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Controlling the Propagation Environment with a Computer©

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A computer can help you with many aspects of propagation, including accuracy, trouble-shooting or fine-tuning efficiency. I will be talking to you about controlling the propagation environment with a computer.

First I would like to tell you about where I work and then how we use our computer. Some interest was expressed in explaining how we use Remay and later I would like to spend some time to share our experiences.

The family operation grows and sells ornamental landscape plants as well as florist azaleas on over 250 acres of land and in over 70 acres of greenhouses in Woodburn, Oregon. Millions and millions of cuttings are propagated in a 4-acre, Dutch-style propagation house. The computer in the propagation house is connected to controllers that manipulate the vents, heating, shade curtains, energy curtains, and horizontal air flow, as well as many other components. It is connected to the traveling booms for misting, the overhead misting, and the ebb and flow system. The computer also has the ability to control the pH and EC in the ebb and flow reservoir tanks.

The whole system works with many sensors and controllers; it automatically makes adjustments based on the computer settings.

The amount of water being misted on the cuttings is critical in successful propagation. The computer controls the irrigation with a light sensor; it can be set to run at particular times or intervals. When we start sticking, we set the computer to mist every 10 or 15 min during the day. It automatically switches to our night setting, which is every 3 h at night during the summer, just to make sure the soft cuttings are standing in the morning. Then we cover our cuttings with Remay and change the settings. We set the computer to accumulate light within a set time window (300 $W \cdot m^{-2} \cdot h^{-1}$ are the settings). So now the computer will start accumulating light starting at 30 min after dawn and will accumulate light until it reaches 300 $W \cdot m^{-2} \cdot h^{-1}$. It will send water every time it reaches that setting until it reaches the end of the windowed time, which is 30 min before dusk. With this computer setting, the frequency of the mist will be automatically adjusted to mist less when clouds are present and more when we have bright skies. We are misting more in the middle of the day than in the mornings or evenings. The frequency of mist will be changed automatically. If a grower uses a time clock, the grower usually will not adjust the clock several times a day and will naturally set the mist for more than was required.

Sensors are also required to run the boiler system correctly and efficiently. There are sensors measuring the temperature in the boiler water going out to the greenhouse, others measuring the temperature of the pipes in the greenhouse and others are used to measure the temperature of the boiler pipes where the boiler water returns. Suppose you get your fuel bill and it seems unbelievably high. It may be a good time to look at your settings. By looking at your history recorded by the computer, you can more than just look at how cold it was last night or what the humidity might have been. You can also look back at your history and see how much the boiler system was working. You can look back and see at any particular time and see any position of any valve or equipment, from irrigation valves or heat valves to energy curtains or shade curtains.

Sometimes in the evening and at night the greenhouse may have plenty of activity. The shade curtain may open, the energy curtain may close, the vents may close, and the heat may come on. This may not happen in the order intended. Of course if the settings are incorrect or if one zone is having an effect on another, things may not happen in the correct order. If the heat comes on before your vents have closed, it would get very expensive.

With a computer we can make sure things are going correctly, even when we are not there. We can use a modem to connect to the computer over the phone line and see everything as if we were at the greenhouse computer.

Often the timing of the adjustment is required when we cannot be there.

We cannot expect to be looking over our crops 24 h a day, however the sensors can. I mentioned that our computer has a modem that you can call and connect. The modem can also be used to call you to inform you of alarms sounding, such as when temperatures reach extreme values. Even when there is no emergency, sensors are recording and every midnight all of the information from all of the sensors and events are recorded on the hard drive. Archiving helps us adjust our settings. For example, you may find a crop that appears that it is not getting enough water. If something looks like it may be a bit dry in the morning, we can take a look and see how often the misting was and see when the last time the previous day was misted.

Because the crops are getting the correct water automatically, the correct shade automatically, the correct humidity automatically, grown in the correct temperature, and the computer is adjusting controls continuously based on the inside and the outside environments, the crop quality is increased.

More plants can be sold at a higher grade and we can enjoy the greater success of the nursery.

Remay is a synthetic cloth with random weave usually used as a crop cover for frost protection. It breathes well when dry and less when wet. We use it on all of the azaleas and many of the other broad-leaved plants for propagation. We put it on as soon as we are done sticking a section, a bed or a house of cuttings. When we start out, we are sticking using the time clock. The water is set to go every 10 min. After we completed the house we put the Remay on and we switch the misting to the computer (300 $W \cdot m^{-2} \cdot h^{-1}$). Without Remay, on a spring day, if we misted every 15 min from 6 AM to 9 PM, the plants would get misted 60 times a day. With Remay and the computer set setting of 300 $W \cdot m^{-2} \cdot h^{-1}$, we would mist only 7 to 15 times a day. Depending on the variety, after 4 to 6 weeks we begin to decrease the water to 350 $W \cdot m^{-2} \cdot h^{-1}$ and we decrease the water without risking wilting the cuttings. The cloth also helps to protect from the sun, and the spread of diseases and the spread of

weed seeds as well as protecting crops from insects. The easy tricks to using remay are as follows:

- Learn to apply the correct amount of water. I would suggest putting enough water to completely wet the Remay, but not so much that the water puddles on the top or that it creates droplets that hang below the cloth.
- Learn the correct interval. The correct interval can be determined by allowing the cloth to almost completely dry out (some varieties may allow for more drying). The cloth will slightly change color when it is completely dry. However, I would suggest that you use your sense of touch rather than your eyes to monitor the moisture level.

Computers are not a luxury. Usually when it is time to think about a computer system, it has become a necessity. Many things may need to be considered when choosing a computer system. Dynamics of a greenhouse can be very complex and the needs of your crop should be met with a system that works for the grower, the propagation environment, and the crops that are being grown.

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Using Compost Successfully in Propagation Systems©

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INTRODUCTION

Composting vegetative and animal waste has been part of intentional human activity for centuries. With the increasing urbanization of the world's population and the concentration of waste products, compost products have become increasingly available. Compost use in horticulture falls primarily into three areas. The first is amending field soils to improve organic matter and nutrient retention. The second use is as a partial replacement for bark fines or peat in containerized production. Finally, compost may be included in a container or greenhouse media for disease control.

CHARACTERISTICS OF COMPOST

Compost for propagation systems should be evaluated for maturity, salts, pH, particle size, and nutrient levels. Compost maturity may be measured by microbial respiration, carbon-to-nitrogen ratio, a seedling germination test, or the ratio of available nitrate to ammonium. Not all of these parameters are accepted as being useful in predicting compost maturity. For a propagation compost, low ammonium is a critical factor so a lab analysis or a Solvita ammonium test should be required. A Solvita test available from Woods End Laboratory measures CO_2 respiration and ammonium and may be provided by your composter. A highly stable compost will show a result of 7 or 8 on the colorimetric scale.

Electrical conductivity ranges widely in compost depending on the initial feedstocks. Electrical conductivity readings may range from 0.5 $dS \cdot m^{-1}$ to 12 $dS \cdot m^{-1}$ or