New Propagation Facilities at Monrovia Nursery, Visalia, California©

Jeremy Bahne
Monrovia Growers, P.O. Box 489, Woodlake, California 93286-0489

INTRODUCTION

To meet propagation needs for Monrovia's current expansion, work is under way to construct additional propagation facilities at the Visalia, California location. The projects include a 4-acre glass greenhouse that is nearing completion and a 4-acre retractable shade house that was recently completed. The new facilities will provide Monrovia with increased flexibility and operational efficiency.

THE FOUR-ACRE GLASS GREENHOUSE

This greenhouse is a Venlo-style house, which means that it has a truss system to support multiple ridgelines between posts. In one house there are a total of three ridgelines that measure 13.13 ft each between post lines. The house is made up of 20 gutter-connected houses that are each 39.39 by 212 ft. This house has a tempered glass roof and will be used for rooting cuttings and to house grafted trees. Glass was chosen to maximize light transmission during the cooler months. The house stands 16 ft to the gutter and has a venting ratio of 25%. For greater environmental control, the roof vents are divided into two zones and have directional control (east- and west-facing vents). For greater access to plant material and to increase natural ventilation, the north and south walls have roll-up curtains from 3 ft under the gutter to the ground. One of the venting zones houses 2 acres of concrete bottom heat, while the other zone has a rolling bench system with pipe heating. The 2 acres of concrete bottom heat are further broken down into 20 separate heating zones that measure 100 by 39.39 ft each. Within each heating zone there are two zones of mist. This provides 40 misting zones, which enables the care of crops at multiple stages of readiness. To improve drainage, the concrete was laser graded to a compound grade.

In the 2 acres of benches with pipe heat, each of the 10 houses has one stationary bench with six rolling benches and one moving aisle. The use of rolling benches makes it possible to bring the detailed work of grafting up to a comfortable level for employees and increase space usage by 16%. This area will initially be watered by hand, but provisions have been made to automate irrigation in this area at a later date. To prevent disease and aid with water recycling, a weed barrier was installed in the aisles and black plastic was placed under the benches. To help with cooling, a high-pressure fogging system will be employed and a thermal curtain may be installed to further increase heating and cooling efficiency.

THE FOUR-ACRE RETRACTABLE SHADE HOUSE

The retractable shade house has the same framework as the glass greenhouse, so it can easily be upgraded if more greenhouse space is required. There are four independently operated roof zones within this structure, each encompassing 1 acre. Two of those roof zones cover the 2 acres of concrete bottom heat with the same 40-zone mist system layout as the glasshouse. This area will be used for rooting evergreen

cuttings in the winter and sun-sensitive crops in the spring and summer. The other 2 acres of this structure are unheated and will be used to maintain rooted crops until they are ready to be shifted into larger containers. The shade material used in this structure is similar to a thermal curtain, so it will provide some protection from freezing temperatures in the winter.

GENERAL INFORMATION

The cutting production house is centrally located for improved access and material handling. It measures 78.78 by 100 ft and has the same design as the greenhouse. The primary difference between this house and the greenhouse is that the roof and sidewalls are covered with white acrylic to reduce heat build up. This structure will house two cutting lines, and a plug transplanter, flat filler, potting machine and soil mixer.

The 6-acre heating system is powered by two water heaters each with a capacity of 14 million Btu/h. The water heaters will operate in tandem to reduce equipment wear. The pipe heating for the rolling benches operates directly off the water heaters, while the concrete bottom heat is separated from the water heaters with a heat exchanger. With the addition of a flue gas condenser, this system will operate at a level of 96.7% efficiency (104% by American standards).

Water for the propagation area comes from 20 different wells on the nursery and is seasonally combined with water from a local river. The water is stored in two different tanks in the propagation area. Water entering the first tank is injected with chlorine for pathogen control. This fresh water tank is used to feed the mist system and for irrigating seedling flats. The water in the second tank is injected with chlorine and fertilizer. The fortified water is used to irrigate freshly rooted crops and to maintain finished crops. All of the water used in propagation is recycled for use in regular production areas. By using only a fresh water source in propagation, the spread of disease and weed seeds is prevented.

There are two systems used to control automation in propagation. In the glasshouse and retractable shade, Argus Control Systems are employed to control mist, irrigation, venting, shading, heating, cooling, and fertilizer injection. In the other 18 acres of propagation, a proprietary vapor-pressure-deficit system is used to control irrigation and fertilizer injection. In the two acres of open section mist and 1 acre of 50% shade mist, Phytotronic six-zone misting controllers with Intermatic 24-h time switches are utilized.

THINGS YOU SHOULD KEEP IN MIND DURING EXPANSION

- Plan, Plan, Plan.
- Study up by reading, talking to builders, and visiting other nurseries.
- Check with local officials for zoning and permit requirements.
- Work with your growers to meet their needs. The growing environment that you will create should be your first concern. Bells and whistles can come later.
- Build to fit your systems.
- Build for flexibility. Does your system allow for the use of new chemicals, new equipment, new containers, and new product lines?
- Build back-ups into the system that allow you to maintain the growing environment if a system failure occurs, i.e., gas, electric, water, and heating.

- Know who is responsible for labor, materials, and equipment. Foundations, wiring, downspouts, and groundwork are generally not included.
- Expect projects to take longer and cost more than you plan.

LITERATURE CITED

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General Session I: Question and Answer Session©

Kristin Yanker-Hansen: Can plants develop resistance to viruses and does the health of the soil help?

Michael Yoshimura: The common rose mosaic virus is not transmitted by any known vector. Plants that contain the viruses started out with the virus. It would not be carried from that diseased plant to other plants. Viruses react like other microorganisms, and their infectability depends on the host and the environment, which determine whether we see symptoms or not. Usually viruses are inhibited, they aren't as active, when temperatures are high so we tend to see rose mosaic virus most often in the springtime when the new leaves are out and then as it gets warmer we tend not to see them as much. Plants do have resistance to these microorganisms. The reaction between the virus and the host will determine the severity of the symptoms. Rose mosaic virus is not a very severe virus. It doesn't apparently harm the plant, and the plant will survive year after year with the virus in it. It doesn't affect the quality or appearance of the flower. Overall, infected plants seem to grow very well. Maintaining healthy plants probably does help the plant, but it's more a case of genetic resistance.

Tom Branca: If we want to propagate virus-infected plants conventionally, is there a distance behind the apical meristem or lateral meristem where the virus is absent so cuttings we take will be virus-free?

Michael Yoshimura: Viruses spread within the plant via plasmodesmata, and those haven't yet formed in the apical meristem. Viruses also move through the phloem, and it hasn't formed yet in the apical meristem either. Depending on the plant species then the virus will get very close to the apical meristem. Usually when you do meristem culture you grow the plant at an elevated temperature to slow down the growth of the virus and hope it gets farther away from the apical meristem and then excise the apical meristem so you can obtain a plant without the virus. Some chemicals (Ribavirin) have been used to slow down the virus.

Tom Branca: What actually makes a species? How do we determine taxonomically what the difference between genus and species is? You said that we can have two plants that look alike phenotypically, but yet genotypically they are somewhat different. From a molecular viewpoint how do you determine what a species is?