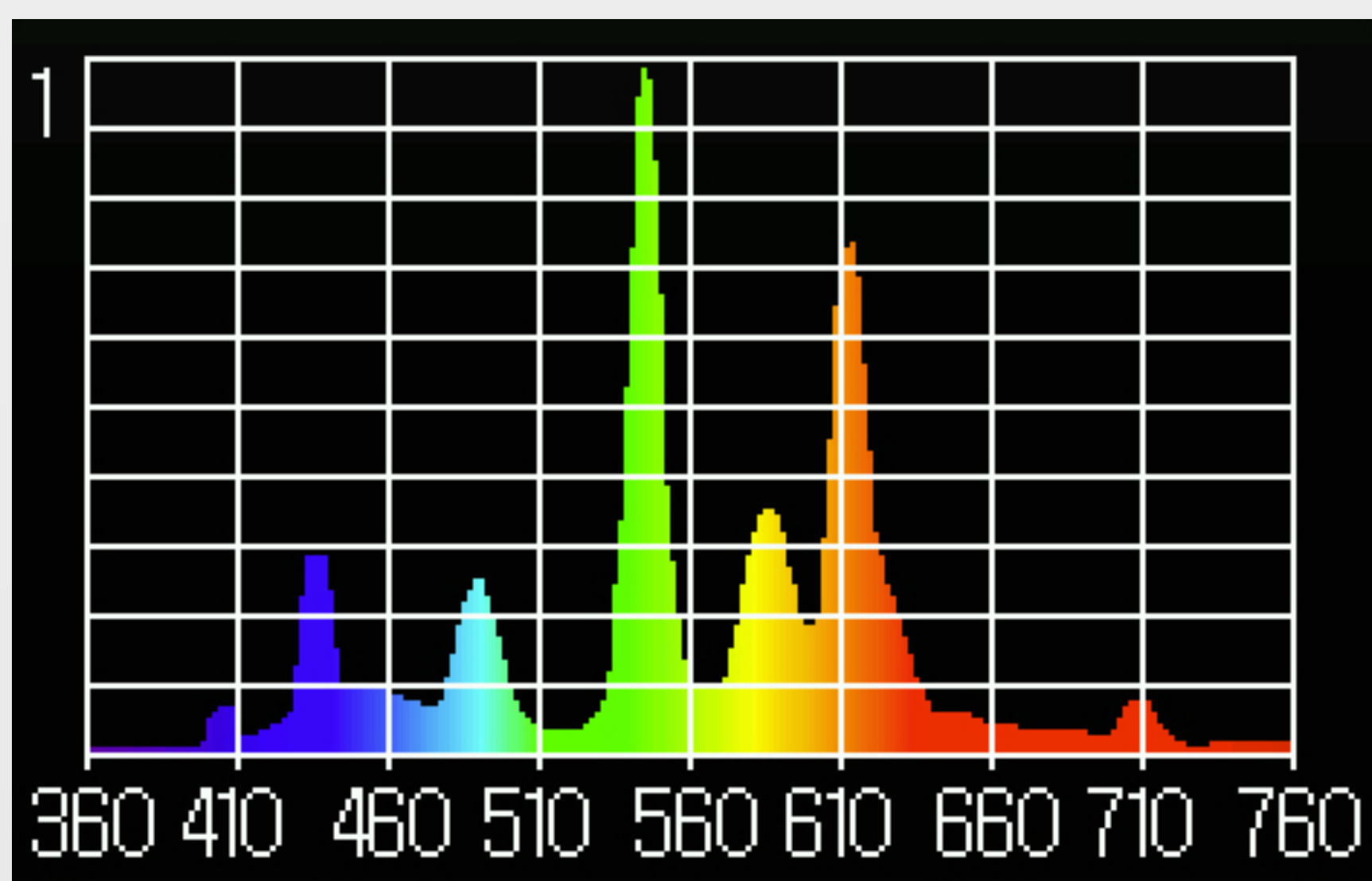


Fluorescent and LED Lighting Effects on Hydroponically Grown 'Winter Density' Bibb Lettuce

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Introduction



There is growing concern about food safety, environmental impact, and efficient energy usage in horticultural production systems. Producing lettuce under artificial lighting could be a solution addressing these concerns.

Objective: Determine the effects of different light sources on the growth of compact 'Winter Density' Bibb lettuce in a noncirculating hydroponic system.

Methods

- Lettuce seeds were started in Oasis cubes. Seedlings were transferred to 5.1-cm net pots in 1.9-L containers containing a hydroponic nutrient solution.
- Solution was Hydro-Gardens' Chem-Gro Hobby Formula 10-8-22 hydroponic fertilizer and magnesium sulfate (9.8% Mg).
- Plants were grown under red+blue+white light-emitting diodes (LEDs). Light level was 121 $\mu\text{mol}/\text{m}^2/\text{s}$, photoperiod 16 h.
- After 10 days, half of the plants were moved under T5 high output fluorescent lighting for 10 more days. Light level was 118 $\mu\text{mol}/\text{m}^2/\text{s}$, photoperiod 16 h.

Methods



Fig. 1. T5 high output fluorescent lighting setup.



Fig. 2. Light-emitting diode (LED) lighting setup.

Results

Table 1. Lettuce height and dry weight (DW).

Treatment	Plant height (cm)	Shoot dry weight (DW) (g)	Root DW (g)	Total plant DW (g)
Red+blue+white LEDs, then fluorescent	18.4 ns	3.17	0.34	3.50
Red+blue+white LEDs	16.2	3.68	0.45	4.13

Results

Table 2. Lettuce DW partitioning and SPAD reading.

Treatment	Shoot DW partitioning (%)	Root DW partitioning (%)	Shoot-root ratio	SPAD reading
Red+blue+white LEDs, then fluorescent	90.4 ns	9.6	9.48	48.1
Red+blue+white LEDs	89.4	10.7	8.45	46.8

Table 3. Lettuce hydroponic nutrient solution.

Treatment	Shoot DW / nutrient solution used (mg/mL)	Nutrient solution used (mL)	EC (mS/cm)	pH
Red+blue+white LEDs, then fluorescent	3.27 b	968 a	3.62 a	7.44 ns
Red+blue+white LEDs	4.39 a	833 b	2.47 b	7.76

Conclusion

Moving lettuce plants from initial LED lighting to later fluorescent lighting can enhance nutrient solution use and nutrient solution use efficiency of hydroponically grown compact lettuce.

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