PHILIPS

Horticulture
LED Solutions

Case study
Warsaw University of
Life Sciences

Warsaw, Poland

Philips GreenPower LED toplighting
and LED interlighting

LED is the best for growing cucumbers in winter

Our trial proved that 100% LED lighting is the most cost-effective way to grow cucumbers in winter

> The 100% LED compartment used 60% less electricity and 1.4 less liters of water per kilogram, **and produced a 24.8% higher yield."**

Professor Janina Gajc-Wolska and Dr. Katarzyna Kowalczyk,
Department of Vegetables and Medicinal Plants

Background

Established 200 years ago, Warsaw University of Life Sciences is ranked in the top one hundred international universities in agriculture and forestry by the QS World University Rankings. The Department of Vegetables and Medicinal Plants is a leading academic knowledge center that focuses on testing environmentally-friendly and ecologically responsible methods for producing vegetables, fruits, and medicinal raw materials. When Philips Horticulture LED Solutions approached them with the challenge of growing cucumbers under 100% LED lighting in the winter, they were skeptical but interested. They set up a cross-technology scientific trial to test the theory.

The challenge

Philips and the Warsaw University of Life Sciences had several goals for this trial. They wanted to prove if it was possible to get high yields of good quality, tasty cucumbers using only LED lighting. They also wanted to investigate the efficiency of using LED interlighting on crops. During the trial, the team also wanted to gather data on the most economical way to grow cucumbers using existing greenhouse technologies, including HID and LED lighting, as well as heating and irrigation systems.
Professor Janina Gajc-Wolska, Department of Vegetables and Medicinal Plants says, "I was a bit skeptical about how much impact the LEDs would have on our crops. As we began the trial, the plants grown under LEDs were actually more compact so I thought they would not deliver as many fruits as in the HID field. However, in the end they delivered even more than normal size plants, mostly because of lower abortion rates, which also allowed us to do less intense pruning. We just had to get used to the fact that the plants look different, but in the end that meant they were better."

The solution

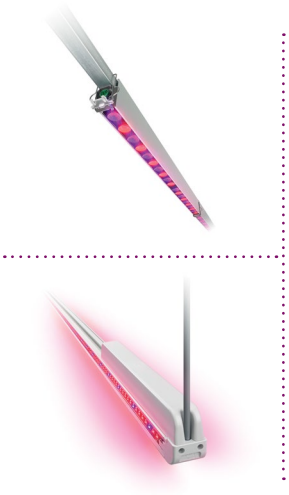
During the winter months many countries in the Nordics and Eastern Europe rely heavily on cucumbers imported from countries in Southern Europe. It is simply too expensive to

produce cucumbers using conventional high intensity discharge (HID) lighting, which uses a great deal of energy and produces high levels of heat. The latest Philips LED lighting modules are extremely energy efficient and produce very little heat, opening opportunities to grow vegetables cost-effectively in the late autumn and early spring periods.
The University set up three separate growing compartments for cucumbers. They all applied the same growth light levels, each provided by different lighting technologies. The power installed in the reference compartment, with HID toplighting luminaires alone, was set at 200 W/m^2. The hybrid trial compartment used a combination of Philips GreenPower HID toplighting luminaires at 150 W/m^2 and a double line of Philips GreenPower LED interlighting modules; together they amounted to 190 W/m^2 in the compartment. The full LED trial compartment was equipped with Philips GreenPower LED toplighting, set at 220 µmol/s/m^2, and an additional double line of Philips GreenPower LED interlighting; together they amounted to 138 W/m^2 in the compartment. Despite the different amounts of energy used, each compartment received 320 µmol/s/m^2 of light in total.

Benefits

This trial proved that cucumbers grow really well under 100% LED and it is the most cost-effective way to produce cucumbers in late autumn and early spring. "You think you are getting a lot of 'free' heat with HID lights, but they actually deliver heat at the wrong moment during the day and a lot of it is lost into the air. It also results in a loss of CO_2 which could be used for production due to ventilation. With the LEDs, we were able to reduce our energy costs by 60%. We also used 1.4 fewer liters of water per 1 kg of cucumbers produced, and increased yields by over 24.8% per square meter," says Professor Gajc-Wolska.

In the 100% LED treatment compartment, there were much lower rates of fruit abortion and individual fruits were significantly heavier. Although each individual fruit was fairly the same size, a medium-sized cucumber grown with 100% LED weighed 200-210 grams versus up to 190 grams for those produced under HIDs. That means growers can harvest more kilos per square meter to increase their profits. In consumer taste tests, there was a preference for the cucumbers grown under 100% LED as well – they had a slightly sweeter and less watery taste.



"The fruits grown under 100% LED looked much the same as under HIDs but **consumers preferred their taste."**

Facts

Horticulturalist / grower
Warsaw University of Life Sciences.

Sector
Vegetables.

Crop
Cucumbers.

Location
Warsaw, Poland.

Solution
Philips GreenPower LED toplighting and LED interlighting.

Results
60% lower energy costs, less water usage, 24.8% higher yields, lower levels of fruit abortion and higher weights.

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