Influence of Compost Application Rates on Nitrogen Management and Processing Tomato Productivity 2019-2020

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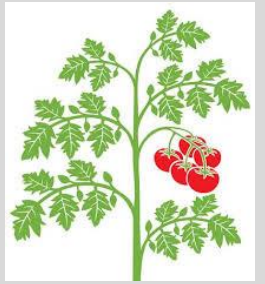
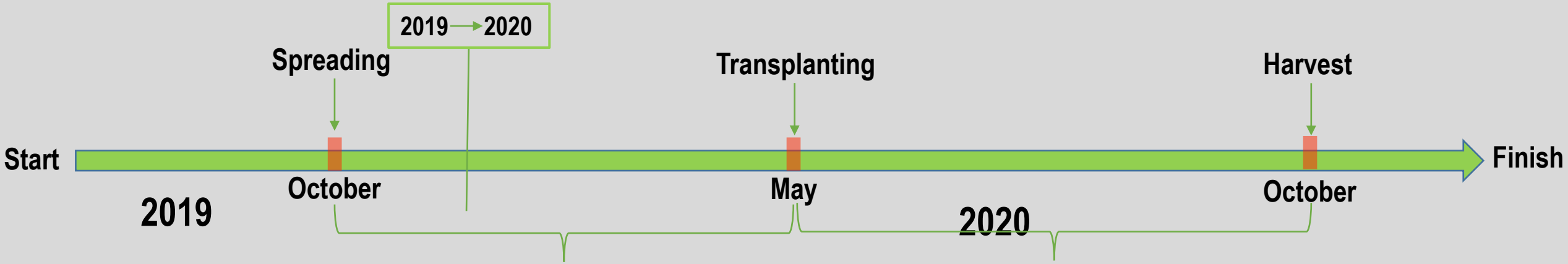
Project timeline: 2019-2020, Patterson

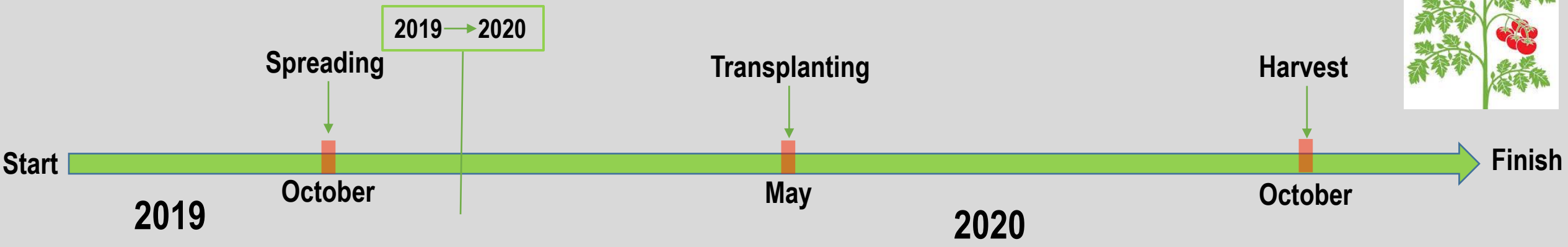




Question 1: will green-waste compost help with inorganic N mineralization?

Question 2: what are the impacts on yield, quality, and nitrogen translocation?

Note this is a one-year compost application. Initial benefits may encourage a long-term use of compost.

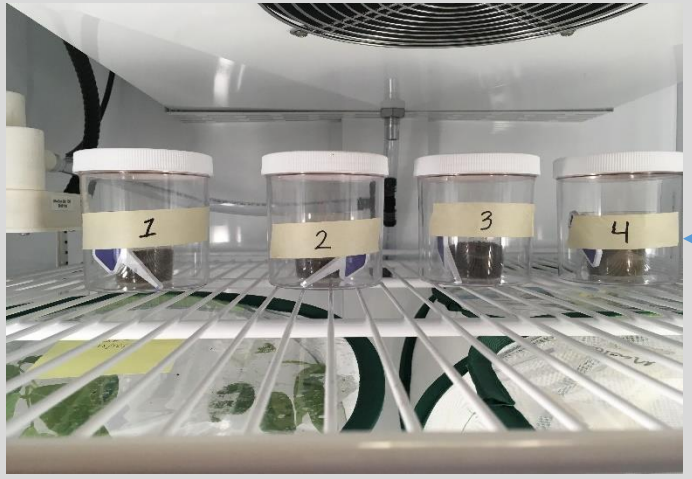


Three objectives…

- Monitor mineralized N from compost application to before tomato transplanting (period > 6 months).
- Determine the impacts of compost application rates (5, 10, and 15 tons/acre) on N mineralization, and how these N-related dynamics affect plant development, yield, and fruit quality.
- Synthesize data and write newsletters and trade magazine articles.

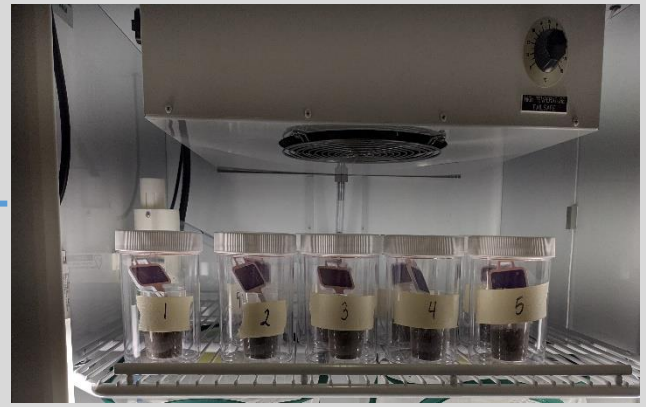
Timelines: 2019 – 2020, Patterson

Pre-plant (Oct. 2019 – Mar. 2020): Spread, Sample, Sieve, Fill, Bury, Incubate
Soil N mineralization prior to transplanting



Timelines: 2019 – 2020, Patterson

Post-plant (May. 2019 – Oct. 2020): Plant, Sample, Measure, Incubate, Harvest
Impact on plant development, soil inorganic N mineralization, and plant productivity



Key takeaways: Nov. 2019 – April 2020

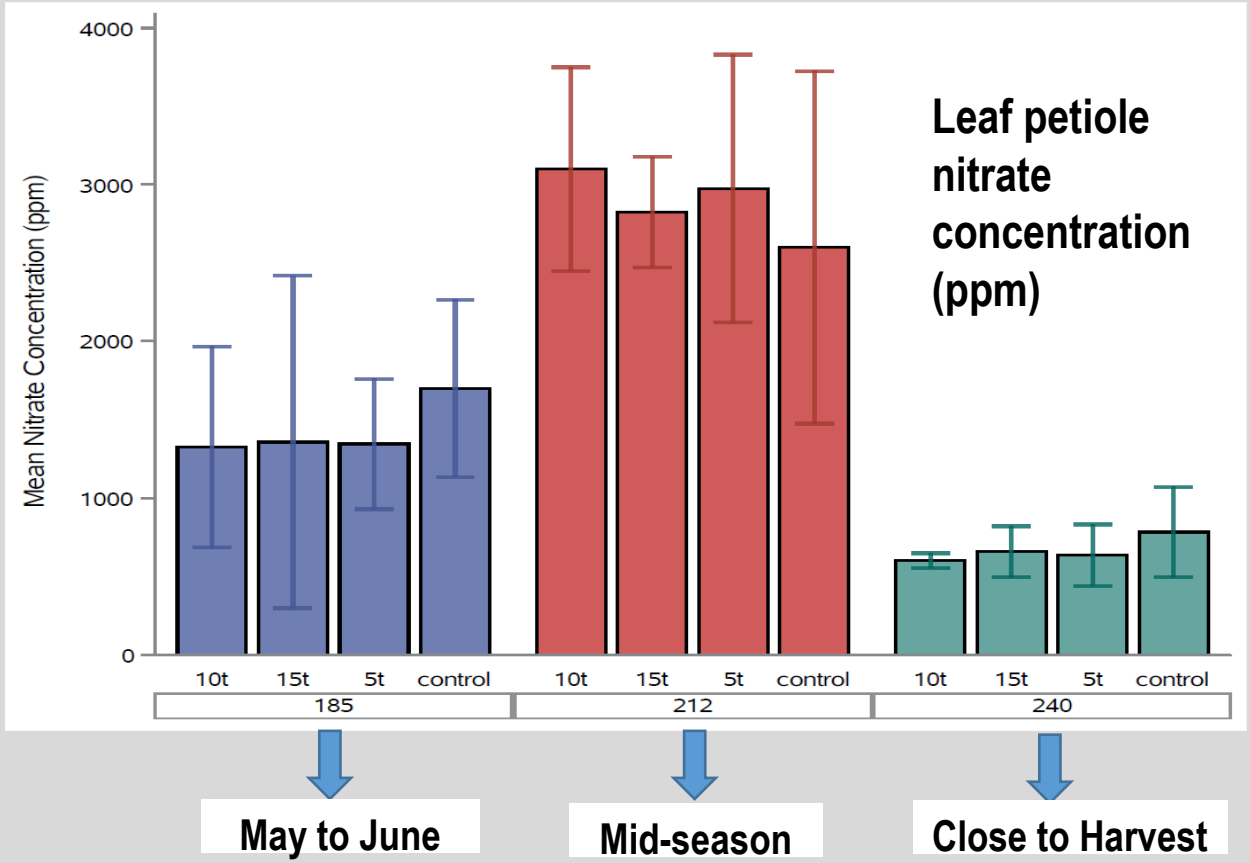
1. We did not observe the increase in soil inorganic nitrogen accumulation for composted soil.
2. Net positive mineralized inorganic N in April 2020 was detected for composted soil.

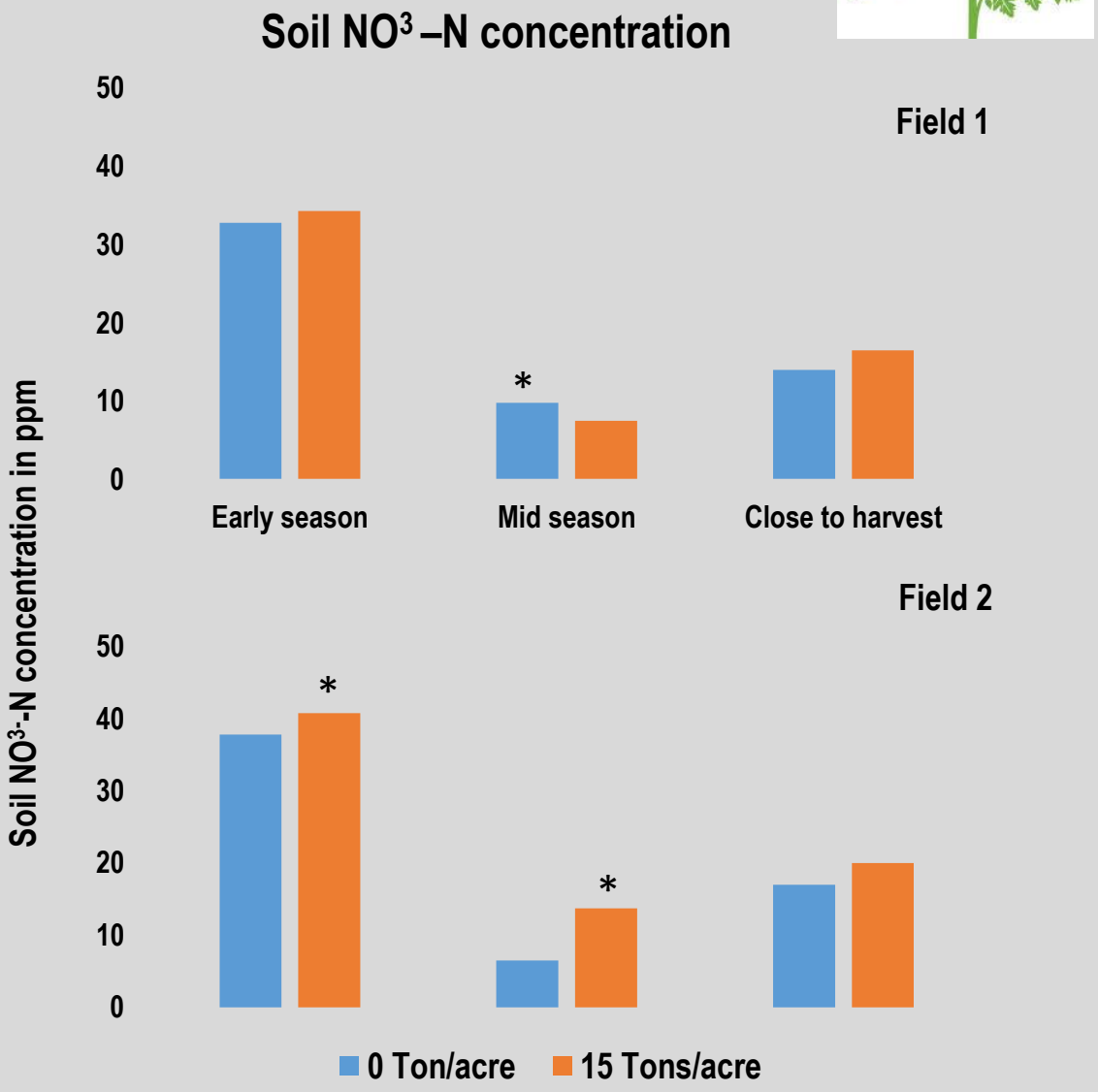
Changes of the accumulated inorganic N (NH_4-N + NO_3-N) during wintertime for both fields.						
Application rate	% changes of mineralized N (ppm) in Field 1 [Month (T) – November (T_0)]/November (T_0)					
	November (T_0)	December	January	February	March	April
5 tons/ac.	19.45	-52.3%*	-47.8%	-22.2%	-6.9%	N/A**
10 tons/ac.	17.56	-36.4%	-35.8%	-21.5%	0.5%*	N/A
15 tons/ac.	18.77	-50.1%	-26.8%	-48.6%	-12.8%	82.5%
Control	15.11	-6.39%	-0.44%	-5.83%	5.93%	100.2%
	% changes of mineralized N (ppm) in Field 2 [Month (T) – November (T_0)]/November (T_0)					
5 tons/ac.	18.94	-28.1%	-37.6%	-14.5%	-3.7%	N/A
10 tons/ac.	25.14	-41.5%	-47.0%	-42.9%	-24.8%	N/A
15 tons/ac.	22.02	-70.8%	-68.0%	-42.2%	2.2%	85.1%
Control	24.34	-51.8%	-7.1%	-21.0%	28.3%	55.1%

**Negative number indicates nitrogen immobilization and positive number indicates nitrogen mineralization.*

***Starting in April 2020, to reduce the exposure of COVID-19, only buried bags and soil samples with two extremes of composting were measured for inorganic N mineralization.*

Key takeaways: May to October 2020





Reverse trend-plant tissue vs. soil

Key takeaways: May to October 2020

Fruit yield from each compost application treatment in both fields.

Application Rate	Yield in Field 1 (tons/acre)	Yield in Field 2 (tons/acre)
5 tons/acre	62.6 AB	69.7 A
10 tons/acre	63.6 A	68.0 A
15 tons/acre	63.2 AB	66.9 A
Unamended control	58.2 B	66.6 A
$HSD_{0.05}$	5.2	5.4
Mean fruit yields followed by the same letter are not significantly different at $P \leq 0.05$ according to Tukey's Honest Significant Difference (HSD).		

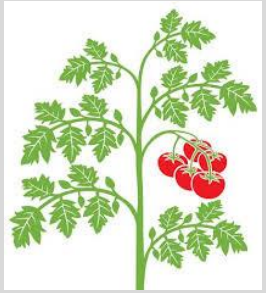
Key takeaways: May to October 2020

No difference in fruit quality

Fruit quality from each compost application treatment in both fields.

	Field 1 Fruit Quality			
Application rate	Brix	pH	TA	HUE
5 tons/acre	4.88	4.28	1.73	20.0
10 tons/acre	4.78	4.30	1.64	20.4
15 tons/acre	4.88	4.31	1.55	20.0
Control	5.00	4.30	1.67	20.2
	Field 2 Fruit Quality			
5 tons/acre	5.03	4.35	1.68	20.2
10 tons/acre	5.05	4.38	1.57	20.4
15 tons/acre	5.08	4.35	1.51	20.3
Control	5.00	4.38	1.64	20.4

1. Will there be any worthiness of using compost for possible long-term benefits?



2. Rain precipitation/moisture may play critical roles for compost to mineralize N.

3. A slight yield increase may be an indicator for a long-term composting.

4. Rate vs. economics. $5 per ton for our compost.


Thank You!
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