

SEED GERMINATION DATA SHEET

9. SMOKE AS A SEED PRETREATMENT

Introduction

Following the discovery that smoke stimulated the germination of the rare South African plant *Audonia capitata*, similar research was subsequently conducted by a research team from Kings Park and Botanic Garden in West Perth on Western Australian species.

They found that:

- Smoke can promote earlier and more uniform germination for a variety of species. However, for certain species, smoke or smoke products have delayed germination.
- Smoke enables germination in species previously thought difficult or impossible to germinate by conventional methods e.g. *Eriostomen* (Rutaceae), *Hibbertia* (Dilleniaceae), *Conospermum* (Proteaceae), *Calytrix* (Myrtaceae) and *Pimelea* (Thymelaceae).
- Smoke substantially promotes germination in species with normally low levels of germination e.g. some members of the Liliaceae, Iridaceae, Goodeniaceae, Stackhousia and Violaceae families.
- The promotive effect of smoke is independent of seed size, seed shape and plant life form i.e. whether annual, perennial, herbaceous, seeder (fire sensitive) or resprouter (fire tolerant).
- Certain species e.g. *Bursaria spinosa*, *Drosera gigantea*, *Ptilotus polystachys* and *Schoenia cassiniana* were inhibited by 1 hour of smoke treatment.
- Certain species appear to be inhibited by a direct smoke application but are promoted if smoked after sowing in punnets e.g. *Caesia calliantha* and *Hovea chorizemiflolia*.
- High doses of smoked water can inhibit germination of many species.
- Species not responding to smoke treatment e.g. *Persoonia* were investigated for possible barriers for smoke entering the seed, but all attempts at acid treatment and mechanical scarification were unsuccessful in achieving germination.



N.B. It is also interesting to note that Western Australian populations of *Burchardia umbellata* are difficult to germinate without smoke, whereas Victorian populations germinate readily without smoke, but are still promoted by it.

Methods of Smoke Application

- Direct smoking of seed (usually 1 hour).
- Smoke fumigation in the field with the use of tents.
- Soak seed in diluted smoke water (usually 6-36 hours).
- Direct use of smoked water in the field e.g. minesite rehabilitation (ideally prior to onset of first rains).
- Watering of nursery punnets/trays after seed sowing (be careful not to overwater in first weeks of treatment).
- Use of smoked filter paper in the presoaking of seed.
- Use of smoked filter paper as a germination base in the laboratory.
- Vacuum infiltration using a tap-mounted venturi vacuum pump.

Smoked Water Suppliers

TreeMax (03) 9429 6000, Kings Park and Botanic Garden (08) 9480 3600 Also See FloraBank Fact Sheet 'Equipment Suppliers'.

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SMOKE TRIALS IN MELBOURNE

The Melbourne Indigenous Seedbank, with the assistance of indigenous nurseries, have evaluated a number of smoke methods for species exhibiting a low germination rate or species which have not known to have previously germinated in a nursery or laboratory situation. The major results can be summarised in the following table and at this stage can be viewed as indicative, but further testing is required.

SPECIES NAME	COMMON NAME	SMOKE METHOD	RESPONSE TO SMOKE*
<i>Atriplex nummularia</i>	Old-man Saltbush	Smoke 15-30 mins	Possibly positive but results inconsistent
<i>Atriplex nummularia</i>	Old-man Saltbush	G.A.V. Smoked filter paper	Possibly positive but results inconsistent
<i>Baumea articulata</i>	Jointed Twig Sedge	Smoked	Positive
<i>Billardiera cymosa</i>	Sweet Apple-berry	Smoked 1 hour	Small positive response
<i>Billardiera scandens</i>	Common Apple-berry	Smoked 1 hour	Large positive response
<i>Dianella revoluta</i>	Black-anther Flax-lily	Smoked 1 hour	Large positive response
<i>Enchylaena tomentosa</i>	Ruby Saltbush	Smoked 1 hour	Moderate positive response
<i>Epacris impressa</i>	Common Heath	Smoked 1 hour	Positive
<i>Imperata cylindrica</i>	Blady Grass	Smoked 1 hour	No germination
<i>Isopogon ceratophyllus</i>	Horny Cone-bush	Smoked	Germinates with smoke
<i>Joycea pallida</i>	Silvertop Wallaby-grass	GAV smoked filter paper	Usually moderate to large positive
<i>Lepidosperma longitudinalis</i>	Pithy Sword Sedge	Smoked	Positive
<i>Patersonia occidentalis</i>	Long Purple-flag	Smoked 1 hour	Moderate positive response
<i>Ricinocarpus pinifolius</i>	Wedding Bush	Smoked 1 hour	Very small response (c.f. 0 germination)
<i>Trachymene anisocarpa</i>	Parsnip Trachymene	Smoked 1 hour	Moderate positive response
<i>Tricoryne elatior</i>	Yellow Rush-lily	Smoked 1 hour	No germination

Greening Australia gratefully acknowledges the contribution of the indigenous nurseries who assisted in the evaluations of many germination trials.