

our buildings. We brought in a structural engineer to build a walkway system that connects our Library Building with the patch of forest behind it. The Library Building represents, in many ways, how humans store, and use information—in our library, our computer center, our art galleries, and administrative offices, all of which are contained in this building. But the forest also contains information—in the species that live there, and their interactions with each other and their environment. By directly connecting the library to the forest, we make a symbolic link between these two ways of understanding the three-dimensional forest from a different perspective.

Thus, forest canopy studies have been going through a rapid evolution in the types of studies that are carried out, the forms of data being collected and shared, the pathways of communication, and the relevance to societal issues. However, the field retains a youthful exuberance and openness to all who are interested in forest ecosystems.

Propagation of *Begonia hiemalis* at Klem's Greenhouse, Inc.®

Mark Klemmedson

Klem's Greenhouse, Inc., 18728 NE 109th St., Redmond, Washington 98052

ROOTING BEGONIA CUTTINGS

Rooting *Begonia hiemalis* tip cuttings is quite easy and there are many different methods used by different growers. Some use propagation tents, some use mist, and some don't use either. We root our cuttings in a double-layer system with mist. The cuttings start on a warm heated floor for 2 weeks where they receive just enough mist to keep them from stress. On tray tables just above this crop is a crop 2 weeks older. The cuttings receive minimal light, provided by fluorescent lamps, under the tray tables. After 2 weeks the cuttings are moved up onto the tables and the floors are cleaned and disinfected in preparation for a new crop of cuttings. A new crop of cuttings is put under mist in the same process that takes the 2-week-old crop out of the mist. The table that is emptied into the just-cleaned space is immediately filled with the next 36 flats of 2-week-old cuttings, and the process repeats until all of the 2-week-old cuttings are up on tables and the new cuttings are on the floor underneath them. At 2 weeks most of the cuttings have small roots. Up on the tables conditions are much dryer and brighter, and during the warmer months spritzing the cuttings is necessary for the transition. At 4½ weeks most of the cuttings are well rooted and ready for shipping.

There are many rooting media that work well for rooting hiemalis begonias. The medium needs to be light and well drained. Artificial media like oasis and rock wool can be challenging because they dry out too fast and the cuttings don't transition to bigger pots well. We have historically had best results using peat-based media. A direct-stick program works very well where only one cutting per pot is required.

We now root our cuttings in a 35-mm Jiffy pellet. The Jiffy Corporation designed a tray to meet our specifications. The tray gives the cuttings just enough space to

meet the cultural needs, but tight enough for economic efficiency. The tray is actually a double row strip. This allows us to separate the strips to provide space between the cuttings in propagation, but the strips can be pushed close together for shipping which reduces shipping damage and freight costs.

STOCK PLANTS

Producing a top quality, vegetative hiemalis begonia cutting is the most challenging part of the process. The stock plants must be correctly managed by controlling all of the following things:

- 1) Light intensity—no more than 2500 footcandles
- 2) Daylength—16 h or longer
- 3) Humidity—below dew point
- 4) Temperature—62 to 80°F
- 5) CO₂ concentrations—ambient levels or higher
- 6) Soil moisture—roots are very sensitive
- 7) Soil pH—5.5 to 6.5 (important)
- 8) Soil EC—1.0 to 1.5 (important)
- 9) Powdery mildew—sulfur vaporizers
- 10) Aphids—Marathon works well on stock
- 11) Botrytis—cleanliness, cleanliness, cleanliness
- 12) Staff taking the cuttings—training, training, training

Training the staff to take the cuttings and care for the stock plants correctly is the most difficult item on the list. The stock must be cut and groomed on a timely schedule or the cuttings quickly grow past their optimum stage. Once we get a new person trained we have to help them learn how to do that exact job very quickly. A piece rate bonus system has been the answer for me.

We have designed special stock tables to help us efficiently manage our plants. The tables roll to allow access aisles for cutting. They provide a secure place for the plants to sit with a uniform spacing pattern. They also have a drip tube placed just right so when the plant is put back on the table it is tubed in without any adjustment. The table is also completely open for maximum air movement and doesn't hold plant parts that routinely drop off and spread disease.

We plant new stock plants every year so the stock stays young and vigorous. It also gets very difficult to maintain the soil pH and EC in an acceptable range for more than a year. Different colors are started at different times of the year so cuttings are ready for the different holiday color demands.