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*Light and Health  
Research Center*

# Research Spotlight: UV-C Treatment of Cucumber Downy Mildew

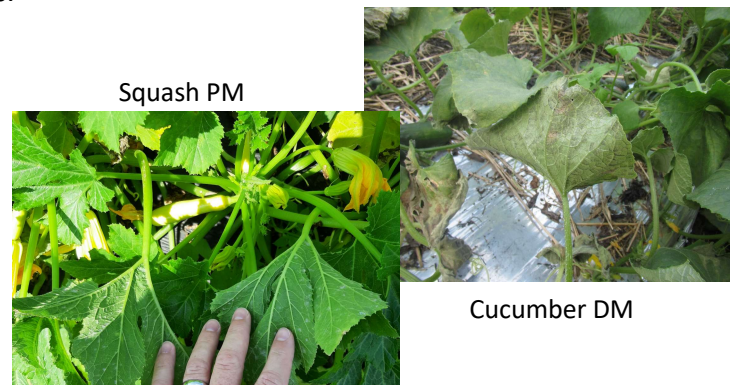
## What is UV?

Ultraviolet “light” is energy with wavelengths shorter than visible light. It is classified into 3 wavelength bands: UV-A (315-400 nm), UV-B (280-315 nm), and UV-C (200-280 nm). UV-A and -B are present in sunlight; UV-C (also known as germicidal UV) is completely blocked by the atmosphere.

UV-C can be generated by electrical sources and has been in use for 100+ years for sanitation (controlling tuberculosis bacteria in healthcare settings, sanitation of air and water) and UV has been commonly used in industrial processes for 60+ years.

## Crops and diseases that have been studied

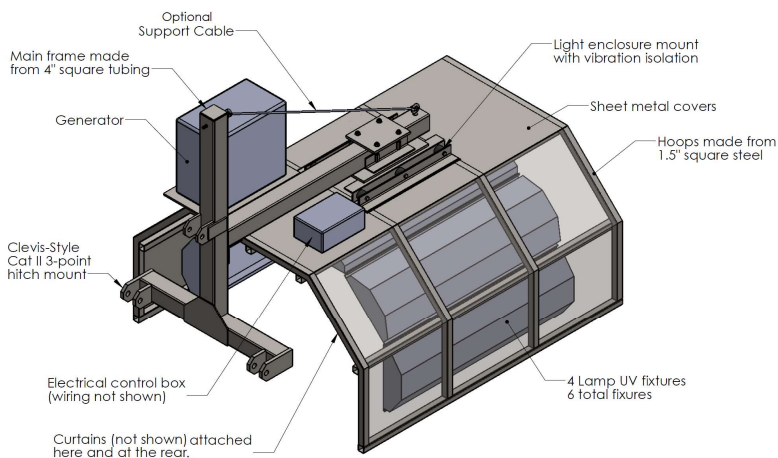
Controlling powdery mildew (PM) and downy mildew (DM) with UV has been researched and demonstrated on numerous crops including strawberries (PM), grapes (PM), squash (PM), cucumbers (PM), and basil (DM).



## UV application

A tractor-mounted UV applicator attachment contains several UV-producing fixtures arranged lengthwise in an arch over the row (see lower left image). Plans for building various unit designs are available here: <https://tinyurl.com/uv-attachment-plans>

Treatment is applied by energizing the UV fixtures from a switch at the tractor operator’s station and driving over the row to be treated at a fixed speed. The speed traveled determines the dose given, and ranges between 1 and 3 MPH. The lower right image shows a tractor with a UV attachment in a row of cucumbers.



To watch a video presentation about this research:  
[https://youtu.be/6g\\_S2T49VfU](https://youtu.be/6g_S2T49VfU)



Light and Health Research Center Website:  
<https://icahn.mssm.edu/research/light-health>



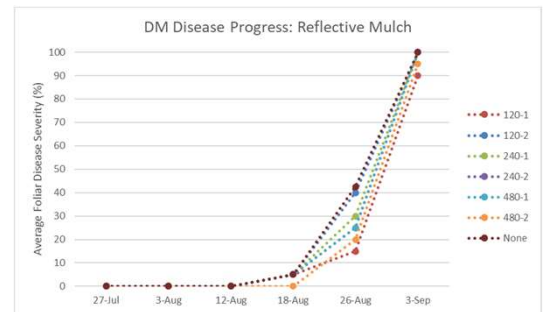
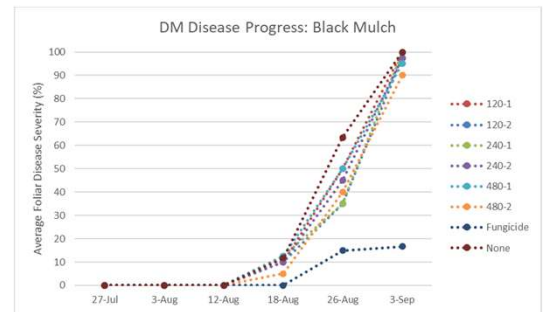
## 2020 Field Trial: Dose and Frequency

This study investigated various combinations of UV dose and frequency applied to rows made with black or reflective silver mulch and compared to untreated controls and conventional fungicide treatments.

- UV Doses: 120, 240, and 480 J·m<sup>-2</sup>
- Frequency: weekly and twice-weekly
- Mulch: black and reflective silver
- Controls: fungicide (black mulch only) and untreated (black and silver mulch)

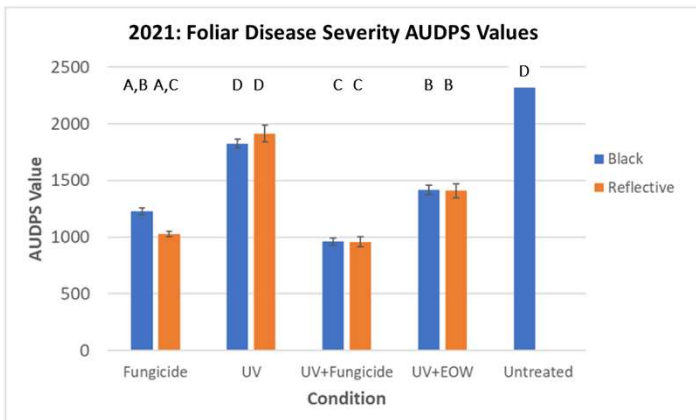
### 2020 Findings:

- Fungicide control was reliably better than UV and untreated conditions
- No reliable difference among UV dose levels, or treatment frequencies
- Small but reliable delay in disease onset on reflective mulch



## 2021 Field Trial: Comparing UV, fungicide, and combination treatments

Treatments: UV (480 J·m<sup>-2</sup> twice-weekly), weekly fungicide, UV + weekly fungicide, UV + every-other-week (EOW) fungicide, and untreated control.



### 2021 Findings:

- UV treatment alone resulted in a small, but non-significant disease delay relative to the untreated condition
- Fungicide and both combination treatments were reliably better than non-treated
- Fungicide performed modestly, but reliably, better on reflective mulch

### Conclusions:

- The application of UV did not noticeably diminish plant health or yield
- UV alone did not adequately control cucumber downy mildew (for the doses investigated)
- Combination approaches may be a viable way to boost effectiveness of fungicide programs or to reduce the number of fungicide applications needed
- Powdery mildew was well controlled in all UV plots
- Fungicide treatments applied on beds with reflective mulch outperformed treatments on beds with black mulch

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