WHITEPAPER: UV DISINFECTION FOR

Cannabis Cultivation

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The Issue: Mold and Mildew

Since its legalization in 2012, the cannabis market has grown into a thriving industry worth tens of billions of dollars.[1] Many have sought to capitalize on this popularity by opening cannabis cultivation facilities, not anticipating the difficulties of growing a healthy crop. Indoor facilities require precise control of plant nutrition, water quality, lighting, temperature, and humidity.

Growers must find that perfect balance of maintaining a moist habitat while not generating too much humidity. An overly humid environment could result in the manifestation of two popular plant-killing pathogens: *Botrytis cinerea* and *Podosphaera macularis*, better known as Gray Mold and Powdery Mildew. Cannabis companies can suffer substantial financial losses due to these destructive fungi. One bad sample causes entire batches to be discarded.

These destructive microorganisms attack at three different stages of cultivation: the vegetative stage, the flowering stage, and the drying/curing stage. During the drying phase, another group of molds take aim at dead plants: *Aspergillus*, *Rhizopus*, and *Penicillium*.

The best initial method to thwart this mold and mildew is clean air circulation.[2] While some growers utilize fungicides to deter growth, many of these molds have developed immunities to chemical treatments—which, in many cases, leave behind hazardous residues. One laboratory found that 80 percent of cannabis product entered in a California competition came back tainted with mold, pesticides, and harmful solvents.[3] There is another chemical-free strategy from which cannabis facilities could benefit: Germicidal ultraviolet air and surface disinfection (UV-C).

How UV-C Works

UV light is made up of three wavelength ranges (UV-A, UV-B, and UV-C). UV-C lamps emit wavelengths at 254 nanometers (nm), which impact the DNA of harmful microorganisms and hinder their ability to multiply. Unwanted microbes eventually die off, making facilities safer, healthier, and even more efficient.

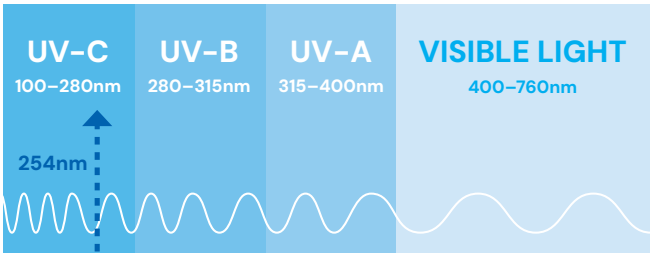

Figure 1: A Portion of the Electromagnetic Spectrum

Documented Evidence

Studies show a clear correlation of reduced microorganisms after UV-C treatment. An extensive Canadian study cited in the respected medical journal *The Lancet* found a reduction of 99% of microbial and endotoxin concentrations in a ventilation system, following proper use of an installed air duct UV-C apparatus.[4] Kill ratios over 99.9% on a first-pass basis have been modeled and, as air is recirculated, concentrations are further reduced with each subsequent pass. Recent studies by Latorre, Mercier, and Marquenie have demonstrated the susceptibility of *Botrytis cinerea* to UV-C disinfection.[5]

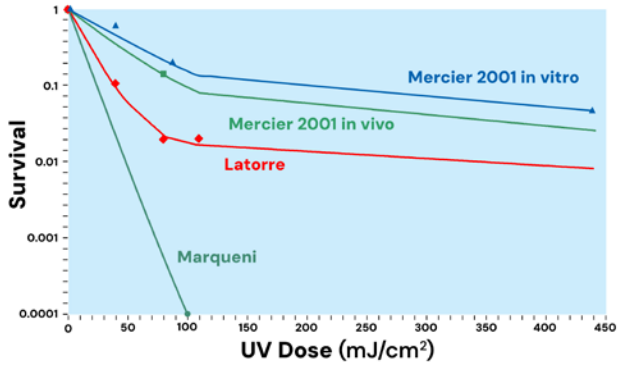

Figure 2: Survival of *Botrytis* spores after UV-C exposure.

UV-C Doses

The UV-C doses below will inactivate the mold and mildew contaminants that are commonly found in cannabis cultivation facilities. Millijoules per square centimeter (mJ/cm²) measure energy produced by germicidal lamps over a certain amount of time.

Microorganism	UV Dose (mJ/cm²)
Botrytis cinerea	110.0
Podosphaera macularis	16.90
Aspergillus niger	226.0
Rhizopus stolonifer	191.0
Penicillium	80.0

Table 1: UV-C Doses to Neutralize Cannabis-Attacking Molds

UV-C Solutions

Air Ducts

Our AeroLogic® UV disinfection models can be easily installed inside HVAC systems by a professional or facility owner. For best results, mount perpendicular to airflow and direct at the condenser coil, where mold and fungus tend to grow and thrive. In-duct systems are most efficient when installed in a long, straight run allowing at least 0.25 seconds of UV exposure.[6] Our specialists can recommend the model that best fits your duct or AHU size, air speed, and air temperature.

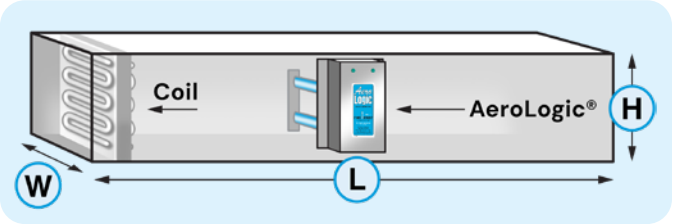

Figure 3: UV Disinfection Installed Horizontally in Air Duct

Circulation & Ventilation

Increased airflow and air exchange should be combined with UV treatment to help protect cannabis from disease-causing mold. Our Sanitaire® UV Room Air Sanitizers are designed to fill those needs.

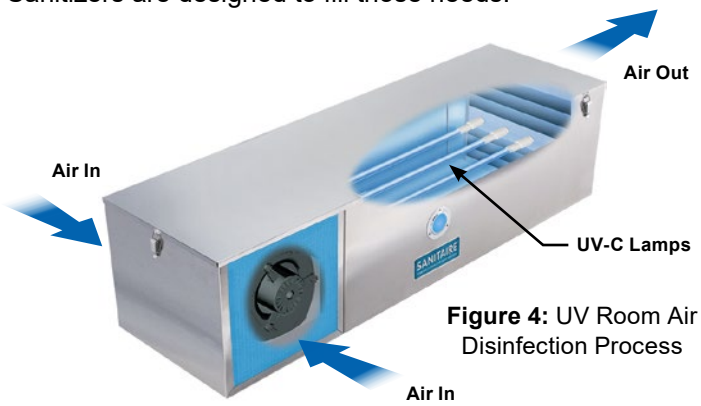

Figure 4: UV Room Air Disinfection Process

Directly on Surfaces

Work benches, seedling trays, surfaces, and tools should be directly disinfected with UV rays in labs and in between drying batches. Our Sanidyne®, SaniLight®, SaniRay®, and SaniUV-Cube™ models will inactivate spores that may be transported and recirculated around the room by drying fans. Since these products have UV-C lamps exposed, rooms cannot be occupied during these treatments and plants should not be present.

Water Disinfection

We know success in the cannabis industry involves the careful processes of growing and drying. But don't forget to create the optimal conditions for your plants to thrive. Cultivate your cannabis with UV purified water to decrease the likelihood of diseased plants. Our Sanitron® and Mighty Pure® product lines will provide your facility with the water flow requirements you need.

"Although [air filtration and chemical treatment] can be effective in combating microbial threats to cannabis production, the cleanest, most direct way of inactivating them is to use ultraviolet germicidal irradiation (UVGI)."

Engineered Systems Magazine[5]

Sources

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