30] Damage can occur if crop not actively growing. Do not apply after the fully-tillered stage.
[31] Do not plant susceptible crops within 12 months of applying the product.
[32] 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.
[37] See label for partner herbicides for control.
[38] Add Uptake™ spraying oil 500ml/100L water
(S) Suppression only.

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Diuron 900 g/kg + MCPA 750 g/L Diuron® WG + Agritone® 750 (28)	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®	MCPA 570 g/L LVE Agritone® (22)	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™ (38)	Pyroxsulam 150 g/kg + halauxifen 50 g/kg Rexade™ Not durum or barley
Apply at crop growth stage	3–5 leaf	3 leaf–fully tillered	Early tillering–fully tillered	5 leaf–before booting	3 leaf–before booting	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	3 leaf to 1st node
Zadoks code	13–15	13–30	21–30	15–37	13–37	22–30	13–30	12–31	13–31; 15–31	13–39	13–31
Weeds controlled	(grams + litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)
New Zealand spinach	–	–	1.7	–	–	1.0 (S)	–	–	–	–	–
Paterson's curse	–	1.0–1.43	–	0.66–0.96 (13)	0.44–1.84 (13)	–	1.0 (S)	0.5–1.0	1.0–2.0	–	–
peppercress	–	–	–	–	–	–	1.0 (S)	–	–	–	–
radish – wild	280 + 0. 33	1.0–1.43	1.0–1.7	0.66 (13) or (19)	0.175–0.35 (15)	1.0	0.5–1.0 (10)	0.5–1.0	1.0–2.0	–	100 (37)
rough poppy	–	1.0–1.43	–	0.46–0.96	–	–	1.0 (S)	–	–	–	–
saffron thistle	–	1.0–1.43	1.7	0.66–1.35 (13)	0.44–1.84 (13)	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 (13)	0.44–1.84 (13)	1.0	1.0 (S)	–	–	–	–
slender thistle	–	1.0–1.43	–	0.66–1.35 (13)	0.44–1.84 (13)	–	–	–	–	–	–
sorrel	–	–	1.0–1.7	–	–	–	–	–	–	–	–
soursob	1.1	–	–	–	–	–	–	–	–	–	–
sowthistle	–	1.0–1.5 (16)	–	–	–	1.0	1.0 (S)	0.5–1.0	1.0–2.0	0.4	100 (36)
spear/black thistle	–	–	–	0.96–1.35 (13)	0.44–1.84 (13)	–	–	–	–	–	–
spiny emex	280 + 0.33	1.0–1.43 (17)	1.0–1.7	(19)	–	1.0	1.0 (S)	0.5–1.0	1.5–2.0 (S)	–	100 (37)
St Barnaby thistle	–	–	–	–	–	–	–	–	–	–	–
sunflower – volunteer	–	–	–	0.69–1.0 (13)	–	–	–	–	–	–	–
toad rush	–	–	–	–	0.44–1.84 (13)	–	1.0	–	–	–	–
turnip weed	280 + 0.33	1.0–1.43	1.0–1.7	0.66 (13) or (19)	0.44–1.84 (13)	1.0	0.5–1.0	0.5–1.0	1.0–2.0	–	100
variegated thistle	–	1.0–1.43 (18)	1.7	0.66–1.35 (13)	0.44–1.84 (13)	1.0	1.0 (S)	–	–	–	–
vetch	–	–	1.0	–	–	–	1.0 (S)	0.5–1.0 (S)	1.0 (3)	–	100
vulpia	–	–	–	–	–	–	–	–	–	–	100 (S)
wild lettuce	–	–	–	–	–	–	0.5–1.0	0.5–1.0	1.0–2.0	–	–
wild oats	–	–	–	–	–	–	–	–	–	–	100
wild turnip	280 + 0.33	1.0–1.43	1.0–1.7	0.66 (13) or (19)	0.44–1.84 (13)	1.0	0.5–1.0	0.5–1.0	1.0–2.0	–	–
wireweed	–	1.0–1.43 (18)	1.0–1.7	–	–	1.0 (S)	0.75 (S)	0.5 (S)–1.0	1.0–2.0	–	100
Recom water L/ha	20–100	50–200	50 min	20–100	30–120	50 min	50 min	50–150	50–100	80	80–100
Herbicide group	C + I	C + I	I	I	I	I	I + F	H + C	H + I	I	B + I

(3) Add Lontrel™ Advanced for control. See label for rates.
(10) Tankmix 350–500 mL/ha Tigrex® plus 175–350 mL/ha MCPA LVE (570 g/L) for control.
(13) See critical comments on label in 'Directions for Use', showing varying rate according to weed size.
(15) Plus 0.35–0.5 Nugrex®. 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
(18) 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
(19) Small weeds 330 mL/ha + 500 mL/ha Nufarm flowable Diuron. Read lable for critical comments.
(22) 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.
(28) Use only on moist soils. This is a tank mix.
(29) 1.4 L/ha can be used at 3-leaf stage.
(30) Damage can occur if crop not actively growing. Do not apply after the fully-tillered stage.
(31) Do not plant susceptible crops within 12 months of applying the product.
(32) 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.
(36) Plus Hotshot 500 mL/ha + LVE 600 MCPA 400 mL/ha.
(37) See label for partner herbicides for control.
(38) 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 concentrations. 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 (40) Buttress® (34)	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot™ (35)	Dicamba 750 g/L Kamba® 750 (37) (8)
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–1st node**	**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 (8)	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	–	–	0.105
corn gromwell	–	0.5–0.75	1.0	1.0–1.4	–	–	–	–	–
common barbgrass	–	–	–	–	–	–	–	–	–
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 (8)	–	0.5–0.75 (6)	–
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 (8)	–	0.5 (7)	–
medics	50 (S) (18)	–	–	–	–	0.075	–	–	–
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

(3) Add 5 g of metsulfuron-methyl (600 g/kg) and non-ionic wetter at 100 mL/100 L of water. 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.
(12) Tankmix 0.135–0.185 L/ha Kamba® 750 with 5–7 g/ha Associate®.
(13) Sub-clover only.
(14) Not Clearfield canola volunteers.
(18) Add partner herbicide for control, see label.
(19) Tankmix with 0.465 l/ha of Agritone®750.
(21) Seedlings only.
(24) See label for controlling Roudup Ready canola volunteers.
(31) Apply with 0.5 L Uptake™ spraying oil or 1 L D-C-Trate®/100 L water. Can be tankmixed with 0.35–0.5 L LVE MCPA/ha to broaden weed
(32) 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®, MCPA LVE or MCPA amine 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.

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

Rate per hectare Various trade names sometimes available under these concentrations. 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 [40] Buttress® [34]	Fluroxypyr 140 g/L + aminopyralid 10 g/L Hotshot™ [35]	Dicamba 750 g/L Kamba® 750 [37] [8]
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–1st node**	**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] [8]	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 [8]	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

[1] Add 1.0 L/ha MCPA 500 g/L for control.
[3] Add 5 g of metsulfuron-methyl (600 g/kg) and non-ionic wetter at 100 mL/100 L of water. See label.
[4] Add 500–700 mL MCPA LVE. See label.
[5] Northern NSW only.
[6] 500 mL (southern NSW), 750 mL (northern NSW).
[8] See label for tankmix options.
[10] Mix with 1 L/ha MCPA amine (500 g.a.i.) or 0.7 L/ha LVE MCPA (500 g.a.i.) for control.
[17] Tankmix 0.185 L/ha Kamba® 750 with 0.8 L/ha Agritone® 750 OR with 0.5 L/ha Amicide Advance 700.
[18] Add partner herbicide for control, see label.
[19] Tankmix 0.105 L/ha Kamba® 750 with 0.465 L/ha of Agritone®750.
[22] Tankmix 500 mL/ha Jaguar® with 200–400 mL/ha MCPA LVE (500 g/L) for control.
[31] Apply with 0.5 L Uptake™ spraying oil or 1 L D-C-Trate®/100 L water. Can be tankmixed with 0.35–0.5 L LVE MCPA/ha to broaden weed
[32] 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®, MCPA LVE or MCPA amine 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.

Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (cont. 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 Paradigm™ 38	Florasulam 6.25 g/L + 2,4-D LV ester 300 g/L Vortex® 41	MCPA (ethyl hexyl ester) 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L Triathlon®	Picolinafen 50 g/L + MCPA 500 g/L Paragon® 39	Picolinafen 35 g/L + bromoxynil 210 g/L + MCPA 350 g/L Flight® EC	Pyraflufen-ethyl 20 g/L Ecopar®	Pyroxsulam 150 g/kg + halauxifen 50 g/kg Rexade ™ 23 Wheat only not durum	2,4-D amine 700 g/kg Amicide ® Advance 700
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**
Zadoks code	**13–39**	**15–37**	**13–30**	**13–15**	**13–28**	**12–29**	**13–31**	**15–22**
Weeds controlled	**(grams)**	**(millilitres)**	**(litres)**	**(litres)**	**(millilitres)**	**(litres)**	**(grams)**	**(litres)**
amsinckia	–	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–	100	–
annual ryegrass	–	–	–	–	–	–	100 (S)	–
barley grass	–	–	–	–	–	–	100 (S)	–
bedstraw	25 25	820	–	–	–	0.4–0.8 9	100	–
black bindweed	–	–	–	–	–	–	100 2	–
brome grass	–	–	–	–	–	–	100	–
buchan weed	–	–	–	–	–	–	–	–
canola – volunteer	25 25 14	820	0.5	0.25 24	360	0.4–0.8 9 24	100 36	–
capeweed	25 (S) 25; 26	–	0.5–1.0	0.25–0.5	360–720	0.4–0.8 9	100 2	–
charlock	25 25	–	0.5–1.0	0.25–0.5	360–720	–	–	0.5
cereals – volunteer	–	–	–	–	–	–	–	–
chickpea – volunteer	25 25	820	–	–	–	0.4 11	100	–
cleavers	25	–	–	–	–	–	–	–
climbing buckwheat	–	820 (S) 8	–	–	–	–	–	–
clover	25 25	–	–	–	–	0.4 11 13	100	–
corn gromwell	–	–	1.0	0.5	720	–	–	–
common barbgrass	–	–	–	–	–	–	–	–
deadnettle	25	–	1.0	0.5 (S)	720 (S)	0.4 11	100	–
dock	–	–	1.0 (S)	–	–	–	–	–
erodium	–	–	1.0 (S)	–	–	0.4–0.8 9	–	–
faba bean – volunteer	25 25	820	–	–	–	0.4 11	100	–
field pea – volunteer	25 25	820	–	–	–	–	100	–
fumitory	25	–	0.75 27	0.5 (S)	540–720 (S) 8	0.4 11	100	0.5 28
lentil – volunteer	25 25	820	–	–	–	–	–	–
lesser swinecress	–	–	–	–	–	–	–	–
lupin – volunteer	25 25	820	1.0 (S)	0.5 (S)	720 (S) 9	0.4–0.8 9	100	–
medics	25 25	–	–	–	–	0.4 11	100	–
melons	–	–	–	–	–	–	–	0.5 29
Mexican poppy	25	–	–	–	–	–	–	–
Recom water L/ha	80–100	80–100 L/ha	50–100 L/ha	50 min	50–150	70–150	50–100	50–250
Herbicide group	I + B	B + I	F + C + I	F + I	C + F + I	G	B	I

8 See label for tankmix options.
9 Add 500 mL/ha MCPA amine 500 or 330 mL/ha Agroxone® 750 for control.
11 Add 500 mL/ha MCPA amine 500 + 5 g/ha Esteem® WDG, or 330 mL/ha Agroxone® 750 + 5 g/ha Esteem® WDG.
13 Sub-clover only.
14 Not Clearfield canola volunteers.
23 Always use BS1000® or Chemwet® 1000 at 250/100 L spray volume.
24 See label for controlling RR Canola volunteers.
25 Add MCPA (see label for rates).
26 Add 50 mL Lontrel™ Advanced for improved control.
27 Denseflower fumitory.
28 White fumitory.
29 Afghan or camel melon.
36 Excluding Clearfield® varieties.
38 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.
39 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.
41 Adjuvants: always use Uptake™ spraying oil (500 mL/100 L water).
(S) Suppression only.

Table 16. Herbicides for weed control for wheat and barley – Early post-emergence – Part 2 (cont. 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	Pyroxsulam 150 g/kg + halauxifen 50 g/kg	2,4-D amine 700 g/kg
	Paradigm™ 38	Vortex® 41	Triathlon®	Paragon® 39	Flight® EC	Ecopar®	Rexade ™ 23 Wheat only not durum	Amicide ® Advance 700
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**
Zadoks code	**13–39**	**15–37**	**13–30**	**13–15**	**13–28**	**12–29**	**13–31**	**15–22**
Weeds controlled	**(grams)**	**(millilitres)**	**(litres)**	**(litres)**	**(millilitres)**	**(litres)**	**(grams)**	**(litres)**
mintweed	–	–	–	–	–	–	–	–
mustards	25 25	820	0.5–1.0	0.25–0.5	360–720	0.4–0.8 9	100 2	0.2–0.5
New Zealand spinach	–	–	–	–	–	–	–	–
Paterson's curse	–	–	1.0 (S)	–	–	0.4 11	–	–
peppercress	–	–	1.0 (S)	–	–	–	–	–
radish – wild	25 25	820	0.5–1.0	0.25–0.5	360–720	0.3–0.8 9	100 2	–
rough poppy	–	–	1.0 (S)	–	–	–	–	–
safflower volunteer	–	–	–	–	–	–	–	0.5
saffron thistle	–	–	1.0	0.5	720	–	–	0.5
shepherd's purse	25 25	–	0.5–1.0	0.25–0.5	360–720	–	–	–
skeleton weed	–	–	1.0 (S)	–	–	–	–	–
slender thistle	–	–	–	–	–	–	–	–
sorrel	–	–	–	–	–	0.4 11	–	–
soursob	–	–	–	–	–	0.4 11	–	–
sowthistle	25 25	–	1.0 (S)	0.5 (S)	720 (S)	0.4 11	100 15 16	–
spear/black thistle	–	–	–	–	–	–	–	0.5
spiny emex	25 (S) 25	820	1.0 (S)	0.5 (S)	720 (S)	0.4 11	100 2	–
St Barnaby thistle	–	–	–	–	–	–	–	–
sunflower – volunteer	–	–	–	–	–	–	–	0.5 30
toad rush	25 (S)	–	1.0	0.5	720	–	–	–
turnip weed	25 25	–	0.5–1.0	0.25–0.5	360–720	0.4 11	100	0.5
variegated thistle	–	820 (S) 8	1.0 (S)	–	–	–	–	0.5
vetch	25 25	820	1.0 (S)	–	–	–	100	–
vulpia	–	–	–	–	–	–	100 (S)	–
wild lettuce	–	–	0.5–1.0	0.25–0.5	360–720	0.4–0.8 9	100 2	–
wild oats	–	–	–	–	–	–	100	–
wild turnip	25 25	820 (600–820 mL) nth NSW	0.5–1.0	0.25–0.5	360–720	0.4–0.8 9	–	0.2–0.5
wireweed	–	–	0.75 (S)	–	–	0.4 11	100 23	–
Recom water L/ha	80–100	80–100 L/ha	50–100 L/ha	50 min	50–150	70–150	50–100	50–250
Herbicide group	I + B	B + I	F + C + I	F + I	C + F + I	G	B	I

2 See label for weed size and tank mix options.
8 See label for tankmix options.
9 Add 500 mL/ha MCPA amine 500 or 330 mL/ha Agroxone® 750 for control.
11 Add 500 mL/ha MCPA amine 500 + 5 g/ha Esteem® WDG, or 330 mL/ha Agroxone® 750 + 5 g/ha Esteem® WDG.
15 Colyledon sowthistle 4-leaf up to 10 cm + 500 mL Hotshot + 400 mL LVE 600 MCPA.
16 Colyledon sowthistle 4-leaf up to 8 cm + 400 mL LVE 600 MCPA.
23 Always use BS1000® or Chemwet® 1000 at 250/100 L spray volume.
25 Add MCPA (see label for rates)
30 Seedlings.
38 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.
39 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.
(S) Suppression only.

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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	Clodinafop propagyl 240 g/L + cloquintocet-mexyl 60 g/L	Diclofop-methyl 200 g/L + sethoxydim 20 g/L	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L	Fenoxaprop-p-ethyl 13.6 g/L + diclofop-methyl 200 g/L + sethoxydim 20 g/L	Fenoxyprop-p-ethyl 69 g/L + cloquintocet-mexyl 34.5 g/L	Imazamox 33 g/L + imazapyr 15 g/L	Imazapic 525 g/kg + imazapyr 175 g/kg	Sulfosulfuron 750 g/kg	Iodosulfuron-methyl-sodium 100 g/L	Mesosulfuron-methyl 30 g/L	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg	S-metolachlor 120 g/L + prosulfocarb 800 g/L
	Achieve® WG (11)	Mandate® (12)	Decision® (13)	Axial® (14)	Cheetah® Gold (15)	Foxtrot®	Intervix® (6 10 16)	Sentry® (20)	Monza® (17)	Hussar® OD (9)	Atlantis® OD (19)	Stinger™ (18)	Boxer Gold® (4)
		Wheat only					Clearfield wheat and barley only	Imidazolinone herbicide-tolerant wheat (single gene) and barley	Wheat only	Wheat and barley only	Wheat only	Not durum	
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	3 leaf–1st node	4 leaf–flag leaf	Emergence–early tillering	3 leaf–5-tillers	Not before 3 leaf	3 leaf–1st node	Up to mid tillering
Zadoks code	12–22	12–37	12–21	12–49	12–22	12–24	13–31	14–37	11–22	13–25	>13	13–31	00–25
Weeds controlled	(grams)	(millilitres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(grams)	(grams)	(millilitres)	(litres)	(grams)	(litres)
amsinckia	–	–	–	–	–	–	–	40	25	–	–	–	–
annual phalaris	380–500 (S)	85–160	–	0.2–0.25	1.0 (S)	0.635–0.8	–	40	–	100 (7)	0.33	–	–
annual ryegrass	380–500	160–210	1.0	0.25–0.3 (S)	1.0	–	600–750	–	–	75–100	0.33 (S)	–	2.5 (8)
barley grass	–	–	–	–	–	–	375–750	40	25 (S)	–	0.33 (S)	–	–
bedstraw	–	–	–	–	–	–	600–750 (S)	40	–	100 (S)	–	–	–
black bindweed	–	–	–	–	–	–	–	–	–	75 (S)	–	14	–
brome grass	–	–	–	–	–	–	375–750	40	20–25 (S)	–	0.33 (S)	–	–
buchan weed	–	–	–	–	–	–	–	–	–	–	–	–	–
canola – volunteer	–	–	–	–	–	–	–	40 (21)	20 (5)	–	–	–	–
capeweed	–	–	–	–	–	–	–	–	–	–	–	–	–
cereals – volunteer	–	–	–	–	–	–	375–750	40 (21)	–	–	–	–	–
charlock	–	–	–	–	–	–	–	–	–	75	–	–	–
chickpea – volunteer	–	–	–	–	–	–	–	–	–	–	–	10	–
cleavers	–	–	–	–	–	–	–	–	–	–	–	–	–
clover	–	–	–	–	–	–	600–750 (3)	40	–	75	–	10	–
corn gromwell	–	–	–	–	–	–	–	40	–	75 (S)	–	–	–
common barbgrass	–	–	–	–	–	–	–	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–	–	40	–	75	–	10	–
dock	–	–	–	–	–	–	–	–	–	–	–	10 or 14	–
erodium	–	–	–	–	–	–	–	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–	–	–	–	–	–	10	–
field pea – volunteer	–	–	–	–	–	–	–	–	20	75 (S)	–	–	–
fumitory	–	–	–	–	–	–	600-750	40	–	75	–	–	–
lesser swinecress	–	–	–	–	–	–	–	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–	–	–	–	75	–	–	–
medics	–	–	–	–	–	–	–	–	–	75	–	10	–
Mexican poppy	–	–	–	–	–	–	–	–	–	–	–	–	–
mintweed	–	–	–	–	–	–	–	–	–	–	–	–	–
mustards	–	–	–	–	–	–	375–750	20	25 (S)	75	–	10	–
New Zealand spinach	–	–	–	–	–	–	–	–	–	–	–	10	–
Paterson's curse	–	–	–	–	–	–	–	40	–	100	–	–	–
pepper cress	–	–	–	–	–	–	–	–	–	–	–	–	–
radish – wild	–	–	–	–	–	–	–	20	20	100	–	–	–
radish – wild	–	–	–	–	–	–	–	20	20	100	–	–	–
Rec water L/ha boom	50–150	50–110	50–150	50 min	50–150	50–100	70 min	70–100	40–100	50–80	50–80	70–200	100 min
Herbicide group	A	A	A	A	A	A	B	B	B	B	B	I + B	J + K

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Tralkoxydim 400 g/kg	Clodinafop propagyl 240 g/L + cloquintocet-mexyl 60 g/L	Diclofop-methyl 200 g/L + sethoxydim 20 g/L	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L	Fenoxaprop-p-ethyl 13.6 g/L + diclofop-methyl 200 g/L + sethoxydim 20 g/L	Fenoxyprop-p-ethyl 69 g/L + cloquintocet-mexyl 34.5 g/L	Imazamox 33 g/L + imazapyr 15 g/L	Imazapic 525 g/kg + imazapyr 175 g/kg	Sulfosulfuron 750 g/kg	Iodosulfuron-methyl-sodium 100 g/L	Mesosulfuron-methyl 30 g/L	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg	S-metolachlor 120 g/L + prosulfocarb 800 g/L
	Achieve® WG (11)	Mandate® (12)	Decision® (13)	Axial® (14)	Cheetah® Gold (15)	Foxtrot®	Intervix® (6)(10)(16)	Sentry® (20)	Monza® (17)	Hussar® OD (9)	Atlantis® OD (19)	Stinger™ (18)	Boxer Gold® (4)
		Wheat only					Clearfield wheat and barley only	Imidazolinone herbicide-tolerant wheat (single gene) and barley	Wheat only	Wheat and barley only	Wheat only	Not durum	
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	3 leaf–1st node	4 leaf–flag leaf	Emergence–early tillering	3 leaf–5-tillers	Not before 3 leaf	3 leaf–1st node	Up to mid tillering
Zadoks code	12–22	12–37	12–21	12–49	12–22	12–24	13–31	14–37	11–22	13–25	>13	13–31	00–25
Weeds controlled	(grams)	(millilitres)	(litres)	(litres)	(litres)	(litres)	(millilitres)	(grams)	(grams)	(millilitres)	(litres)	(grams)	(litres)
skeleton weed	–	–	–	–	–	–	–	–	–	–	–	–	–
slender thistle	–	–	–	–	–	–	–	–	–	–	–	–	–
sorrel	–	–	–	–	–	–	–	–	–	–	–	–	–
soursob	–	–	–	–	–	–	–	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–	–	–	–	100 (S)	–	–	–
spear/black thistle	–	–	–	–	–	–	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	600–750 (S)	–	–	100	–	10 or 14	–
St Barnaby thistle	–	–	–	–	–	–	–	–	–	–	–	–	–
sunflower – volunteer	–	–	–	–	–	–	–	–	–	–	–	10 or 14	–
toad rush	–	–	–	–	–	–	–	40	–	75 (S)	–	–	–
turnip weed	–	–	–	–	–	–	–	–	–	75	–	10	–
variegated thistle	–	–	–	–	–	–	–	–	–	–	–	–	–
vetch	–	–	–	–	–	–	–	–	–	75 (S) (1)	–	–	–
vulpia	–	–	–	–	–	–	600–750 (S)	–	25	–	–	–	–
wild lettuce	–	–	–	–	–	–	–	–	–	–	–	10 or 14	–
wild oats	300–500	65–125 (2)	–	0.15–0.2	1.0	0.475–0.635	375–750	40	25 (S)	100	0.33	–	–
wild turnip	–	–	–	–	–	–	375–750	–	20	–	–	10	–
Rec water L/ha boom	50–150	50–110	50–150	50 min	50–150	50–100	70 min	70–100	40–100	50–80	50–80	70–200	100 min
Herbicide group	A	A	A	A	A	A	B	B	B	B	B	I + B	J + K

(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 0.5% or D-C-Trate® at 1% or Hasten™ at 1% v/v. See label for further details.
(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 D-C-Trate® at 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.
(S) Suppression only.

Herbicides that can be used with undersown legume pastures.

Herbicides for control and suppression

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L	Flumetsulam 800 g/kg	Low volatile 2,4-D ester 680 g/L	2,4-D amine 700 g/L	2,4-DB 500 g/L [15]	MCPA 750 g/L	MCPA 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid + 7.5 g/L	Clopyralid 600 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	200 g/kg halauxifen -methyl + 200 g/kg florasulam
	Axial® [7]	Broadstrike™ [8]	Estercide® Xtra 680	Amicide® Advance 700 [9]	Buttress® [10]	Agritone® 750 [11]	LVE Agritone® [12]	Trooper™ 242 [13]	FallowBoss™ Tordon™ [14]	Lontrel™ Advanced [1] [4]	Pixxaro™ [16]	Paradigm™
Apply at crop growth stage	**Up to awn peep**	**Flowering–early dough**	**1st node–before booting**	**Fully tillered–booting**	**5 leaf–before booting**	**Fully tillered–booting**	**3 leaf–before booting**	**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**	**30–37**	**13–37**	**22–30**	**23–31**	**12–45**	**13–39**	**13–39**
Weeds controlled	**(litres)**	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
amsinckia	–	–	–	0.98	–	Tankmix [1]	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–	–	–	–	–	–	–
black bindweed	–	–	–	–	–	0.46–1.45	–	1.0 [3]	0.3	–	0.4–0.6	–
capeweed	–	–	0.53–0.8	0.98-1.5	2.1–3.2	Tankmix [1]	0.44–1.84 [5]	–	–	0.15	–	28 (S)
canola – volunteer	–	–		0.9–1.25	–	See label [1]	0.44–1.84 [5]	–	–	–	–	–
charlock	–	–	0.41	0.5–1.5	2.1–3.2	Tankmix [1]	0.44–1.84 [5]	–	–	–	–	–
chickpea – volunteer	–	–	–	–	–	–	–	–	–	–	–	25 [16]
clover	–	–	0.62–0.8	1.1	–	–	–	–	–	–	0.3	25
corn gromwell	–	–	0.8	–	–	Tankmix [1]	–	–	–	–	–	–
deadnettle	–	–	0.8	–	–	Tankmix [1]	–	–	–	–	0.2–0.3	25
erodium	–	–	0.8	–	–	Tankmix [1]	–	–	–	–	–	–
fleabane	–	–	–	1.5 [6]	–	–	–	–	–	–	0.3	25
fumitory	–	–	0.8	0.5-1.5	2.1–3.2	0.46–1.45	0.44–1.84 [5]	–	–	–	0.3	25
marshmallow	–	–	–	–	–	–	–	–	–	–	–	25
medic	–	–	–	–	–	–	–	–	–	–	–	25 [16]
Mexican poppy	–	–	0.8	–	2.1–3.2	–	–	–	–	–	0.2–0.3	25
mintweed	–	–	0.8	0.98	–	0.46–1.45	–	–	0.3 [2]	–	–	–
mustards	–	–	0.41–0.8	0.5–0.98	2.1–3.2	0.46–1.45	0.44–1.84 [5]	1.0	0.3 [2]	–	–	25
New Zealand spinach	–	–	0.8	0.98–1.5	–	–	–	1.0 (S)	0.3	–	–	
Paterson's curse	–	25	0.8	0.98–1.5	2.1–3.2	0.46–1.45	0.44–1.84 [5]	–	–	–	–	
radish – wild	–	25	0.41–0.8	0.715-1.5	–	Tankmix [1]	0.44–1.84 [5]	1.0	0.3 [2]	–	–	25 [16]
rough poppy	–	–	0.41–0.8	0.98	–	0.46–1.45	–	–	–	–	–	
saffron thistle	–	–	0.41–0.8	0.5–1.5	2.1–3.2	0.46–1.45	0.44–1.84 [5]	1.0	0.3	–	–	
scotch thistle	–	–	–	–	–	–	0.44–1.84 [5]	–	–	–	–	
shepherd's purse	–	–	0.8	0.98–1.5	2.1–3.2	–	–	–	–	–	–	25
skeleton weed	–	–	0.8	0.98–1.5	–	–	0.44–1.84 [5]	1.0	–	–	–	
slender thistle	–	–	0.8	0.715–1.5	2.1–3.2	–	0.44–1.84 [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	0.46–1.45	0.44–1.84 [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 (page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L	Flumetsulam 800 g/kg	Low volatile 2,4-D ester 680 g/L	2,4-D amine 700 g/L	2,4-DB 500 g/L (15)	MCPA 750 g/L	MCPA 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid + 7.5 g/L	Clopyralid 600 g/L	Fluroxypyr 250 g/L + halauxifen 16.25 g/L	200 g/kg halauxifen -methyl + 200 g/kg florasulam
	Axial® (7)	Broadstrike™ (8)	Estercide® Xtra 680	Amicide® Advance 700 (9)	Buttress® (10)	Agritone® 750 (11)	LVE Agritone® (12)	Trooper™ 242 (13)	FallowBoss™ Tordon™ (14)	Lontrel™ Advanced (1) (4)	Pixxaro™ (16)	Paradigm™
Apply at crop growth stage	**Up to awn peep**	**Flowering–early dough**	**1st node–before booting**	**Fully tillered–booting**	**5 leaf–before booting**	**Fully tillered–booting**	**3 leaf–before booting**	**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**	**30–37**	**13–37**	**22–30**	**23–31**	**12–45**	**13–39**	**13–39**
Weeds controlled	**(litres)**	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
spiny emex	–	–	–	1.25	2.1–3.2	Tankmix (1)	–	1.0	0.3	–	–	25 (S)
St Barnaby thistle	–	–	–	–	–	–	–	–	–	–	–	
sunflower	–	–	0.41–0.8	0.5–1.25	–	–	0.44–1.84 (5)	–	0.3 (2)	–	–	
toadrush	–	–	–	–	–	–	–	–	–	–	–	25
turnip weed	–	25	0.41–0.8	0.5–0.98	2.1–3.2	Tankmix (1)	0.44–1.84 (5)	1.0	0.3 (2)	–	–	25
variegated thistle	–	–	0.41–0.8	0.5–1.5	2.1–3.2	0.46–1.45	0.44–1.84 (5)	1.0	0.3 (2)	–	–	
vetch	–	–	–	0.98-1.25	–	–	–	–	–	0.05	–	25
wild oats	0.2	–	–	–	–	–	–	–	–	–	–	
wild turnip	–	–	0.41–0.8	0.5–1.5	2.1–3.2	Tankmix (1)	0.44–1.84 (5)	1.0	–	–	–	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

(1) See label for tankmix options.
(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) See critical comments on label in 'Directions for Use', showing varying rate according to weed size.
(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® more than once per crop. Sth NSW 150–200 mL Axial® 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).
(S) Suppression only.

Herbicides that can be used with undersown legume pastures.

Herbicides for control and suppression

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® ('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. Tackle or Associate®) and an imidazolinone herbicide (e.g. 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.

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).

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)**
GROUP A: Inhibitors of acetyl coA carboxylase (inhibitors of fat synthesis/ACC'ase inhibitors)	
Aryloxyphenoxypropionates: (Fops):	clodinafop (Topik®), cyhalofop (Barnstorm®), diclofop (Cheetah® Gold*, Decision®*, Hoegrass®*), fenoxaprop (Cheetah® Gold*, Wildcat®), fluazifop (Fusilade®, Fusion®*), haloxyfop (Verdict®), propaquizafop (Shogun®), quizalofop (Targa®)
Cyclohexanediones: (Dims):	butroxydim (Falcon®, Fusion®), clethodim (Select®), profoxydim (Aura®), sethoxydim (Cheetah® Gold*, Decision®*), tralkoxydim (Achieve®)
Phenylpyrazoles: (Dens):	pinoxaden (Axial®)
GROUP B: Inhibitors of acetolactate synthase (ALS inhibitors)	
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 (Monza®), 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®), pyroxsulam (Rexade®, Crusader®)
Pyrimidinylthiobenzoates:	bispyribac (Nominee®), pyrithiobac (Staple®)

* This product contains more than one active constituent

Table 21. Moderate resistance risk

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

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

* 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. 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 Website: 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®) 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. Approximatley 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 use 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). 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 (dims)	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)

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

	Tested	Res	DR	%	Susc
'fops'					
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
'dims'					
Select	112	26	13	35	73
Achieve	13	13	0	100	0
Factor	6	0	0	0	6
'fop' & 'dim'					
Decision	7	6	1	100	0
'den'					
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)

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)

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)
'dims'	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)

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
Horticulture	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)

Rate per hectare	Metosulam 100 g/L Eclipse® 100 SC [19]	Chlorsulfuron 750 g/kg Tackle® [21]	Bromoxynil 200 g/L Bromicide®200 [22]	Bromoxynil 280 g/L + MCPA 280 g/L Bronco®MA-X [23]	Bromoxynil 140 g/L+ MCPA 280 g/L+ dicamba + 40 g/L Broadside®	Pyraflufen-ethyl 20 g/L Ecopar® [24]	Pyrasulfotole 25 g/L + MCPA 125 g/L 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	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 [13]	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 0.465 L/ha Agritone® 750.
[3] 500 mL (southern NSW), 750 mL (northern NSW).
[4] Northern NSW only.
[5] Tankmix with 1.2 L/ha MCPA 500.
[6] Not Clearfield canola volunteers.
[7] Tankmix 350–500 mL/ha Tigrex® plus 200–400 mL/ha MCPA LVE (500 g/L) 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 500 mL/ha MCPA amine 500 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 or 1 L D-C-Trate® oil/100 L water. Can be tankmixed with 0.35–0.5 L LVE MCPA/ha 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] Not before 2-leaf stage of oats. Moist soils or rain within 7 days enhances results. Add wetter.

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

Rate per hectare	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
	Kamba® 750 [26]	Kamba® M	Starane™ Advanced [17] [27]	Hotshot™	Tigrex® [20]	Pixxaro™ [28]
Apply at crop growth stage	**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	**15–22**	**21–30**	**13–39**	**13–31**	**13–30**	**13–39**
Weeds controlled	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
amsinckia	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–
bedstraw	–	–	0.3	–	–	–
black bindweed	0.185	1.7	0.3–0.45 [14]	0.5–0.75 [4]	–	0.4–0.6
canola – volunteer	–	–	–	–	0.5 [18]	–
capeweed	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	–	–	0.9	0.5 [9]	1.0 (S)	–
Mexican poppy	–	–	–	–	–	0.2–0.3
mintweed	0.185 [29]	1.7	–	–	–	–
mustards	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	0.105 [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	–	–	0.3–0.6	0.5–0.75 [4]	0.5–1.0	–
wild oats	–	–	–	–	–	–
wild turnip	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	50 min	50 min	50 min	80 min	50 min	80 min
Herbicide group	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. 1.43 L/ha MCPA).
[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 MCPA amine 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 0.8 L/ha 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	Diuron 900 g/kg	Terbutryn flowable 500 g	Terbutryn 275 g + MCPA 160 g	Picolinafen 50 g + MCPA 500 g	Picolinafen 35 g + MCPA 350 g/L + bromoxynil 210 g
	Broadstrike™ 17	Diuron WG 16	Igran® 5 18	Agtryne® MA 19	Paragon® 20	Flight® EC 21
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 1 (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

1 Refer to weed table on label. Weed size will dictate rate.
2 Tank mix with 0.3 L/ha MCPA 500 g/L 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 comntrolling RR canola volunteers.
11 Tankmix of Igran® 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 115 g Cadence®/ha with 0.7 L MCPA (500 g/L) per ha 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 trifoliate 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 (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	MCPA 750 g/L	MCPA 570 g/L	Clopyralid 600 g/L	2,4-DB 500 g/L [25]	200 g/kg halauxifen-methyl + 200 g/kg florasulam
	Trooper™ 242 [22]	Agritone® 750	LVE Agritone® [23]	Lontrel™ Advanced [8] [24]	Buttress® [7] [9]	Paradigm™ [26]
Apply at crop growth stage	**Early tillering– fully tillered**	**5 leaf–early tillering**	**3 leaf–early flag**	**2 leaf–booting**	**5 leaf–before booting**	**1st node–first awns visible**
Zadoks code	**22–30**	**15–37**	**13–37**	**12–40**	**15–33**	**13–39**
Weeds controlled	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
amsinckia	–	–	–	–	–	
annual ryegrass	–	–	–	–	–	
black bindweed	1.0	0.46–1.45 [1]	–	–	–	
canola – volunteer	–	–	–	–	–	
capeweed	–	0.46–1.45 [1]	0.44–1.4 [1]	0.15 [2]	2.1–3.2	
charlock	–	0.46–1.45 [1]	0.44–1.4 [1]	–	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	–	0.46–1.45 [1]	0.44–1.4 [1]	–	2.1–3.2	25
lupin – volunteer	–	–	–	0.125 [4]	–	
marshmallow	–	–	–	–	–	25
medic	–	–	–	–	–	25
Mexican poppy	–	–	–	–	–	25
mintweed	–	0.46–1.45 [1]	–	–	–	
mustards	1.0	0.46–1.45 [1]	0.44–1.4 [1]	–	2.1–3.2	25
New Zealand spinach	1.0 (S)	–	–	–	–	
Paterson's curse	–	0.46–1.45 [1]	0.44–1.4 [1]	–	2.1–3.2	
prickly/wild lettuce	–	–	–	0.075 [4]	2.1–3.2	
radish – wild	1.0	0.46–1.45 [1]	0.44–1.4 [1]	–	–	25
rough poppy	–	–	–	–	–	
saffron thistle	1.0	0.46–1.45 [1]	0.44–1.4 [1]	0.025	2.1–3.2	
shepherd's purse	–	–	–	–	2.1–3.2	25
skeleton weed	1.0	0.46–1.45 [1]	0.44–1.4 [1]	0.25 [3]	–	
slender thistle	–	–	0.44–1.4 [1]	0.025	2.1–3.2	
sorrel	–	–	–	–	–	
soursob	–	–	–	–	–	
sowthistle	1.0	–	–	–	2.1–3.2	25
spear thistle	–	0.46–1.45 [1]	0.44–1.4 [1]	0.025	2.1–3.2	
spiny emex	1.0	–	–	–	2.1–3.2	25(S)
toad rush	–	–	–	–	–	25
turnip weed	1.0	0.46–1.45 [1]	0.44–1.4 [1]	–	2.1–3.2	25
variegated thistle	1.0	0.46–1.45 [1]	0.44–1.4 [1]	0.025	2.1–3.2	
vetch	–	–	–	–	–	25
wild oats	–	–	–	–	–	
wild turnip	1.0	0.46–1.45 [1]	0.44–1.4 [1]	–	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

[1] Refer to weed table on label. Weed size will dictate rate.
[2] Tank mix with 0.3 L/ha MCPA 500 g/L or 0.3 L 2,4-D amine 500 g/L for control.
[3] Add 1.0 L/ha MCPA 500 g/L for control.
[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).
(S) Suppression only.

Herbicides that can be used with undersown legume pastures.

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	2,4-D amine 700 g/L	2,4-DB 500 g/L [10]	MCPA 750 g/L	MCPA LVE 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg	Fluroxypur 250 g/L + hallauxifen 16.25 g/L
	Broadstrike™ [4]	Amicide® Advance 700 [5]	Buttress® [6]	Agritone® 750 [7]	LVE Agritone® [8]	Trooper® 242 [9]	FallowBoss™ Tordon™ [9]	Paradigm™	Pixxaro™ [13]
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**	**Mid tillering–start of jointing**	**Z13–39, 3 leaf–flag leaf emergence**	**3 leaf to flag leaf**
Zadoks code	**61–83**	**30–37**	**15–33**	**30–37**	**15–38**	**22–30**	**23–31**	**13–39**	**13–39**
Weeds controlled	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**	**(litres)**
amsinckia	–	0.98	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	–
bedstraw	–	–	–	–	–	–	–	25 [11]	0.4
black bindweed	–	–	–	–	–	1.0 [2]	0.3	–	0.4–0.6
canola (volunteer)	–	–	–	–	–	–	–	25 [12]	–
capeweed	–	0.98–1.15	2.1–3.2	0.46–1.45	0.44–1.4	–	–	25(S)	–
charlock	–	0.5–1.15	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
chickpea volunteer	–	–	–	–	–	–	–	25	
clover	–	1.1	–	–	–	–	–	25 [11]	0.3
corn gromwell	–	–	–	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–	–	25	0.2–0.3
field pea (volunteer)	–	–	–	–	–	–	–	25 [11]	–
fumitory	–	0.5–1.15	2.1–3.2	–	0.44–1.4	–	–	25	0.3
marshmallow	–	–	–	–	–	–	–	25 (S)	–
medic	–	–	–	–	–	–	–	25 [13]	
Mexican poppy	–	–	2.1–3.2	–	–	–	–	25	0.2–0.3
mintweed	–	0.8–0.98	–	0.46–1.45	–	–	0.3 [1]	–	–
mustards	–	0.2–1.15	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3 [1]	25 [11]	–
New Zealand spinach	–	0.98–1.15	–	–	–	1.0 (S)	0.3	–	–
Paterson's curse	25	0.98–1.15	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
prickly lettuce	–	–	–	–	–	–	–	25 [11]	0.4
radish – wild	25	0.715–1.15	–	0.46–1.45	0.44–1.4 [3]	1.0	0.3 [1]	25 [11]	–
rough poppy	–	0.98	–	–	–	–	–	–	–
saffron thistle	–	0.5–1.15	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3	–	–
scotch thistle	–	–	–	–	0.44–1.4	–	–	–	–
shepherd's purse	–	0.98–1.15	2.1–3.2	0.46–1.45	–	–	–	25 [11]	–
skeleton weed	–	0.98–1.15	–	0.46–1.45	0.44–1.4	1.0	–		–
slender thistle	–	0.715–1.15	2.1–3.2	–	0.44–1.4	–	–		–
sorrel	–	0.715	–	–	–	–	–		–
sowthistle	–	–	2.1–3.2	–	–	1.0	0.3	25 [11]	0.4
spear thistle	–	–	2.1–3.2	0.46–1.45	0.44–1.4	–	–		–
spiny emex	–	–	2.1–3.2	–	–	1.0	0.3	25 (S) [11]	–
toad rush	–	–	–	–	–	–	–	25 (S) [11]	–
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 (page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg	2,4-D amine 700 g/L	2,4-DB 500 g/L (10)	MCPA 750 g/L	MCPA LVE 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg	Fluroxypur 250 g/L + hallauxifen 16.25 g/L
	Broadstrike™ (4)	Amicide® Advance 700 (5)	Buttress® (6)	Agritone® 750 (7)	LVE Agritone® (8)	Trooper® 242 (9)	FallowBoss™ Tordon™ (9)	Paradigm™	Pixxaro™ (13)
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**	**Mid tillering–start of jointing**	**Z13–39, 3 leaf–flag leaf emergence**	**3 leaf to flag leaf**
Zadoks code	**61–83**	**30–37**	**15–33**	**30–37**	**15–38**	**22–30**	**23–31**	**13–39**	**13–39**
Weeds controlled	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**	**(litres)**
turnip weed	25	0.5–0.98	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3 (1)	25 (11)	–
variegated thistle	–	0.5–1.15	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3 (1)		–
vetch	–	–	–	–	–	–	–	25	–
wild oats	–	–	–	–	–	–	–		–
wild turnip	–	0.2–1.15	2.1–3.2	0.46–1.45	0.44–1.4	1.0	–	25 (11)	–
wireweed	–	–	2.1–3.2	–	–	1.0 (S)	0.3 (1) (S)		–
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 Nugrex® 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.
(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).
(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 (page 1 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See labels for details.	Fenoxaprop-p-ethyl 69 g/L + cloquintocet-mexyl 34.5 g/L	Chlorsulfuron 750 g/kg	Metsulfuron-methyl 600 g/kg	Bromoxynil 200 g/L	Terbutryn 500 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg
	Foxtrot®	Tackle® 15	Associate® 16	Bromicide® 17	Igran® 18 Triticale only	Paradigm™ 11 Triticale only
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**
Zadoks code	**12–15**	**12–23**	**13–35**	**13–30**	**13–21**	**13–39**
Weed controlled	**(litres)**	**(grams)**	**(grams)**	**(litres)**	**(litres)**	**(grams)**
amsinckia	–	15	5 or 7	1.4–2.0	0.55–0.85	–
annual ryegrass	–	20 or 25 1	–	–	–	–
annual phalaris	0.635– 0.8	–	–	–	–	–
bedstraw	–	–	–	1.4–2.0	–	–
black bindweed	–	20	–	1.4–2.0	–	–
capeweed	–	–	–	1.4–2.0	0.55–0.85	25(S)
canola – volunteer	–	–	–	–	–	–
charlock	–	15	5	–	0.55–0.85 2	–
chickpea – volunteer	–	–	–	–	–	25 31 32
cleavers	–	–	–	–	–	–
climbing buckwheat	–	–	–	–	–	–
clover	–	–	5	–	–	25
corn gromwell	–	20	–	1.4–2.0	0.55–0.85	–
deadnettle	–	15 or 20	5	–	0.55–0.85	25
dock – seedling	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	–	–	7	–	–	–
fleabane	–	–	–	–	–	–
fumitory	–	20	5	2.0	0.55–0.85	25
lentil – volunteer	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–
marshmallow	–	–	–	–	–	–
medic	–	–	5	–	–	25 31
Mexican poppy	–	–	–	2.0	–	25
mintweed	–	20	–	–	–	–
mustards	–	15	5	2.0	0.55–0.85 2	25
New Zealand spinach	–	–	–	–	–	–
Paterson's curse	–	15	5 or 7	2.0	0.55–0.85	–
prickly lettuce	–	–	–	–	–	–
radish – wild	–	15 or 20	–	2.0	–	25
rough poppy	–	20	5	–	–	–
saffron thistle	–	–	–	1.4–2.0	–	–
shepherd's purse	–	20	5	1.4–2.0	–	25
skeleton weed	–	–	7 (S)	–	–	–
slender thistle	–	–	–	–	–	–
sorrel	–	–	5	–	–	–
soursob	–	20	5	–	–	–
sowthistle	–	–	5	–	–	25
spiny emex	–	–	5 or 7	2.0	0.55–0.85 2	25(S)
toad rush	–	–	–	–	0.55–0.85	25
turnip weed	–	15	5	2.0	0.55–0.85 2	25
variegated thistle	–	–	–	1.4–2.0	–	–
vetch – volunteer	–	–	–	–	–	25 11
wild oats	0.475–0.635	–	–	–	–	–
wild turnip	–	15	5	2.0	0.55–0.85 2	25
wireweed	–	20	5 or 7	2.0	–	–
Rec water L/ha boom	50–100	30 min	50 min	50–200	50–100	80–100
Herbicide group	A	B	B	C	C	B + I

1 No more than 3 leaves of annual ryegrass. Use more than 50 L/ha water.
2 Tankmix with 0.3 L/ha MCPA 500 g/L or 0.3 L/ha 2,4-D amine 500 g/L for control.
4 Add 500 mL/ha MCPA amine 500 or 330 mL/ha Agroxone® 750 for control.
5 Add 500 mL MCPA 500 + 5 g/ha Esteem® WDG or 330 mL/ha Agroxone® 750 + 5 g/ha Esteem® WDG.
6 Tankmix 500 mL/ha Jaguar® with 200–400 mL/ha MCPA LVE (500 g/L) for control.
7 Northern NSW only.
8 Sub-clover only.
9 See label for controlling RR canola volunteers.
11 Add MCPA (See label for rates).
15 Moist soil or rain within 7 days improves results. Add wetter.
16 Add surfactant.
17 Not on undersown medics. Avoid spraying when temperatures above 20 °C. Aerial application can be unsatisfactory.
18 Avoid spraying when temperatures exceed 18 °C. Do not use on undersown lucerne and medics.

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

Rate per hectare Various trade names sometimes available under these concentrations. See labels for details.	Bromoxynil 250 g/L + diflufenican + 25 g/L	Bromoxynil 280 g/L + MCPA 280 g/L	Bromoxynil 140 g/L + MCPA 280 g/L + dicamba 40 g/L	Picolinafen + MCPA 50 g/L + 500 g/L	Picolinafen 35 g/L + MCPA 350 g/L + bromoxynil 210 g/L	Pyraflufen -ethyl 20g/L
	Jaguar® [19]	Bronco®MA-X [20]	Broadside®	Paragon® [21]	Flight® EC	Ecopar® Triticale only
Apply at crop growth stage	**2 leaf–fully tillered**	**5 leaf– fully tillered**	**3 leaf–fully tillered**	**3–5 leaf**	**3 leaf–late tillering**	**2 leaf–late tillering**
Zadoks code	**12–29**	**15–30**	**13–30**	**13–15**	**13–28**	**12–29**
Weed controlled	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
amsinckia	0.75	1.0–1.43	0.75–1.0	–	–	–
annual ryegrass	–	–	–	–	–	–
annual phalaris	–	–	–	–	–	–
bedstraw	1.0 (S)	–	–	–	–	0.4–0.8 [4]
black bindweed	0.5–1.0	1.0–1.43	1.0–1.4	–	–	–
capeweed	0.5–1.0	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.4–0.8 [4]
canola – volunteer	0.5–0.75 [9]	–	1.4	0.25 [9]	0.36	0.4–0.8 [4] [9]
charlock	0.5–0.75	1.0–1.43	–	0.25–0.5	0.36–0.72	–
chickpea – volunteer	–	–	–	–	–	–
cleavers	–	–	–	–	–	–
climbing buckwheat	–	–	–	–	–	–
clover	–	–	–	–	–	0.4 [5] [8]
corn gromwell	0.5–0.75	1.0–1.43	1.0–1.4	0.5	0.72	–
deadnettle	0.5–0.75	–	–	0.5 (S)	0.72 (S)	0.4 [5]
dock – seedling	1.0 (S)	–	0.75–1.0	–	–	–
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	0.75 (S)	–	–	–	–	–
fleabane	–	–	–	–	–	–
fumitory	0.75–1.0 (S)	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 (S)	1.0–1.43	–	–	–	–
mustards	0.5–1.0	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.4–0.8 [4]
New Zealand spinach	–	–	–	–	–	–
Paterson's curse	0.5–0.75	1.0–1.43	–	–	–	0.4 [5]
prickly lettuce	1.0 (S)	–	–	0.25–0.5	0.36–0.72	0.4–0.8 [4]
radish – wild	0.5–1.0 [6]	1.0–1.43	0.75–1.0	0.25–0.5	0.36–0.72	0.3–0.48 [4]
rough poppy	0.5–0.75	1.0–1.43	–	–	–	–
saffron thistle	1.0	1.0–1.43	–	0.5	0.72	–
shepherd's purse	1.0	1.0–1.43	–	0.25–0.5	0.36–0.72	–
skeleton weed	1.0 (S)	–	–	–	–	–
slender thistle	–	1.0–1.43	–	–	–	–
sorrel	1.0 (S)	–	–	–	–	0.4 [5]
soursob	–	–	–	–	–	0.4 [5]
sowthistle	–	1.0–1.43 [7]	–	0.5(S)	0.72 (S)	0.4 [5]
spiny emex	0.5–0.75	1.0–1.43	0.75–1.0	0.5(S)	0.72 (S)	0.4 [5]
toad rush	1.0 (S)	–	–	0.5	0.72	–
turnip weed	0.5–0.75	1.0–1.43	–	0.25–0.5	0.36–0.72	0.4 [5]
variegated thistle	1.0	1.0–1.43	–	–	–	–
vetch – volunteer	–	–	–	–	–	–
wild oats	–	–	–	–	–	–
wild turnip	0.5–0.75	1.0–1.43	–	0.25–0.5	0.36–0.72	0.4–0.8 [4]
wireweed	1.0	1.0–1.43	0.75–1.0	–	–	0.4 [5]
Rec water L/ha boom	50 min	50–200	50 min	50 min	50 –150	70 –150
Herbicide group	C + F	C + I	C + I	F + I	C + F + I	G

[19] Can be used on clover and lucerne. Not on annual medics. Application should be made from first to eighth trifoliate leaf stage.
[20] 1.0 L/ha can be used from 3 leaf stage, 1.43 L/ha from 5 leaf to fully tillered stage.
[21] 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.
[31] Add Uptake™ spraying oil (500 mL/100 L water).
(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 (page 3 of 3)

Rate per hectare Various trade names sometimes available under these concentrations. See labels for details.	Dicamba 750 g/L	MCPA 340 g/L + dicamba 80 g/L	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	Fluroxypur 250 g/L + hallauxifen 16.25 g/L
	Kamba® 750	Kamba® M (23)	Trooper® 242 (24) Triticale only	LVE Agritone® (25)	Starane™ Advanced (26) Triticale only	Triathlon®	Paradigm™ (27) Triticale only	Vortex® (29) Triticale only	Pixxaro™ (30)
Apply at crop growth stage	**5 leaf–early tillering**	**Early– fully tillered**	**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	**15–22**	**21–30**	**22–30**	**13–15**	**13–39**	**13–30**	**13–39**	**15–32**	**13–39**
Weed controlled	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**	**(millilitres)**	**(litres)**
amsinckia	–	–	–	–	–	–	–		
annual ryegrass	–	–	–	–	–	–	–		
annual phalaris	–	–	–	–	–	–	–		
bedstraw	–	–	–	–	0.3	–	25 (11)	820	0.4
black bindweed	0.185	1.7	1.0	–	0.3–0.4	–	–		0.4–0.6
capeweed	0.105 (3)	1.0–1.7	–	0.44	–	0.5–1.0	25 (S) (11) (13)		
canola – volunteer	–	–	–	0.44 (10)	–	–	25 (11) (12)	820	
charlock	0.105 (3)	1.0–1.7	–	0.44	–	0.5–1.0	–		
chickpea – volunteer	–	–	–	–	–	–	–	820 (600–820 mL) (7)	
cleavers	–	–	–	–	0.6	–	–		
climbing buckwheat	–	–	–	–	–	–	–	820 (S) (28)	
clover	0.185	1.7	–	–	–	–	25 (11)		0.3
corn gromwell	–	–	–	–	–	–	–		
deadnettle	–	–	–	–	0.9	–	25		0.2–0.3
dock – seedling	0.105 (3)	1.0–1.7	–	–	–	1.0 (S)	–		
faba bean – volunteer	–	–	–	–	–	–	–	820 (600–820 mL) (7)	
field pea – volunteer	–	–	–	–	–	–	25 (11)	820	
fleabane	–	–	–	–	–	–	25 (11)	–	–
fumitory	–	–	–	0.44	–	–	25		0.3
lentil – volunteer	–	–	–	–	–	–	–	820	
lupin – volunteer	–	–	–	–	–	–	–	820	
marshmallow	–	–	–	–	–	–	25	–	–
medic	–	–	–	–	–	–	–	–	0.3
Mexican poppy	–	–	–	–	–	–	25		0.2–0.3
mintweed	0.185 (33)	1.7	–	–	–	–	–		
mustards	0.105 (3)	1.0–1.7	1.0	0.44	–	0.5–1.0 (14)	25 (11)	820	
New Zealand spinach	0.185	1.7	1.0 (S)	–	–	–	–		
Paterson's curse	–	–	–	0.44	–	1.0 (S)	–		
prickly lettuce	–	–	–	–	0.3	0.5–1.0	–		0.4
radish – wild	0.105 (3)	1.0–1.7	1.0	0.44 (12)	–	0.5–1.0	25 (11)	820	
rough poppy	–	–	–	–	–	1.0 (S)	25		
saffron thistle	0.185 (33)	1.7	1.0	0.44	–	–	–		
shepherd's purse	–	–	–	–	–	0.5–1.0	25 (11)		
skeleton weed	–	–	1.0	0.44	–	1.0 (S)	–		
slender thistle	–	–	–	0.44	–	–	–		
sorrel	0.185 (33)	1.0–1.7	–	–	–	–	–		
soursob	–	–	–	–	–	–	–		
sowthistle	–	–	1.0	1.0	0.6	1.0 (S)	25 (11)		0.4
spiny emex	0.185	1.0–1.7	1.0	1.0	0.9	1.0 (S)	25(S) (11)		
toad rush	–	–	–	–	–	–	25 (S)		
turnip weed	0.105 (3)	1.0–1.7	1.0	1.0	–	0.5–1.0	25 (11)		
variegated thistle	0.185	1.7	1.0	1.0	–	1.0 (S)	–	820 (S) (28)	
vetch –volunteer	0.105 (3)	–	–	–	–	–	–	820	
wild oats	–	–	–	–	–	–	–		
wild turnip	0.105 (3)	1.0–1.7	1.0	1.0	–	0.5–1.0	25 (11)	820 (600–820 mL) (7)	
wireweed	0.185 (3)	1.0–1.7	1.0 (S)	1.0 (S)	0.9	0.75 (S)	–		
Rec water L/ha boom	50 min	50 min	50 min	30–120	50 min	50–100	80–100	80–100	80 min
Herbicide group	I	I	I	I	I	F + C + I	I + B	I + B	I

(3) Tankmix Kamba® 750 with 0.465 L/ha Agritone® 750.
(7) Northern NSW only.
(10) See label for tankmix options with Nugrex® for improved control.
(11) Add MCPA (See label for rates).
(12) Not Clearfield canola volunteers.
(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®, MCPA LVE 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 0.8 L/ha 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	Flumetsulam 800 g/kg	Diuron 900 g/kg + MCPA 500 g/L	Pyrasulfotole 37.5 g/L + bromoxynil 10 g/L	Pyrasulfotole 25 g/L + MCPA 125 g/L	Dicamba 750 g/kg	Clopyralid 600 g/L	Fluroxypyr140 g/L + aminopyralid 10 g/L	MCPA 250 g/L + diflufenican 25 g/L	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg	Pyroxsulam 150 g/kg+ halauxifen 50 g/kg	Florasulam 6.25 g/L + 2,4-D (ethylhexyl ester) 300 g/L
	Eclipse® 100 SC [24]	Broadstrike™ [25]	Diuron® WG + MCPA amine 500 [5] [11]	Velocity® [27]	Precept® [28]	Kamba®750 [29]	Lontrel™ Advanced [14] [30] Triticale only	Hotshot™ [31] Triticale only	Tigrex® [32]	Stinger™ [33]	Rexade™ [3] Triticale only	Vortex® Triticale only
Apply at crop growth stage	2 leaf–1st node	Mid till–start of jointing	3 leaf–early tillering	2 leaf–full till	3 leaf–1st node	5 leaf–fully tillered	2 leaf–boot	3 leaf–1st node	3–5 leaf to L till	3 leaf–1st node	3 leaf–1st node	5 leaf–2nd node visible
Zadoks code	12–31	23–31	13–23	12–30	13–31	15–30	12–40	13–31	13–30	13–31	13–31	15–32
Weeds controlled	(millilitres)	(grams)	(kg + L)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(grams)	(grams)	(litres)
amsinckia	50	25	0.28 + 0.5	0.6–1.0	1.5–2.0	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	–	–	100 (S)	–
annual phalaris	–	–	–	–	–	–	–	–	–	–	100	–
bedstraw	50 (S) [20]	–	–	0.67–1.0	1.5–2.0	–	–	–	–	–	100	0.82 [15]
black bindweed	–	–	–	0.5–1.0	–	0.185	–	0.5–0.75 [17]	–	14 [1]	–	0.82 (S) [17] [15]
canola – volunteer	50 [10]	25 [10]	–	0.5–1.0 [22]	1.0–2.0	–	–	–	0.5 [22]	–	100 [13]	0.82 [26] [15]
capeweed	35–50 [20]	25	0.28 + 0.5	0.5–1.0	1.0 [16]	0.185 [34]	0.075–0.15	–	0.5–1.0	–	100 [23]	–
charlock	–	25	0.28 + 0.5	–	–	–	–	–	0.5–1.0	–	–	–
chickpea – volunteer	35–50 [20]	–	–	0.5–1.0 (S)	1.0 [16]	–	0.125	0.75 [17]	–	10 [1]	–	0.82 [15]
chickweed	–	–	–	–	–	0.185 [34]	–	–	–	–	–	
cleavers	–	–	–	–	–	–	–	–	–	–	–	–
clover	50 (S) [19] [20]	–	–	–	1.0 [19]	0.185	0.075 [19]	–	–	10 [1]	–	–
common barbgrass	–	–	–	–	–	–	–	–	–	–	–	–
corn gromwell	–	–	0.28 + 0.5	0.5–1.0	1.0–2.0	–	–	–	1.0	–	–	–
deadnettle	–	–	0.28 + 0.5	0.5–1.0	1.0–2.0	–	–	0.5–0.75 [4] [17]	1.0	10 [1]	100	–
dock	–	–	–	–	–	0.185	–	–	1.0 (S)	10 or 14 [1]	–	–
faba bean – volunteer	35–50 [20]	–	–	0.5–1.0	1.0 [16]	–	0.125	0.5–0.75 [2]	–	10 [1]	–	0.82 [15]
fat hen	–	–	–	–	–	0.185	–	–	–	–	–	–
field pea – volunteer	35–50 [20]	–	–	0.5 (S) 0.67–1.0	1.0–2.0 [16]	–	0.075	0.5–0.75 [2]	–	–	–	0.82 [15]
fumitory	–	25 [9]	–	0.5–1.0	1.0–2.0	–	–	–	0.75	–	–	–
Indian hedge mustard	–	–	–	–	–	–	–	–	–	–	–	0.82 [15]
lentil – volunteer	–	–	–	–	–	–	–	–	–	–	–	0.82 [15]
lupin – volunteer	35–50 [20]	25 [9]	–	0.5–1.0	1.0–2.0	–	0.125	0.5 [8]	1.0 (S)	–	–	0.82 [15]
Mexican poppy	–	–	–	–	–	–	–	–	–	–	–	–
mintweed	–	–	–	–	–	0.185 [34]	–	–	–	–	–	–
mustards	50	25	0.28 + 0.5	0.5–1.0	1.0 [7]	0.185 [34]	–	–	0.5–1.0	10 [1]	–	–
New Zealand spinach	–	25 (S)	–	–	–	–	–	–	–	10 [1]	–	–
Paterson's curse	–	25 (S) [9]	–	0.5–1.0	1.0–2.0	–	–	–	1.0 (S)	–	–	–
peppercress	–	25	–	–	–	–	–	–	1.0 (S)	–	–	–
prickly lettuce	35–50 [20] (S)	–	–	0.5–1.0	1.0–2.0	–	–	0.75 [17]	0.5–1.0	–	–	–
radish – wild	50	25 (S) [9]	0.28 + 0.5	0.5–1.0	1.0–2.0	–	–	–	0.5–1.0 [12]	–	100 [23]	0.82 [15]
Rec water L/ha boom	50–100	50–150	20–100	50–150	50–100	50 min	50 min	80 min	50 min	70–200	50–100	80–100
Herbicide group	B	B	C + I	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 (page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metosulam 100 g/L	Flumetsulam 800 g/kg	Diuron 900 g/kg + MCPA 500 g/L	Pyrasulfotole 37.5 g/L + bromoxynil 10 g/L	Pyrasulfotole 25 g/L + MCPA 125 g/L	Dicamba 750 g/kg	Clopyralid 600 g/L	Fluroxypyr140 g/L + aminopyralid 10 g/L	MCPA 250 g/L + diflufenican 25 g/L	Aminopyralid 375 g/kg + metsulfuron methyl 300 g/kg	Pyroxsulam 150 g/kg+ halauxifen 50 g/kg	Florasulam 6.25 g/L + 2,4-D (ethylyhexyl ester) 300 g/L
	Eclipse® 100 SC 24	Broadstrike™ 25	Diuron® WG + MCPA amine 500 5 11	Velocity® 27	Precept® 28	Kamba®750 29	Lontrel™ Advanced 14 30 Triticale only	Hotshot™ 31 Triticale only	Tigrex® 32	Stinger™ 33	Rexade™ 3 Triticale only	Vortex® Triticale only
rough poppy	–	–	–	–	–	–	–	–	1.0 (S)	–	–	–
saffron thistle	35–50 (S) 20	–	–	0.67–1.0	–	0.185 34	Tankmix 21	–	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) 20	–	–	–	–	–	Tankmix 21	–	–	–	–	–
sorrel	–	–	–	–	–	0.185 34	–	–	–	–	–	–
soursob	–	–	1.1 18	–	–	–	–	–	–	–	–	–
sowthistle	35–50 (S) 20	–	–	0.5–1.0	0.5–1.0	–	–	0.5–0.75 12 17 or 4	1.0 (S)	–	100 23	–
spear/black thistle	35–50 (S) 20	–	–	–	–	–	Tankmix 21	–	–	–	–	–
spiny emex	–	25 (S)	0.28 + 0.5	0.75–1.0 (S)	0.75–1.0 (S)	0.185	–	0.5–0.75 12 17	1.0 (S)	10 or 14 1	100 23	0.82 15
sunflower	–	–	–	–	–	0.185	–	–	–	–	–	–
toad rush	–	–	–	–	–	–	–	–	1.0	–	–	–
turnip weed	35–50	15–25	0.28 + 0.5	0.5–1.0	1.0–2.0	0.185 34	–	–	0.5–1.0	10 or 14 1	100	0.82
variegated thistle	35–50 20 (S)	–	–	–	–	0.185	Tankmix 21	0.5–0.75 12 17	1.0 (S)	–	–	0.82 (S) 17 15
vetch	35–50 20	–	–	0.5–1.0 (S)	1.0 16	0.185	0.05	0.5–0.75 2	–	–	–	0.82 15
wild oats	–	–	–	–	–	–	–	–	–	–	100	–
wild turnip	35–50	25	0.28–0.5	0.5–1.0	1.0–2.0	–	–	–	0.5–1.0	10 1	–	0.82 15
wireweed	–	–	–	0.5 (S) 0.67–1.0	1.0–2.0	0.185	–	0.5–0.75 4 17	0.75 (S)	10 or 14 1	100	–
Rec water L/ha boom	50–100	50–150	20–100	50–150	50–100	50 min	50 min	80 min	50 min	70–200	50–100	80–100
Herbicide group	B	B	C + I	H + C	H + I	I	I	I	I + F	I + B	B	B + I

1. See label for weed size and tank mix options.
2. 500 mL (southern NSW), 750 mL (northern NSW).
3. Always use BS1000® or Chemwet® 1000 at 250/100 L spray volume.
4. Add 5 g metsulfuron-methyl (600 g/kg) and non-ionic wetter at 100 mL/100 L of water.
5. Alternatively Diuron, 500 g/L.
6. Add 1.0 L/ha MCPA 500 g/L for control.
7. Indian hedge mustard only.
8. Southern NSW only.
9. See label for tankmix of Broadstrike™ and other herbicides for control.
10. Not Clearfield canola volunteers.
11. Use only on moist soils.
12. Add 500–700 mL MCPA LVE. See label.
13. Excluding Clearfield® varieties.
14. Clopyralid also available in 750 SG. See label for rates.
15. Add Uptake™ spray oil at 50 mL/100 L water.
16. Add Lontrel™ 750 SG for control. See label for rates.
17. Northern NSW only.
18. Triticale only.
19. Sub-clover only.
20. Add partner herbicide for control. See label.
21. Mix 25 mL/ha Lontrel™ Advanced with 1 L/ha MCPA Amine (500 g/L) or 0.7 L/ha LVE MCPA (500 g/L) for control.
22. See label for controlling RR canola volunteers.
23. Refer to label for weed size and tank mix options.
24. Apply with 0.5 L Uptake™ spraying oil or 1 L D–C–Trate® oil/100 L water. Can be tankmixed with 0.35–0·5 L/ha LVE MCPA for improved control. See label.
25. Safe on undersown lucerne, medics, sub-clover, after the 2–3 trifoliate leaf stage. Use Uptake™ spraying oil on wetting agents such as BS1000® with triticale and cereal rye.
26. Conventional/triazine tolerant varieties only.
27. 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.
28. 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.
29. See Kamba 750 label for tank mix optionsl.
30. Lontrel™ also available as soluble granule 750 g/kg formulation.
31. Add BS1000® (when mixing with metsulfuron-methyl).
32. 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 trifoliate leaf stage.
33. Always add BS1000 at 250 mL/100 L or an alternative (see the section 'use of surfactant/wedding agent' in the general instructions on the label.
34. 185 mL/ha Kamba® 750 + 800 mL/ha Agritone® 750 or 185 mL/ha + 500 mL/ha Amicide® Advance 700.

(S) Suppression only.

Herbicides that can be used with undersown legume pastures.

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	Low volatile 2,4-D ester 680 g/L	2,4-D amine 700 g/L	2,4-DB 500 g/L (4)	MCPA 750 g/L	MCPA LVE 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L	Fluroxypyr 250 g/L + hallauxifen 16.25 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg
	Broadstrike™ (5)	Estercide® Xtra 680	Amicide® Advance 700	Buttress® (6)	Agritone® 750 (7) Triticale only	LVE Agritone® (8)	Trooper® 242 (9) Triticale only	FallowBoss™ Tordon™ (9) Triticale only	Pixxaro™ (10) Triticale only	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**	**13–39**
Weeds controlled	**(grams)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(grams)**
amsinckia	–	–	0.98	–	–	–	–	–	–	–
annual ryegrass	–	–	–	–	–	–	–	–	–	–
black bindweed	–	–	–	–	0.46–1.45	–	1.0	0.3	0.4–0.6	–
capeweed	–	0.53–0.8	0.98–1.5	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	25(S)
canola – volunteer	–	0.9–1.25	0.9–1.25	–	–	1.31	–	–	–	–
charlock	–	0.41	0.5–1.25	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
chickpea volunteer	–	–	–	–	–	–	–	–	–	25 (10)
clover	–	0.62–0.8	1.1	–	–	–	–	–	0.3	25
corn gromwell	–	0.8	–	–	–	–	–	–	–	–
deadnettle	–	0.8	–	–	–	–	–	–	0.2–0.3	25
fleabane	–	–	1.5	–	–	–	–	0.3	0.3 (10)	25
fumitory	–	0.8	0.5–1.5 (3)	2.1–3.2	–	0.44–1.4	–	–	0.3	25
marshmallow	–	–	–	1.0–3.2	–	–	–	–	–	25
medic	–	–	–		–	–	–	–	–	25 (10)
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	–	–	0.3 (1)	–	–
mustards	–	0.41–0.8	0.2–1.25	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3 (1)	–	25
New Zealand spinach	–	0.8	0.98–1.5	–	–	–	1.0 (S)	0.3	–	–
Paterson's curse	25	0.8	0.98–1.5	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
prickly lettuce	–	–	–	2.1–3.2	–	–	–	–	–	–
radish – wild	25	0.41–0.8	0.715–1.5	–	0.46–1.45	0.44–1.4 (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	0.44–1.4	1.0	0.3	–	–
Scotch thistle	–	–	–	–	–	0.44–1.4	–	–	–	–
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 Nugrex® 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).
(S) Suppression only.

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Flumetsulam 800 g/kg	Low volatile 2,4-D ester 680 g/L	2,4-D amine 700 g/L	2,4-DB 500 g/L [4]	MCPA 750 g/L	MCPA LVE 570 g/L	Picloram 26 g/L + MCPA 420 g/L	Picloram 75 g/L + 2,4-D 300 g/L + aminopyralid 7.5 g/L	Fluroxypyr 250 g/L + hallauxifen 16.25 g/L	Florasulam 200 g/kg + halauxifen 200 g/kg
	Broadstrike™ [5]	Estercide® Xtra 680	Amicide® Advance 700	Buttress® [6]	Agritone® 750 [7] Triticale only	LVE Agritone® [8]	Trooper® 242 [9] Triticale only	FallowBoss™ Tordon™ [9] Triticale only	Pixxaro™ [10] Triticale only	Paradigm™ Triticale only
shepherd's purse	–	0.8	0.98–1.5	2.1–3.2	–	–	–	–	–	25
skeleton weed	–	0.8	0.98–1.5	–	0.46–1.45	0.44–1.4	1.0	–	–	–
slender thistle	–	0.8	0.715–1.5	2.1–3.2	0.46–1.45	0.44–1.4	–	–	–	–
sorrel	–	–	1.25–1.5	–	–	–	–	–	–	–
sowthistle	–	–	1.25–1.5	2.1–3.2	–	–	1.0	0.3	0.4	25
spear thistle	–	–	0.5–1.45	2.1–3.2	0.46–1.45	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	0.46–1.45	0.44–1.4	1.0	0.3 [1]	–	25
variegated thistle	–	0.41–0.8	0.5–1.5	2.1–3.2	0.46–1.45	0.44–1.4	1.0	0.3 [1]	–	–
vetch	–	–	1.25	–	–	–	–	–	–	25
wild oats	–	–	–	–		–	–	–	–	–
wild turnip	–	0.41–0.8	0.2–1.25	2.1–3.2	0.46–1.45	0.44–1.4	1.0	–	–	25
wireweed	–	0.8	–	2.1–3.2	–	–	1.0 (S)	0.3 [1]	–	–
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 Nugrex® 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).

(S) 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		Simazine 900 g/kg	Atrazine 900 g/kg	Trifluralin 480 g/L	Propyzamide 500 g/kg	Imazapic 525 g/kg + imazapyr 175 g/kg
	Terbyne® Xtreme® Triazine tolerant (TT) canola only		Simanex® 900 WG Triazine tolerant (TT) canola only	Gesaprim® 7 Triazine tolerant (TT) canola only	Triflur® X 8	Rustler®	Sentry™ Imidazolinone herbicide-tolerant canola
Incorporation/growth stage application	IBS	PSPE 6	PSI, IBS PSPE	PSI, IBS PSPE	PSI IBS	IBS	IBS
Weeds controlled	(kilograms)		(kilograms)	(kilograms)	(litres)	(litres)	(grams)
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	40–50 (S)
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	40–50 (S)
barley grass	–	–	1.1–2.2 (S)	1.1–2.2 (S)	1.5–3.0 (S) (IBS) 2	1.0	40–50
bedstraw	–	–	–	–	–	–	–
brome grass	–	–	1.1–2.2 (S)	1.1–2.2 (S)	1.5–3.0 (S) (IBS) 2	1.0	40–50
capeweed	–	–	1.1–2.2	1.1–2.2	–	–	40–50 (S)
cereals – volunteer	–	–	–	–	–	–	40–50 (S) 13
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	–	–	–	40–50 (S)
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	–	40–50 (S)
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	40–50 (S)
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	–	40–50
Rec water L/ha boom	50 min		100	50–100	70–450	not stated	70–100
Herbicide group	C		C	C	D	D	B

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.
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.
13 Other than imidazolinone herbicide-tolerant varieties.
(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 34. Herbicides for weed control for canola – Pre-emergence (page 2 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Pendimethalin 440 g/L	Trifluralin 125 g/L + oryzalin 125 g/L	Tri-allate 500 g/L		S-metolachlor 960 g/L	Metazachlor 500g/L
	Pendimethalin 440 EC [9]	Duet® 250 EC [10]	Avadex® Xtra		Dual® Gold [12]	Butisan®
			Conventional [11]	KP/PW [3]		
Incorporation/growth stage application	**PSI**	**PSI**	**PSI**	**PSI**	**IBS**	**IBS**
	IBS	**IBS**	**IBS**	**IBS**	**PSPE**	
Weeds controlled	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
amsinckia	–	–	–	–	–	–
annual phalaris	–	1.6 or 2.3	[1]	[5]	–	–
annual ryegrass	1.35–2.25	1.6 or 2.3	[1]	3.0 or [5]	–	1.5–1.8
barley grass	–	–	–	[5] (S)	–	–
bedstraw	–	–	–	–	–	–
brome grass	–	–	–	3 (S)	–	–
capeweed	–	–	–	–	–	–
cereals – volunteer	–	–	–	–	–	–
charlock	–	–	–	–	–	–
common barbgrass	–	–	–	–	–	–
corn gromwell	–	–	–	[5] (S)	–	–
deadnettle	–	1.6 or 2.3	–	[5] (S)	–	–
Erodium/storksbill	–	–	–	–	–	–
faba bean – volunteer	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–
fumitory	–	1.6 or 2.3 (S)	–	–	–	–
lupin – volunteer	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–
medics – volunteer	–	–	–	–	–	–
mustards	–	–	–	[5]	–	–
Paterson's curse	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–
scotch thistle	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–
sowthistle	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–
sub. clover	–	–	–	–	–	–
toadrush	–	–	–	[5]	0.15–0.25	–
turnips – wild	–	–	–	[5]	–	–
variegated thistle	–	–	–	–	–	–
vulpia	1.5–2.25 (S)	1.6 (S)	–	–	–	–
wild oats	1.35–2.25 (S)	1.6 or 2.3 (S)	1.6 [1]	3.2 or [5]	–	1.8
wild radish	–	–	–	–	–	–
winter grass	–	–	–	[5]	–	–
wireweed	1.35–2.25	1.6 or 2.3	[1]	[5]	–	1.8
Rec water L/ha boom	50–200	50–100	30–100		60 min	80–250
Herbicide group	D	D	J		K	K

[1] Add trifluralin for mixed infestations of wild oats, annual phalaris and annual ryegrass or wireweed. See Avadex Xtra® and trifluralin labels.
[3] 3.0 L/ha and 3.2 L/ha rates are for use in KP/PW situations only.
[5] Tank mix 1.6–2.4 L/ha + 1.5–2 L/ha Triflur® X
[9] 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.
[10] Use 1.6 L rate for conventional cultivation and incorporate before sowing or at sowing with full disturbance. Use 2.3 L rate for direct drill and incorporate with full disturbance at sowing. Apply up to 5 days before sowing. Canola should be sown at normal depth of 2–4 cm. See label.
[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 sometimes available under these concentrations. See specific labels for details.	Propaquizafop 100 g/L	Clethodim 240 g/L	Butroxydim 250 g/kg	Fluazifop-P 128 g/L	Haloxyfop-R 520 g/L	Quizalofop-p-ethyl 200 g/L
	Shogun® 11	Status® 1 12	Factor® WG 13	Fusilade® Forte	Verdict™ 520 14	Elantra® Xtreme® 15
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**
Weeds controlled	**(litres)**	**(litres)**	**(grams)**	**(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	–	–	–	–	–	–
cereals – volunteer	0.2 5	0.2–0.5 7	80 8	0.41	0.05–0.1	0.125
charlock	–	–	–	–	–	–
chickpea – volunteer	–	–	–	–	–	–
corn gromwell	–	–	–	–	–	–
deadnettle	–	–	–	–	–	–
field pea – volunteer	–	–	–	–	–	–
fumitory	–	–	–	–	–	–
lupin – volunteer	–	–	–	–	–	–
Mexican poppy	–	–	–	–	–	–
medics – volunteer	–	–	–	–	–	–
mustards	–	–	–	–	–	–
Paterson's curse	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–
scotch thistle	–	–	–	–	–	–
shepherd's purse	–	–	–	–	–	–
skeleton weed	–	–	–	–	–	–
spear thistle	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–
sub. clover	–	–	–	–	–	–
toadrush	–	–	–	–	–	–
turnips – wild	–	–	–	–	–	–
variegated thistle	–	–	–	–	–	–
vulpia	–	0.25–0.5 (S)	–	–	–	–
wild mustard	–	–	–	–	–	–
wild oats	0.25	0.175–0.5	80 8	0.41	0.0375–0.1 3	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.
3. Use 0.0375–0.075 L/ha in southern and central NSW and 0.05–0.1 L/ha in northern NSW.
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.
11. Always add either BS1000® at 250 mL/100 L spray or Hasten™ or Kwickin™ at 500 mL/100 L spray.
12. Add 2 L D–C–Trate® or 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.
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.

(S) Suppression.

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

Rate per hectare Various trade names sometimes 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	Gesaprim® 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– 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	0.3–0.75 2	40–55 (S)	0.5–1.1	0.6–1.2(S)	–	1.15
barley grass	0.3–0.75 2	40–55	–	–	–	1.15
bedstraw	0.6–0.75 (S) 2	40–55	–	–	–	–
brome grass	0.3–0.75 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	0.3–0.75 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

2 See label for tankmix options.
4 Indian hedge mustard only.
9 Canary grass only.
10 plus Hasten™ or Kwickin™ at 0.5 L/100 L spray volume
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.
21 Other than imidazolinone herbicide-tolerant varieties.
22 Two applications of Roundup Ready® PL herbicide provide higher levels of control than a single application.
(S) Suppression.

Table 37. 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	Pendimethalin 440 g/L	Tri-allate 500 g/L	Diclofop-methyl 375 g/L	Propaquizafop 100 g/L	Metsulfuron-methyl 600 g/kg
	Triflur® X [5]	Pendimethalin 440 EC [6]	Avadex® Xtra [7]	Rhino® [8]	Shogun® [9]	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 36. 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	Tri-allate 500 g/L
	Triflur® X [3] Not linola	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	Propaquizafop 100 g/L	Haloxyfop-R 520 g/L	Butroxydim 250 g/kg	Diclofop-methyl 375 g/L	Bromoxynil 200 g/L	Bromoxynil 280 g/L + MCPA 80 g/L	MCPA 750 g/L	Picloram 26 g/L + MCPA 420 g/L	Metsulfuron-methyl 600 g/kg
	Fusilade® Forte Not linola	Shogun® (5) Not linola	Verdict™ 520 (6)	Factor® WG (7) Not linola	Rhino® (8) Not linola	Bromicide® (9) Not linola	Bronco®MA-X (10) Not linola	Agritone® 750 (11) Not linola	Trooper® 242 (12)	Associate® (13) Not linola
Incorporation/growth stage application	**Any time until 17 weeks before harvest**	**Up until 16 weeks before harvest**	**5 cm to flowering**	**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 (1)	–	–	–	–	–	–
annual ryegrass	0.41	0.45	0.075–0.1	80–180 (1)	1.0	–	–	–	–	–
barley grass	0.41	0.2	0.05–0.1	80–180 (1)	–	–	–	–	–	–
black bindweed	–	–	–	–	–	–	1.0–1.43	–	0.67–0.84	–
brome grass	–	0.3	0.05–0.1	80–180 (1)	–	–	–	–	–	–
capeweed	–	–	–	–	–	1.4–2.0	1.0–1.43	–	–	–
cereals	0.41	0.2 (2)	0.05–0.1	80–180 (1)	–	–	–	–	–	–
charlock	–	–	–	–	–	–	1.0–1.43	0.5–1.0	–	5
Chickpea (volunteer)	–	–	–	–	–	–	–	–	–	5
corn gromwell	–	–	–	–	–	1.4–2.0	1.0–1.43	–	–	–
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	1.0	0.67–0.84	5
New Zealand spinach	–	–	–	–	–	–	–	–	0.67–0.84 (S)	–
Paterson's curse	–	–	–	–	–	2.0	1.0–1.43	1.0	–	5–7
radish – wild	–	–	–	–	–	2.0	1.0–1.43	0.7–1.0	0.67–0.84	–
rough poppy	–	–	–	–	–	–	1.0–1.43	0.7–1.0	–	5
saffron thistle	–	–	–	–	–	1.4–2.0	1.0–1.43	1.1	0.67–0.84	–
shepherd's purse	–	–	–	–	–	–	1.0–1.43	1.4–2.0	–	5
skeleton weed	–	–	–	–	–	–	–	–	0.67–0.84	7
slender thistle	–	–	–	–	–	–	1.0–1.43	1.1	–	5
sorrel	–	–	–	–	–	–	–	–	–	7
soursob	–	–	–	–	–	–	–	–	–	5
spiny emex	–	–	–	–	–	2.0	1.0–1.43	–	0.67–0.84	–
turnip weed	–	–	–	–	–	–	1.0–1.43	1.0	–	–
variegated thistle	–	–	–	–	–	1.4–2.0	1.0–1.43	1.1	0.67–0.84	–
wild oats	0.41	0.25	0.0375–0.1 (3)	80–180 (1)	1.5–2.0	–	–	–	–	–
wild turnip	–	–	–	–	–	2.0	1.0–1.43	0.7–1.0	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 'fop' 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. Maximum rate in NSW 730 mL/ha.
(12) Not if legumes to follow crop – one year.
(13) Add wetting agent.
(S) Suppression only

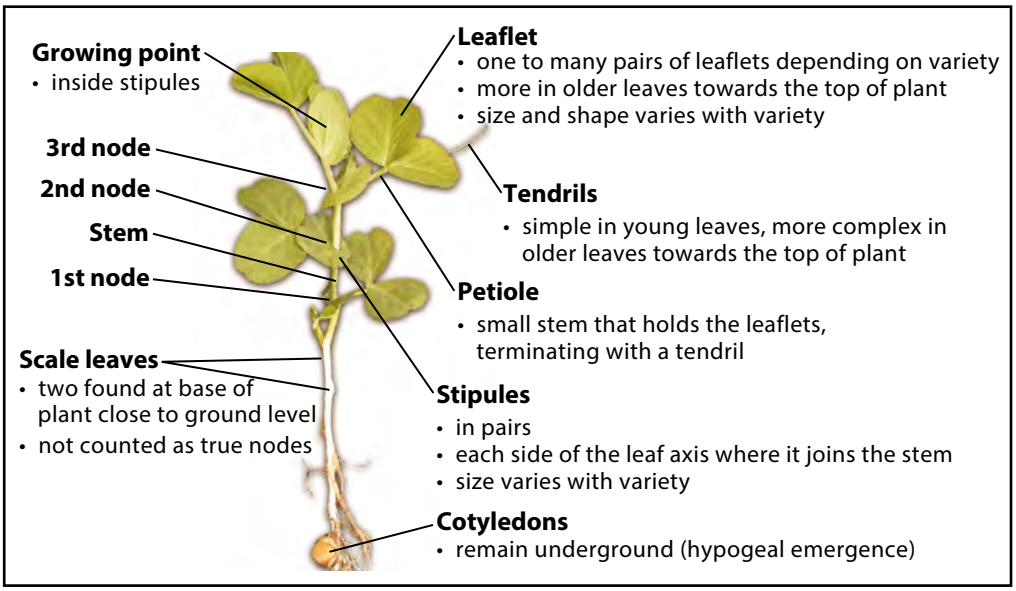
Incorporation

PSI Pre-sowing incorporated.
IBS Incorporated by sowing.

Herbicides that can be used with undersown legume pastures.

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$^{\phi}$, Sturt

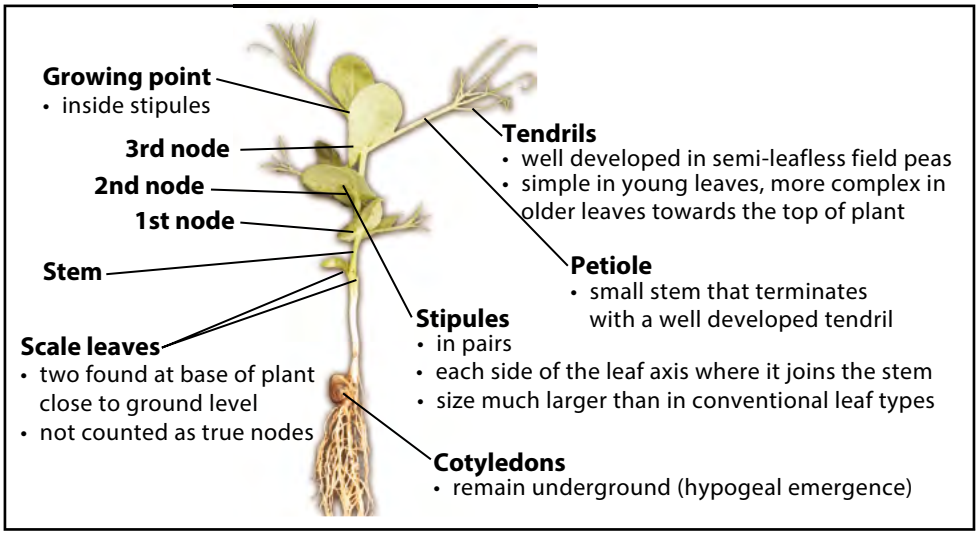


Figure 6. Field pea – semi-leafless leaf type (*Pisum sativum*) e.g. PBA Butler$^{\phi}$, PBA Oura$^{\phi}$ PBA Wharton$^{\phi}$, Morgan.

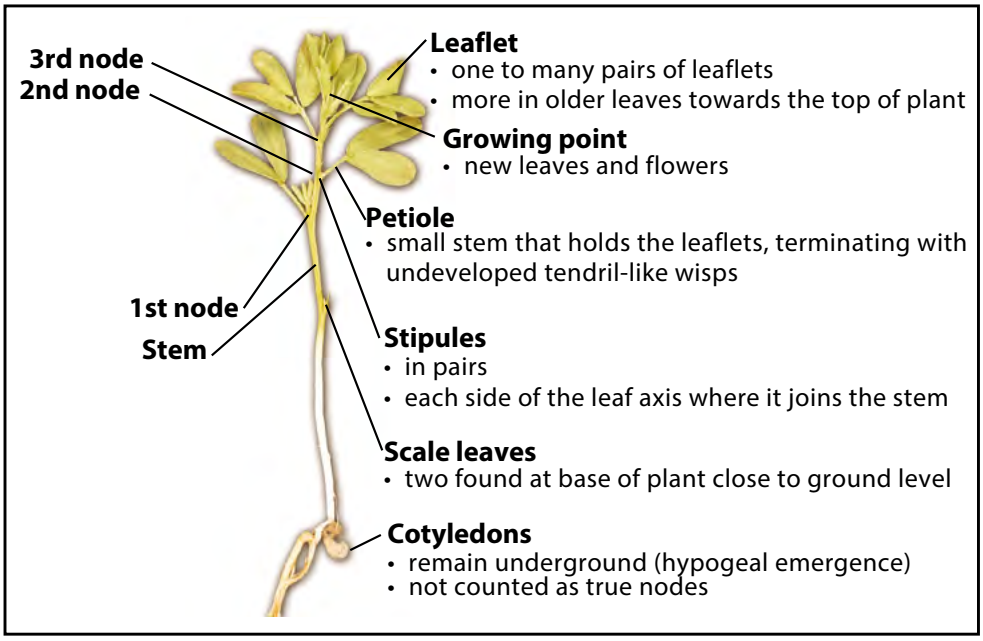


Figure 7. Lentil (*Lens culinaris*)

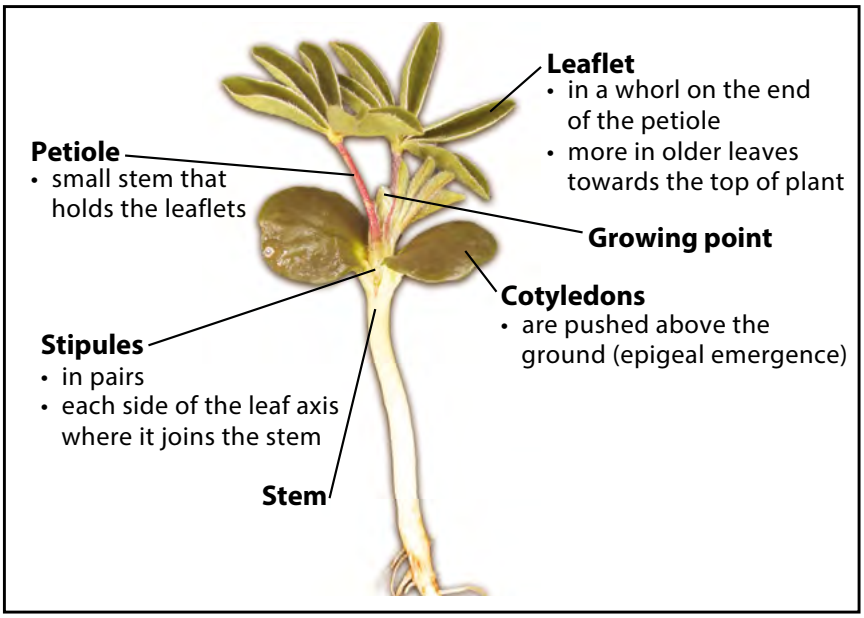


Figure 9. Lupin – albus (*Lupinus albus*) pictured and narrow-leafed (*L. angustifolius*)

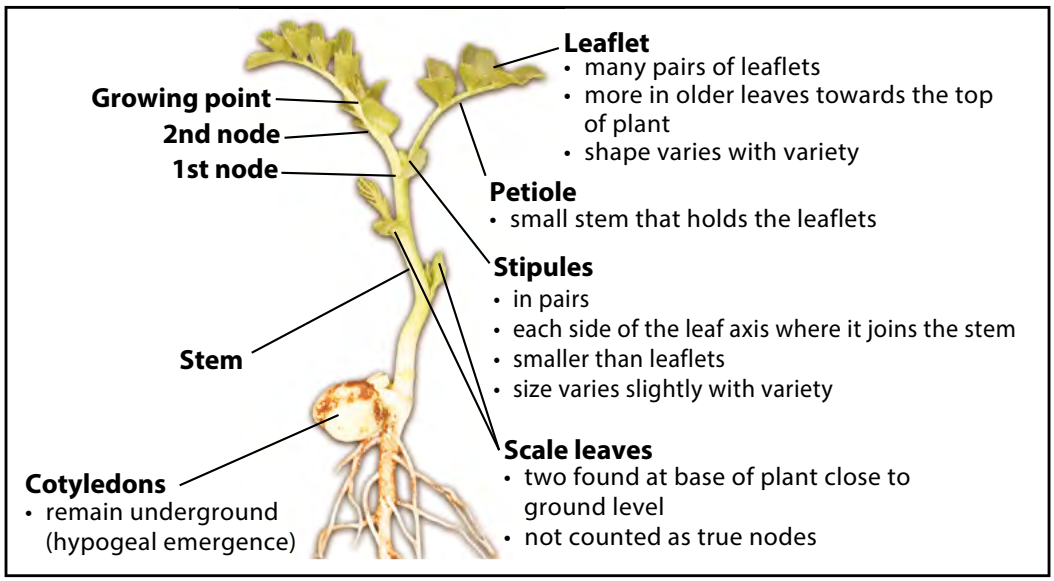


Figure 8. Chickpea (*Cicer arietinum*)

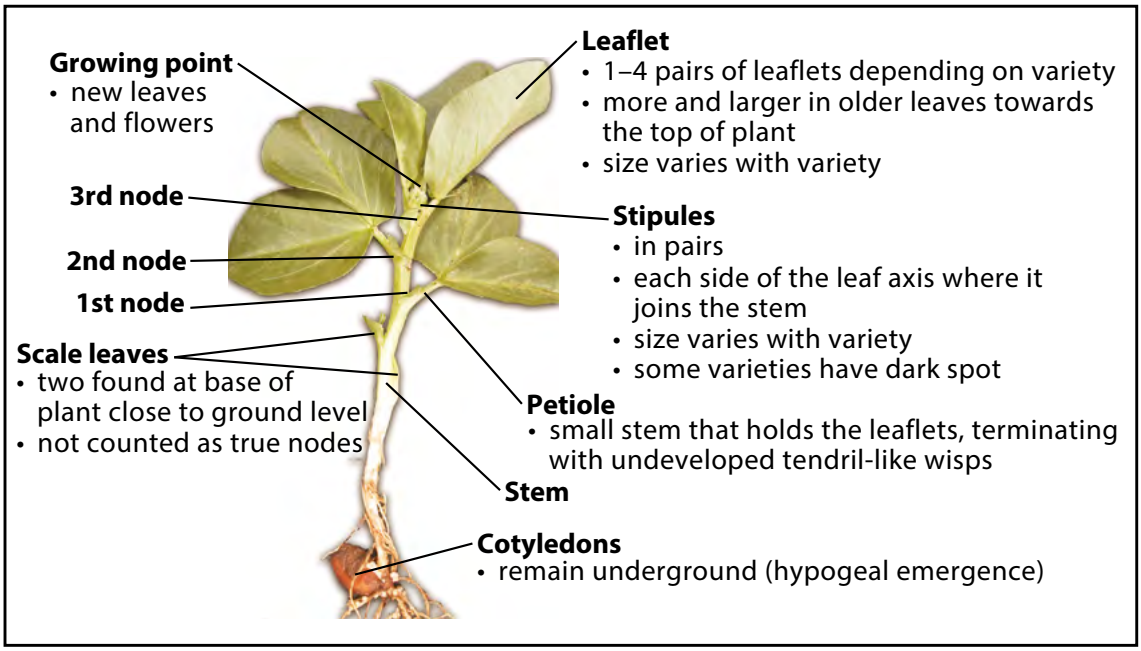


Figure 10. Faba bean (*Vicia faba*)

Table 31. 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	Terbuthylazine 875 g/kg		Metribuzin 480 g/L	Prometryn 900 g/kg	Cyanazine 900 g/kg	Propyzamide 500 g/L
	Outlook® 13	Terbyne® Xtreme® 14 5		Sencor® 480 4 15	Prometryn 900 DF 16	Bladex® 17	Rustler® 17
Incorporation/growth stage application	IBS KP/PW	IBS	PSPE	PSPE	PSPE	PSI, IBS PSPE	IBS
Weeds controlled	(litres)	(kilograms)		(litres)	(kilograms)	(kilograms)	(litres)
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	1–2
barley grass	–	–	–	–	–	1.7 or 2.2 (S)	1–2
brome grass	–	–	–	–	–	1.7 or 2.2 (S) 8	1–2
capeweed	–	–	–	0.28–0.58	–	1.7 or 2.2	–
cereals	–	–	–	–	–	–	–
cockspur – Maltese	–	–	–	–	–	–	–
corn gromwell	–	0.86–1.2	0.6–0.86	–	–	–	–
crassula	–	–	–	–	–	1.7 or 2.2	–
deadnettle	–	0.86–1.2	0.6–0.86	0.28–0.58	0.83 7	1.7 or 2.2	–
fumitory	–	–	–	–	–	1.7 or 2.2 (S)	–
goosefoot – purple	–	–	–	–	0.83 7	–	–
lettuce – wild	–	0.86–1.2	0.6–0.86	–	0.83 7	1.7 or 2.2	–
medic	–	0.86–1.2	0.6–0.86	–	–	–	–
mustards	–	0.86–1.2 12	0.6–0.86 12	0.28–0.58	0.83 7	1.7 or 2.2	–
Paterson's curse	–	–	–	–	–	–	–
radish – wild	–	0.86–1.2(S)	0.6–0.86 (S)	0.28–0.58	–	–	–
rough poppy	–	–	–	0.28–0.58	–	1.7 or 2.2	–
saffron thistle	–	–	–	–	–	–	–
shepherds purse	–	0.86–1.2	0.6–0.86	0.28–0.58	0.83 7	–	–
sowthistle	–	0.86–1.2	0.6–0.86	0.28–0.58	–	1.7 or 2.2	–
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	–	–	–
turnip weed	–	0.86–1.2	0.6–0.86	–	0.83 7	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 7	1.7 or 2.2 (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	C	D

4 Metribuzin also available as 750 g/kg formulation, see label for rates.
7 Tank mix with 830 g/ha simazine 900 DF for control.
8 Great brome only.
12 Indian hedge mustard.
13 Outlook® has demonstrated annual ryegrass control in low weed populations only (<100 plant/m^2). 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.
14 Terbyne® can be used IBS or PSPE. Use the lower rate on light soils and the higher rate on heavier soils.
15 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.
16 Apply immediately post–planting with simazine. For reliable results significant rain 20–30 mm is necessary within 2–3 weeks of sowing.
17 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.

Table 39. Herbicides for weed control for chickpea pre-emergence (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-allate 500 g/L
	Boxer Gold®	Simanex® WG 9 18	Diuron 900 WG		Triflur® X 19	Pendimethalin 440 EC 2)	Balance® 750 WG 21	Avadex® Xtra 22
Incorporation/growth stage application	**IBS**	**PSI, IBS**	**IBS**	**PSPE**	**PSI**	**PSI**	**PSPE**	**PSI**
		PSPE			**IBS**	**IBS**		**IBS**
Weeds controlled	**(litres)**	**(grams)**	**(kilograms)**		**(litres)**	**(litres)**	**(grams)**	**(litres)**
amsinckia	–	–	–	–	–	–	–	–
annual phalaris	–	–	–	–	1.2–1.7 6	–	–	1
annual ryegrass	2.5	0.8–1.1 10	–	–	1.2–1.7 6	1.5–2.25	–	1
barley grass	–	0.8–1.1 10	–	–	–	–	–	–
brome grass	–	0.8–1.1 10 (S)	–	–	–	–	–	–
capeweed	–	0.8–1.1 10	0.83–1.1	0.55–0.83	–	–	100	–
cereals	–	–	–	–	–	–	–	–
cockspur – Maltese	–	–	–	–	–	–	–	–
corn gromwell	–	0.8–1.1 10	–	–	–	–	–	–
crassula	–	–	0.83–1.1	0.55–0.83	–	–	100	–
deadnettle	–	–	–	–	–	–	100 11	–
fumitory	–	0.8–1.1 10	–	–	1.2–1.7 6 (S)	–	–	–
goosefoot – purple	–	–	–	–	–	–	–	–
lettuce – wild	–	0.8–1.1 (S)	–	–	–	–	100	–
medic	–	–	–	–	–	–	100	–
mustards	–	0.8–1.1 10	–	–	–	–	100	–
Paterson's curse	–	–	–	–	–	–	–	–
radish – wild	–	–	0.83–1.1	0.55–0.83	–	–	100	–
rough poppy	–	0.8–1.1	–	–	–	–	–	–
saffron thistle	–	–	–	–	–	–	100 11 (S)	–
shepherds purse	–	0.8–1.1 (S)	–	–	–	–	–	–
sowthistle	–	0.8–1.1	–	–	–	–	100	–
spear thistle	–	–	–	–	–	–	100 11	–
spiny emex	–	–	0.83–1.1	0.55–0.83	–	–	100 11 (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 11	–
wild oats	–	0.8–1.1 10 (S)	–	–	1.2–1.7 2 6	1.5–2.25 (S)	–	1.6 3
wild turnip	–	0.8–1.1 10	0.83–1.1	0.55–0.83	–	–	–	–
winter grass	–	–	–	–	1.2–1.7 6	–	–	–
wireweed	–	0.8–1.1 10	–	–	1.2–1.7 6	1.5–2.25	100 11 (S)	1
Rec water L/ha boom	50 min	50–100	50–100	50–100	70–450	50–200	50 min	30–100
Herbicide group/mode	J + K	C	C	C	D	D	H	J

1 Add 0.7 L/ha trifluralin for mixed infestations of wild oats.
2 Rate varies with soil texture. Refer to label.
3 Preferred option northern NSW only.
6 Use low rate when applying immediately prior to sowing, and higher rate when applying to dry soil before the planting rain.
9 Simazine is also available in a liquid formulation.
10 Tankmix with 0.8 L/ha 480 g/L trifluralin for control and apply and incorporate presowing. Trifluralin must be applied PSI or IBS.
11 Tankmix with 1.5 L simazine (500 g/L) per ha..
18 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® or prometryn (Gesagard®) to broaden weed control. Simazine also available as 600 g/L formulation in Simanex® 600 SC applied at slightly lower rates – see label.
19 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.
20 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.
21 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.
22 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 32. 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	Butroxydim 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 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 2 L D–C–Trate® or 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 33. 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
	Outlook® 8	Terbyne® Xtreme® 9		Bladex® 10	Boxer Gold®	Triflur® X 11	Pendimethalin 440 EC 12	Avadex® Xtra 3	Rustler® 13
Incorporation	**IBS KP/PW**	**IBS**	**PSPE**	**PSI, IBS**	**IBS**	**PSI, IBS**	**PSI, IBS**	**PSI, IBS**	**IBS**
Weeds controlled	**(litres)**	**(kilograms)**		**(kilograms)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**	**(litres)**
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	–	–	–	–	–
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	–	–	–	–	–
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	–	–	–
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)	–	–	–	–	–
rough poppy	–	–	–	1.7 or 2.2	–	–	–	–	–
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	–	–	–	–	–
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	–	–	–	–
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) 6	–	1.2–1.7	1.5–2.25	–	–
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

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/m2). 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.
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 34. Herbicides for weed control for field pea – Post-sowing pre-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazethapyr 700 g/kg Spinnaker® 700 WDG [3]	Metribuzin 750 g/kg Sencor® 750 WG [2]	Cyanazine 900 g/kg Bladex® [1]	Diuron*900 g/kg Diuron® 900 WDG	
Incorporation	**PSPE**	**PSPE**	**PSPE**	**PSPE**	**IBS**
Weeds controlled	**(grams)**	**(kilograms)**	**(kilograms)**	**(kilograms)**	
amsinckia	70–100	0.18–0.38	–	–	–
annual phalaris	–	–	–	–	–
annual ryegrass	70 [4]	–	1.1 or 1.7	–	–
barley grass	70 [4]	–	1.1 or 1.7(S)	–	–
blackberry nightshade	–	–	1.1 or 1.7	–	–
capeweed	70–100	0.18–0.38	1.1 or 1.7	0.55–0.83	0.83–1.1
charlock	–	0.18–0.38	–	–	–
chickweed	70–100	0.18–0.38	1.1 or 1.7	–	–
corn gromwell	–	0.18–0.38	–	–	–
cotula – common	–	0.18–0.38	–	–	–
crassula	–	–	1.1 or 1.7	0.55–0.83	0.83–1.1
deadnettle	70	0.18–0.38	1.1 or 1.7	–	–
fat hen	–	–	1.1 or 1.7	–	–
fumitory	–	0.18–0.38	1.1 or 1.7 (S)	–	–
great brome	–	–	1.1 or 1.7(S)	–	–
mouse-ear chickweed	–	–	1.1 or 1.7	–	–
mustards	70 [6]	0.18–0.38	1.1 or 1.7	–	–
Paterson's curse	70	–	–	–	–
prickly lettuce	70–100	–	1.1 or 1.7	–	–
radish – wild	70 [5] (S)	0.18–0.38	1.1 or 1.7 (S)	0.55–0.83	0.83–1.1
rough poppy	–	0.18–0.38	1.1 or 1.7	–	–
shepherd's purse	70	0.18–0.38	–	–	–
silver grass	–	–	–	–	–
sowthistle	–	0.18–0.38	1.1 or 1.7	–	–
spiny emex	70	0.18–0.38	1.1 or 1.7	0.55–0.83	0.83–1.1
stinging nettle	70	–	1.1 or 1.7	–	–
stone crop	–	–	–	–	–
toad rush	70	0.18–0.38	–	0.55–0.83	0.83–1.1
turnip weed	70	–	1.1 or 1.7	–	–
vulpia	–	–	–	–	–
wild oats	70 [4] (S)	–	–	–	–
wild turnip	–	0.18–0.38	1.1 or 1.7	0.55–0.83	0.83–1.1
winter grass	–	0.18–0.38	–	–	–
wireweed	70	0.18–0.38	1.1 or 1.7 (S)	–	–
Rec water L/ha boom	50–100	50–100	80–100	–	–
Herbicide group	B	C	C	C	C

[1] Use higher rate on heavier soil types. Post–sowing pre-emergence application: apply 1.1 or 1.7 kg/ha from immediately after until 1 week after sowing.

[2] Do not tank mix with other herbicides for field pea. Check label for suitable rate. Best results with moist soil surface. Use higher rate on heavier soil types. See label.

[3] Apply immediately post–sowing. Note recropping intervals on Table 2 on page 8. Refer label.

[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] Indian hedge mustard.

(S) Suppression only.

Incorporation

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

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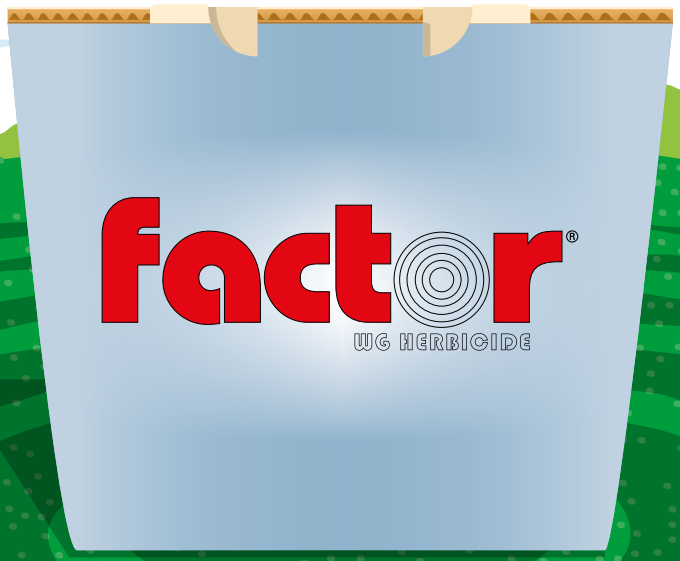

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Table 35. Herbicides for weed control for field pea – Early post-emergence (page 1 of 2)

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Quizalofop-p-ethyl 200 g/L	Clethodim 240 g/L	Propaquizafop 100 g/L	Haloxyfop-R 520 g/L	Butroxydim 250 g/kg	Fluazifop-p 128 g/L	Imazethapyr 700 g/kg
	Elantra® Xtreme® 9	Status® 10	Shogun® 1 11	Verdict™ 520 12	Factor® WG 13	Fusilade® Forte	Spinnaker®700 WDG 7
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 5	–	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 4	0.2–0.3 2	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 6
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 3	80–180	0.41	–
wild turnip	–	–	–	–	–	–	–
winter grass	–	–	–	–	–	–	–
wireweed	–	–	–	–		–	70
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

1 See label for tank mix options.
2 Volunteer triticale 250 mL/ha.
3 Use 0.0375–0.1 L/ha in southern and central NSW and 0.05–0.1 L/ha in northern NSW.
4 Use high rate for volunteer barley.
5 Use high rate on *Phalaris paradoxa*
6 Indian hedge mustard.
7 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.
9 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.
10 Add 2 L D–C–Trate® or 1 L Hasten™ or Kwickin™ or 0.5 L Uptake™ oil/100 L spray.
11 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.
12 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 haloxyfop-R formulation (Assett®).
13 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.
(S) Suppression only.

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Imazamox 700 g/kg	Flumetsulam 800 g/kg	Metribuzin 480 g/L	Cyanazine 900 g/kg	Diflufenican 500 g/L	MCPA 750 g/L
	Raptor® [15]	Broadstrike™ [16]	Sencor® 480 SC [17]	Bladex® [18]	Brodal® Options [19]	Agritone® 750 [14]
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	–	–
chickweed	–	–	0.28–0.58	0.85–1.1	0.2	0.08–0.1 [8]
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	0.08–0.1 [8]
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

[8] Add 125–150 mL Agility®.
[14] May delay crop maturity. Apply early post-emergence after the 3rd node stage and before the start of flowering. Weeds 4–6 leaf stage.
[15] Apply only on varieties Alma, Banzer, Dun, Dundale, Glenroy, Laura and Wirrega. Add BS1000® or equivalent at 250 mL/100 L water. Small weeds. See Table 2 on page 8 for plantback requirements.
[16] Do not add any spray additives. May cause yellowing, reduced height and delayed flowering.
[17] 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.
[18] Not on Wirrega field pea post-emergent. Use higher rate on larger weeds.
[19] Apply before crop canopy obscures weeds. Caution on alkaline soils.
(S) Suppression only.

Table 36. 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	Terbuthylazine 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	Loam soils	Light soils	Loam soils	Triflur® X 10	Pendimethalin 440 EC 13	Boxer Gold®	Avadex® Xtra 2 12	Rustler® 13
				Simazine 900 DF 1 2 8	Simazine 900 DF 1 2 8	Simazine 500 1 2 8 9	Simazine 500 1 2 8 9					
Incorporation	IBS KP/PW only	IBS	PSPE	PSPE	PSPE	PSPE	PSPE	IBS, PSI	IBS, PSI	IBS	IBS, PSI	IBS
Weeds controlled	(litres)	(kilograms)		(kilograms)	(kilograms)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)	(litres)
amsinckia	–	–	–	–	–	–	–	–	–	–	–	–
annual phalaris	–	0.86–1.2	0.6–0.86 (S)	–	–	–	–	1.2–1.7	–	–	–	1–2
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	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	–	–	–	–	1–2
brome grass	–	–	–	0.8–1.1 (S)	1.3–2.2 (S)	1.5–2.0 (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	–	–	–	–	–
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	–	–	–	–	–
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	1.2–1.7 (S)	–	–	–	–
mustards	–	0.86–1.2 5	0.6–0.86 5	0.8–1.1	1.3–2.2	1.5–2.0	2.5–4.0	–	–	–	–	–
Paterson's curse	–	–	–	–	–	1.5–2.0	2.5–4.0	–	–	–	–	–
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	–	–	1.5–2.0	2.5–4.0	–	–	–	–	–
silvergrass	–	–	–	–	–	–	–	–	1.5 13	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	–	–	–	–	–	–	2.5	–	–
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	–	–	–	–	–
vulpia												1–2
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)	1.2–1.7 3	1.5 (S) 13	–	1.6 4	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	–	–	–	–	–
winter grass	–	–	–	–	–	1.5–2.0	2.5–4.0	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 13	–		–
Rec water L/ha boom	70–120	50 min		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	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^2). 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.
7. 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.
8. Apply to level seedbed within 2 days after sowing.
9. Simazine also available as 600 g/L. See label for rates.
10. 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.
12. Apply and incorporate immediately prior to or up to 3 weeks before sowing.
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 37. Herbicides for weed control for lupin – post-emergence

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Diclofop-methyl 375 g/L	Fluazifop-P 128 g/L	Haloxyfop-R 520 g/L	Quizalofop-P-ethyl 200 g/L	Butroxydim 250 g/kg	Clethodim 240 g/L	Propaquizafop 100 g/L	Metosulam 100 g/L	Picolinafen 50 g/kg	Diflufenican 500 g/L	Paraquat 360 g/L
	Rhino® (8)	Fusilade® Forte (5)	Verdict™ 520 (9)	Elantra® Xtreme® (10)	Factor® WG (2) (11)	Status® (12)	Shogun® (13)	Eclipse® 100 SC (7) (14)	Sniper® (15)	Brodal® Options (16)	Gramoxone® 360 Pro (+ appropriate adjuvant) (17)
Apply at crop growth stage	–	Any time until 17 weeks before harvest	2 leaf to flowering	Up until 6 weeks before harvest	–	Before 80% flowering	Any time until 15 weeks before harvest	2–10 leaf	2–6 Leaf	2 Leaf to flowering	Physiological maturity
Weeds controlled	(litres)	(litres)	(litres)	(litres)	(grams)	(litres)	(litres)	(millilitres)	(grams)	(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	–	0.41–0.82	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	–	–	–	–	–	–	–	–	50(S)	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	–	–	–	–	–	–	–	50–70	33–50	0.2	–
rough poppy	–	–	–	–	–	–	–	–	–	0.2 (S)	–
shepherd's purse	–	–	–	–	–	–	–	–	–	0.2 (S)	–
skeleton weed	–	–	–	–	–	–	–	–	–	0.2 (S)	–
sowthistle	–	–	–	–	–	–	–	–	–	–	–
spiny emex	–	–	–	–	–	–	–	–	–	–	–
toadrush	–	–	–	–	–	–	–	–	–	0.2 (S)	–
turnip weed	–	–	–	–	–	–	–	–	–	0.2	–
vulpia	–	–	–	–	–	0.25–0.5 (S)	–	–	–	–	–
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	–	–	–	–	–	–	–	–	–	0.15–0.2	–
winter grass	–	–	–	–	–	–	–	–	–	–	–
wireweed	–	–	–	–	–	–	–	–	–	0.2 (S)	–
Rec water L/ha boom	50–150	50–100	50–150	50–150	50 min	50 min	30–150	50–100	50 min	70–100	50–100
Herbicide group	A	A	A	A	A	A	A	B	F	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, Quilinock and Wonga varieties. Do not apply past 8-leaf in Wonga.
(8) 1.25 L/ha controls common barbgrass. 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 2 L D–C–Trate® or 1 L Hasten™ or Kwickin™ or 0.5 L Uptake™ oil/100 L spray. Use lower rates on small actively growing weeds.
(13) Always add either BS1000® at 250 mL/100 L water or Hasten™ or Kwickin™ 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.
(S) Suppression only.

Table 38. 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	Terbuthylazine 875 g/kg		Simazine 900 g/kg	Cyanazine 900 g/kg	Prosulfocarb 800 g/L + S- metolachlor 120 g/L
	Spinnaker® 700 WDG (10) Faba bean only	Terbyne® Xtreme® (11)		Simazine 900 DF (12) Faba bean only	Bladex® (13)	Boxer Gold®
Incorporation	**PSPE**	**IBS**	**PSPE**	**PSI, IBS, PSPE**	**PSI, IBS**	**IBS**
Weeds controlled	**(grams)**	**(kilograms)**		**(kilograms)**	**(kilograms)**	**(litres)**
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

(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.
(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.
(S) Suppression only.

Incorporation

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

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

Rate per hectare Various trade names sometimes available under these concentrations. See specific labels for details.	Metribuzin 480 g/L	Diuron 900 g/kg		Trifluralin 480 g/L	Pendimethalin 440 g/L	Triallate 500 g/L	Propyzamide 500 g/L
	Sencor® 480 (2) (14) Faba bean only	Diuron® 900 WDG		Triflur® X (15) Lentil only	Pendimethalin 440 EC (16)	Avadex® Xtra (17) Faba bean only	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)	1–2
annual ryegrass	–	–	–	0.8–1.2	1.5–2.25	(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)	–
Rec water L/ha boom	50–100	–	–	70–450	50–200	30–100	not stated
Herbicide group/mode	C	C	C	D	D	J	D

(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.
(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.
(16) 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.

Table 39. 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	Haloxyfop-R 520 g/L	Quizalofop-p-ethyl 200 g/L	Butroxydim 250 g/kg	Clethodim 240 g/L	Propaquizafop 100 g/L	Flumetsulam 800 g/kg	Diflufenican 500 g/L
	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
Apply at crop growth stage	–	**2 Leaf to flowering**	**Lentil and faba bean up until 12 weeks before harvest**	–	**Faba bean – Not beyond full flowering. Lentil – Up to 7th node – Early branching**	**Any time until 7 weeks before harvest**	**4–8 Leaf**	**3 Leaf to flowering**
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 2 L D–C–Trate® or 1 L Hasten™ or Kwickin™ 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 Kwickin™ 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.

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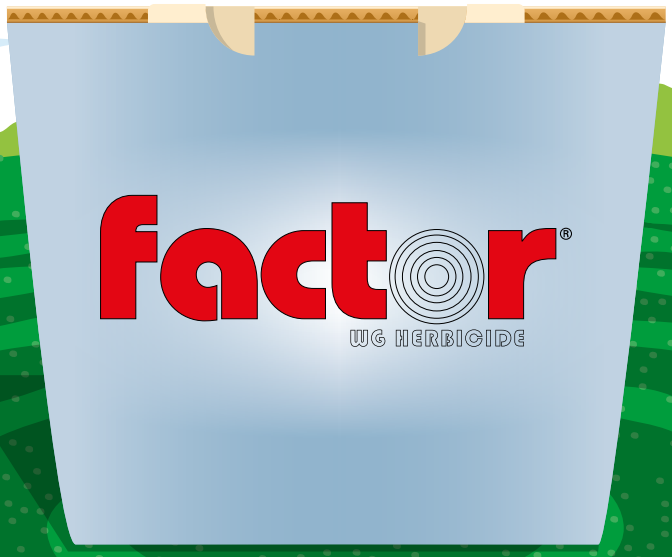

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*Paddocks can have multiple biotypes (ryegrass with different resistance profiles) and a mix of herbicides can manage the variation of mutations as it is less likely biotypes will be resistant to all herbicides in a mix compared to only one being applied.

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Table 40. Fungicide/herbicide compatibility chart for wheat (page 1 of 2)

Product							
Fungicides		Amistar® Xtra	Hornet®	Opera®	Opus® 125	Prosaro®	Throttle® 500
Herbicides		200 g/L azoxystrobin, 80 g/L cyproconazole	430 g/L tebuconazole	85 g/L pyraclostrobin, 62.5 g/L epoxiconazole	125 g/L epoxiconazole	210 g/L prothioconazole, 210 g/L tebuconazole	500 g/L propiconazole
2,4-D LV Estercide Xtra 680	680 g/L 2,4-D (present as the ethylhexyl ester)	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible with Estercide® Xtra 680. No info. on crop safety or efficacy available.	Physically compatible with Estercide® Xtra 680. No info. on crop safety or efficacy available.	Physically compatible. May result in adverse crop effects including reduced growth and yield loss through phenoxy herbicide damage, if applied at the incorrect crop growth stage. The use of an adjuvant in the mix is likely to result in increased damage. If using an adjuvant limit Prosaro® rate to 150 mL/ha and adhere to all recommendations on the use of phenoxy herbicides for the crop. Note that generally adjuvants are not recommended with 2,4-D ester.	Physically compatible with Estercide® Xtra 680. No info. on crop safety or efficacy available.
Achieve® WG	400 g/kg tralkoxydim	Physically compatible. No info. on crop safety or efficacy available.	–	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible, very good crop safety, with no indication the addition of Prosaro® increased crop effects. Hasten™ was used as the adjuvant. Supercharge® is generally recommended for use with Achieve® but has not been evaluated with Prosaro®. Any adjuvant recommended for use with Prosaro® may be used. Contact Achieve® manufacturer to confirm suitability of alternative adjuvants to Supercharge®.	Physically compatible. No info. on crop safety or efficacy available.
Agritone® 750 SL	750 g/L MCPA (as dimethyl-amine salt) + Hasten™ 1%	Physically compatible with MCPA amine, ester LVE. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible, No info. on crop safety or efficacy available. BS1000® @ 0.25% recommended adjuvant.	Physically compatible. No info. on crop safety or efficacy available.
Associate® 7 g/ha	600 g/kg metsulfuron-methyl (+ BS1000®)	–	–	Physically compatible with Associate®. Nufarm recommend including Chemwet® 1000. No info. on crop safety or efficacy available.	Physically compatible with Associate®. Nufarm recommend including Chemwet® 1000. No info. on crop safety or efficacy available.	Physically compatible. The addition of Prosaro® to Associate® increased crop effects although effects were generally transient and crops recovered. This was done with the addition of Hasten™ adjuvant. The use of a non-ionic surfactant should improve crop safety although the rate required (0.25%) is higher than usually recommended for use with Associate®.	Physically compatible with Associate®. No info. on crop safety or efficacy available.
Amicide® Advance 700, 2,4-D	(present as the dimethylamine and monomethylamine salts)	Physically compatible. No info. on crop safety or efficacy available.	–	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. May result in adverse crop effects including reduced growth and yield loss through phenoxy herbicide damage, if applied at the incorrect crop growth stage. The use of an adjuvant in the mix is likely to result in increased damage. If using an adjuvant limit Prosaro® rate to 150 mL/ha and adhere to all recommendations on the use of phenoxy herbicides for the crop. Note that generally adjuvants are not recommended with Amicide® 625.	Physically compatible. No info. on crop safety or efficacy available.
Atlantis® OD	30 g/L mesosulfuron-methyl + 90 g/L mefenpyr-diethyl	–	–	–	–	Physically compatible. May result in increased crop effects, limiting Prosaro® rate to 150 mL/ha should improve crop safety. BS1000® @ 0.25%,Hasten™ 1% or Rocket® 1% (choose adjuvant depending on weed target for Atlantis® OD.)	–
Axial® 100 EC	pinoxaden 100 g/L + cloquintocet-mexyl 25 g/L (+ Adigor® 0.5%)	Physically compatible. No info. on crop safety or efficacy available.	–	–	–	Physically compatible. May result in adverse crop effects if used late in the season. Limiting Prosaro® rate to 150 mL/ha should improve crop safety. Adhere to the crop stage recommendations for Axial® application. Use Adigor® 0.5% (as required for Axial® use).	–

Where there is a blank compatibility is not known, contact the manufacturer. Compatibility is dependent upon use pattern, rates, surfactants, compatibility agents, temperature and water quality. Mixtures generally require constant agitation. Mixing more than two products is not recommended. This chart only indicates which chemicals are compatible in mixtures at the time of compilation March 2012. Read the compatibility and crop safety sections of all labels before mixing. Mixing chemicals is at the user's own risk. See Tips for tankmixing herbicides on page 18.

Three-way mixes can cause compatibility problems in some instances. Important to read critical comments on technical sheets and labels as some rates can cause an adverse crop effect. Product compatibility is sourced from technical notes and labels of the fungicide manufacturer. Both products and companies should be consulted prior to undertaking a tank mix. This chart is for wheat, however individual wheat varieties will need to be checked for suitability for use with any particular herbicide or fungicide listed here.

Table 40. Fungicide/herbicide compatibility chart for wheat (page 2 of 2)

Product							
Fungicides		Amistar® Xtra	Hornet®	Opera®	Opus® 125	Prosaro®	Throttle® 500
Herbicides		200 g/L azoxystrobin, 80 g/L cyproconazole	430 g/L tebuconazole	85 g/L pyraclostrobin, 62.5 g/L epoxiconazole	125 g/L epoxiconazole	210 g/L prothioconazole, 210 g/L tebuconazole	500 g/L propiconazole
Cadence® WG	700 g/kg (dicamba present as sodium salt)	Not compatible.	–	–	–	Physically compatible. Good crop safety. Typical dicamba wilting effects on the crop are often observed within days of application, these effects have been transient in the trials conducted.	–
Ken-Gran 750 WG	750 g/kg triasulfuron	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible with Nugran®. No info. on crop safety or efficacy available.	Physically compatible with Nugran®. No info. on crop safety or efficacy available.	Physically compatible with Nugran®. No info. on crop safety or efficacy available.	–	Physically compatible. No info. on crop safety or efficacy available.
Lontrel™ Advanced	600 g/L clopyralid (present as triisopropanolamine salt) (+Hasten™)	–	–	–	–	Physically compatible, very good crop safety.	–
LVE Agritone®	570 g/L MCPA (present as the 2-ethyl-hexyl ester)	Physically compatible with LVE. No info. on crop safety or efficacy available.	–	–	–	Physically compatible with MCPA LVE 500 g/L (+Hasten™). Very good crop safety. Any adjuvant recommended for use with Prosaro® may be used.	–
Paragon®	500 g/L MCPA (present as the ethylhexyl ester) + 50 g/L picolinafen	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	Physically compatible. No info. on crop safety or efficacy available.	–	Physically compatible. No info. on crop safety or efficacy available.
Tigrex®	250 g/L MCPA as ethylhexl ester + 25 g/L diflufenican	Physically compatible. No info. on crop safety or efficacy available.	–	–	–	Physically compatible. Crop safety with Tigrex® is very good even though Hasten™ was used in all trials, against the recommendation for use of Tigrex®. The use of a non ionic-surfactant rather than a crop oil should further improve crop safety.	Physically compatible. No info. on crop safety or efficacy available.
Topik® 240 EC	240 g/L clodinafop propargyl + cloquintocet-mexyl 125 mL/ha	Physically compatible. No info. on crop safety or efficacy available.	–	–	–	Physically compatible. May result in adverse crop effects if used late in the season. Limiting Prosaro® rate to 150 mL/ha should improve crop safety. Adhere to the crop stage recommendations for Topik® application. Recommended adjuvant Uptake™ 0.5% or D-C-Trate 1%.	–
* Fallowboss Tordon™	300 g/L 2,4-D + 75 g/L picloram + 7.5 g/L aminopyralid (all as the triisopropanola-mine salt)	–	–	–	–	Physically compatible. No information on crop safety of the mixture is available. The use of an adjuvant with Fallowboss Tordon™ is NOT recommended. This may compromise efficacy of Prosaro®.	–
Velocity®	bromoxynil (mixed heptanoic and octanoic acid esters) + 37.5 g/L pyrasulfotole + 9.4 g/L mefenpyr-diethyl	–	–	–	–	Physically compatible. Limited data but good crop safety indicated. Use Hasten™ 1% or an alternative crop oil that is recommended for use with both products.	–

*Tordon 75-D" has been superseded by "FallowBoss Tordon" 300 g/L 2, 4-D (present as triisopropanolamine salt) + 75 g/L picloram (present as triisopropanolamine salt) + 7.5 g/L aminopyralid (present as triisopropanolamine salt) - Dow AgroSciences. Compatibilities should be similar to Tordon 75-D.

In many cases it is useful to mix a herbicide and fungicide together to save on further application passes within a paddock. This has been more common in recent years with less varietal resistance to stripe rust. Mixing herbicides and fungicides whilst practical, can be risky. Many products may be Physically compatible, however interactions may occur between the herbicide and the fungicide which may reduce the efficacy of either or both products. Crop damage may also be greater when mixing herbicides and fungicides. An adjuvant recommended for one product in a tank mix may have an adverse effect on the other product. The same is true of water quality where solubility for one product might be quite different for the other.

Whilst this table provides the best available information regarding common herbicide and fungicide mixtures, always consult with your advisor and product manufacturers before tankmixing herbicides with fungicides, and check for any updated technical information on such mixes.

Table 41. Cereal foliar fungicides – 2019 currently registered products (NSW) – winter cereals (page 1 of 3)

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

Active and concentration	Examples of commercial trade names: Product	Manufacturer	WHP (weeks) W – wheat B – barley: Grazing	Harvest	Cost/L [1]	Adjuvant (as per label)	Diseases controlled [2]: Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	Powdery mildew	Registered for aerial application
Azoxystrobin 200 g/L + cyproconazole 80 g/L	Amistar® Xtra	Syngenta	3	6	$45.32	Barley – addition of Adigor® at 200 mL/100 L improves disease control at lower rates	400–800 mL (wheat) $18.13–36.26	400–800 mL (wheat) $18.13–36.26	400–800 mL (wheat) & 200–800 mL (barley) $9.06–36.26	–	–	–	400–800 mL (wheat) $18.13–36.26	–	200–800 mL (barley) $9.06–36.26	400–800 mL (wheat & barley) $18.13–36.26	Yes
Azoxystrobin 80g/L + Epiconazole 31.25 g/L	Tazer® Xpert™ [7]	Nufarm	3		$25.30	Plus Banjo® 1%v/v for some diseases. Adding Banjo® might improve efficacy at lower rates. Refer to label.	1000–2000 mL (wheat) $25.30–50.60 **or** 500 mL + Banjo® at 1% v/v (wheat) $12.65	1000–2000 mL (wheat & barley) $25.30–50.60 **or** 500 mL + Banjo® 1% at v/v (wheat & barley) $12.65	1000– 2000 mL (wheat & barley) $25.30–50.60 **or** 500 mL (wheat) 500–1000 mL (barley) + Banjo® 1% at v/v (wheat & barley) $12.65–25.30	–	1000 mL (wheat) $25.30	1000–2000 mL (wheat) $25.30–50.60	1000–2000 mL (wheat) $25.30–50.60	1000–2000 mL (barley) $25.30–50.60	1000–2000 mL (barley) $25.30–50.60 **or** 500–1000 mL + Banjo® 1% at v/v (wheat & barley) $12.65–25.30	1000–2000 mL (wheat & barley) $25.30–50.60 **or** 500–1000 mL + Banjo® 1% at v/v (barley only) $12.65–25.30	Yes
Azoxystrobin 75 g/L + Epoxiconazole 75 g/L	Radial®	Adama Australia	6 + ESI	6	$31.83	–	420–840 mL (wheat) $13.37–26.73	420–840 mL (wheat) $13.37–26.73	420–840 mL (wheat & barley) $13.37–26.73	–	420–840 mL (wheat) $13.37–26.73	420–840 mL (wheat) $13.37–26.73	420–840 mL (wheat) $13.37–26.73	420–840 mL (barley) $13.37–26.73	420–840 mL (barley) $13.37–26.73	420–840 mL (wheat & barley) $13.37–26.73	Yes
Azoxystrobin 120 g/L + tebuconazole 200 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) $8.64 **or** $17.27	315 **or** 630 mL (wheat & barley) $8.64 **or** $17.27	–	630 mL (wheat) $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	315 mL **or** 630 mL (barley [9]) $8.64 **or** $17.27	315 mL **or** 630 mL (barley) $8.64 **or** $17.27	Yes
Epoxiconazole 125 g/L	Opus® 125	BASF	6 + ESI	6	$23.94	200 mL/100 L Chemwet may assist in certain conditions	250–500 mL (wheat) $5.99–11.97	–	500 mL (wheat) 250–500 mL (barley) $5.99–11.97	–	–	250–500 mL (wheat) $5.99–11.97	–	250 mL (barley) $5.99	250–500 mL (barley [6]) $5.99–11.97	250 mL (wheat & barley) $5.99	Yes
Fenbuconazole 240 g/L	Indar®	Dow AgroSciences	2 + ESI	NR	$13.20	500 mL/100 L Uptake Spraying Oil	150–300 mL (wheat) $1.98–3.96	–	–	–	–	–	–	–	–	–	No
Flutriafol 250 g/L	Various	–	7-W 10-B	7-W 10-B	$19.80	200 mL/100 L BS1000®	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	$42.02	200 mL/100 L BS1000®	125–250 mL (wheat) $5.25–10.51	–	125–250 mL (wheat) $5.25–10.51	–	125–250 mL (wheat) $5.25–10.51	125–250 mL (wheat) $5.25–10.51	–	–	–	125–250 mL (barley) $5.25–10.51	Yes

Table 41. Cereal foliar fungicides – 2019 currently registered products (NSW) – winter cereals (continued; page 2 of 3)

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

Active and concentration	Examples of commercial trade names: Product	Manufacturer	WHP (weeks) W – wheat B – barley: Grazing	Harvest	Cost/L (1)	Adjuvant (as per label)	Diseases controlled (2): Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	Powdery mildew	Registered for aerial application
Propiconazole 250 g/L (10)	Tilt®250 EC	Syngenta	1	4	$15.62	Not required	250–500 mL (wheat) $3.91–7.81	500 mL (wheat & oats) $7.81	150–500 mL (wheat) $2.34–7.81	250–500 mL (oats) $3.91–7.81	250–500 mL (wheat & oats (4)) $3.91–7.81	150–500 mL (wheat) $2.34–7.81	250–500 mL (wheat) $3.91–7.81	500 mL (barley) $7.81	250–500 mL (barley) $3.91–7.81	150–500 mL (wheat & barley) $2.34–7.81	Yes
Propiconazole 435 g/L	PropiMax™	Dow AgroSciences	1	4	$29.70	Not required	145 mL **or** 285 mL (wheat) $4.31–8.46	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)) $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	285 mL (barley (5)) $8.46	85–285 mL (wheat & barley) $2.58–$8.46	Yes
Propiconazole 500 g/L	Throttle®500	Nufarm	1	4	$31.85	Not required	125 mL or 250 mL (wheat) $3.98–7.96	250 mL (wheat & oats) $7.96	75–250 mL (wheat) 125–250 mL (barley) $2.39–$7.96	125–250 mL (oats) $3.98–7.96	125–250 mL (wheat & oats (4)) $3.98–7.96	75–250 mL (wheat) $1 $2.39–7.96	125–250 mL (wheat) $3.98–7.96	250 mL (barley) $7.96	125–250 mL (barley) $3.98–7.96	75–250 mL (wheat & barley) $2.39–7.96	Yes
Propiconazole 250 g/L + cyproconazole 80 g/L	Tilt® Xtra	Syngenta	3 + ESI	6	$39.19	Not required	250–500 mL (wheat) $9.80–19.59	500 mL (wheat) $19.59	150–500 mL (wheat & barley (3)) $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	500 mL (barley) $19.59	250 or 500 mL (barley) $9.80–19.59	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	125–250 mL (wheat) 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 (4)) $3.74–7.49	125–250 mL (wheat) $3.74–7.49	125–250 mL (wheat) $3.74–7.49	250 mL (barley) $7.49	125–250 mL (barley) $3.74–7.49	125–250 mL (wheat & barley) $3.74–7.49	Yes
Prothioconazole 210 g/L + tebuconazole 210 g/L	Prosaro® 420 SC (8)	Bayer CropScience	2	5	$81.95	Various(adjuvants required for some diseases) – As per label directions	150–300 mL (wheat & triticale) $12.29–24.59	150–300 mL (wheat) 300 mL (oats) $12.29–24.59	150–300 mL (wheat & barley) 300 mL (oats) $12.29–24.59	300 mL (oats) $24.59	–	150–300 mL (wheat, oats) $12.29–24.59	150–300 mL (wheat) $12.29–24.59	150–300 mL (barley) $12.29–24.59	150–300 mL (barley) $12.29–24.59	150–300 mL (wheat & barley) $12.29–24.59	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) Rate on barley is 250–500 mL.
(4) Propiconazole and propiconazole + tebuconazole is registered for suppression of Septoria leaf blotch in oats.
(5) Spot form of net blotch.
(6) Net form of net blotch only.
(7) Tazer®Expert™ is registered for control of sseptorial leaf blotch in oats.
(8) Prosaro® 420 is registered for the control of Fusarium head blight.
(9) Suppression only.
(10) Various formulations and active ingredient concentrations of propiconazole and tebuconazle are available.

+ ESI Export slaughter interval applies. Do not slaughter animals destined for export within 7 days of consumption of treated cereal forage or straw.

NR 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.

Compatibilities

Table 41. Cereal foliar fungicides – 2019 currently registered products (NSW) – winter cereals (continued; page 3 of 3)

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

Active and concentration	Examples of commercial trade names: Product	Manufacturer	WHP (weeks) W – wheat B – barley: Grazing	Harvest	Cost/L [1]	Adjuvant (as per label)	Diseases controlled [2]: Stripe rust	Stem rust	Leaf rust	Crown (leaf) rust	Septoria tritici blotch	Septoria nodorum blotch	Yellow spot	Barley scald	Net blotch	Powdery mildew	Registered for aerial application
Pyraclostrobin 85 g/L + epoxiconazole 62.5 g/L	Opera®	BASF	3 + ESI	NR	$35.05	Non-ionic surfactant (not specified)	500 mL (wheat) $17.53	500 mL (wheat) $17.53	500–1000 mL (wheat) 500 mL (barley) $17.53–35.05	–	500 mL (oats) $17.53	500 mL (wheat) $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 [10]	Various	–	2	5	$19.43	1% D-C-Trate or equivalent may improve results	145–290 mL (wheat) $2.82–5.64	145–290 mL (wheat & oats) $2.82–5.64	145–290 mL (wheat) $2.82–5.64	145–290 mL (oats) $2.82–5.64	290 mL (wheat) $5.64	145–290 mL (wheat) $2.82–5.64	145–290 mL (wheat) $2.82–5.64	145 mL (barley) $2.82	–	145–290 mL (barley) $2.82–5.64	Yes
Tebuconazole 45 g/kg + sulfur 700 g/kg	Unicorn 745 WG	Sulphur Mills Aust. Limited	2	5	–	–	1370 g or 2750 kg (wheat)	1370 g or 2750 g (wheat & oats)	1370 g or 2750 g (wheat)	1370 g or 2750 g (wheat & oats)	2750 g (wheat)	1370 g or 2750 g (wheat)	1370 g or 2750 g (wheat)	1370 g (barley)		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) $8.58–17.16	–	–	–	–	–	–	1000 mL (barley) $17.16	–	1000 mL (barley) $17.16	Yes
Triadimefon 500 g/kg	Ospray Triadimefon 500WG	FMC	Not stated, [11]	4	$19.80	Not required	125–250 g (wheat) $2.48–4.95	–	125–250 g (wheat) $2.48–4.95	–	125–250 g (wheat – southern NSW only) $2.48–4.95	–	–	–	–	250 g (barley) 125–250 g (wheat) $2.48–4.95	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.

[10] Various formulations and active ingredient concentrations of propiconazole and tebuconazle are available.

[11] Do not mix leaves treated with this product with feed intended for animal consumption.

[12] Feed treated with this product must not be used for animal consumption, poultry feed or mixed with animal feed.

+ ESI Export slaughter interval applies. Do not slaughter animals destined for export within 7 days of consumption of treated cereal forage or straw.

NR 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 42. Canola and pulse foliar fungicides – 2019

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) 1	28 days	28 days	500 mL	14.95			Botrytis grey mould		Chocolate spot	
Bravo® Weather Stik – Syngenta	chlorothalonil (720 g/L)	7 days	Do not graze	1.4–2.3 L	17.65	5–200 L	–	–	–	Chocolate spot, rust	–
Barrack® 720 – Crop Care	chlorothalonil (720 g/L)	14 days	14 days 3	1.4–2.3 L (faba bean)	14.48	5–200 L	–	Ascochyta blight	–	Chocolate spot, rust	–
Unite® 720 – Nufarm				1.0–2.0 L (chickpea)		5–1000 L					
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)	18.05	1–20 kg	–	Ascochyta blight	–	Chocolate spot, rust	–
Rovral® Liquid – FMC	iprodione (250 g/L)	42 days	42 days	2.0 L	18.80	5–1000 L	Sclerotinia stem rot	–	–	–	–
Dithane® Rainshield Neo Tec Fungicide – Dow AgroSciences	mancozeb (750 g/kg)	28 days	14 days	1.0–2.2 kg	11.40	20 kg	–	Ascochyta blight, botrytis grey mould, rust	Ascochyta blight blackspot, botrytis grey mould	Ascochyta blight, chocolate spot, Cercospora, rust	Anthracnose, botrytis grey mould
Fortress® 500 – Nufarm	procymidone (500 g/L) 2	Canola not required	9 weeks	1.0 L (canola)	34.35	5–10 L	Sclerotinia stem rot	–	–	Chocolate spot	–
Sumisclex® Broadacre – Sumitomo		Faba bean 9 days	Not stated	0.5 L (faba bean)		20 L					
Prosaro® 420 SC – Bayer CropScience	prothioconazole (210 g/L) + tebuconazole (210 g/L)	Not required	14 days	375–450 mL	81.95	5–20 L	Blackleg, sclerotinia stem rot	–	–	–	–
Aviator® XproTM – Bayer	Prothioconazole (150 g/L) + bixafen (75 g/L)	Not required	Canola 28 days Chickpea, Field pea and faba bean all 35 days	Canola Blackleg 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	59.95	10 L	Blackleg, sclerotinia stem rot	Ascochyta blight	–	–	–
Miravis® Fungicide – Syngenta	pydiflumetofen (200 g/L)	Not required	6 weeks	300–450 mL#	153.45	–	Blackleg, White leaf spot	–	–	–	–
				450–600 mL							
Orius® 430 SC Fungicide – Adama	tebuconazole (430 g/L)	3 days	3 days	145 mL	18.20	5–1000 L	–	–	Powdery mildew	Cercospora, rust (PER13752, expiry 30/06/ 24)	–
		PER13752 21 days	PER13752 14 days								
Veritas® Fungicide – Adama	tebuconazole (200 g/L) + azoxystrobin (100 g/L)	Canola, not required	Canola 14 days	Canola Sclerotinia stem rot 1.0 L; Pulses 0.75–1.0 L Faba bean Rust and Cercospora 300 mL	27.42	1–1000 L	Sclerotinia stem rot	Botrytis grey mould, ascochyta blight	Botrytis grey mould	Botrytis grey mould, ascochyta blight, chocolate spot, Cercospora, rust	Botrytis grey mould
		Pulses 28 days	Pulses 28 days								
Triadimefon 125EC – FMC	triadimefon (125 g/L)	14 days	Not stated	500 mL	17.60	5–1000 L	–	–	Powdery mildew	–	–

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.

When combined with use of a seed treatment or in-furrow fungicide treatment
Prices quoted are GST Inclusive at 30 January 2019 and approximate only.
Prices will vary depending on pack size purchased.

Table 51. 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
Achieve®	Tralkoxydim 400 g/kg	Crop Care	57.00	0.4 kg	22.80
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	15.54	1.0 L	15.54
Alliance®	Paraquat 125 g/L + amitrole 250 g/L	Crop Care	15.50	2.0 L	31.00
Associate®	Metsulfuron-methyl 600 g/kg	Nufarm	90.00	5 g	0.45
Amicide® Advance 700	2,4-D amine 700 g/L	Nufarm	6.75	0.8 L	5.40
Aptitude®	Metribuzin 375 g/kg + carfentrazone-ethyl 90 g/kg	FMC	100.00	0.2 kg	20.00
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®	Pinoxaden 100 g/L+ cloquintocet-mexyl 25 g/L	Syngenta	150.70	0.2 L	30.14
Balance®	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	Dow AgroSciences	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
Butisan®	Metazachlor 500 g/L	BASF	24.02	1.8 L	43.24
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
Clincher® Plus	Metolachlor 960 g/kg	Adama	9.73	0.225 L	2.20
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	15.00
Elantra®Xtreme	Quizalofop-P-ethyl 200 g/L	Sipcam	19.70	0.25 L	4.93
Express®	Tribenuron-methyl 750 g/L	DuPont	230.00	25 g	5.75
Factor* WG	Butroxydim 250 g/kg	CropCare	145.00	130 g	18.85
FallowBoss™ Tordon™	Picloram + 2,4-D	Dow AgroSciences	15.10	0.3 L	4.53
Flight® EC	Picolinafen 35 g/L + bromoxynil 210 g/L + MCPA 350 g/L	Nufarm	68.87	0.41 L	28.24
Fusilade® Forte	Fluazifop-P 212 g/L	Syngenta	18.00	0.12 L	2.16
Garlon™ 600	Triclopyr 600 g/L	Dow AgroSciences	36.00	0.0375 L	1.35
GoalTender™	Oxyfluorfen 480 g/L	Dow AgroSciences	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	Dow AgroSciences	47.20	0.3 L	14.16
Gundy 240	Imazapic 240 g/L	Kenso	44.00	0.175 L	7.70
Hammer®	Carfentrazone-ethyl 400 g/L	FMC	300.00	0.050 L	15.00
Hotshot®	Aminopyralid 10 g/L + fluroxypyr 140 g/L	Dow AgroSciences	21.71	0.5 L	10.86
Hussar® OD	Iodosulfuron-methyl-sodium 100 g/L	Bayer CropScience	297.00	0.1 L	32.70
Igran®	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® 500	Dicamba 500 g/L	Nufarm	24.00	0.28 L	6.72
Logran® B-Power	Triasulfuron 520 g/kg + butafenacil 200 g/kg	Syngenta	228.00	50 g	11.40
Lontrel™ Advanced SG	Clopyralid 600 g/kg	Dow AgroSciences	42.05	0.15 L	6.31
LV Ester 680	2,4-D LV ester 680 g/L	Crop Care	8.50	0.8 L	6.80
Mandate® 240 EC	Cloquintocet-mexyl 60 g/L + clodinafop-propargyl 240 g/L	Syngenta	38.00	85 mL	3.23
MCPA LVE	MCPA LVE 570 g/L	Various	11.05	0.7 L	7.73
Midas	MCPA 288.5g/L + imazapyr 7.3 g/L + imazapic 22g/L	BASF	21.95	0.9 L	19.76
Monza®	Sulfosulfuron 750 g/kg	Nufarm	350.00	25 g	8.75
Paradigm™	Halauxifen-methyl 200 g/kg + florasulam 200 g/kg	Dow Agrosciences	500.00	25 g	12.50
Paragon®	Picolinafen 50 g/L + MCPA 500 g/L	Nufarm	27.10	0.25 L	6.78
Pantera®	Quizalofop-P-tefuryl 120 g/L	Crompton	39.60	0.25 L	9.90
Pendimethalin®	Pendimethalin 440 g/L	FMC	11.54	1.4 L	16.16
Pixxaro™	Fluroxypyr 250 g/L + halauxifen16.25 g/L	Dow Agrosciences	42.50	0.3 L	12.75
Platinum Xtra 360	Clethodim 240g/L	Adama	17.50	0.5 L	8.75
Precept®	Pyrasulfotole 50 g/L + MCPA 125 g/L	Bayer CropScience	16.54	0.5 L	8.27
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

Table 51. 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
Reglone®	Diquat 200 g/L	Syngenta	17.68	2.0 L	35.36
Rexade™	Pyroxsulam 150 g/kg+ halauxifen 50 g/kg	Dow AgroSciences	330.00	100 g	33.00
Roundup® Ultra Max™	Glyphosate 570 g/L	Sinochem	8.22	0.95 L	7.81
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
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
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	Dow AgroSciences	29.50	0.45 L	13.28
Status®	Clethodim 240 g/L	Sumitomo Chemical	13.50	0.3 L	4.05
Stinger™	Aminopyralid 375 g/kg + metsulfuron-methyl 300 g/kg	Dow AgroSciences	285.00	10 g	2.85
Tackle®	Chlorsulfuron 750 g/kg	DuPont/Nufarm	75.00	20 g	1.50
Talinor®	Bicyclopyrone + bromoxynil + cloquintoced-mexyl	Syngenta	25.75	0.5 L	12.88
Terbyne®	Terbuthylazine 750 g/kg	Sipcam	30.00	1 kg	30.00
Tigrex®	MCPA 250 g/L + diflufenican 25 g/L	Bayer CropScience	10.94	0.5 L	5.47
Triflur® X	Trifluralin 480 g/L	Nufarm	7.27	0.8 L	5.82
Trooper™ 242	Picloram 26 g/L + MCPA 420 g/L	Dow AgroSciences	8.58	1.0 L	8.58
Triathlon®	MCPA 250 g/L + bromoxynil 150 g/L + diflufenican 25 g/L	Adama Australia	17.50	750 L	13.13
Terrain™	Flumioxazin 500 g/kg	Nufarm	183.33	30 g	5.50
Velocity®	Pyrasulfotole 37.5 g/L + bromoxynil 210 g/L	Bayer CropScience	31.50	0.5 L	15.75
Verdict™ 520	Haloxyfop-R 520 g/L	Dow AgroSciences	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
Yield® 250 EC	Oryzalin 125 g/L + trifluralin 125 g/L	UPL Australia	10.28	1.6 L	16.45

Table 52. 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
Caltex Sprayplus®	Crop oil	Caltex	2.00	2.0 L/100 L	4.00
D-C-Trate®	Petroleum oil	Caltex	4.60	2.0 L/100 L	9.20
Hasten™	Crop oil + surfactant	Vic Chemical Co	5.50	1.0 L/100 L	5.50
Liase®	Ammonium sulfate	Nufarm	3.03	2.0 L/100 L	6.06
LI 700®	Surfactant/penetrant	Nufarm	6.00	0.25 L/100 L	1.50
Uptake™ spraying oil	Crop oil + surfactants	Dow	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.

Notes

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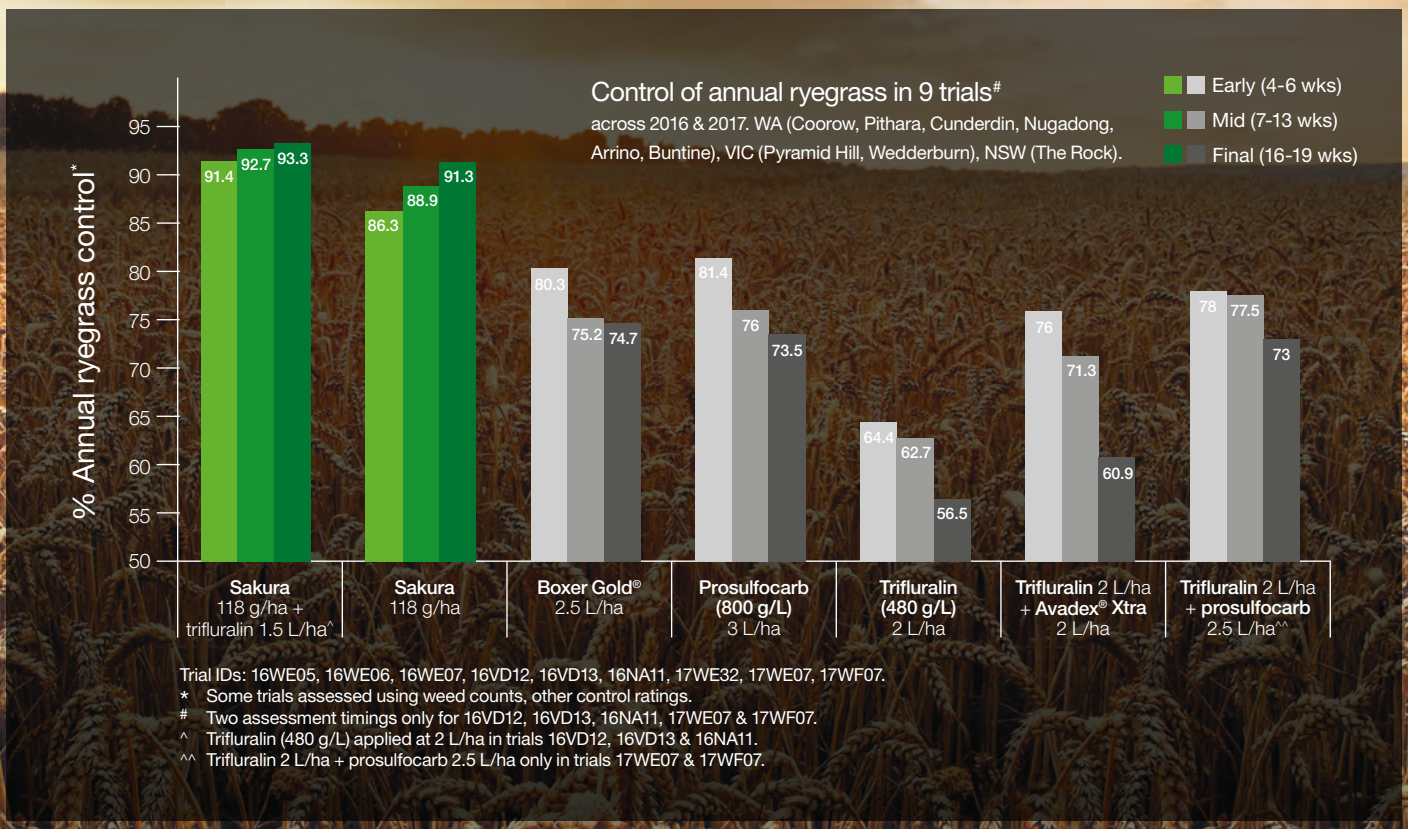

Trial IDs: 16WE05, 16WE06, 16WE07, 16VD12, 16VD13, 16NA11, 17WE32, 17WE07, 17WF07.
* Some trials assessed using weed counts, other control ratings.
\# Two assessment timings only for 16VD12, 16VD13, 16NA11, 17WE07 & 17WF07.
^ Trifluralin (480 g/L) applied at 2 L/ha in trials 16VD12, 16VD13 & 16NA11.
^^ Trifluralin 2 L/ha + prosulfocarb 2.5 L/ha only in trials 17WE07 & 17WF07.

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