# Tissue Culture Propagation of *Zantedeschia* (Calla Lily)

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## INTRODUCTION

The *Zantedeschia* or calla lily belongs to the aroid family (Araceae) and is commonly known as arum lily, pig lily, or yellow and pink arums. It belongs to the same genera as *Anthurium*, *Caladium*, *Dieffenbachia*, *Monstera*, *Philodendron*, *Scindapsus*, *Spathiphyllum*, and *Syngonium*. The genus was named by Sprengel in 1826, in honor of Professor Zantedeschi. There are numerous species: *Z. aethiopica*—the common white calla lily or arum, *Z. rehmannii*—narrow lanceolate leaves with flowers varying in color from ivory-white to deep-pink, *Z. jucunda*—yellow flowers in the summer, *Z. elliottiana*—yellow flowers with spotted leaves, *Z. pentlandii*—varying colors from white to yellow, and *Z. albomaculata*—strong growing with pale cream-lemon flowers.

The hybrids we are working with at the lab were developed in New Zealand from these species.

The calla lily comes from the summer rainfall areas of South Africa, growing and flowering in the early summer and dying back in late autumn to a fleshy tuber that remains dormant until spring. It was back in 1930 that hybridizing work started with these plants. The commercial objective of the breeding work is productivity, longer and stiffer flower stems, uniformity, and larger spathes.

For many years seed production has been carried out and it is well-known that this will provide a varying color range, many of which are unacceptable for the cut flower industry. With markets wanting quality, the use of tissue culture is imperative to ensure that this crop will, first, produce the flower with the necessary characteristics to satisfy the client and, consequently, demand the highest return.

The technique for propagating Zantedeschias was developed at the DSIR, Palmerston North, New Zealand by Cohen (1983). It is now the commonly accepted means of bulking up new cultivars. The initiation in culture is simple and multiplication rates are high. Dasheen mosaic virus (DMV) and *Erwinia* are the main concerns with zantedeschias and, therefore, the importance of tissue culture. Tissue culture is the only means of insuring clean propagules for planting (Zettler, 1988).

## MICROPROPAGATION

**Stock Solution and Media Preparation.** We prepare all stock solutions and media in the preparation room. The Murashige and Skoog mineral medium is supplemented with vitamins, cytokinin, carbohydrates, and agar to promote shoot formation and root initiation. The mixture is brought to proper pH (5.8) with sodium hydroxide and/or hydrochloric acid and then heated and stirred until the agar is melted. The mixture is dispensed into culture vessels. All vessels are carefully labelled and autoclaved at 121C for 15 min.

**Initiating Cultures.** Zantedeschias need to undergo a dormancy period before they can be replanted. Buds can be dissected either during the dormant phase or as the buds begin to swell. The rhizome is first washed to remove surface dirt and

a section of the rhizome with a bud is removed with a sharp knife. These sections are dipped in 95% ethanol and flamed twice. A small piece of tissue (2 to 4 mm long) containing the apical bud is cut out. The vessels are taken to the incubation room where they receive continuous light for 16 h and the temperature is 70 to 75F.

**Shoot Multiplication and Elongation.** Before opening any vessel, we check for contamination that might appear either in the media or directly on the explants and begin to subculture. Buds that are initiated expand rapidly and are split to enhance the development of a proliferating bud mass consisting of small buds. This mass can be cut into sections and replanted onto the same medium indefinitely.

**Root Formation.** The cultures are placed on a rooting medium with 0.1 mg/liter BA where rooting usually occurs within 2 weeks. After another 2 weeks, the leaf sheath grows to about 30 to 50 mm. The plantlets are easily handled at this stage and can be transferred directly to a potting mix.

**Transfer to Potting Mixes.** The rooted shoots are rinsed to remove agar and are planted in freely draining soilless mixes and placed directly into a shaded greenhouse under a fertilization program. The leaves start to unroll and new leaves develop. After approximately 6 months, the plantlets form a small rhizome that is harvested and cured. These rhizomes need to undergo a 6- to 8-week dormancy period before they can be planted. They can be planted into 2-, 4-, or 6-inch pots and will develop well as pot plants or they can be planted out in the fields to grow them on to larger flowering sizes.

## TRANSFER TO THE FIELD

In the field, the ground beds are prepared to provide the best soil drainage possible for the rhizome. Pumice, organic matter, complete fertilizers, and soil disinfectants are applied to the beds before planting. During planting, the rhizomes are handled with the greatest care to avoid bruising them. The worst enemy of zantedeschias is *Erwinia* and this can be controlled by careful, hygienic handling of the bulbs and by providing excellent soil drainage. The rhizomes are covered with 2 to 3 cm of light soil, pumice, sawdust, or rice hulls; the amount varies according to the size of the rhizome.

The rhizomes will begin to flower 8 to 12 weeks after planting. The flower is a transformed leaf bract and is composed of a central spadix bearing true male and female flowers, a colored spathe, and a flower stem. The top of the flower spathe is round or pointed in shape and the front can be open or semi-open. Flower quantity depends on cultivar, rhizome size, storage treatments, and growth regulator applications.

## ADVANTAGES AND DISADVANTAGES OF MICROPROPAGATION

The technique for micropropagation developed in New Zealand has been a great accomplishment for the commercial development of callas.

**Advantages of Micropropagation.**

1) Only a small amount of source plant material is required. Once clean material is initiated *in vitro*, it can be rapidly bulked up and maintained over a long period of time in very little space.

2) Micropropagation is a much more rapid mass production method due to the high *in vitro* multiplication rate of the plant material.

3) The plant material obtained through micropropagation will be of the highest quality, free of any pathogen, and producing a crop identical to the parent plant. Tissue culture is the only means of ensuring clean propagules free of DMV and *Erwinia*.

4) The rooting percentage *in vitro* is high and the plantlets can be transferred easily to the greenhouse.

**Disadvantages of Micropropagation.**

1) It is still, today, a more laborious method requiring a controlled environment.

2) It takes approximately 9 months to produce a 1 to 2 cm rhizome (0.50 to 0.75 in.) and this size rhizome cannot produce a long-stemmed cut flower for the cut flower industry. Therefore, due to the work involved in propagating *Zantedeschia* and the time required to obtain a good quality rhizome, the cost of initial stock rhizomes is somewhat high.

## LITERATURE CITED

**Cohen, D.** 1981. Micropropagation of *Zantedeschia* hybrids. Comb. Proc. Intl. Plant Prop. Soc. 31:312-316.

**Zettler, F.W.** 1988. DMV controlled by tissue culture. Greenhouse Grower 6(5):66-68.