The **Orchid Grower**

In the third article of this four-part series, find out how to cash in on orchids, the second hottest potted flowering plant in the United States.

Figure 1. Symptoms of chilling injury in phalaenopsis.

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IN the last issue of *Greenhouse Grower*, we discussed how to manage media, watering and fertility of potted phalaenopsis orchid production. In this third article of our four-part series, we discuss the importance of temperature and light during vegetative growth and flower induction, and also mention some of the insect and disease pests that can present problems with phalaenopsis orchids.

Phalaenopsis orchids originate from tropical and subtropical areas of the South Pacific Islands and Asia, and thus have unique temperature and light requirements compared to other common potted flowering plants. In their native habitats, tropical conditions persist throughout the year with temperatures ranging from 82°F to 95°F (28°C to 35°C) during the day and 68°F to 75°F (20°C to 24°C) at night. Epiphytic orchids, such as phalaenopsis, grow on tree trunks and limbs and are shaded by the dense canopy of the forest. Therefore, successful commercial production requires providing warm and shaded conditions, especially during vegetative growth.

Temperature

There are two distinct phases of phalaenopsis production: the vegetative phase and the flowering phase. Plants are usually grown in separate greenhouses with different temperature setpoints during these two different phases.

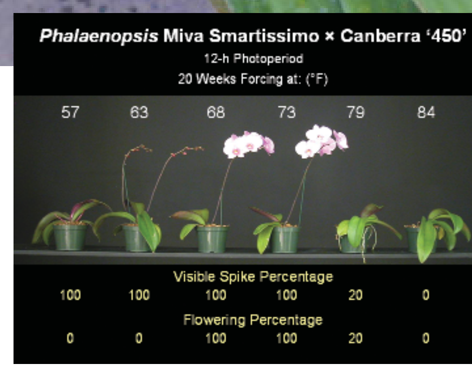

Figure 2. Effects of temperature on flower initiation and flower development in Phalaenopsis. Visible spike and flowering percentages represent the proportion of plants in flower when the photograph was taken.

Vegetative phase – To maintain vegetative plants, they must be grown at

82°F (28°C) or higher to avoid the development of immature inflorescences (spiking). This high temperature also promotes rapid leaf growth. Flowering can be suppressed with a cooler night (77°F or 25°C) if the day temperature is sufficiently warm (82°F or 30°C). If young plants (for example, plants with a leaf span of less than 10 inches or 25 centimeters) are exposed to lower temperatures, especially during the day, then premature spiking can occur. Spikes that develop on young plants are often not uniform and spikes are of poor quality (for example, short flower spikes with a low flower count). The small-flowered multiflora "mini phalaenopsis" do flower uniformly on plants with a leaf span of less than 8 inches (20 centimeters).

Figure 3. Phalaenopsis spike initiation usually occurs from the second, third and/or fourth node below the uppermost mature leaf.

Figure 4. Phalaenopsis with severe sun scald after being grown under a light intensity > 1500 footcandles. Photo courtesy of Kari Robinson.

Phalaenopsis can tolerate temperatures as high as 90°F to 95°F (32°C to 35°C) for a few hours per day if there is adequate moisture in the medium and good air movement. Because phalaenopsis are tropical plants, they should not be exposed to temperatures below 50°F (10°C) or large and rapid fluctuations in temperature, as they can suffer from chilling injury. A common symptom of chilling damage is the development of yellow, water-soaked and sometimes sunken spots on upper leaf surfaces (Figure 1). Chilling injury can develop in a matter of a few hours exposure to low temperatures.

Flowering phase – Once a population of plants is uniformly mature, they can be exposed to cooler temperatures to induce the flowering process (Figure 2). Phalaenopsis is induced to flower when exposed to temperatures lower than 79°F (26°C), particularly during the day. Traditionally, growers use a 77°F/68°F day/night (25°C/20°C) temperature regimen for spike initiation. After four to five weeks at these temperatures, plants can be grown at a wider range of temperatures (63°F to 79°F, or 17°C to 26°C) to time flowering with a specific

Figure 5. Effects of a single 250 ppm Bonzi foliar spray at various stages of spike development. The string is attached to the nodes of the lowest flowers. CK = check (no spray), 0 = applied prior to spiking, B= applied at spiking, and numbers = applied when inflorescences were 1.0, 2.5, 5.0, 7.5 and 10 centimeters tall. Photo courtesy of Tony Hsu.

marketing date. The flower spike usually emerges from the third and sometimes the second or fourth node below the uppermost mature leaf (Figure 3). Some growers in warm climates use air-conditioned greenhouses to induce phalaenopsis into flower during the warm months for year-round production, because naturally low temperatures do not exist during the summer.

Flower bud initiation starts after the spike has reached about 2 inches (5 centimeters) in length if environmental conditions are favorable (<82°F or 28°C). However, if a plant with a young inflorescence (less than 4 inches or 10 centimeters) is subsequently grown at 82°F or higher, a spike can form a vegetative air plantlet known as a "keiki" instead of flower buds, buds may abort or both. Spikes may continue to elongate to several feet without producing flowers. In general, temperature during the flowering phase has little or no effect on spike height or flower size. However, high temperatures (above 80°F) could reduce flower count compared to lower temperatures. Flowers that develop and open under high temperatures are usually thinner and do not last as long.

Time from spike initiation to the

first flower opening depends on the average daily temperature and the orchid hybrid. For example, time from spike emergence to open flower in phalaenopsis 'Miva Smartissimo' at 68°F (20°C) and 73°F (23°C) occurred after 89 and 72 days, respectively.

Light

Light intensity should be controlled throughout the phalaenopsis production cycle. This requires shading during most of the year, except possibly during the winter in northern climates. Except in northern latitudes (such as in northern Europe), supplemental lighting is not necessary for growing phalaenopsis. Photoperiod has no effect on flowering of most large- to medium-flowered phalaenopsis hybrids, although for some smaller-flowered hybrids, flowering may occur slightly earlier under short days.

Once bare-root plants have been transplanted into new containers, they should remain under diffuse light no greater than 1,000 footcandles (200 $\mu mol \cdot m^{-2} \cdot s^{-1}$ photosynthetic photon flux) for a few weeks to avoid transplant shock. This is particularly important during hot summer days. There must be a balance between light intensity and temperature; when temperature exceeds 90°F (32°C), light should be reduced to avoid overheating of the foliage. Excessive shading (less than 500 footcandles, or 100 $\mu mol \cdot m^{-2} \cdot s^{-1}$) should be avoided because this can slow down plant recovery after transplanting.

When new roots begin to form and leaves have regained their turgidity, light may be increased up to 1,500 footcandles (300 $\mu mol \cdot m^{-2} \cdot s^{-1}$) during the remaining vegetative phase. Light above 1,500 footcandles can cause irreversible sun scald (Figure 4). During the flowering phase, between 1,000 and 1,500 footcandles (200 to 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$) of light is recommended. Plants may tolerate up to 2,000 footcandles if the temperature is not too high (< 77°F or 25°C).

Research has shown that spiking of phalaenopsis orchids can be prevented by low light (40 footcandles) or complete darkness. Most commercial growers inhibit flowering by providing high temperatures (82°F or 28°C or higher), but growers without temperature control (such as those growing outdoors under shade cloth) can delay flowering by providing blackout cloth for four or five days per week.

Figure 6. Phalaenopsis infected with erwinia soft rot.

Height Control

Production of phalaenopsis usually does not require any means of height control. If height control is desired to shorten the portion of the inflorescence below the first flower, a single foliar application of Sumagic or Bonzi can be effective. The plant growth regulator (PGR) application should be made before the spike has reached 2 inches (5 centimeters) in length for best results (Figure 5). Alternatively, a quick preplanting root dip of mature plants in Sumagic (25 ppm) or Bonzi (100 ppm) can also effective. Plants treated with PGRs produce smaller leaves and subsequent flowering could be delayed. Late PGR sprays can cause flowers to be bunched together, creating an undesirable appearance. As with all PGRs, conduct your own trials on a small scale first to determine the appropriate rates.

Disease And Insects

Phalaenopsis are susceptible to a variety of diseases and insects. To minimize the threat of infection and the spread of disease, benches, pots and cutting tools should be sanitized. In addition, media should be free of insects and pathogens. Diseased or infested plants should be discarded immediately and samples should be sent in for proper diagnosis. Plants can be particularly susceptible to pathogens soon after transplant, and thus moderating air movement and avoiding a constant wet medium after transplant are important.

Erwinia (bacterial soft rot, Figure 6) and pseudomonas (brown rot) are more prevalent during moist and warm conditions. The best way to avoid these rots is to water plants early in the morning so they are dry at night. Fungal diseases such as fusarium, rhizoctonia, pythium and phytophthora can also be problematic when cultural conditions are substandard. When conditions are cool and humid, Botrytis petal blight can develop quickly as small brown spots on flower buds and flowers.

Mealy bugs, spider mites, scales, thrips, slugs and snails can also be problematic on phalaenopsis. Routine scouting for these pests should be made, and control measures should be taken rapidly to help prevent insect spread. **GG**

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