



Four spinifex species of the East Kimberley

Wright, ALJ¹

¹Gelganyem Seed Operation, PO Box 5, Kununurra, WA 6743, Amy.Wright@gelganyem.com.au

Key words: Native seed collection, land restoration, spinifex

Abstract

The Kimberley sits in the northwestern corner of Australia, in the state of Western Australia. In the wet season, between December and March, spinifex grass species in the Kimberley flower, set seed and are ready to be harvested for use. Four spinifex species have been selected for discussion; the method of identification, collection and storage will be discussed for *Triodia bitextura*, *T. bynoei*, *T. epactia* and *T. racemigera*. Many spinifex species, such as *Triodia racemigera*, are poorly understood and not enough is known about their habit, habitat and distribution. This impacts revegetation projects as certain plant species protected by legislation cannot be returned through re-seeding. A greater understanding of the spinifex species of the Kimberley will be beneficial for the successful management, conservation and rehabilitation of the northern rangelands.

Introduction

This paper aims to share knowledge and provoke discussion on the collection and use of spinifex seed in the restoration industry in the East Kimberley, focusing on four species: *Triodia bitextura*, *Triodia bynoei*, *Triodia epactia* and *Triodia racemigera*. It will outline the species distribution, plant and seed characteristics and habitat. The plant identification, seed harvesting and processing techniques and storage methodology will be discussed. Finally, the future of spinifex seed collection will be discussed as it relates to land restoration in northern Australia.

Spinifex, the common name for approximately 64 species of perennial hummock grasses in the genus *Triodia*, is endemic to Australia and is characteristic of arid and semi-arid rangeland regions (Pitman and Wallis 2012; Jacobs 2004). In the Kimberley region of Western Australia, spinifex is common throughout much of the environment and is well suited to the harsh climate and frequent bushfires that affect country each year (Gamage et al. 2014; Wright and Fensham 2018). Spinifex is important to the local communities of the East Kimberley for several cultural reasons, including hunting, medicinal and food purposes. The book *Kimberley Bush Medicine* states that “decoctions of the leaves or resin (of spinifex) are used as an external medicinal wash to treat the symptoms of colds, influenza and general soreness” (King and Horsfall 2023). According to *Kimberley Bush Food*, the seed of some spinifex species from the Kimberley region were collected to be ground into flour and made into damper (King and Horsfall 2023). The Gelganyem Seed Operation (GSO) works in the East Kimberley region to collect, treat and store native plant seed,

including spinifex seed, predominately for use in the rehabilitation of the Argyle Diamond Mine. The cultural significance of spinifex is emphasised in the name of the Gelganyem Seed Operation (GSO); the term Gelganyem refers to a traditional Miriwoong fishing method of crafting fishing nets from rolled spinifex (Gelganyem 2024).

Due to its high cultural and environmental value, the return of spinifex to rehabilitation areas is a critical element of land restoration. Each year the GSO collects the seed of six species of spinifex from a 200km provenance area around the Argyle Diamond Mine (the mine), to be spread on the mine site at the beginning of the wet season. The seed is separated into mixes, based on the suitability of each species for the geographical characteristics of the areas designated and prepared for rehabilitation that year.

The timing of seed collection, as well as the seed cleaning and storage methodology, is critical to maximise viability and subsequent germination of spinifex seeds. Most spinifex species are manually harvested during the wet season using hand sickles. Size, fullness and colour of spinifex seed florets are some of the factors which differ between each species and are indicators of the optimal time for seed collection and of seed viability. Samples of each seed batch collected are sent to Curtin University to test for viability and germination rate, the data of which inform future collections and seeding rates for rehabilitation projects. The spinifex seed collected by the GSO is 'smoked' prior to seeding, a process which aims to break the seeds' dormancy mechanisms and increase germination rates (Connolly 2014).

Certain limitations affect the return of some spinifex species to restoration areas, including species protected under the Biodiversity Conservation Act 2016. An example is *T. racemigera*, a Priority One species known to have existed on the mine site before mining began. Due to its protected status, this species will not be reintroduced to rehabilitation areas. The Department of Biodiversity, Conservation and Attractions states that a Priority One species is in urgent need of further survey (Department of Biodiversity, Conservation and Attractions 2016). Further work to understand the distribution and level of threat to priority spinifex species may result in the reclassification of some species and enable restoration practitioners to return those species to areas they inhabited prior to human disturbance.

Methods

Identification

Identification of *Triodia* species is required to collect seed and is undertaken by observing habitat, habit and seed morphology. Online resources, such as Florabase (Western Australian Herbarium, Florabase 1998), Flora of Australia Key (KeyBase 2013) and AusGrass (Lucid Central, Aus Grass 2002) are used to assist with identifying species. The GSO maintains an herbarium of East Kimberley plant specimens, identified by professional botanists with regional expertise to ensure correct plant identification prior to seed collection. Figure 1 shows the East Kimberley distribution of *T. bitextura*, *T. bynoei*, *T. epactia* and *T. racemigera*.

T. bitextura is identifiable by its habitat, which can include a variety of soil types, plant habit, and seed morphology. Identifying features include the seeds' light cream colour, long wispy awns, and the plants' curled leaf-blades. *T. bitextura* is widely distributed throughout the East Kimberley and is collected by the GSO in several locations. As this species commonly grows in open fields, there are instances where it can be mechanically harvested, using custom-built native grass harvesters.

T. bynoei is commonly found around Lake Argyle Road and the surrounding regions of Kununurra, often on rocky escarpments and creek beds. Identifying features include the inflorescence structure and awns, which appear similar to those of *T. bitextura* in their feathery appearance.

T. epactia grows in several habitats, including sandy plains and rocky hills. It is hand collected by the GSO in two locations, on rocky outcrops, and is identified by its distinct spikelet and inflorescence morphology, amongst other characteristics.

T. racemigera grows alongside other spinifex species at certain locations and the different species are distinguished in the field by the inflorescences and spikelet morphology. Due to its status as a protected species, *T. racemigera* seed is not collected and subsequently the species will not be returned to rehabilitation areas.

Seed Collection

Spinifex plants which are planned for collection are checked regularly when seed heads develop, to ensure that the seed is collected at an optimal time. This optimal time is when the seeds easily separate from the inflorescence. When ready to collect, gently threshing a seed head into a cupped palm should dislodge a portion of the seed. Issues affecting seed viability and germination rate, such as ‘false seeding’ events and pest damage, are taken into consideration when collecting seed. Spinifex species can be separated roughly into early, mid and late wet season collections, as the seed of each species matures at a different rate. Factors such as rainfall and temperature affect the development of seed, so seed of the same species will often mature at different rates in different locations. Careful planning goes into seed collection, to ensure that the seed is collected at the optimal time in each location.

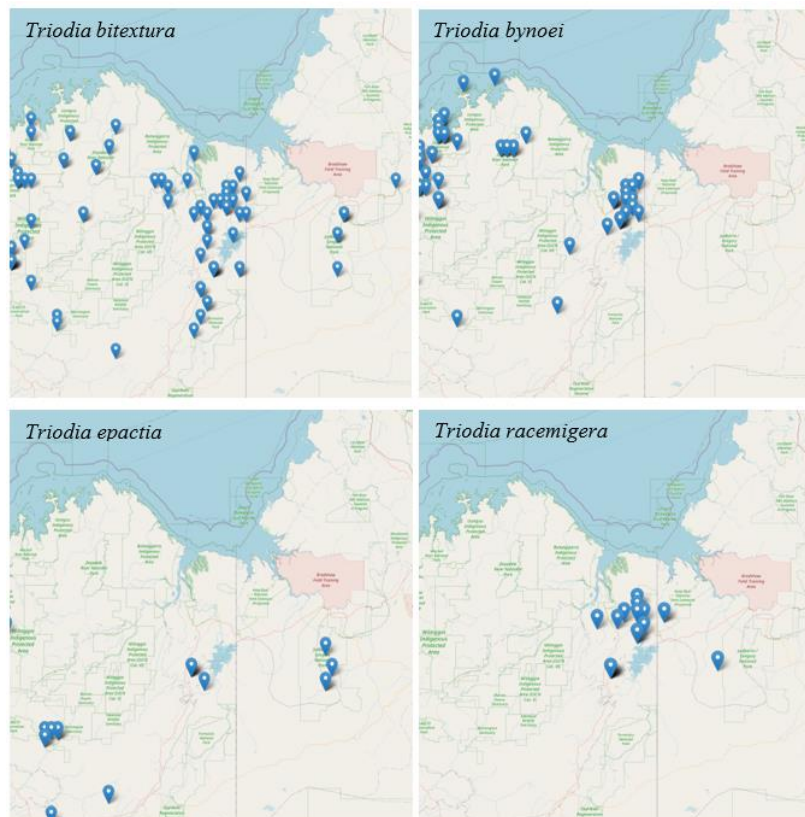


Figure 1: East Kimberley occurrence record maps for four spinifex species (Western Australian Herbarium, Florabase 1998)

Seed Processing

The seed heads collected are laid out in a well-ventilated area, on a flat surface such as a tarpaulin, in a thin layer to dry completely. Once dry, the seed heads are threshed into a container, then 'cleaned' using a sieve, to separate the seed from all other plant material. Correct cleaning allows for efficient storage and reduces the likelihood of pests. Seed which is contaminated with pests is CO₂ treated prior to storage. This is done by placing the clean seed into an airtight bag, which is filled with CO₂, and left for a minimum of 2 weeks. The seed is then re-inspected for pests prior to bagging and placing in storage.

Seed Storage

Anecdotal evidence from seed collectors in northern Australia suggests that allowing spinifex seed a 12 month 'maturing' stage in a non-climate-controlled area increases its germination rate. This is undertaken by the GSO by placing bags of cleaned spinifex seed in a raised, well-ventilated and dry area, prior to cool room storage, where it is kept between 15°C and 16°C. This maturing process can be complicated by certain factors such as high humidity and rainfall, especially during the wet season, which increases the risk of seeds absorbing moisture and developing mould. This is managed by ensuring the seed stays in a well-ventilated and dry environment, and by ensuring that the seed is completely dry prior to bagging.

Discussion

Spinifex seed collection is undertaken by the GSO in the East Kimberley region to return species to degraded country. Understanding plant identification, seed collection, cleaning and storage processes are critical for maximising the seeds germination potential and therefore, for the success of rehabilitation efforts involving direct seeding.

Restoring *T. bitextura*, *T. bynoei* and *T. epactia* to rehabilitation areas in the East Kimberley is a high priority due to their environmental and cultural significance and it is critical to return the country to a level of plant species diversity that closely resembles its pre-mining state.

To progress the native seed industry, it is essential to encourage continuous learning and knowledge sharing across all aspects of seed collection. Enormous rehabilitation efforts will likely be required in the future, and for these to succeed in the Kimberley, the sustainable and accurate collection of seed is of paramount importance. Wild populations of native plants are not capable of sustaining unethical seed harvesting methods, where the quantity of seed collected impacts the survival of plant populations. This fact highlights the need for correctly identified and collected seed, which has the highest possible germination rate, and which therefore reduces the overall volume of seed required to achieve successful rehabilitation outcomes.

There are many difficulties surrounding the collection and use of native seed, including storage, germination and legislative limitations. These challenges often lead to a reduced species diversity in rehabilitation areas compared to baseline levels. Whilst managing potentially at-risk species is crucial, further study of these species could better inform their management and potential reintroduction to former habitats. Improving our understanding of all Kimberley spinifex species will improve restoration, conservation and management outcomes.

Acknowledgements

I would like to thank Gelganyem team members, Riley Shaw, Katrina Nissen, William Rosewood and Robert Hill for the native plant knowledge they have imparted to me over the past 15 months. I'd also like to acknowledge Gelganyem and Rio Tinto for their financial support of the Gelganyem Seed Operation. Finally, I'd like to thank Matt Fletcher and Rose Ridgeway for their amazing editorial support of this paper.

References

- Connolly M J (2014) An investigation of sustainable spinifex-harvesting and knowledge revival: A case study in northwest Queensland. Honours thesis, The University of Queensland, Brisbane, QLD, Australia.
- Department of Biodiversity, Conservation and Attractions (2016) Conservation status definitions. Available at <https://bio.wa.gov.au/guide/conservation-status-definitions#p1> [Accessed 28 11 2024]
- Gamage HK, Memmott P, Firn J, Schmidt S (2014) Harvesting as an alternative to burning for managing spinifex grasslands in Australia. *Advances in Ecology* 2014, 1-9.
- Gelganyem (2024) Barramundi Dreaming Story. Available at <https://gelganyem.com.au/barramundi-dreaming-story/> [Accessed 28 11 2024]
- Jacobs SWL (2004) The tribe Triodieae (Chloridoideae: Gramineae). *Telopea* 10, 701-702.
- KeyBase (2013) Flora of Australia: vascular plants. Available at <https://keybase.rb.gov.au/keys/show/1126> [Accessed 28 11 2024]
- Lucid Central, Aus Grass (2002) *Triodia bitextura*. Available at <https://keys.lucidcentral.org/keys/v3/AusGrass/key/AusGrass/Media/Html/TRIODIA/TRIBIT.HTML> [Accessed 28 11 2024]
- Madison King and John Horsfall (2023) Kimberley Bush Medicine. In 'Spinifex'. pp. 514-515. (UWA Publishing: Crawley, WA)
- Madison King and John Horsfall (2023) Kimberley Bush Food. In 'Grasses'. pp. 182-184. (UWA Publishing: Crawley, WA)
- Pitman HJ, Wallis LA (2012) The Point of Spinifex: Aboriginal uses of spinifex grasses in Australia. *Ethnobotany Journal* 10, 109-126.
- Western Australian Herbarium, Florabase (1998) *Triodia bitextura*. Available at <https://florabase.dbca.wa.gov.au/> [Accessed 28 11 2024]
- Wright, BR, Fensham RJ (2018) Fire timing in relation to masting: an important determinant of post-fire recruitment success for the obligate-seeding arid zone soft spinifex (*Triodia pungens*). *Annals of Botany* 121, 119-128.