Plant Culture

How Temperature and Photoperiod Impact Orchid Spiking

By: Yin-Tung Wang | Wei-Ting Tsai | Ting-En Dai

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Orchids are everywhere and the demand is continuing to

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grow as the most popular blooming potted crop in the U.S. Between 2010 and 2011, production increased by 11 percent. Yet, for such a rapidly growing crop, do we understand enough of the science behind growing the best phalaenopsis?

Bougainvillea requires short photoperiod to initiate flowers when it is warm, but is day-neutral under cool conditions. For other floral crops, such as poinsettia and chrysanthemum, exposing plants to a short photoperiod for an adequate period of time triggers the flower initiation process.

Similarly, in orchids like cattleya and many of its hybrids, short photoperiod induces their floral initiation or causes the preformed floral primordia or buds to grow and bloom. By imposing the appropriate short photoperiod under the needed temperature, these plants can be forced to flower as desired.

Photoperiod Not Required

Most phalaenopsis species are native to areas close to the Equator and do not need a specific photoperiod to induce flowering. Instead, it is the low temperature that triggers phalaenopsis to start the flowering process. Many growers now use expensive air-conditioning to flower phalaenopsis during the warm period of the year. Any other means that can induce earlier spiking would shorten the production process and lower the cost. Using short photoperiod naturally comes to mind.

However, research at both Texas A&M University and Taiwan Floriculture Research Center shows phalaenopsis does not respond markedly to photoperiod for spiking. Short days have a marginal effect of inducing spiking 5 to 8 days earlier than a similar but long-day condition, regardless of temperature in the needed range (Table 1). It seems when temperature is at the upper limit of triggering spiking, short days may induce some plants to spike.

The species *Phalaenopsis pulcherrima* (formerly *Doritis pulcherrima*) introduces intense color, straight spike and

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summer-flowering to some phalaenopsis hybrids. The species and some of its hybrids, particularly its first-generation hybrids, do have a specific photoperiod requirement for spiking.

In a 2003 *Scientia Horticulturae* report, this species is said to require a 9-hour short photoperiod under field conditions to spike. Given the latitude of the location where this study was conducted (22.6°N), it is not possible to obtain this short photoperiod in the open. In this study, plants under the 16-hour long photoperiod did not spike.

As opposed to most hybrid phalaenopsis that spike in the fall, it is well known that *Phalaenopsis pulcherrima* naturally spikes in mid-spring and flowers in the summer. This species starts spiking in April in Weslaco, Texas (latitude 26.2°N). The day lengths from dawn to dusk in late March to April are between 13 and 14 hours.

In a 2005 study conducted in growth chambers, *Phalaenopsis pulcherrima, Phalaenopsis buyssoniana,* and *Doritaenopsis* 'Purple Gem' all spiked under a 14-hour period at 77°F day/68°F night (25°C day/20°C night). The light intensity in growth chambers was adjusted, allowing plants under both 14- and 9-hour photoperiods to receive 8.4 μmol•m-2•day-1 PAR.

None of the plants under the 9-hour photoperiod spiked. All of the plants in the greenhouse started to spike in late April and continued to produce more spikes through September under the natural long photoperiods. It is not clear if flower bud initiation would take place under short photoperiods after spiking.

Run Orchids Hot, Then Cold

Some growers believe that phalaenopsis plants spike faster if they are exposed to high temperatures for a few weeks before being subjected to cooling. In one study, plants of two clones were placed for four weeks at 91.5°F, 86°F, or 82.4°F (33°C, 30°C, or 28°C) before subjecting them to 71,6°F (22°C). In both clones, spiking was not accelerated by prior exposure to high

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temperatures (Table 2). Nor was spike number enhanced by the four weeks of heat before cooling.

A technique has been developed for growing phalaenopsis under high temperatures during the day (86°F to 92°F or 30°C to 33°C) and higher temperatures (72°F to 75°F/low 20s C) at night to reduce the cost of heating, while keeping plants growing but not spiking during the cool months (Figures 2 and 3). This technique is particularly effective if plants are kept above 82.4°F (28°C) for 12 hours with more hours at the ceiling of 91°F to 95°F (33°C to 35°C) daily.

There have been concerns that exposing mature phalaenopsis plants to such high temperatures for extended periods may cause abnormal spiking. The above data and another study conducted at the Floriculture Research Center in 2012 confirm that exposing plants to 86°F to 89°F (30°C to 33°C) from four weeks to several months before cooling did not cause the plants to spike any slower or produce fewer spikes, when cooled, than those grown under the lower temperature of 77°F or 82.4°F (25°C or 28°C). Because hundreds of varieties are in commercial production, it is conceivable that some varieties may not tolerate such high temperatures or do not respond similarly. Also, in areas of high humidity, disease control becomes an important task to keep plants healthy.

Cooling Delays Spiking And Flowering

Once cooling has started, exposing plants to high temperatures nullifies the accumulated cooling stimulation and delays spiking and flowering. In one study, exposing plants to 86°F (30°C) for one week, after one to four weeks of cooling, effectively delayed spiking by 9 to 23 days and delayed flowering by 2 to 3 weeks (Table 3). Neither flower count nor flower size was affected. This information is particularly useful for growers who rely on natural ventilation to cool their greenhouses and temperatures can rise over 86°F (30°C).

Also, in this study, none of the phalaenopsis plants spiked while being exposed to a constant 86°F (30°C) for 27 weeks. After being moved into a greenhouse, these plants spiked normally in an average of 38 days (Table 3). This study points to the possibility of using intermittent high temperatures to prevent spiking. By applying cycles of 1 to 3 weeks of reduced temperatures (down to 59°F or 15°C) followed by 1 week of high temperature to inhibit spiking between late fall and early spring, it may lower the cost of inhibiting spiking by using constant 82°F (28°C). More studies are needed to explore this strategy and to determine 1) if varieties respond similarly and 2) the possible energy savings under commercial conditions.

It is well worth mentioning that some phalaenopsis varieties spike 1 to 2 weeks faster at 77°F day/68°F night (25°C/20°C) than under 68°F day/59°F night (20°C/15°C; Tables 3 and 4. Therefore, when air conditioning is employed to trigger spiking, there is no need to use such low temperatures at increased cost. However, depending on the variety and plant maturity, more plants may produce multiple spikes under the lower temperatures.

One unconventional strategy, perhaps, could be cooling plants at 68°F day/59°F night (20°C/15°C) for 2 to 3 weeks and them raising the temperature to 77°F day/68°F night (25°C/20°C) to maximize the spike number and accelerate spiking while keeping the cost more affordable.

Phalaenopsis spikes readily at a constant temperature in the proper range and a day and night temperature differential is not required (Table 4).

Although it may not be feasible in commercial production, for a given set of day/night temperatures in the spiking induction range, it is interesting that cooler day and warmer night accelerates flowering (Figure 4). However, after prolonged exposure, leaf growth becomes much slower at 59°F day/68°F night (15°C/20°C) than at 68°F day/59°F night (20°C/15°C),

despite the same average daily temperature of 63.5°F (17.5°C; Figure 3).

More U.S. Research Is Needed For Successful Production

Despite orchids having become the most valued pot flowers in the U.S. and the European Union, we read few articles on growing orchids. University research geared to improving the commercial production and lowering the cost has been lagging far behind in the Western hemisphere.

Unfortunately, none of the university scientists in North America are currently doing research on growing pot orchids. Taiwan leads the orchid research in the world, with more than a dozen universities and research institutions receiving multi-million dollars in government grants. However, results from research overseas often may not be useful to producers in the U.S. This booming orchid market needs sustaining support through continued research at Land Grant institutions. **GG**

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One comment on "How Temperature and Photoperiod Impact Orchid Spiking"

Allyn Engman · February 5, 2017 at 9:41 pm

I am looking to order some of your beautiful cut White Phalaenopsis Orchid stems. I understand they come in a box of 12....please let me know what you need from me in the way of tax ID address etc. I would like to have them shipped to me to arrive on Wednesday, February 22nd. Thank you for your time and trouble... yours, Allyn Engman

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