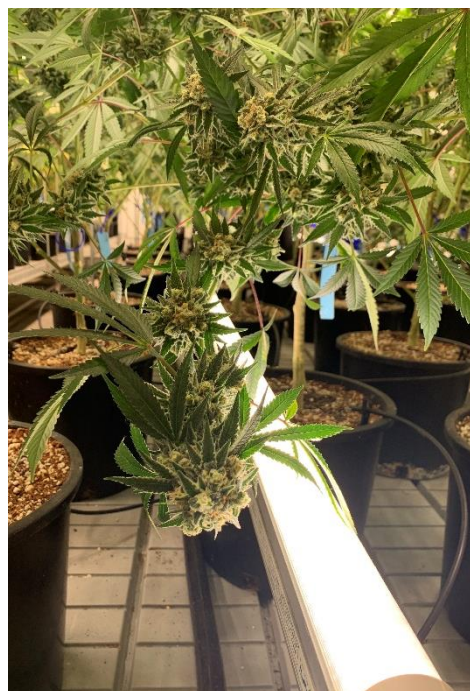


Unlocking the Potential of Under Canopy Lighting in Cannabis Cultivation

In the dynamic world of cannabis cultivation, growers are continually seeking innovative solutions to enhance production efficiency, quality, and profitability. One such breakthrough is the strategic application of under canopy lighting in grow rooms, a method that promises a multitude of benefits for cultivators. This white paper explores the transformative impact of under canopy lighting, highlighting its role in significantly reducing labor costs, while improving plant morphology, bud quality and production yield. Through a comprehensive analysis, this paper equips cannabis cultivators with the knowledge to leverage under canopy lighting, turning it into a cornerstone of their cultivation strategy.

In traditional cannabis cultivation setups, the majority of the light is delivered from above, mimicking the natural direction of sunlight. However, this top-down lighting approach often results in uneven light distribution, with the uppermost leaves receiving the majority of the light, while the lower leaves and branches receive less. This disparity can lead to suboptimal growth and underdevelopment of the plant beneath the canopy. Under canopy lighting is an advanced cultivation technique used in cannabis production that involves installing supplemental lighting systems beneath the upper canopy of the cannabis plants. This method addresses one of the primary challenges in growing cannabis: ensuring that sufficient light reaches the lower regions of the plant. The concept of under canopy lighting is illustrated in the figures below.

Under Canopy Lighting Examples



Quality

In cannabis production, "A" buds refer to the highest quality buds, typically large, dense, and potent, while "B" buds, or popcorn buds, are of lower quality, often smaller or less potent than "A" buds. The distinction between A and B buds is based on factors like appearance, aroma, potency, and overall desirability for consumers and growers. The quality of buds can vary based on factors such as genetics, cultivation methods, nutrient levels, and environmental conditions during growth.¹

Examples of cannabis bud quality²



Without sufficient light below the canopy, lower rates of photosynthesis result in a large percentage of B buds – or worse. And this has obvious economic consequences when the product goes to market as producers typically sell B buds for a fraction of the price of A buds.

By supplementing traditional overhead lighting with under canopy lighting, growers can achieve a more even distribution of light throughout the plant. This ensures that all parts of the plant, including those below the top canopy, receive the light they need to perform photosynthesis effectively. This direct lighting encourages more uniform growth throughout the plant, transforming underdeveloped "B" buds into higher quality "A" buds.

Not only are there more A buds with the introduction of under canopy lighting, but these more desirable buds typically exhibit increased cannabinoid and terpene profiles throughout the plant, leading to a more consistent and potent product.³ Without under canopy lighting, a recent study found that the “total CBD-concentration...in different fractions of the plant’s height was significantly higher in the top (9.9%) in comparison with mid (8.2%) and low (7.7%) fractions.”⁴

¹ N. Reiff, I. Pena Alfaro, “Cannabis Industry Introduction,” Investopedia, December 12, 2022.

² D. Nunez, “How to see the difference between good and bad cannabis buds,” 42 Fast Buds, March 03, 2023.

³ Hawley, Dave. “The influence of spectral quality of light on plant secondary metabolism and photosynthetic acclimation to light quality”, A Thesis presented to The University of Guelph, 2018.

⁴ Crispim Massuela, Danilo & Hartung, Jens & Munz, Sebastian & Graeff, Simone. (2022). Impact of Harvest Time and Pruning Technique on Total CBD Concentration and Yield of Medicinal Cannabis. Plants. 11. 140. 10.3390/plants11010140.

Furthermore, cannabis plants tend to stretch towards the light source, which can lead to elongated stems and a less desirable structure. By providing light from below as well as above, plants grow more uniformly, reducing the need to stretch and resulting in sturdier plants with a more desirable morphology.

Labor Savings

The B buds below the canopy are commonly referred to as “larf.” Cannabis growers typically trim the plants below the canopy, a process referred to as lollipopping, because the buds are immature due to inadequate light during the flowering phase. The ultimate objective in lollipopping is to redirect energy and other resources such as nutrients and CO₂ to the branches at the top of the canopy that receive the most light – thereby increasing biomass of the A buds.

But lollipopping is a labor intensive process that can substantially contribute to the operating expenses for a grower and lower overall profitability. By providing supplemental light to the lower branches and under canopy areas, growers can develop buds in these typically shaded regions, eliminating, or vastly reducing, the need for costly lollipopping.

Production Yields

With the addition of under canopy lighting, the lower parts of the cannabis plant can develop more robustly, leading to an increase in the production of high-quality buds throughout the plant, not just below the canopy. Growers have reported yield increases of up to 20% by implementing under canopy lighting, making it a valuable investment for optimizing harvests and improving the overall efficiency of cultivation operations.

Economics / Payback

By implementing an under canopy lighting strategy, the combination of reduced labor costs, higher quality production, and increased yields directly contributes to improved financial performance for cannabis growers. Higher quality buds fetch a higher price in the market, and increased yields mean more product to sell, positively affecting both the top and bottom lines. Lower operating costs and increased revenues typically result in a payback for the investment in the additional lighting of less than one year.

Pest and Disease Management

Improved light distribution can also help in managing pests and diseases. Healthier plants with adequate light are generally more resistant to pests and diseases. Moreover, the dry, less humid environment created by the light can make the under canopy area less hospitable to some pests and pathogens.

Product Attributes

There are a number of lighting companies that sell under canopy lights for cannabis production, but not all offerings are created equal. Cannabis operators should ensure that the lights are manufactured by a reputable company with a proven track-record of supplying the industry with under canopy lighting. Since the lights will be located below the canopy in a wet and dirty environment, it is important that the lights have a minimum ingress protection rating of IP66. This will ensure the lights will not be affected by exposure to dust and water jet cleaning. To ensure a quality product that has met regulatory performance and safety requirements, the lights should be listed by Design Lights Consortium (DLC) and certified by Underwriter Laboratories (UL) and/or Intertek Testing Laboratories. And in case there are any problems with the under canopy lighting, growers should confirm the lighting manufacturer warrants the lights.

Thrive Agritech manufactures a 120W under canopy light called Boost XE. This model has been installed throughout North America by leading cannabis growers. The light is IP66 compliant, DLC listed, UL certified, and comes with a 5-year warranty.

Boost XE Under Canopy Light



Boost XE Under Canopy Installation



Summary

In essence, under canopy lighting is a sophisticated technique that, when implemented correctly, can significantly improve the efficiency and output of cannabis cultivation. It represents a holistic approach to lighting, addressing the unique needs of the cannabis plant for optimal growth and quality while reducing operating expenses.