

Managing feathertop Rhodes grass

A best weed management guide

May 2008

From DPI&F research conducted 2003 – 2008
and grower/industry experiences captured
through the feathertop Rhodes grass taskforce

An initiative of the *Continued delivery of applied solutions to CQ weed issues* project and the *CQSFS* project (GRDC funded)

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Background

This best weed management guide is an initiative of the GRDC funded projects *continued delivery of applied solutions to central Queensland weed issues* and the central Queensland sustainable farming systems project (CQSFSF), and a taskforce of central Queensland growers, consultants and researchers. Feathertop Rhodes grass has become a

major weed in farming systems on many central Queensland farms, mainly because it has proven very difficult to control. The guide outlines what is currently known about managing this weed, and has been drawn from local research and industry experiences. It will be revised as more information becomes available from on-farm experience and research.

Weed description

Feathertop Rhodes grass (*Chloris virgata* Sw.), also known as feathertop Chloris, hairy Rhodes grass and woollytop Rhodes grass, is a native of north America. It is a tufted annual grass up to 1 m tall with erect and semi-prostrate branched stems capable of rooting at the joints. Leaf blades are bluish-green, 5 to 25 cm long and 3 to 6 mm wide. The flower/seed heads or panicles have 7 to 19 feathery, 3–9 mm long white-silver spikes with the feathery

appearance coming from the stiff white hairs and awns arising from the seeds. Unlike common Rhodes grass, the panicles of feathertop Rhodes grass tend to remain unplayed and pointing upwards. Seedlings are erect but with a flattened appearance, and this becomes more obvious in older tillers (flat in cross-section). Leaf blades have tufts of hairs along the margins and where the blade joins the sheath. The stem joints are hairless and sometimes very dark.



germinated seed



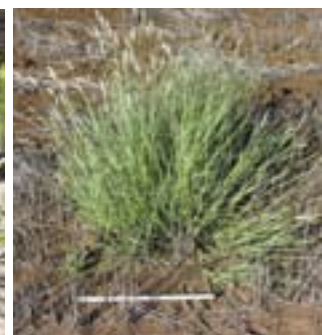
pre-tillering



early tillering



pre-booting



mature

Key management messages and principles:

- There are no silver bullets for easy management of feathertop Rhodes grass, it requires an intensive integrated approach.
- Seed set must be stopped or minimised to break the cycle and reduce future weed burdens.
- Large weeds (>15 cm, tillering or with seed heads) are very difficult to kill with knock-down herbicides.
- Target small active growing weeds (<7.5 cm; pre-tillering) when using post-emergence herbicides.
- Maximise effectiveness of pre-emergent herbicides (residuals) by applying when soil surface has very little or no weed cover.
- Monitor for escapes and spot treat as soon as possible.
- The double knock tactic can be very effective.
- Strategic tillage, to bury seed or control large plants, has a role but may not suit all situations.
- Plant competitive crops and cultivars, and utilise narrow row spacings and high crop populations where possible.
- Crops that allow the use of the grass-active Group A (fops, dens and dims) herbicides offer alternatives to glyphosate and allow for herbicide group rotation.
- Plant into weed-free soil, utilise pre-emergent herbicides and be prepared to treat in-crop with post-emergent herbicides (over-the-top or shielded boom) or inter-row tillage.

Where and why is feathertop Rhodes grass (FTR) a problem?

FTR is now considered a weed of major importance in cropping in central Queensland, particularly in the Dawson Callide Valleys and in parts of the Central Highlands. Previously an obvious weed of roadsides, fence-lines and wasteland areas, it has now become an issue in cropping country, particularly where minimum/zero tillage has been practiced for several years. FTR is not particularly susceptible to glyphosate herbicide particularly after the early tillering stage, so the prolonged use and reliance on this herbicide has assisted with a species

shift towards this grass. With minimal disturbance, the seed remains in the upper soil surface which is ideal for emergence and perpetuation of the weed. Dry conditions in the past have made management difficult allowing a seedbank build-up, and coupled with more recent wet seasons has seen field populations explode. While FTR has a preference for lighter textured soils, it will also survive on heavier clay soils as well. Some growers believe biotypes of FTR exist and those with darker nodes and leaf margins are more difficult to control with herbicides.

Knowing the enemy: basic biology

Being an annual, the dynamics of feathertop Rhodes grass is driven through the seed. Manage the seed production and recruitment, and effective control will eventuate.

Replicated in-ground pot studies to examine field emergence, persistence (viability and dormancy over time) with the effect of burial depth on fresh FTR seed are currently being undertaken in Emerald along with some growth cabinet germination studies. Key results to date show:

- Germination occurred across the range of temperatures studied (20 to 30°C) but a preference is shown for temperature at and above 25°C and exposure to light.
- Seed has an apparent innate dormancy, requiring an after-ripening period of approximately 10 weeks; and pre-chilling assists in breaking this dormancy.
- Approximately 25% of seed produced is non-viable (dead or incomplete), but this may vary and be influenced by growing conditions prior to and at seed maturation.
- The majority of field germinations occur in the 0-2 cm seed burial depth; over 12 months 47% of seed buried near the surface germinated, compared with 5% at 5 cm and 0% at 10 cm depths (Figure 1).
- Seed viability is short-lived (about 12 months) irrespective of burial depth, suggesting short persistence.

These results infer that FTR is:

- Likely to germinate all year round but with preference between spring and autumn. Mild wet winters will also produce recruitments (evident in the graph below).
- There will be no immediate recruitment from freshly-shed seed due to the after-ripening requirement.
- Seed shed during late autumn will receive immediate pre-chilling (in winter), breaking dormancy and allowing recruitment on the first spring rains.
- Seed shed two years or more previously is not likely to produce new seedlings.
- Burying the seed deeper than 5 cm and leaving it there undisturbed for at least 12 months will stop seedling recruitment and will significantly reduce the seedbank as the viability of seeds deteriorates.

Anecdotal field trial observations suggest that a peak or major flush of emergence will occur if good rain (50 – 100 mm) occurs over several days within 1 – 2 weeks, particularly in spring. These major flushes will exhaust the majority of the viable non-dormant seedbank, and offer an ideal weed control opportunity. More sporadic and smaller rain events can cause a number of smaller *ad hoc* germinations, making control more difficult.

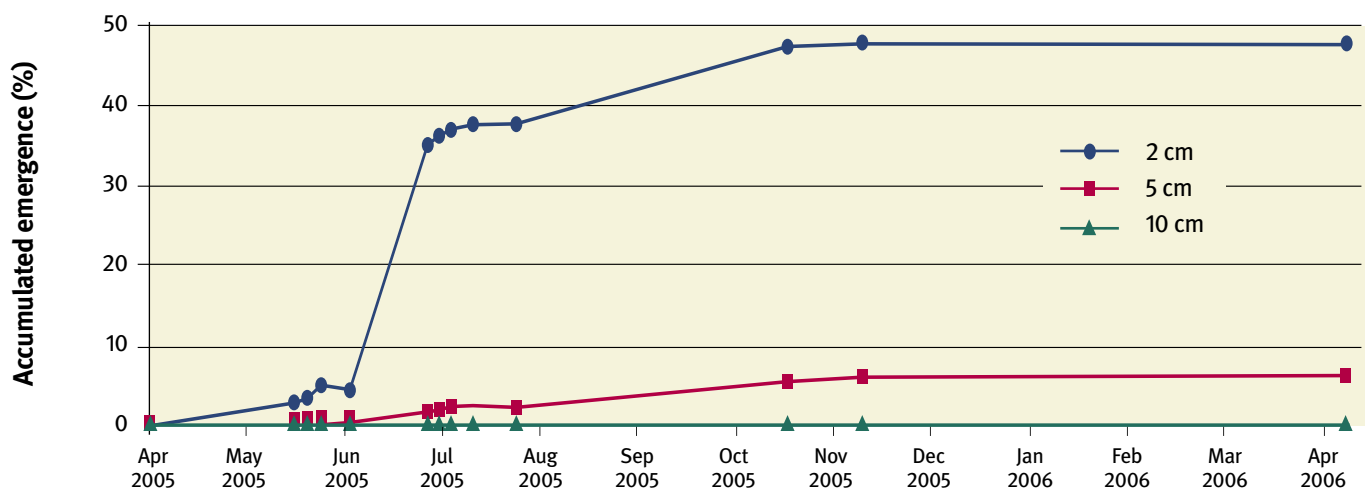


Figure 1. Accumulative in-field emergence of feathertop Rhodes grass from seed burial depths of 2, 5 and 10 cm for the 12 month period, April 2005 to April 2006 (in-ground pot study, Emerald) [Note: May, June and July 2005 was a mild and very wet (>150 mm rain) period].

Management strategies

Recent research and industry experience indicates that management of feathertop Rhodes grass requires a fairly intense integrated approach, with attention given to both fallow and in-crop phases. Important management considerations and principles across all farming system phases include:

- No single weed management application will effectively control this species.
- Seed set must be stopped or at least minimised to halt the perpetuation of this grass problem.
- Like all weeds, targeting small actively growing plants improves the chances of good control. Spraying small FTR seedlings as soon as possible after rain is likely to provide best control, and aerial application should be considered if it stays too wet to use ground sprayers.
- Need to closely monitor the results of all management applications.
- Survivors/escapes (detected during monitoring) need to be spot treated as soon as possible.
- When using pre-emergent (residual) herbicides, the soil surface needs to have less than 50% weed cover but ideally should have no weeds present.
- If using tillage to control existing plants, the depth and type of tillage should be sufficient to uproot the grass without subsequently transplanting it. The rooting depth will depend on the season – roots will be shallow in a dry season.

- If using tillage for seed burial, the depth of soil inversion needs to be at least 10 cm.

The few herbicides specifically registered for the control of FTR include atrazine, butroxydim (e.g. Factor[®]), clethodim (e.g. Select[®]), Arsenal Xpress[®] (imazapyr + glyphosate for non-crop land uses only); while clorthal-methyl (Dacthal[®]) is registered for control of *Chloris* spp. in cotton.

Several herbicides that have demonstrated reasonable to good efficacy on FTR in research trials are registered for use in certain fallow and or in-crop situations in Queensland but not specifically for FTR control. These fallow herbicides include:

- glyphosate (Roundup Powermax[®] has a registration for Rhodes grass control at 2 – 4 L/ha),
- paraquat (e.g. Gramoxone[®]) (registration covers annual grasses in general), and
- imazapic (Flame[®]).

Promising in-crop herbicides include s-metolachlor (Dual Gold[®]), haloxyfop (e.g. Verdict[®]), fenoxaprop (Wildcat[®]) and fluazifop + butroxydim (Fusion Super[®]). Local research will continue over the next 18 months to screen the effectiveness of group A herbicides (pinoxaden or Axial[®], tepraloxym, sethoxydim, propaquizafop, fluazifop and quizalofop) as well as others from various groups (diuron, atrazine, s-metolachlor, imazapic, paraquat, glyphosate imazethapyr, metribuzin, prometryn, trifluralin, amitrole and pendimethalin) with and without adjuvants on FTR.



Best-bet fallow management

Managing feathertop Rhodes grass is probably facilitated the easiest during the fallow phase where it is likely to be more visible and accessible. Key considerations and learnings for fallow management of FTR are:

- Density and distribution across paddocks will determine treatment type – boom, spot sprayer, aerial, or expansive versus spot tillage.
- For scattered or occasional FTR infestations, make a concerted effort to prevent these from becoming bigger problems using whatever spot treatment is necessary or available.
- Actively growing small pre-tillering plants with minimal stress are the best target (chances of stress likely to increase as weed size increases in line with the soil profile drying down over time).
- Small refers to the individual plants, not the clump/patch. Within larger patches, plants need to be small to reduce chances of leaf/stem overlap thereby increasing chances of spray coverage (important for both translocated and contact herbicides).
- Local research has shown that glyphosate rates need to be kept above 2 L/ha and closer to 3 L/ha (of a 450 g ai/L formulation) for consistent results. Control reliability also increased with the addition of a 100% non-ionic wetter (0.2%) + ammonium sulphate (Liaise 2% v/v) and a buffer (LI700 at 0.25%).
- The ‘double knock’ tactic (glyphosate followed by paraquat; paraquat after paraquat; and glyphosate followed by tillage) has proved very effective. Rates of both herbicides need to be robust (2 L/ha or greater). The interval between knocks can be extended to 21 days, but sooner (14 days) is preferable.
- Costs of the double knock can be reduced by applying the second knock as a spot spray (density dependent) or using WeedSeeker technology if available. Spot tillage may also be an option.
- If plants are stressed, paraquat is a better herbicide option as it relies on contact not translocation.
- Many growers have had variable results with the addition of adjuvants (Synertrol oil, fulvic acid, citric acid, ammonium sulphate); while research has shown no benefits from Pulse, Hasten, Hotup, Striker or Liaise on its own.
- Effects of water volume and droplet size are still unclear; current best bet is to apply high (>80 L/ha) spray volumes, particularly when using residuals and contact (paraquat) herbicides.
- Use of the pre-emergent residual herbicides atrazine, s-metolachlor and imazapic has been beneficial in fallow (need to consider recropping options). Research also indicates the mix of atrazine (1.25 kg ai/ha) + s-metolachlor (2 L/ha Dual Gold®) is better than either applied alone.
- Atrazine and s-metolachlor also work better when incorporated; and growers have indicated that shallow mechanical incorporation of the latter is better than relying on rainfall incorporation.
- Again, and most importantly, survivors of any management practice need to be retreated as soon as possible (e.g. spot spraying or individual treatment).
- Manage outbreaks along roads, fences and around sheds as these will be a continuing seed source.



Untreated
(at 23 days)



glyphosate (450 g/L) 2L/ha
23 DAT



glyphosate (450 g/L) 3 L/ha
23 DAT



atrazine (500 g/L) 2.5 L/ha+
Dual Gold 2 L/ha
82 DAT



Best bet in-crop management

In-crop management of feathertop Rhodes grass will be limited by the crop chosen and the herbicides which can be safely used within those crops. However, across all crops, manipulative agronomy should also be utilised to maximise crop competition, thereby using the crop itself as a weed management tool. The considerations for in-crop FTR management include:

- Sow crops into weed-free conditions (requires astute fallow management and or pre-plant preparation).
- When using residual pre-emergent herbicides, the most ideal time to apply is prior to the sowing rain (herbicide will control FTR plants emerging with the crop). Applying pre-emergent herbicide immediately after sowing is an alternative but tends to be less effective if rain does not occur within a month. Use robust herbicide rates.
- Select crops that are more competitive (e.g. barley is more competitive than wheat; maize is more competitive than sorghum).
- Select cultivars that are more competitive and able to close the canopy quickly.
- Select crops that allow the use of grass-active (Group A) herbicides (chickpea, mungbean, sunflower, wheat, barley and cotton).
- Sow crops on narrow rows and keep crop populations high. However if choosing to use wide-rows, take advantage of the wide space to implement inter-row treatments (tillage, shielded herbicide sprays).
- Consider atrazine and s-metolachlor in sorghum and maize; imazethapyr in mungbean; pendimethalin and s-metolachlor in sunflower; metsulfuron and chlorsulfuron in wheat.



Feathertop Rhodes grass in sorghum



Feathertop Rhodes grass in wheat

Future research and development work

Current research and development work specific to feathertop Rhodes grass will focus on:

- Validating the seed biology and ecology results through current in-ground pots and growth cabinet studies (Emerald Research Station and laboratory).
- Determining the impacts of management within crop rotations (currently addressing wide and narrow row chickpea and winter fallow) switching back to fallow, sorghum and mungbean in early 2009 (Biloela Research Station trial).
- Determining tillage impacts (type and depth) on seedling recruitment (Biloela Research Station trial).
- Addressing autumn fallow management of FTR (residuals and post-emergence herbicides).
- Determining whether FTR biotypes do exist and if herbicide susceptibility differs.
- Determining the effects of water deficit/stress on herbicide dose responses across various growth stages.
- Screening the efficacy of Group A herbicide (fops and dims).
- Clarifying the effects of water volume and droplet size on herbicide efficacy.
- Examining the seasonal timing of herbicides.
- Limited screening of adjuvants and their impact on herbicide efficacy for FTR control.

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