



ORGANIC NITROGEN MANAGEMENT: Nitrogen (N) management in organic production is challenging because microorganisms must mineralize organic N into plant available forms. Mineralization rate of organic fertilizer depends on factors including soil moisture, temperature, fertilizer source, timing, placement, rate, and soil properties. Here, we present findings on how temperature, fertilizer source, and soil health affect organic fertilizer N mineralization rates.

TEMPERATURE AFFECTS N MINERALIZATION RATE BASED ON FERTILIZER TYPE

EXPERIMENT 1 SETUP

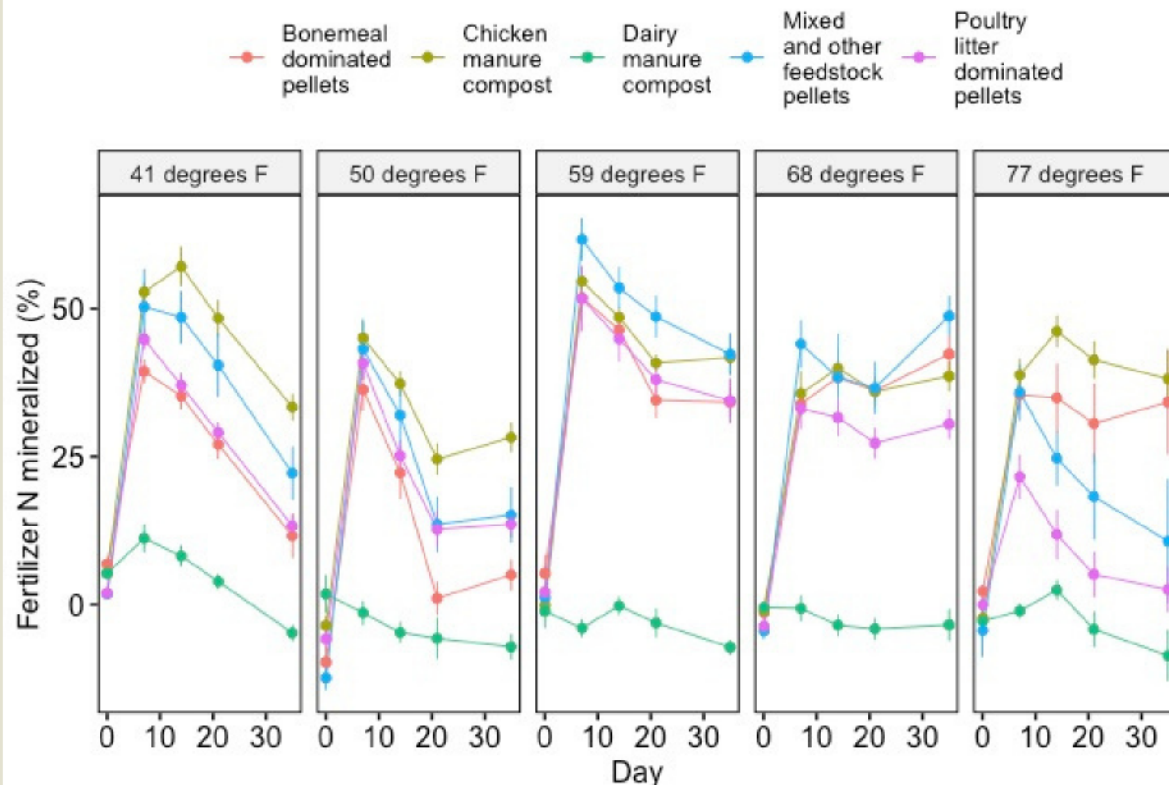
- Soil (Milagro loamy sand, 0.66% C) was incubated with 12 organic fertilizers at 41, 50, 59, 68, and 77°F and 60% water holding capacity
- Fertilizers were categorized as chicken manure compost, dairy manure compost, bone meal dominated pellets, poultry litter dominated pellets, and mixed feedstock pellets
- Fertilizers were added one week after rewetting the soil at a rate of 50 mg N/kg soil (~100 lb N/acre)
- Soil ammonium and nitrate concentrations were determined on day 1, 7, 14, 28 and 35 following fertilizer application
- The percentage N mineralized was calculated as the difference in N concentration in the treatments receiving fertilizer compared to a untreated control divided by the total N applied.



KEY FINDINGS

- Mineralization rates were highest at 59°F.
- Chicken manure compost had highest overall rates
- Dairy manure compost had low rates but a C:N ratio of 12:1 vs 4-5 for others
- Bone meal mineralized more at > 50°F
- Poultry litter mineralization decreased at 77°F

Consider soil temperature when choosing an organic fertilizer source



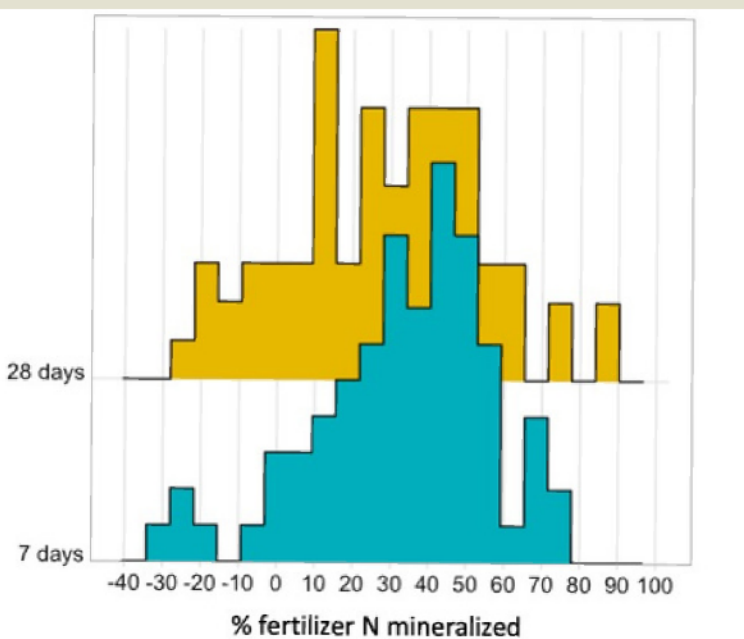
FERTILIZER N MINERALIZATION IS GREATER IN HIGH ORGANIC MATTER SOILS

EXPERIMENT 2 SETUP

- We incubated soil from 72 organic vegetable production fields from the Santa Maria Valley at 77°F for 28 days with and without an 8-5-1 organic fertilizer at 50 mg N/kg soil (~100 lb N/acre).
- We measured soil physical, chemical and biological properties.
- Ammonium and nitrate concentrations were determined after 1, 7 and 28 days of incubation and % N mineralized calculated as in experiment 1.

KEY FINDINGS

Frequency of soils by % N mineralized. A "-" result means net N immobilization



- N mineralization by soil ranged between -31 to 78 % after 7 days of incubation and -22 to 87 % after 28 days

Correlation of soil properties to 7 day mineralization rate "-" = inverse relationship

Predictor variable	range	% OF mineralized at 7 days	
		rho	p
Sand	34-89%	-0.30	0.019
Clay	1-41%	0.33	0.008
SOM	0.8-5.5%	0.40	0.001
C:N ratio of SOM	8.8-14.3	0.13	0.325
MAOM N content	0.3-1.9 g N/kg soil	0.26	0.045
CEC	4-45 cmolc/kg soil	0.33	0.009
pH	5.3-8.2	0.43	0.001
EC	0.68-3.63 dS/m	-0.26	0.040
ESP	1.3-12.3 %	-0.41	0.001
NO ₃ ⁻ -N	0-57 mg/kg soil	0.25	0.052
NH ₄ ⁺ -N	1-19 mg/kg soil	0.25	0.052
Olsen P	2-77 mg P/kg soil	0.25	0.050
K	67-343 mg K/kg soil	0.26	0.042
Ca	561-5974 mg/kg soil	0.37	0.003
Mg	111-1682 mg/kg soil	0.25	0.047
SO ₄ ⁻ -S	20-302 mg/kg soil	0.09	0.504
Soil respiration	14-94 mg C/kg soil	0.06	0.625
Active carbon (POXC)	77-418 mg C/kg soil	0.23	0.075

- SOM %, pH, and Ca and others positively correlated
- Exchangeable sodium % (ESP), EC & sand % negatively correlated

- Our findings highlight the importance of building or maintaining soil health and fertility to optimize nutrient cycling and plant nutrition in organic production systems
- Growers transitioning to organic production may need to apply greater fertilizer rates, while building up soil organic matter reserves.

IN THE PIPELINE

- Lab trials assessing the effect of fertilizer pellet density on N mineralization
- Field trials assessing the effect of fertilizer rate, irrigation management and soil texture on N mineralization and broccoli N uptake in the Santa Maria and Salinas Valleys
- Field trials assessing tillage intensity on soil health and fertility in organic vegetables

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