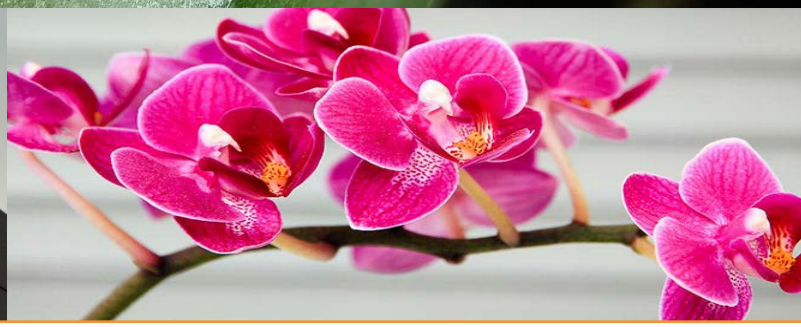
Sendot research



Measuring photosynthesis for highly efficient production in Phalaenopsis

Application Note

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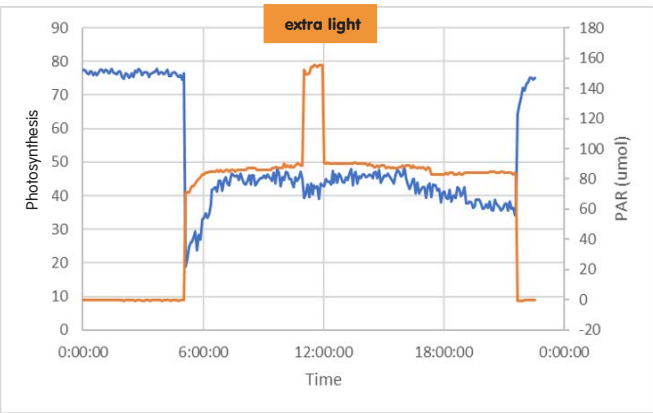
Fiber-optic photosynthesis sensors are becoming essential to enhance highly efficient plant performance. They provide real-time answers to questions about the optimal values for growth factors like temperature, PAR light levels, CO2, oxygen in the root zone and vapor pressure deficit (VPD). This enables growers to optimize their growing strategy, resulting in lower costs and bigger profits. Itís value for (a.o.) Phalaenopsis growers is evident.

The innovative Sendot fiber-optic photosynthesis sensor can be used as a flexible hand-held tool and as a semi-permanent logging instrument. Simply attach the optical fiber on a leaf with the practical leaf clip and data will start to flow in. The sensorís logger function allows it to monitor and collect data on site continuously for several weeks. The sensor can be connected to a climate computer and be used as an extra control device for the optimization of growth strategies. The potential of photosynthesis measurements has been demonstrated in research and in practical use, a.o. in Phalaenopsis.

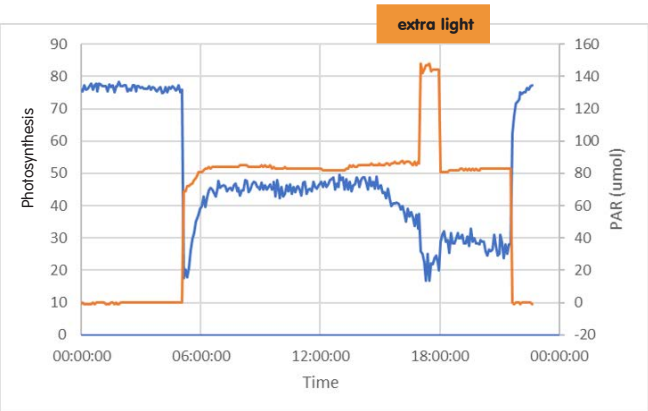
How it works

The fiber-optic photosynthesis sensor measures the efficiency of photosynthesis by means of chlorophyl activity in the leaves. This parameter is strongly influence by the growth factors light (PAR level) and available CO2.

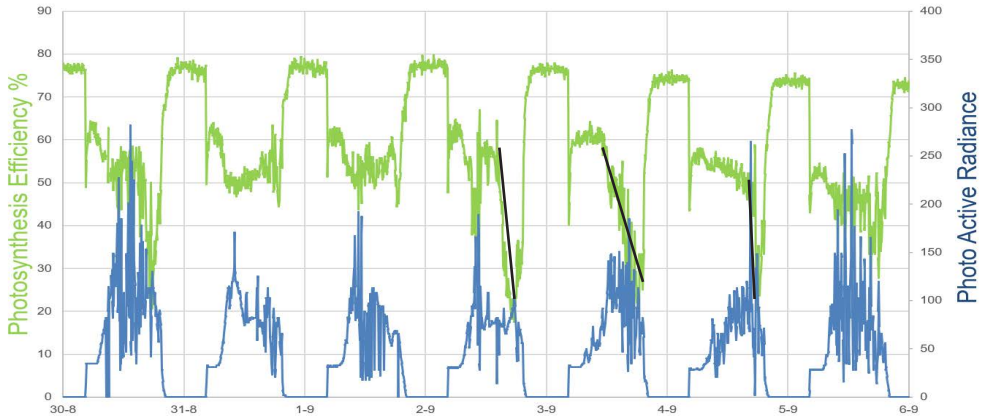
Phalaenopsis, a member of the orchid family, stores CO2 at night (dark period) and consumes it during photosynthesis the next day (light period). The critical moment, when nearly all stored CO2 has been consumed during daytime, can easily be detected with the sensor, as the photosynthesis-efficiency will decrease sharply. Phalaenopsis growers control lighting by measuring the total light sum. The light sum the plant receives should enable it to consume all the available (stored) CO2. Continued lighting after this critical moment will lead to stress, damage and productivity loss. If the available CO2 is not yet completely consumed, more light can be given to prolong photosynthesis and production.



Graph 1: Extra light at 12:00 - stable photosynthesis



Graph 2: Extra light at 18:00 - drop of photosynthesis



Graph 3: Photosynthesis monitoring at grower Vijvenberg - Plant stressed on 2nd, 3rd and 4th of September

These effects are illustrated In the following graphs. Graph 1 shows that extra light given around 12:00 has no effect on efficiency, because there is still enough CO2 available to be consumed. Graph 2 shows that extra light given at the end of the day has a strong negative effect on photosynthesis, because all CO2 has already been consumed. The extra light results in stress and internal damage, and even in lower photosynthesis the next day.

Case: energy savings and improvements

Because of day-to-day variations in growing conditions and their potential impact on plant performance, itís crucial for phalaenopsis growers to be well informed and apply the right light sum. At Kwekerij Piet Vijverberg, a well-known phalaenopsis grower in The Netherlands, photosynthesis is monitored continuously. As seen in graph 3, the monitored plant shows a predictable rhythm during the night and variations in photosynthesis at daytime.

Lower peaks in photo active radiation on the 2nd, 3rd and 4th of September clearly indicate that the plant is stressed and has reached its limits for the day. This usually happens between 15:00 and 16:00h, confirming that all CO2 has been used and that continued lighting causes stress rather than growth. Consequently, the grower decided to change his light strategy. This simultaneously resulted in plant recovery (increased photosynthesis and production) as well as energy savings (lower costs).

Added value

In short, monitoring photosynthesis in Phalaenopsis leads to:

- Energy savings, as artificial lighting can be directly linked to plant performance (0.2ct/m2 per day);
- Increased production, as determining growth parameters can be set in line with the cropís potential.

Contact us

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