

Getting the Best out of your CITRUS Herbicide Applications

NSW DPI Citrus roadshow 2017

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Notes in NSW DPI Citrus Plant Protection Guide



Citrus plant protection and management guide 2017



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Fleabane (*Conyza* spp.)

- Flax-leaf fleabane can grow up to 1 m in height, is multi-branched and stems are covered with stiff hairs.
- Leaves are grey-green, coarsely toothed and **covered in fine hairs**.
- A **prolific seed producer** that can produce over 100,000 windblown seeds.
- **Most seed are viable for up to 18 months**, but some can survive for several years.



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Fleabane (*Conyza* spp.): Herbicides

Glyphosate

- Can be quite tolerant to glyphosate when it gets larger or Resistant
- If using Glyphosate plants must be less than 5cm in diameter
- Using the “double knock” technique on fleabane is quite effective on plants up to the late rosette stage.
- Glyphosate and following up with an application of paraquat or SPRAY.SEED® 5 to 7 days later

SPRAY.SEED

- Can be used effectively on weeds up to 10cm in height,
- The use of SPRAY.SEED requires thorough spray coverage of the plant.
- The addition of a registered Group G herbicide spike e.g. Oxyflurofen (e.g. Striker®) with the knockdown herbicides such as glyphosate or SPRAY.SEED may further improve the results.

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Fleabane (*Conyza* spp.): Herbicides

Glufosinate-ammonium (e.g. Basta®)

- Can be used when the plant is no bigger than the 4 leaf stage
- Must be sprayed under warm, high humidity conditions to ensure spray droplet remains on the leaf surface as long as possible
- Follow Delta-T

Saflufenacil (Sharpen®)

- The low label rate will control plants up to 4 leaf stage and the higher rate should be used when targeting weeds up to maximum of 6 leaves.
- For plants greater than six leaf to bolting stage efficacy of Sharpen WG® herbicide may be reduced and regrowth may occur.

Amitrole +paraquat (e.g. Alliance®)

- Must be applied before the 7 leaf stage (5 cm diameter rosette).
- This can be effective on larger plants but may take time to take effect.

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Fleabane (*Conyza* spp.): Knockdown Herbicides

Bromacil

Not registered for fleabane control but when used as a pre-emergent and post-emergent herbicide for other weeds in citrus it will have good knockdown properties and can provide about 3-4 months of residual activity against Fleabane.

- The fleabane leaf is quite hairy and you need the spray droplets to run down these hairs and contact the leaf surface it is for this reason that higher water volumes may be needed.
- Water Rates
 - As a suggestion use >100 L/ha for systemic products (e.g. glyphosate) and
 - 150-300L for contact and locally systemic products like paraquat + diquat (e.g. Spray.Seed®) / glufosinate (e.g. Basta®).
- The use of an adjuvant may help to improve coverage and spread of a herbicide solution

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Feathertop Rhodes Grass (*Chloris virgata*)

- Feather-top Rhodes germinates in **summer and flowers in summer to autumn.**
- **Germination is favoured after good rains from spring to late autumn.**
- The seed of this species germinates on top of or just below the soil surface.
- Feather-top Rhodes seed only **remains viable for up to 12 months** in the soil.
- Generally the **first to establish on bare ground (No germination from >2cm)**
- **Plants greater than 10 cm in height and at the tillering (branching) growth stage or with seed heads are difficult to control with knockdown herbicides.**
 - Best results are achieved by targeting plants less than 5 cm tall or pre-tillering and achieving as thorough spray coverage of the plant as possible.

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Feathertop Rhodes Grass (*Chloris virgata*): Herbicides

Glyphosate

- Does not provide good control in most situations due to resistance issues. Rates as high as 4L/ha have only provided 50% control in some studies completed in Queensland
- Best results from using Glyphosate and following up with an application of paraquat or Spray.Seed® 7 to 14 days later

SPRAY.SEED

- Can be used effectively on weeds up to 5 to 10 cm in height
- The use of SPRAY.SEED requires thorough spray coverage of the plant.

Group A herbicides such as Haloxypol (e.g. Verdict®)

- Provides reasonable and better control is achieved when a double knock follow up application of paraquat is applied within 7 to 14 days (see management section for double knock discussion).

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Feathertop Rhodes Grass (*Chloris virgata*): Herbicides

Pendimethalin (e.g. Rifle 440)

- Provides good control.
- Feather-top germination is favoured after good rains from spring to late autumn and best results are achieved when pendimethalin is applied prior to favourable germination conditions (i.e. rain from spring to late autumn).

- Removing the seed bank source by implementing a continuous control strategy is a critical for effective long-term control.
- A pre-emergent herbicide programme provides reasonable control. Best effect is reached when it is controlled during early growth stages.
- Combinations of mulching, early light cultivations, pre-emergence herbicides and/or effective post-emergence herbicides applied to young feather-top Rhodes grass will result in effective control of this weed.

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Annual Ryegrass (*Lolium rigidum*): Herbicides

- Seeds are **dormant over summer and germinate from late autumn to early spring.**
- Ideal germination conditions are after a **significant autumn/winter rain event.**
- Optimum temperature for germination is 11°C for buried seed and 27°C for surface seeds.
- Up to **99% of the annual rye grass seed bank will germinate within three years** however some can germinate up to 5 years after seed set.
- Annual ryegrass is potentially resistant to many herbicide mode-of-action groups.
 - Glyphosate resistance is very common and paraquat resistance is expected to increase due to over-reliance on this alternative knockdown herbicide.

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Annual Ryegrass (*Lolium rigidum*): Herbicides

Glyphosate

- Provides good control in most situations providing there is no resistance issues.
- If targeting larger plants or potentially resistant plants the best results from using Glyphosate and following up with an application of paraquat or SPRAY.SEED 5 to 7 days later

SPRAY.SEED

- Can be used effectively on weeds up to 5 to 10 cm in height
- The use of SPRAY.SEED requires thorough spray coverage of the plant.

Glufosinate-ammonium (e.g. Basta®)

- Can be used when the plant is at the pre-tillering stage.
- It must be sprayed under warm, high humidity conditions to ensure spray droplet remains on the leaf surface as long as possible.

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Annual Ryegrass (*Lolium rigidum*): Herbicides

Amitrole +paraquat (e.g. Alliance®)

- Provides is an effective option but needs to applied to annual ryegrass no larger than the mid tillering stage
- This can be effective on larger plants but may take time to take effect.

Pendimethalin (e.g. Rifle 440)

- Provides good control of annual ryegrass.
- It is best applied at late autumn prior to the germination of the annual ryegrass.

Group A herbicides such as Fluazifop (e.g. Fusilade Forte®) and Haloxyfop (e.g. Verdict®)

- Provide very effective control of susceptible annual ryegrass if there is no resistance.
- These chemicals have a high resistance risk and should not be over-used.

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Annual Ryegrass (*Lolium rigidum*): Herbicides

Simazine

- Has good activity as pre-emergent herbicides and can be tank mixed with other registered pre-emergent herbicides such as Norflurazon (e.g. Zoliar®)

Bromacil

- Is best applied to a weed-free ground in autumn and spring
- If weeds are present add non-ionic surfactant at 100 mL/100L (0.1% v/v) of spray solution.

Norflurazon (e.g. Zoliar®)

- Has low volatility and good photo-stability (lasts longer under sunlight), which will give growers a longer incorporation window.

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Annual Ryegrass (*Lolium rigidum*): Herbicides

- The likelihood of having some resistance to Group M (e.g. glyphosate) or Group A (e.g. haloxyfop) herbicides in annual ryegrass is high. Resistance to Group L (e.g. Spray.Seed®) has also been detected in some horticultural production areas. Therefore it is recommended to have plants tested for their resistance profile.
- Removing the seed bank source by implementing a continuous control strategy is a critical for effective long-term control.
- Applying pre-emergent herbicides close to autumn break rain events is likely to provide high levels of control.

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Coverage: When Weeds Get **TOO BIG**

Photo Courtesy – Simon Bonny, Syngenta Australia , Griffiths NSW



NO Coverage from the herbicide application = **NO Weed Control**

GOOD Coverage from the herbicide application = **Weed Control**



HERBICIDES: Factors that can affect performance

Active ingredients, in their dry crystalline form cannot move into the plant.



Evaporation doubles when:

Temperature increases from:	10°C to 20°C
	20°C to 30°C



Evaporation doubles when:

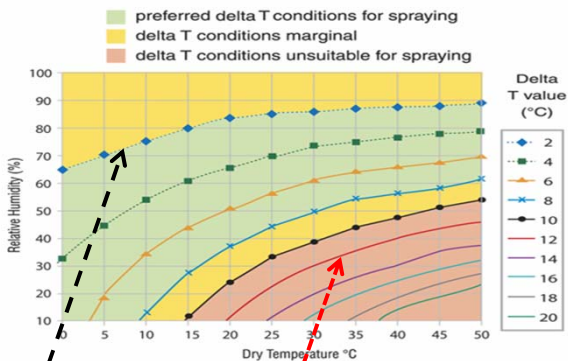
Relative humidity drops from::	95% - 85%
	85% - 70%
	70% - 45%
	45% - 0%

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Delta T

SELECTING THE RIGHT DELTA T CONDITIONS FOR SPRAYING.



Delta T °C	2	4	8	12
Droplet Diameter (µm)	Survival Time: Seconds			
100	62.50	31.25	15.63	10.42
200	250	125	62.50	41.66
400	1000	500	250	166.66

- A 50µm droplet will evaporate over 250 times quicker than a 200µm droplet.
- On a hot day a 50µm droplet may only travel 0.1 to 1m before it disappears while the 200µm and larger droplets have little to no chance of evaporating before reaching its target.

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Fleabane (*Conyza* spp.) Resistance: What to look for

Photo Courtesy – Simon Bonny, Syngenta Australia, Griffiths NSW



Individual Plant/s being found after multiple applications of Paraquat or SPRAY.SEED



Eventually resulting in a population of weeds that take over and area that are resistant

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Glyphosate resistance in Australia at Sept 2017

Weed species	Year first documented	Number of confirmed populations as at September 2017
Annual ryegrass (<i>Lolium rigidum</i>)	1996	678
Barnyard grass (<i>Echinochloa colona</i>)	2007	102
Liverseed		4
Flaxleaf P		65
Windmill gra		11
Wild rad		2
Great br		5
Tall fleaba		10
Sowt		23
Red br		1
Sweet summer g		1
Prickly lettuce (<i>Lactuca serriola</i>)	2014	1
Feathertop Rhodes grass (<i>Chloris virgata</i>)	2015	4
Tridax daisy (<i>Tridax procumbens</i>)	2016	1
Winter grass (<i>Poa annua</i>)	2017	3
Willow-leaved lettuce (<i>Lactuca saligna</i>)	2017	2

5% are in Horticulture

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Key messages for maximizing herbicide efficacy

- 1 Target small weeds
- 2 Keep herbicide application rates robust
- 3 Match the water rate to the weeds being sprayed

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Key messages for knockdown efficacy (cont)

4

Ensure you follow all the label directions

5

Coverage is critical, trials have been successful with coarse air induction (AI) droplets, when water rates are kept up

6

When used as part of a double knock, the timing of the second knock is a key factor

7

Resistance is a real threat—manage knockdown herbicides wisely!!

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