Phalaenopsis Orchid Light Requirements

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Taiwan is one of the world's top producer of phalaenopsis orchids (*Phalaenopsis* Blume.). In the past, growers have used heavy shading during the summer to reduce heat stress. As a result, plants did not produce acceptable inflorescences until 2 to 3 years after their removal from in vitro. Following the introduction of Venlo-type greenhouses with fan and pad cooling during the summer and heating during the winter, greenhouse air temperatures were maintained at between 30 and 20 °C (86 and 68 °F). Computer-controlled exterior and interior shading maintained light intensity between 200 and 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$ (1000 and 1500 ft-c). All these optimal environmental factors greatly reduced the duration of the juvenile period of phalaenopsis orchids to 1 to 1.5 years following their removal from in vitro culture.

Plants that were grown under 80 to 160 $\mu mol \cdot m^{-2} \cdot s^{-1}$ (solar noon on a sunny day) of photosynthetic photon flux (*PPF*) had significantly less weight in their leaves and roots, delayed spiking and flowering, as well as fewer flower count compared to those produced under 260 to 360 $\mu mol \cdot m^{-2} \cdot s^{-1}$. Exposing *Phalaenopsis amabilis* Blume. to low *PPF* while plants were being cooled to trigger spiking resulted in reduced flowering, low flower counts, and delayed flowering. All of the plants bloomed when daily light integral has reached or exceeded 2.2 $mol \cdot m^{-2}$ photosynthetic photons, regardless of the length of the photoperiod and *PPF*. When plants with 10- to 15-mm (0.4- to 0.6-inch) flower buds were placed under low *PPF* (4.6 to 7.0 $\mu mol \cdot m^{-2} \cdot s^{-1}$) for 1 week, bud blasting was more severe at high [25 °C (77 °F) day and 20 °C (68 °F) night) than low [15 °C (59 °F) day and 13 °C (55 °F) night] temperatures. Spray application of 0.5 mM silver thiosulfate (STS) on inflorescences reduced bud blasting following simulated shipment in darkness. Flower bud blasting of *P. amabilis* were more sensitive to low irradiance than the hybrid phalaenopsis, 'Joseph Hampton.'

Leaves of phalaenopsis orchids had less carbohydrates when grown under low irradiance. Roots of *P. amabilis* accumulated sugar and starch under low irradiance, while hybrids with large white flowers did not. Phalaenopsis orchid production in Taiwan is mainly in the south. Between October and early May, southern Taiwan has more than twice as many hours of sunshine than the north. The flower count and concentrations of carbohydrates in the leaves *of P. amabilis* grown in southern Taiwan were higher than those in the north.

Phalaenopsis leaves pose the crasulacean acid metabolism (CAM) photosynthetic pathway. They grow best under day and night temperatures of 30 and 25 °C, respectively. In the second mature acropetal leaf, the maximal nocturnal CO_2 fixation occurs while *PPF* during the day is 100 to 200 $\mu mol \cdot m^{-2} \cdot s^{-1}$ during the day. However, CO_2 fixation also occurs near the end of the light period (Phase IV) that has an optimal light requirement of 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$. The results of 10 years of investigation indicate that the optimal *PPF* for growing phalaenopsis orchids is between 200 and 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$, with photoinhibition occurring above 400 $\mu mol \cdot m^{-2} \cdot s^{-1}$.