

# LED Lighting Can Control Plant Growth, Flavor, and Aroma in *Ocimum basilicum*

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## Objective

Growing marketable basil with today's LED lighting in the greenhouse, or as the sole lighting source, is an effective, productive and energy-efficient lighting solution. In this study, we examine the effects of varying light ratios on basil plants in using LEDs at the sole light source. The LED fixtures had independently controlled color spectrums and allowed for growth under 5 different light treatments. Results gave distinct differences in plant morphology, flavor and flowering. By exploring the various ratios of blue, white and red light on basil growth, we hope to inform growers on the use of programmable LED light spectrums to steer plant growth and flavor.

## Materials and Methods

Sweet basil seeds, *Ocimum basilicum*, were planted in 4-inch pots using commercially available potting soil. Plants were watered as needed to maintain adequate soil moisture and fertilized as necessary. Ambient air temperatures averaged 78° Fahrenheit and relative humidity averaged 46% for all treatments. Basil were grown in curtained chambers under 5 different light conditions with varying ratios of blue and red and a constant level of white light.

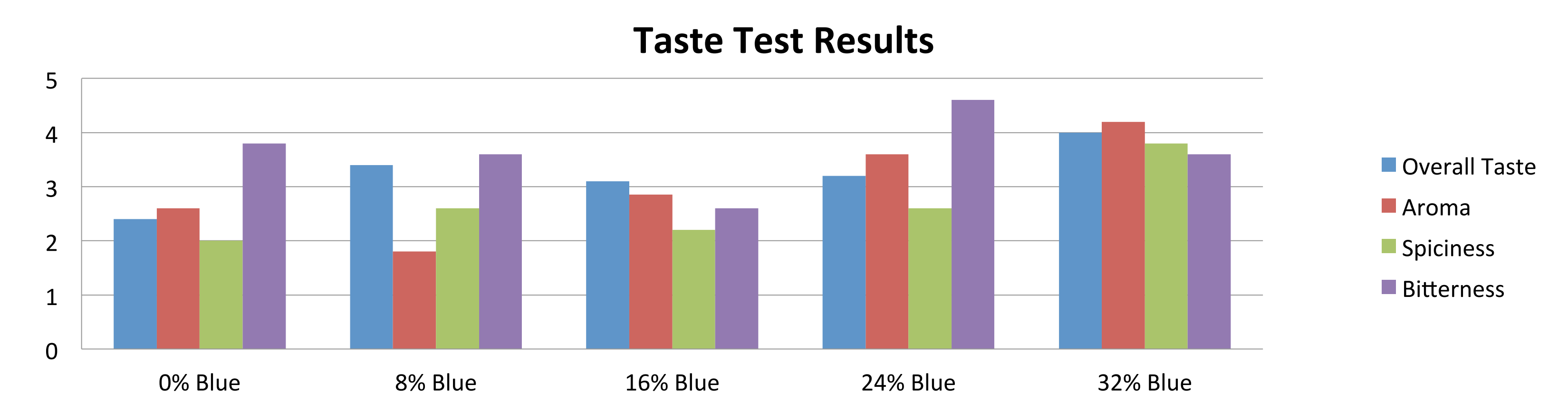
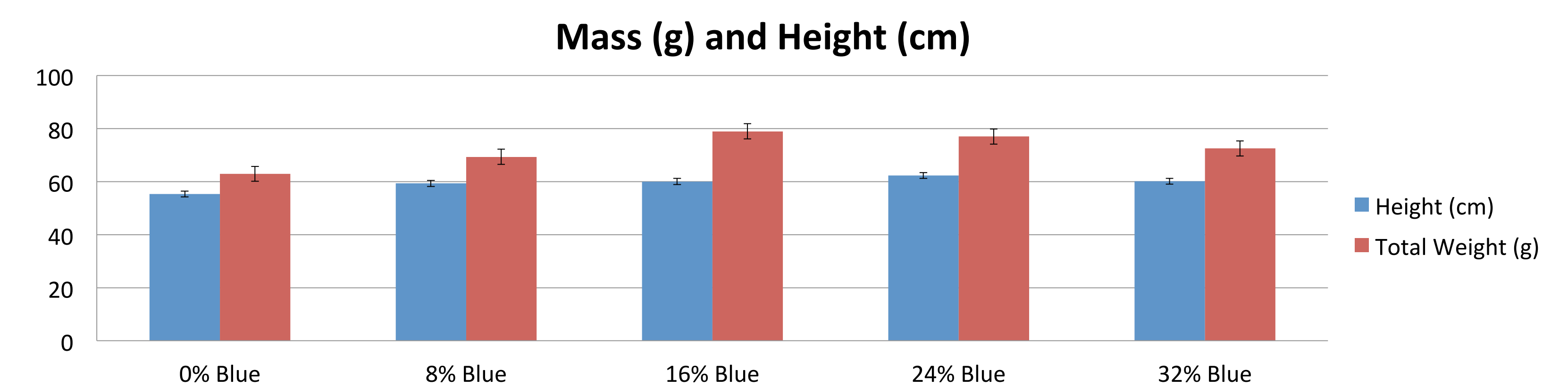
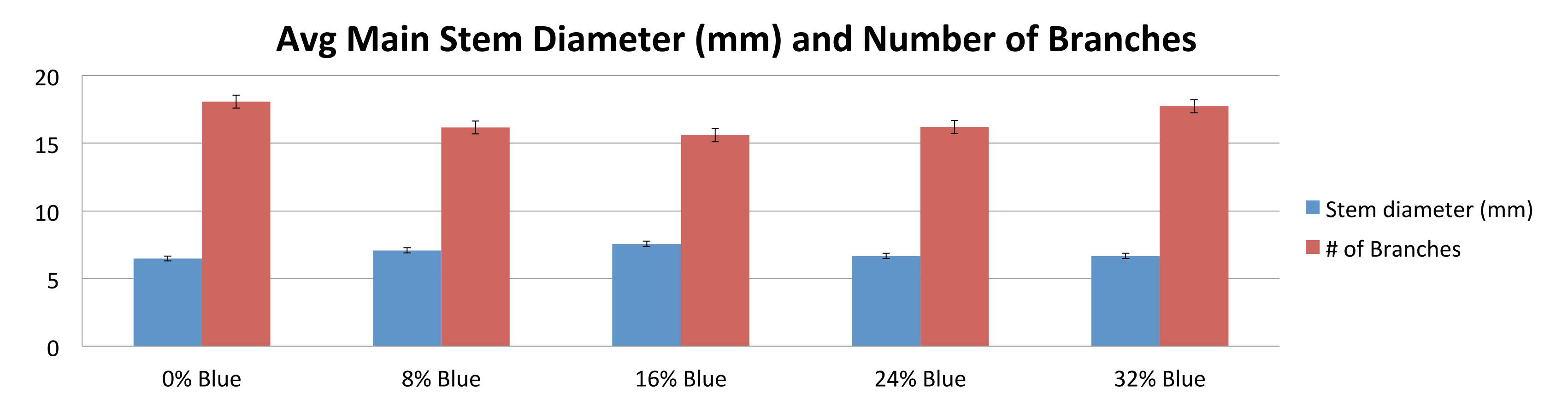
Light Treatment	Blue ( $\mu\text{mol}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$ )	White ( $\mu\text{mol}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$ )	Red ( $\mu\text{mol}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$ )
0% Blue 0B:20W:230R	0	20	230
8% Blue 20B:20W:210R	20	20	210
16% Blue 40B:20W:190R	40	20	190
24% Blue 60B:20W:170R	60	20	170
32% Blue 80B:20W:150R	80	20	150



32% Blue Treatment

## Results

Treatment	Height (cm)	Total Weight (g)	Stem Diameter (mm)	# of Branches
0% Blue	55.32	62.93	6.48	18.07
8% Blue	59.29	69.34	7.08	16.17
16% Blue	60.01	78.93	7.55	15.59
24% Blue	62.29	76.97	6.67	16.19
32% Blue	60.13	72.50	6.67	17.73



## Conclusion

This study demonstrates the effects of different light ratios on basil morphology, flavor and aroma. Through the use of adjustable light treatments, growers can meet the needs of changing market demands.

In this study, 8% or 32% blue grew the best basil for bunched sale. For growers that sell by weight, the 16% blue lighting regime produced plants with the highest average weight.

In our tasting panel, the 32% blue treatment was rated as having the ideal aroma, highest spice and best flavor. Given the different growth responses and distinctive flavor profiles produced by each treatment, savvy growers can develop their own custom basil light programs.