RESEARCH

USING HEAT TO BREAK DORMANCY OF WA LEGUME AND NON-LEGUME SPECIES

by Anle Tieu and Kingsley Dixon

temperatures represented the level and duration experienced by a buried seed during the passage of fire (80°C for 10 mins) as well as artificially high temperatures, not usually experienced in nature, or lasting for such long periods of time (ie. 100°C for 3 h).

The results

For most species tested, the influence of heat was higher than smoke alone, and the combination of heat and smoke encouraged slightly higher germination or made no change compared to heat alone. *Anigozanthos manglesii* exhibited the highest response to heat (100°C/ 3h) by germinating from 0% (control) to 84% with heat. Germination of *Actinotus leucocephalus* seed improved almost three-fold (14.5%) at 100°C for 3h compared to the control, and five-fold (17%) for *Loxocarya striatus* seed at 120°C for 30 mins. The legume species, *Gompholobium marginatum* was also extremely heat responsive with a germination level of 0% (control) compared to 90.7% at 120°C for 30 mins.

For other species, the effect of heat was considerable but lower than smoke, as in the case of *Stylidium affine*, with 2% (control), 70% (following heat at 120°C for 30 mins) and 90% (smoke). For *Sowerbaea laxiflora*, a combination of heat and smoke produced optimal germination from 7% (control) to 15% (120°C for 10 mins).

From these results the application of heat and exposure combinations of 100°C for 3 h and 120°C for 30 minutes, in particular, enhanced germination of several species tested so far. Heat alone was found to replace the requirement for smoke for some of these species. The extreme temperature and time combinations, which do not naturally occur in nature, indicate that the mechanism of dormancy release may be due to a form of accelerated after-ripening, leading to high germination. After-ripening in many Australian native species is the process that occurs during a period of dry storage, ensuring seed does not germinate immediately after it is shed and allows for germination to occur over time, ensuring maximum recruitment.

Implications for revegetation

These findings may directly assist in land rehabilitation schemes by improving the germination levels of seeds in broadcast mixes and to maximise tube stock production. The heat pre-treatment using ovens is simple, fast and clean. It has been shown to be a very effective and consistent dormancy breaking tool in species of the Haemodoraceae family such as *Conostylis* and *Anigozanthos* spp. Further testing of heat treatment in other plant families may lead to an increase in the number of species on the list of heat-responsive species which can be utilised for land rehabilitation programs.

References

Tieu A, Dixon, Meney and Sivasithamparam. 2001. The interaction of heat and smoke for releasing seed dormancy in seven plant species from southwestern Australia. *Annals of Botany*. in press.

high temperature pulses

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ursery conditions)

tinotus leucocephalus (Apiaceae)

xocarya striatus (Restionaceae)

hoenus unispiculatus (Cyperaceae)