

# INDOOR GREEN AND PURPLE LETTUCE SEEDLING PRODUCTION UNDER LED LIGHTS

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## INTRODUCTION & AIM

In the Balkan's agroecological conditions, early seedling production occurs during winter. The quality and duration of sunlight during this period are suboptimal, preventing the seedlings from reaching their full genetic yield potential due to the deprivation of certain light qualities. Therefore, our study aimed to test whether the usage of energy-efficient light-emitting diodes (LEDs) can fulfill the plants' light requirements during the early stages of seedling production.

## METHOD

The research was performed at the Institute for Vegetable Crops Smederevska Palanka, Serbia. We used three commercial lettuce (*Lactuca sativa* L.) cultivars – Genesis, Jukebox, and Viola for the experiment. In the three-leaf stage, plants were placed in plant growth chambers and exposed to multispectral white (W) and monochromatic blue (B) LEDs for 25 days with a 9/15h and 10/14h (light/dark) photoperiod, to simulate outdoor conditions. Cultivation in a greenhouse using only natural daily light (DL) served as the control. After 25 days, morphological growth parameters such as root and shoot weight were measured. Additionally, the total chlorophyll content was determined spectrophotometrically using the method described by Lichtenthaler. A two-factor ANOVA analysis model was used to examine the effects of light treatments and genotypes on lettuce's morphological and chemical properties. Duncan's test was performed to determine the significance of mean differences ( $p < 0.01$ ) between genotypes and light treatment using SPSS software version 22.0 (IBM Corporation, New York, NY, USA). Different lowercase letters (a, b, c) indicate statistically significant differences ( $p < 0.01$ ) between genotypes. Different uppercase letters (A, B) indicate statistically significant differences ( $p < 0.01$ ) between light treatments.

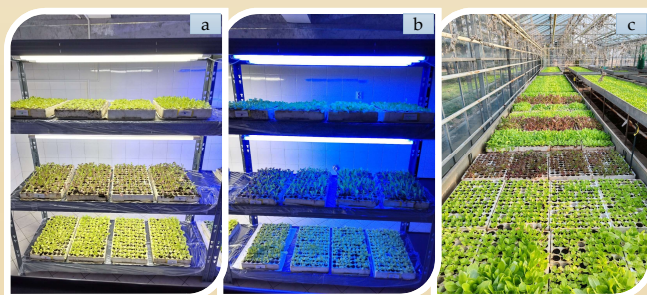


Figure 1. Growing lettuce seedlings under multispectral white LEDs (a), monochromatic blue LEDs (b), and daily light (c).

## REFERENCES

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## RESULTS & DISCUSSION

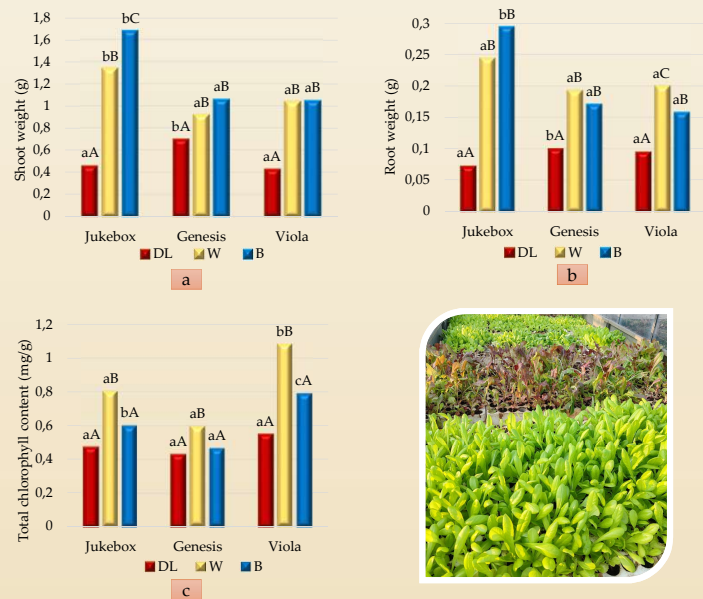


Figure 2. Average values of shoot weight (a), root weight (b), and the total chlorophyll content (c) in Jukebox, Genesis, and Viola lettuce seedlings grown under daily light (DL), multispectral white LEDs (W), and monochromatic blue LEDs (B).

Table 1. Analysis of variance for shoot weight, root weight, and the total chlorophyll content in lettuce seedlings

Source of variation	df	Shoot weight		Root weight		Total chlorophyll content	
		MS	F	MS	F	MS	F
Genotype (G)	2	1.301	15.711**	0.038	8.686**	0.218	24.704**
Light treatment (L)	2	6.709	81.045**	0.218	49.144**	0.269	30.464**
Repetition	2	0.066	0.802 <sup>ns</sup>	0.003	0.772 <sup>ns</sup>	0.016	1.790 <sup>ns</sup>
G × L	4	0.836	10.094**	0.030	6.820**	0.025	2.874 <sup>ns</sup>
Error	16	0.083	-	0.004	-	0.009	-
Total	26	-	-	-	-	-	-

\*\*Significant at  $p = 0.01$  level, <sup>ns</sup>Non significant

## CONCLUSION

- Compared with the control, W and B LEDs significantly increased the seedling root and shoot weight, while B LEDs increased the total chlorophyll content.
- The Jukebox genotype exhibited the strongest response to the light treatment. This genotype had the highest total chlorophyll content, as well as shoot and root weight under B LEDs compared to W LEDs and DL. When exposed to B LEDs, the Jukebox genotype reached the shoot and root weight up to 4 times compared to DL.
- Based on our results, this lettuce cultivation method enhances seedling growth and chlorophyll content and positively affects seedling quality.