

Cycad Seed Germination[©]

Eric Anderson

Anderson Seeds, 20253 Elfin Forest Rd., Escondido, California 92029, USA

Email: sales@seedcoseeds.com

INTRODUCTION

This group of living fossils produces some of the most interesting and brightly colored seed cones. The key to good germination of cycads starts with successful pollination. Cycads are dioecious producing either pollen cones or seeds cones. There are 11 genera of cycads and each group is defined by their pollination and germination techniques. In nature, most cycads are insect-pollinated and wild seed generally has higher viability than artificially pollinated cultivated plants. Once pollinated, the seed develops in the seed cone for several months to 2 years with the average seed cone maturing after 8-9 months.

POLLINATION

In cultivation the cycads lack natural pollinators and so they must be hand-pollinated to produce viable seeds. The first step is pollen collection. The pollen cone, when fully developed, will release the pollen from capsules. The easiest test is to tap the cone and watch for pollen to fall. Please take precautions not to breathe the pollen. Australian cycad species are especially hazardous as some of the scientists who have been heavily exposed developed severe health issues that were thought to be a result of exposure to cycad pollen. Then, remove the pollen cone from the plant and lay it on smooth paper so the pollen is easily collected. With *Cycas* which is the most primitive of the cycads you can simply dust a receptive seed cone which is made up of modified leaves with the ovules attached directly. All the rest of the genera produce a true cone and it's more difficult to determine when they are receptive and how to deliver the pollen. The pollen must get to the micropyle of a receptive female ovule. When receptive, a small drop of liquid is present and the pollen must get to this liquid for pollination to occur. As the liquid dries it pulls the pollen into the seed. Fertilization will usually take place several months later.

Fresh pollen is the best, but it's not always available. Fresh pollen will lose its viability within a few months. Pollen can be stored by drying and then freezing for up to 3 years. The pollen can then be applied to a receptive seed cone either dry or wet. Shortly after the seed cone fully emerges it will loosen up in some way while they are receptive, but usually for only a few days. With seed cones the easiest way to deliver the pollen is to remove the top and blow or pour the pollen in. The *Dioon* cones are different as they open from the base and in nature the insects climb in and deliver the pollen into the cone. It is tricky to figure out when this is occurring.

After pollination or a few days after being receptive the seed cones close up and the seed will develop. In most genera if the pollination is not successful the seed will not produce full-sized seeds except the *Encephalartos*. They will produce seed which appears normal, but is not viable. The method to tell if your pollination has been successful is by cutting the seed and looking for a coiled suspensor and embryo. However, with some cycads this is difficult to really see. A germinating seed is the only way to really tell if pollination was successful.

GERMINATION

To germinate, place cycad seeds on a light, well-drained soil mix. Lay the seeds on top of coarse sand, horticultural perlite or sponge rock in humid greenhouse conditions for the best results. Bottom heat at 80°F will speed germination. When the root is about 1 in. long the seedling should be potted up in a 1-gal container. Be sure not to use a soil mix with peat moss for the Australian cycads.

Bowenia

Seeds germinate quickly and are ready to plant when the seed cone falls apart.

Ceratozamia

The most commonly cultivated species is *C. hildae* and the easiest to pollinate. The time of day and the method of pollination (wet or dry) are critical and the seeds are fully developed and ready to plant immediately when the seed cone falls apart. The other species are more difficult.

Chigua

Is a tropical genus that is very rare and most closely related to *Zamia*.

Cycas

Most have distinct, closed cones like *C. revoluta*, with a second group having open and loose cones where the seeds are always exposed. The open cone seeds are larger and often have a spongy layer that causes the seeds to float. After the *Cycas* seed mature most of the species do best if you store the seeds for 3-5 months to allow the embryo to develop more before sowing.

Dioon

A cone that is distinct from all other cycads and must be pollinated from the base with a dust gun to blow the pollen into the cone. The seeds take from 8 months to 2 years to mature. When mature the fruit on the seeds is very fragrant. Most *Dioon* seed should be stored a few months before sowing to allow additional time for the embryo to develop. Floating the seeds at that time is a good way to remove non-viable seeds.

Encephalartos

Will produce full-sized seeds even if not pollinated. Floating the seeds is not a reliable indicator of viability. Most species require 4-6 months of storage to get the best results. A few species of *Encephalartos* are fully mature when the cones fall apart and are ready to plant immediately.

Lepidozamia

The seed cones are large and can weigh up over 60 lb. with over 300 seeds inside. Store the seed for a few months after the seed cone matures to allow the embryo to develop and then plant for best germination. The pollen cones have a dramatic way of shedding the pollen.

Macrozamia

The seed cone develops quickly and it is difficult to determine when it is time to pollinate; however, if the pollen is applied at the right time the fertilization rate can be very high. The seeds should be stored for 2-4 months before sowing.

Microcycas

This species produces a bad smell when both the male and female cones are receptive. The seed is fully mature and ready to sow when the seed cone disintegrates. The Fairchild Gardens in Florida has mature coning plants and has successfully produced many viable seed of this very rare and endangered plant.

Stangeria

It is easy to pollinate the seed cone. A slight opening will occur that allows the pollen to be introduced and the seed cone takes 6-10 months to fully mature. The seeds should be stored for about 3 months to allow sufficient embryo development before sowing.

Zamia

This is a mostly tropical genus with a few species hardy enough for cultivation outside subtropical climates. The seed cones, when pollinated, take 6-14 months to mature with most species maturing in 9 months. The tropical species are ready to germinate when released from the cone while the temperate species need a few months to fully develop before sowing.