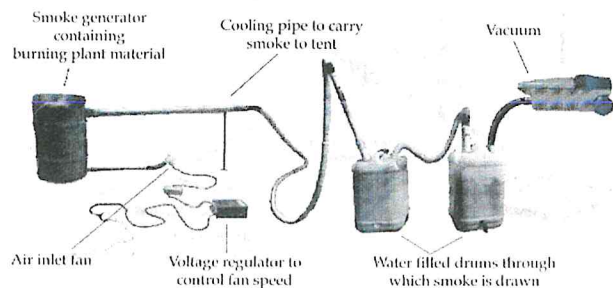


LIBRARY

Department of Biodiversity,
Conservation and Attractions

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Smoke water is produced by drawing smoke from the smoke generator through drums (20-30 L) containing water for up to 60 minutes (see illustration). A cheaper and more effective method is to use REGEN 2000®. This is a highly concentrated smoke water which is ideal for germinating seeds and for application to bushland soils.



Components for making smoke water

What to Burn

Most types of fresh or dried plant or woody materials will produce potentially useful smoke. Good germination results are obtained when a mixture of dry and green foliage and twigs are burnt.

Note: Do not combust plants with white sap (e.g. Euphorbiaceae) or oleander as the smoke produced may be noxious.

Further Information

For information on smoke methodology

Research Laboratory

Kings Park and Botanic Garden

Ph: (08) 9480 3640

Fx: (08) 9480 3641

Email: plantsci@kpbg.wa.gov.au

Website: <http://www.kpbg.wa.gov.au/>

For supply of REGEN 2000®

Grayson Trading

Ph: (03) 9720 7705

Fx: (03) 9720 7706

CD-ROM

A CD-ROM is available which provides comprehensive information on the use of smoke for propagation and restoration of native plants. Contact Kings Park and Botanic Garden for ordering information.

Acknowledgements: Land and Water Resources Research and Development Corporation provided support for the research outlined in this brochure.

Plant Genera that are Responsive to Smoke

Australian genera which are responsive to smoke for germination under nursery or field conditions.

<i>Acacia</i> *	<i>Diplolaena</i>	<i>Myriocephalus</i>
<i>Acanthocarpus</i>	<i>Drosera</i>	<i>Neurachne</i>
<i>Acrotriche</i>	<i>Epacris</i>	<i>Opercularia</i> *
<i>Actinostrobos</i>	<i>Eriostemon</i>	<i>Orthrosanthus</i>
<i>Actinotus</i>	<i>Eucalyptus</i> *	<i>Patersonia</i>
<i>Adenanthos</i> *	<i>Exocarpus</i>	<i>Persoonia</i>
<i>Agonis</i>	<i>Gahnia</i>	<i>Petrophile</i>
<i>Agrostocrinum</i>	<i>Geleznowia</i>	<i>Phyllanthus</i> *
<i>Allocasuarina</i> *	<i>Georgiella</i>	<i>Pimelea</i>
<i>Alyxia</i>	<i>Gompholobium</i> *	<i>Pityrodia</i>
<i>Amphipogon</i>	<i>Gonocarpus</i>	<i>Platysace</i>
<i>Andersonia</i>	<i>Grevillea</i>	<i>Pomaderris</i>
<i>Anigozanthos</i>	<i>Gyrostemon</i>	<i>Poranthera</i> *
<i>Arthropodium</i>	<i>Haemodorum</i>	<i>Ptilous</i>
<i>Astartea</i>	<i>Hakea</i>	<i>Ricinocarpus</i>
<i>Astroloma</i>	<i>Hemigenia</i> *	<i>Rulingia</i>
<i>Baeckea</i>	<i>Hemiphora</i>	<i>Scaevola</i>
<i>Banksia</i> *	<i>Hibbertia</i>	<i>Siegfriedia</i>
<i>Billardiera</i>	<i>Hovea</i> *	<i>Sollya</i>
<i>Blancoa</i>	<i>Hyalosperma</i> *	<i>Sowerbaea</i> *
<i>Boronia</i>	<i>Hybanthus</i>	<i>Sphenotoma</i>
<i>Bossiaea</i> *	<i>Hydrocotyle</i> *	<i>Spyridium</i>
<i>Brunonia</i>	<i>Hypocalymma</i>	<i>Stackhousia</i>
<i>Burchardia</i>	<i>Isopogon</i>	<i>Stipa</i> *
<i>Bursaria</i>	<i>Isotoma</i> *	<i>Stirlingia</i>
<i>Caesia</i>	<i>Johnsonia</i>	<i>Stylidium</i>
<i>Callitris</i>	<i>Kennedia</i> *	<i>Tersonia</i>
<i>Calytrix</i>	<i>Lachnostachys</i>	<i>Tetralia</i>
<i>Chamaescilla</i>	<i>Lasiopetalum</i>	<i>Tetarrhena</i>
<i>Chieranthera</i>	<i>Laxmannia</i>	<i>Tetralthea</i>
<i>Clematis</i>	<i>Lechenaultia</i>	<i>Thysanotus</i>
<i>Codonocarpus</i>	<i>Leptomeria</i>	<i>Trachymene</i> *
<i>Comesperma</i>	<i>Leptospermum</i>	<i>Trichocline</i>
<i>Conospermum</i>	<i>Leucopogon</i>	<i>Tripterococcus</i>
<i>Conostephium</i> *	<i>Levenhookia</i> *	<i>Trymalium</i> *
<i>Conostylis</i>	<i>Lobelia</i>	<i>Velleia</i>
<i>Crassula</i>	<i>Lomandra</i>	<i>Verticordia</i>
<i>Cryptandra</i>	<i>Loxocarya</i>	<i>Waitzia</i> *
<i>Cyathochaeta</i> *	<i>Lysinema</i>	<i>Xanthorrhoea</i> *
<i>Dampiera</i> *	<i>Macropidia</i>	<i>Xanthosia</i>
<i>Desmocladius</i> *	<i>Melaleuca</i> *	
<i>Dianella</i>	<i>Mitrasacme</i>	

* Smoke response under field conditions



Smoke to Sow and Grow

USING SMOKE TO GERMINATE
AUSTRALIAN NATIVE PLANTS

Following a lead from South African botanists, scientists at Kings Park and Botanic Garden in Western Australia have found that it is not the heat and ash from a fire, but rather the smoke that holds the key to germination for many native Australian plants.

Smoke is now widely used in nursery production, bushland management and mine-site restoration.

This brochure describes how to use smoke at home, on the farm or in the nursery to germinate native plants.

A companion CD-ROM is also available which describes in detail many of the practical uses of smoke (see overleaf for ordering information).

Land & Water Resources Research & Development Corporation



What Species Can be Grown?

Over 400 native species of seeds respond to smoke treatment.

Smoke can be applied as water (i.e. smoke water) or in the aerosol form to seed trays, bushland soil or directly applied to seeds.

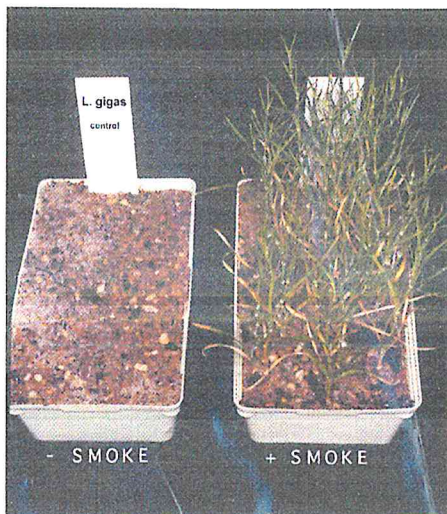
Research has found that smoke responsive native species occur throughout temperate southern and arid Australia. Even species from habitats which are not fire-prone (e.g. the alpine herb fields of Tasmania) germinate well following application of smoke.

Note: Tropical species may require research to determine the extent to which smoke may be important for germination.

Benefits of Smoke

Whereas heat and ash are of limited value for breaking dormancy in many species, smoke promotes:

- Germination of species which are difficult to germinate by conventional means
- More uniform germination
- Earlier germination
- Seedlings which are more robust.



For many native species application of smoke can result in remarkable germination

Which Plants Respond to Smoke?

Trees, shrubs, herbs and annuals respond to smoke-treatment.

There is no clear distinction in the relationship between taxonomic groups and the requirement for smoke. Proteaceae, Myrtaceae and most other dominant Australian plant families contain smoke responsive species. Some experimentation is essential to determine if an untested species might be smoke responsive. Do not rely only on evidence from related species to predict if a species is smoke responsive.

The Link Between Soil Disturbance and Fire.

Research at Kings Park and Botanic Garden has found that after a bushfire, smoke is deposited as a residue on soil and is then washed through to the soil seed bank when autumn rains arrive (for southern Australia). It has also been shown that smoke-like chemicals are released from the soil organic layer following physical disturbance, leading to a promotion of germination similar to that following a bushfire.

When to Smoke

For regions in southern Australia, smoke is best applied from autumn to early winter. For tropical or arid zone species, some experimentation may be required to determine the best time to apply smoke. As a general rule, sowing and smoking should be done when germination is most likely to occur in nature.

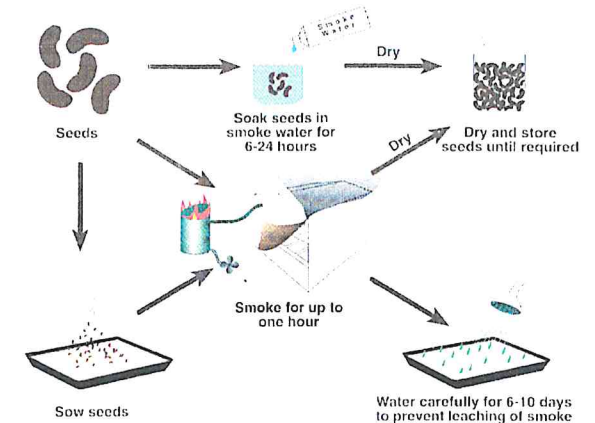
Note: Smoke is highly water soluble and over-watering of seed trays can leach the active agents from the soil before seed dormancy has been broken.

How to Make and Use Smoke

Liquid (smoke water) or aerosol smoke are the two most common methods for applying smoke to soil or seeds.

Nursery Propagation

Seeds can be smoked directly in a smoke tent or alternatively soaked in a dilute solution of smoke water (see below for method) for 6-24 hours. Treated seeds are then dried and sown when required. Alternatively, trays containing sown seeds can be smoked in a smoke tent for 60 minutes and then carefully watered for the first 6-10 days to ensure adequate penetration of the smoke chemicals.



Using smoke for nursery germination

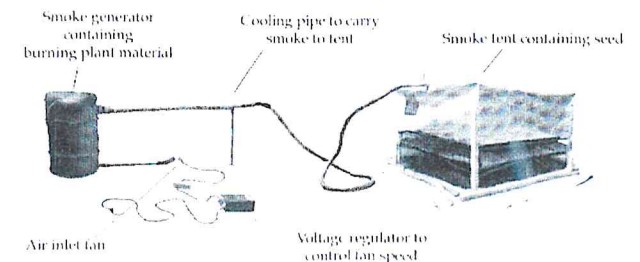
Soil Restoration/Bushland Management

Broadcast seed which has been smoke treated is an effective way to germinate a wide variety of species. Smoke treated seeds used in broadcasting often germinate better including seeds of species which do not normally require smoke for germination under nursery conditions (e.g. Eucalypts, Banksias).

If a seed bank is present in soil then good germination is possible following the addition of smoke either using aerosol smoke (area for treatment is limited using this method) or smoke water (using automated sprayers). A new product, REGEN 2000[®] (see overleaf for supplier details), is a synthesised smoke product which is a more concentrated and cost effective means for broad-acre application of smoke.

Making Your Own Smoke Tent & Smoke Water

The illustration shows a typical smoke tent with smoke generator, cooling pipe and inlet fan. The tent can contain up to three levels of shelving. Leave approximately 30 cm between each shelf to ensure adequate flow of smoke between the shelves.



Components of a typical smoke tent