

PERFAND LED®



**LIGHTING
FOR PLANTS
GROWTH SUPPORT**



HORTI

Lifetime 60 000h for L80B10
Ambient temperature range -35°C...+40°C
5 year warranty

**DEMESNE
ELECTRICAL**



**640
µmol/s**
**680
µmol/s**

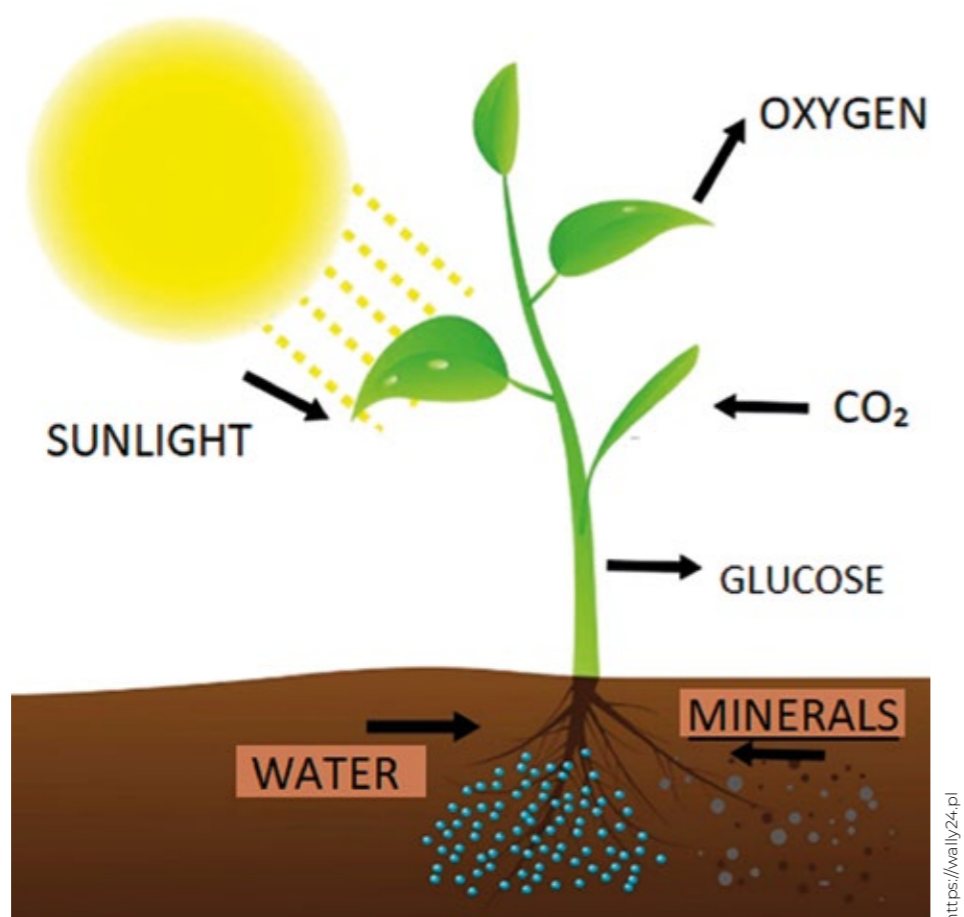
**3,20
µmol/J**
**3,40
µmol/J**

**IP
65**

INTRODUCTION

Light is an important factor in the life of all plants. It is necessary for self-rearing species whose existence depends on photosynthesis. Photosynthesis is the process of producing organic compounds from inorganic matter with the participation of light, occurring in cells containing chlorophyll or bacteriophores. This is one of the most important biochemical transformations on Earth. The process produces glucose and oxygen. Glucose, among other things, nourishes the plant while oxygen is released into the atmosphere.

FACTORS AFFECTING THE PHOTOSYNTHESIS PROCESS

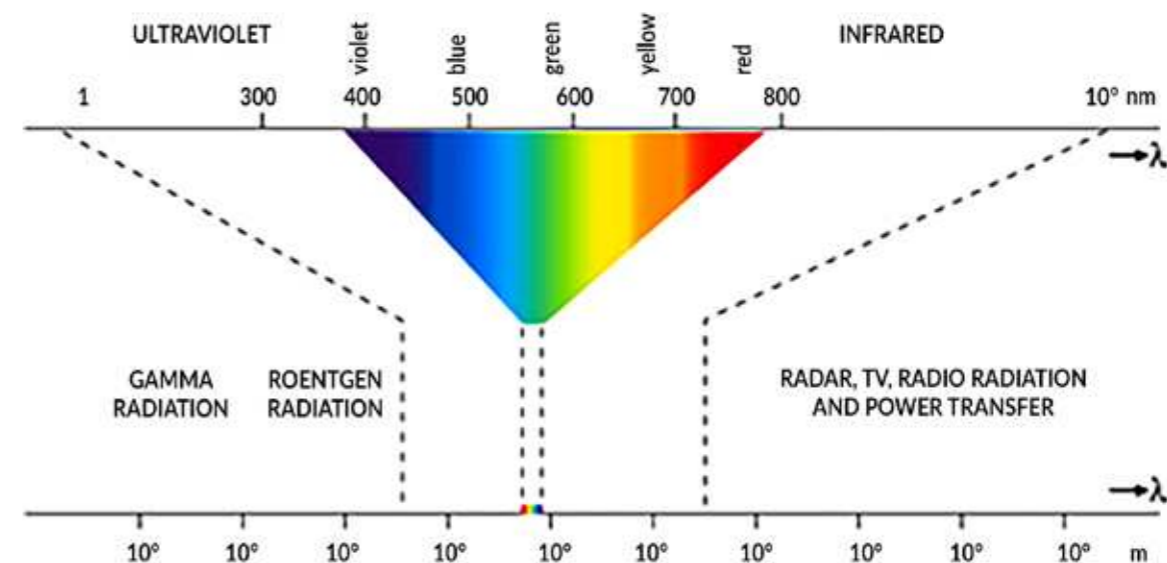


Pic. 1. Photosynthesis factors

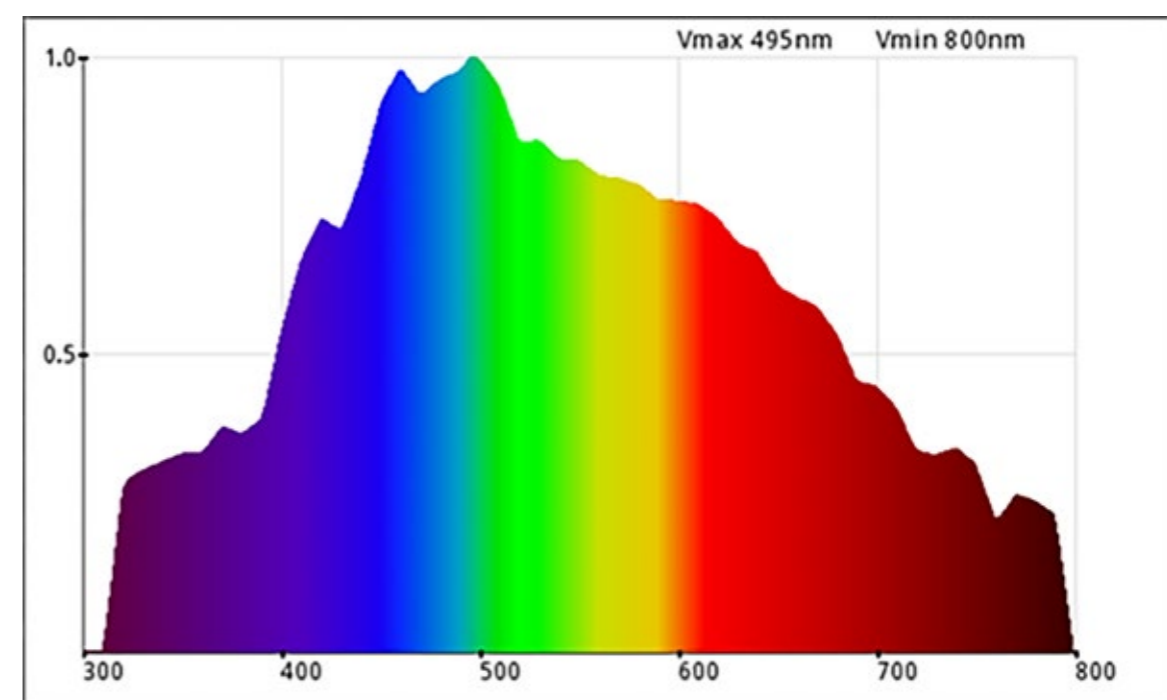
The intensity of the photosynthesis process is conditioned by many external factors such as: light, temperature, carbon dioxide, water, minerals, etc. Pic. 1. If proportions are not right the photosynthesis process could occur slower or even be halted. Therefore, all factors must be delivered to the plant in the right amount.

LIGHT

The light is called natural when it is emitted by an object that is a product of nature. The sun or solar energy is a primary source of natural light on our planet. **Solar energy** - is the energy of electromagnetic radiation Pic. 2. and Pic. 3. has a wavelength in the range 300nm-800nm. This energy is essential for photosynthesis in green plants.



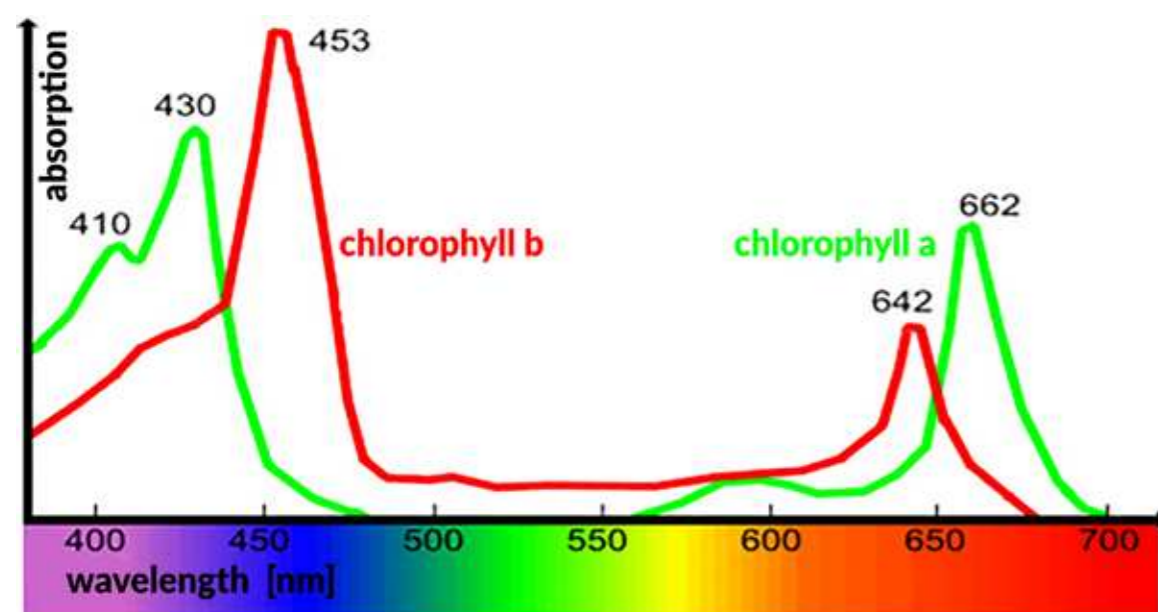
Pic. 2. The spectrum of electromagnetic radiation.



Pic. 3. The spectrum of solar radiation reaching the ground.

LIGHT FOR PLANTS

There is an obvious relation between plants and sunlight is obvious. Plants use solar radiation energy through photosynthesis for their own development. The growth process is called photomorphogenesis. Plants absorb mainly blue and the red colours of the waves of Pic. 4., while they almost do not absorb the green (most of them reflect it), Pic. 5.



Pic.4. Absorptive spectrum of chlorophyll a and chlorophyll b.



Pic.5. Diagram of the green colour reflection mechanism.

LIGHT FOR PLANTS

In our latitude, in the autumn-winter-spring days, the days are short and hence the amount of solar energy reaching the ground is small. During this period, the plants are unable to carry out the photosynthesis process in a proper way. Therefore, it is necessary to light the plants with artificial light. Plants were lighted with fluorescent lamps, sodium HPS or metal halide. Lamps of this type consume a lot of electricity and their light does not adequately cover the absorption spectrum of plants. **The costs of lighting are very high.**

Modern LED technologies allow to create energy-efficient luminaires with a given colour of light. Plants absorb the blue and red lights the most. That is why luminaire manufacturers build luminaires with a blue-red colour of light.

In our opinion, this is not an optimal solution, because such a colour of light differs very much from the spectrum of sunlight. Our research and experience show, that the best light for plants is sunlight (not red - blue). In addition, working under such lighting in greenhouses, seems to be very onerous and practically impossible task for people.

That is why PERFAND LED has designed the HORTI A seedling frame and HORTI B for plant growth. Both luminaires shine white. HORTI A shines with an increased stream of blue and red and is intended for seedlings. HORTI B, on the other hand, shines with an increased stream of red colour and is intended for the growth of plants in Pic. 6. and Pic. 7. The colour of light emitted from these frames allows free work of people.

These luminaires have a patented light modulation system making it even more economical compared to lamps made in traditional LED technology - **the average power of the luminaire - 90W. Very low lighting costs.**



Pic. 6. Horti A luminaire for seedlings.



Pic. 7. Horti B luminaire to grow.

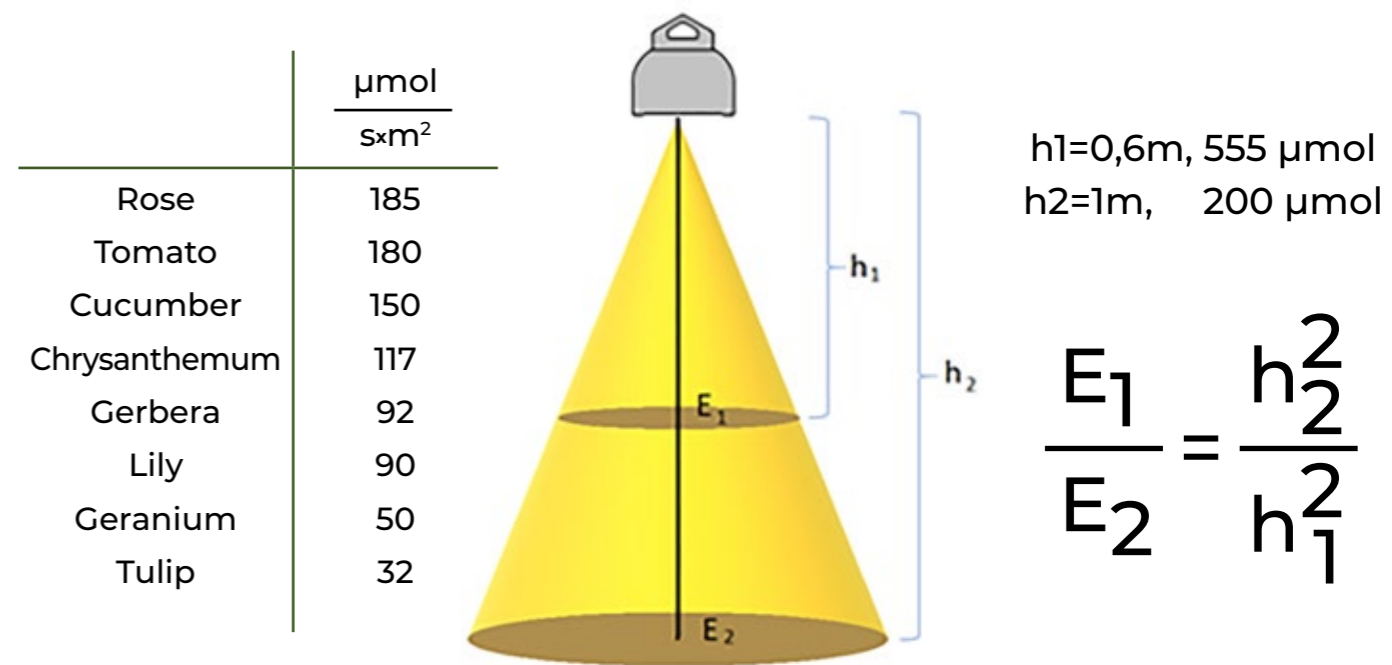
The application of the impulse luminous flux of the luminaire guarantees large savings in electricity consumption of more than 50% compared to constant LED lighting, while stimulating plants to increase growth. From our experience and opinions of growers, it appears that plants illuminated with HORTI luminaires had a higher mass and a clearly darker colour, which indicates a greater accumulation of assimilates. Very good rooting of cuttings was also observed. Growers also emphasize that the impulse nature of light allows for free and unobtrusive work of employees in the illuminated objects.



Pic. 8. An exemplary implementation of the cultivation of pink cultivation with HORTI fixtures produced by PERFAND LED.

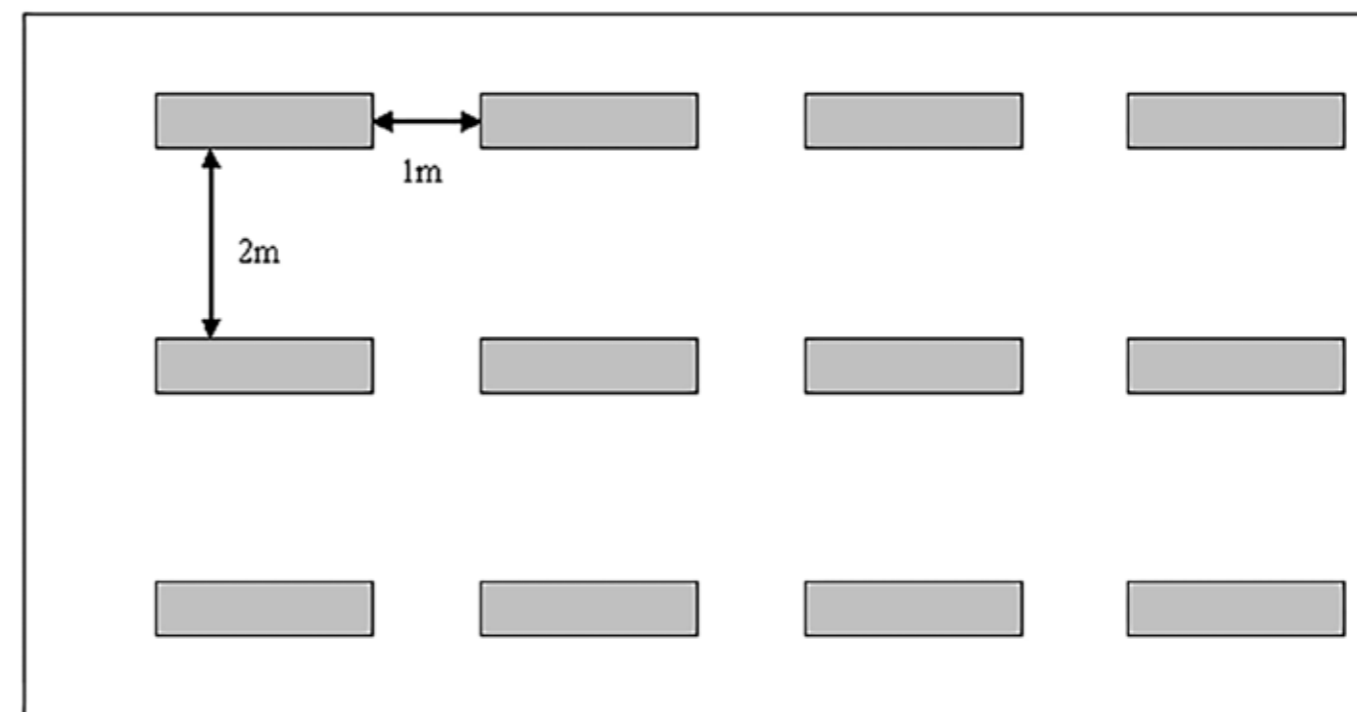
LIGHT FOR PLANTS

Each plant needs light. Different species of plants require a different amount of light. Therefore, it is important to put the lamp above the plant and how well the lamps are arranged. The amount of light is expressed in units: $\mu\text{mol}/\text{s}\times\text{m}^2$



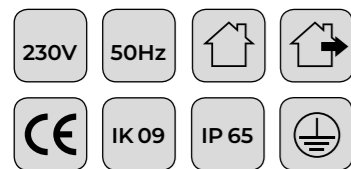
Pic. 9. Loss of light quantity depending on height.

Our research shows that our luminaires should be suspended at a height of 0.6 m to 1 m, spaced every 1 m. at 2 m.



Pic. 10. Sample arrangement of luminaires over seedlings.

HORTI



HORTI – is a linear LED lighting fixtures for applications in plant growing. Working in pulse mode allows you to get additional energy savings. A properly selected spectrum of light supports the growth of plants in the seedling stage as well as growth and fruiting.

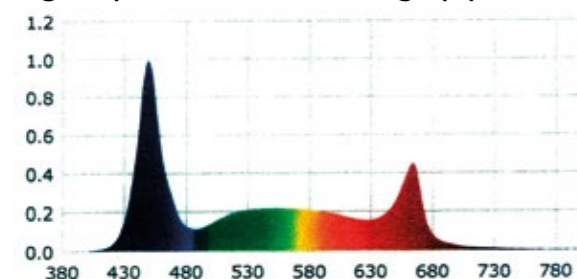
Example applications:

Production of seedlings, lighting of vegetable and fruit crops.

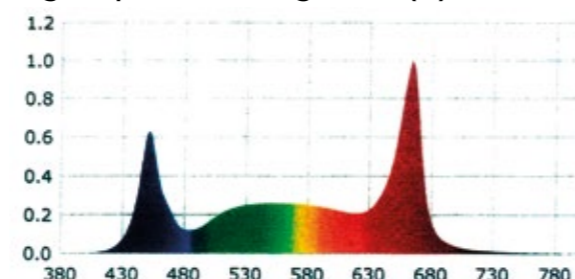
Name	Power [W]	Average power [W]	Luminous flux	Protection class	IP	IK	Luminous efficiency up to
HORTI A	200W/30	90	640 μmol/s	I	IP65	IK09	3,2 μmol/J
HORTI B	200W/30	90	680 μmol/s	I	IP65	IK09	3,4 μmol/J

Different parameters on request. Luminous flux for Ta=25° C.

Light spectrum for seedlings (A):

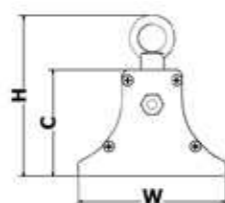
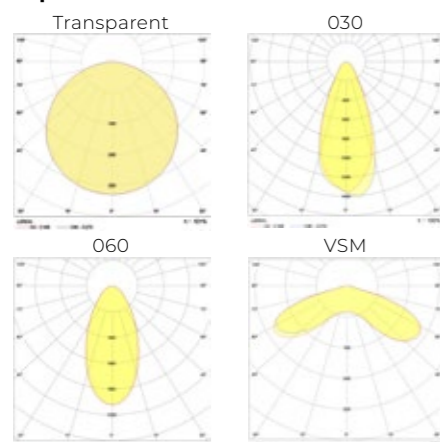


Light spectrum for growth (B):

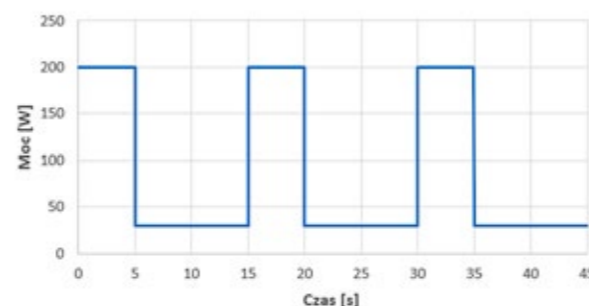


- Montaż: zwieszany
- Supply voltage: 230V AC / 50-60Hz
- Ambient temperature range: -35°C...+40°C
- Lifetime L80B10: 60 000h
- Power factor: >0,97
- Surge protection: 6kV
- Housing: aluminum, tempered glass/PC
- Warranty: 5 years

Optics:

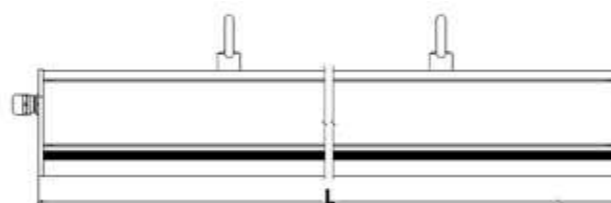


Time period:



Dimension drawing:

Name	L	C	H	W	Weight
HORTI	1510	76	115	105	5 kg



Luminous flux tolerance +/-10%
Our products are constantly being upgraded. We reserve right to any construction changes without previous notice.

REFERENCE

Bogucice, 27.02.2019

ROZSADNIK
Horticulture Farm
Bogucice 5
62-814 Blizanów

The study was carried out in the production season 2018/2019 on tomato seedlings. LED lamps delivered by PERFAND LED operating in the pulse mode were used for lighting. They were compared with 600W HPS sodium lamps.

The plant lighting system AURE HORTI A / AURE HORTI B is based on LED modules with a suitably selected light spectrum with very high efficiency and a 230 V 50 Hz power supply operating in the pulse mode.

During the test, a positive reaction of plants to the applied LED light source was found. Due to the fact that plants illuminated with LED and sodium lamps grew in the same greenhouse with the established technology (temperature, irrigation, humidity), it was not fully possible to create modified climatic conditions that would fully utilize the potential of plants illuminated with the LED system.

Compared to the traditional HPS system, plants irradiated with LED light showed greater mass and a distinct darker colour, which indicates a greater accumulation of assimilates (photosynthesis products). It gives the possibility of conducting more intensive production using appropriate climatic conditions, as well as the possibility of reducing the costs of lighting by limiting the number of hours of illumination. In addition, LED lamps consume less electricity compared to traditional HPS lamps.

The operation of the luminaires in the pulse mode allows to achieve economic savings in relation to the LED constant lighting as well as conventional the HPS lightning. The lack of a total blanking effect and the frequency of pulses allows an unrestrained and non-burdensome work of people employed in facilities with the PERFAND LED lighting.

Kind regards,

GOSPODARSTWO ROLNO - OGRÓDNICZE
Marek Wasiewicz
Bogucice 5
62-814 BLIZANÓW
NIP 968-087-59-99 REGON 250901229

Tłumaczenie z języka polskiego na język angielski wykonane przez Biuro Tłumaczeń Specjalistycznych „ORSA” sp. z o.o. z siedzibą ul. Paryska 31/6, 03-945 Warszawa, www.orsa.pl tel. +48 22 616 00 94 e-mail: orsa@orsa.pl

Horticulture Paweł Pychyński
Strojec ul. Ogrodowa 4
46-320 Praszka

19.02.2019

Statement

The study was carried out on mother plantations of chrysanthemums with the day extension up to 16 hours of light daily from 9/11/2018 to 11/02/2019 in the greenhouse No. 1 with an area of 3,600 m². For illumination was used the lighting provided by PERFAND LED company as well as the LED lighting in the permanent work mode and HPS type lighting: AURE HORTI A, AURE HORTI B

The plant lighting system was based on LED modules with a suitably selected spectrum of light with very high efficiency and a 230V 50HZ power supply operating in the pulse mode and a comparative system of HPS and LED lighting operating in the continuous mode.

Differences in the yield of plants were found. Good results were obtained from plants illuminated by PERFAND LED lighting. We also tested the pulse lighting during rooting of chrysanthemums with a very good result, all varieties of chrysanthemums successfully rooted. In addition, with the varieties sensitive to poor lighting, we noticed a smaller percentage of budding plants. Lighting of plants with light emitted by diodes resulted in a significant increase in yield compared to sodium light. The experiment did not show significant differences in the size of the green colour index between plants illuminated with LED in different ways, which may indicate a similar chlorophyll content in their leaves.

Luminaires in the pulse mode enabled economical savings in relation to the continuous LED lighting as well as the conventional HPS.

Kind regards,
Paweł Pychyński

Z poważaniem
Paweł Pychyński

Paweł Pychyński
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Horticulture Farm
Jan Zdunek
Kowalew, ul. Łąkowa 3b
63-300 Pleszew

Kowalew, 27.02.2019

In the Horticulture Farm Jan Zdunek the study was conducted in January and February 2019 on the tomato seedlings.

The LED lamps operating in the pulsed mode supplied by PERFAND LED company were used for lighting.

The study was conducted in comparison with sodium lamps with a power of 400 W. The plants responded positively to lighting with LED light.

Vegetative growth of plants was better, they had intensive coloration of the leaves.

The lamp's light does not interfere with work.

I find that LED lamps, due to the saving of electricity, are worth recommending for use in plant production.


GOSPODARSTWO ROLNO-OGRODNICZE
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Prus Ryszard, Horticulture Farm
Cienia Pierwsza 4, 62-860 Opatówek

The tests of AURE HORTI B luminaires were carried out on raspberry coloured tomatoes on our farm from 20/10/2019 to 20/02/2019. The LED lighting operating in the pulsed mode provided by PERFAND LED company was used for illumination, and also for comparison with the LED lighting of another manufacturer.

In both cases, the same yield was obtained. However, the work of Perfand LED luminaires in the pulsed mode allowed to obtain much higher economic savings compared to the constant LED lighting. The lack of complete blanking and the intensity of pulses allowed for non-burdensome work with such lighting in greenhouses.

Kind regards,


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