The Propagation of *Spiranthes cernua*, Ladies' Tresses Orchid©

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INTRODUCTION

Spiranthes cernua is a widely dispersed, but rarely seen terrestrial orchid whose range runs from Eastern North Dakota south to Texas and East to the Atlantic Ocean. They are most frequently found in damp meadows, road ditches, and near streams. Their preference is for nearly full to full sun as long as sufficient moisture and organic soils are available. In nature, *Spiranthes* are most often found in the fall as a single inflorescence in widely dispersed colonies. The inflorescence is up to 60 cm tall with the top half to third covered with up to 70 small, porcelain white, fragrant flowers.

During most of the year, the plant is only 5 to 10 cm tall, stretching up to 25 cm under ideal conditions just before initiation of its terminal inflorescence. About this same time one to several buds (eyes) will begin to swell at the base of the plant, eventually forming next years plant(s). Under greenhouse conditions (probably in nature as well), *S. cernua* has the unusual ability to form new shoots/plants at their root tips, this most frequently occurs when the root tip is exposed to light or air. Under these conditions, cresting of the root tip will often occur, resulting in a cluster of new plantlets. I've seen up to 10 shoots develop on one crested root tip. As with many orchids the roots do not appear to be polarized by gravity, but rather grow horizontally and occasionally turning up towards the light.

PROPAGATION

Seed Propagation. As with all orchids, the seed is extremely small, dust-like in appearance, and lacks any appreciable food reserve to aid in germination.

With *Spiranthes*, the first obstacle in seed propagation is to obtain fertile seed. Nearly every flower will produce a seedpod and "seed", but if hand or insects do not pollinate the flower, the seed is not viable. The most effective means of pollination that I've seen are bumble bees (*Bombus fervidus or B. ternarius*). Hand pollination can be very tedious when dealing with small flowers even though I've done it when bumble bees weren't available.

The next obstacle is to transfer the seed to a sterile nutrient-rich medium. As with most orchids, green pod culture is much easier than sowing dry seed. In the green pod method the entire seed pod is disinfected rather than individual seed. *Spiranthes* seed is very sensitive to disinfectants. I have not found a disinfectant that can disinfect the seed without killing them. By using the green pod method, the seed is not directly exposed to the disinfectant, thus preserving the seeds' viability and a much harsher (effective) disinfectant regime can be incorporated.

Spiranthes bloom from the bottom of the inflorescence to the top over a 4- to 6-week period. Not all of the seedpods are ripe at the same time. As soon as the first pod begins to split (yielding ripe seed: tan in color versus white for immature seed),

the next five to ten pods are harvested while still attached to the inflorescence. The bracts and old flower parts are removed, being careful not to damage the pods. The pods are then rinsed in clean water to remove any dust and debris. At this point the inflorescence section with the mature seed pods still attached are transferred into a solution of disinfectant (20% chlorox/1% sodium hypochlorite plus surfactant) for up to 10 min. All work from this point on is performed under sterile conditions, preferably under a laminar-flow hood. After surface sterilization of the seed pods, they can be rinsed in a sterile distilled water solution buffered with an antioxidant such as citric acid or as I prefer, rather than rinsing the inflorescence sections, they are quickly dipped into denatured alcohol and run across an alcohol lamp to ignite the alcohol. By using the second method, no moisture is present to interfere with seed extraction from the pods. After flaming the inflorescence section, it is transferred to a sterile petri dish where the seed can be removed and subsequently transferred to jars containing nutrient media (Table 1). In 2 to 4 weeks, the seed should begin to show signs of germination by turning green. After 1 to 2 replantings, the seedlings should be ready to plant out into the greenhouse, 4 to 6 months after sowing. If all goes well, most of the seedlings will bloom within 2 years from sowing. A few occasionally bloom during their first fall (less than 1 year after sowing), especially if a second replating is preformed and the seedlings are planted out into the greenhouse by April.

Table 1. Nutrient medium.

Murashige and Skoog basal medium ($^1/_3$ strength) with Gamborg's vitamins (Sigma Chemical Company, St. Louis, Missouri 63178 USA)	
Sucrose	20 g·liter^{-1}
Casein enzymatic hyrdolysate	0.5 g·liter^{-1}
Adenine	0.0 8 g·liter^{-1}
Ascorbic acid	0.1 mg·liter^{-1} (or as needed to lower pH to 6.0)
Phytagel (gellan gum)	2.25 g·liter^{-1}

If a second replanting is performed, casein hydrolysate is replaced by 90 g·liter^{-1} banana homogenate. Banana homogenate does inhibit germination and development of embryos, but once the first true roots develop, banana homogenate will increase root diameter and leaf thickness.

Vacin and Went basal medium, as well as Knudson salt base media with similar supplements, yield similar results.

Adding 0.5 mg·liter^{-1} of the banana homogenate to the above media can induce proliferation of selected clones. However, due to the uniformity of the seedling populations being produced, little need to pursue this aspect was deemed necessary until a unique clone is found other than to prove that it could be done.

Spiranthes seeds are germinated and grown under artificial light until they are planted out into the greenhouse.

In conclusion, *S. cernua* can be brought into commercial propagation rapidly using the above procedures, yielding thousands of plants per year.

Similar techniques were already being used at the nursery to produce *Bletilla striata.* Half-strength Murashige and Skoog medium was used instead of one-third strength.

Preliminary work on the commercial propagation of *Dactylorhiza* is also under

way, but has been limited by the availability or rather lack of seed. Initial results indicate that the above media supplemented with 40 ml·liter^{-1} of potato (homogenate) will work for germination and subsequent growth. Media supplemented with coconut milk and even an extract from oak leaves appears promising for initial germination. Light appears to inhibit germination and germination can be sporadic. Seed sown over 2 years ago is still germinating.

ADDITIONAL READING

Arditti, J. 1982. Orchid biology: Reviews and perspectives, II. Cornell University Press, Ithaca, New York.

Keenan, P.E. 1998. Wild orchids across North America. Timber Press. Portland, Oregon.

Scandinavia 2002, Observations from the Exchange Propagator©

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I would like to start by thanking the members of the Scandinavian Region and all of the other plants-persons that I had the fortunate opportunity to meet while traveling across Denmark. Their openness and willingness to share information was exemplary, as well as their hospitality to a foreign visitor.

My first taste of horticulture in Denmark was obtained while walking through a residential area in Copenhagen, a chance to stretch the legs after a long flight. Knowing little of Denmark upon my arrival I was amazed by the small, but meticulous gardens kept by the residents of Copenhagen. Every yard was surrounded by a hedge (I later found out that the tradition had ancient roots, first used to control livestock, later a law to mark property lines, and now an everyday tradition), past the hedges you would expect to see lawn/grass, maybe a few shrubs, but instead a wealth of plant material was found, only in the largest of "yards" could you find grass. If there wasn't room for a garden, there were planters, window boxes, and/or plants on the window sills. Everyone seemed to be a gardener or maybe they're like me and hate to mow grass. Horticulture in Denmark is definitely not restricted to commercial operations. As mentioned in previous reports from exchange propagators horticulture even extends into the cemeteries.

The morning of my first full day in Denmark was spent on the University Campus in Copenhagen with Dr. Arne Skytt Andersen viewing gardens, research greenhouses, and the remodeled research facilities (to be used for genetic and tissue research). Since school had yet to start little was actually happening at the time, but the dedication to horticulture was obvious when walking around the campus and the extensive plant collections.

By afternoon I was on a train traveling across Denmark to meet up with Per Boisen Andersen and Marianne Buchhave. Per was a very interesting individual indeed, besides the extensive plantings around his residence, he served on a Consulting Board for Garden Centers. One of his many projects included a downloadable full color labeling system for garden systems. Marianne serves as a consultant to commercial growers and worked closely with the research center at the Danish Institute of Agricultural Sciences at Aarslev. Per and Marianne are also very in-