# Fluorescent and LED lighting effects on hydroponically grown 'Winter Density' bibb lettuce©

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***Abstract***

**Food safety, environmental impacts, and efficient energy usage are increasing concerns in horticultural production systems. Producing lettuce under artificial lighting could be a solution addressing these concerns. Light-emitting diodes (LED) offer the advantages of a narrow light spectrum, low power consumption, and little heat production. The objective of this study was to compare the effects of different light sources on the growth of compact 'Winter Density' bibb lettuce in a non-circulating hydroponic system. 'Winter Density' bibb lettuce seeds were started in Oasis cubes under T5 high output fluorescent lighting in a lab. Seedlings were transferred to 5.1-cm net pots, which were placed in 1.9-L containers containing a hydroponic nutrient solution. The solution was composed of Hydro-Gardens' (Colorado Springs, CO) Hobby Formula 10-8-22 hydroponic fertilizer with added magnesium sulfate (9.8% Mg). The lettuce seedlings were grown under red+blue+white LEDs with a light level of 121 µmol $m^{-2}$ $s^{-1}$ and a photoperiod of 16 h. After 10 days, half of the plants in the containers were moved under T5 high output fluorescent lighting for 10 more days. The light level was 118 µmol $m^{-2}$ $s^{-1}$ and the photoperiod was 16 h. At the end of the study, lettuce under LED lighting used significantly less hydroponic nutrient solution than those under fluorescent lighting. Biomass productivity (biomass produced per unit of nutrient solution used) was higher with LEDs. Electrical conductivity (EC) of the nutrient solution was lower in the LED treatment. However, there was no significant difference in the pH of the nutrient solution. Plant height, shoot dry weight, root dry weight, shoot:root ratio, total plant dry weight, partitioning of dry weight to the shoots, partitioning of dry weight to the roots, and SPAD readings did not significantly differ between light treatments. In conclusion, LED lighting was more efficient by using less nutrient solution and producing more biomass per unit of nutrient solution. Moving lettuce plants from initial LED lighting to later fluorescent lighting did not enhance the growth of hydroponically grown compact lettuce.**

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