FLEABANE & MILK THISTLE
NGN workshops

2025

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

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GRDC project codes: ICN2404-002RTX & ICN2403-002RTX
Version: August 2025

MANAGING FLEABANE & MILK THISTLE
NGN WORKSHOPS - 2025

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

1

Competition for resources

Fleabane and milk thistle compete with establishing winter crops

Poorly controlled populations in fallow reduce stored moisture

% fleabane control	Increase in stored soil moisture relative to fallow with untreated fleabane
52% control	17 mm
62% control	29 mm
80% control	45 mm
99% control	71 mm

Fleet, B., & Gill, G. (2013). Fleabane ecology and control in cropping systems of southern Australia. GRDC Updates.

2

Large seed producers

- Fleabane over 110 000 seeds per plant
- Milk thistle over 25 000 seeds per plant
- Small, lightweight seed with pappus
  - Suited for wind and water dispersal
  - Minimal germination from > 1-2cm depth
- Poor competitor against existing vegetative cover
- Well adapted to zero till fallows, sprayed roadsides, fencelines

3

Rainfall triggers germination

Germinates over a wide temperature range

- Fleabane 4 to 30ºC (opt 20ºC)
- Milk thistle 5 to 35ºC

Rainfall drives germination

- Wet soil surface over multiple days triggers large germinations
- Often find germinations in the stubble line

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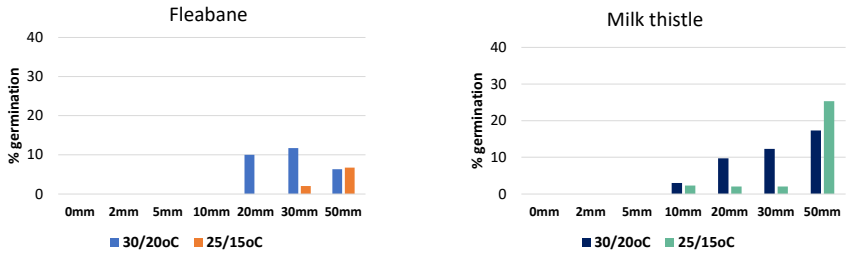
Rainfall triggers germination

Fleabane germinates from 4 to 30ºC (opt 20ºC). Milk thistle 5 to 35ºC

Wet soil surface for multiple days triggers large germinations

Simulated rainfall as a single event



Werth, J., Keenan, M., Thornby, D., Bell, K., & Walker, S. (2017). Emergence of four weed species in response to rainfall.

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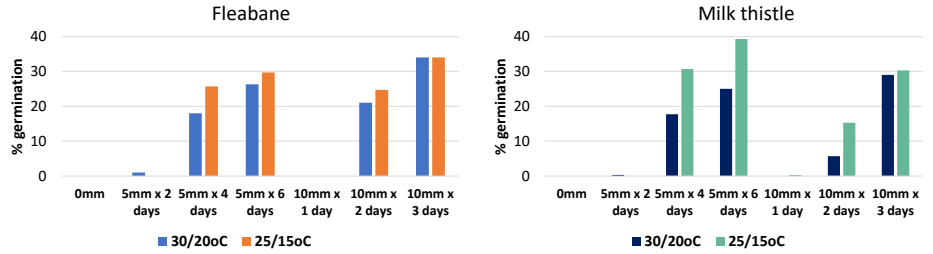
Rainfall triggers germination

Simulated rainfall over consecutive days



Werth, J., Keenan, M., Thornby, D., Bell, K., & Walker, S. (2017). Emergence of four weed species in response to rainfall.

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Fleabane size doesn't represent weed age

- Rosette growth is very slow in winter, but root system will be developing
- Plants move rapidly to stem elongation with increasing day length in spring

Dig up the root system to better understand weed age/size

Croppa Creek (NSW) May 2025 ~25 days after germinating rain.

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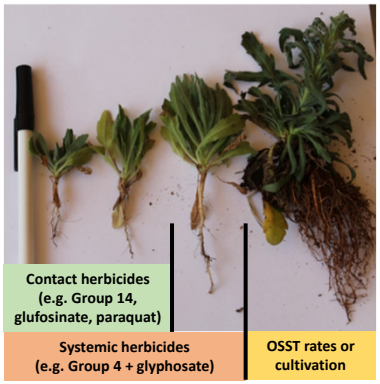
Fleabane size doesn't represent weed age



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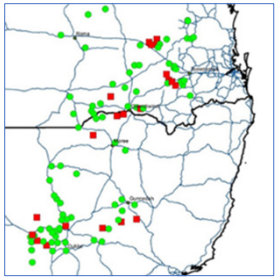
Milk thistle herbicide resistance

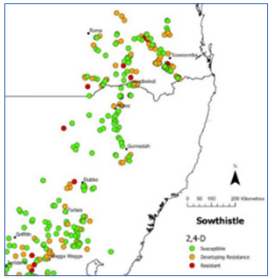
Group 2 resistance >75% nationally (IMI and SU)

- Express (tribenuron) commonly 'failing' in many paddocks in the north

Glyphosate resistance 2016/18



2,4-D resistance 2020



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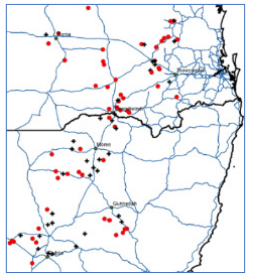
Fleabane herbicide resistance

Flaxleaf fleabane	
Group 2	High. But not frequently quantified in testing
2,4-D	No resistance detected to date
Glyphosate	100% in 2016-2018 survey
Paraquat	Several unconfirmed reports from NSW growers
Tall fleabane	
Paraquat	Confirmed in 2 populations from sth Qld



Glyphosate resistance 2016/18

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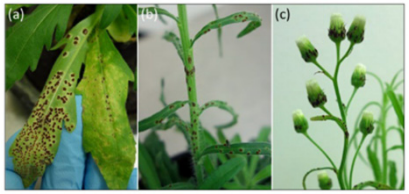
Biological control

- Field scale release of a rust targeting fleabane has been underway since 2021



- Milk thistle biocontrol program for sowthistle has been terminated due to impact on native species

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Winter cereal herbicides

Stack effective tactics to be free of fleabane and milk thistle at harvest

- Pre-emergents
- Crop competition
- Early post-emergents
  - With or without residual
- Late post-emergents

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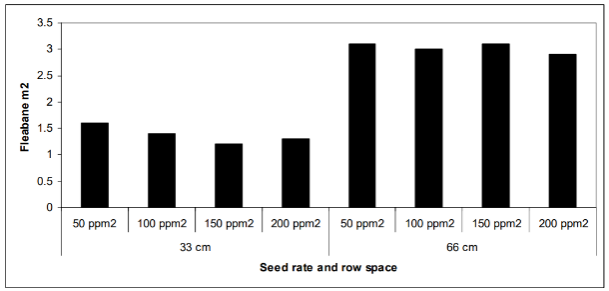
Crop competition



Fleabane /m² were reduced as wheat row spacing was reduced from 66cm to 33cm in a trial conducted in 2011 at Trangie, NSW. There was only a minor benefit to increasing plant populations within the row (Brill, Street, & Monroe).

https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/431269/Fleabane-management-in-crop-rotations.pdf

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Early post-em herbicides

Decision making factors

- Pre-em at planting? Or early post-em?
- Crop growth stage (especially for Group 4)
- Other weeds to be controlled
  - Other broadleafs
  - Grasses
- Residual activity?

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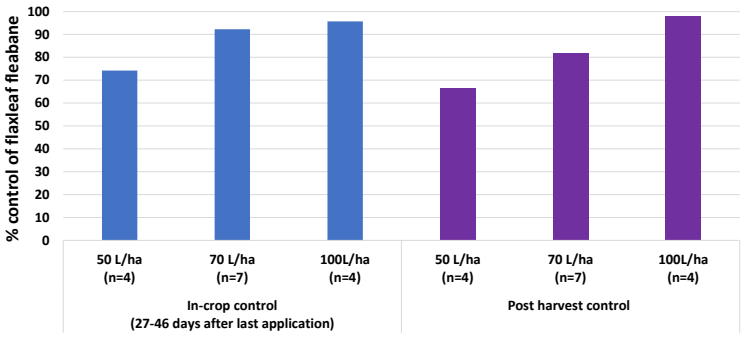
Effect of application volume on knockdown and residual control of flaxleaf fleabane in wheat following application of picloram + MCPA + metsulfuron (NGA trials 2011/12)



Selected treatments from trials RD1110 (Jondaryan), RD1201 (Brigalow), RH1217 (North Star), AM1207 (Merriwa), AM1208 (Pilliga). Applications from GS13 to GS39 across the trials.

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Winter pre-emergent herbicides

Winter pre-emergent herbicides targeting other weeds are likely to be suppressing fleabane populations

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Winter pre-emergent herbicides

Picloram based in-crop herbicides can provide high levels of suppression of fleabane into spring

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Pyridines in cereal crops
(clopyralid, picloram, aminopyralid)

- May not be fully metabolised by the cereal crop when applied post-em
- Herbicide can be released as stubble decomposes
  - Apply **early** post-em – target the soil
  - Rotate to canola or cereals
  - **Incorporate stubble in spring if going to pulses**
  - Don't use with chaff lining

https://grdc.com.au/rotational-constraints-for-pulse-crops

Rick Rundell-Gordon Barry Haskins

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Late post-emergent (salvage)

Reduced weed biomass and flowering

- Don't expect 100% weed control
- Likely to require follow up after harvest

Mode of action	Herbicide	Wheat – bread	Wheat – durum	Barley	Triticale	Oats
4	**2,4-D amine** After firm dough stage	■	■	■	■	■
14	**Saflufenacil e.g. Sharpen®** BBCH71 (watery ripe) to BBCH 83 (firm dough)	■	■	■	■	
	Pyraflufen e.g. Sledge® After BBCH71 (watery ripe). 2 applications can be applied if > 14 days apart	■	■	■		

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Chickpea

- Paddock selection
- Pre-emergent + early crop competition
- Late post-emergent desiccation & seed set reduction

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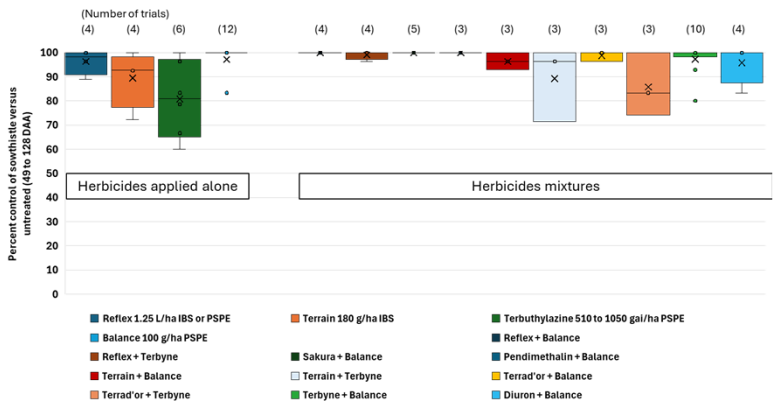
Sowthistle control (49-128 DAA)

(NGA. 11 trials (2013 – 2023): LB1308, LB1309, LB1406, LB1408, AM1534, LB1612, LB2104, LB2201, DH2204, LB2302, LB2303)



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Desiccation

Desiccation timing may reduce some seed set

- Fleabane & milk thistle likely to have already shed some seed

Chickpea desiccation timing	
Sharpen	80-85% pods yellow-brown & at least 7 days prior to harvest
Sledge	90-95% seeds physiologically mature (80-85% pods yellow-brown & at least 7 prior to harvest. Can add glyphosate or paraquat.
Crucial	Physiologically mature (less than 15% green pods) & at least 7 days prior to harvest. Can add metsulfuron.
Diquat	Full crop maturity & at least 2 days prior to harvest

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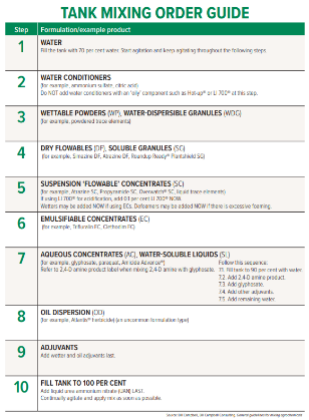
Water quality

Ammonium sulphate

- All glyphosate, glufosinate, clethodim
- All bore water applications (conditions hard water)
- Consider adding for rainwater (helps cell entry)
- Helps with compatibility

Needs 5-10 minutes to dissolve & 5-10 minutes in tank before adding pesticides

- Pre-treat water and hold in a storage tank



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Application considerations

Very Coarse (or larger) spray quality

- Label requirement for all 2,4-D applications
  - Check most recent spray charts
- Large, fast-moving droplets are more difficult to stick to leaves
  => Pay extra attention to travel speed and boom height
- Water rates of 80-100 L/ha (or more) when applying VC spray quality

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Glyphosate

Weed control is a factor of how much enters plant before crystalising on leaf

- Adjuvants
- Water quality
- Formulation surfactants
- Droplet size
- Temperature / RH%
- Dust
- Weed size
- Application rate
- Leaf properties
- Rainfast period
- Antagonistic mixtures

Glyphosate requires several hours to enter the leaf, several days to fully translocate and several weeks for full results – Have patience

Poor results with glyphosate are not always 'resistance'

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Fleabane - Leaf surface / droplet capture

Low leaf area to root size ratio

Hairy leaf = droplets held off the leaf surface

- Droplets may evaporate without contacting the leaf surface, especially under high Delta T conditions in summer

A 'spreading' surfactant may help increase contact, BUT

- Will increase spray drift risk
- Accelerates droplet evaporation when spraying during the day (especially in spring/summer)

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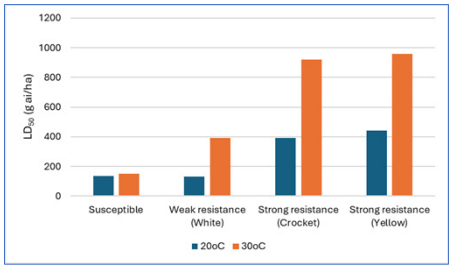
Application considerations

Moving from night to day spraying

- Reduces drift risk
- Increases droplet evaporation & reduces leaf uptake
  - Less time for glyphosate, glufosinate and amines to enter the leaf
  - Avoid Delta T above 8 - 10



Lethal dose required to achieve 50% biomass reduction for glyphosate applied to four sowthistle populations grown and sprayed under mild (20°C) and hot (30°C) conditions (Boutsalis, et al., 2018).

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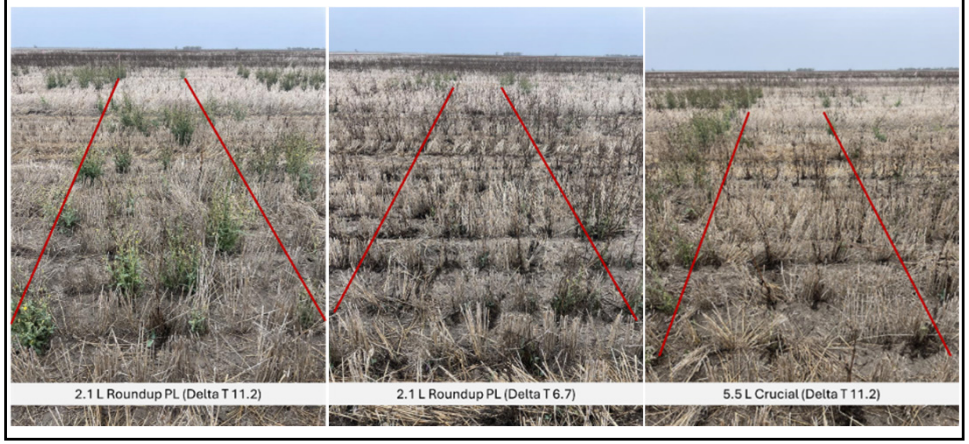
Northern NSW Problem Weeds NGN

Bullarah, NSW (March 2025)

Elongating milk thistle at application



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Double knock likely to be required

Contact herbicides limited to ~ 4-6 leaf

Systemic herbicides often can be used to ~ 10-15cm and prior to stem elongation

OSST application generally required from stem elongation to flowering

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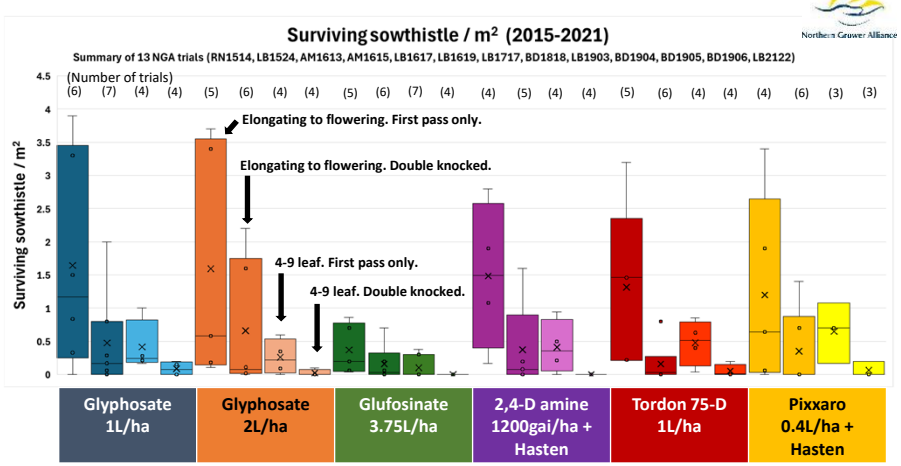

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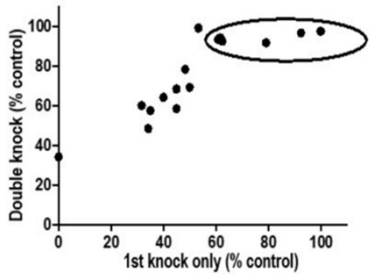
Importance of the double knock

Timing

- 1-3 days for systemic (e.g. glyphosate) followed by systemic (e.g. 2,4-D)
- 5-10 days for systemic (glyphosate, 2,4-D) followed by contact (e.g. paraquat, glufosinate, Group 14)

Double knock is not a 'Get out of jail free' card

- First application must be effective



Is there spray capacity to treat all the fallow area twice within ~ 14 days?

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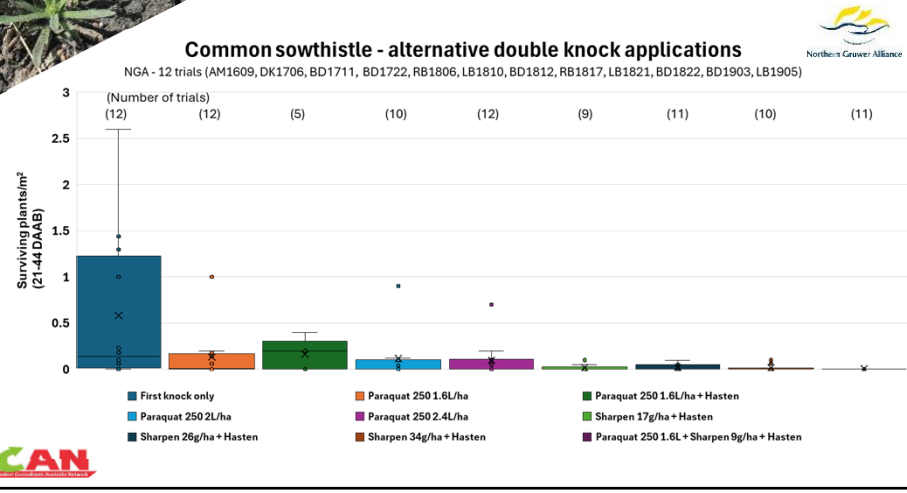

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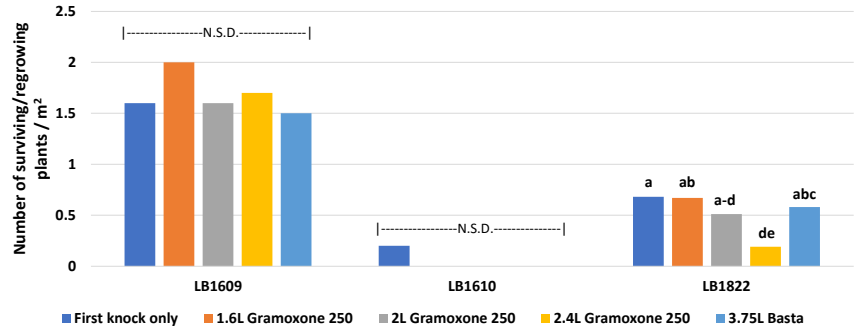
Comparison of paraquat v glufosinate against large (elongating to flowering) flaxleaf fleabane

NGA. 3 trials 2016-18. (LB1609, LB1610, LB1822)



Note: Several other treatments included in some of these trials (not shown). No other treatments provided significantly better control.

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Optical spot spraying

- Increasing number of herbicides being registered
- PER90223 https://permits.apvma.gov.au/PER90223.PDF (Expires 31 Dec 2026) allows use of several other herbicides via OSST.
- Consider the residual at high rates
  - Plantback periods on label reflect boom spray rates only
- Calibration of the spray important to deliver target application rate

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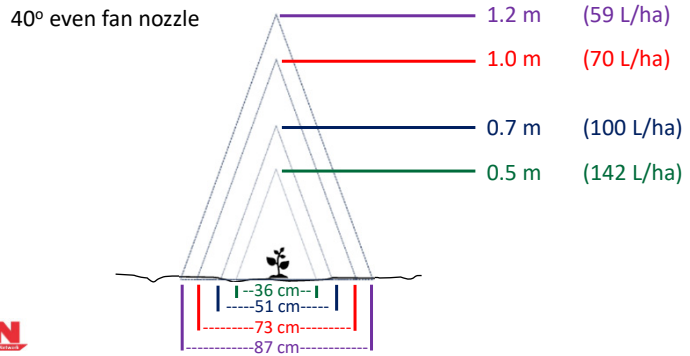
Optical spot spraying

Calibration of the sprayer important to deliver target application rate



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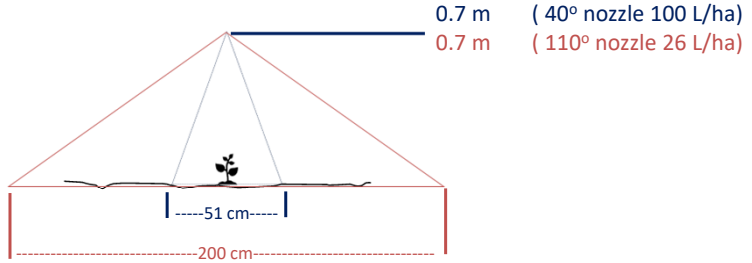
Optical spot spraying

Calibration of the sprayer important to deliver target application rate



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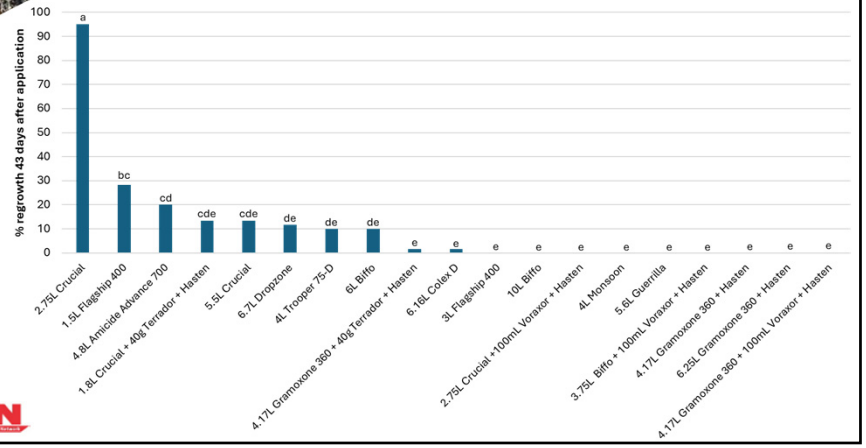
Northern NSW Problem Weeds NGN

Bullarah, NSW (March 2025)

Elongating milk thistle at application



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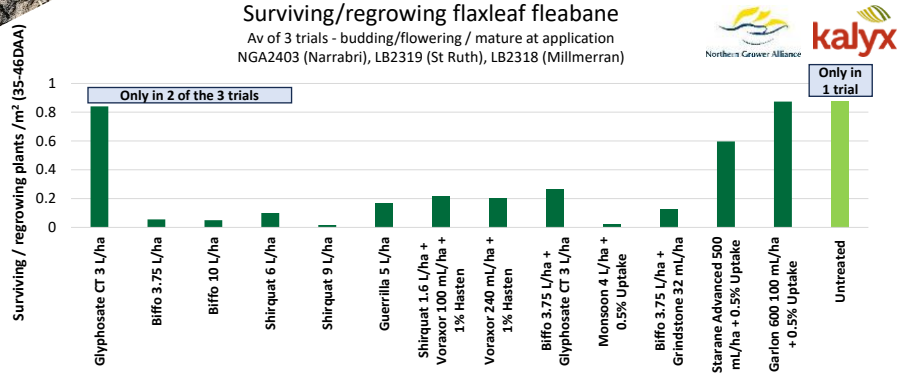
Comparison of optical spot sprayer application rates

Surviving/regrowing flaxleaf fleabane

Av of 3 trials - budding/flowering / mature at application

NGA2403 (Narrabri), LB2319 (St Ruth), LB2318 (Millmerran)



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Residual herbicides in fallow

Reduced weed pressure in fallow

- Resistance management benefit
- Better timing of knockdowns in other paddocks
- Reduced spraying around sensitive crops

Best suited to paddocks with known crop rotation

- Rotational crop often drives herbicide choice

Application timing prior to extended rainfall event

Most products deliver consistent control for ~ 60-70 days

- Longer control = very persistent herbicides and/or periods of dry soil

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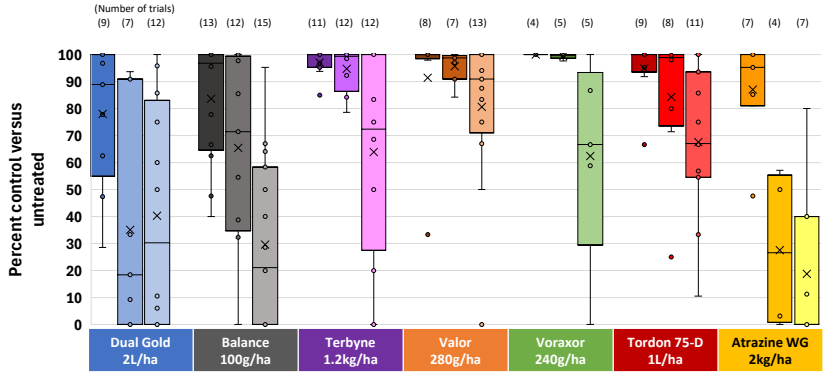
Residual control of common sowthistle in fallow (2002-2022)

Summary of 22 NGA trials (CFT0801, AM0804, CFT0912, CFT0929, AM09-1006, AM10-1103, RN1505, DK1510, AM1522, AM1544, AM1604, AM1605, AM1611, LB1620, DK1620, LB2020, DH2104, LB2108, LB2115, LB2116, LB2215, LB2222)



For each herbicide

First column – trials rated @ 25-59 days after application
Second column – trials rate @ 60-89 days after application
Third column – trials rated @ 90-130 days after application

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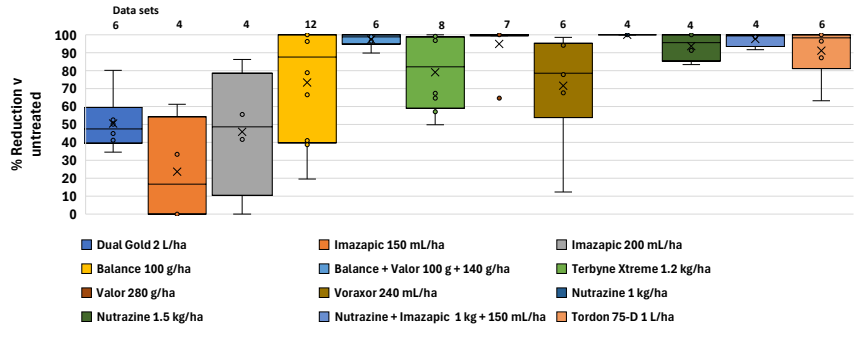
Residual control of *Conyza spp.*

Min of 4 data sets per treatment required. Data from trials rated at 20-82 days after application



Comparison of common fallow herbicide options used in the northern grains region.
Balance, Valor, Terbyne Xtreme and Tordon 75-D are registered for residual control of fleabane in fallow.

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Integrating management strategies

Winter cereals – ***ensure crop is clean at harvest***

- Pre-emergent or early post-em with residual
- Crop competition
- Late post-em (salvage) if needed

Chickpea – ***limit blow outs***

- Paddock selection
- Pre-emergent + early crop closure
- Desiccation strategy
- Early harvest

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Integrating management strategies

Fallow ***Immediately post-harvest: If the paddock is clean***

- Residual applied before first spring storms

Main options

MOA	Herbicide	Rotational crop options
4	Tordon® 75-D, FallowBoss® Tordon® (Qld, NSW rego only)	Cereals, canola
5	Terbyne® Extreme	Sorghum, cereals, TT canola
14	Valor®, Terrain®	Sorghum, most pulses, cereals
27	Balance®	Chickpea, cereals
27 + 5	Palmero® TX	Chickpea, cereals

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Integrating management strategies

Fallow ***Immediately post-harvest: If fleabane are already present***

- Double knock: e.g. glyphosate + 2,4-D followed by paraquat (+/- Gr 14) plus residual
- Optical spot sprayer as needed over summer to clean up escapes

Optical sprayer + autonomous sprayer is a game changer

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