Growing the Best Phalaenopsis

Part 3: Temperature and Light Requirements, Height, Insect and Disease Control

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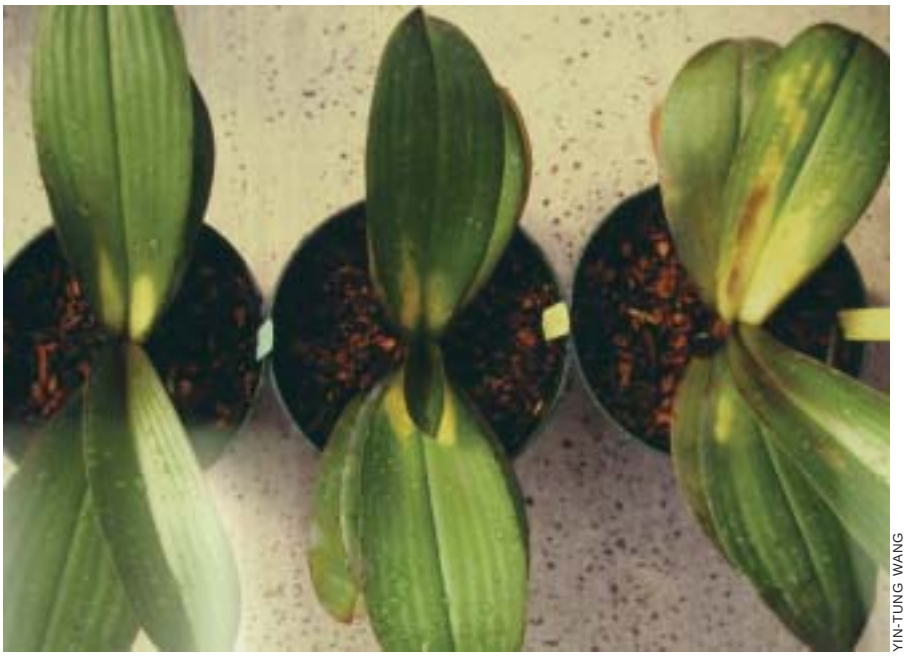

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TOP Symptoms of chilling injury in phalaenopsis.
ABOVE Symptoms of cold injury in phalaenopsis.

OPPOSITE Flowering phalaenopsis at Clone Biotechnology in Taiwan. The inflorescences are tied on wires and shaped starting at an early stage.

IN THE FEBRUARY 2007 ISSUE OF *Orchids*, we discussed how to manage media, watering and fertilization 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.

Phalaenopsis originate from tropical and subtropical areas of the South Pacific Islands and Asia, and thus have unique temperature and light requirements compared with 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 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 temperatures during these two phases.

Vegetative Phase To maintain plants in the vegetative state, 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. For most hybrids, flowering can be suppressed with a cooler night (77 F or 25 C) if the day temperature is sufficiently warm (86 F or 30 C). If young plants (for example, plants with a leafspan of less than 10 inches or 25 cm) 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" flower uniformly on

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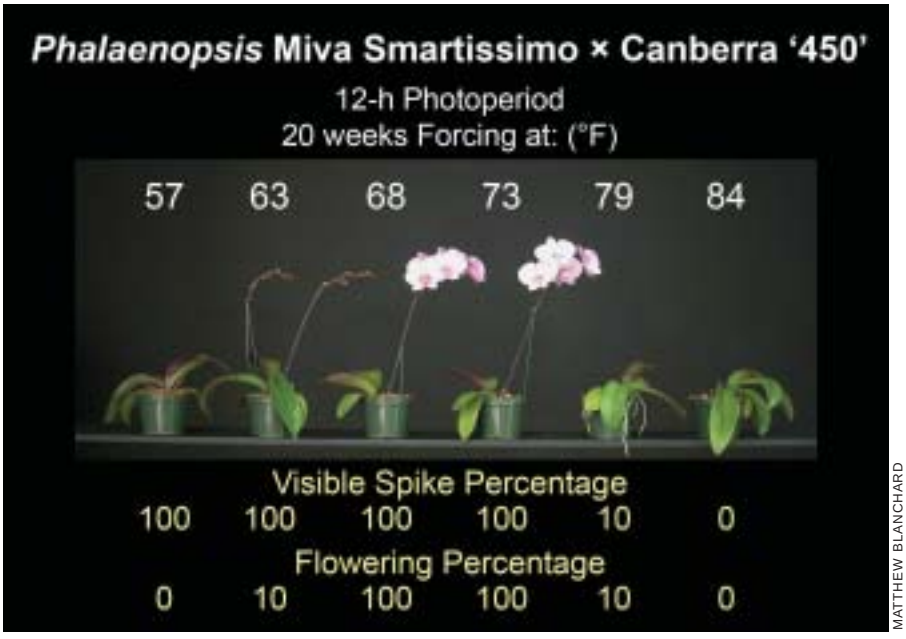
plants with a leafspan of less than 8 inches (20 cm). Phalaenopsis can tolerate temperatures as high as 90 F to 95 F (32 C to 35 C) for a few hours per day if there is adequate moisture in the medium and good air movement. Because phalaenopsis are tropical plants, they should not be exposed to temperatures below 50 F (10 C) or large or 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. 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. Phalaenopsis are 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. However, studies at Texas A&M University have shown that mature phalaenopsis can spike at constant day/night temperatures at or below 77 F (25 C). In fact, plants spike faster at a constant 25 C than at 20 C. 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 marketing date. The flower spike usually emerges from the third and sometimes the second or fourth node below the uppermost mature leaf. 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 cm) 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 cm) is subsequently grown at 82 F (28 C) 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.

High temperatures during the flowering phase may increase the length of the flower stem, but have little or no effect on flower size. However, high temperatures (above 80 F; 28 C) reduce flower count as compared with 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 × Canbeta '450') at 68 F



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TOP Effects of temperature on flower initiation and flower development in *Phalaenopsis* Miva Smartissimo × Canberra '450'. Visible spike and flowering percentages represent the proportion of plants in flower when the photograph was taken.

ABOVE Lower than desirable light levels result in long and thin leaves, as phalaenopsis plants illustrate.

OPPOSITE ABOVE LEFT Phalaenopsis being induced to flower in a greenhouse at Sogo Team Co. in southern Taiwan. Cold water flows through the air exchanger to provide air conditioning. Such cooling of the greenhouses does not remove as much moisture from the air as using the conventional coolant and maintains a desirable relative humidity.

OPPOSITE ABOVE RIGHT Phalaenopsis spiking usually occurs at the base of the third mature leaf from the top, but can occur at the base of the second or fourth nodes below the uppermost mature leaf.

OPPOSITE Taida Orchids uses mechanized heavy shading to defer spiking. The shade fabric is slightly open to allow for taking photographs.

(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. Lower than desirable light levels result in long thin leaves. 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 foot-candles (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 foot-candles, 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 foot-candles (300 $\mu mol \cdot m^{-2} \cdot s^{-1}$) during the remaining vegetative phase. Light above 1,500 foot-candles can cause irreversible sun scald under high temperatures or if the plants were produced under a much lower light level.

During the flowering phase, between 1,000 and 1,500 foot-candles (200 to 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$) of light is recommended. Plants may tolerate up to 2,000 foot-candles or higher 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 foot-candles) or complete darkness. Most commercial growers inhibit flowering by providing high temperatures (82 F or 28 C or higher), but growers without temperature control (those growing outdoors under shade cloth) can delay flowering by providing blackout cloth for four or five days per week.

HEIGHT CONTROL Production of phalaenopsis usually does not require any means of height control. If height control is desired to shorten the

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portion of the inflorescence below the first flower, a single foliar application of Sumagic (uniconazole) or Bonzi (paclobutrazol) can be effective. The plant growth regulator (PGR) application should be made before the spike has reached 2 inches (5 cm) in length for best results. Alternatively, a quick preplanting root dip of mature plants in Sumagic (25 ppm) or Bonzi (100 ppm) can also be effective. Plants treated with PGRs produce smaller leaves, and spiking during the next season could be delayed. Late PGR sprays can cause flowers to be bunched together, creating an undesirable appearance. B-Nine (daminozide) is ineffective. 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 to a diagnostic laboratory for proper diagnosis.

Plants can be particularly susceptible to pathogens soon after transplanting, and thus moderating air movement and avoiding a constant wet medium after transplant are important. Erwinia (bacterial soft rot) 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 open flowers. Mealybugs, 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 their spread.

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ABOVE LEFT A clone of *Phalaenopsis* Sogo Grape (Super Stupid × Princess Kaiulani) with severe sun scald after being exposed to excessive light in a warm environment.
ABOVE Plants that were induced to flowering in air-conditioned greenhouses at Yupin Biotechnology in Taiwan.
OPPOSITE Effects of a single 250 ppm paclobutrazol 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 cm tall.

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Diseases and Insects Affecting Phalaenopsis

Erwinia soft rot

Botrytis

Mealybugs

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