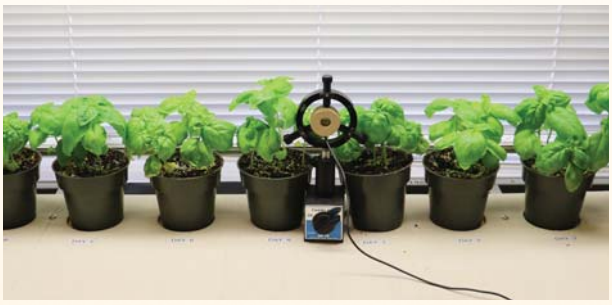
UV-B Radiation Improves Disease Resistance in Plants

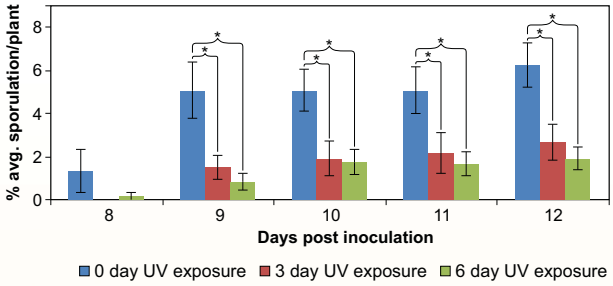
Downy mildew of basil, caused by *Peronospora belbahrii*, is a destructive disease of basil in the United States. Since detected in 2007 in Florida, it has spread to more than 40 states. Basil downy mildew can be controlled by fungicides, but this tactic is constrained by the risk of pathogen resistance to fungicides, and by the fact that basil leaves are often consumed as fresh herbs. Pre-harvest intervals of fungicides may preclude their use. Alternatives to fungicidal suppression would not only provide additional options, but would potentially aid in delaying the development of resistance to crop protection chemicals.

Previous research has shown that ultraviolet radiation (UV) can induce resistance to downy mildew in lettuce. In this study, the LRC sought to determine the effects of exposure to UV treatments on subsequent infection and development of basil downy mildew.



Seeds of sweet basil (*Genovese*) were sown in pots filled with soil mix and slow-release fertilizer. These pots were placed under fluorescent lamps (4 ft. 4100K F32T8) which were switched on at 08:00 and switched off at 18:00, providing an average photosynthetic photon flux density (PPFD) of 45 µmol • m^{-2} • s^{-1}.

On day 48, three pots each containing four plants were exposed to UV-B light-emitting diodes (LEDs) for 6, 3 and 0 days before inoculation with sporangia of *P. belbahrii*. The UV-B LED luminaire (DNA Group Inc., Raleigh, NC; peak wavelength: 292 nm, full-width half-maximum [FWHM]: 13 nm) was positioned 1.5 inches in front of the pots, providing an average dose of 1368 J/m² over a period of 120 minutes. The percentage of the plant with sporulation was assessed for each treatment at 8, 9, 10, 11 and 12 days post-inoculation.

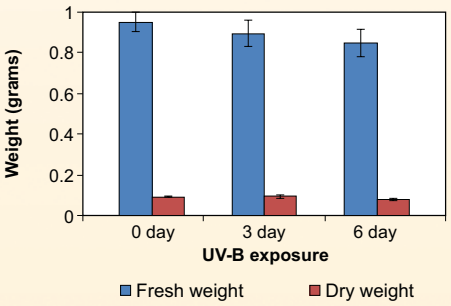


Percent average sporulation per basil plant exposed to pre-inoculation UV-B treatment for 6, 3 and 0 days. * = significant difference ($p < 0.05$).

The percentage of the plant with sporulation was lower on basil plants exposed to UV-B for 6 days than 3 days, however, it was not significantly different. Non-exposed (0 days) basil plants had greater percentage of the plant with sporulation.

The fresh weight and dry weight of the basil leaves were not significantly different for 6, 3 and 0 days of UV-B exposure. Basil leaves exposed to UV-B for 6 and 3 days had some leaf-burning effects. The leaf burning was only seen on the leaves closest to the UV-B luminaire.

The results suggest that an optimum UV-B dose could induce disease resistance in basil and may suppress basil downy mildew if the dose is given in a manner that allows the treatment to be applied uniformly to the leaf surfaces versus just from one side as was done in this experiment. UV-B treatments may be able to suppress basil downy mildew without compromising basil yield if the distribution of UV is more uniform. Plants may also not need to be exposed to UV-B for 6 days as they statistically achieved the same level of reduced sporulation as plants exposed for 3 days.



Fresh and dry weight of the basil plants exposed to pre-inoculation UV-B treatment for 6, 3 and 0 days.

Sponsor

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