Maximising the performance of paraquat based herbicides in northern fallow

Today’s technical expert

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Syngenta - Toowoomba

Facilitated by Mark Congreve and Erica McKay (ICAN)

GRDC Project Code: ICN00016
Today’s Agenda

• What are bipyridal herbicides?
• How does paraquat work?
• Using paraquat in northern fallows
• Maximising performance
  – Rate v weed size
  – Water volumes and droplet spectrum
  – Day v night application
  – Tank mixing
• Paraquat safety
Bipyridal (Group L) herbicides

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>250g/L paraquat (300, 334, 350 &amp; 360g/L formulations also registered)</td>
<td>e.g. Gramoxone®</td>
</tr>
<tr>
<td>135g/L paraquat + 115g/L diquat</td>
<td>e.g. Spray.Seed®</td>
</tr>
<tr>
<td>200g/L diquat</td>
<td>e.g. Reglone®</td>
</tr>
<tr>
<td>125g/L paraquat + 250g/L amitrole (Group Q)</td>
<td>e.g. Alliance®</td>
</tr>
<tr>
<td>250g/L paraquat + 10g/L amitrole (Group Q)</td>
<td>e.g. Paraglide</td>
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How does paraquat work?

Paraquat disrupts photosynthesis in chloroplasts

Source: Syngenta paraquat website
Paraquat herbicide use patterns

1. Alternative fallow knockdown
   - Reduce glyphosate selection pressure
   - Consider replacing at least one glyphosate application per fallow
   - Contact herbicide: small weed, high water rates
   - High rates via optical sprayers (e.g. WeedSeeker)
Paraquat herbicide use patterns

1. Alternative fallow knockdown

2. Double knock
   - Strategy 1
     - Needed for some difficult weeds (e.g. fleabane, feathertop Rhodes)
   - Strategy 2
     - Two different modes of action for resistance management
       - Robust rates required
Paraquat herbicide use patterns

1. Alternative fallow knockdown
2. Double knock
3. To “buy some time”
   – Night spraying option
   – Burn off weeds before another tactic
Paraquat herbicide use patterns

1. Alternative fallow knockdown
2. Double knock
3. To “buy some time”
4. Managing moisture stressed weeds
   – e.g. early tillering barnyard grass, 35°C day temps, glyphosate resistance
Double paraquat

Glyphosate resistant barnyard grass
Belatta, NSW. 2009. 10-20 tillers per plant. Early panicle emergence.

% reduction in plant numbers (42DAA)

0 10 20 30 40 50 60 70 80 90 100

2L/ha Glyphosate CT  2.4L/ha paraquat  Untreated

First knock

Source: GRDC project code UQ00054
Double paraquat

Glyphosate resistant barnyard grass
Belatta, NSW. 2009. 10-20 tillers per plant. Early panicle emergence.

% reduction in plant numbers (42DAA)

- 2L/ha Glyphosate CT
- 2.4L/ha paraquat
- Nil

Second knock (+ 2.4L/ha paraquat)

Source: GRDC project code UQ00054
Maximising performance

• Adjust rate for weed size
• High water volumes
• Droplet size
• Day v night application
• Tank mix partners
## Northern Australia – Fallow / Minimal Disturbance

<table>
<thead>
<tr>
<th>Grass Weed Size</th>
<th>Spray/Seed Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 leaf to pre-tiller</td>
<td>1.2 to 1.6 L/ha</td>
</tr>
<tr>
<td>Early tillering</td>
<td>1.6 to 2.4 L/ha</td>
</tr>
<tr>
<td>Mid to fully tillered</td>
<td></td>
</tr>
</tbody>
</table>
## Northern Australia – Fallow / Minimal Disturbance

<table>
<thead>
<tr>
<th>Broadleaf Weed Size</th>
<th>Spray.Seed Rate</th>
</tr>
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<tbody>
<tr>
<td>1 to 4 leaf&lt;br&gt;<em>Most broadleaf weeds including volunteer cotton</em></td>
<td>1.6 to 2.4 L/ha</td>
</tr>
<tr>
<td>1 to 8 leaf&lt;br&gt;<em>Boggabri weed; Hexham scent, Wild carrot, Phalynthus</em></td>
<td>1.6 to 2.4 L/ha</td>
</tr>
<tr>
<td>5 to 9 leaf&lt;br&gt;<em>Volunteer cotton</em></td>
<td>2.4 to 3.2 L/ha</td>
</tr>
</tbody>
</table>
Optical (camera) sprayers

Optical spot spray herbicide registrations

<table>
<thead>
<tr>
<th></th>
<th>Rate per 100L spray mix. Calibrate sprayers to apply 100L/ha.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuquat® 250</td>
<td>3 - 9 L</td>
</tr>
<tr>
<td>Alliance®</td>
<td>7 - 10 L</td>
</tr>
</tbody>
</table>

Barnyard grass, fleabane, sowthistle, bladder ketmia, caltrop, turnip weed
Australian bindweed (Nuquat only)

PER11163 for WeedSeeker® (N.B. expires 28/02/2019)

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<th>Rate per 100L spray mix. Calibrate sprayers to apply 100L/ha.</th>
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<tr>
<td>paraquat + diquat (e.g. Spray.Seed)</td>
<td>3 -4 L</td>
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</table>
Importance of weed size

Control of feathertop Rhodes grass
Summary of 6 trials. Central Queensland.

Source: Central Queensland Grower Solutions Group 2011-12
Double knock: 2.4L/ha Gramoxone 250

NB: Verdict can be used in Qld against feathertop Rhodes grass under PER12941 prior to mungbeans
Importance of weed size

Control of feathertop Rhodes grass
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## Water volumes

**Spray.Seed label recommendations for application in summer rainfall areas**

<table>
<thead>
<tr>
<th>Stage Description</th>
<th>Water Volume</th>
</tr>
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<tbody>
<tr>
<td>Small plants (2 to 5 leaf) and well separated</td>
<td>50 to 100L/ha</td>
</tr>
<tr>
<td>5 leaf to early tiller/rosette; 30 -50% ground cover</td>
<td>100 to 150L/ha</td>
</tr>
<tr>
<td>Advanced growth; dense and/or tall weed stands</td>
<td>150 to 200L/ha</td>
</tr>
<tr>
<td>Very dense and tall weed growth</td>
<td>Split applications @ 150L/ha</td>
</tr>
</tbody>
</table>

**Gramoxone label recommendations for application in cereals & broadacre**

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<tr>
<th>Stage Description</th>
<th>Water Volume</th>
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<tr>
<td>Seedlings (up to 2cm high)</td>
<td>100L/ha</td>
</tr>
<tr>
<td>2 to 5cm high</td>
<td>150L/ha</td>
</tr>
<tr>
<td>6 to 10cm high</td>
<td>200L/ha</td>
</tr>
<tr>
<td>Weeds less than 5cm, spray topping, hay freezing</td>
<td>Minimum 50L/ha, if using 200-250μ VMD (fine-medium) spray quality</td>
</tr>
</tbody>
</table>
Mixing and water quality

• Bipyridals physically compatible (with agitation) with most other herbicides
  – Rapid tissue destruction may prevent translocation of systemic products

• Use clean water
  – will binding with soil particles = reduce performance

• Water ‘hardness’ = no issue
• Water pH = no issue
Night v Day application

• Night application (fallow spraying northern summer conditions)
  – Lower humidity, better delta T
  – However more opportunity for inversions.

• Paraquat requires light to activate
  – Night ‘may’ allow some translocation
  – Often no measurable benefit when targeting small weeds with robust rates
Day v night application

Large barnyard grass (10.5/m²)
March 2015.

Source: NSW DPI

Live plants (% untreated) 24 DAA

Rate Paraquat 250g/L

2L/ha | 3L/ha | 6L/ha | 9L/ha

Day
Night

Source: NSW DPI
Tank mixing

- Usually not required for small weeds or double knock
- Paraquat well suited to mixing with residual herbicides
- Lack of translocation with systemic herbicides
- Photosystem II herbicides (Group C)
Using paraquat safely

Potentially fatal if swallowed.

Formulation is corrosive. Eye protection is essential.

Nasal ingestion
  - Respirator when mixing. Do not come into contact with spray mist.

Dermal (skin) absorption is low.

In Australia: Blue dye
  Stench agent
  Emetic (to induce vomiting if swallowed)
  Minimum pack size 20L
Personal Protective Equipment
ICAN would like to thank the GRDC for their support of the ICN00016 weeds extension project.

We also wish to thank Syngenta, the GRDC northern Grower Solutions Groups and northern Weeds Research Groups for making their data available for this webinar.

Further information on bipyridal herbicides can be found on product labels

portal.apvma.gov.au/pubcris

or at paraquat.com