

How do I ...

use selective herbicides to safely remove common weeds from sown mixed pastures?

- The issue:** Weeds can invade sown clover/grass pastures, competing for moisture and nutrients over time. Selective herbicides provide additional weed control options to the more common control techniques of spray-grazing, winter cleaning and spray-topping. However, with many herbicides on the market, knowing which herbicides are tough on weeds but safe on desirable species can be confusing.
- The impact:** Weeds reduce the productivity of the desirable species and while some selective herbicides can kill them, others may cause unacceptable damage, reduce available feed and open the pasture up to further weed invasion.
- The opportunity:** Selective herbicides offer more management options to extend the productive life of a sown clover/grass, provided label directions are followed and the pasture is managed to minimise pasture damage.

There are three common and safe herbicide application techniques to control weeds in pastures.

These are:

- spray-grazing
- spray-topping
- winter cleaning (with simazine and paraquat).

More information on these techniques is available from the MLA website (see links on the last page of this fact sheet).

Selective herbicides offer a fourth option for controlling common weeds, especially in newly sown pastures or to provide diversity in the chemical groups used.

The success of selective herbicides depends on their ability to kill the target weeds such as barley grass, silver grass, soft brome grass, capeweed, thistles and erodium, while minimising damage to desirable species, such as phalaris, perennial ryegrass, cocksfoot, tall fescue and sub-clover.



Removal of capeweed using broadleaf selective herbicide. Image credit: Alistair Crawford, ADAMA.

It is challenging to remove broadleaf weeds from other broadleaf plants and especially difficult to remove grass weeds from other desirable grasses. The plants are similar in many characteristics and, because of these similarities, options are often limited.

There can even be differences in herbicide tolerance between varieties within the same species.

To complicate things further, most pastures contain both desirable grasses and legumes (broadleaf plants). A herbicide which is safe on specific desirable grasses may have detrimental effects on legumes and vice versa. This further limits the choice of herbicides available.

It is not uncommon to encounter some level of production loss or 'checking' in the desirable species. Therefore, an important aspect of using a selective herbicide is to minimise possible damage through careful herbicide choice and pre-spraying pasture management.

This fact sheet will outline selective herbicides which can be used in mixed pastures to remove problem weeds. It will also describe management to minimise non-target damage. These are referred to as pasture or crop safety techniques.

When using selective herbicides remember:

- choices may be limited for use in mixed pasture swards
- expect some level of 'checking' (impact) to the desirable species, but this can be minimised by applying appropriate pasture safety techniques
- there can be variable responses between species (for example, phalaris to perennial ryegrass) and varieties within species (for example, Australian to Sirosa phalaris).
- to enhance the long-term benefits of the herbicide intervention, changes to soil fertility, species and grazing method (for example, grazing and spelling) may be required to favour growth of the desirable species.

Understanding herbicides

Active ingredients

All herbicides contain an active ingredient or combination of active ingredients which describes the chemical type, formulation and their concentration. This is commonly found below the herbicide trademark name.



It is not unusual for a herbicide with the same active ingredient or with slightly different concentrations to be marketed using a range of different commercial names. For this reason, information in this fact sheet is presented for the active ingredients, with examples given of common herbicide names.

Understanding selective herbicide uptake

To maximise herbicide efficacy, weeds must be actively growing and not stressed by frost, dryness, waterlogging or extreme temperatures.

Selective herbicides interact with the plants through the leaves (foliar) and/or the roots.

Leaf-absorbed herbicides use two pathways:

1. Foliar contact

Foliar contact herbicides are absorbed at the site they touch, but have limited movement within the plant. Therefore, application should aim to maximise coverage of the leaf surface of the weed.

2. Foliar translocated

Herbicide uptake occurs either through direct contact with the entire leaf or through absorption of the chemical on part of the plant, which then moves (translocates) to other parts of the plant.

Translocated herbicides are absorbed into the sap system but do not kill the plant until they move to the base of the stem, where new growth starts (called meristematic tissue).

To maximise the effectiveness of foliar herbicides:

- avoid spraying overgrown pastures, where leaves are protected
- use maximum water rates
- for foliar-translocated herbicides, avoid grazing for at least seven days to maximise the movement from the leaf to the new growth tissue (even if the grazing withholding period is shorter).

Root-absorbed herbicides are often slower to take effect because the herbicide needs to move into the soil and then be drawn up through the root system. If the herbicide contacts the leaf, then sufficient rain is needed to 'wash' this off and into the soil.

To maximise the efficacy of root-absorbed herbicides, consider the existing soil moisture and likelihood of rain. Grazing hard to expose bare soil will enhance direct herbicide contact with the soil.

The different uptake pathways are summarised in Figure 1.

Effective chemical uptake for different herbicide modes of action

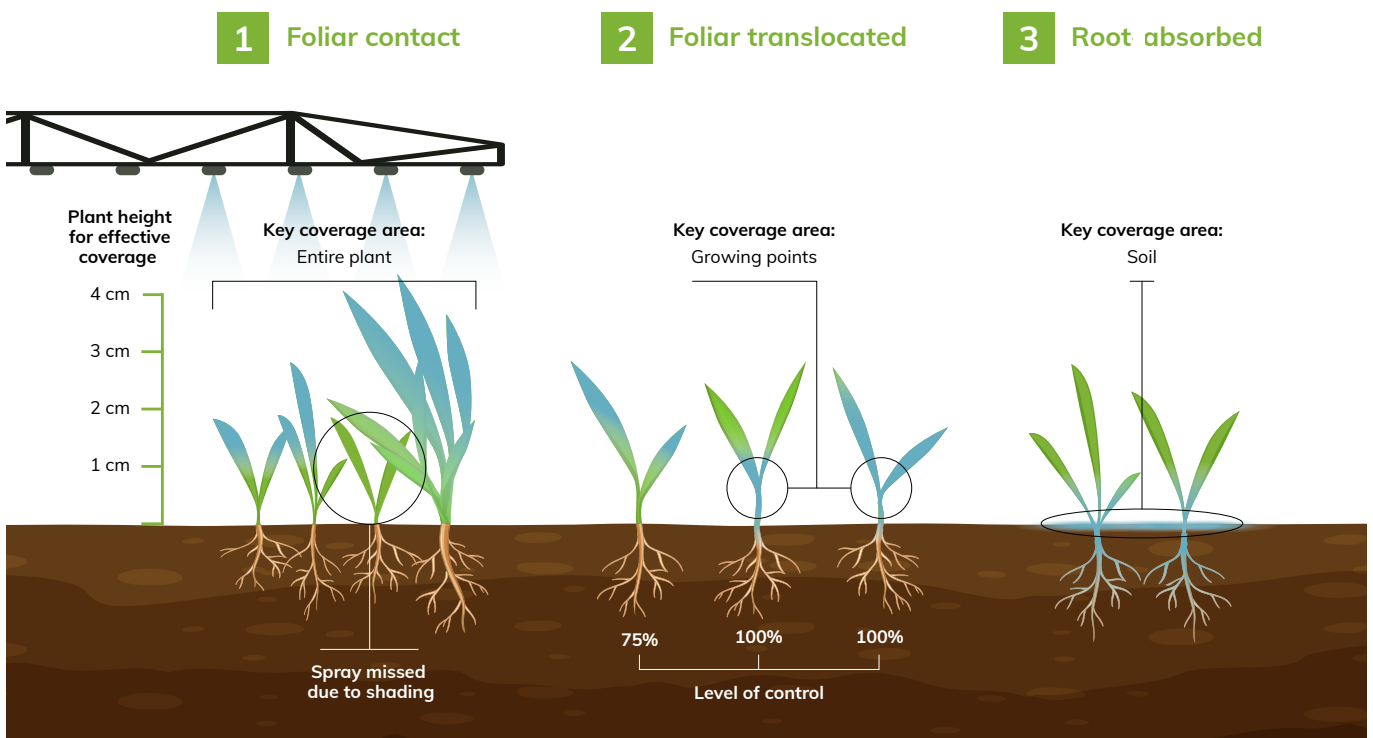


Figure 1: Effective chemical uptake for different herbicide modes of action.

The modes of uptake for different herbicide groups is presented in Table 1. Herbicide groups based on mode of action is changing from an alphabetical classification to an international numbering system. For convenience, both are given.

Table 1: Selective herbicide groups and their mode of uptake for different active ingredients and example herbicides commonly used in pastures. Always follow product label directions.

Herbicide group/s	Mode of uptake	Active ingredient	Example commercial names
1 (A)	Foliar translocated	Propaquizafop	Shogun®
		Haloxypop	Verdict® 520, Exert® 520, Firepower® 900, Inquest®
		Sethoxydim	
		Butroxydim	Factor® WG
2 (B)	Foliar translocated	Imazamox	Raptor®, Claw® 350SL
		Flumetsulam	Broadstrike®, BroadSword®
		Metsulfuron methyl	Associate®, Metsulfuron 600 WG
3 (D)	Root absorbed	Propyzamide	Burst® 500 SC, Rustler® 900 WG, Kerb® 500 SC
4 (I)	Foliar translocated	MCPA amine	Agritone® 750, MCPA 750, Agroxone® 750
		2,4-D amine	Amicide® Advance 700, Amine 625
		2,4-DB	Buttress®
		2,4-D LV ester	Estercide® Xtra 680
5 (C)	Foliar translocated or root absorbed	Simazine	Genfarm Simazine 900 WG
		Terbutryn	Igran® 500, Justice®
6 (C)	Foliar translocated or root absorbed	Bromoxynil	Bronco® 400, Bromicide® 200
12 (F)	Foliar contact	Diflufenican	Brodal®, Aspect® Options
14 (G)	Foliar contact	Pyraflufen-ethyl	Ecopar®
15 (J)	Foliar-translocated	Ethofumesate	Tramat® 500 SC, Matrix® 500
4, 6 (C, I)	Foliar contact and translocated	Bromoxynil + MCPA	Bromicide® MA, Bronco® MA-X
		Terbutryn + MCPA amine	Agtryne® MA
6, 12 (C, F)	Foliar contact and translocated	Bromoxynil + diflufenican	Jaguar®, Bentley™, Colt®
2, 4 (I, B)	Foliar translocated	MCPB + MCPA + flumetsulam	Thistrol® Gold
4, 12 (I, F)	Foliar translocated	MCPA (iso octyl ester) + diflufenican	Tigrex®, Legacy® MA
		MCPA (ethyl hexyl ester) + diflufenican	T-Rex®, Fatcat
4, 6, 12 (F,C,I)	Foliar contact and translocated	MCPA + bromoxynil + diflufenican	Triathlon®

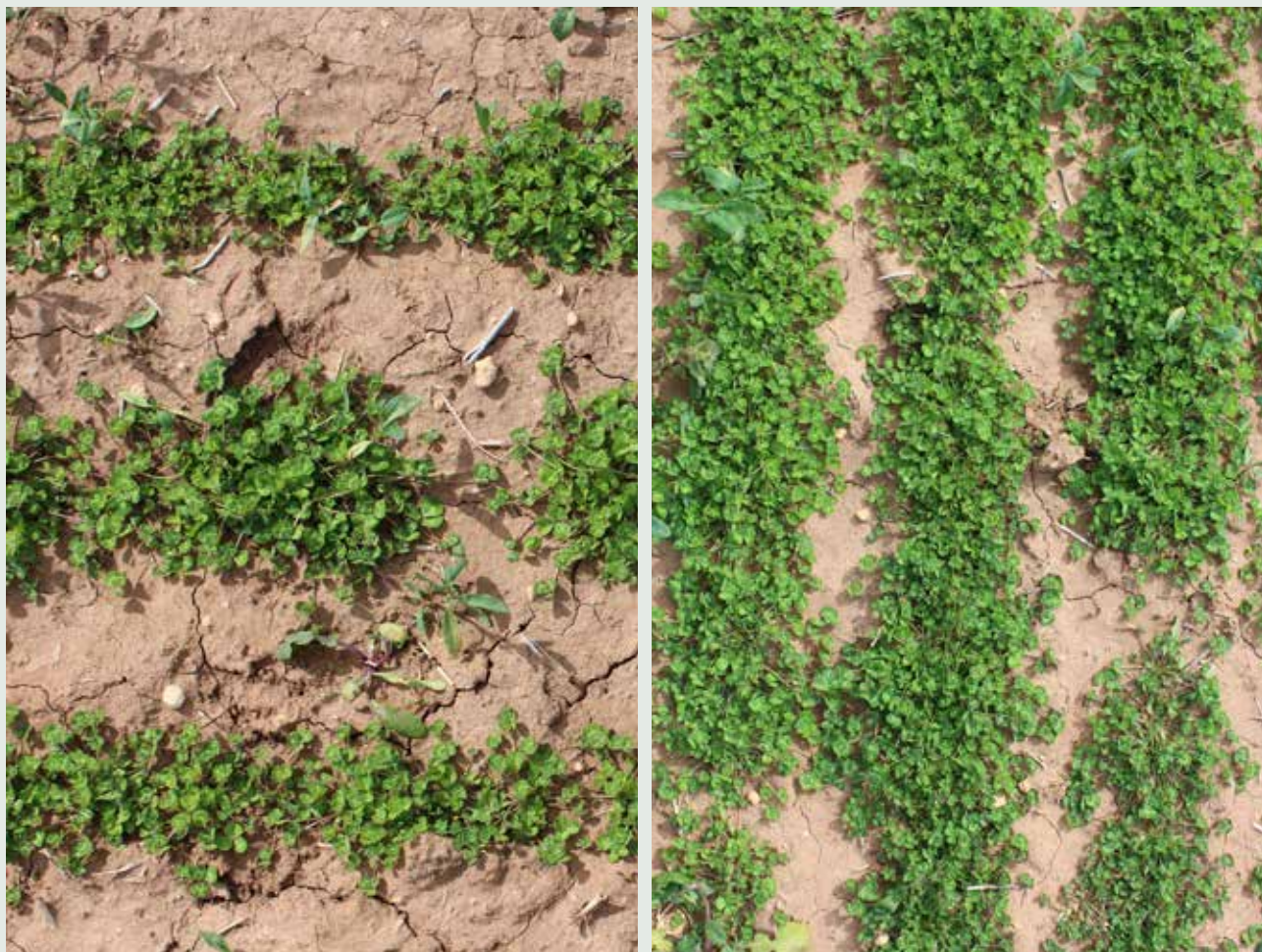
Herbicide resistance

All plant populations have a few plants naturally resistant to the active ingredient applied. Herbicide resistance can occur if there has been repeated use of the same herbicide mode of action (same chemical group), as the resistant plants survive, reproduce and increase in number.

If a level of herbicide-resistant weeds is suspected (or confirmed through resistance testing), selective herbicides with the same mode of action should not be used. Alternating herbicide modes of action and using non-herbicide control methods will be effective at preventing herbicide-resistant weeds developing.

Pasture safety and management

Some level of damage to the desirable species may occur from applying selective herbicides.



Two different registered 'clover-safe' broadleaf herbicides showing more suppression on Seaton Park sub-clover on left (active ingredient 2,4-D amine) than on right (2,4-DB) at label rates. Image credit: David Keetch, Nufarm.

To reduce damage to the desirable species when using selective herbicides:

- 1. Apply when weeds are seedlings or immature**
Small, immature weeds or weeds less than 12 months old usually require a lower rate of herbicide. Lower rates, which are still effective on the weeds, commonly reduce the negative impacts on desirable species.
- 2. Reduce the leaf area of the desirable species**
This can be achieved by grazing prior to herbicide application (to about 4cm height). Livestock will tend to eat the desirable species first, leaving a greater proportion of weed leaves.
- 3. Apply when desirable plants are growing slowly**
In pasture this is commonly in winter, but be mindful of recent frosts.
- 4. Avoid non-label additives**
This includes other herbicides or wetters not listed on the label, as they either enhance ('hot up') the herbicide's action or antagonise it, causing serious reductions in efficacy.
- 5. Avoid application in warm temperatures**
As temperature rises, some herbicides 'hot up', increasing the damage to the desirable species. This can commonly occur in early spring. Generally, do not spray after mid-August.
- 6. Apply herbicides after the emergence of the third trifoliate clover leaf and prior to flowering to reduce clover damage**



Phalaris pasture shows reduced damage when grazed and leaf area is reduced prior to selective herbicide application (left) compared to leafy ungrazed phalaris (right). Image credit: Alister Crawford, ADAMA

Herbicide manufacturers test products to determine crop and pasture safety. This information may be on the product label, can be accessed through manufacturers' websites or on request from technical representatives.

In this fact sheet pasture safety is reported in a 'traffic light' system of green, amber and red, based on using the herbicide at the label-recommended rate. The traffic

light system is applied to indicate the effect of the herbicide on desirable species. The same traffic light system is used to indicate the effectiveness of the herbicide on the target weed.

The interpretation of the traffic lights is presented in Table 2.

Table 2: Interpretation of traffic light system for weed kill and desirable species tolerance.

	Weed kill	Desirable species tolerance
	Very good to complete control	Minimal to light damage to sown pasture – acceptable
	Suppression	Some or moderate damage to sown pasture species but regrowth and recovery expected
	Not on label, poor control	Severe damage – unacceptable
	Grey area – don't know, not on label or no published data available	Grey area – no published data available on species tolerance

Using selective herbicide tables

Selective herbicides for post-emergent removal of common grasses and broadleaf weeds in established pastures (greater than 12 months old) are shown in Tables 4 and 5. These tables also contain the effect the selected herbicide would have on common desirable grasses and legumes based on kill rates within specified uses or, where applicable, spray-grazing rates. If the tolerance to individual species and their cultivar are known, these will be listed.

To use these tables, follow the example shown in Table 3. The steps are:

1. Identify the weed to control in the left-hand column.
2. Move across the row to identify herbicides which have a green colour.
3. Once selected, move down the column to identify the desirable species in the pasture to be treated.

For individual species not specified or if no data is available, consider applying to a small area to assess tolerance prior to commercial scale application.

4. Check the safety on the desirable species (shown in traffic light colours as green – preferable, or amber).
5. Consider the varieties listed. Note: the absence of a variety does not imply tolerance. Further consultation with the chemical supplier may be required.
6. Identify possible herbicide and check other critical comments.

In some cases, grass herbicides may also control some broadleaf weeds. Before undertaking selective herbicide use, consider seeking advice from a pasture agronomist or chemical manufacturer and always check the label, as registrations for weeds vary across states.

Table 3: Example of a simplified table to demonstrate use, with silver grass as the target weed for removal in perennial ryegrass.

	Propaquizafop	Haloxyp ²	Imazamox	Ethofumesate	Simazine ²	Propyzamide	Sethoxydim	Butroxydim
Weeds	Weed efficacy							
Wimmera ryegrass	Green	Green	Yellow	Red	Red	Green	Green	Green
Silver grass	Red	Red	Green	Red	Green Refer to winter cleaning technique	Red	Red	Red
Winter grass	Red	Grey	Yellow	Green	Red	Green	Red	Red
	Safety on mature desirable species							
Perennial ryegrass	Grey	Red	cv: ³ Ansa	Safe on seedling ryegrass and annual ryegrass	Green Refer to winter cleaning technique OK	Red	Red	Red
Example herbicide trade names	Shogun ¹	Verdict [®] 520, Inquest [®] , Firepower [®] 900	Raptor ^{®2} , Claw [®] 350SL ³	Tramat [®] 500 SC, Matrix [®] 500 ⁴	Genfarm Simazine 900 WG	Burst [®] 500 SC, Rustler [®] 900 WG, Kerb [®] 500 SC		Factor [®] WG
Group	1	1	2	15	5	3	1	1
WHP from grazing	3 days (but leave longer for uptake)	7 days	7 days	7 days	14 days	25 days	14 days	14 days
Additional critical comments	Do not use on desirable seedling grasses	.		Can reduce clover stands by 40–50%	Do not apply to sands, use lower rates on light-textured soils			

Table 4: Grass selective herbicides applied post-emergent – traffic light effectiveness on target weeds and safety on mature (>1 year old) desirable grasses and sub-clover species, December 2021.

WHP = Withholding period following herbicide application

	Propaquizafop	Haloxypop ²	Imazamox	Ethofumesate	Simazine ²	Propyzamide	Sethoxydim	Butroxydim
Weeds	Weed efficacy							
Barley grass								
Brome grass								
Wimmera ryegrass								
Silver grass					Refer to winter cleaning technique			
Winter grass								
Erodium spp.				Seedling				
Wireweed				Seedling		Seedling		
Fat hen				Seedling				
Chickweed				Seedling				
Capeweed								
Sorrel						Seedling		
Safety on mature desirable species								
Perennial ryegrass			cv: ³ Ansa	Safe on seedling ryegrass and annual ryegrass	Refer to winter cleaning technique			
Phalaris			cv: ³ Australis		Refer to winter cleaning technique			
Cocksfoot			cv: ³ Convoy		Refer to winter cleaning technique			
Tall fescue			cvs: ³ Origin, Tower	Safe on turf fescues	Refer to winter cleaning technique			
Sub-clover (min. 3–5 leaves unless stated)	cvs: ⁴ Campeda, Clare, Denmark, Gosse, Goulburn, Junee, Karridale, Larisa, Leura, Mt Barker, Nuba, Riverina, Seaton Park, Trikkala, Woogenellup, York	cvs: ² Coolamon ⁰ , Dalkeith, Gosse, Napier, Riverina, Urana, York	cvs: ³ Leura, Seaton Park, Dalsa, Clare 2, Ovaflo cvs: ² Coolamon ⁰ , Dalkeith, Gosse, Napier, Riverina, Urana, York		Refer to winter cleaning technique cvs: ² Coolamon ⁰ , Dalkeith, Gosse, Napier, Riverina, Urana, York			
Example herbicide trade names	Shogun ⁰¹	Verdict ⁰ 520, Inquest ⁰ , Firepower ⁰ 900	Raptor ⁰² , Claw ⁰ 350SL ³	Tramat ⁰ 500 SC, Matrix ⁰ 500 ⁴	Genfarm Simazine 900 WG	Burst ⁰ 500 SC, Rustler ⁰ 900 WG, Kerb ⁰ 500 SC		Factor ⁰ WG
Group	1	1	2	15	5	3	1	1
WHP from grazing	3 days (but leave longer for uptake)	7 days	7 days	7 days	14 days	25 days	14 days	14 days
Additional critical comments	Do not use on desirable seedling grasses			Can reduce clover stands by 40–50%	Do not apply to sands, use lower rates on light-textured soils			

cv = cultivar

Table 5: Broadleaf selective herbicides applied post-emergent – traffic light effectiveness on target weeds and safety on mature (>1 year old) desirable grasses and sub-clover species, September 2021.

WHP = Withholding period following herbicide application

Weeds	MCPA (as amine salt)	Pyraflufen-ethyl + MCPA (as amine salt) ^e	Terbutryn + MCPA (as amine salt)	Terbutryn	MCPB + MCPA (as amine salt) + flumetsulam	Flumetsulam	MCPA (as iso octyl ester or ethyl hexyl ester) + diflufenican	2,4-D amine	2,4-DB	2,4-D LV ester	Bromoxynil	MCPA (as ethyl hexyl ester) + bromoxynil + diflufenican	Bromoxynil + MCPA (as iso octyl ester)	Bromoxynil + diflufenican	Metsulfuron methyl
	Weed efficacy														
Capeweed															
Erodium spp.							Long storksbill only			NSW/ACT only					
Marshmallow															
Sow thistle															
Wireweed															
Fat hen										NSW/ACT only					
Paterson's curse															
Flatweed										NSW/ACT only					
Onion grass															
Safety on mature desirable species															
Perennial ryegrass (min. 3 leaves)															
Phalaris (min. 3 leaves)															
Cocksfoot (min. 3 leaves)															
Tall fescue (min. 3 leaves)															

cv = cultivar

Table 5 continued

	MCPA (as amine salt)	Pyraflufen-ethyl + MCPA (as amine salt) ⁵	Terbutryn + MCPA (as amine salt)	Terbutryn	MCPB + MCPA (as amine salt) + flumetsulam	Flumetsulam	MCPA (as iso octyl ester or ethyl hexyl ester) + diflufenican	2,4-D amine	2,4-DB	2,4-D LV ester	Bromoxynil	MCPA (as ethyl hexyl ester) + bromoxynil + diflufenican	Bromoxynil + MCPA (as iso octyl ester)	Bromoxynil + diflufenican	Metsulfuron methyl
Sub-clover (min. 3–5 leaf stage unless stated)	Spray-graze rates cvs: ⁵ Antas, Clare, Coolamon ⁶ , Dalkeith, Gosse, Goulburn, Karridale, Riverina, Trikkala, Urana, Woogenellup	Rate plus MCPA cvs: ⁶ Coolamon ⁶ , Dalkeith, Dalsa, Leura, Napier, Riverina, Siera, Trikkala, Urana				cvs: ⁵ Antas	cvs (label): Denmark, Esperance, Geraldton, Goulburn, Karridale, Leura, Mt Barker, Nungarin, Rosedale, Seaton Park, Trikkala, Woogenellup	Spray-graze rates cvs: ⁵ Dalkeith, Gosse, Goulburn, Riverina, Trikkala, Urana Selective rate: Dalkeith, Trikkala, Woogenellup	cvs: ⁵ Antas, Clare, Coolamon ⁶ , Dalkeith, Gosse, Goulburn, Riverina, Seaton Park, Trikkala, Urana	Clover must be well covered by grass or extensive damage may result		cvs (label): Esperance, Goulburn, Larisa, Napier, Seaton Park, Trikkala		cvs (label): Daliak, Dalkeith, Denmark, Goulburn, Karridale, Leura, Mt Barker, Nungarin, Rosedale, Seaton Park, Trikkala, Woogenellup	
	Selective rate cvs: ⁵ Clare, Coolamon ⁶ , Dalkeith, Gosse, Goulburn, Karridale, Nungarin, Riverina, Trikkala, Urana, Woogenellup					cvs: ⁵ Goulburn, Riverina, Urana cv (label): Nungarin		Spray-graze rates cvs: ⁵ Trikkala, Woogenellup Selective rate cvs: ⁵ Antas, Clare, Coolamon ⁶ , Gosse, Goulburn, Riverina, Urana Selective rate cvs: ⁵ Gosse, Trikkala, Woogenellup	cvs: ⁵ Antas, Coolamon ⁶ , Dalkeith, Gosse, Riverina, Trikkala, Urana					cv (label): Junee	
Example herbicide trade names	Agritone® 750, MCPA® 750, Agroxone® 750	Ecopar® + Agritone® 750	Agtryne® MA7	Igran® 500, Justice®	Thistrol Gold®	Broadstrike®, BroadSword®	Tigrex®7, Legacy®, MA, T-Rex®, Fatcat®	Amicide® Advance 700, Amine® 625	Buttress®	Estericide® Xtra® 680	Bronco® 400, Bromicide® 200	Triathlon®	Bromicide® MA, Bronco® MA-X	Jaguar®, Bentley®, Colt®	Associate®, Metsulfuron 600 WG
Group	4	4, 14	4, 6	5	2, 4	2	4, 12	4	4	4	6	4, 6, 12	4, 6	6, 12	2
WHP from grazing	7 days	7 days	7 days	7 days	7 days	7 days	7 days	7 days	7 days	7 days	8 weeks	8 weeks	8 weeks	8 weeks	Nil, but allow 2–3 days for uptake
Critical comments	Weeds may be poisonous to stock after use due to increasing intake because of increased palatability.	Always use MCPA with amine salt formulations. Good coverage is critical.	Useful on larger weeds. Desirable grasses must have a minimum of three leaves.	Useful on larger weeds. Desirable grasses must have a minimum of three leaves. Temperature restrictions.	Weeds best controlled when small.		Restricted use in Tasmania. MCPA safer on sub-clover and 2,4-D amine preferred in pastures containing white clover.	Sub-clover generally requires at least 10–20 leaves.	Areas of restricted use and timing. Consult state agriculture authority.	Use in grass pastures only.			Use in grass pastures only.	Weeds must be small to allow use of lower rates to avoid clover damage. Best suited to lucerne pastures. Temperature restrictions.	

cv = cultivar

Enhance pasture competition

Selective herbicides should be used strategically and full benefit is only achieved if subsequent pasture competition can be achieved. The aim should be to remove the weed for a sufficient period to allow the more desirable species to grow into their place and compete. Changes to soil fertility, species and grazing method (such as grazing and spelling) may be required to enhance the long-term effect of the herbicide.



Use selective herbicides on small weeds but not until sub-clover has grown three trifoliate leaves.

References

Note references listed are in addition to herbicide labels.

1. ADAMA Shogun Product label. Available online at: <https://www.adama.com/australia/en/crop-protection-solutions/herbicide/shogun>
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3. Keetch D (2021) Nufarm (personal communication) Nufarm pasture herbicide tolerance screening.
4. Crawford A (2021) ADAMA (personal communication).
5. Nufarm (2018) Pasture Herbicide Tolerance Guide. In: Grassmanship Initiative – The Nufarm Guide to Pasture Protection.
6. Calderwood K (2021) Sipcam (personal communication). Safety to pasture.
7. Crop Care (2008) Technotes Agtryne MA. *The control of capeweed and erodium in clover-based pastures*.
8. Nufarm technical guide. *Protect the investment in your clover, medic or grass pasture with Thistrol Gold*.

More information

Find the full range of MLA pasture fact sheets and resources at:

[mла.com.au/extension-training-and-tools/feedbase-hub/persistent-pastures/](https://mla.com.au/extension-training-and-tools/feedbase-hub/persistent-pastures/)

MLA Weed Control Hub: mла.com.au/extension-training-and-tools/feedbase-hub/weed-control/

Watch: Spray-grazing – Turning weeds into feed at <https://www.youtube.com/watch?v=T5Ti0reGclc>

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The herbicide label provides all the critical comments and precautions for the safe and responsible use of this technique. Always read the label and only use as directed.



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