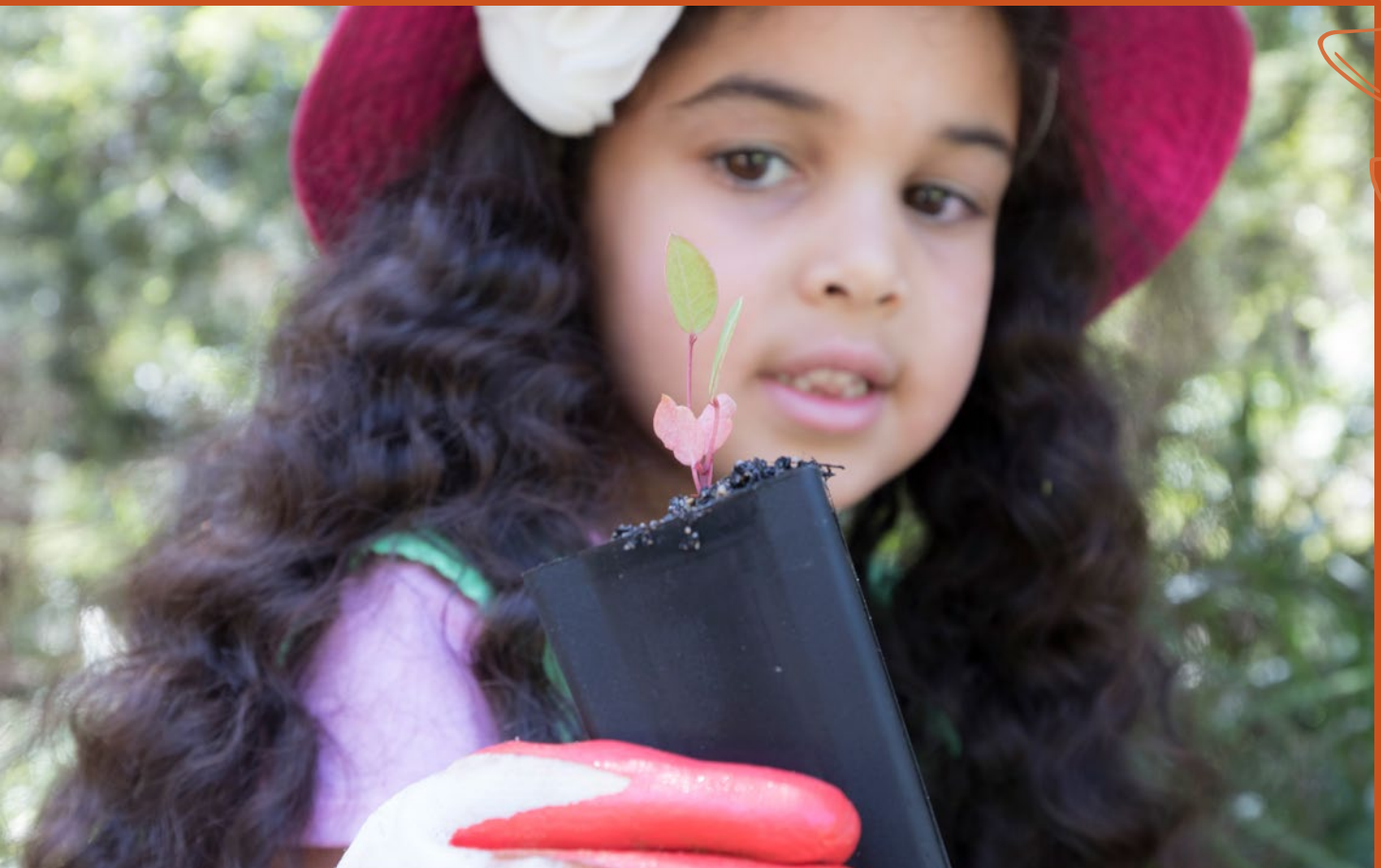




Australian National
Botanic Gardens

Alive with learning

Plant Propagation



This learning resource is intended to be used as a stand-alone information document to advise teachers on appropriate planting techniques for different Australian Plants.



Australian Government
Parks Australia

Using this resource

This document provides advice on suitable propagation techniques for a variety of Australian plant species. This information is intended to be used with students from Foundation to year 12.

It contains:

- Information on collecting seeds
- Specific Australian plants and seed collecting techniques
- Information on how to propagate plants from seed
- Information on how to propagate plants from cuttings
- Links to information on the Gardens and National Seed Bank, horticulture and seed collecting procedures
- Information on specific plants, when to plant, ease of propagation and seed pre-treatment required
- Glossary
- References



Propagating Australian Plants

For further information on the Gardens' horticultural, seed collecting, and propagating procedures please see our website – <http://anbg.gov.au/gardens/living/horticulture/index.html>

Successful propagation

The two most common methods of plant propagation are:

- from seed (sexual)
- from cuttings (asexual or vegetative)

Most plants can be propagated by one or both methods. Each method has advantages and disadvantages.



Propagation from seed	
Advantages	Disadvantages
<ul style="list-style-type: none">• Some seed can be collected and stored for long periods of time and still be capable of germinating.• Many plants can be produced from seed.	<ul style="list-style-type: none">• Plants propagated from seed are not clones, they are not genetically the same as the parent plant. Therefore, they can vary in appearance. For example, the plants can vary in overall size and shape and the leaves and flowers can vary in size, shape and colour from plant to plant.• Many species are difficult to grow from seed. For example, the seeds of many <i>Boronia</i> species do not germinate quickly, if at all. Many Australian plants have seeds that require special treatments to break their dormancy.• There are several plants which we cannot germinate from seed. This is probably because we do not know the special conditions required to break dormancy or trigger a growth response.

Propagation from cuttings	
Advantages	Disadvantages
<ul style="list-style-type: none">• Propagation from cuttings is a vegetative method and therefore each plant produced is genetically identical to the parent plant.	<ul style="list-style-type: none">• Cuttings should be made as soon as possible after the plant material is collected. However, if kept cool, moist and free of fungus, some plant material can be stored for several days.• Not all species of plants can be propagated from cuttings. Cuttings taken from species of <i>Eucalyptus</i> do not readily form roots. This is also the case with many <i>Acacia</i> species and most monocotyledons, e.g. grasses.

Propagating from Seed



Collecting, preparing and storing seeds

A few tips

- Use old envelopes or cotton pillow cases for collecting and drying your seeds. Avoid plastic bags or glass jars.
- Place the bags of woody fruits on a window sill in the sun for speedy seed release.
- Store the seeds in a dark, cool place in a dry, airtight container. A relative humidity level of 16% or less is ideal.
- Write on the package the name of the plant, the date and the place where you collected the seed.



Acacia species (wattles)

Autumn is the best time to collect wattle seeds. The seeds are released as the pods ripen, so collect the pods when they are turning brown. Remove the seeds by splitting the pods open along the seam of the pod. Some pods burst open with such force that they send the seeds flying – on quiet, hot days you may even hear them exploding!

Wattle seeds have a very hard seed coat that must be ruptured before the seed can absorb water and germinate. One way to break the seed coat is to soak the seeds in near-boiling water and allow to cool. Discard any floating seeds before planting, they are likely to be infertile. Alternatively you can rub the seeds with sandpaper (scarification) to abrade the hard seed coat.



Acacia melanoxylon seed and seed pod



Banksia integrifolia subsp. *compar*

***Banksia* species**

Collect woody banksia fruits which are at least one year old and have lots of large, velvety bumps called follicles – the seeds are inside these bumps.

The follicles of many banksia species open and release the seeds only after they are heated, as in a bushfire. You can copy nature by baking the cones in the oven at 100°C for about 20 minutes. Remove the seeds from open follicles when the fruits have cooled by using tweezers or gently knocking the fruits on a hard surface.

***Callistemon* species (bottlebrushes)**

The woody fruits of bottlebrushes stay on the plant for 2 to 3 years before they release the seeds. To collect seeds, select old fruits lower down the branches (with capsules still tightly closed), place them in a brown paper bag and leave in a warm spot. After a few days the seeds will be released. You can then plant them without any special treatment.



Callistemon sieberi flower and fruit



Eucalyptus cosmophylla seed

***Eucalyptus* species (gums)**

As gumnuts mature, they change from green to brown and woody. Pick the brown woody fruits and place them in a paper bag in a warm position. The gumnuts release the tiny seeds as they ripen. Separate the seeds from the chaff by gently blowing away the chaff. Eucalyptus seeds generally take about 2 weeks to germinate.

***Xerochrysum* species (paper daisies)**

Catch them if you can! These seeds have little parachutes for dispersal by wind. Collect the old flower heads when they are looking fluffy. If you are going to store the seeds for a while, place the dry seeds in a dark jar in the fridge for a couple of days to kill any insects. Most daisy seed is best used when it is fresh. It generally germinates within a few days or possibly a little longer.



Xerochrysum bracteatum flower and seed

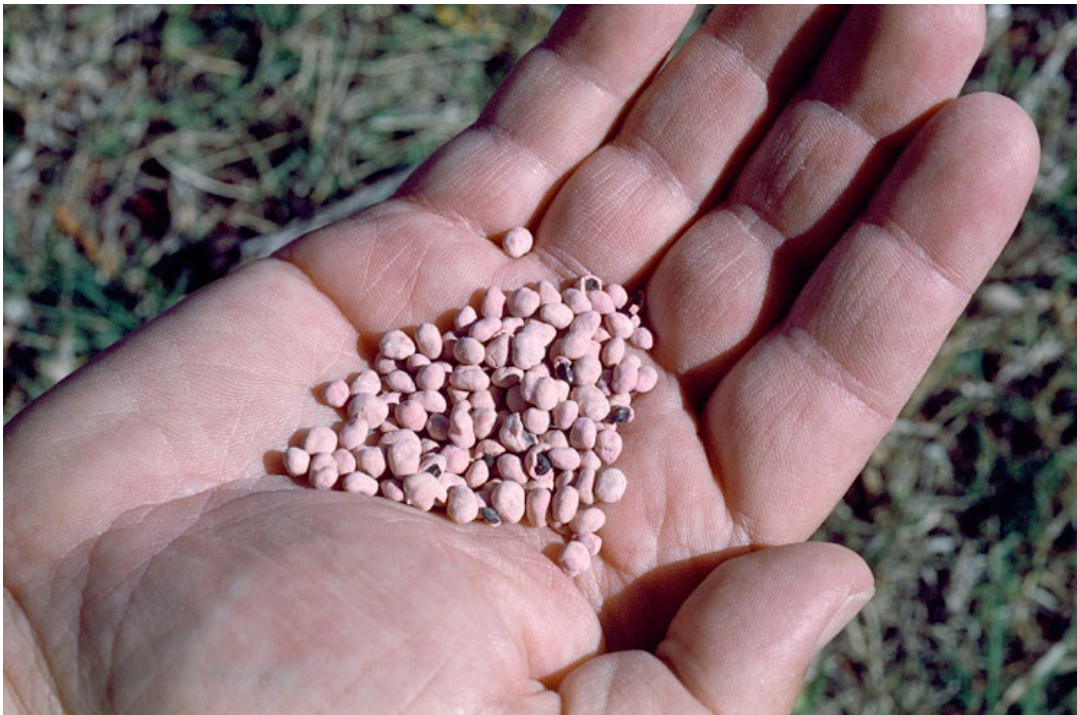
Using Smoke

Smoke or smoke water is often used in the propagation of Australian plants that are reliant on fire for germination. More information on this process can be found online:

<https://www.bgpa.wa.gov.au/about-us/conservation/research/seed-conservation/2479-smoke-to-sow-and-grow>

How to propagate from seed

- Ensure the seed is fresh, mature, and insect- and disease-free.
- Pre-treat the seed if necessary. Refer to Appendix 1 for seed pre-treatment.
- Sprinkle a small amount of seed on the surface of a free draining seed mix in a punnet. You can purchase some seed and cutting potting mix or mix your own – equal parts coarse river sand and vermiculite is suitable.
- Cover lightly with sifted sand so that the seed is buried to a depth about equal to its thickness.
- Water the punnet carefully and place it on a capillary bed in a warm spot. Do not allow the mixture to dry out. For information on how to make a simple capillary bed, there are many resources online.
- Re-pot the seedlings – Prick out the seedlings once germination has occurred and the cotyledons (seed leaves) are large enough to hold, the seedlings can be pricked out into small pots containing a suitable potting mix.



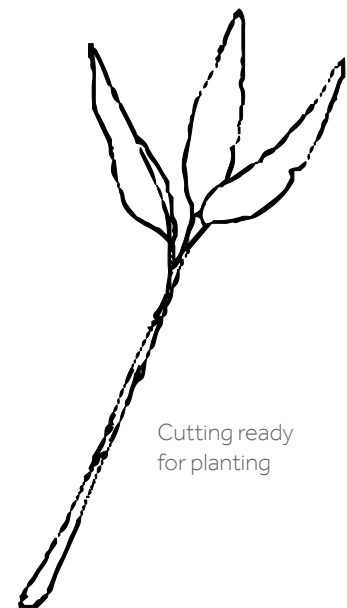
Propagating from Cuttings

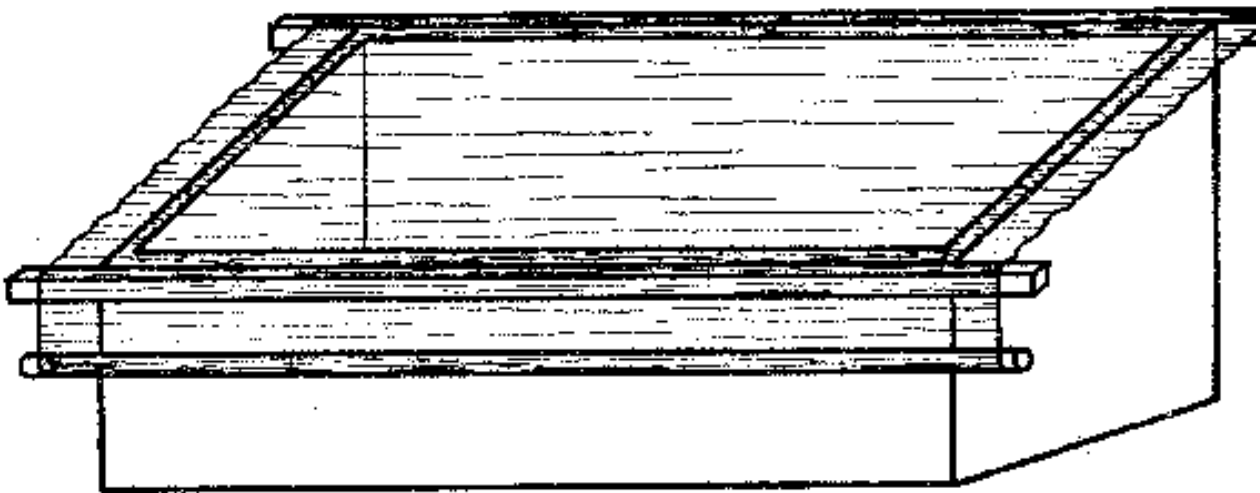
Preparing cuttings

- Collect shoot tips 8-12 cm long, preferably in the morning or evening. The plant material should be semi-mature, i.e. semi-hardwood.
- The best time to take cuttings is late spring or early summer. Cuttings taken at other times will often root but may take much longer, although there are many exceptions.
- Carefully remove the leaves (and leaf stalks) from the bottom half of the cutting and recut the base just below a node, as shown in the diagram.
- Treat the base of the cutting with a preparation of rooting hormone. Some plant species will form roots without being treated with a hormone.

Note: Care at all times is essential when using hormone solutions. Follow all directions as stated on the product.

- Where possible, use a small propagation box. Fill a punnet with a cutting medium which can be purchased commercially or made. A sterilised mixture of 5 parts vermiculite to 1 part cocopeat is ideal. Use boiled water for sterilising.
- Carefully place the cutting in a hole and gently firm the cutting medium around it.
- Insert the cuttings at about 1.5 to 2 cm intervals, depending on the size of the species used.
- Place the punnet containing the cuttings in a warm, humid place which receives filtered sunlight. A small propagation box can be purchased in a variety of designs or alternatively, made, as shown in the image on page 8.
- Cuttings take 4-10 weeks or longer to root, depending on the species.
- Note: to help ensure the success of your cuttings, strict hygiene practices must be followed, i.e. working surfaces and secateurs should be sterilised with a dilute solution of bleach or methylated spirits. Pots may be washed thoroughly in water with household detergent.





Simply constructed propagation frame with timber base and roll-up heavy duty polythene cover.



Appendix 1

Propagation methods for selected native plants



Easy to propagate



Scarification – abrade seed coat with sandpaper or file






















Pour near boiling water over seeds and leave to cool



Sun drying woody fruits

<i>Acacia</i>	Seed	Aug-Sept
<i>Allocasuarina</i>	Seed	Summer and Mar-May
<i>Angophora</i>	Seed	Sept-Nov
<i>Anigozanthos</i>	Division (virus tested stock)	Sept-Nov
	Seed-fresh	Sept-Nov
<i>Araucaria</i>	Cuttings Seed	Dec-Feb
<i>Asplenium</i>	Spores – 2-3 weeks after ripening Division	Mar-May
<i>Backhousia</i>	Seed	Sept-Nov
<i>Baeckia</i>	Soft tip cuttings	Dec-April
<i>Banksia</i>	Seed Soft tip cuttings	Sept-Nov
<i>Bauera</i>	Soft tip cuttings Seeds 8 weeks to germinate Layering	Sept-Oct
<i>Billardiera</i>	Seed-difficult Division Soft tip cuttings	Mar-May
<i>Blandfordia</i>	Seed	Sept-Nov
<i>Boronia</i>	Soft tip cuttings	Sept-Nov
<i>Brachychiton</i>	Seeds (wear gloves & mask – often hairs surrounding seeds) Graft onto seedling understock	Sept-Nov Sept-Nov
<i>Brachyscome</i>	Seed Soft tip cuttings Division	Sept-Nov any time Mar-May
<i>Brachysema</i>	Seed Soft tip cuttings	Sept-Nov Mar-Apr
<i>Bracteantha</i>	Seed Soft tip cuttings	all year
<i>Callistemon</i>	Seed from one-year-old woody fruits Soft tip cuttings	Sept-Nov Dec-Jun
<i>Callitris</i>	Seed-viable for several years	Mar-May
<i>Calothamnus</i>	Seed-place one-year-old or older woody fruits Soft tip cuttings	Sept-Nov
<i>Cassia</i>	Seed Soft tip cuttings	Sept-Nov Dec-Mar

<i>Clematis</i>	Seed-fresh	Sept
<i>Correa</i>	Soft tip cuttings 	Jan-Mar
<i>Crowea</i>	Soft tip cuttings	Jan-Mar
<i>Cyathea</i>	Spores – 2-3 weeks after ripening	Mar-May
<i>Dampiera</i>	Soft tip cuttings 	Sept-Nov
<i>Darwinia</i>	Seeds cuttings	Sept-Nov
<i>Dendrobium</i>	Division	Mar-May
<i>Dianella</i>	Division	Mar-May
<i>Dicksonia</i>	Spores – 2-3 weeks after ripening	Mar-May
<i>Dillwynia</i>	Seed   Soft tip cuttings	Dec-Mar
<i>Dodonaea</i>	Soft tip cuttings	Sept-Nov Dec-Mar
<i>Doryanthes</i>	Seed-soak for several hours 	Sept-Nov
<i>Drosera</i>	Division Leaf cuttings	Mar-May Sept-Nov
<i>Dryandra</i>	Seeds	Sept-Nov
<i>Epacris</i>	Seeds Soft tip cuttings	Sept-Nov Dec-Mar
<i>Eremophila</i>	Soft tip cuttings 	Sept-Nov
<i>Eriostemon</i>	Soft tip cuttings 	Mar-May
<i>Eucalyptus</i>	Seed	Sept-Mar
<i>Ficus</i>	Seed-fresh cuttings	varies
<i>Gahnia</i>	Seed Division	Mar-May
<i>Goodenia</i>	Seed Stem cuttings, stolons	Dec-Feb
<i>Grevillea</i>	Soft tip cuttings	Dec-Mar
<i>Hakea</i>	Seed (sun dry woody fruit) Soft tip cuttings	Sept-Nov Dec-Apr
<i>Hardenbergia</i>	Seeds    Soft tip cuttings	Sept-Nov Mar-Apr
<i>Hibbertia</i>	cuttings	Summer
<i>Hovea</i>	Seed  	Summer
<i>Indigofera</i>	Seed   	Sept-Oct
<i>Isopogon</i>	Seed Soft tip cuttings	Sept-Nov Feb-Mar
<i>Jasminum</i>	Seed-pre-treatment	
<i>Kennedia</i>	Seed    Soft tip cuttings	Sept-Nov Dec-Feb
<i>Kunzea</i>	Soft tip cuttings 	Feb-Apr
<i>Lambertia</i>	Seed Soft tip cuttings	Sept-Nov Feb-Apr
<i>Lechenaultia</i>	Soft tip cuttings	Sept-Nov

<i>Leptospermum</i>	Seeds  Soft tip cuttings 	Sept-Nov May-Jun
<i>Livistonia</i>	Seed	
<i>Lomandra</i>	Seed Division	Mar-May
<i>Macadamia</i>	Seed – as soon as ripe (6 months to germinate) Graft	
<i>Macrozamia</i>	Seed	
<i>Melaleuca</i>	Seed  Soft tip cuttings  Soft wood cuttings	Sept-Nov Sept-Nov Dec-Mar
<i>Melia</i>	Seed (poisonous) Soft tip cuttings	Sept-Nov
<i>Myoporum</i>	Soft tip cuttings 	Sept-Mar
<i>Nothofagus</i>	Seed	
<i>Olearia</i>	Soft tip cuttings	
<i>Pandorea</i>	Soft tip cuttings Seed	Sept-Mar
<i>Pepperomia</i>	Leaf cuttings 	all year
<i>Persoonia</i>	Seed (difficult) Soft tip cuttings	Sept-Mar
<i>Phebalium</i>	Soft tip cuttings	
<i>Pimelea</i>	Soft tip cuttings 	Nov-Dec
<i>Pittosporum</i>	Seed	
<i>Pomaderris</i>	Seed	
<i>Prostanthera</i>	Soft tip cuttings	Nov-Dec
<i>Pultaneae</i>	Seed cuttings	Sept-Nov
<i>Quandong</i>	Seed (moist, dark, stratification)	
<i>Scaevola</i>	Soft tip cuttings	
<i>Sollya</i>	Seed  Soft tip cuttings	Sept-Nov
<i>Syzygium</i>	Soft tip cuttings	Dec-Mar
<i>Telopea</i>	Seed Soft tip cuttings	Jun-Jul Sept
<i>Thryptomene</i>	Soft tip cuttings	Sept-May
<i>Verticordia</i>	Soft tip cuttings	Sept-Nov
<i>Viola</i>	Division 	all year
<i>Westringia</i>	Soft tip cuttings 	Mar-May
<i>Xanthorrhoea</i>	Seeds	Sept-Nov
<i>Zieria</i>	Soft tip cuttings	Dec-Mar

Appendix 2

Growing plants – Glossary

Capillary bed:

a bed, usually of gravel, for germinating punnets of seeds. Water is fed in continuously from the bottom and kept at a constant level. Heating may be provided. Replaces overhead watering which can lead to damping off (a fungal disease) or can disturb the surface of the seed mix.

Chaff:

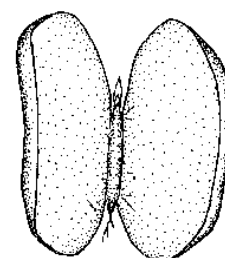
seed coverings and other debris that are separated from the seed.

Clone:

plants which have been propagated from cuttings or by layering (i.e. vegetatively) have an identical genetic make-up to parent plant. They are called clones.

Cotyledon:

a leaf-forming part of the embryo of a seed plant. Monocotyledons have one and dicotyledons have two cotyledons in each seed.



Two cotyledons (seed leaves) of a dicotyledon

Damping off:

a fungal disease which attacks young seedlings at ground level causing them to rot and fall over. Overcrowding of seedlings and poor drainage of seed mix are common causes. Destroy seedlings as soon as detected.

Hardening off:

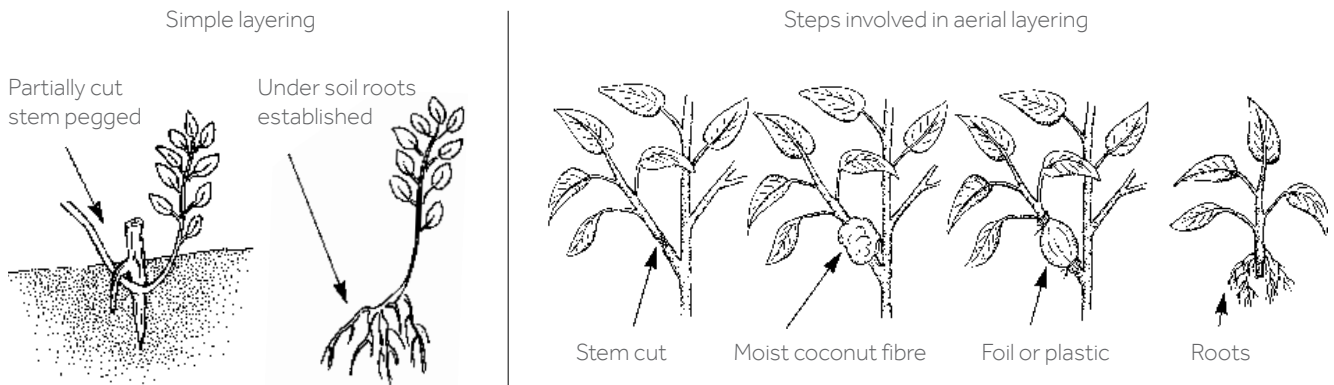
the gradual process of conditioning plants to the garden climate. A shaded area or a shady, wind-protected position in the garden is used to acclimatise the young plants for a week or two, then a further three days of exposed hardening off is recommended prior to planting out.

Hormone:

a substance which can be transported through an organism and can affect growth, reproduction or metabolism (rate at which food is converted into part of the living thing). Certain synthetic hormones can be applied to cuttings to encourage quick root formation. They are particularly useful for slow rooting species. Hormones must be used with great care.

Layering:

a method of vegetative propagation where stems are partially cut and either wrapped in coconut fibre or pegged down under soil until they root. Rooted pieces are then cut from the parent plant and potted up.



Parent plant:

plant from which cutting material for propagation is collected.

Peat:

brown decomposed plant matter found in some swampy areas. It has a high water holding capacity and was once widely used in potting mixes and cutting mixes. The extraction of peat is having a damaging effect on the ecosystems from which it is taken and its use is not recommended for this reason. It is now frequently replaced by substitutes such as composted woodchip fines, coconut fibres or rice hulls.

Potting on:

this is the process of transferring rooted cuttings from the cutting mix into pots of potting mix for growth before hardening off. Potting on enables the plant to establish a good root system.

Pre-treatment:

one method of pre-treatment involves lightly damaging the seed coat to allow water uptake necessary for germination. Usually heat or abrasion (rubbing the seed coat with sandpaper) are used - e.g. with Acacia seeds. Pre-treatment for seeds of some plants involves chilling seeds (cold, moist stratification).

Pricking out:

the process of transferring seedlings from the seed mix into pots of potting mix for growth before hardening off and planting out.

Semi-hardwood:

last season's growth which has hardened off. This growth is ready for preparing cuttings if it does not break when bent in half.

Appendix 3

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