Cultivation of the strange desert relic, *Welwitschia mirabilis*

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Some useful tips on seed sowing and cultivating this unusual plant. Photos by the author.

This unique desert plant, which is found in the western coastal region of Namibia and into Angola, is a very old genus adapted to the oldest desert in the world. These relic plants, from the Jurassic period, when most large plants were gymnosperms (cone bearing plants, like pine trees, cycads and the ginkgo tree), have adapted over time to an increasingly arid climate and are ideally suitable to this part of Namibia and Angola. It is also the only gymnosperm which uses the CAM photosynthetic pathway (Crassulacean acid metabolism) which is typical of many desert plants to produce food whilst the stomata remain closed during the day. This is used by the plant to conserve moisture, and carbon dioxide is taken up and fixed during the cool night to form the sugars and starch which are utilised during the day for growth.

The cold Benguela sea current from the Antarctic meets the hot air of the Namib desert, and causes dense fogs which roll inland for up to 100km. When this cold fog comes into contact with the leaves of these plants, it condenses on them and the moisture drips onto the sand near the plants and is taken up by the roots. There is also the occasional rainfall during summer (up to 50mm per annum) which also further helps these plants to survive. Many grow in dry riverbeds and with the help of their long taproot, can then take advantage of this underground source of moisture.

Fig. 1 A male plant on the right and the female with larger cones on the left

Fig. 2 A large female plant with around 15,000 seeds in July 2002

These plants, with only one pair of leaves, can live to over 1,000 years and as the leaves continually grow from a meristematic base, can during this period grow more than 150m. In the desert, however, the leaves are shredded by the desert winds and are eaten by animals so do not generally exceed 4m in length.

Fig. 3 The woody stem and root of a dead plant from seed sown in 1974

Plants are dioecious (ie male and female cones are on separate plants, Fig. 1) and the cones develop in summer. Their interesting pollination mechanism is different from other gymnosperms which have copious pollen and are wind pollinated, and it appears as if they are insect pollinated as both male and female fruiting cones exude a sugary solution to attract, most probably, a species of wasp, but also other insects.

The female cones develop through the summer and then at the end of winter shed their seed (up to 100 per cone). Depending on the size of the plants, they shed around 15,000 seeds per large plant, which are winged (Figs. 2 & 7) and which are blown by the desert winds to a suitable site. If there are sufficient rains in summer, there is a chance that a few seeds will germinate and in time become large specimens.

Many seeds are eaten or damaged by animals (mice and other rodents) as well as cones being infected with a fungus (*Aspergillus niger* – the same black fungus found often between the scales of onions). A large stink bug can reduce viable seed very significantly and often whole seed stocks on some plants are all sucked dry or damaged.

Fig. 4 A plant grown from seed in 2012 and unusually splitting into several separate leaves

My first encounter with this plant was at the University of Natal in my first year of study (1973) when I took botany as my first-year subject. Professor Chris Bornman, who was doing a study on this plant, was producing a green callus on a growth medium from germinating seed. The study was to try to obtain differentiated tissue from this callus to produce plantlets, but he found this was not possible. I spoke to

Fig. 5 (left) A typical plant with the two permanent leaves and the cotyledonary nodes clearly visible

Fig. 6 (below) Even a lost leaf does not hamper this plant which will only have this one leaf for as long as it lives

Fig. 7 (left above) The winged fruit for wind dispersion. The seed should be freed by bending the middle backwards and extracting the seed

Fig. 8 (left centre) Seed which has been damaged from feeding stink bugs. These will not germinate so need to be discarded

Fig. 9 (left below) Three healthy seeds which were planted

his technician, Nigel Fanshawe and was able to obtain a dozen seeds from him to plant for myself.

These I took back home to Klerksdorp and sowed them into long sand-filled pipes around 60×10cm. The seed germinated and the plants grew, and the pipes with plants were taken to Pretoria in later years. Over the years these plants unfortunately did not receive the attention they required and died from lack of water (Fig. 3). A most important lesson was learned from this experience, which is that plants in cultivation should never be allowed to dry out.

The next *Welwitschia* encounter arrived in July 2002 when we, as a family, visited Namibia during the July holidays. We drove there in a VW Kombi and stayed near the town of Swakopmund. Visits were paid to the Moon Landscape where a lot of *Welwitschia* plants grow.

Fig. 10 The emerging seedling just after germination

Fig. 11 The brownish seedling standing upright after a week from planting

Fig. 12 The cotyledons turn green after another 2–3 days

The previous season had been a good rain year and the plants were loaded with seed (Figs. 1 & 2). There were literally millions of seeds and a glassful or two came back to Pretoria, and these were subsequently placed in the fridge until 2012 when it was decided to plant some. The other seed was placed in the fridge and in the deep freeze.

The cultivation of this first planting was as follows. Any seed capsules which were either infected with *Aspergillus* or were stained by stink bugs were discarded. Then the healthy-looking seeds had their wings removed by cracking open the seed covering by bending back the lower attachment of the seed and freeing the seed itself (Fig. 7). The seed when removed looks a bit like sunflower seed. These were further selected by discarding any with stink bug damage (Fig. 8) so that only uniformly clean white seed would be used for planting (Fig. 9). The germination medium used was coarse sand without any organic matter. The seeds were planted one per plastic pot (10cm diameter) and 1cm below the soil surface. The first signs of germination were within one week after sowing (Fig. 10) and then within a few days the cotyledons changed colour from brownish (Fig. 11) to green (Fig. 12). These cotyledons will open and then in another 2–3 weeks the permanent two leaves will appear between them (Fig. 13).

Watering is one of the most important criteria and the sand that the seed is sown in should never be allowed to dry out. One day of dryness will lead to the seedling wilting and resultant death. The secret is to keep the sand moist but not wet all year round. These plants were found to be very tolerant of high as well as low temperatures, as temperatures near freezing did not affect the plants.

Once the two leaves have appeared, keep the sand moist and a diluted multi-purpose fertiliser can be given 3–4 times per year. The seedlings can be transplanted into larger pots but ensure that the main taproot, which in time can become very long, is not damaged or the plants will just die. It should be noted that a 30% shading will suffice for plants and, if the moisture regime is followed, they will grow larger and larger so that within a few years the plants will start to produce cones. To date I have had only male ones which have been formed in spring but, as with other plants, males often flower earlier than the female ones.

At the beginning of 2020 I decided to plant out the 18-year-old seeds from the freezer to see if they were still viable. The same procedure of selecting healthy seed was followed and seed was planted in a similar sandy soil. The viability was determined to be around 10% and this was not because of insect or fungal loss but more likely through a loss of viability because of age/storage. However, this shows that even if stored for 18 years in a fridge (and in a freezer) some seed will still germinate.

Fig. 13 The small permanent leaves appear after another week

Fig. 14 After another month the cotyledonary nodes appear between the permanent leaves and from here the development tissue for further growth and the reproductive organs develop

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