

## Using UV Light to Control Powdery Mildew in Greenhouses



## INTRODUCTION

Powdery mildew is a common fungal disease that affects a wide variety of plants. Controlling powdery mildew is a challenge for the growers and it is conventionally treated by using fungicides. Tomato and cucumber plants suffer from mildew when there is a sudden change in humidity and temperature. The mildew can spread fast and can be detrimental to the plants. The effect of mildew is significant in vegetable farming. As an example, in nurseries and greenhouses that grow cocktail cucumbers, mildew can cause a reduction in yield up to 40%. The cost of chemicals and labour to spray a hectare of cucumber greenhouse is estimated to be \$10,000 per year. Further, there is a major disruption to work when plants are sprayed. This disruption amounts to a 10% impact on work efficiency and processes.

UV lights can be used to kill the pathogen responsible for powdery mildew by damaging its DNA such that it can no longer replicate and therefore powdery mildew is controlled. Using UV lights in greenhouses to prevent powdery mildew could greatly reduce the need for fungicide applications. As UVC technology involves a particular spectrum of non-visible light and it is non-penetrative, there is no residue left behind after the treatment.

## Research Findings

There is already significant existing research showing efficacy of UV-C on both fruit and vegetables, and this includes cucumbers and tomatoes.

The previously mentioned project undertaken by Interreg Northwest Europe has provided various data on dose frequency and efficacy for both tomatoes and cucumbers, including the following:

Optimal UV-C dose for tomatoes. Doses applied Mon, Wed, Fri (3x per week).

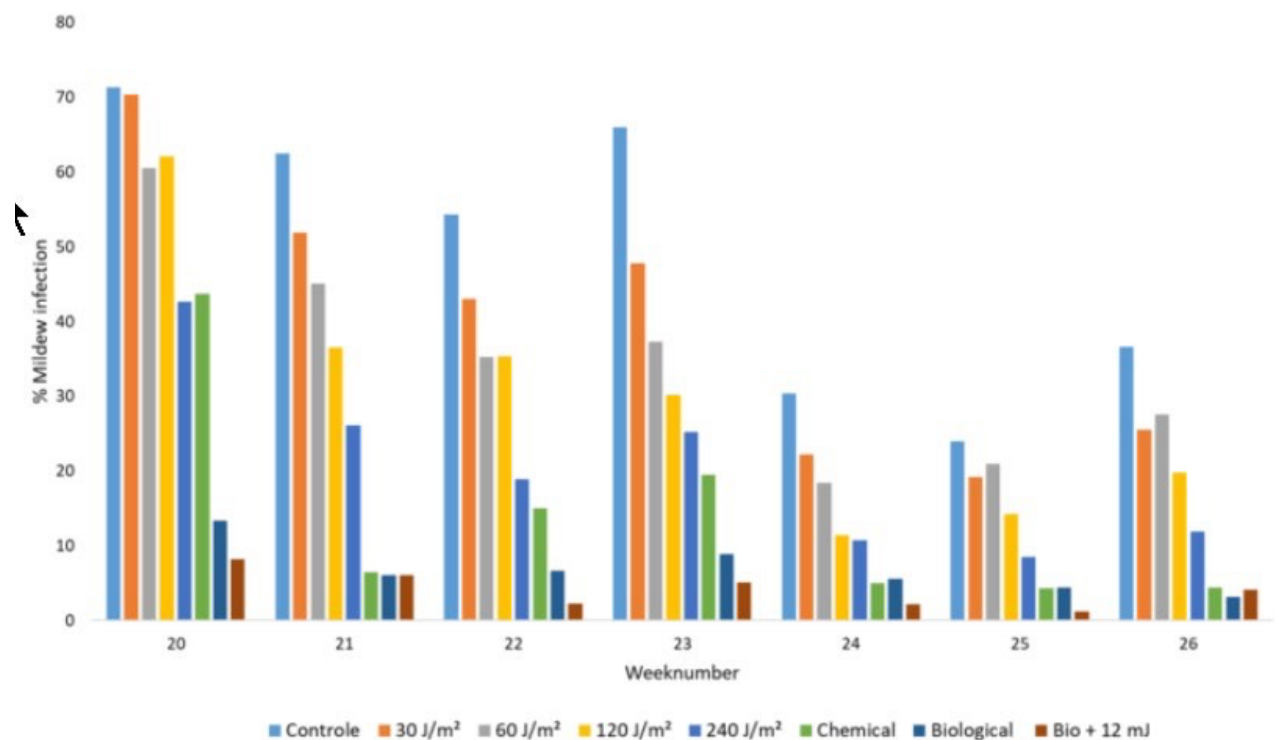


Figure 1 Mildew infection over time with every other day treatment

Further results on effectiveness of UV-C on tomato. Treatments given 3x/week. 3- 6mj/cm² with dark period was found to be very effective.

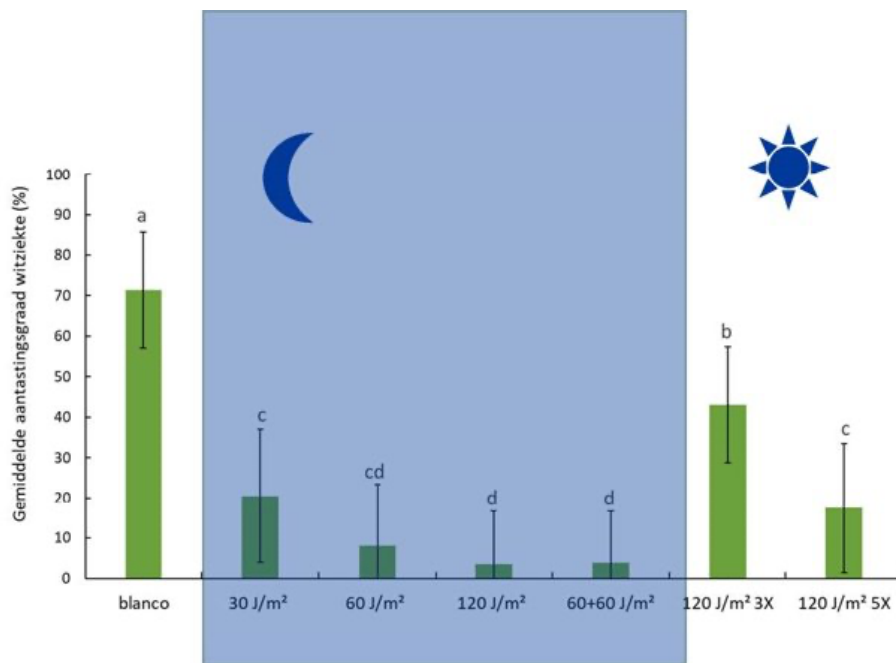


Figure 2 Mildew infection over time with low to medium UVC doses

Optimal UV-C does for cucumbers. Both curative and preventative treatments were applied. Although curative treatment was effective it damaged leaves and fruit. Doses applied 3 and 5 times/week and the efficacy difference between two was found to be negligible.

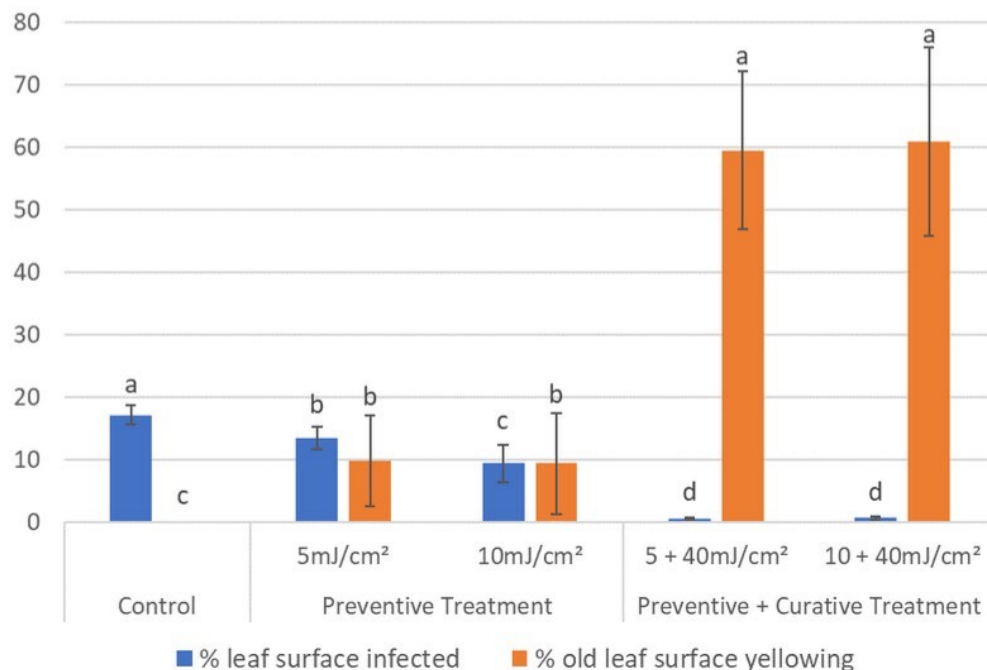


Figure 3 Optimal UVC doses for cucumber

The Lighting Research Center at Rensselaer Polytechnic Institute published the following data on nighttime UV-C doses and intervals for Cucumber plants:

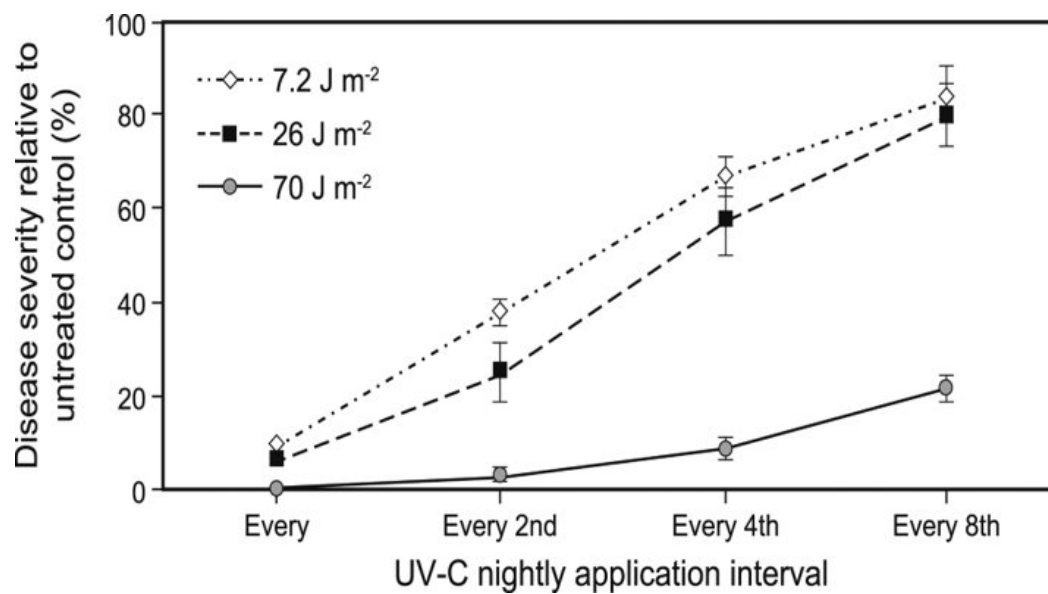


Figure 4 Comparison of UVC treatment intervals on cucumbers

Advanced Intelligent Systems and Kwantlen Polytechnic University worked together to research the efficacy of UVC light for controlling powdery mildew. Low to medium doses of UVC applied on the cucumber plants infected with powdery mildew. Regular applications of UVC provided suppression of foliar powdery mildew, even with the lower doses, across the duration of experiment compared to the untreated control group.

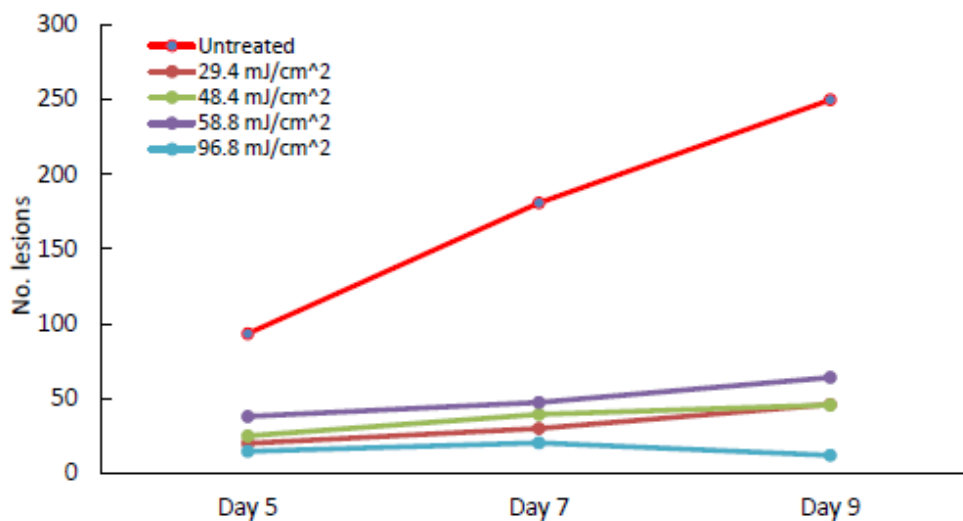


Figure 5 Number of powdery mildew lesions per leaf over time

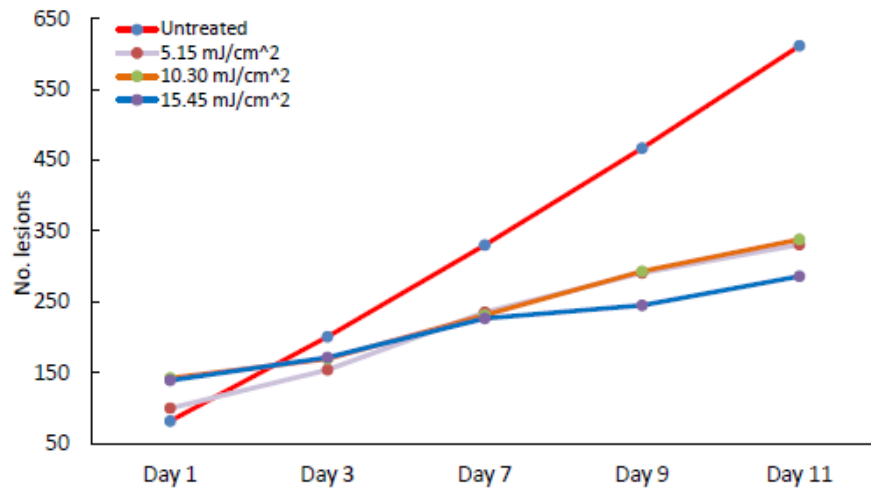


Figure 6 Number of powdery mildew lesions per leaf over time

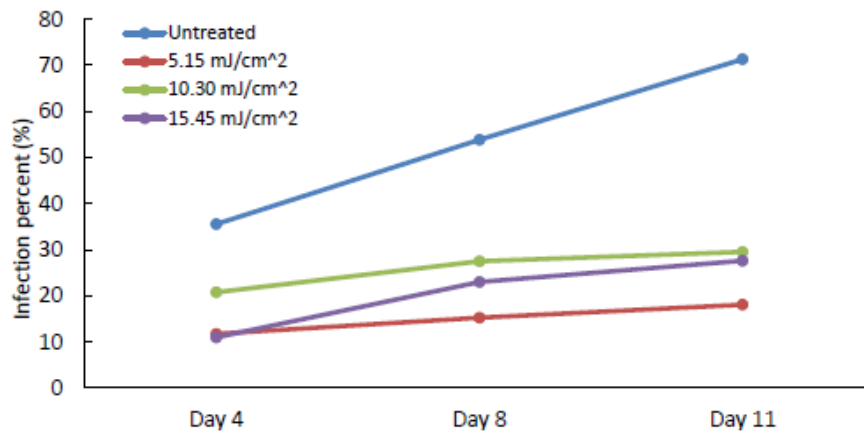


Figure 7 Percentage of leaf area covered by powdery mildew over time on infected cucumber leaves treated with different doses of UVC