

Feathertop Rhodes grass ecology and management. What strategies are working best?

Mark Congreve¹ and Richard Daniel²

¹ICAN

²NGA

Key words

feathertop Rhodes grass, *Chloris virgata*, ecology, management

GRDC code

ICN00016, NGA00003

Take home message

Commitment to two summers of 100% control of feathertop Rhodes grass should exhaust the seed bank in the soil.

Control strategies are likely to require an integrated approach that includes tillage, crop selection, maximising crop competition, residual herbicides and selective use of double knock applications in fallow.

Feathertop Rhodes (*Chloris virgata*) grass continues to be a major problem weed in zero till farming systems in the northern grains region, with populations continuing to expand further south, particularly along road corridors.

Agronomic factors that influence control strategies

Feathertop Rhodes grass is often the first weed to establish on bare ground following a rainfall event in spring/summer. Studies by Queensland Department of Agriculture and Fisheries showed that feathertop Rhodes would germinate following as little as a 10mm simulated rainfall event, with peak germination occurring at 2 days under a 30°C/20°C day/night environment or 3 days under a 25/15 environment. This was faster than barnyard grass, sow thistle and fleabane which were also included in this study. The broadleaf weeds also required a substantially higher rainfall event to initiate germination. This highlights that feathertop Rhodes is likely to be the first weed to germinate and establish following spring storms.

Feathertop Rhodes is a surface germinator, with practically no germination occurring from seed below the top 2cm in the soil.

Seed persistence is short. Viability of seed declines rapidly and almost no seed remains viable 12 months after shedding. This can be utilised as the proverbial boxer's 'glass jaw' in management of feathertop Rhodes – a concerted effort over two consecutive summers to completely stop seed set and any further recruitment into the paddock can see paddocks rapidly go from infested to effectively no feathertop Rhodes grass, in a couple of years.

Unlike most other weeds, studies have shown that burying seed does not increase persistence. This also opens up opportunities for management where cultivation is an option.

Feathertop Rhodes is a prolific seeder, with an individual plant producing up to 6000 viable seeds under good growing conditions. However, when plants are under moisture stress, they will quickly begin setting viable seed, even when the plant is small/young.

Feathertop Rhodes grass does not compete well against existing grass or pasture. However, it often is the dominant species in any bare areas (e.g. roads, fallow) right up against the edge of the crop and pasture paddocks.

These factors see FTR quickly dominate bare earth roadsides or zero till paddocks, especially following wet summers where control programs have not been able to stop seed set and recruitment into the seed bank.

Outside of the cropping paddock, residual control can be achieved by the use of imazapyr based herbicides (e.g. Arsenal®) in non-crop areas. The flumioxazin based herbicides Terrain® and Valor® have recently obtained registrations for residual control in fencelines and irrigation channels respectively.

The first punch – prevention is better than cure

Control of established populations of large feathertop Rhodes is difficult, extremely costly and most likely to be incompatible with zero till farming. Therefore, growers should seek to keep FTR out of farming paddocks wherever possible, and urgently seek to remove individual plants before they have a chance to set seed.

Seed can be blown into paddocks from adjacent paddocks, roadways and fence lines where knockdown herbicides have been used to keep these free of vegetation and feathertop is the surviving species. Or seeds may be deposited in the paddock via livestock or machinery or flood water. Typically, a single plant in year 1 will result in a small clump covering maybe 2-3m² in year 2. Over coming years these patches will continue to expand, potentially seeing the whole paddock infested if nothing is done to stop seed set.

Growers should be continually on the lookout for individual plants and act quickly to manually remove or spot spray these before they are allowed to set seed. Small patches should be chipped, burnt or cultivated to prevent spread. Ideally these should be GPS mapped for future monitoring with a residual herbicide applied prior to the commencement of spring rainfall events.

The second punch – knockdown herbicides

The use of glyphosate alone cannot be expected to achieve control. Even when using a double knock of glyphosate followed by paraquat under ideal conditions and targeting seedlings before they start tillering, control is variable and rarely provides a commercially acceptable result.

Targeting larger weeds that have commenced tillering, or are under any stress, will typically achieve less than 50% control as a double knock, and often not significantly better than using paraquat alone as a single application.

Glyphosate is not registered specifically for control of feathertop Rhodes grass but is registered for the control of annual weeds in agricultural areas.

Research trials and commercial experience have shown that Group A herbicides can be effective in providing useful control.

Currently there is a permit (PER12941 expires 31 August 2019) in place in Queensland to permit the use of haloxyfop (e.g. Verdict®) against feathertop Rhodes grass in fallow, prior to planting mungbeans. Haloxyfop must be applied to weeds at the 3-leaf to early tillering growth stage and followed with an application of paraquat within 7-14 days (double knock). Shogun® (propaquizafop) is registered for the control of feathertop Rhodes grass in fallow and in cotton, peanuts and sunflower. In fallow, Shogun must be applied to weeds at the 3-leaf to early tillering growth stage and followed with an application of paraquat within 7-14 days (double knock).

The importance of weed growth stage is critical for the performance of Group A herbicides. As weed size increases, translocation of the herbicide reduces throughout the plant. Once plants move from vegetative production to reproductive growth, production of the enzyme targeted by the Group A herbicide reduces in the plant. Further information explaining this can be found in the GRDC Fact Sheet 'Group A Herbicides in Fallow'. <http://www.grdc.com.au/GRDC-FS-GroupAinFallow>

Figure 1 below presents a summary of 6 trials targeting various sizes of feathertop Rhodes grass at the minimum and maximum application rates specified by the permit PER12941, with and without the double knock of paraquat. As can be seen from this analysis, no treatment consistently gave 100% control, however these results clearly demonstrate why the permit requires application on small seedlings (3-leaf to early tiller).

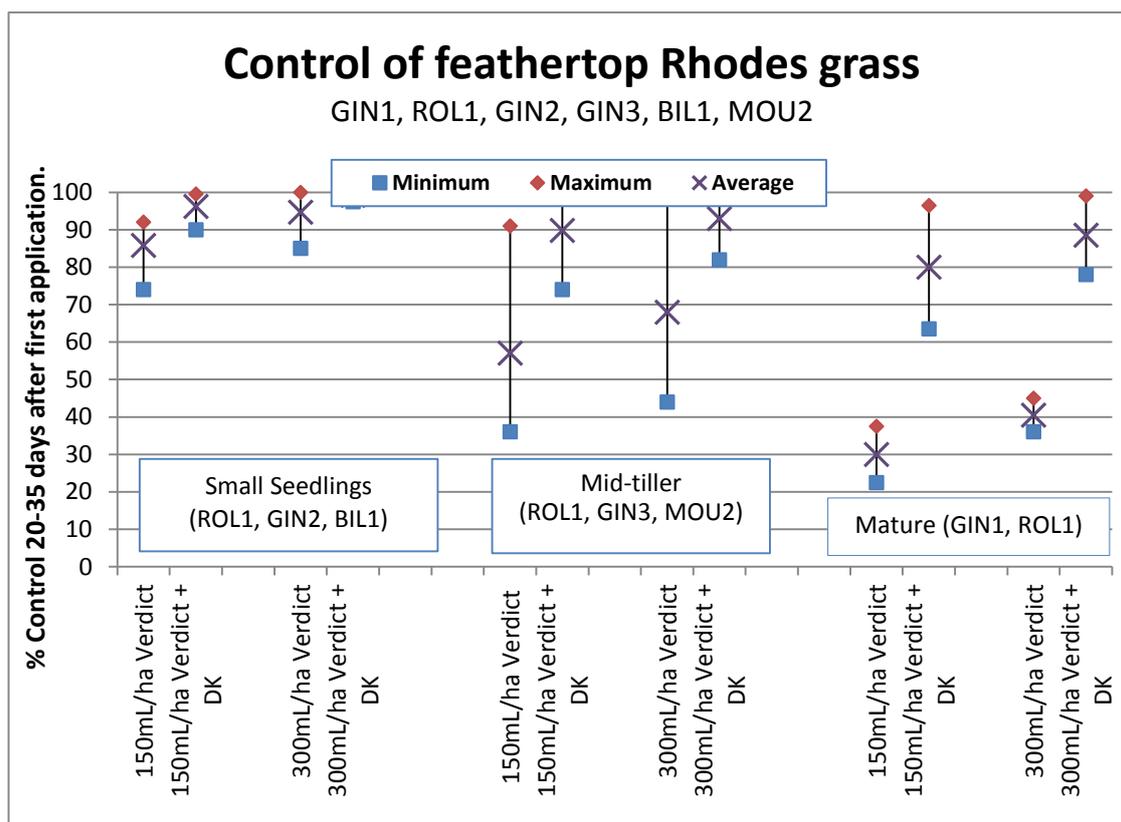


Figure 1. Control of feathertop Rhodes grass at different weed growth stages by 150 and 300 mL/ha Verdict 520, followed by paraquat double knock (DK). Source: Central Queensland Grower Solutions Project 2011/12

Experience in other grass weed species has shown that Group A herbicides are one of the quickest modes of action to select for resistance as there is typically a high frequency of resistant individuals in the natural population.

For this reason, all Group A applications in fallow must be followed by a double knock; they should only be targeted at small weeds; and should not be used more than once per season.

It is essential that this mode of action is protected from resistance selection. Group A herbicides are the mainstay of post-emergent grass weed control in summer broadleaf crops.

The third punch – tactical cultivation

Where feathertop Rhodes grass has got out of hand and established plants are present, it is likely that tillage will be needed to remove existing weeds.

It is unlikely that any herbicide treatment will provide cost-effective control of mature plants. Where old, established plants remain from last summer they can frequently shade herbicide application, thus leading to unsatisfactory results from subsequent knockdown or residual herbicide applications.

Removing mature plants via cultivation can be very effective. Burial of seed below 5cm prevents germination and this seed will lose viability within about 12 months (providing it is not subsequently returned to the soil surface by further tillage).

While an effective cultivation may bury the vast majority of seed, there is always a small percent of seed remaining at the soil surface in the preferred germination zone. If something is not done to prevent these seeds from germinating and establishing then the cycle commences again.

A plan should be in place to manage these subsequent germinations via either knockdown, residual herbicides or tillage.

The knockout blow – residual herbicides

The most successful strategies employed by growers for managing feathertop Rhodes grass have included the use of residual herbicides. Either directly targeted at known feathertop Rhodes in the seed bank, or more broadly, by keeping feathertop Rhodes at bay when targeting other grass weed problems on the farm. The seed viability of most other grass weed seeds in the soil is much longer than feathertop Rhodes, so where growers are incorporating residual herbicides into their program to manage grass weeds such as barnyard grass, feathertop Rhodes is often also controlled or suppressed.

Balance® can be a particularly effective option for fallow management. In addition to residual control of feathertop Rhodes, it will also control fleabane and sow thistle and provide suppression of barnyard grass, however significant plantback periods apply for many summer crop options.

Dual® Gold is now registered for residual control of feathertop Rhodes grass prior to planting a wide range of summer crops and also in fallow situations, with minimal plantback constraints. A new use pattern also allows for a top-up application in sorghum after crop emergence.

Valor, applied at rates for residual control, is also an option prior to planting selected summer crops. Plantback periods apply for some summer crops when using Valor, so always check the label. In addition to control of feathertop, Valor can also provide residual control of a range of difficult to control broadleaf weeds such as fleabane, sowthistle, red pigweed, caltrop, bladder ketmia and the *Ipomea* species such as bell vine and morning glory.

Other herbicides used to provide residual control of barnyard grass in a range of situations (e.g. imazapic, trifluralin and pendimethalin) have been noted to reduce germinations of feathertop Rhodes grass.

Going the full ten rounds – pulling it all together

Where there has been a 'blow out' and a paddock has become infested with feathertop Rhodes, it is likely that a management strategy will look something like the following:

- Cultivation of established plants (before seed has been shed).
- Residual herbicide applied if there is still the possibility of further germination before winter.
- Decide on your strategy for summer before the first spring rainfall event, and potential weed germination
 - If fallowing over summer, apply a residual herbicide before spring rainfall. Monitor frequently for any escapes or breakdown of the residual herbicide. Access to an optical (camera) sprayer can be beneficial in cost effectively treating isolated escapes. If the

residual treatment has broken down, a double knock application will be required, with consideration given to including another residual application with the second knock.

- Where soil moisture is adequate, consider a summer broadleaf crop (or cotton where suitable). Use a pre-emergent herbicide effective on grass weeds; keep row spacing narrow and plant population high to increase the benefit of crop competition; and utilise a selective Group A 'fop' herbicide in-crop to control any escapes. Inter-row tillage is also a valid strategy in wide row summer crops.
- Do not plant sorghum or maize into paddocks with a high seed bank population. Pre-emergent herbicide options such as Dual Gold are unlikely to provide full season residual control, even at the highest application rate – especially in wet seasons. Late season germinations can establish after the pre-emergent herbicide has broken down.
- If no feathertop Rhodes was allowed to set seed, then seed bank viability should be low the following year. Continue vigilant management for another season to ensure depletion of the seed bank.

Unfortunately, the best management strategies for this difficult to manage weed place great reliance on herbicides; and therefore, selection of resistant individuals. Glyphosate is ineffective and Group A herbicides are known to be of significant risk of rapid selection for resistance. While there is currently negligible resistance in the northern grains region too many of the pre-emergent herbicides with efficacy on this weed, one thing we have learnt from history is that if we over-rely on a particular herbicide or herbicide group and don't stop weed seed set of survivors, then we will break it.

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the authors would like to thank them for their continued support.

Contact details

Mark Congreve
ICAN
PO Box 718, Hornsby. NSW 1630
Ph: 0427 209 234
Email: mark@icanrural.com.au

Richard Daniel
NGA
PO Box 78, Harlaxton Qld 4350
Ph: 0428 657 782
Email: richard.daniel@nga.org.au

Reviewed by John Cameron