

Fallow management of grass weeds and common sowthistle

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Key words

Awnless barnyard grass, feathertop Rhodes grass, liverseed grass, button grass, windmill grass, common sowthistle

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Take home messages

- Effective fallow management of key summer grass weeds and common sowthistle - relying on glyphosate alone - is increasingly unsustainable
- Need to incorporate a range of other tactics including double knocks and residual herbicides to assist management
- Knockdown options can be effective but heavily rely on preplanning and being able to target small growth stages
- Suitable tactics will vary by weed species but in all cases there is a need to utilise as many non-chemical approaches as practical
- Individual paddock rotations may need to change to enable use of effective residual chemistry in fallow or in-crop

The issue

Grass control in the summer fallow has become an increasingly difficult and expensive component of many northern farming systems in recent years. At least part of the reason has been due to the heavy reliance on glyphosate. This has selected weed species that were naturally more glyphosate tolerant or selected for glyphosate resistant populations.

Although this paper will focus on chemical management of these weeds, it is clear we need to better understand and employ other weed management tactics to successfully and economically control these significant threats to cropping.

1. Awnless barnyard grass (*Echinochloa colona*)

Awnless barnyard grass (ABYG) has been a major summer grass issue for many years. It is a difficult weed to manage for at least three key reasons:

1. Multiple emergence flushes (cohorts) each season
2. Easily moisture stressed, leading to inconsistent knockdown control
3. Glyphosate resistant populations are becoming widespread

Resistance levels

Prior to summer 2011/12, there were 21 cases (confirmed with laboratory testing) of glyphosate resistant ABYG. Collaborative survey work was conducted by NSW DPI, DAF Qld and NGA in summer 2011/12 with a targeted follow-up in 2012/13. Agronomists from the Liverpool Plains to the Darling Downs and west to areas including Mungindi collected ABYG samples that were tested at the Tamworth Agricultural Institute.

The key outcome was that the number of 'confirmed' glyphosate resistant ABYG populations had nearly trebled. Selected populations were also evaluated in a glyphosate rate response trial. This showed that some of these populations were still only suppressed when sprayed with 12.8 L/ha. Additionally it has been found recently that the glyphosate 'resistance' expression is increased when conditions are warmer ie glyphosate resistant populations are even 'more resistant' under hotter temperatures.

The days of solely relying on glyphosate for ABYG control are behind us.

Residual herbicides (fallow and in-crop)

There are a range of active ingredients registered in either summer crop e.g. metolachlor (e.g. Dual Gold®) and atrazine or in fallow e.g. imazapic (e.g. Flame®) that provide useful management of ABYG. The new fallow registration of isoxaflutole (e.g. Balance®) can provide useful suppression of ABYG but has stronger activity against other problem weed species. Few, if any, residual applications will provide complete control. However they are important tools that need to be considered to reduce the population size exposed to knockdown herbicides as well as to alternate the herbicide chemistry being employed. Use of residuals together with camera spray technology (for escapes) can be a very effective strategy in fallow.

Double knock control

This approach uses two different tactics applied sequentially. In reduced tillage situations, it is frequently glyphosate first followed by a paraquat based spray as the second application or 'knock'. Trials have shown that **glyphosate followed by paraquat can give effective control even on glyphosate resistant ABYG but timing and stress are important**. Ensure glyphosate rates are robust. Another strategy can be to use paraquat as both 'knocks', particularly for populations where glyphosate effectiveness has been poor.

Timing of paraquat application as the second "knock" for ABYG control has generally proven flexible. The most consistent control is obtained from a delay of ~3-5 days, which also can allow for lower rates of paraquat to be used. Longer intervals may be warranted when ABYG is still emerging at the first application timing, shorter intervals are generally required when weed size is larger or moisture stress conditions are expected. High levels of control can still be obtained with larger weeds but paraquat rates will need to be increased to 2.0 or 2.4 L/ha.

Knockdown control

A number of Group A herbicides eg haloxyfop (e.g. Verdict®) and eg clethodim (e.g. Select®) are effective on ABYG but are only registered in summer crops such as mung beans. NB Group A herbicides are generally more sensitive to weed moisture stress or size. Application to large or mature weeds can result in poor efficacy.

Key points ABYG

- Glyphosate resistance is widespread. **Tactics against this weed must change from glyphosate alone**
- Utilise residual chemistry wherever possible and aim to control 'escapes' with camera spray technology
- Try to ensure a double knock of glyphosate followed by paraquat is used on one of the larger early summer ABYG flushes
- Utilise Group A herbicides in crop and aim for strong crop competition
- Cultivation can be very effective on this weed but multiple emergences are likely each summer season

2. Feathertop Rhodes grass (*Chloris virgata*)

Feathertop Rhodes grass (FTR) started to become an important weed in southern Qld and northern NSW in ~2008. It is a small seeded species that germinates on, or close to, the soil surface. It has rapid early growth rates and easily becomes moisture stressed.

Some likely reasons for the difficulty of managing this weed are:

- It is a species with higher levels of natural tolerance/resistance to glyphosate and has been selected by glyphosate dominated fallow/roadside management strategies
- It is frequently poorly controlled by paraquat alone or even a double knock of glyphosate followed by paraquat
- QDAF research showed FTR is one of the first weed species to colonise bare areas and can germinate on smaller rainfall events than many other problem species
- Minimum/zero tillage practices are likely to have contributed to the threat posed by this weed as cultivation or seed burial (to depths of 2cm or deeper) can be effective management tools

Three characteristics that can be useful to assist FTR control are that:

1. Seed viability does not appear to be improved by seed burial (in contrast to many other weed species)
2. Seed longevity is short (~12 months). If effective control strategies can be used for a period of ~12-18 months, the seedbank of FTR can be rapidly run-down.
3. New incursions of FTR are often in well-defined patches (in contrast to weeds such as common sowthistle). Aggressively treatment of these patches can prevent whole of paddock blow-outs

Residual herbicides (fallow)

Evaluation of a wide range of residual herbicides has shown a number of promising candidates for FTR management. Currently the only registered product for residual control in fallow is Balance®. Additional product registrations for fallow use are being sought.

Residual herbicide (in-crop)

Utilising residual herbicides in-crop will allow the use of additional weed management approaches.

In-crop use benefits from:

- Crop competition
- Change in crop being grown and available herbicide options
- Herbicide application often under more favourable conditions than in fallow or where a level of mechanical incorporation occurs
- 'Increased disturbance' planting may provide benefits for FTR management via weed seed burial or removal of early weed emergence

Currently there are no registrations for residual control of FTR in-crop. Residual herbicide strategies for awnless barnyard grass control (e.g. Dual® Gold, Flame®, trifluralin eg TriflurX® and pendimethalin eg Stomp® applied in a range of summer crops have been noted to reduce the emergence of FTR.

FTR is predominantly a summer weed but the first cohort of emergence can occur during the winter crop phase. Screening of herbicides, currently registered for residual control of other weeds, in



winter cereal or chickpea production has shown encouraging levels of activity. Residual herbicide strategies for the control of a range of both grass and broadleaf weeds (e.g. Balance[®], Treflan[®], Stomp[®], Sakura[®] and terbuthylazine eg Terbyne[®] Xtreme) applied in a range of winter crops have been noted to reduce the emergence of FTR. It is noted that none of these products have an in-crop registration for control of feathertop Rhodes grass.

Residual herbicides for FTR in non-crop situations

FTR frequently dominates in non-crop areas with a potential for re-infestation of adjacent areas. For non-crop areas, there is a registration for 7L/ha of imazapyr 150g/L and glyphosate 150g/L (eg Arsenal Xpress[®]).

Knockdown herbicides (in-crop)

The main registrations for knockdown of FTR are from the use of Group A (grass selective) herbicides in cotton, mungbeans and other broadleaf summer crops.

Double knock control

Glyphosate followed by paraquat is generally an effective strategy for ABYG management. However the same approach is rarely effective for FTR management. In contrast, a small number of Group A herbicides can be effective against FTR but need to be managed within a number of constraints:

- Although they can provide high levels of efficacy on fresh and seedling FTR, they need to be followed by a paraquat double knock to get consistent levels of control
- Group A herbicides have a high risk for resistance selection, again requiring follow up with paraquat
- Many Group A herbicides have plantback restrictions to cereal crops
- Group A herbicides generally have narrower growth stage windows for successful use than herbicides such as glyphosate ie Group A herbicides will generally give unsatisfactory results on larger stressed weeds
- Group A herbicides vary in their effectiveness on FTR

A permit (PER12941) is valid until 31/8/2019, in Qld only, for the control of FTR in summer fallow situations prior to planting mungbeans. The permit is for the application of haloxyfop 520 g ai/L formulations (eg Verdict[®]) at 150-300mL/ha followed by paraquat at a minimum of 1.6 L/ha, within 7-14 days after the first application. In addition there has been a recent registration of Shogun[®] for FTR management in fallow, but only when followed by a bipyridyl double knock as per label instructions.

Key points FTR

- Glyphosate alone or glyphosate followed by paraquat is generally unsatisfactory
- Utilise residual chemistry wherever possible and prepare a plan to control 'escapes' eg camera spray technology
- Utilise aggressive patch management for new incursions (including manual weeding and chipping) and preferably follow up with residual herbicides over previous patches where weeds may have seeded

Other tactics to consider

- Salvage cultivation is often the most effective and economic tool for mature plants



- Consider (infrequent) strategic cultivations for seed burial (repeated tillage may simply return seeds to the soil surface)
- Burning appears a useful tool where blow outs have occurred in patches or even in larger areas to reduce seed viability

3. Liverseed grass (*Urochloa panicoides*)

Liverseed grass is another widespread weed in the northern grains region. Unlike ABYG, Liverseed grass is generally noted for a single main emergence flush each season.

Residual herbicides (fallow)

The only product currently registered for residual control in fallow is Flame®. Evaluation of a wide range of residual herbicides has generally shown inconsistent residual control of liverseed grass (particularly compared to ABYG and FTR)

Residual herbicide (in-crop)

There are a number of residual herbicide options registered for in-crop use eg Dual® Gold, TriflurX®, Stomp® and imazamox eg Raptor®. A good strategy for paddocks with high seed burdens of liverseed grass seed is to grow crops that allow the use of these residual herbicides. Use of these herbicides in registered winter crops can also assist in liverseed grass management.

Double knock control

A double knock of glyphosate followed by paraquat is generally an effective option with paraquat followed by paraquat also an option to consider. The paraquat followed by paraquat approach is likely to be more successful particularly on moisture stressed populations.

Knockdown control

A number of Group A herbicides eg Verdict® and Select® are effective on Liverseed grass but are only registered in broadleaf summer crops, e.g; mung beans. NB Group A herbicides are generally more sensitive to weed moisture stress or size. Application to large or mature weeds can result in poor efficacy.

4. Button grass (*Dactyloctenium radulans*)

Button grass is generally a more localised weed threat than ABYG or liverseed grass. It prefers lighter soils and is often one of the first weeds to emerge after rain events. Button grass often appears as the first weed species to enter moisture stress.

Residual herbicides (fallow or in-crop)

Very restricted range of options. The only product currently registered for residual control in fallow is Flame®. The only product currently registered for residual control in-crop is Stomp®.

Use of these residuals on small infestations of button grass (eg on sandy ridges) may allow more targeted and timely knockdown applications.

Double knock control

Trial work in 2015/16 showed a double knock of glyphosate followed by paraquat as an effective option together with paraquat followed by paraquat. Large rate responses were seen to glyphosate alone. It is important to keep the glyphosate rates robust.

There are no currently registered in-crop knockdown options.

5. Windmill grass (*Chloris truncata*)

FTR has been a grass weed threat coming from Qld and heading south, windmill grass (WG) is more of an issue in central NSW but is spreading north. WG is a perennial, native species found throughout northern NSW and southern Qld. The key cropping threat appears to be from the selection of glyphosate resistant populations with control of the tussock stage providing most management challenges.

Residual herbicides (fallow and in-crop)

Preliminary trial work has shown a range of residual herbicides with useful levels of efficacy against WG. These herbicides have potential for both fallow and in-crop situations. **Currently there are no products registered for residual control of WG.**

Double knock control

Similar to FTR, a double knock of a Group A herbicide followed by paraquat has provided clear benefits compared to the disappointing results usually achieved by glyphosate followed by paraquat. Similar constraints apply to double-knock for WG control as they do for FTR.

- Although some Group A products can provide high levels of efficacy on fresh and seedling WG, they need to be followed by a paraquat double-knock to get consistent high levels of final control
- Group A herbicides have a high risk for resistance selection, again requiring follow up with paraquat
- Many Group A herbicides have plantback restrictions to cereal crops
- Group A herbicides generally have narrower windows of weed growth stage for successful use than herbicides such as glyphosate ie Group A herbicides will generally give unsatisfactory results on larger or stressed weeds.

A permit (PER13460) has been issued, in NSW only (only valid until March 31, 2017), for the control of WG in summer fallow situations. It is for quizalofop-p-ethyl (e.g. Targa® 99.5 g ai/L or 100 g ai/L products at 0.5-1.0 L/ha) followed by paraquat at a minimum of 1.6 L/ha, within 7 days after the first application. Use of 200 g ai/L quizalofop-p-ethyl formulations is also permitted at 0.25-0.5 L/ha. First application should be at WG growth stages between 3 leaf and early tillering.

Timing of the second application for WG is still being refined but application at ~7-14 days generally provides the most consistent control – however the permit requires application within 7 days. Application of paraquat at shorter intervals can be successful, but has resulted in more variable control in field trials and has been clearly antagonistic when the interval is one day or less.

Key points Windmill grass

- Glyphosate alone or glyphosate followed by paraquat is generally poor.
- Preliminary data suggests that residual chemistry may provide some benefit
- A double-knock of quizalofop-p-ethyl (e.g. Targa) followed by paraquat can be used in NSW

6. Common sowthistle (*Sonchus oleraceus*)

Common sowthistle is one of the most widespread broadleaf weeds in the northern cropping region with seed very easily dispersed by wind. It was once considered a winter weed but has become an issue all year round.

The two biggest challenges with common sowthistle are management of glyphosate resistant populations and the successful fallow control of large weeds. NGA have been evaluating options for residual, knockdown or double knock approaches during the last 18 months.

Residual herbicides (fallow or in-crop)

Products currently registered for residual control in fallow include Balance and Terbyne® Xtreme. Balance, Terbyne Xtreme and simazine are all registered for in-crop residual control. NGA have been involved in screening other herbicides for residual control of common sowthistle with encouraging results from members of other herbicide mode of action groups.

Double knock control

Using a double knock of glyphosate followed by paraquat can be an effective tool on small common sowthistle eg 4-8 leaf but generally leads to variable control, at best, on larger rosettes and at more advanced growth stages. Evaluation of alternative first knock candidates indicates that Group I products followed by paraquat are providing improved levels of efficacy compared to glyphosate followed paraquat on larger rosettes. Many of these options are used for fleabane control and often provide a level of residual activity.

Basta® (200g/L glufosinate ammonium) followed by paraquat appears promising but is likely to be restricted to optical spray situations due to the high cost. Screening is also underway for alternative 2nd knock herbicides to paraquat.

Knockdown control

There are limited knockdown (single knock) options for common sowthistle. Sharpen® is registered for use in mixture with glyphosate. This can be an effective tool but needs to be applied on very small weeds for consistent control. Basta alone is also registered and maybe a consideration in 'non-broadacre' spray situations. Trial work in 2016/17 has shown promising knockdown activity from optical sprayer rates of Basta on larger common sowthistle.

Key points

- Commercially unacceptable efficacy from glyphosate or glyphosate followed by paraquat is becoming more widespread.
- The industry must develop 'non-glyphosate' based management strategies
- Residual chemistry clearly has a benefit with encouraging levels of activity from a range of herbicide mode of action groups.
- Double knocks of Group I herbicides followed by paraquat appear promising and may be suitable where grass weeds are of less concern.
- Basta may become an option, primarily through optical sprayer setups, but more work is needed to ensure robustness across a range of environmental conditions.

Conclusions

Profitability is of course still paramount. The suggestion with these problem weeds is to focus on individual paddocks and adjust rotations to crops that most suit your environmental conditions but also enable the use of effective residual herbicides in the previous fallow or even in crop. Particularly for FTR, the seed bank appears only short lived and two years of effective management can ensure that paddocks return to full flexibility of rotational choice.



Northern Grower Alliance



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