# Ultraviolet Supplement for Cannabis Production

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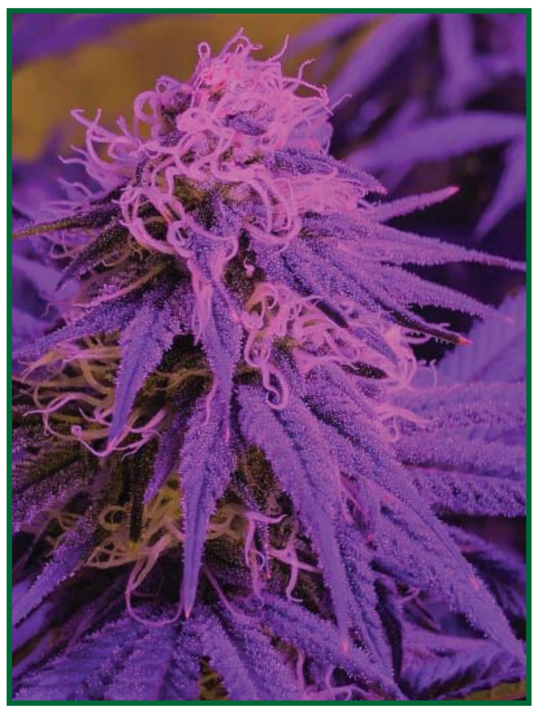
**by Yan Ren-Butcher,PhD**
Director of
Horticulture Science

The possibility of introducing UV spectra to increase THC, other cannabinoids, and terpenoids, is becoming widely talked about amongst cannabis growers. Beyond cannabis, the effect of UV radiation has been studied on several other crops including red-leaf lettuce, tomatoes, basil, wheat, and rice (Li Q and Kubota C. 2009). The observations have shown both positive and negative results regarding crop quality and yield.

In relation to cannabis, 15% and 32% increases of THC were reported in *Cannabis sativa* under different doses of UV-B lights in greenhouse by Lydon et al. (1987). Our own Master Grower also reported higher productions of trichomes and terpenes under Illumitex LEDs, with additional combinative light of UV-A and Far-red light in the indoor cannabis growth.

UV radiation is divided into three wavebands: UV-A (315 nm- 400 nm), UV-B (280 – 315 nm) and UV-C (100-280 nm). UV-A and UV-B has benefits to photosynthesis, yield and quality. For example, UV-B increases photosynthetic rate, provides photoprotection to young seedlings prior to being transfered to the field, and improves pigmentation, aroma, and resistances to fungal diseases and insects. UV-C and sometimes UV-B are used for disinfection purpose like water/air purification by killing almost all micro-organisms.



The UV-A, UV-B and blue light (400-500 nm) radiation can be sensed by multiple photoreceptors however the majority of information regards a specific type - cryptochromes (Li et al., 2015). UV-A, UV-B and blue light (400-500 nm) have also been shown to improve production of secondary metabolites. Therefore, these spectra seem to have overlapping functions. They may work in different pathways but ultimately lead to the similar outcomes. For instance, our master grower observed resistance to the powdery mildew disease on cannabis plants under the combination of UV-A and Far-red. This resistance was also been reported in plants treated with UV-B exposure.

The UV-B spectrum primarily targets the UVR8 photoreceptor (UV Resistance Locus 8) to trigger the other gene expression to stimulate secondary metabolites biosynthesis by relatively lower doses than UV-A spectrum, and regulatory fluence rates of UV-B (Favory et al., 2009). Other than plant stress response, UV-B was reported to reduce stem elongation, inhibit leaf expansion, increase leaf thickness and waxiness, increase resistance to fungal disease, photoprotection, and photosynthetic competence, increase shelf life, improve yield, and modify food taste and nutritional value (Wargent and Jordan, 2013).

## ILLUMITEX INITIAL TRIALS

In the first trial of cannabis exposed to LED lighting with a UV supplement resulted in a positive visual improvement to plant quality. The plants were exposed to 4 total hours of UV daily (2 hours in the morning and 2 hours in the afternoon) for 6 weeks during flowering. The grower conducting the study reported the plants under the test light were very "sticky." He also observed the bud size was double compared to the plants not grown under the UV test light.

The results of the study were as followed:

- Average dry weight under UV-A and Far-Red supplement: 135 grams
- Average dry weight of the control: 72.5 grams
- Powdery Mildew Appearance: 100% reduction in spots compared to the control plants
- Visual Notes for UV-A exposed plants: the trichome production was "out of this world," there was an extremely noticeable difference in smell from increased terpene levels

## PERSONNEL UV EXPOSURE CONSIDERATIONS

Even with all the positive outcomes UV may provide to the quality of crop, some growers are worried about the potential damage of UV light to human health. This concern can be addressed with proper protocol development and exposure limitation requirements.

The World Health Organization suggested, "There is no doubt that a little sunlight is good for you! But 5 to 15 minutes of casual sun exposure of hands, face and arms two to three times a week during the summer months is sufficient to keep your vitamin D levels high."

Excessive UV exposure will damage your skin and DNA. The most common recommendation to avoid UV exposure in grow operations is to apply the rays at night. As a non-photoperiod regulating light, UV will not disturb phytochrome photoequilibrium to interrupt flowering time. For example, Suthaparan et al. (2016) reported 90-99% reduction of powdery mildew in strawberry and rosemary plants by applying UV-B in the night with different frequencies.

## CONCLUSION

There is no doubt about the benefits of applying biologically active UV light (UV-A and UV-B) in greenhouse and indoor growth. The key question is how much UV-A/UV-B is needed for what crops. As the intensities and doses of UV-A/UV-B varied largely (from less than 1 $mW/m^2$ to 1600 $mW/m^2$ for intensity, and from less than 1 $KJ/m^2/d$ to more than 100 $KJ/m^2/d$), determining an effective intensity and dose for your crop(s) is strongly suggested.

**To contact one of our horticulture specialists who can help answer any additional questions you may have about the effects of UV, or any of your lighting needs for your crops, contact us today.**

## REFERENCE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