past year, going from the worst to the best. There is a right computer system for any size business today and there is a way of finding it. We went the wrong way and then the right. If any of you are looking for computers, I would be glad to share my information and experience with you.

DECIDUOUS AZALEA PROPAGATION: AN OVERVIEW OF OLD AND NEW TECHNIQUES.

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Deciduous azaleas with their vibrant flower colors should be an important plant for the landscape. However, there is a negative response to them in the nursery industry because of foliar problems. The most common cultivars, such as 'Old Gold', 'Golddust', and 'Orangeade', are highly susceptible to powdery mildew and from mid-summer on, the foliage of susceptible cultivars begin to look unattractive unless treated every 2 weeks with a fungicide.

There are other cultivars, however, such as 'Royal Lodge', and 'Visco Sepala', 'Sunset Boulevard', 'Satan', 'Crimson Tide', and 'Pink Jolly', that are not affected by powdery mildew and have attractive fall foliage. These plants would be a welcome addition to any garden and be saleable in both spring and fall. Clearly this type of cultivar should be selected for production by the commercial propagator.

To propagate deciduous azaleas by stem cuttings, we made use of a program at Knuttel Nursery that was described by H. C. Nienhuys of Roadview Farm Nursery in Gloucester, Virginia, at the 1980 meeting of the Southern Region, International Plant Propagators' Society (1). I will only describe this method briefly, including minor variations.

During late fall we leave our stock plants outside, exposed to the cold weather, so that they become completely dormant. During the third week of December, we bring these plants into a large greenhouse that is heated to approximately 40°F. We allow the plants to thaw out gradually, slowly increasing the temperature to 70°F by the beginning of March. The plants are usually in full flower by mid-March.

We begin to take cuttings during the first week of April. Cuttings are taken from herbaceous shoots approximately 6 in. long. The optimal cutting should be hairy and slightly firm. To insure crispness of the cuttings we take the cuttings early in the morning and only take enough to process by noon. The cuttings are 3 to 4 in. long. The apical tip is removed and the lower leaves are stripped, leaving 3 to 5 leaves. The cutting is wounded on one side approximately 1 in. and treated with a hormone. The hormone powder consists of three tablespoons 1% IBA (indole-3-butyric acid), two tablespoons Dithane M-22 (maneb, Rohm & Haas), one tablespoon Benlate (benomyl) and a pinch of boric acid. The cuttings are planted in beds filled with a fine consistency Canadian sphagnum peat. The peat is moist but not soggy. We mist these cuttings with a mist nozzle at the end of a hose. With careful regulation, we prevent the peat from becoming too wet. The rooting medium is maintained at 73°F with forced hot air underneath the propagation beds.

In 4 weeks the cuttings begin to root. We then fertilize weekly with a combination of one tablespoon 23-19-17 (Rapid-Gro-Co.) and one tablespoon of Dithane M-22 per 3 gal. of water. Around June 15, the cuttings are then planted into 1½ gal. containers and placed in shaded hoophouses for the rest of the summer.

This method of propagating deciduous azaleas is highly successful for us. We generally have 80 to 85% rooting and the plants are usually a saleable size after 1½ years.

The traditional method of stem cutting propagation has a serious drawback in that it takes many years to get new cultivars into production. With cultivars that show a tendency towards difficult rooting such as 'Cecile' and 'Ballerina', it makes serious marketing of these plants nearly impossible. Tissue culture, on the other hand, allows quantity production more rapidly for all types of deciduous azaleas.

Charles Addison's tissue culture procedure makes use of dormant shoot cuttings taken from November to April. These shoots can be stored under refrigeration until July, which allows for continuous production for 9 months. Unlike that used in many other tissue culture labs, this procedure utilizes dormant buds. This enables the use of more concentrated sterilization materials.

Under a dissecting microscope, the dormant bud is opened and the well-protected meristematic point, which is approximately 1 mm in length, is extracted. The tip is then floated on a sterile liquid medium in a test tube.

In a primary growth room, utilizing proper lighting and heating techniques, the tiny growth tip increases to approximately 5 to 6 mm in 3 weeks. At this point, the tissue is transferred to a container with solidified agar supplemented with essential nutrients and a cytokinin, either 2iP or zeatin. Occasionally, a few tenths of a milligram of IBA may be added for increased proliferation. The ingredients of both the liquid and agar media are similar to the woody plant medium developed by McCown and Lloyd (2) at the University of Wisconsin.

As growth continues and the containers fill with increasing tissue mass, the clumps are divided and transferred to new containers for further proliferation. When adequate growth has occurred and significant numbers have been attained, the plantlets are then transferred to a container with a new medium. This modified medium has activiated charcoal, little or no cytokinin, a higher IBA content, and reduced inorganic nutrients.

After 3 to 5 weeks the plantlets are harvested. These plantlets are then transferred into either a peat/sawdust or peat/milled sphagnum mixture in trays. These are then placed in a secondary growth room which has high humidity and provides bottom heat. In 4 to 5 weeks rooting usually occurs. At this point they are hardened off and transplanted into 2¼ in. mesh pots for growing-on in a greenhouse.

With this method of propagation, thousands of plants can be produced within a year or two. This allows new and difficult-to-root cultivars to be produced and marketable in a much shorter period of time than with the traditional method of stem cutting propagation.

Using either of these two methods of propagation the nursery industry should concentrate on selecting and propagating cultivars of deciduous azaleas with powdery mildew resistance. The attractive foliage of these deciduous azaleas would make them better landscape plants and would extend the market time of these beautiful springtime plants into the fall.

LITERATURE CITED

1. Nienhuys, H. C. 1980. Propagation of deciduous azaleas. *Proc. Inter. Plant Prop. Soc.* 30: 457-459
2. McCown, B. H. and Lloyd, G. B. 1983. A survey of the response of rhododendron to *in vitro* culture. *Plant Cell Tissue Organ Culture* 2: 77-85
3. Lloyd, G. B. and McCown, B. H. 1980. Commercially-feasible micropropagation of mountain laurel, *Kalmia latifolia*, by use of shoot-tip culture. *Proc. Inter. Plant Prop. Soc.* 30: 421-437