FARM-SCALE EVALUATION OF UV-C FOR CONTROL OF POWDERY MILDEW IN STRAWBERRIES

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Introduction

This study compared the efficacy of UV-C and a conventional fungicide program against strawberry powdery mildew within a commercial strawberry production field. As the limitations of fungicides continue to increase, alternative methods such as UV-C are being explored as an alternative approach[1].

Materials and Methods

A powdery mildew-susceptible cultivar 'Portola' was planted on 30 May 2022 in Nipomo, CA. Strawberry beds were divided into two treatments: grower standard and UV-C. Ten plants were rated weekly for incidence (total infected leaves per plot/total leaves per plot) and severity (infected % of total leaf surface) in 5 pseudo-replications. UV- treatment was applied twice-weekly between 9:00 PM and 1:00 AM using an autonomous robot.

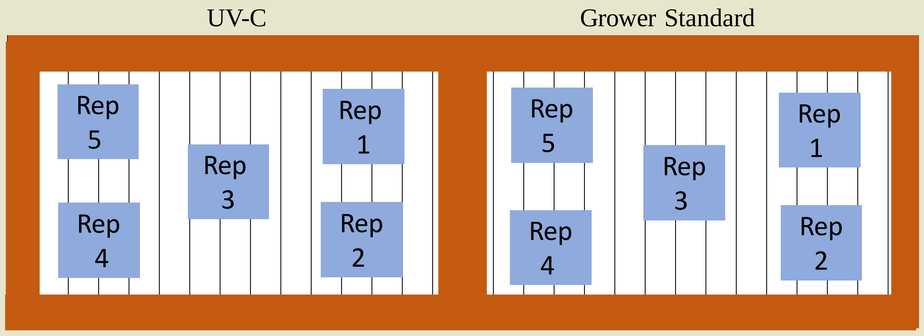

Figure 1. Experiment layout: Five areas (pseudo-reps 1-5) were identified in each of the two plots, no plants were sampled from a 25-ft buffer around the field edge (shown in orange).

Table 1. Grower fungicide program. Fungicide applications are listed in chronological order.

Date	Product
13-Jun	Microthiol Disperss Wettable Sulfur 80WP
	Rhyme 2.08SC
22-Jun	Microthiol Disperss Wettable Sulfur 80WP
5-Jul	Quintec 2.08SC
16-Jul	Prev-am 0.084SC
	Fontelis 1.67SC
30-Jul	Procure 480SC
	Captan 80WDG
	Microthiol Disperss Wettable Sulfur 80WP
6-Aug	Luna Sensation 4.2SC
	Microthiol Disperss Wettable Sulfur 80WP
13-Aug	Dusting Sulfur 98WP
19-Aug	Rhyme 2.08SC
	Microthiol Disperss Wettable Sulfur 80WP
	Switch 62.5WG
26-Aug	Pristine 0.0238SC
	Microthiol Disperss Wettable Sulfur 80WP
10-Sep	Switch 62.5WG

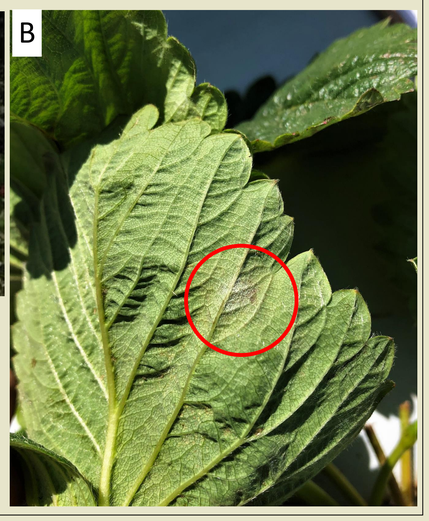

Figure 2. **A**. Saga Robotics autonomous robot treating at night with UV-C light. **B.** Example of 5% severity rating of powdery mildew infection in trial.

Results and Discussion

UV-C treated plants had significantly less powdery mildew incidence at five of the nine evaluation dates. Disease incidence peaked 26 Jul, reaching 16.1% and 37.8% for the UV-C treatment and grower standard treatment.

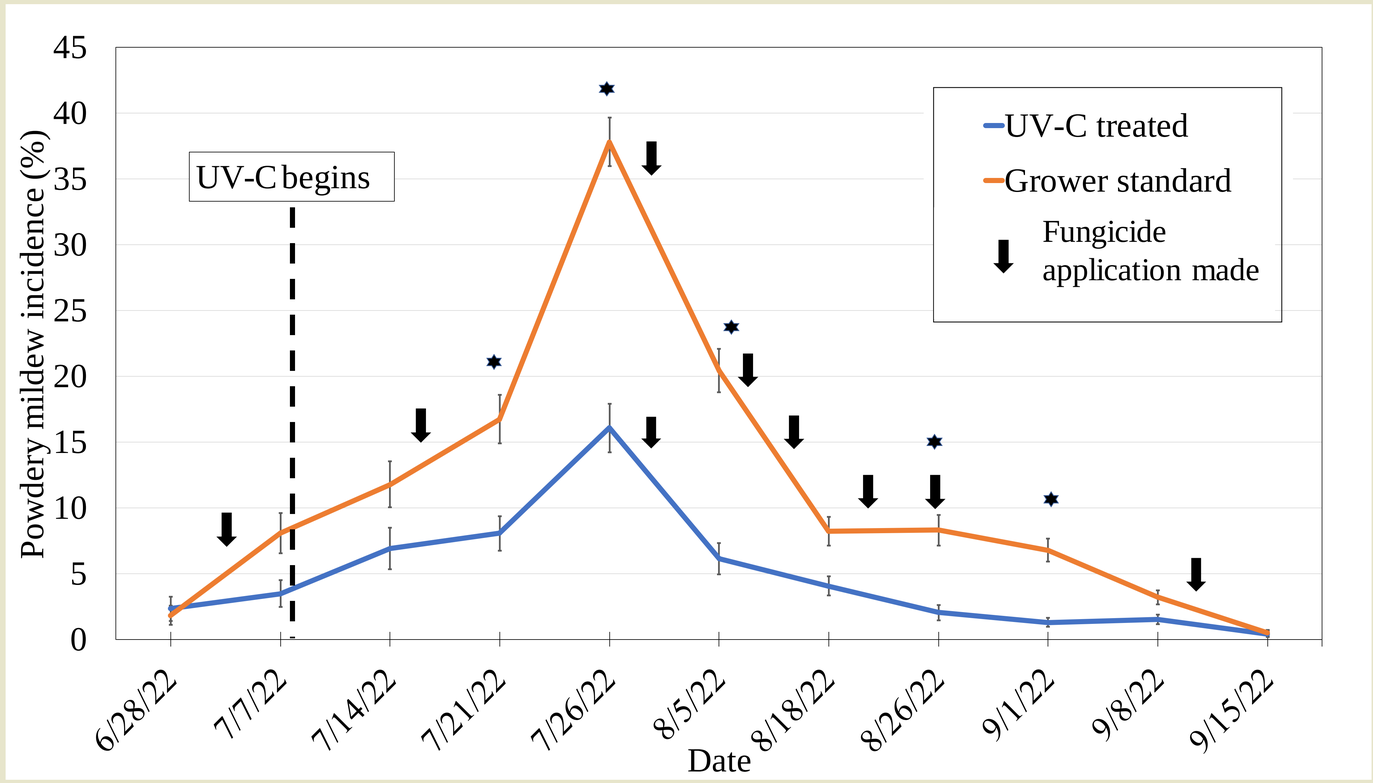

Figure 3. Powdery mildew incidence over time.* indicates treatments were significantly different on that evaluation date per *t*-test.

Table 2. Powdery mildew incidence over time and area under the disease progress curves (AUDPC) with statistical analysis

	Powdery mildew incidence (%)											
Treatment	28-Jun[zy]	7-July[y]	14-Jul	21-Jul	26-Jul	5-Aug	18-Aug	26-Aug	1-Sep	8-Sep	15-Sep	AUDPC
UV-C Treated	2.3 a	3.5 a	6.9 a	8.1 a	16.1 a	6.1 a	4.1 a	2.0 a	1.3 a	1.5 a	0.4 a	383.5 a
Grower fungicide program	1.8 a	8.1 a	11.8 a	16.7 b	37.8 b	20.4 b	8.2 a	8.3 b	6.8 b	3.2 a	0.5 a	974.7 b

[z] Numbers within a column followed by the same letter are not significantly different (P=0.05) per *t*-test calculated using JMP version 16.
[y] Evaluations done prior to UV-C treatment.

Conclusion

This study demonstrates that UV-C treatment, applied twice-weekly, significantly reduces powdery mildew incidence compared to the growers' fungicide program. Additional studies are recommended to draw stronger conclusions by including a non-treated area. This study confirms results from similar studies (Mello et al.)

Acknowledgements and References

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1. Janisiewicz, W. J., Takeda, F., Glenn, D. M., Camp, M.J., and Jurick, W.M. 2016. Dark period following UV-C treatment enhances killing of *Botrytis cineria* conidia and controls grey mold of strawberries. Phytopathology 106:320-329.
2. Mello, P. P., Onofre, R. B., Rea, M., Bierman, A., Gadoury, D. M., Ivors, K., Ganci, M., Broome, J. C. and Peres, N. A. 2022. Design, construction, and evaluation of equipment for nighttime application of UV-C for management of strawberry powdery mildew in Florida and California. https://doi.org/10.1094/PHP-01-22-0002-RS