Evaluating nitrogen availability from organic amendments in an organically managed processing tomato field in the California Central Valley

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Introduction

California growers must minimize nitrogen (N) losses through improved nutrient management practices. This is particularly challenging for organic growers due to the variable nature of organic N sources that must be mineralized by microbes to become plant-available.

Objectives

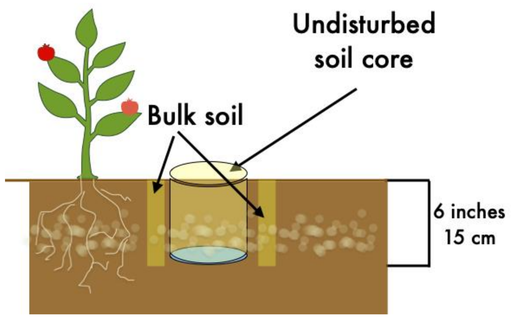
Our objective is to evaluate temporal patterns of N mineralization from organic amendments in organically managed systems in the Central Valley. Future work will aim to better understand the mineralization process and provide improved predictions of N availability from organic amendments.

Methods

A field trial was implemented in an organic processing tomato field in Esparto, CA, using a randomized complete block design with 5 replicates. Five treatments were:

- **Pelleted 4-4-2**
- **Pelleted 6-6-2**
- **Mixed blend Compost**
- **Soymeal hydrolysate**
- **Untreated Control**

Amendments were applied as subsurface bands in the bed center in late April. organic amendments were applied at a rate of 44 pounds of predicted available N/acre.



Soil was collected and analyzed for mineral N every four weeks:

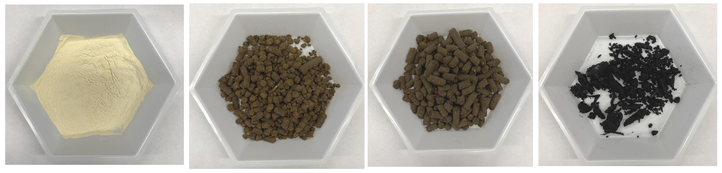
Undisturbed soil cores: plastic sleeves with caps at the bottom were incubated in field and used to determine N mineralization.

Bulk soil: Soil surrounding the cores was collected to determine residual N.

Soil & Amendment Characteristics

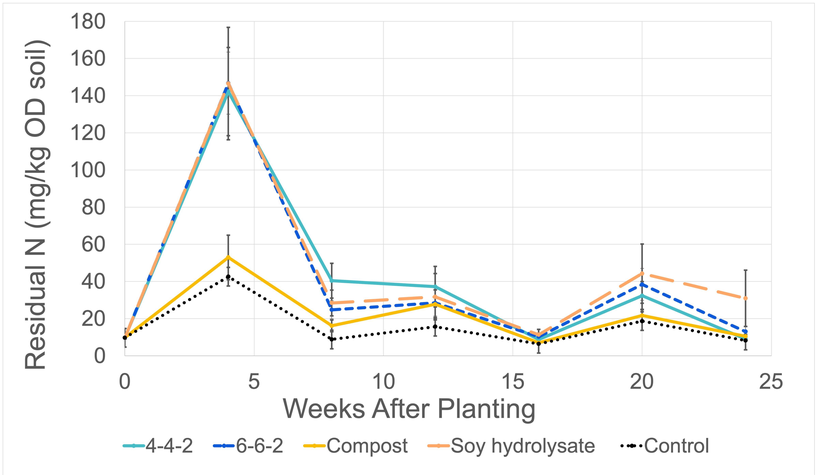
Bulk Density	EC	pH	Olsen-P	K	Na	Ca	Mg	SOM
g/cm^3	dS/m		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
1.36	0.206	7.89	50.59	376.32	95.92	3266.98	688.35	2.01

All analyses were performed on soil collected from a depth of 6”



	Soymeal Hydrolysate	Pelleted 6-6-2	Pelleted 4-4-2	Compost
C:N	2.59	5.75	6.71	17.61
%N (dry weight)	14.55	6.27	4.22	1.85

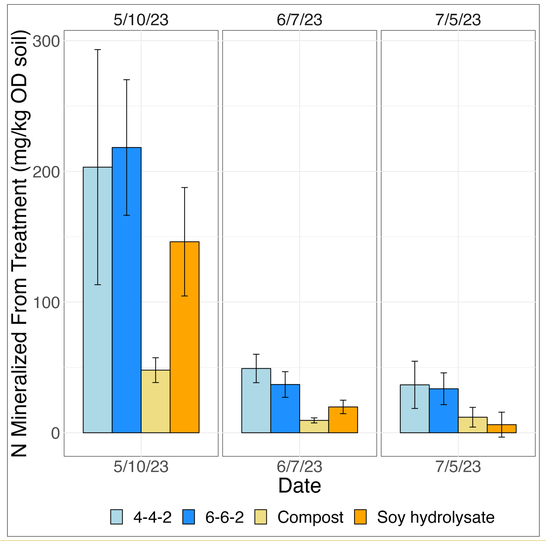
Residual N



- The treatments with higher N availability, namely 4-4-2, 6-6-2, and soymeal hydrolysate, exhibited rapid N release.
- The compost demonstrated significantly lower residual N than the other treatments after 4 weeks and was not significantly different than the control ($p < 0.05$).

N Mineralized from Treatment

- The 4-4-2, 6-6-2, and soy hydrolysate mineralized more N at a faster rate than the compost under field incubated conditions.



Implications for The 4Rs of Nutrient Management

<u>The right rate</u>: The C:N ratio of an amendment, or how available the N in the amendment is, is indicative of N mineralization potential.

<u>The right time</u>: More recalcitrant materials with a low C:N, like the compost, take longer to mineralize than readily available ones.

<u>The right place</u>: Subsurface application of organic amendments reduces N losses; they contain more NH4 than traditional fertilizers and are susceptible to volatilization.

<u>The right source</u>: Improved understanding of N mineralization from organic amendments informs source selections that best suit N demands.

Conclusions

- **There were no significant differences in yield, plant N uptake, or leaf tissue N between treatments** ($p < 0.05$). Note: all treatments received 7.7 lbs/acre N from fertigation.
- All treatments experienced the **highest net N mineralization within the first 4 weeks of application**
- Treatments with a high available N content (soymeal hydrolysate, 4-4-2, & 6-2-2) had **significantly higher residual N and higher N mineralization** trends than the compost after 4 weeks ($p < 0.05$).

Acknowledgements

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