Title: Changes of Leaf Morphology and Growth of *Spinacia oleracea* Grown under Different Light-Emitting Diodes

Myungok Lee, Eunkyung Cho, Jinhee An, Sangmin Park and Eunyoung Choi*
Dept. of Agricultural Science, Korea National Open University, Seoul 110-791, Korea

This study aimed to determinate effects of light-emitting diodes on growth, leaf morphology and cellular structure of two cultivars ('World-star' and 'Sushiro') of *Spinacia oleracea*. Plants were grown in a NFT system for 25 days after transplanting (DAT) under the LEDs (White (W), Red and Blue (RB, ratio 2:1), Blue (B), Red (R) LED) under the same light intensity and photoperiod (130μmol·m-2·s-1, 12 hours). Higher fresh and dry leaf weights, leaf number and leaf area were observed in the 'World-star' cultivar than 'Sushiro'. A 35% increase in leaf dry weight of 'World star' was found under both the RB and R LEDs than the B and W LEDs at 25 DAT. In the 'Sushiro' cultivar, the leaf dry and fresh weights were higher under the RB followed by R 25 DAT. Leaf apinasty symptom was appeared in plants grown under both R and RB LEDs with much more severe degree of symptom under the R than RB LED. Microscope analysis indicated that the cell elongation of center region (Adaxial) of leaf blade under the RB was much longer than the R LED. The photosynthetic activity were lower in the leaves grown under the R LED. All the integrated results suggest that it is necessary to determine proper ratio of R and B LEDs for a closed cultivation of Spinacia oleracea since the B LED is a light compensating the leaf apinasty symptom caused under the R LED. Also, 'Worldstar' variety is more suitable for a closed cultivation with LED light sources.

Presenting author details
Full name: Eunyoung Choi
Contact number:+82 10 5437 7862
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