The Hilton daisy, *Gerbera aurantiaca,* is one of our beautiful but rare and endangered plant species, endemic to the KwaZulu-Natal mistbelt grasslands. Photo: Robin Gardner.

Cultivating the Hilton daisy

Robin Gardner looks at simple ways in which the endangered Hilton daisy, *Gerbera aurantiaca,* can be propagated for repatriation in the wild.

The Hilton daisy, *Gerbera aurantiaca*, is a rare and endangered perennial herb endemic to the KwaZulu-Natal mistbelt grasslands. From August to October, its stark orange to crimson daisy-like flowers and glossy green leaves are conspicuous in the grasslands. But for how much longer? Progressive fragmentation and degradation of their natural grassland habitat - the result of agricultural and urban expansion – as well as pillaging of plants and flowers from the wild, selective grazing by domestic livestock and inappropriate fire management of habitat, have played a significant role in the plant's demise. The situation is further exacerbated by the fact that the species is extremely difficult to propagate and transplant.

Over the past decade as a forestry researcher, I have met a number of KwaZulu-Natal timber growers actively trying to conserve colonies of *Gerbera aurantiaca* on grassland areas of their estates. However, difficulty in propagating the species consistently placed a stumbling block in the way of these conservation efforts. Scott-Shaw (see further reading list below) recommended that the propagation of *G. aurantiaca* should be high on the list of priorities for its future conservation, and with this is mind, I decided to do a bit of experimenting in my own time to satisfy my curiosity as to whether the Hilton daisy could be propagated simply. I was particularly keen to provide a mechanism whereby landowners with *G. aurantiaca* growing on their properties could increase the numbers of the plants of their particular populations in situations where they had been seriously depleted.

On perusing the available literature, I found that *G. aurantiaca* had been successfully propagated via 'tissue culture' but the method required specialised equipment and controlled conditions, and I was looking for a more user-friendly method. In mid-November I collected seed from a wild population of *G. aurantiaca* at Queen Elizabeth Park in Pietermaritzburg (with the kind permission and assistance of eZemvelo KwaZulu-Natal Wildlife). One flower head per plant was collected from forty different individuals. Assisted by my children, the viable seeds were painstakingly separated from the non-viable seeds in each flower head: the viable seeds could be clearly distinguished from the non-viable in that the former were plump and fell relatively fast when dropped. Each flower head produced, on average, about three viable seeds.

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Seedling propagation

Basically, I tried two methods of propagation. With the first batch of seeds, I further divided them into two lots, and treated the first half with a seed surface disinfectant called Thiram w.p. (the 'treated' seeds). The second half was not treated (the 'untreated' seeds). Pre-germination was carried out by placing the seeds on filter paper and vermiculite in 9 cm wide petri-dishes and incubating in the dark at 27 ^{0}C. Distilled water was added to the petri-dishes periodically to keep the filter paper damp. The second batch of seeds were not treated with any seed surface disinfectant, neither were they pre-germinated. This batch was going to be directly sown into the soil medium.

The pre-germinated seeds were pricked out and the direct-sown seeds were sown into non-sterilized soil-filled polystyrene seedling trays having 72 x 100 ml compartments. Dolerite-derived, humic topsoil was collected from a virgin grassland site in the KwaZulu-Natal Midlands and sieved using a 0.5 cm mesh, and placed in the seedtrays. No fertilizer was added. Each pre-germinant was transplanted into the soil medium before the radicle (the emerging root) reached 1 cm in length, whereas the direct-sown batch of seeds were each inserted into the soil medium in erect position leaving the pappus (a bristle-like structure) showing above the soil level. The seedtrays were covered with a plate of transparent glass after a watering and placed outdoors under 30% shade-cloth.

In the pre-germinated 'treated' batch, germination and pricking out were completed within eleven days. With the direct-sown batch, germination was much slower, with some seedlings taking fifty-three days to emerge. Final germination percentages for the pre-germinated 'treated' and 'untreated' seeds were 39.3% and 44% respectively, and for the untreated, direct-sown seeds, 31.8%. All seedlings were transplanted out into 15 cm wide plastic plant pots (filled with similar humic topsoil to that used in the seedtrays) during the first two weeks of February 2001 within eighty days of sowing. Transplanting was carried out during late afternoon in cool, cloudy conditions. The pots were placed outdoors and covered with 30% shade-cloth. The plants were watered fortnightly by drenching with a hydroponic solution. Thirty-five percent of the plants survived transplanting into pots.

In July 2002, 50% of all surviving potted plants were transplanted directly into the open ground. The remaining 50% were planted out two

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Any research on this beautiful threatened daisy contributes to our knowledge of it's population biology and conservation management. However, some factors to bear in mind are:

- Under no circumstances may *Gerbera aurantiaca* seed or plants be collected anywhere (including privately owned land) without a permit from eZemvelo KZN Wildlife because it is a specially protected species. Permits will only be granted in exceptional circumstances for scientific research after sufficient motivation to the principal research officer.
- The apparently low seedling recruitment in the remaining populations means that any removal of seed will probably have a detrimental effect on the long-term survival of the species.
- Recently reservations have been voiced concerning the re-introduction of *ex-situ* raised plants. These include the possible exposure of wild populations to nursery pathogens and genetic contamination.

It is important to bear in mind that by far the biggest threat to the Hilton daisy is the ongoing destruction of its habitat, the moist mistbelt grasslands of KwaZulu-Natal.

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Isabel Johnson is working towards a doctorate with the University of KwaZulu-Natal on the conservation biology of *Gerbera aurantiaca*. Her project is sponsored in part by a Conservation Small Grant from the Botanical Society.

RIGHT: Jayne Gardner with the first *Gerbera aurantiaca* flower that appeared thirty-three months after the pre-germinated batch of seeds was sown. Photo: Robin Gardner.

years later in July 2004. A survival count in September 2004 showed that all of the plants transplanted from pot to ground had survived. The first flowering occurred, in the plants still in pots, thirty-three months after sowing (see accompanying illustration). By December 2004, four years after sowing, a few plants still had not flowered. I found that burning and smoking the aerial portions of Hilton daisies was not always successful in stimulating flowering, but, on the other hand, drying them out appeared to stimulate flowering rather successfully.

On a cloudy cool, humid day in early August 2004 I lifted one well-established (July 2002 out-planted) dormant Hilton daisy out of the open ground. The plant chosen had three distinctly separate terminals. I cut the stock into three portions, each having a few roots and a shoot terminal. I set the plantlets carefully back in the open ground with shoot terminals slightly above the soil surface. The soil surface was covered with 30 % shade-cloth and the bed watered occasionally to prevent drying out. By December 2004 the three plantlets had become well established and were actively growing.

It appears that *G. aurantiaca* is very specific in its environmental needs. Apart from an ideal altitudinal niche of 950-1 500 m in KwaZulu-Natal, the species appears to favour dolerite-derived, well-drained soils high in organic carbon. Not taking these specialized needs into account is probably why most propagation and transplanting attempts fail. My results show that *G. aurantiaca* can be sexually propagated fairly easily, using healthy, viable seed and basic propagation equipment. A further trial carried out during early 2001 using *G. aurantiaca* seed from the Byrne area near Richmond, produced similar germination rates using the same pre-germination method described here, but a far higher, (one hundred percent) planting success rate, was achieved when the germinants were pricked directly into the pots. This would seem to be the best route to follow regarding sexual propagation of the species. Finally, with proper care, propagation by division of underground stems appears to offer a viable method of cloning *G. aurantiaca* plants where necessary.

I hope this has provided some practical advice for potential conservators, and that the sight of this beautiful daisy flowering in the KwaZulu-Natal grasslands won't disappear forever.

RIGHT: These *Gerbera aurantiaca* seeds were treated with a seed surface disinfectant called Thiram, placed on filter paper and vermiculite in 9 cm wide petri-dishes and incubated in the dark at 27 ºC. Six days later the germination process is well underway. Photo: Robin Gardner.

TOP LEFT: A *Gerbera aurantiaca* seedling, fourteen months after being pre-germinated and eleven months after being transplanted into a pot.

LEFT: Thirty days after being sown, the *Gerbera aurantiaca* seeds were pricked out into polystyrene seedling trays filled with a dolerite-derived, humic topsoil that was collected from a grassland site in the KwaZulu-Natal Midlands. Here they are seen twenty-four days after being transplanted. Photos: Robin Gardner.

Further reading

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The author

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