

Greenhouse Automation and Plant Propagation's Global Connection[®]

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Plant propagation has been approached in different ways in different growing operations. Unrooted cuttings are usually collected either from the shade house or greenhouse or even from plants grown in landscaped areas in order to produce rooted vegetative liners in a nursery set up. Therefore, the seasonal changes in all the environmental parameters influence the quality of cuttings and rooting ability of cuttings throughout the year.

There is, however, a new approach to propagation in certain greenhouse operations. The global connection between cutting production facilities around the world and some of the very sophisticated greenhouse operations here in the United States of America is a fascinating phenomenon.

New introductions of ornamental plants are developed constantly by plant breeders around the world. Once produced, these plants are nurtured through tissue culture to maintain the true genetics and then mass-produced in perfect greenhouse conditions. The nuclear/mother stock plants, the foundation stocks, and unrooted cutting material are tested constantly for virus and other diseases by plant scientists and agronomists to ensure disease-free cutting materials. The regular pathogen testing and true-to-type testing of stock plants and cutting material is done regularly in their on-site laboratories.

The propagation nurseries around the world export unrooted cuttings throughout the year. Their emphasis is both on year-round quality assurance and on attentiveness to customer needs. Certified cuttings (E cuttings) are produced with a special quality certificate. The pathogen testing and true-to-type testing is performed on nuclear stock, foundation stock, and the cuttings. The unrooted cuttings are then distributed by U.S.A. brokers and rooted at the designated rooting stations in the U.S.A. After proper import permit processes, custom clearance, and agriculture inspection clearance, cuttings are delivered by air and Fed-Ex[™] to the rooting station/propagation greenhouses. Many suppliers are including temperature-recording devices in shipments in order to verify temperature records during the transit. The unrooted cuttings and tissue-cultured plants are stored at 40 °F humidity chambers and are either planted in substrate on the same day or stored for few days before transplanting.

Most of the rooting stations have state-of-the-art automated greenhouse facilities. Unrooted cutting production facilities are spread throughout the world, including Israel, Africa, China, Costa Rica, Guatemala, Australia, Brazil, Netherlands, Columbia, and Spain. Tissue culture factories are established in New Zealand, Australia, Denmark, and Netherlands. One of the largest unrooted cutting producers (Carmel) is located in Israel, where they produce excellent quality cutting materials. Throughout the world, Israel Carmel brand name stands for selected fresh produce delivered on time and in perfect condition. Carmel has excelled in produc-

ing greenhouse cuttings for over 25 years. With headquarters in Tel Aviv, Israel, and branches throughout the world, Agresco (Carmel) worldwide network provides marketing, delivery, and sales services all over the globe.

Greenhouse automation is a very important part of producing high-quality rooted liners and seedling plugs. Automation of cutting material facility first produces unrooted cuttings of optimum physiological status year-round. Then, automation in the propagation greenhouses produces high-quality plants with consistent results. In addition, purchasing high-quality seeds for maximum germination and diseases-free plants is also important. Applying strict chemical and environmental protocols in combination with the perfect optimum conditions results in very successful growing operation.

Use of efficient and automatic seeders minimizes labor and produces uniform seedlings and can potentially save time and money for growers. Transplanters, which automate the task of picking plugs from plug trays and inserting them into pots, provide many benefits to growers. The most complex transplanters can plant from 10,000 to 35,000 plugs per h depending on the configuration of the machine (Bolus, 2005).

In addition, stepping up greenhouse sanitation plays a very important role in propagation. Disease can cause severe economical damage to nursery crops. Installing foot-baths and hand sanitizers at each greenhouse entrance for prevention of viral and bacterial diseases have proven to be very useful tools (Hall, 2005). All employees handling the plant material in the production cycle must use aprons and gloves. Preventative and curative use of fungicide management is the most critical component of a sanitation program.

The greenhouse automation includes irrigation booms, computer-controlled greenhouse environments, proper and strict management of light levels, photoperiod, humidity levels, day- and night-temperature regimes. The irrigation booms are useful for applying fertilizers, fungicides, and plant growth retardants. The training and management of greenhouse staff at all levels of growing in combination with greenhouse automation results in the creation of mathematical growing formulas for each plant taxon. Use of strict growing protocols and use of strict chemical protocols is necessary for year-round success in any plant propagation environment.

LITERATURE CITED

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- Hall, R.** 2004. Stepping up greenhouse sanitation. *Comb. Proc. Intl. Plant Prop. Soc.* 54:363–364.