

Seed Cleaning and Treatment



The Seedy Side of Plants



Lower Hunter Region
Community Seedbank



AUSTRALIAN Government
envirofund


Natural Heritage Trust
Building Communities Building Australia
An Australian Government Initiative


Hunter Councils
ENVIRONMENT DIVISION


trees
IN NEWCASTLE



Lower Hunter Region Community Seedbank

The objectives of the Seedbank programme are

- To provide facilities for the collection, sorting and storage of local indigenous seed
- To provide the community with education and training on 'best practice' methods used in the collection, sorting and storage of local indigenous seed
- To encourage the community to use local indigenous seed and plants in their revegetation activities
- To promote the 'Florabank' guidelines to the community for the collection, sorting and storage of local indigenous seed
- To maintain an up to date database of all local seed collection records for the community



Lambertia formosa



Lambertia formosa

The objectives of the Community Education and Training programme are

To provide workshops and training notes covering

- Fruit and Seed identification, dispersal and pre-germination treatment
- Seed collection methods and techniques
- Seed cleaning methods and techniques
- Seed storage methods and techniques

Workshops will be designed to encourage the community to use the facilities of the Seedbank for the seed collection, sorting and storage of local indigenous seed from their own local reserves and/or Council areas for their own revegetation activities



INTRODUCTION

Workshop 3: Seed Cleaning and Treatment

Workshop 4: Seed Storage.

Introduction

What happens to the ripe seed after it is collected?

Cleaning, treatment and storage of native seed are very important practices if the seed is going to be at its most viable. Any knowledge we have and can apply to maintaining viable seed, ultimately contributes to the health of our bushland areas, keeping the evolutionary processes continuing.

Cleaning the seed well, treating seed with special considerations and practicing the best methods of storage, will effect the viability of the seed and can be the difference between a high germination rate and none at all.

An understanding of why fruit and seed are designed the way they are helps us know what to do with fresh seed, so an understanding of the natural dispersal identification of the type of seed you have is invaluable (workshop 1).

Flora, fauna and fire observations are invaluable. Understanding the connection and roles of animals, weather, soils and seed types is also an important key to our treatment of seed.

Knowledge in the area of seed treatments for germination is still being accumulated and correlated. Some fruit and seed are difficult to germinate for one reason or another. Viability time frames and dormancies, are just starting to really be known and understood.

This workshop is designed to support our natural seed resource by understanding and preserving what we hold in our hands, in the best way possible.



Seed Cleaning and Treatment

Collection Records
Occupational Health and Safety
Vacuum Separation Cleaning Methods
Hand Cleaning Methods
Cleaning Seed Types
Pre-germination Treatments
References
Acknowledgements





COLLECTION RECORDS

When seed is collected the following information will be recorded:

- species
- location
- date
- who collected



Dry seed will generally be picked and placed in a paper bag when ripe, but may need to be left in the bag until completely dry or the valves or pods etc are opened and seed is ready for release.



Most seed waiting to be cleaned should be placed in an airy dark space, free from pests, direct sunlight and moisture.

The type of seed, and the time the seed has been in the paper bag is important information for the seed cleaner. Woody capsules, most soft woody capsules, pods and papery capsules especially, need to be left long enough in a bag to open properly, for ease of cleaning.

Other seed such as follicles may need extra heat after being in a drying bag for the same amount of time.

Seed viability and freshness diminishes if dry seed has been left in a paper bag too long before cleaning and proper storage commences.

The aim of cleaning is to release the seed from germinating inhibitors and casings or flesh without damaging or breaking the seed.

Removal of all contact with any pest present is also very important. Removal of live pests can be time consuming and difficult depending on the seed type you have. Some times they can be removed with a sieve or they might simply be squashed.



The most effective method by far is with the use of CO₂ which kills them on contact.

It is also important to discard seed that has any signs of disease as germination may be inhibited, or the new plant will be weakened or begin life with the disease of the parent plant.



OCCUPATIONAL HEALTH AND SAFETY

Some parts of the seed may be harmful if ingested or may cause skin or eye or lung irritation. Some plants are toxic or may cause allergic reactions. Dusts and powders from some seeds can present a problem especially for asthmatics. Most seed will present little problem, however, a risk assessment must be done prior to contact with the seed and control of the risk must be adhered to.

Arising problems

Sharp tools like side cutters, Secateurs and scalpels need to be used with care and attention and safety gloves where possible.



Spiders, centipedes and other biting insects will be encountered in the drying bags. It is therefore best to tip the contents out into a bowl rather than delve the hands into the material to give the crawlies a time to escape.



Moulds may be encountered in the bags if seed was not dry when picked or fruit was left instead of being treated and sown. Always wear gloves and a respirator if this is a problem, though there is a distinct possibility that seed will no longer be viable and should be thrown away.



Food consumed in seed cleaning areas should be avoided

Body fatigue happens when you sit in the one spot for a long time. It is therefore necessary to get up and move about every hour to stretch your muscles.



Alectryon subcinereus



Angophora costata



Alphitonia excelsa



The following is a guide:

Spiky seed casings and spiky leaves and twigs- use leather gloves and safety glasses *Hakea spp., Lomandra spp.*



Hakea teretifolia

Seed with fine sharp hairs -use leather gloves at rubbing stage and then latex or vinyl to handle tweezers if necessary. Safety glasses and cleaning seed outside or with a ventilator is also recommended.

Hibbiscus spp. , Bracychiton sp. Isopogon sp.



Isopogon anemonifolius

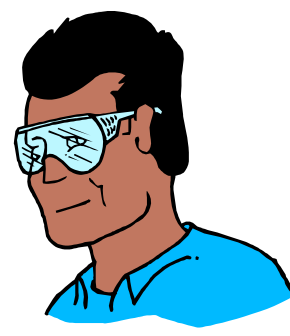
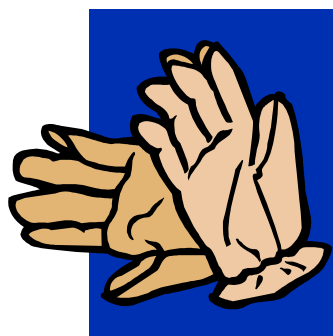
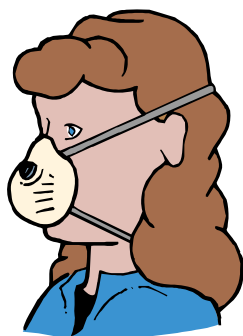
Acid coatings -seeds have a potential allergic reaction. Use latex or vinyl gloves and safety glasses *Hibbertia spp.*

Dusty seed -accumulation of dust is dangerous for lungs. If you can see or smell dust you are breathing it in. A dust extractor or seed cleaning extractor should be used where large quantities are to be cleaned. A mask and glasses must be worn. Otherwise dusty seeds should be cleaned in a well ventilated space with a dust mask or outside.

Grass species , Banksia species



Banksia serrata





Seed Germination and Treatment Table— for a few species

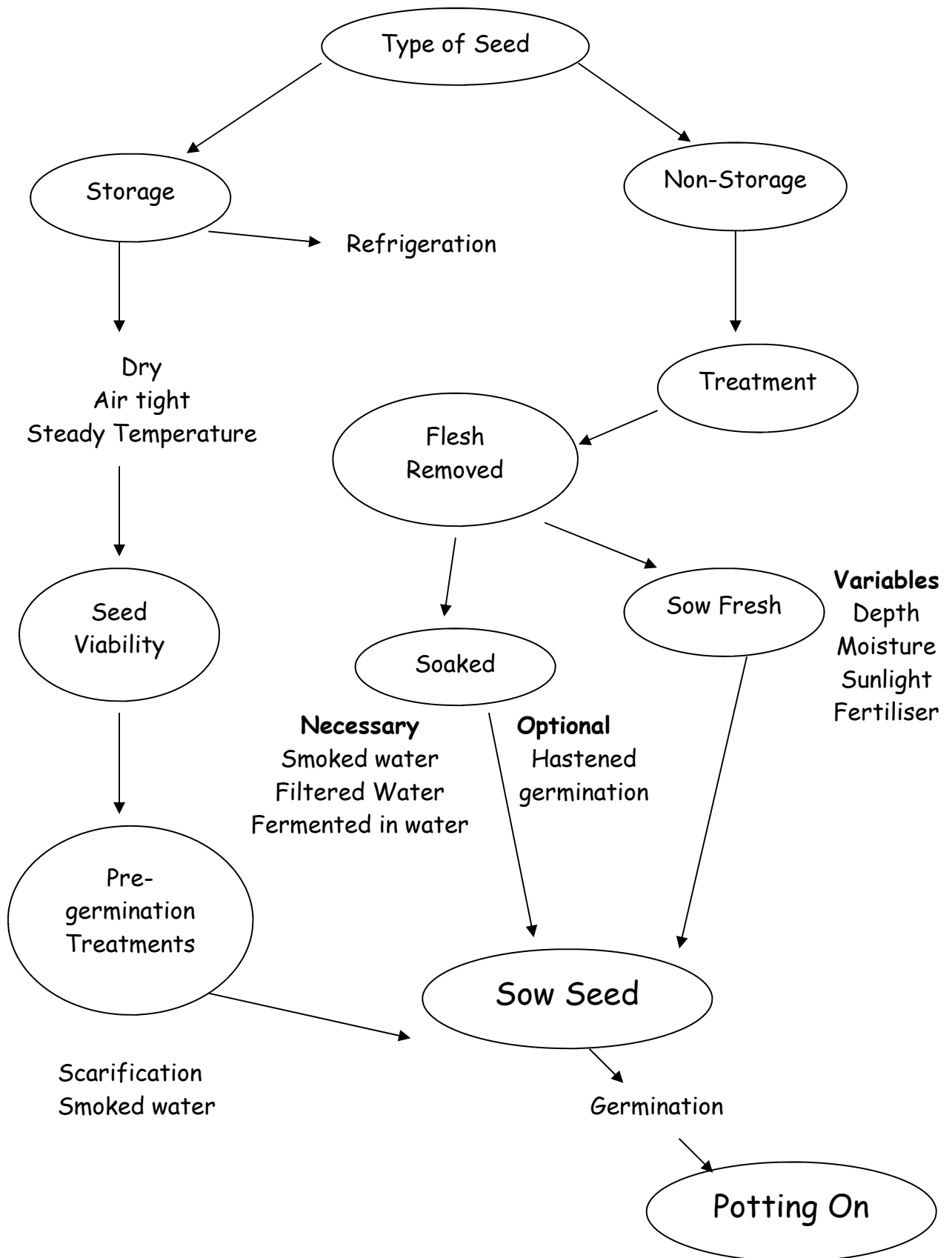
Botanicalname	Commonname	Family	Typeof fruit	Ripe	Germination Treatment	Dispersal method	Storage	Storage viability	Cuttings	Germinationlength	TINexperience
Acaciafimbriata	FringedWattle	Mimosaceae	Pod	Nov-mid Dec	Boilingwater/ Scarification.~25 viableseeds/gm		Dry				BoilingH ₂ O, successful.
Allocasuarina verticillata	DroopingShe -oak	Casuarinaceae	Cone		Smoketmt.Best ifinoculatedwith <i>Frankia</i> spp whensown. Viability~120 - 270seeds/gm.		Treatwith fungicide& insecticide. Dry,room temp.	Atleast5 yrs.		2-6wks.25 - 30°Cbest.	
Aotusericoides	Aotus	Fabaceae	Pod	EndOct - Nov	Boilingorhot watertmt(70 - 100°C),ordry heat(80 -100°C). Nickingmay help.	Ants		Long.		3-6wks. Avoidover - wateringas pronetorot.	BoilingH ₂ O successful.
Austrostipa pubescens	TallSpeargrass	Poaceae	Grain		After-ripening periodmay be2 -24months. Removalofhusk maypartially overcome dormancy, smoketmtmay helpolderseed.		2-24 months.			3-10wks withnon - dormant seed.	
Banksiaserrata	OldManBanksia	Proteaceae	Follicles	Allyear	Viability~18 seeds/gm.			Atleast3yr		Possibly slow.	3yroidseed successful
Billardierascandens	Dumplings,Apple -berry	Pittosporaceae	Berry	Jun-Apr	Removeseed frompod.Clean seedindiluted detergent.				Easilygrown.	8-10wks.	SoakedH ₂ O 8days;fermented 21days.
Bursariaspinosa	Blackthorn	Pittosporaceae	Papery capsule	Apr-Aug, Nov	Stratification,2 ⁰ -4 ⁰ for3 -4wk	wind	dry	8years	yes	SowinJul - Aug.4 -6wk, maybeerratic.Need 10 ⁰ day/5 ⁰ night,prone todamping off.	2yroidseed successful

Carex gaudichaudiana	TuftedSedge	Cyperaceae	Nut	EndDec	Bogmethod. Doesn'tsetseed regularly.					Easily propagated bydivision		
Dillwyniareorta	ParrotPea,Eggsand Bacon	Fabaceae	Pod	MidOct - earlyDec	Boilingorhot watertmt(70 - 100°C),ordry heat(80 -100°C). Nickingmay help.	fire	Dry,5-10 years			Canbe grown		BoilingH ₂ O, very successful
Eupomatialaurina	BolwarraNativeGuava	Eupomatiaceae	Achene	Apr-Jun May,Jul, Aug	Fresh-remove pulp	Hostspe- cificWeevil	Dryand refrigerate	1-2days	Slow	19-35days		Sownfresh, removed flesh: successful
Isolepispodosa	KnobbyClubRush	Cyperaceae		Oct-Dec, Feb-Apr, Jun,Aug	Bogmethod. Smoketmtmay help.Sow shallow-light maybeneeded.			Atleast2 yr.TIN success 2.5yr		4-5wks,sow latespring/ early summer		Successful withsmoked H ₂ O(?) (>1000plants/batch)
Leptomeriaacida	NativeCurrant,Acid Drops	Santalaceae		Sep								
Lissanthesapida	NativeCranberry	Epacridaceae		LateOct	Propagationfrom seedisdifficult. removeflesh, mayneed1yr naturalweathering, thensmoke, possalsoheat.			Possibly several years	Usually grownfrom cuttings, whichare slowtostrike.			
Prostantheraincana	VelvetMint -bush	Lamiaceae			Resultsmaybe erratic. Seed viabilitymaybe lowinheavy seedcropyears. Smoketmtmay help.			Useseed thatisless than6mths old.	Cangrow fromcuttings withaheel takenfrom youngplants only.	3-10wks. Sowinlate win/early spr.Cover lightly.		
Xanthorrhoea macronema		Xanthorrhoeaceae		Dec- Feb, May-Jun	Mostsppgood resultsfrom seed.Coldtmt mayhelpsome spporsmoke tmt.			Fresh recommended butsome sppmaybe okfor years.		Somespp mayneed4 - 52wks.Slow growing, maytake2 -3 yrtoreach plantable size.		





Treatments and methods of sowing and propagating native plants





VACUUM SEPARATION SEED CLEANING METHODS

The purpose of this machine is to clean seed by lifting out the lighter material by a vacuum stream of air and dumping it into a separate compartment to the heavier material. The lighter material can be the seed or the chaff, depending on the seed type. The electric fan has a speed control to vary the force for light and heavier seed or chaff. As a rule light seed needs a lower setting. The machine also has several filter screens to catch the dust sucked from the batch but it won't catch very fine dust. It needs to be cleaned regularly.



An induction for the use of this machine has identified the following problems:

Creation of a dusty work environment- dictates the installation of an exhaust duct and a limit of persons involved in the operation at any one time wearing a dust mask and safety glasses.

Noisy environment -speed up to 4 on the dial is not too bad but speeds higher than this can get quite noisy. There shouldn't be a need to have it too much higher than 5 for more than a minute, but ear plugs may be necessary especially if use is continuous.

Under no circumstances should this machine be used for the following seeds:
Isopogon spp., *Hibiscus sp*, *Brachychiton spp*, mouldy seed

The following genus have seed which is too fine and will fall through the dust mesh:
Callistemon, *Leptospermum*, *Melaleuca*, *Eucalyptus*

For best results use it on the following:

Gahnia- seed size and weight will vary the speed setting, 90% of the chaff will be extracted.

Acacia- seed size will vary the speed setting, some seed sucked up will usually indicate an empty seed casing or an underdeveloped seed.

Lomandra- husks will be sucked out

Casuarina, *Allocasuarina*- can suck loose seeds from cones

Bossiaea, *Daviesia*, *Dillwynia*, all the pods, varying sizes and speed settings

Ozothamnus- seed is very light

All other seed types are worthy of a trial



HAND CLEANING METHODS

Heat Extraction

Usually for woody cases methods include fire, oven, hot room and BBQ plate



Water Extraction

Method uses washing to remove pulp, or aril, but can be used as soaking for some soft woody capsules which should not be opened by direct heat.

Chemical Extraction

COKE and SUPHURIC ACID can be used for hard and stubborn testa, by placing inside a jar with lid and monitoring for several days.



Shaking and Threshing

Method of placing seed inside a paper or cloth bag and shaking and threshing until the seed has been totally released



Rubbing and Crushing

Method of placing seed into a wire sieve and rubbing and crushing until the seed is totally released.

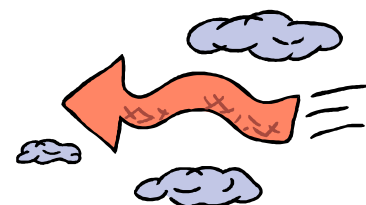
Removal by Hand

Often the method used for stubborn seed easier to be removed by tweezers or fingernails, or by tapping the individual seed.



Wind and vacuum

Method is used for seed which is hard to divide from its papery capsule or light parts, a vacuum is used above the seed but care should be taken not to suck up the seed. Equally wind can be a tool but is a little harder to control. Winnowing can be used by gently turning the seed by hand, letting the lighter husks dispart into the air.





CLEANING SEED

Generally the type of seed, because it is designed for certain dispersal methods, dictates the cleaning and storage it should have.

WOODY CAPSULES

Capsules must be hard and dry or stored in a paper or cloth bag in a warm and airy place until they are dry so as the valves open. Seed must be removed from the hard capsule via the open valves before germination or storage by shaking and thrashing in a bag or wire mesh.



Eucalyptus robusta

PAPERY CAPSULES

The outer casing must be removed for storage or germination, when seed is ripe and capsule has turned a brown colour, or dried. The Papery Capsule is easy to remove by crushing and thrashing and rubbing with the use of a wire sieve, and also with use of vacuum.



Dodonaea triquetra

SOFT WOODY CAPSULES

Capsules are not hard to remove if they are dry, however *Alphitonia excelsa* needs to be placed in a little water in a bowl in the sun until the water dries up, this is repeated until the case splits releasing the seed for storage or germination.



Alphitonia excelsa

LEGUMES OR PODS

Outer casing or pod must be removed by crushing a wire sieve or in a plastic bowl by hand or cloth bag.



Acacia suaveolens

DRUPES AND FLESHY FRUIT

Fleshy casings must be removed before the seed can be germinated. Often the best method is to remove the aril in water by hand. Some fruit will need the use of gloves because of the acidic content and dermatological reaction of the skin. For example *Cassine australis* and *Solanum aviculare*



Persoonia levis



BERRIES

Washing to remove pulp if sowing immediately or storing dry, is recommended.



Dianella caerulea var producta

FOLLICLES

Heat the cone or hard casing to release the seed - on a BBQ, in a fire / oven, stove, dry and warm room.



Hakea gibbosa

NUTS

Remove seed from dried outer casing by thrashing and rubbing. Scizocarps must be placed in a bag until casing is completely dry where shaking gently will release the very fine seed.



Gahnia clarkei

GRAINS

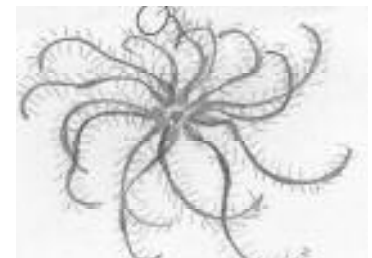
Remove outer casing by thrashing and rubbing and winnowing.



Themeda australis

ACHENES AND CYPSELAS

Shaking in paper bag, thrashing, winnowing or blowing rubbing in seed sieve.



Clematis

CONES

Break apart or use heated room to release the seed.



Allocasuarina distyla



Pre-Germination Treatments

Woody Capsules
Papery Capsules
Soft Woody Capsules
Legumes or Pods
Drupes or Fleshy Fruit
Berries
Follicles
Nuts
Grains
Achenes and Cypselas
Cones



Acmena smithii



PRE-GERMINATION TREATMENTS

Treatments aim to mimic the dispersal methods of the seed and often this also includes how the seed is released from its hiding place. Because of the different types of forest and aspects the plant species exists in, some seed have developed certain dormancy techniques to make sure germination will occur in the most optimum place and times for survival. Fermenting and leaching are used to rid the seed of substances which inhibit germination. Some seed does not need pre-germination treatment and when it reaches the ground will germinate readily. Other seed will take a long time to germinate or not at all unless there has been a fire. Fruit seems to be designed to go through the stomach of an animal to help break the hard testa. It is known that native fauna feed on all kinds of seed and fruit, and that rainforest trees in particular are the product of fauna dispersal. The birds, bats or other animals eat the seed or fruit whole and in flight or sitting on another tree, excrete it. If it is deposited in the best position for maximum germination, the plant will start to grow.

OH&S Recommendations

Methods using sulphuric acid should be done with care in a well ventilated area, rubber gloves and safety glasses must be worn, and rinsing water must be on hand. Methods using fire should be in an outside area, long leather gloves and safety glasses must be worn.

Pre-germination Methods Include:

Stratification - placing the seed in a bag or prepared seed tray in the fridge for several weeks or overnight.

Scarification - cutting, scraping, nicking or pouring boiling water over the seed coat for water penetration.

Soaking - softening the testa, and allowing water in. Seed is placed in a jar overnight or for a couple of days.

Fermenting and Leaching - Place seeds in a sealed plastic bag or jar in the sun for several days or weeks. Wash and leach in a nylon stocking in a cistern for 3 weeks. Each treatment may be done without the other for certain seeds.

Freezing - used mainly for plants at high altitudes or affected by snowfall.

Smoked water - Used at 1/5 dilution to mimic rain after a fire.



Pre-germination treatments of seed types

The following information is general to the types of seed and fruit and any exceptions to the treatments, will be covered in the spreadsheet provided.

WOODY CAPSULES

Seed must be out of capsule for germination. Can hasten germination with 1/5 diluted smoked water, but is not necessary. Eucalypts from snow or ice habitats should be stratified for success.



Melaleuca nodosa

PAPERY CAPSULES

Seed must be out of capsule for germination. Treatments vary with different Genus, however usually no treatment is required.



Lomandra longifolia

SOFT WOODY CAPSULES

Seed must be out of capsule for germination. Some may need smoke treatment others will readily germinate with a short soak in water.



Glochidion ferdinandi

LEGUMES OR PODS

Scarification required and care needs to be taken not to cut the area where the seed will germinate.



Acacia terminalis

DRUPES AND FLESHY FRUIT

Many different ways of allowing water into the testa have been tried, e.g. fermentation, soaking in water overnight, chemical soaking, all methods help to allow water into the testa for germination. Smoked water treatment and breaking the testa with a hammer have also been used successfully; however this depends on the species as the seed can be damaged this way. For the various fleshy seed examples refer to the spreadsheet.



Elaeocarpus reticulatus



BERRIES

Generally just washing and cleaning is enough for germination, but they can be soaked in water for 24 hours to speed up the process.



Ficus coronata

FOLLICLES

Can be soaked for a couple of hours to speed up the process (depending on species), but generally not required as germination occurs readily. The seeds may germinate faster when soaked or watered with smoked water.



Banksia integrifolia

NUTS

Can be soaked for a couple of hours in water but will germinate readily with no treatment at all. Schizocarps like *Westringia fruticosa* may respond to smoked water.



Gahnia melanocarpa

GRAINS

Some grains need stratification by placing them in a bag or prepared seed tray and placing in the fridge for a couple of weeks, then bringing them out to temperatures up to 24°C to activate germination.



Themeda australis

ACHENES AND CYPSELAS

No treatment – just add water for germination with the exception of *Pimelea* which needs prompting with smoked water.



Brachycome multifida

CONES

Isopogon, and *Petrophile* don't seem to need any treatment, but may respond faster to smoked water. Fermentation and leaching or soaking can be undertaken for 3 weeks for *Macrozamia*, or cycads.



Isopogon anemonifolius



REFERENCES

Blombery, A.M & Malohey, B. *Propagating Australian Plants*. Kangaroo Press, NSW, 1994

Floyd, A.G. *Rainforest Trees of Mainland South-eastern Australia*. Inkata Press Melbourne. 1989

Greening Australia *Local Native Seed Collection, ' Processing and Storage*. 1998

Greening Australia *How to Germinate Native Tree and Shrub Seed*. National Capital Printing ACT. 1991

Ralph M. *Seed Collect on of Australian Native Plants, For Revegetation, Tree Planting and Direct Seeding*, Fitzroy, 1994

Robinson, L. *Field Guide to the Native Plants of Sydney*., Australian Print, Victoria, 1994



Acacia echinula



Blandfordia grandiflora



Styphelia laeta



Billardiera scandens



Pultenaea palacea var palacea



ACKNOWLEDGEMENTS

Barb Nanshe: Seed Cleaning and pre germination treatment information, Fruit and Germination table & Clematis drawing

Nina Blake-Goh- Fruit and Germination table

Peter Sanderson: Photographs

Suzanne Pritchard: Desktop Publishing

Trees In Newcastle Volunteers and Staff



252 Parry Street,
Newcastle West , 2302
Phone: 4969 1500
Fax. 4927 6821
email tin@bravo.net.au



AUSTRALIAN Government
envirofund



Natural Heritage Trust
Helping Communities Helping Australia
An Australian Government Initiative

Hunter Councils
ENVIRONMENT DIVISION