

# Feathertop Rhodes Grass: Biology



## Feathertop Rhodes grass in the southern cropping region of Australia

Already a major weed in the northern cropping region of Australia, Feathertop Rhodes grass (FTR) is now occurring in fields in the southern and western cropping regions. FTR has been favoured by the shift towards reduced tillage. In addition, the heavy reliance on glyphosate that typically accompanies reduced tillage has led to resistance, further increasing the threat of FTR. An understanding of FTR biology will help guide management choices to enable successful long-term control. This factsheet includes findings from recent research by the Weed Science Group at the University of Adelaide.

### Key Points

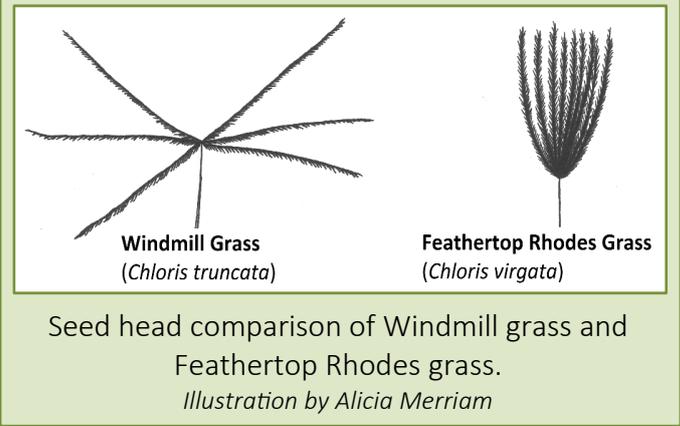
- No-till systems have favoured this species and it is becoming common in the southern region.
- Glyphosate resistance has been documented in populations from NSW, Qld and SA.
- A single plant can produce up to 40,000 seeds and a single panicle can have > 1000 seeds.
- Seed is dormant for about 2 months after maturity.
- Seed has rapid germination and a low minimum temperature requirement, so plants can establish after rainfall in spring, summer and autumn.
- Light stimulates germination but is not an absolute requirement, so seed burial by tillage will assist management but is not enough on its own.
- Seedbank persistence is generally around 12 months but can be extended by dry conditions.

### Quick Facts

Time to maturity (irrigated)	67 days
Dormancy of fresh seed	2 months
Optimum germination temperature	20 - 25°C
Minimum germination temperature	2°C
Effect of seed burial on germination	Reduction
Seedbank persistence	12 months

### Common Names

Feathertop Rhodes grass	Feathertop Chloris
Feather Windmill grass	Showy Chloris
Feather Fingergrass	



### Introduction

Feathertop Rhodes grass (*Chloris virgata*) is a warm-season grass with an annual life cycle in the southern region of Australia. It is closely related to native Windmill grass (*Chloris truncata*) but at mature stages they are easily distinguished by their seed heads.

Favoured by the widespread adoption of minimum or zero-till cropping systems, FTR has recently been observed in cropping fields in the southern region. Management has focused on chemical control options and consequently, populations are now developing resistance to glyphosate due to high selection pressure.

Glyphosate resistance has been documented in populations from fallow paddocks in New South Wales and Queensland, and more recently in roadside populations from South Australia. Therefore, it is now necessary to use an Integrated Weed Management (IWM) approach to effectively control FTR and some opportunities are provided by its biology.

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Young Feathertop Rhodes grass seedlings.  
*Photo by Alicia Merriam*



Feathertop Rhodes grass with mature seeds.  
The seeds will change colour upon ripening.  
*Photo by Chris Preston*

## Growth and development of FTR

FTR germinating in late November (2014) progressed to seed maturity in about 4 months, when rain fed. However, plants in irrigated plots reached maturity in just over 2 months. FTR must be controlled before maturity to prevent seed set, so watch out for faster development if there is a wet summer.

A South Australian FTR population compared side-by-side with one from Queensland progressed to each major stage faster than its northern counterpart.

Time taken (days) to reach growth stage		
Growth Stage	Rain Fed	Irrigated
Tillering	14	12
Flowering	96	45
Mature seed	118	67

FTR is a productive species, yielding over 600 g/m<sup>2</sup> dry matter and up to 40,000 seeds per plant in irrigated conditions. This means a small population could progress rapidly to a serious infestation if left unchecked and indicates potentially significant yield penalties if it becomes established in cropped land.

## Seedling emergence and survival

Large flushes of germination are generally stimulated by spring or summer rainfall events and are followed by self-thinning in the summer drought. Due to high seed production and many initial establishments, some seedlings survive until autumn rainfall.

In a 2015 field trial, up to 90% of FTR plants that had established after January rains died later in summer due to severe water stress. But even under such harsh conditions, surviving plants were able to recover and set seed to replenish the seedbank.

## Seed dormancy

South Australian FTR populations did not germinate from fresh seed. Instead, about 2 months of after-ripening was required before germination occurred, which is similar to the dormancy period determined for the Queensland populations.

50% germination was reached when FTR seed was about 5 months old and maximum germination occurred around 8 to 9 months after maturity. Timing of seed maturity did not appear to affect the pattern of dormancy loss, and both South Australian populations tested behaved in very similar ways.

## Environmental effects on germination

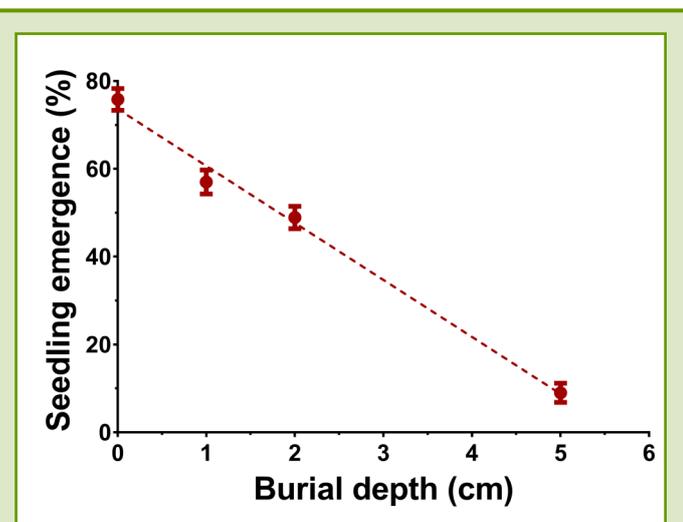
### Temperature

FTR can germinate across a wide temperature range, from 10 to 40°C, and the germination rate increases with temperature. 20 to 25°C was the optimum range for both maximum germination and rate in our study, which saw half the seeds germinate in about 3 days. Although slightly slower in germination than Windmill grass, it is still relatively quick, so both species can take advantage of short windows of adequate moisture in summer.

The base temperature for germination was 2-3°C, lower than Windmill grass and many other annual summer grass weeds. This attribute of FTR is likely to extend the germination season compared to other spring germinating grasses.

### Light and burial depth

Light stimulated germination of FTR, but not to the same extent as for Windmill grass, and up to 30% of germination occurred in complete darkness. Seed burial did not completely prevent germination either, but did reduce germination. This is an advantage for FTR and means that tillage as a management option is unlikely to be as effective as for Windmill grass. Shallow buried FTR seeds may even have an advantage as far as soil moisture is concerned.



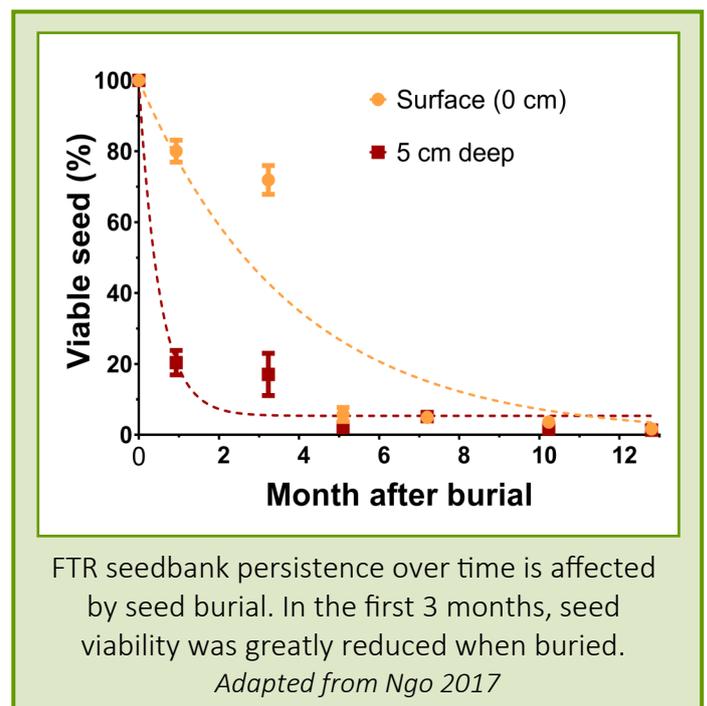
The relationship between FTR seedling emergence and burial depth of the seed. Seeds buried deeper under soil are less likely to germinate.

*Adapted from Ngo 2017*

## Seedbank persistence

The viability of FTR seed in soil decreases over time and the seedbank almost depletes entirely after about 12 months.

Seed burial studies revealed that generally, FTR seeds buried to a depth of about 5 cm lose viability faster than seeds on the surface. This is because higher moisture levels below the surface promote greater decay and germination. However, if summer rains allow surface moisture levels to remain high for long enough, a flush of germination will occur, causing a rapid decrease in viable surface seeds.



This trend can be reversed during extended periods of below-average rainfall that cause depletion of subsoil moisture. In this case, few buried FTR seeds will germinate or decay, so will remain viable for longer. This occurred in 2015-2016, the second consecutive year of below-average rainfall, with the subsoil seedbank having significant viability (30%) beyond 12 months. This highlights that monitoring and management of FTR should be extended during drought conditions.

# Managing Feathertop Rhodes Grass

FTR is a complex weed to manage and with the development of resistance to glyphosate an IWM strategy is increasingly important. Plants must be controlled before seed set for management to be effective, which leaves a window of only about 2 months from emergence if moisture is abundant. Ensuring plants are controlled prior to flowering gives the best chance to reduce the problem.

## Chemical control options

Glyphosate resistance has been documented in this species from the northern region and roadside populations in South Australia, so be on the lookout for suspected resistance on your property and also incorporate other management strategies.

There are a few herbicides registered for use on FTR in the southern region:

- Imazapyr is registered for use on rights-of-way, around buildings and non-agricultural situations.
- Isoxaflutole plus terbuthylazine is registered for use in chickpeas.
- Flumioxazin is registered for fence lines and established lucerne.
- Clethodim is registered for use in pastures and lucerne seed crops.
- Butroxydim is registered for lucerne (Vic only).
- Isoxaflutole and propaquizafop are registered for summer fallow use under some circumstances.

Product labels should be consulted to ensure the use pattern is appropriate and registration includes your location and situation.



Mature Feathertop Rhodes grass plants on a roadside. *Photo by Chris Preston*

## Physical and cultural control options

Because seed burial reduces germination, tillage practices that create soil inversion may be useful. Remember that this species can still germinate with shallow burial, so the deeper the implement works the soil, the better. Tillage and seed burial is unlikely to be as successful as it will be for controlling Windmill grass.

Narrow crop row spacing and cover crops may have some effect for controlling FTR by reducing light penetration to the soil surface during spring. It is also important to sow into clean paddocks wherever possible.

Always remember to follow IWM best practices: Rotate crops, herbicide actives and modes of action. Keeping detailed records will help you greatly with your management strategy decisions in the future.



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### Further Information:

**Journal article:** Ngo, T.D.; Boutsalis, P.; Preston, C.; Gill, G. (2017) Growth, Development, and Seed Biology of Feather Fingergrass (*Chloris virgata*) in Southern Australia. *Weed Science* 65(3):413-425.

**GRDC factsheet:** Managing Feathertop Rhodes grass (2013). ([www.grdc.com.au/GRDC-FS-FeathertopRhodesGrass](http://www.grdc.com.au/GRDC-FS-FeathertopRhodesGrass))