RODALE INSTITUTE
POCONO ORGANIC CENTER
AT POCONO ORGANICS

Ultraviolet Light to Control Powdery Mildew in Vegetable Greenhouses

Powdery mildew is a destructive fungal disease in greenhouses that affects several species of vegetable crops. This disease appears as small white to gray powdery spots on the vegetable seedlings' foliage and can easily spread to the entire greenhouse after transplanting. There are several fungal species that can cause powdery mildew. The damage intensity in greenhouses depends on fungus species, crop species, and management infestation. Lettuce (*Lactuca sativa* L.) is an important leafy vegetable owing to its fast-growing and commercial value. It is often used in salads, soups, and wraps. Powdery mildew significantly influences the yield and quality of lettuces and is often considered as a secondary disease.

Using non-ionizing Ultraviolet (UV) light to control fungal diseases has been considered as an alternative method for conventional pest management approaches. UV-light was used for disinfection of microbial contaminants by preventing their growth. UV radiation is classified into three categories: UV-C (λ = 100-279 nm), UV-B (λ = 280-314 nm), and UV-A (λ= 315-399 nm). UV-C has the greatest germicidal impact while UV-B induces expression of gene involved in microbial and insect-pest resistance in some plants. High energetic UV-C can penetrate cell membrane and causes chemical damage and mutations in organisms. Since most of the UV-C radiations are absorbed by the stratospheric ozone molecules, there is no other natural source of UV-C on earth. Exposure of plants to UV-light delays spores' germination and causes an increased resistance to plant pathogens by promoting the concentration of antimicrobial substances, such as terpenoids.

Fig. 1. Detected powdery mildew on tomato plants.

Researchers at Rodale Institute-Pocono Organic Center are conducting a study on management of powdery mildew infestation with the use of UV-C in greenhouses. This project started with measuring the UV-C light intensity at different distances from the sources of light. Under a compound microscope, we detected powdery mildew on tomato (*Solanum lycopersicum* L.) leaves and used fungal materials to infest the lettuce plants (Fig. 1). Two days after inoculation of leaves, six lettuce plants were treated with UV-C radiation at an intensity of 100-120 J/m^2 for five seconds. After two weeks, we measured the yield and compared it with six non-treated plants that served as the control. Preliminary results illustrated that the treated plants produced 45% more yield in comparison with non-treated controls (Fig. 2). The plants that were exposed to UV light also appeared healthier than non-treated crops. These results demonstrated the potential of using UV-light to control microbial diseases in regenerative organic greenhouses.

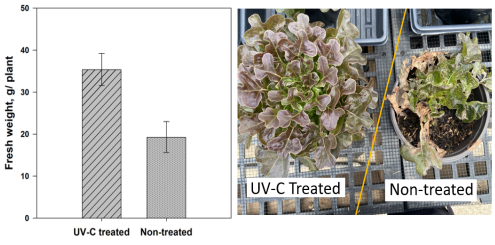

Fig. 2. Average yield of lettuce/plant among treatments.

Written by:
Nikita Bhusal, Dinesh Panday & Dr. Arash Ghalehgolabbehbahani
Contact information: dinesh.panday@rodaleinstitute.org
Rodale Institute Pocono Organic Center - Rodale Institute