CAN FIRE CONTROL GIANT RATS TAIL GRASS *(SPOROBOLUS PYRAMIDALIS)*?

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Abstract

Giant rats tail grass is an unpalatable weedy species which significantly reduces animal productivity from native and improved pasture. It is presently located in coastal and sub-coastal Queensland and northern New South Wales, where pastures are commonly subjected to spring burning. A laboratory experiment found seed viability of giant rats tail grass was reduced to zero when dry heat at 125°C was applied for as little as 15 s. Most grass fires produce temperature conditions more severe than this at the soil surface and this should result in reductions in the viable seed bank particularly at or near the soil surface.

Key words Sporobolus, Burning, Seed viability

Giant rats tail grass (GRT) is an unpalatable, weedy grass which has the potential to considerably reduce animal productivity in native and improved pastures. It is presently confined to coastal and sub-coastal areas from north Queensland to northern New South Wales. In Queensland, much of this area comprises the black spear grass (*Heteropogon contortus*) zone which is commonly subjected to regular spring burning to control woody weeds and enhance pasture composition and productivity (4).

Spring burning stimulates seed germination of the desirable species black spear grass principally through the effects of plant derived smoke, while killing most of the seeds and small seedlings of the undesirable species wire grass (*Aristida* spp.) (2). The effect is enhanced by the lack of a seed burial mechanism in wire grass which effectively leaves about 90 % of seed on the soil surface, where it is highly susceptible to damage from fire. In black spear grass however, a hygroscopic awn effectively buries the seed and protects it against damage from fire (2). GRT seed is a small (300 - 600 μ m) bare caryopsis without a burial mechanism which should leave most seed located at or near the soil surface and potentially susceptible to damage by fire. Anecdotal evidence suggests that burning favours GRT however this is not conclusive. A laboratory experiment was conducted to determine the viability of GRT seed following the application of dry heat.

Materials and methods

Lots of fifty seeds of GRT were randomly selected from a non-dormant seed sample collected in November 1996 at Goomboorian east of Gympie in Queensland. Five heat treatments (100°C, 125°C, 150°C, 175°C and 200°C) for five durations (15, 30, 60, 120 and 240 s) were applied to each lot of fifty seeds. An unheated control was included and treatments were replicated three times.

Heat treatments were carried out in an oven which was preheated to the required temperature. Small aluminium dishes were also preheated. The oven was opened briefly, seeds poured into the dishes and the door was then closed. Seeds were heated for the required time and then removed and transferred into another unheated dish. Seeds were then placed on moist germination pads in petri dishes and incubated at alternating temperatures of 15/35°C with corresponding dark and light periods. Seeds were incubated for two weeks with germinated seeds counted and removed daily. The seed coat of the remaining ungerminated seed was pricked to overcome possible dormancy and these were incubated for a further two weeks (1). Seeds were watered as required.

Results and discussion

Seed lot viability was reduced by all dry heat treatments relative to the untreated controls which were 92% viable. The 125°C heat treatment killed all seeds even at the 15 s duration while the 100°C heat treatment killed all seeds when exposed for 120 s (Table 1, Figure 1). This result highlights the susceptibility of GRT seed to relatively low temperatures for short periods.

Grass fires in the black spear grass zone of Queensland often generate soil surface temperatures well in excess of 125°C for 15 s duration, with soil surface temperatures up to 290°C for 15 s duration being recorded if sufficient fuel is available (2, 3). These temperatures should result in a significant reduction in the viability of the surface seed bank. Soil temperatures under fire at a depth of 1 cm generally are not lethal (2, 3).

Most GRT seed should be located at or near the soil surface as is the case with giant parramatta grass *(Sporobolus indicus* var. *major)* a close relative of GRT. Giant parramatta grass has an almost identical seed to GRT with up to 60 % and 90 % of its seed bank located in the top 5 mm and 10 mm of soil, respectively (1). The part of the seed bank located close to the soil surface should supply a large proportion of future seedlings. This is due to the small seed size of GRT and the stimulation of germination by alternating temperatures which are the greatest at or close to the soil surface (1). If the seed located in the top 5 mm of soil could be killed, the seed bank would be reduced by up to 60 %, therefore reducing the magnitude of future seedling recruitment and helping to control GRT. Fire could also be used to reduce the viable soil seed bank prior to sowing pastures or crops.

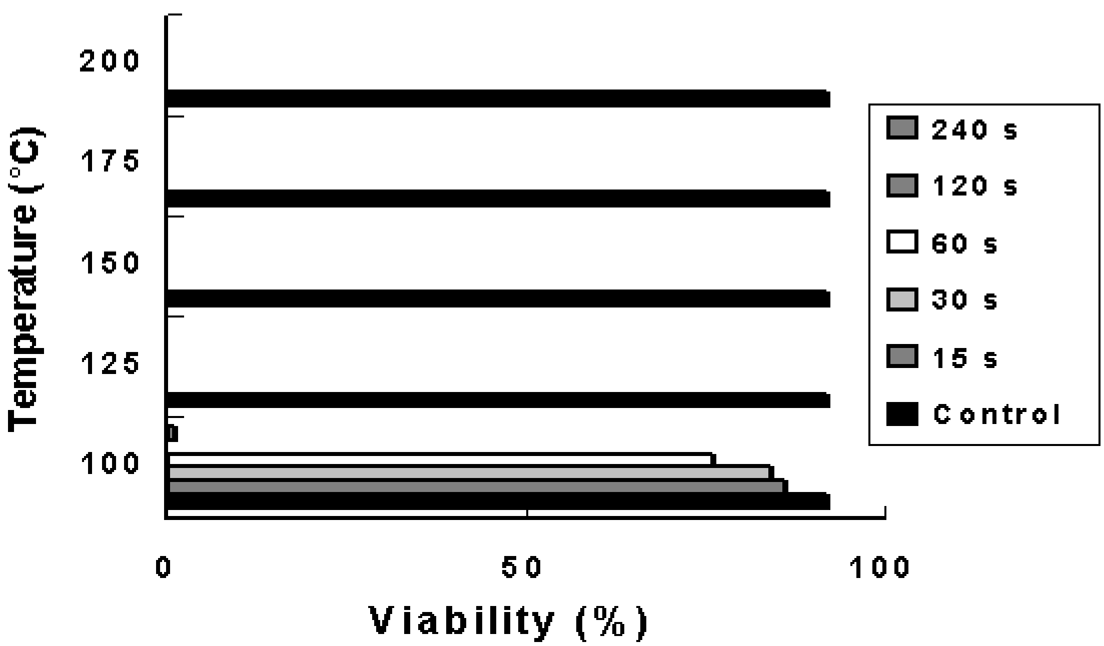

Figure 1. Seed viability (%) after heat treatment.

Conclusion

GRT seed is killed by dry heat and should be killed by fire if the heat generated at the soil surface is above 125°C for longer that 15 s. Significant reductions in the soil seed bank of GRT are possible and should result in reduced seedling emergence therefore helping to control GRT.

References

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