Seeds — Orthodox or Recalcitrant©

Rachel Saunders
Silverhill Seeds, PO Box 53108, Kenilworth, Cape Town, RSA 7745
Email: rachel@silverhillseeds.co.za

INTRODUCTION

Seeds can be divided into two types:

- Orthodox seeds which can be stored.
- Recalcitrant seeds which cannot be stored.

ORTHODOX SEEDS

We will start with the germination of orthodox seeds. All orthodox seeds have one or more strategies to delay germination and members of the same genus may use different strategies. Ninety-five percent of the blocking strategies are chemical and 5% are physical, and they need to be removed or inactivated before the seeds will germinate. Methods of overcoming these strategies include the following.

Drying the seeds before storage at room temperature in a dry state inactivates some of the germination inhibitors. Namaqualand daisy seeds require storage for 6 months or longer and *Strelitzia* seeds require at least 12 months of storage. However, it must be remembered that no seed can be kept in dry storage indefinitely.

Moisture in some cases removes inhibitors, for example, *Clematopsis scabiosifolia* seeds require about 3 months of moisture at 22 °C before they will germinate. Other species, particularly those from high altitude areas, require 3 months moisture at 4 °C followed by a move to 22 °C before they will germinate.

Temperature in some species destroys an inhibitor at one temperature followed by germination at a different temperature. For example, lettuce seeds require a treatment at 4 °C before germinating at 22 °C. In other species two inhibitors are destroyed at different temperatures, an example is most fynbos species require a fluctuating temperature of 10 °C followed by 22 °C followed by 10 °C.

Light is required by some seeds to germinate, for example, *Streptocarpus* and *Zaluzianskya* seeds. While others are inhibited by light (or require darkness); an example is *Lachenalia* seeds.

Gibberellins are chemicals produced by fungi and plants and they are thought to be important in the germination of up to 25% of all species. Most seeds requiring light will germinate in the dark if treated with gibberellic acid (GA_3)

Removal of pulp from some seeds is necessary because it contains inhibitors. When the pulp is removed, water reaches the embryo, inhibitors are destroyed or washed out, and the seeds germinate.

Smoke is important in the germination of many fynbos species. It acts in combination with other factors such as temperature fluctuations.

Nitrogen in the form of nitrate is found in composting leaf litter in forests. This may act with GA_3 formed by fungi in the leaf litter

Removal of physical barriers to water and oxygen, for example the hard coat of legumes. One can grind a hole in the seed coat, rub the seeds on sandpaper or soak the seeds in hot water. All of these result in damage to the seed coat so that water and oxygen can reach the embryo. Care should be taken as some seeds can be damaged by rough treatment. Some hard seeds have water channels in the coat and they do not require any mechanical treatment.

RECALCITRANT SEEDS

- These cannot be dried, so can be stored for short periods only, usually at 4 °C in damp peat or vermiculite.
- They have few or no germination inhibitors.
- Ripe seeds germinate whether circumstances are favourable or not.

Examples of these seeds include:

- All South African Amaryllidaceae except *Cyrtanthus* (*Brunsvigia*, *Haemanthus, Nerine, Crinum, Scadoxus*, etc.). Some have fleshy coats and some do not.
- *Ochna, Podocarpus*, and *Brabejum*. These have no flesh.
- *Syzygium, Kiggelaria,* and *Trichilia*. They do have fleshy coats which need to be removed.

All of these seeds should be sown on the surface of the potting medium immediately when they are ripe, and kept moist. They will produce roots and shoots almost immediately. Most of them require light to germinate.

CONCLUSIONS

- Each and every species is individual and the seeds require their own set of conditions.
- Some seeds may require four or five conditions to germinate — for example, smoke plus fluctuating temperatures plus a particular pH soil plus a certain amount of water.
- Recalcitrant seeds germinate whatever the conditions are.
- The ecology of the plant is extremely important in deciding which conditions may be required, e.g., a forest species is unlikely to require smoke, but may well require gibberellins and nitrates.