

# Kickin<sup>🐛</sup> Frass

*Power Up Your Soil - Naturally*

**VINELAND RESEARCH FIGURES**



# Overview of soil health...



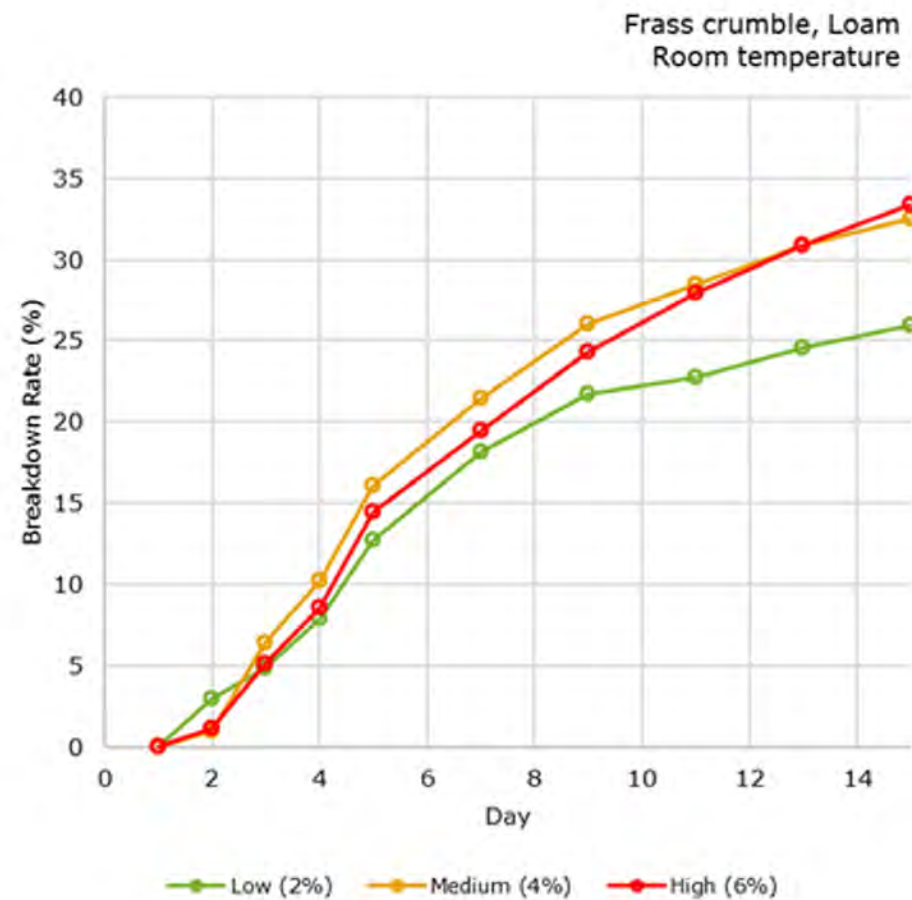
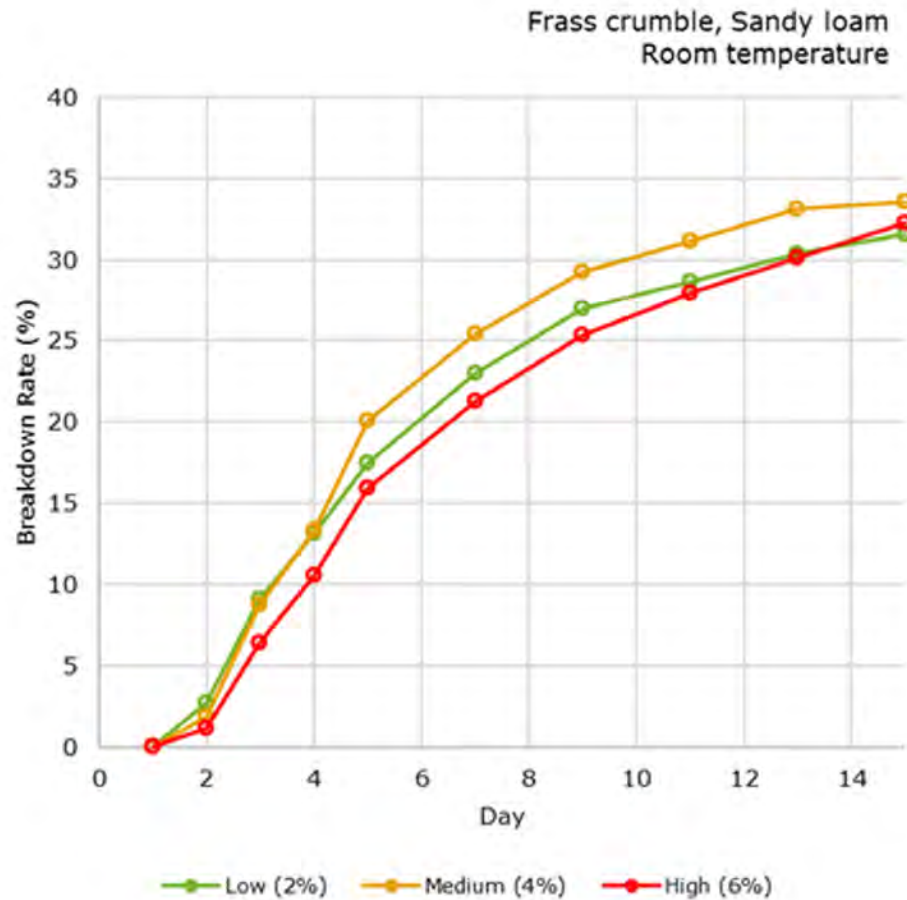
<b>Growing media:</b> Sandy loam (coarse texture)						
<b>Amendment:</b> Frass crumble						
	<b>Control</b> (baseline)	<b>Low</b> (2% w / w)	<b>Moderate</b> (4% w / w)	<b>High</b> (6% w / w)	<b>Very High</b> (8% w / w)	
Organic Matter (%)	<b>3.03</b>	4.76	5.89	7.28	9.15	
pH	<b>6.8</b>	6.5	6.3	6.2	6.2	
Electrical Conductivity (µS/cm)	<b>100</b>	443	563	957	1110	
<b>Growing media:</b> Loam (moderate texture)						
<b>Amendment:</b> Frass crumble						
	<b>Control</b> (baseline)	<b>Low</b> (2% w / w)	<b>Moderate</b> (4% w / w)	<b>High</b> (6% w / w)	<b>Very High</b> (8% w / w)	
Organic Matter (%)	<b>5.90</b>	7.26	8.76	9.99	10.98	
pH	<b>7.5</b>	7.0	6.7	6.6	6.5	
Electrical Conductivity (µS/cm)	<b>270</b>	523	793	940	1110	
<b>Growing media:</b> Clay loam (fine texture)						
<b>Amendment:</b> Frass crumble						
	<b>Control</b> (baseline)	<b>Low</b> (2% w / w)	<b>Moderate</b> (4% w / w)	<b>High</b> (6% w / w)	<b>Very High</b> (8% w / w)	
Organic Matter (%)	<b>6.29</b>	8.21	10.27	10.85	12.66	
pH	<b>7.2</b>	6.8	6.6	6.5	6.4	
Electrical Conductivity (µS/cm)	<b>317</b>	570	757	950	1107	

<span style="display:inline-block; width:15px; height:15px; background-color:#90EE90; border:1px solid black;"></span> Optimal	<span style="display:inline-block; width:15px; height:15px; background-color:#FFFF99; border:1px solid black;"></span> Sub Optimal	<span style="display:inline-block; width:15px; height:15px; background-color:#FFA500; border:1px solid black;"></span> Declining	<span style="display:inline-block; width:15px; height:15px; background-color:#FF6347; border:1px solid black;"></span> Poor
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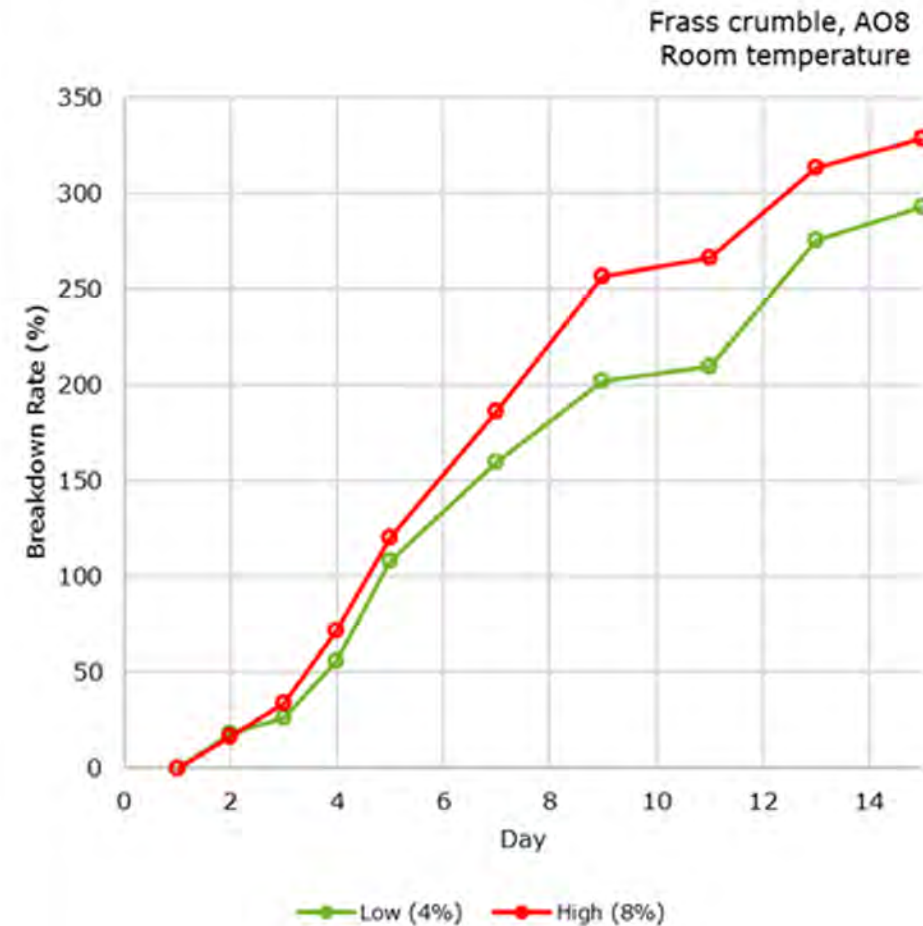
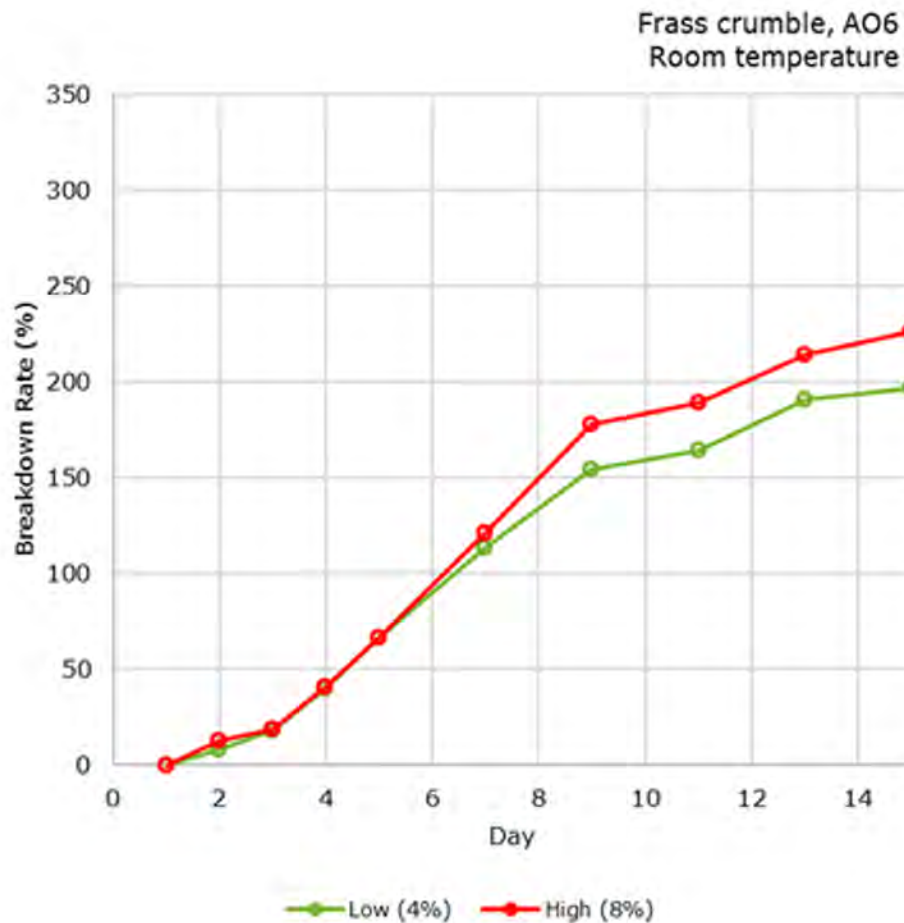
Soil amended with frass showed improved higher organic matter levels, lower pH, and increased electrical conductivity at levels optimal for plant growth.

# Measured breakdown rate for soils



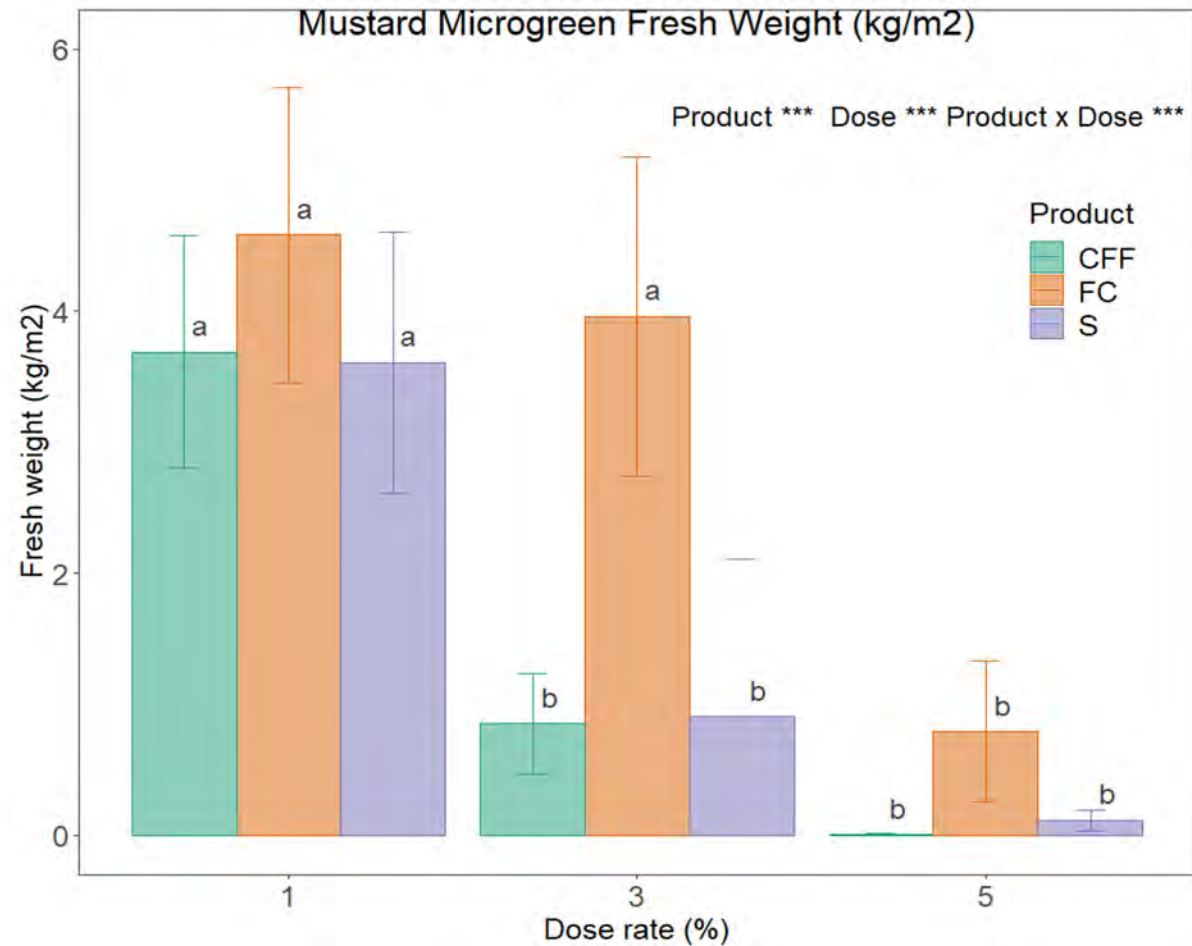
Soil based growing media amended with frass crumble demonstrated extremely high breakdown rates, suggesting rapid nutrient availability. In addition, frass products may be added to compost feedstocks to help break down organic material and aid in the composting process.

# Measured breakdown rate for soils



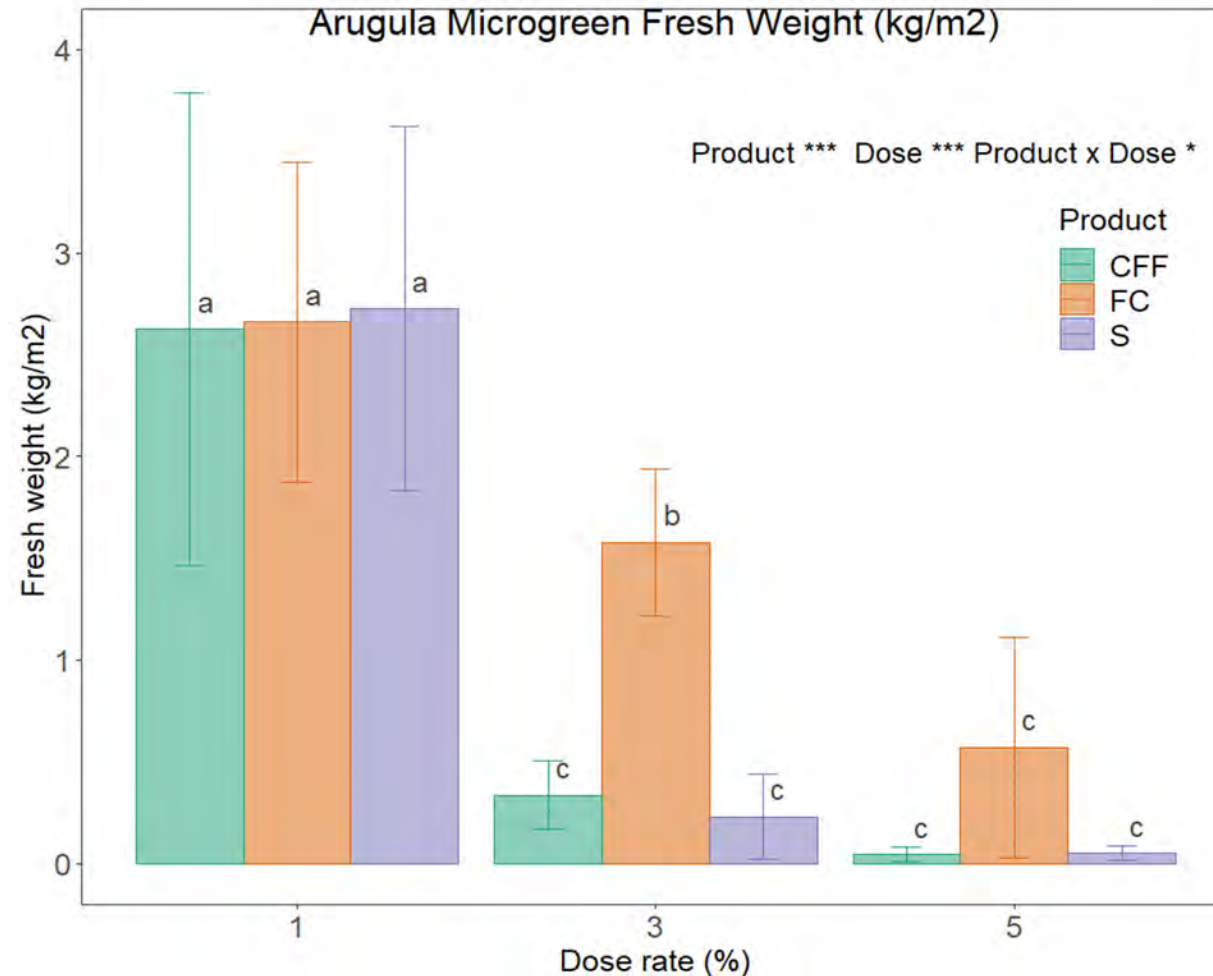
In addition to the rapid mineralization of frass in soil, frass inclusion also resulted in the rapid breakdown of soilless substrates, further supporting its benefit to composting processes.

# Mustard microgreen fresh weight



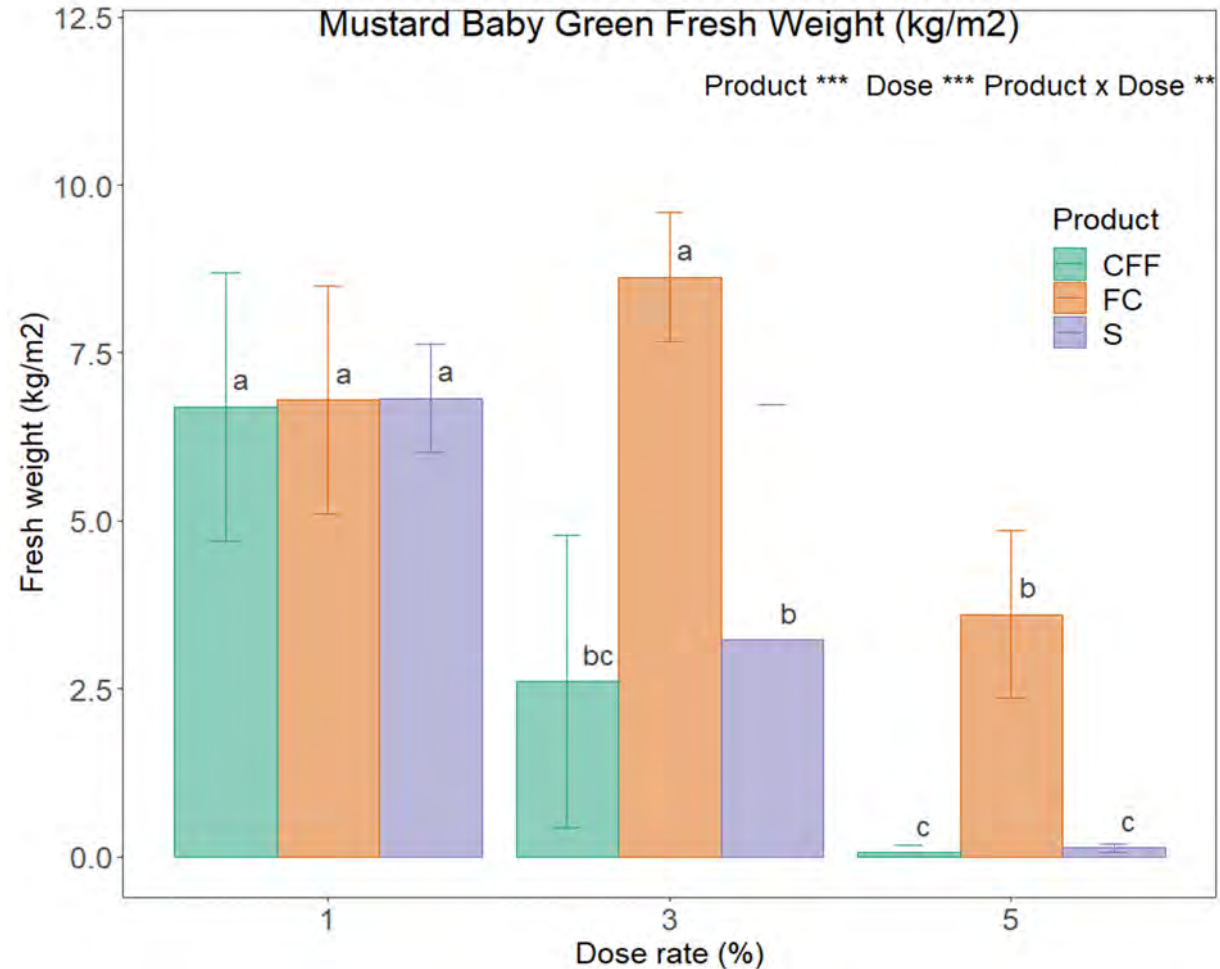
Plant fresh weight for mustard was similar at 1% dose rate and significantly higher in plants treated with FC3% compared to the other products within the 3% incorporation rate, despite the lower nutrient composition of FC (3-2-1) compared to CFF (5-2-3) and S (4-2-5).

# Arugula microgreen fresh weight



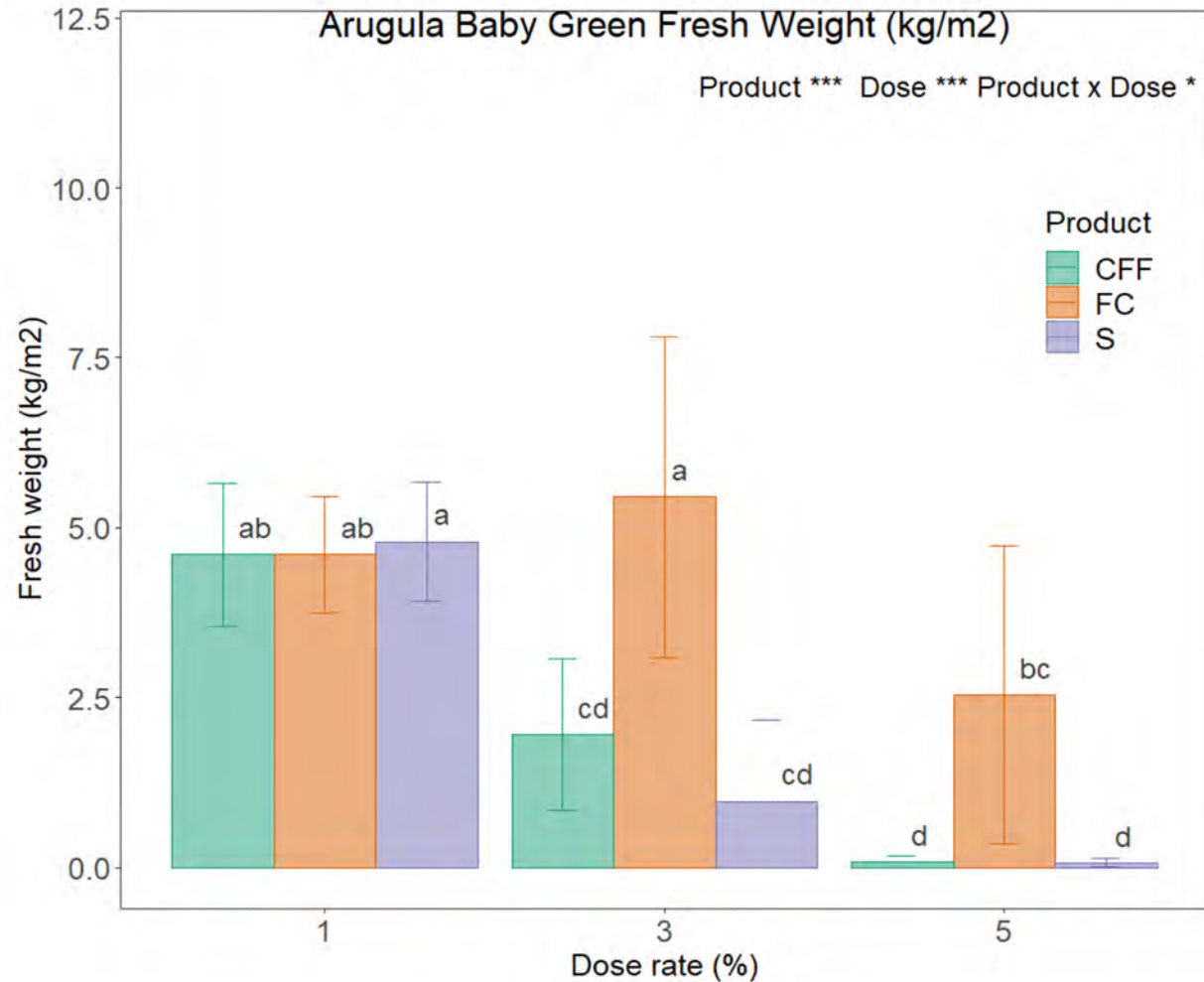
Plant fresh weight for arugula was similar at 1% dose rate and significantly higher in plants treated with FC3% compared to the other products within the 3% incorporation rate, despite the lower nutrient composition of FC (3-2-1) compared to CFF (5-2-3) and S (4-2-5).

# Mustard Baby Green fresh weight



As with the microgreens, mustard baby greens yielded similarly at the recommended dose rate and significantly higher than other treatments at higher rates, indicating a greater “margin of safety” with frass crumble applications.

# 7) Arugula Baby Fresh Weight gGreenraph



As with the microgreens, arugula baby greens yielded similarly at the recommended dose rate and significantly higher than other treatments at higher rates, indicating a greater “margin of safety” with frass crumble applications.



# Microgreen Harvest Date photos - 1% Arugula treatments



# Microgreen Harvest Date photos - 3% Arugula treatments



# Microgreen Harvest Date photos - 1% Mustard treatments



# Microgreen Harvest Date photos - 3% Mustard treatments



# Baby Green Harvest Date photos - 1% Arugula treatments



# Baby Green Harvest Date photos - 3% Arugula treatments



# Baby Green Harvest Date photos - 1% Mustard treatments

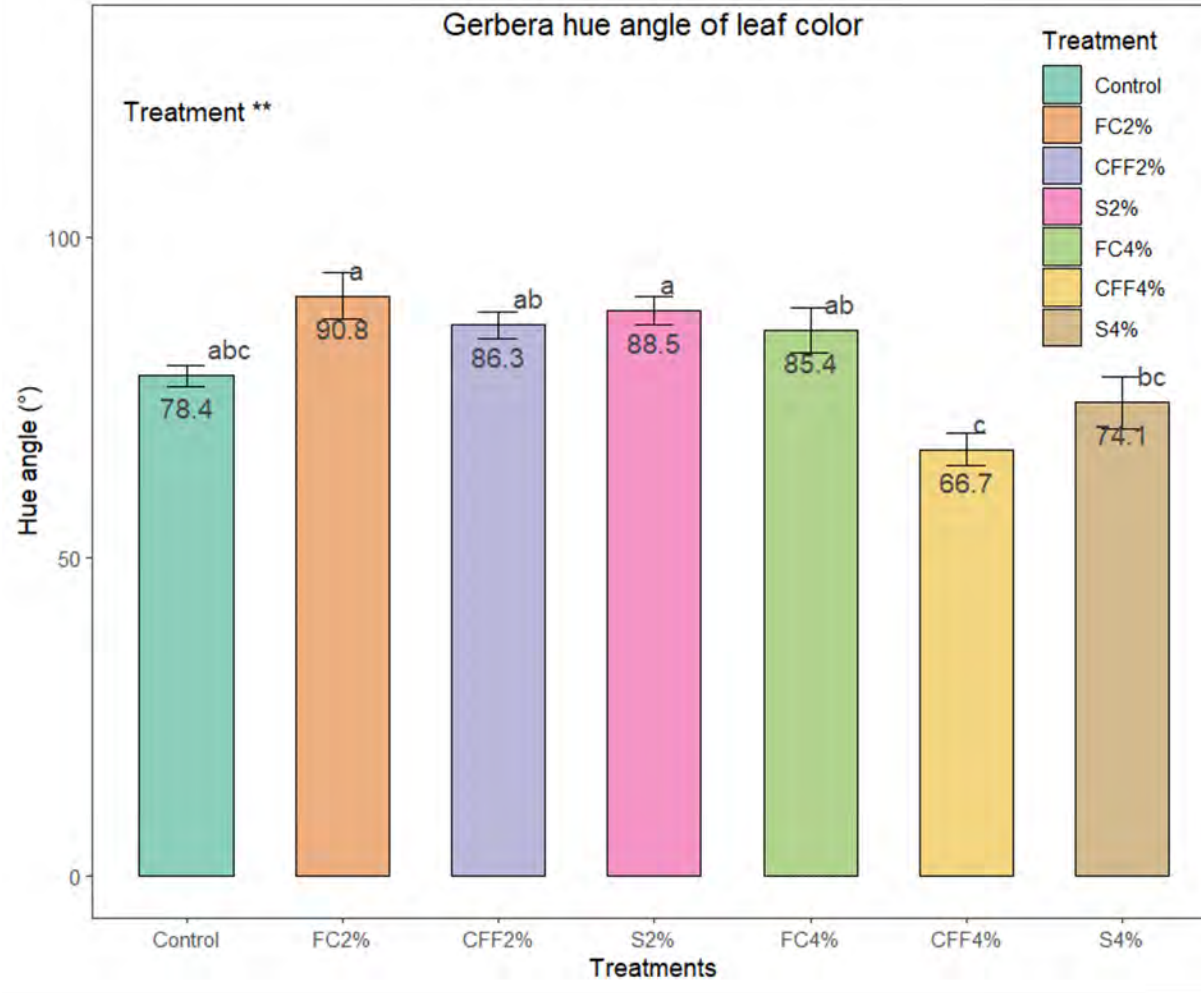


# Baby Green Harvest Date photos - 3% Mustard treatments





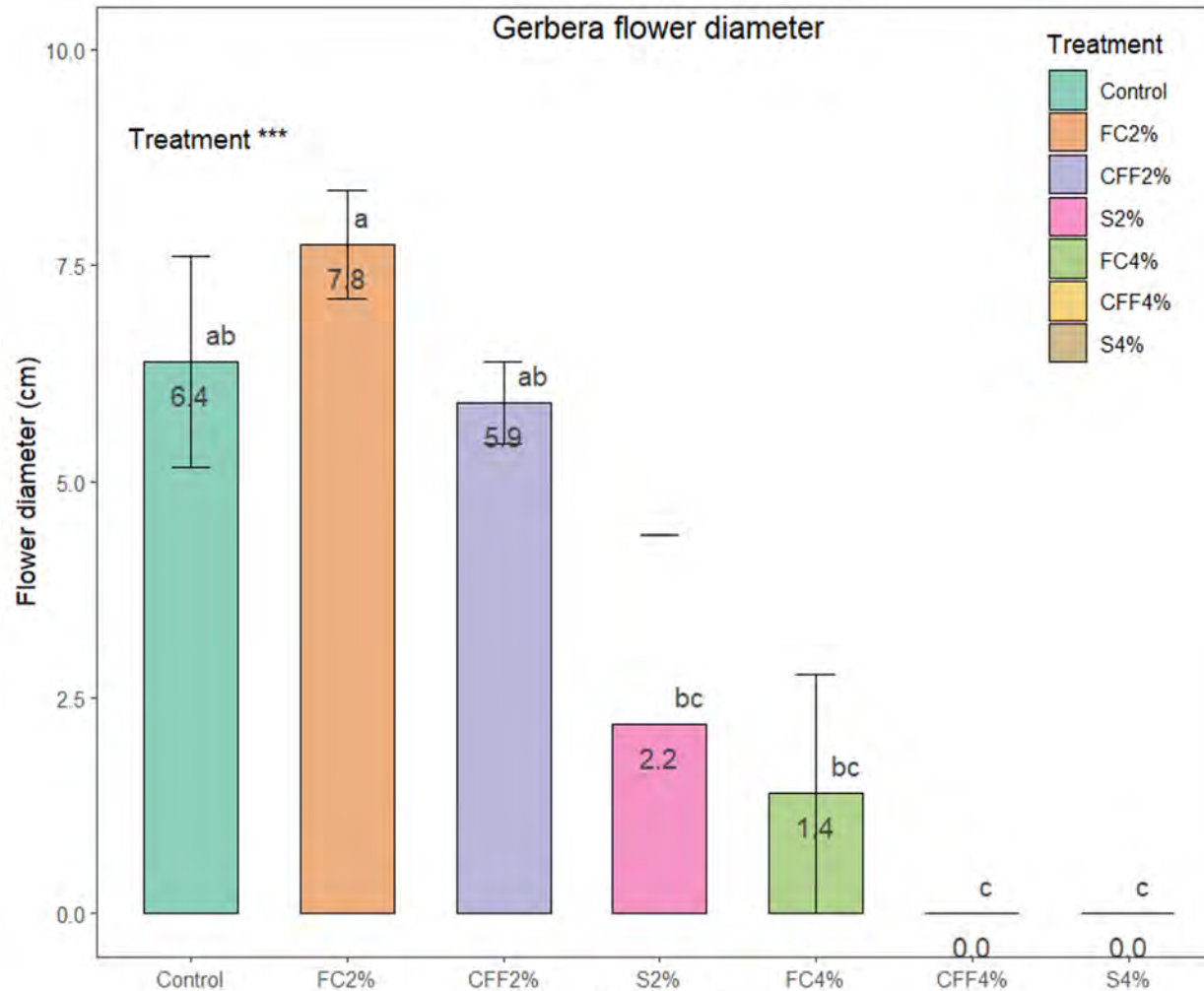
# Gerbera hue angle of leaf colour



Hue angle of leaf color is associated with greater plant health and more attractive plants for potted ornamental production.

**Figure 5. (A)** Hue angle of leaf colour from images taken at the final measurement date (June 6th). Means sharing the same letter are not significantly different by Tukey's honestly significant difference test at  $P \leq 0.05$ . Error bars represent standard error. **(B)** Hue angle of leaf colour wheel for visual aid.

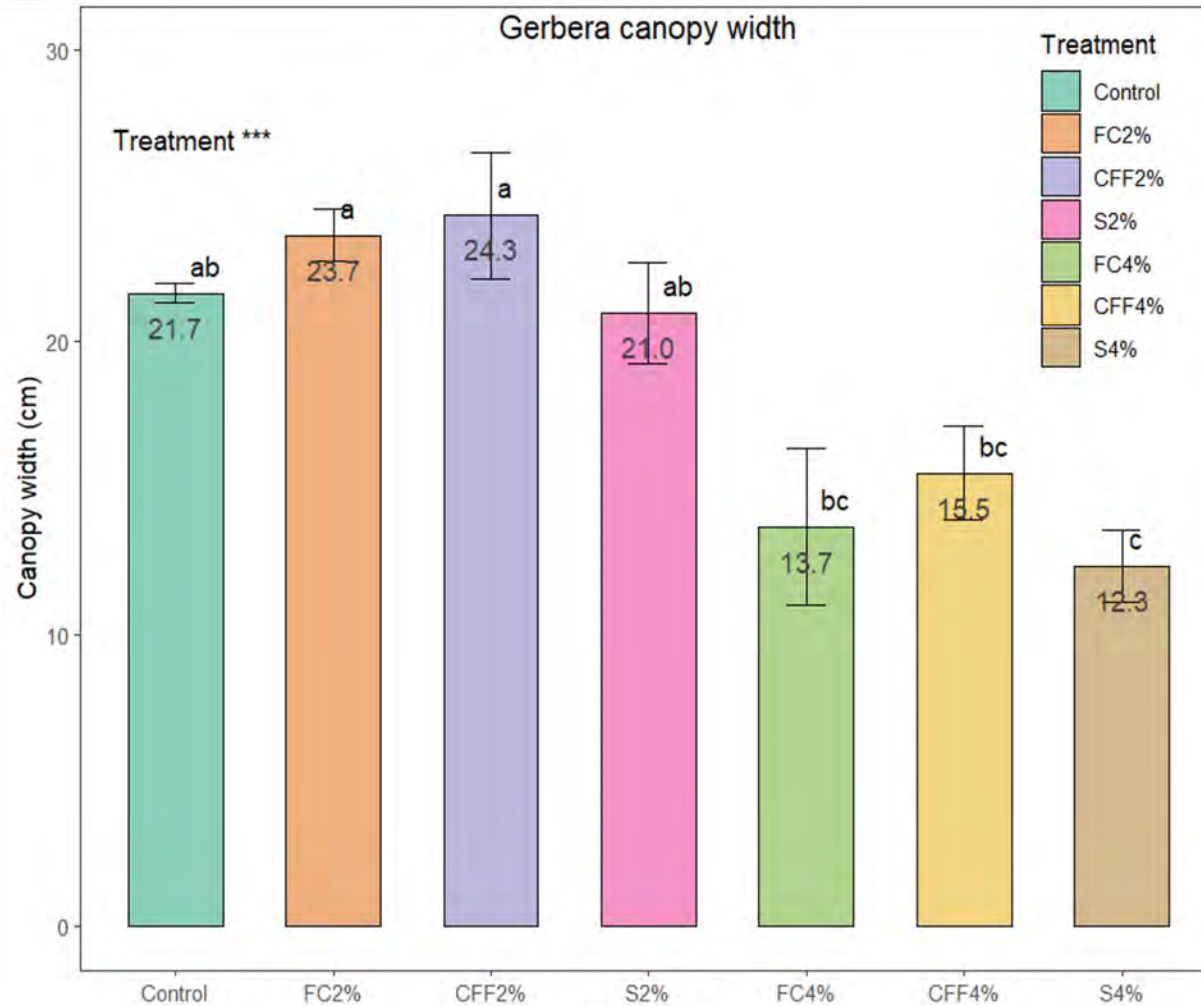
# Gerbera flower diameter graph



The FC 2% treatment also had the highest mean flower diameter and the greatest mean number of flowers.

**Figure 4.** Mean flower diameter at the final measurement date (June 6th). Means sharing the same letter are not significantly different by Tukey's honestly significant difference test at  $P \leq 0.05$ . Error bars represent standard error.

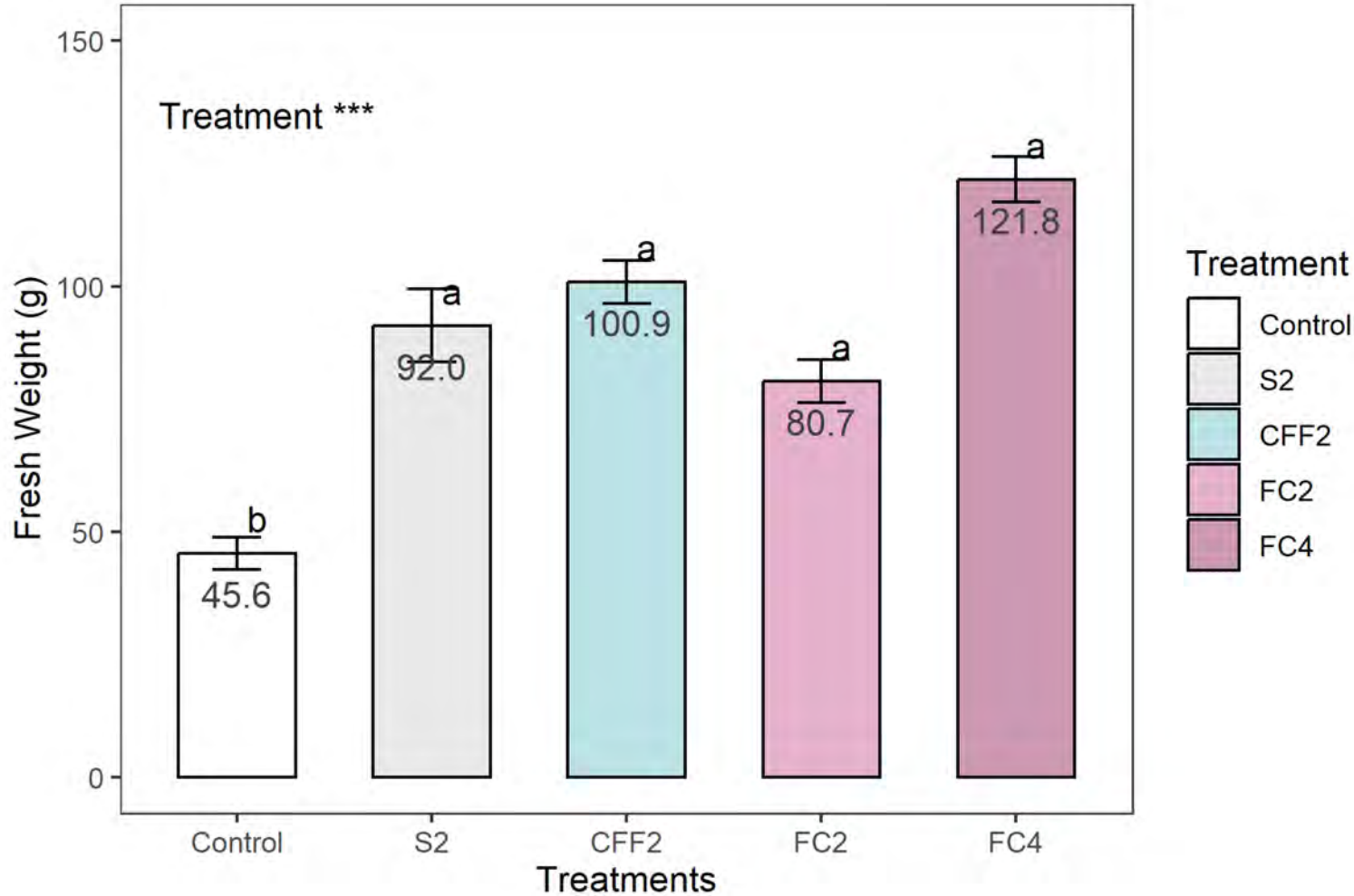
# Gerbera canopy width graph



The Frass Crumble 2% treatment successfully paired high canopy width and the best flower production.

**Figure 3.** Mean canopy width at the final measurement date (June 6th). Means sharing the same letter are not significantly different by Tukey's honestly significant difference test at  $P \leq 0.05$ . Error bars represent standard error.

# Fresh weight of lettuce plants organically grown



Frass fertilizers were equally as effective as commercial organic fertilizer and yielded significantly higher than the control. Frass-treated plants also had higher chlorophyll content and over 30% higher leaf macronutrient content than the controls grown in organic potting mix alone.

# Organic Substrate Trial Canopy Photos (S)



While over-application of commercial organic fertilizer (S 4%) killed the lettuce plants, over-application of Frass Crumble (FC 4%) had no negative effect.

# Organic Substrate Trial Canopy Photos (FC)



**FC**



Control

2%

4%

While over-application of commercial organic fertilizer (S 4%) killed the lettuce plants, over-application of Frass Crumble (FC 4%) had no negative effect.

# Conventional Substrate Trial Canopy Photos 2% Incorporation Rate, 0% Top Dress



2% Incorporation Rate

S

FC

CFF

0% Top Dress



In a conventional substrate, frass outyielded commercial organic fertilizer with slightly higher chlorophyll content.

# Conventional substrate photos



Conventional substrate (G6) with Selectus (S), frass crumble (FC) and customized formula fertilizer (CFF) at 0.5% and 1% incorporation rates



# Treatment Key



Trial	Treatment	Product	Incorporation Rate (amount per 500ml pot)	Top Dressing (amount per 500ml pot)
<b>Organic Substrate Trial</b>	Control	N/A	0% (0g)	0% (0g)
	FC2	Frass Crumble	2% (10g)	0% (0g)
	CFF2	Customer Formula Frass (5-2-3)	2% (10g)	0% (0g)
	S2	Selectus Organic Fertilizer (4-2-5)	2% (10g)	0% (0g)
	FC4	Frass Crumble	4% (20g)	0% (0g)
	CFF4	Customer Formula Frass (5-2-3)	4% (20g)	0% (0g)
	S4	Selectus Organic Fertilizer (4-2-5)	4% (20g)	0% (0g)
<b>Conventional Substrate Trial</b>	Control	N/A	0% (0g)	0% (0g)
	FC0+1	Frass Crumble	0% (0g)	1% (5g)
	S0+1	Selectus Organic Fertilizer (4-2-5)	0% (0g)	1% (5g)
	FC0.5+0.5	Frass Crumble	0.5% (2.5g)	0.5% (2.5g)
	CFF0.5+0.5	Customer Formula Frass (5-2-3)	0.5% (2.5g)	0.5% (2.5g)
	S0.5+0.5	Selectus Organic Fertilizer (4-2-5)	0.5% (2.5g)	0.5% (2.5g)
	CFF0.5+1	Customer Formula Frass (5-2-3)	0.5% (2.5g)	1% (5g)
	S0.5+1	Selectus Organic Fertilizer (4-2-5)	0.5% (2.5g)	1% (5g)
<b>Substrate Comparison Trial</b>	Ctrl	N/A	0% (0g)	0% (0g)
	FC0.5	Frass Crumble	0.5% (2.5g)	0% (0g)
	CFF0.5	Customer Formula Frass (5-2-3)	0.5% (2.5g)	0% (0g)
	FC1	Frass Crumble	1 % (5g)	0% (0g)
	CFF1	Customer Formula Frass (5-2-3)	1 % (5g)	0% (0g)
	FC2	Frass Crumble	2% (10g)	0% (0g)
	CFF2	Customer Formula Frass (5-2-3)	2% (10g)	0% (0g)