



Temperatures affect growth

The ability to control temperature is the foundation of our greenhouse industry. It is what enables us to grow plants when the weather outdoors is too cold. Temperature influences crop timing, crop quality, stem extension, watering frequency, insect reproduction and many other aspects related to floral crop production.

The focus on temperature has been renewed by the recent swell in energy prices. Articles and workshops have been delivered on understanding temperature and the effects of growing plants at different temperatures. However, when we discuss temperature, we generally focus on managing air temperature. We should be more concerned

about managing the temperature of the plant.

Measuring plant temperature

The temperature of the plant is what controls its rate of development. Unfortunately, measuring plant temperature is not very easy.

In research, sometimes we poke a tiny wire (thermocouple) into a shoot apex to measure the temperature where cells are dividing. This provides a reasonably good measurement of plant temperature, but the technique does not lend itself to commercial application. For example, thermocouples can fall out of the shoot tip, growers can trip over wires, and the wires need to be moved every few

days as the shoots develop.

Another way to measure plant temperature is to use an infrared thermometer. An IR thermometer measures the temperature of whatever it is pointed at.

One type of IR sensor is a portable, handheld device that measures temperature instantaneously. These instruments are inexpensive (some cost as little as \$35), and every greenhouse operation should have one.

Many handheld sensors have a laser that turns on when in use to give the user guidance of what is measured. However, IR thermometers measure a circular area, not the temperature of just where the laser is specifically pointed.

Position the sensor several feet above a crop and downwards at an angle if your goal is to measure the temperature of the plant canopy. If you want to measure the temperature of an individual plant, then you'll need to put the sensor within a few inches of the shoot tip.

An IR thermometer can also be a fixed device pointing toward a crop. When connected to a greenhouse computer, the thermometer can track average daily plant temperature

just as air temperature is recorded. Some of the more sophisticated greenhouse environmental-control computers now use IR thermometers to track plant temperature.

For a sensor to be most useful, it should be positioned at least a few feet above a plant canopy and be pointed at an angle downwards toward the crop. The sensor "reads" whatever it is positioned toward, so if you have newly transplanted plugs with a lot of soil exposed, the sensor will primarily read the soil temperature.

Importance of measuring

It is important to measure plant temperature because it is rarely the same as the air temperature. Plants can be several degrees warmer than the air temperature on a sunny day or when grown under high-pressure sodium lamps.

Plants can be considerably cooler than the air temperature at night, especially on a clear night when no retractable shade or energy curtain is used. Studies at Michigan State University have shown that New Guinea impatiens can be 10°F-15°F cooler than the air temperature in a dry glass greenhouse at night during winter.

Although plant temperature is primarily influenced by greenhouse air temperature, humidity and light intensity also have effects. Plants lose water through evaporation. The lower the humidity, the more water that is lost, and the cooler plants become. Since humidity is often very low during winter and early spring, plants can be significantly cooler than the air temperature.

Plant temperature generally increases with an increase in light intensity. During periods of cloudy weather and during winter when light levels are lowest, light does not significantly raise plant temperature unless supplemental lighting is used. One of the benefits of high-pressure sodium lamps not often considered is the increase in plant temperature when the lamps are turned on, particularly at night.

During winter and early spring, greenhouse temperatures, humidity and light levels are low throughout much of the United States. All of these factors contribute to low plant temperature, which delays plant development. As spring progresses, temperature, humidity and light levels increase.

During propagation, water temperature can also influence plant temperature. Cold water misted onto seedlings and cuttings can reduce plant temperature as well as the temperature of the growing medium. Sometimes bench bottom heating is insufficient to maintain a warm rooting medium when cold mist is frequently applied. A cooler rooting medium delays rooting and increases the time in propagation.

Maintain the environment

In winter and spring, a general goal should be to maintain the greenhouse environment so that plant temperature does not excessively deviate from the air temperature. Several methods can be used to maintain the temperature, including:

- Install a retractable energy or shade curtain and close it at night.
- Increase the relative humidity to 50-75 percent, even higher during propagation.
- Provide supplemental light from high-pressure sodium lamps on cloudy days and during a portion of the night.
- Use horizontal-airflow fans throughout the day and night. **GM PRO**