THE EFFECT OF LED LIGHTING ON STRAWBERRY PHOTOSYNTHESIS SYSTEM RESPOND IN *B. CINEREA* PATHOGENESIS

Mantas Kačiušis[1,2], Viktorija Vaštakaitė-Kairienė[1]

[1] Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry. Kaunas str. 30, Babtai, LT-54333, Kaunas dist. Lithuania
[2] Kaunas University of Technology. K. Donelaičio str. 73, LT-44249, Kaunas
mantas14kaunas@gmail.com

Plants are usually affected by many biotic stress factors which can reduce plant photosynthesis system e.g. plants diseases. Normally, intensive growing systems are based on using pesticides to control diseases spreading. However, it has toxic and harmful effect on environment. Besides, pathogens can become resistant to different chemicals. Due to this reason, it promotes to search and implement new control strategies and technologies in horticulture

Light is essential factor which has impact on whole plant photosynthesis and development. Light emitting diodes (LEDs) lighting has a wide range of technological possibilities to control main plants physiological processes [1]. This type of lighting can provide a possibility to apply a corresponding wavelength, change light intensity or to save up energy costs [2]. The experiments with LEDs have claimed a positive effect on photosynthesis intensity and growth [3] [4].

Grey mould (*Botrytis cinerea*) can infect many horticultural plants. It is necrotrophic and one of the most pathogenic fungi in horticulture [5]. Strawberry (*Fragaria x annanasa*) cv. 'Deluxe' are important commercial crop, which characterized by high antioxidants and mineral content [6]. There is no many researchers and evaluations how LEDs can affect photosynthesis respond and optical properties in plants.

The aim of this study was to establish light conditions effect on strawberry cv. 'Deluxe' photosynthesis system and optical properties respond in grey mould (*Botrytis cinerea*) pathogenicity/ effect. The experiment was conducted in Institute of Horticulture, Lithuanian Research Centre for Agricultural and Forestry. All plants were grown in closed environment chamber under LED lighting modules 'Heliospectra RX30' (HelioSpectra) and high-pressure sodium lamps 'SON-T Agro' (Phillips). Day and night temperatures 21/17 °C, relative humidity ~80-85 %. Plants were inoculated by *B. cinerea* isolates discs on the leaves. In order to evaluate strawberry cv. 'Deluxe' photosynthesis system respond (instantaneous photosynthesis (Pn)) to infection by pathogens in light effect all non-destructive measurements (chlorophyll fluorescence ratios, leaf pigments and optical indices) were done 1, 3, and 5 days after inoculation.

It was determined, instantaneous photosynthesis intensity (Pn) has decreased 27 % after first day inoculation by *B. cinerea* comparing with non-inoculated plants under LED lighting. After third day, Pn decreased more than previous day – 23%. Thus, after five days was measured higher photosynthesis intensity, comparing with first and third-day measurements. The same trend was determined under HPS lights. In first and third day after inoculation Pn was reduced 20% and 11% respectively, comparing with non-inoculated plants. After five days Pn increased. Chlorophyll fluorescence results showed, that after first day inoculation under LED maximum quantum yield (Fm/Fv) was decreased ~3,7%. However, under HPS this ratio was higher ~6,3% comparing with non-inoculated. The same trends were measured in next days. Comparing II photosystem efficiency ($Y_{(II)}$) and electron transport rate (ETR) after first day and five-day results showed soft suppression of ratios, though in third day were measured intensive photochemistry. Leaf pigments measurements under LED light first day after inoculation showed reduction of Chl index (~4,6%), respectively. The same results measured in other indexes. Not significant increasement fixed in third day after inoculation, thus in five-day indices slightly decreased again. Under HPS light were measured 7,1% Chl increasement after first day inoculation by *B.cinerea*, comparing with non-inoculated. Leaf optical properties measurements showed slight increasement comparing all experiments days. Photochemical reflectance index (PRI) and photochemical senescence reflectance indexes under HPS light showed more intensive respond.

In conclusion, *B. cinerea* had significant effect on Pn intensity suppression and reduced it after inoculation. In 5 days Pn increased more than initial Pn in first days. Strawberry leaf pigments and optical indices did not show significant differences comparing both illuminations. Under HPS light strawberry indexes respond was slightly higher than LED.

Acknowledgements. This research was funded by a grant No. 09.3.3-LMT-K-712-10-0216 from the Research Council of Lithuania.

[1] C.M. Bourget, An Introduction to Light-emmiting Diodes, HortScience 43:7, 1944-1946 (2008).
[2] D. Singh, C. Basu, M. Meinhardt-Wollweber et al., LEDs for energy efficient greenhouse lighting, Renewable and Sustainable Energy Reviews 49, 139-147 (2015).
[3] J. H. Kang, S. KrishnaKumar, S. L. S. Atulba et al., Light intensity and photoperiod influence the growth and development of hydroponically grown leaf lettuce in a closed-type plant factory system, Horticulture, Environment and Biotechnology 54:6, 501-509 (2013)
[4] X. X. Fan, Z. G. Xu, X. Y. Liu et al., Effects of light intensity on the growth and leaf development of young tomato plants grown under a combination of red and blue light, Scientia Horticulturae 153, 50-55 (2013).
[5] Y. Elad, D. Shtienberg,. Botrytis cinerea in greenhouse vegetables: chemical, cultural, physiological and biological controls and their…, Integrated Pest Management Reviews 1, 15-29 (1995).
[6] F. Giampieri, J.M. Alvarez-Suarez, M. Battino, Strawberry and Human Health: effects beyond antioxidant activity, Journal of Agriculture Food Chemistry 62:18, 3867-3876.