LumiGrow Research Reports

“No Red” Light Treatment for Boosting Terpenes in Cannabis

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OVERVIEW

This experiment provides an analysis of terpene production in flowers resulting from the use of spectral control at the end of the flowering cycle. Effects on cannabinoid content are also noted.

BACKGROUND

Terpenes are aromatic compounds that give cannabis some of its most distinct aromas from citrus and berry, to more earthy tones. Many species of plants produce and emit terpenes in a diurnal, or daily cycle that is regulated by a complex web of signaling. There are also many plants that emit terpenes at night to attract nocturnal pollinators (Marinho et al., 2014). Regardless of when the terpenes are produced or emitted, these processes are often dependent upon cues derived from natural light/dark cycles via a native circadian clock (Dudareva et al., 2004).

Several light sensitive pigments are involved in these processes of production and emission, and the different photoreceptors are dependent upon different wavelengths of light to be activated or deactivated. Emission of terpenes is a process that is entirely dependent upon phytochromes and red/far red light cues in most plant species (Flores and Doskey, 2015). For example, repeated light/dark phytochrome signaling is necessary for emission of terpenes in tobacco plants (Roeder et al., 2007).

Research Summary

Varieties Tested
- Chocolope
- J1
- OG-18
- Reserva

Research Findings
- Terpenes increased in dried Cannabis flowers with a “No Red” light treatment in the final three days of production. Eliminating red light had almost no effect on the final Cannabinoid content.
HYPOTHESIS

Based on previous findings, we hypothesized that a lack of red light and phytochrome-mediated light/dark signaling on the part of the plant is responsible for an increase in terpene content in cannabis. The plant continues to synthesize terpenes, but a lack of red light to trigger the Pr-Pfr shift results in a lack of terpene emission by the plant, thus causing the terpenes to accumulate in the maturing flowers.

MATERIALS AND METHODS

To test our hypothesis, four varieties of Cannabis popular in today’s market were surveyed for cannabinoid and terpene content for both dried flowers grown under normal control conditions, and flowers that were treated with 3 nights of a “No Red” light treatment (during the last 72 hours of growth). The plants were grown in a hydroponic system under LumiGrow Pro 650 LED fixtures. The Cannabis varieties tested are OG-18, J1, Chocolope, and Reserva. Two groups of metabolites were quantified, including cannabinoids and terpenes.

In the “No Red” treatment, red light was eliminated leaving only light from the blue and white diodes (Note: There is a small degree of red light emitted from the white diodes). In the control condition the plants were grown under red, white, and blue light for their complete cycle.

RESULTS/DISCUSSION

Effects of “No Red” Light on Cannabinoid Content

For the strains studied, eliminating red light at the end of a flowering cycle had almost no effect on the final Cannabinoid content of dried and cured flowers.

Among the four varieties of Cannabis sampled, the composition of the Cannabinoids remained fairly constant across varieties and treatments with the occurrence of considerable quantities of CBGA, THCA, and THC in all varieties (Figure 1).

Figure 1. Bar graphs displaying the cumulative Cannabinoid content of mature flowers for four varieties of C. sativa or C. indica control (C) or No Red light treatment (NR) samples. Gas Chromatography as performed for mature flowers of Cannabis varieties Chocolope, J1, OG18, and Reserva to quantify the Cannabinoids CBC, CBD, CBDA, CBG, CBGA, CBN, THC, THCA, and THCV. Treatment plants were exposed to an end of cycle light treatment using the ratio 2.5:0:1; Blue:Red:White for 3 X 12 hour “days”.

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RESULTS/DISCUSSION

Effects of No Red Light on Terpene Content

When totaled, twenty terpenes from the 4 varieties showed differences in terpene quantity for the “No Red” light treatment. The majority of these significantly different terpenes were found in Chocolope and J1 (Figure 2). For these strains, 8 terpenes showed significant differences in the “No Red” light treatment, with 15 of these cases showing significant increases in terpenes and only 1 case showing significant decrease. The data for OG-18 and Reserva strains was much less significant with only 2 terpenes showing significant difference in the “No Red” light treatment.

Reserva flowers contained the greatest quantity of total terpenes on average, followed by J1, and then OG18. Chocolope flowers contained the fewest total terpenes.

CONCLUSION

The data shows that the amount of terpenes in dried Cannabis flowers increases with a “No Red” light treatment for the final three days of production. Based upon these findings, we feel confident in recommending a spectrum control program that eliminates red light output from LumiGrow fixtures for the final 72 hours of the Cannabis flowering cycle. Spectrum control programs, including the program for this study, are easily automated using the LumiGrow SmartPAR Wireless Control System. We recommend lab analysis of the final dried flower product, as there is always some variation within the given varieties.
REFERENCES


ABOUT LUMIGROW

LumiGrow was founded in 2007 with the sole purpose of building a world class LED horticultural lighting solution that enables growers and researchers to manage efficiency, yield, and plant characteristics. Our state of the art hardware LED grow lights emits a targeted spectral output to trigger healthy plant responses, boost yield, and reduce your energy costs.

Our SmartPAR™ wireless control system enables you to control the light intensity, spectrum, and photoperiod of your lighting system from your phone tablet, or computer. To begin automating your lighting system on your schedule, easily and with little setup required, contact a LumiGrow Account Executive.