



▲ left Abrade seed by rubbing it against emery paper (sand paper tends to break up)—rub the seed against the rough paper until the cotyledon begins to show. Shown here are *Erythrina caffra* (red seeds), *Erythrophleum lasianthum* (small flat round seeds), *Entada rheedii* (large brown seed), *Mucuna gigantea* (brown and speckled), and *Caesalpinia bonduc* (grey-blue); right After scarification and soaking, the seeds are ready to be planted. Note how much the seeds on the right have swollen compared to their original size on the left.

■ Hard seed

Seed of *Acacia*, *Erythrina*, *Erythrophleum*, and *Elephantorrhiza* are examples of hard seeds that need to be scarified to germinate successfully. I always soak my seeds in room temperature fresh water after scarification to ensure that they are swelling before finally sowing them.

Abrading

Abrading is a form of scarification using sandpaper, rough emery, or even a grindstone to remove part of the seed capsule to aid germination. Sometimes the seed capsule needs to be cracked using a vice or pliers.

Some hard seeds have a fleshy outer layer that may be soft, like *Harpephyllum caffrum* or *Encephalartos* species, which is relatively easy to remove. However, other species, like *Chaetachme aristata* or *Cassine transvaalensis* have a solid or harder outer layer that needs to be removed to expose the seed within. To remove this can be a tedious task.

This is where electricity and the modern food processor or blender come in handy. Put about 30–50 fruits in the blender with about a cup of water. Press the button in spurts of 5–10 seconds, two or three times. The flesh will be chipped off the seed.

TIP

Do not rub too much of the seed coat off, as this will allow pathogens to attack the cotyledons. Remove just enough to let water get in to start the germination process.



▲ top left Seed of *Erythrina* species; top right Nicking seed of *Erythrina lysistemon*; bottom left Seed swelling in water; bottom right Seed after 24 hours and beginning to send out the radicle.

Tension

Some plants, such as euphorbias, generally have hard capsules, within which, once mature and dried out, a tension is created causing an explosion that scatters the seeds away from the parent plant. Collecting *Euphorbia* seed is best done by picking the ripe fruit. This process can be tricky, given the sharp spines and corrosive latex that can cause severe irritation, should it encounter one's eyes.

WARNING

Wear protective goggles and leather gloves when collecting Euphorbia fruit.

Once the capsules have been collected, place them in a paper or cloth bag. Leave the bag in a dry, warm place to dry out. The bags will seem to come alive when the seeds are ripe and start exploding! When all the seeds have been set free, file the seed coat a little and sow it in a tray of seedling medium. Seeds should germinate after about 14 days, if the weather is warm.

Heat treatment

Heat treatment of seed could also be attempted to aid germination. Heat treatment entails baking the seed in a microwave oven. *Acacia* seed needs about 2 minutes of treatment according to some sources (Stewart, 1999). Small seed should therefore only need a few seconds of this kind of treatment to be effective. Again, this is about experimenting with different techniques, so I recommend using small quantities of seed at a time to prevent unnecessary waste.

Many African plants grow in fire-maintained systems, such as grasslands. Certain species may therefore benefit from scorching the seed with a grass fire. Place some seed on the ground and cover it with enough grass to burn for approximately a minute. Remember to use small quantities of seed in the process of perfecting your technique.

Some Protea seeds will be trapped inside the hard cones for a full season before they are released. Generally, the heat of fire causes the cones to split open and release the seed. Placing collected cones in trays lined with newspaper in the hot sun for a few days, can mimic this stimulus. Not long after, the cones will split open and

- ▶ *One-year-old Euphorbia bupleurifolia seedlings in cultivation.*
- ▼ *Seed capsules of Euphorbia bupleurifolia plants in cultivation.*





▲ left *Smoke in the hills* (Photo: Neville Brown); middle *Smoke drum and tent* (Photo: Neville Brown); right *Smoked Calopsis paniculata seedlings*.

release their seed. Before sowing the seed, refer to the next section on smoke treatment.

Some people recommend soaking leguminous seed in near boiling or hot water to ease germination. Experiment with a few seeds first to get the technique right. When seed germination becomes apparent, use the technique to do a larger batch of seed.

Wash off any gelatinous, jelly-like substance in clean, cold water by rubbing the seeds together gently after the soaking process has been completed.

Smoke treatment

A technique pioneered in South Africa in about 1990 is the use of smoke to break the dormancy of seed. Much has been written about this practice. What follows is a short summary of the principles of the method.

Using smoke to break seed dormancy was pioneered in the winter rainfall areas of the southern Cape, where periodic fires sweep through the fynbos and researchers observed that certain species of the Protea, Restio, and Daisy families responded by germinating in the bare soil left after a fire. This discovery motivated experimentation with other species. It was found that the chemicals in the smoke penetrate the seed coat, either in its airborne form, or in a solution when the smoke chemicals are washed over the seed, thereby breaking its dormancy after the first winter rains.

Over the past few years, the smoke treatment method has been simplified—fynbos plants are placed in a large 200-litre drum and air is added via a bellows system or a compressed air line. The plants are set alight in the drum and the resulting smoke is blown into a tent that has been placed over the trays of seed.

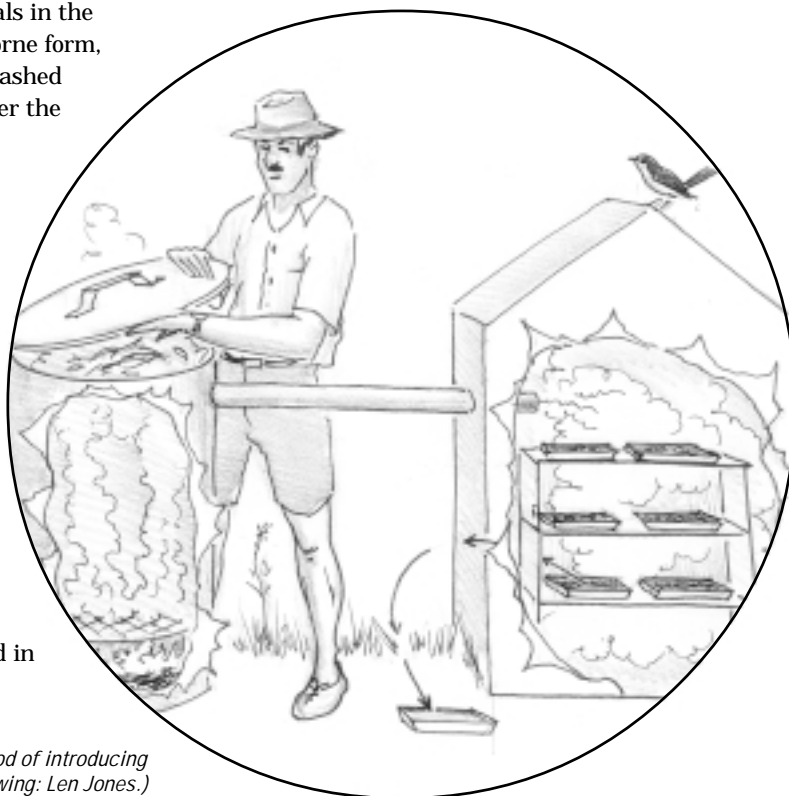
The seed is left in this state for an hour or two, then the trays are removed and the chemicals are washed into the soil. This method is suitable for large quantities of trays.

If you are a domestic grower of fynbos plants, buy the Kirstenbosch Instant Smoke Plus Seed Primer (see the inside back cover for details of suppliers). This kit consists of a filter paper disc impregnated with the chemicals found in

the smoke of burning fynbos. Pour 50 ml of water over the disc into a cup and soak the seed you wish to germinate in the smoke water for 24 hours. To date, over 200 species of plants tested using this method of treatment have shown positive results. It has become standard practice in most of the winter rainfall regions of the world to stimulate seed germination by using smoke treatment.

Cool chilling

For high-altitude montane species, a method known as cool chilling may be needed to stimulate seed to germinate. Simply place the seed in an airtight bag or container with damp sand or vermiculite, perlite, or sphagnum moss. Store the seed in the bottom of a fridge or in a cool room at a temperature of between 2–4°C for a period of about 3–12 weeks. The length of time that the seed is stored, or rested, should mimic the length of the winter period of a particular climate. Sow the seed in spring. Seed that has been allowed to rest well, should germinate more readily.



► A diagram showing a method of introducing seeds to smoke. (Drawing: Len Jones.)

A similar treatment for dryer, warmer climates is to store seed in a dark, dry container that mimics the conditions of a dry forest floor. Again, the period spent in this kind of storage depends on your particular climate's resting periods.

Certain commercial seedling growers aerate the water used to soak seeds before sowing. This is a skilled operation and is only useful when executing large-scale operations. It doesn't, however, meet the needs of general propagators.

■ Winged seed

Many of our plants produce "wings", which make wind distribution possible. Examples of plants with this feature include *Atalaya*, *Combretum*, *Markhamia*, *Pterocarpus*, *Stereospermum*, *Terminalia*, *Entandrophragma datum*, and *Tecoma capensis*.

Crack and rough up the winged testa of these seeds by rubbing them together with your hands. The immediate effect of this action is to reduce bulk.



▲ *Combretum zeyheri* and *Pterocarpus angolensis* seed waiting for rain.
 ◀ *Combretum zeyheri*, largest of the winged *Combretum* seeds in South Africa.



▲ *Tecoma capensis* showing winged seed.
 ◀ *Pterocarpus angolensis* seed.



▲ *Fernandoa magnifica* flower.

◀ top *Fernandoa magnifica* seedlings, about a week old; bottom *Fernandoa magnifica* seed showing the typical winged seed of the family Bignoniaceae.

▼ *Fernandoa magnifica* in flower in the Arabuko Sekoke Forest in Kenya.





■ Parachute seed

Families that employ this airborne method of dispersal in the form of a parachute, rather than a structural wing, include some Proteaceae, Asteraceae, Apocynaceae, and Asclepiads. The parachutes are finely haired and float off in the wind.

In the case of Asteraceae, insect seed predators can damage the whole flower head, because the seeds are so closely packed together. Study the seed heads carefully and pick only the sound ones. I prefer to gather the seed while it is still a little unripe. This allows me to handle more seed in a smaller compartment, rather than deal with only a few ripe seeds, which have split in the seed head and become bulky.

With both Asteraceae and Apocynaceae, I prefer to collect the follicles as they start to split. This prevents the silky haired parachutes from spreading into every corner of your backpack or collecting kit. They are relatively safe from attack by predators, because of the milky latex that many of these plants produce.

These plants germinate relatively easily and they can be stored for about a year under normal room conditions, as long as a small quantity of insecticide or fungicide is placed in the storage containers.

A simple and effective, non-toxic (to humans), method of keeping insects at bay is to place well-ground, grey wood ash from a fire in with the seeds. An old Zulu woman, who stored her maize in this way, taught me this method. Use about one part ash to two parts seed by volume. Shake the mixture together to allow the ash to mix properly with the seeds in the container.



◀ **top** These *Raphionacme hirsuta* follicles are almost ripe—the colour changes to a darker shade when ripe; **middle** *Gerbera aurantiaca* seed. (Photo: Isabel Johnson); **bottom** *Adenium obesum* seed showing parachute hairs at both ends of the seed.

▼ *Mondia whitei* follicle shedding seed. Seed of the Apocynaceae family often have the flattened look of rolled oats or wheat. Look for this pattern and you'll know the family of seed floating past on its silken parachute. Seed in South Africa is ripe in late August just as the summer rains begin.

