



THE UNIVERSITY OF BRITISH COLUMBIA

Plant Care Services

VP Research & Innovation



Observing the Efficacy of Silamol® in Reducing Powdery Mildew (*Erysiphe cichoracearum*) Infection Rate and Severity for *Cucumis melo*.

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Introduction:

From September 1, 2020 to December 1, 2020 (14 weeks) a research project assessing the effectiveness of the Silamol® product in reducing the occurrence and severity of powdery mildew (*Erysiphe cichoracearum*) in cantaloupes (*Cucumis melo*) was conducted at the Horticulture Greenhouse, University of British Columbia, Vancouver, BC. Silamol® is an aqueous solution containing potassium silicate in a concentrated and plant-available form. Silamol® produces $[\text{Si}(\text{OH})_4]$, when diluted in water and is proposed to reduce abiotic stresses in greenhouse crops (Frontline Growing Products, 2015). We anticipate there to be efficacy against the biotic stresses, as well.

Materials and Methods:

All plants were grown in rockwool cubes (inorganic material made into matted fibers, 10 cm x 10 cm x 7cm, Grodan Delta brand) and cocobags (containing shredded coconut fibers, 100cm x 15 cm x 9cm, Rich Grow Terralink brand) on ground plastic, using crop wires to support the vertical growth of the plants. Supplemental Philips LED Green powered top lighting was used, with a photoperiod of 16 hours. The 24hr average greenhouse temperature throughout the project was 18.5°C and the average relative humidity (RH) was 64%.

The cantaloupes were sown into rockwool cubes on August 3rd, 2020 and placed in the middle of the coco bags on September 1, 2020. One rockwool cube per coco bag, with 4 plants per treatment and control group. There were 2 treatment groups and 2 control groups, with a total number of 16 plants. The treatment and control groups were organized in an alternating design, Control Group 1 (CG1), Treatment Group 1 (TG1), Control Group 2 (CG2) and Treatment Group 2 (TG2).

The treatments included:

Silamol® Foliar (SF): Plants were evenly sprayed with diluted Silamol® applied by a foliar spray method.

Control Foliar (CF): Plant were evenly sprayed with tap water applied by a foliar spray method.

The Silamol® foliar applications were applied using a 10 L Solo® 456 sprayer and mixed at a ratio of 1.25 mL of Silamol® concentrate per 1 L of tap water. 1 L of solution was evenly sprayed throughout the treatment groups of cantaloupes at the beginning of the project. As the cantaloupes grew larger, 3 L of solution was sprayed to cover all the leaves in the treatment groups. The same volumes of 1 – 3 L of tap water was sprayed on the control groups, throughout the duration of the project, increasing as the plants grew larger. Treatment applications were applied weekly every Thursday, starting on September 3rd, 2020. Metrics were taken every week on Wednesdays, starting on September 1, 2020. These metrics included the number of leaves infected with powdery mildew and severity ratings of the powdery mildew infections. The severity ratings were based on the amount of the leaf surface covered in powdery mildew, on a scale of 1 – 10, with a rating of 1 implying 1-10% of the leaf surface was

covered and a rating of 10 showing infection covering 91-100% of the leaf surface. All plants in the control and treatment groups were fertilized daily. This was applied by a drip line irrigation system with our proprietary fertilizer mix, recipe below. With an average electro-conductivity (EC) of 2.46 and an average pH of 5.8.

UBC HORTICULTURE GREENHOUSE FERTILIZER RECIPE									
Date	September 13, 2019								
Tank A	Kg								
Ca(NO3)2 + amm	15.0	kg							
Ca(NO3)2 - amm	0.0	kg							
KNO3	0.0	kg							
CaCl2	11.4	kg							
NH4NO3	0.0	kg							
K2SO4	0.0								
Fe DTPA 3.8 Liquid.	1.0	Kg							
B TANK									
MgSO4	15.0	kg							
MgNO4	0.0	kg							
20-20-20	0.0	Kg							
15-5-15	0.0	Kg							
15-30-15	0.0	kg							
KH2PO4	3.8	kg							
Mg EDTA 5.8%	0.0	mL							
KNO3	6.8	Kg							
KCl	0.0	grams							
Urea	0.0	litres							
Amway adjuvant		kg							
Urea	0.0	kg							
CuSO4	7	grams							
Molyb	3	grams							
Solubor	60	grams							
MnSO4	60	grams							
ZnSO4	30	grams							

Figure 1: Fertilizer recipe dissolved in 350 L of water per tank, dosed by an A and B hydroponic system.

Fertilization Check
Drip water
NORTH FEED

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Original

Sample	Research-/ordernumber: 550304/004779180	Date sampling: 30-07-2019	Date report: 01-08-2019	Code of object: 50304
	Test code: 515	Receiving date: 01-08-2019	Sample was taken by: Third party	Contactperson sampling:

Results	test results	at EC 2,6	basic scheme	crop stage	difference	low	high
	pH	6,1					
mS/cm 25°C	EC	2,4	2,6	2,6			
Cations mmol/l	NH ₄	< 0,1	< 0,1	1,2			
	NH ₄ -N	< 0,1					
	K	7,2	8,9	9,5			
	Na	0,4	0,4				
	Ca	4,9	6,1	5,4			
Anions mmol/l	Mg	2,2	2,7	2,4			
	NO ₃	11,9	14,7	16,0			
	NO ₃ -N	11,9					
	Cl	3,0	3,0				
	S	2,0	2,5	4,4			
Micro-nutrients µmol/l	HCO ₃	< 0,1	< 0,1				
	P	1,18	1,46	1,50			
	Fe	8,7	11	25			
	Mn	16	20	10			
	Zn	2,3	2,8	5,0			
mmol/l	B	18	22	30			
	Cu	0,8	1,0	0,8			
	Mo	0,7	0,9	0,5			
	Si	0,28	0,28				

Crop data	Crop	tomato	Indicated pH	not indicated
	Type of crop		Indicated EC	not indicated
	Growing stage			
	Growing mediumsubstrate			

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550304, 01-08-2019



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Figure 2: Feed Analysis.

Results: Image Comparisons



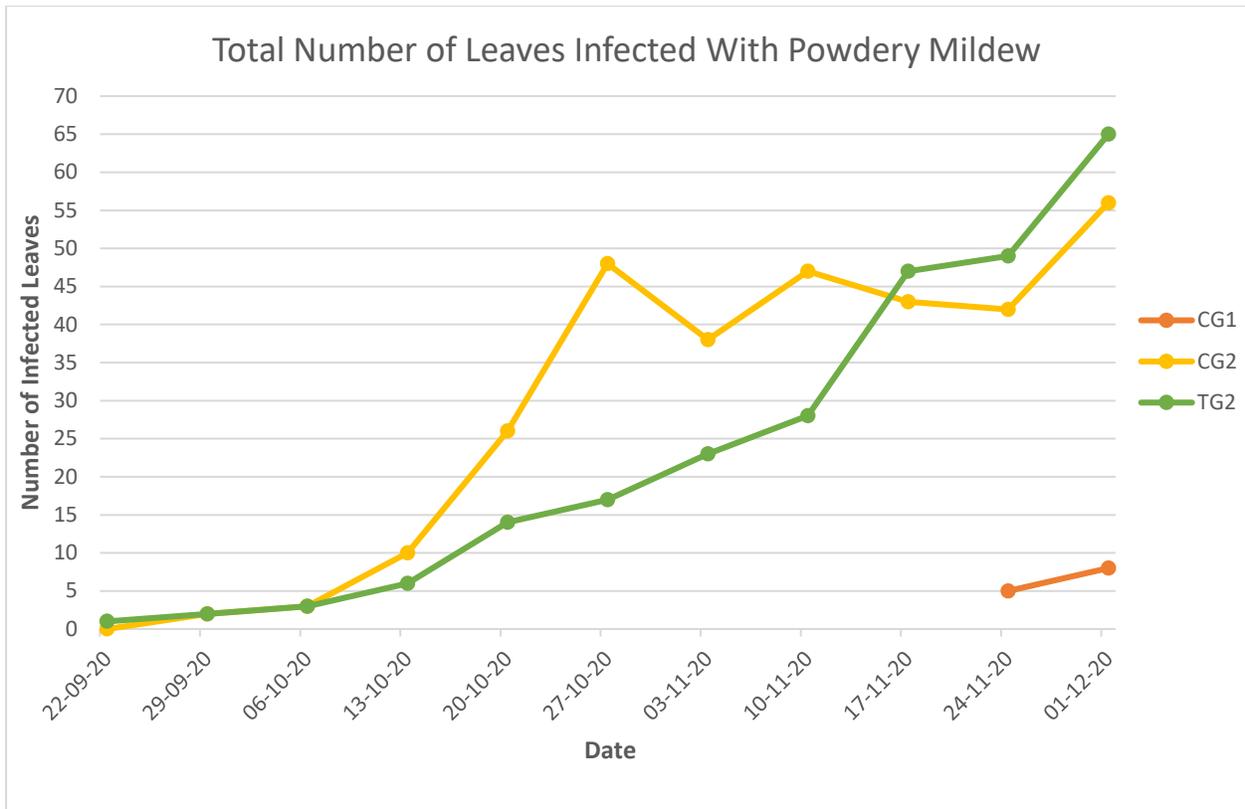
Figure 3: TG2 Photos at first sign of powdery mildew infection on Cantaloupe 3 (C3), on September 22nd, 2020 (left) and on last day of experiment December 1st, 2020 (right).



Figure 4: CG2 Photos at first sign of powdery mildew infection on Cantaloupe 2 (C2), September 29th, 2020 (top) and on last day of experiment December 1st, 2020 (bottom).



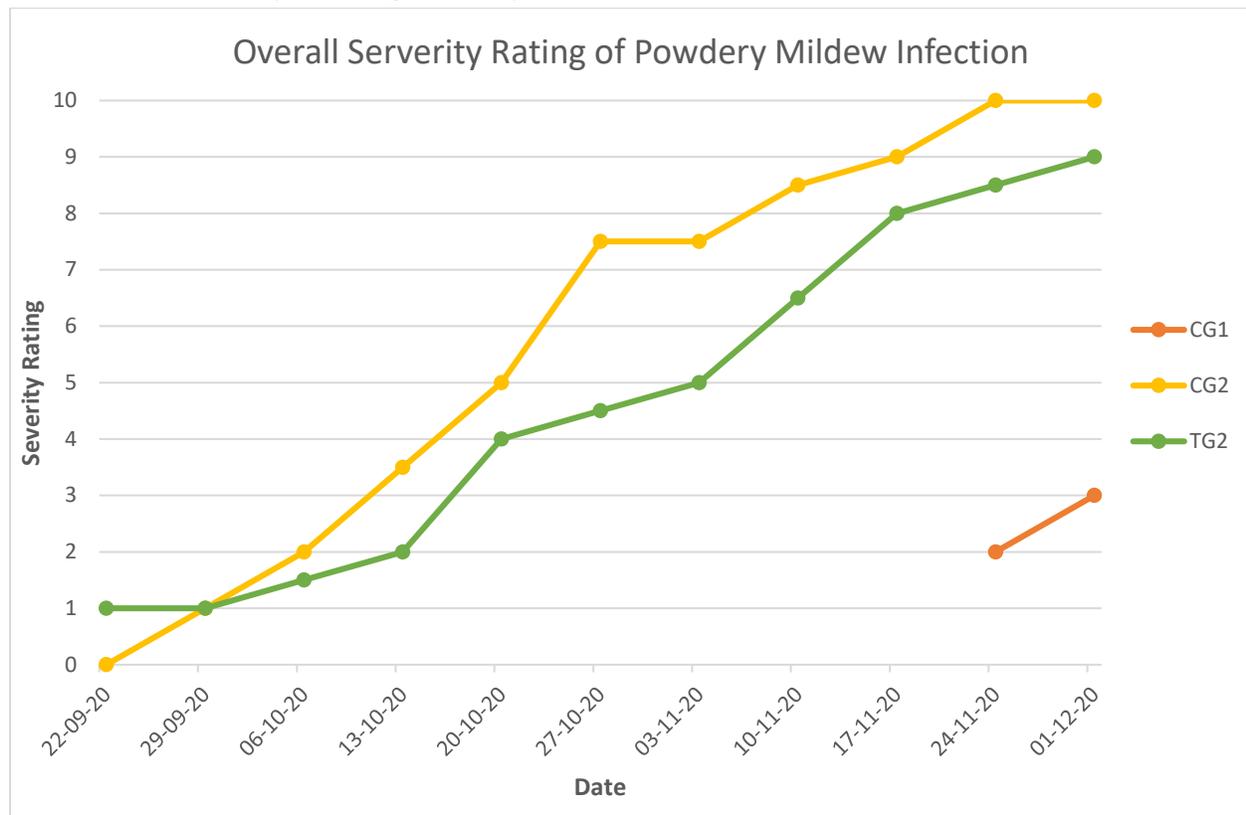
Results: Total Number of Infected Leaves Analysis



Graph 1: Total number of leaves infected with powdery mildew for CG1, CG2 and TG2, observed throughout the duration of the project.

Powdery mildew first appeared in the 4th week of the project, September 22nd, 2020 on TG2, with 1 leaf showing a small amount of infection on Cantaloupe 3 (C3). CG2 first showed powdery mildew pressure the following week on September 29th, 2020 on two leaves of Cantaloupe 2 (C2). CG2 quickly outpaced TG2 in number of infected leaves starting in the 7th week, on October 13th, 2020. By the 9th week, October 27th, 2020 CG2 had nearly 3 times the rate of infection at 48 infected leaves, compared to TG2, which had only 17 infected leaves. During the 12th week, November 17th, 2020 it was observed that TG2 had 47 infected leaves, compared to the 43 infected leaves in CG2. This trend continued for the next two weeks of the experiment. On the 13th week, November 24th, 2020 CG1 showed powdery mildew pressure with 5 infected leaves on Cantaloupe 4 (C4), with an increase to 8 infected leaves on the last week, December 1st, 2020.

Results: Severity Ratings Analysis



Graph 2: Overall severity rating of powdery mildew infection for CG1, CG2 and TG2, assessed throughout the duration of the project.

TG2 showed a severity rating of 1 during the 4th week, September 22nd, 2020. CG2 showed a severity rating of 1 the following week, September 29th, 2020. By the 6th week, October 6th, 2020 CG2 began to show higher overall severity of powdery mildew infection, a trend that continued for the remainder of the experiment. The 9th week, October 27th, 2020 showed the largest difference between the control and treatment groups, with the CG2 severity rating of 7.5, compared to the severity rating of 4.5 found in TG2. CG1 showed powdery mildew infection during the 13th week, November 24th, 2020 with a severity rating of 2. The final week, December 1st, 2020 showed CG1 to have a severity rating of 3, CG2 had a severity rating of 10, whereas TG2 showed a severity rating of 9.

Discussion:

It was observed that only a single plant in each group became infected with powdery mildew. Treatment Group 1 (TG1) did not show any symptoms of powdery mildew infection throughout the experiment. In general, CG2 was observed to have more leaves infected with powdery mildew than TG2, over the majority of the experiment. It is worth noting that CG2 started losing some leaves in the 10th week, November 3rd, 2020. The older leaves on the infected C2 plant, in CG2 became so heavily coated in powdery mildew, that they began to die and drop off the plant. This influenced the counts of the total number of infected leaves for CG2 and may explain why TG2 had higher infected leaf counts, from the 12th week onward. CG1 did eventually show powdery mildew pressure in the 13th and 14th week of the experiment. It is recommended to extend the duration of future trials, to capture more data of delayed powdery mildew infections.

After powdery mildew was first observed in CG2 on the 5th week, September 29, 2020 it consistently showed a higher severity rate of infection throughout the remainder of the 14-week experiment. CG2 had an overall severity rating of 10 at the end of the project, with 91 – 100% of the leaf surfaces being infected with powdery mildew. TG2 had mild powdery mildew pressure a single week earlier than CG2, but showed a lower severity of infection for the majority of the experiment. TG2 had an overall severity rating of 9 on the last week, with 81 – 90% of the leaf surfaces being infected. CG1 had a delayed infection of powdery mildew in the last 2 weeks of the project, with a final overall severity rating of 3 and 21 – 30% of the leaf surfaces showing infection.

Overall, this study strongly suggests that foliar Silamol[®] applications, administered weekly, can be beneficial for greenhouse *Cucumis melo* growers to reduce the occurrence and severity of powdery mildew pressure.

References:

Frontline Growing Products. 2015. Silamol[®] silicon-based supplement. Accessed at https://www.plantproducts.com/ca/images/Silamol_label_2015.pdf, August 23, 2020.

Government of British Columbia. 2020. Cucurbit disease management. Accessed at <https://www2.gov.bc.ca/gov/content/industry/agriservice-bc/production-guides/vegetables/cucurbits?keyword=cucurbits>, August 23, 2020.