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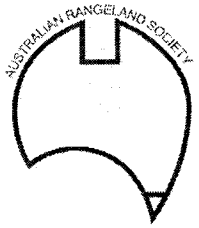


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# VIABILITY OF GRASS SPECIES OF TROPICAL ARID GRASSLANDS

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## ABSTRACT

*Treatment with gibberellic acid induces more germination in a number of Pilbara grass species than does stratification.* Eriachne flaccida *is the most suitable perennial grass for rehabilitation trials (particularly on heavy soils). It germinates successfully without pre-treatment. Germination percentage of* Chrysopogon fallax *is also reasonably high without pre-treatment. For short-term plant cover,* Iseilema membranaceum *is most suitable as mature seed is readily collected and viable. Germination is enhanced with pre-treatment by high temperature storage and gibberellic acid.*

## INTRODUCTION

Little is known about many Australian native grasses and few are used in rehabilitation for such reasons as low germination, dormancy mechanisms and the difficulty of seed collection (Whalley 1985). Where perennial species are lost from degraded rangeland there is often little recruitment due to seed bank depletion. On parts of Ethel Creek and Roy Hill stations in the Pilbara district a combination of past overgrazing and low nutrient levels may have resulted in the local loss of the perennial seed bank (Fox *et al.* 1995). Rehabilitation with soil surface treatments and seeding has, however, resulted in significant increases in plant biomass, density and cover. This paper reports preliminary observations on seed germination of nine grasses common to the Fortescue Valley flood plain.

## METHODS

Seed of nine species (Table 1) collected in April 1993 from Big Mulga paddock on Ethel Creek station was stored for 3 months at 21°C under dark, dry conditions. Caryopses were then separated from chaff and glumes; palea and lemma were removed where possible. Seeds were incubated at the required temperature for 50 days or until there were no new germinants for 14 days. Treatments to break dormancy were selected from those suggested by Ballard (1964) as follows: stratification at 5°C for 24 hours prior to incubation at 25°C; high temperature storage (68°C) for 6 days prior to incubation at 25°C; soaking in 150 ppm gibberellic acid (GAA) for 24 hours prior to incubation at 25°C; incubation at 30°C with no additional treatment; incubation at 25°C with no additional treatment. Cumulative germination was obtained and germination rate was calculated.

## RESULTS

*Chrysopogon fallax*, *Iseilema membranaceum* and *Eriachne flaccida* had the highest final germination percentages, whilst *Eragrostis xerophila*, *Chloris pectinata* and *Dactyloctenium radulans* were poor (Table 1). *Eragrostis japonica* did not germinate. In most cases, 25°C produced more germinants than 30°C. In several species treatment with GAA produced the highest germination percentages. Treatment of *C. fallax* seed with GAA significantly increased germination percentage but not rate. In *C. pectinata* germination rate was enhanced with GAA treatment and high temperature storage. Otherwise it did not germinate. With *E. flaccida*, germination was significantly greater with GAA. *E. setifolia* did not germinate at 30°C and had poor germination in other treatments. *I. membranaceum* had significantly improved germination with GAA and high temperature storage treatments.

Considering all species together, there was a significant difference ($P<0.01$) in mean germination percentage between treatments and GAA gave significantly more germination than stratification or incubation at 30°C. *C. fallax*, *E. flaccida* and *I. membranaceum*, the species with the greatest seed weights, tended to have higher germination percentages.

**Table 1.** Germination percentage and germination rate in days (in brackets) for nine grass species.

| Incubation temperature | 25°C | | | | 30°C | Wt. of 100 seeds (g) |
|---|---|---|---|---|---|---|
| Pre-treatment | Nil | GAA | 68°C | 5°C | Nil | |
| *Chloris pectinata* | 0 (-)b | 4 (40)a | 2 (27)a | 0 (-)b | 0 (-)b | 0.037 |
| *Chrysopogon fallax* | 21b (12) | 50a (10) | 21b (12) | 18b (13) | 9b (15) | 0.276 |
| *Dactyloctenium radulans* | 0 (-) | 5 (14) | 0 (-) | 4 (15) | 0 (-) | 0.056 |
| *Eragrostis dielsii* | 3 (8) | 0 (-) | 1 (8) | 9 (8) | 2 (8) | 0.008 |
| *Eragrostis japonica* | 0 (-) | 0 (-) | 0 (-) | 0 (-) | 0 (-) | 0.007 |
| *Eragrostis setifolia* | 3 (15)a | 10 (9)a | 8 (19)a | 1 (7)a | 0 (-)b | 0.015 |
| *Eragrostis xerophila* | 0 (-) | 1 (6) | 0 (-) | 2 (14) | 2 (10) | 0.014 |
| *Eriachne flaccida* | 15b (13) | 49a (8) | 22b (8) | 3b (7) | 4b (10) | 0.064 |
| *Iseilema membranaceum* | 5b (12) | 54a (5) | 70a (8) | 5b (9) | 2b (2) | 0.127 |

Different letters in rows after germination % or rate indicate significant differences at P=0.05.

## DISCUSSION

*I. membranaceum* is capable of germinating after low temperatures but appears to require after-ripening at temperatures of between 65°C and 70°C for a period of at least six days. *I. membranaceum* seeds may be produced as a result of summer or autumn germination events and remain dormant on or near the soil surface, undergoing an after-ripening period prior to the summer rains. High temperatures at the soil surface may condition the seed. Although germination percentages of *E. flaccida* appeared higher with GAA and high temperature storage at 25°C, differences were not significant. Further investigation is required to unravel the germination biology of this species.

Germination rate of *C. fallax* was low with all treatments suggesting dormancy. *C. fallax* germinated best with GAA (50%). High temperature storage gave 21%. Dry storage at alternating temperatures for six months breaks dormancy in *C. fallax* (Whalley 1985). Stratification and incubation at 30°C produced germination percentages less than those of the control. Whalley (1985) suggests stratification has no effect on germination of *C. fallax*, and this species is unlikely to be a winter germinant.

The small-seeded species trialled produce large numbers of seeds that are both difficult to collect and to distinguish between mature and immature caryopses. It is probable that these would have inherently low germination percentages. Seeds of *C. pectinata* and *E. setifolia* used in this study were thought to be mostly immature. Where germination did occur both species had moderately high germination rates compared to other species. Caution must be applied when relating laboratory germination trials to the field where germination may be poor if naked caryopses are sown (Bogdan 1977).

## ACKNOWLEDGEMENTS

The work reported was made possible by research funding support from BHP Iron Ore.

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