

To UV-C or not to UV-C? Adaptation of autonomous UV-C irradiation to table-top strawberries.

Erica Pate, OMAFA; Konrad Konnerth, Konnexio

Powdery mildew (*Podosphaera aphanis*) is a challenging disease for strawberry growers, particularly day-neutral, table top, and greenhouse growers. The pathogen prefers warm temperatures (15-27°C) and high humidity, conditions often found in protected environments. Powdery mildew infections cause leaf edges to curl and become discoloured, and a white powdery substance can form on the fruit. Infected berries will become cracked, seedy and unmarketable.

Currently, growers rely on regular fungicide applications to control powdery mildew. Although fungicides are effective, there is interest in alternative tools to reduce reliance on pesticides and reduce the risk of developing fungicide resistance. New integrated pest management (IPM) strategies are being tested for powdery mildew control, and one of the most exciting developments comes from research into ultraviolet light (UV-C) technology. UV-C light works by disrupting the DNA of fungal spores and arthropod pests, stopping them from germinating and spreading. UV-C light ranges from 100- 280 nm. UV-C is currently used as a disinfectant in hospitals, water treatment, and laboratories, and use in agriculture is expanding.

Ultraviolet (UV-C) light is effective at controlling multiple strawberry pests including powdery mildew, botrytis grey mould, and anthracnose. 60 seconds of UV-C exposure followed by a 4-hour dark period significantly decreased powdery mildew infection on strawberry leaves without damaging plants (Janisiewicz et al. 2016). Recently, in Florida and California, tractor-drawn implements with UV-C lamp arrays were designed to apply nighttime applications of UV-C for suppression of powdery mildew on strawberry. Applications of UV-C at 200 J/m<sup>2</sup> was just as or more effective than weekly fungicide applications, even when applied to cultivars highly susceptible to powdery mildew (Mello et al. 2022). In addition to pathogens, UV-C may be a promising tool for two-spotted spider mite control (Montemayor et al. 2022). Unfortunately, UV-C does not appear to be effective against cyclamen mite (Renkema et al. 2023).

UV-C is most effective when applied at night, to allow for a dark period after the irradiation treatment. This dark period prevents DNA in target pests and pathogens from repairing, which occurs when light is present, thus reducing the time and dose required to control the different pests and improving the efficacy of UV-C. A dark period of 4 hours is required after UV-C application to prevent DNA repair.

UV-C light is not currently being used in Ontario table-top strawberry production for pest control. Autonomous, UV-C application is a novel approach that is undergoing proofing and adoption in strawberry production areas in the United States and Europe. This

technology couples the pest management efficacy of UV-C light with a robotics platform that can deliver the treatment without an applicator. Strawberry production is labour intensive and requires careful and regular pest monitoring and management to protect this fresh market, perishable fruit that has very little tolerance for damage. Combining the advancements of UV-C technology and automation with the emerging table-top production systems will improve the viability and sustainability of table-top production (Fig. 1). Autonomous UV-C applications can also be adapted to field use for day-neutral growers.



**Figure 1.** Table top strawberries.

In 2024 Berry Growers of Ontario along with Konnexio Inc., a London, Ontario based company, began a demonstration project to pilot the use of an autonomous rover to deliver UV-C irradiation to table-top strawberries (Fig. 2). This project is funded in part by the Governments of Canada and Ontario under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.



**Figure 2.** agroTRAX™

The objectives of this project were to adapt an existing autonomous rover to deliver UV-C irradiation to table top strawberries, validate its use for pest control in commercial strawberry production in Ontario, and demonstrate the technology to Ontario strawberry growers. The technology was tested in a commercial table top strawberry operation and the crop was regularly monitored for pests compared to a conventionally managed crop. UV-C was applied to strawberry cultivars Malling Ace and Florida Beauty. Treatments included 85 J/m<sup>2</sup> applied twice weekly, 170 J/m<sup>2</sup> applied weekly, and a control where conventional fungicides were applied weekly. Initial results indicate that using UV-C once or twice a week provided better or similar control of powdery mildew infection on fruit compared to weekly fungicide applications.



**Figure 3.** Demonstration of the Konnexio robot at the Berry Growers of Ontario twilight meeting, September 2025.

In September 2025, the technology was demonstrated to Ontario berry growers to allow growers to see the rover in use and become familiar with this technology (Fig. 3).

While progress on the adaptation of an autonomous rover for UV-C application on table tops is promising, the work is ongoing. In 2026 Konnexio will deploy a fully autonomous solution with 4 times the capacity that can apply the full weekly dose of 200 J/m<sup>2</sup> in one pass to two adjacent table top rows simultaneously.

Konrad Konnerth (Konnexio) and Kevin Howe (Howe Family Farms) will be speaking on their experiences with the robot in table top strawberries at the Ontario Fruit and Vegetable Convention, in the 'Grower Experiences with Robotics and Technology' session the morning of Thursday, February 19. Catch them there to hear more about this work and the future of UV-C and robots in strawberries!

**Further reading:**

[Field Trials of Ultraviolet Light \(UV-C\) to Fight Plant Pathogens](#)

[Using Ultraviolet Light \(UV-C\) to Fight Plant Pathogens](#)

**References:**

Janisiewicz, J.W., F. Takeda, B. Nichols, D.M. Glenn., W.M. Jurick II, and M.J. Camp. 2016. Use of low-dose UV-C irradiation to control powdery mildew caused by *Podosphaera aphanis* on strawberry plants. *Can. J. Plant. Pathol.*: 38, 430-439.

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Montemayor, J.D., Smith, H.A., Peres, N.A., and Lahiri, S., 2022. Potential of UV-C for management of two-spotted spider mites and thrips in Florida strawberry. *Pest Manag Sci*:79:891-898.

Onofre, R.B., D.M., Gadoury, A. Stensvand, A. Bierman, M. Rea, and N.A. Peres. 2019. Use of Ultraviolet light to suppress powdery mildew in strawberry fruit production fields. *Plant Disease*.

Renkema, J.M., Takeda, F., and Janisiewicz, W. 2023. Ultraviolet-C irradiation has no short-term, direct effects on cyclamen mite (*Phytonemus pallidus* (Banks)) in strawberry. *Canadian Journal of Plant Science*: 103, 589-594.