

Supplementary Material

Fertilizer ^{15}N tracing reveals compost-induced changes in mineral-associated organic matter and soil nitrogen pools

Biogeochemistry

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The supplemental information provided here includes ANOVA tables presenting the significance of fixed effects as support for the analyses presented in the main text. In addition, Table S7 provides soil C and N stocks, as calculated from the bulk density of 0–60 cm soil cores.

	2022-2023						2023-2024					
	MAOM		POM		Whole		MAOM		POM		Whole	
	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	0.9		2.9		0.1		1.1		2.6		0.1	
Compost (C)	20.7	***	13.4	***	35.2	***	0.0		1.2		3.2	
Depth (D)	72.2	***	94.9	***	133.4	***	67.8	***	43.0	***	122.9	***
N x C	0.1		0.8		1.2		2.1		0.0		0.2	
N x D	0.5		1.2		0.5		0.4		0.5		0.3	
C x D	0.5		5.0	**	0.6		0.7		9.4	***	1.7	
N x C x D	0.3		1.7		0.5		0.4		1.0		0.3	

Table S1: Type III test of fixed effects for total carbon in MAOM, POM, and whole-soil fractions in both study years. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

	2022-2023						2023-2024					
	MAOM		POM		Whole		MAOM		POM		Whole	
	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	0.09		1.4		1.4		0.3		0.4		0.1	
Compost (C)	15.97	***	22.2	***	20.2	***	3.7		5.9	*	2.3	
Depth (D)	71.73	***	121.6	***	144.7	***	106.0	***	149.3	***	125.4	***
N x C	0.12		0.0		0.7		0.8		2.6		0.2	
N x D	1.2		0.4		0.9		0.6		0.5		0.3	
C x D	1.46		2.4		0.5		0.5		7.2	***	0.9	
N x C x D	0.5		1.8		1.1		0.6		0.6		0.3	

Table S2: Type III test of fixed effects for total nitrogen in MAOM, POM, and whole-soil fractions in both study years. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

	2022-2023						2023-2024					
	MAOM		POM		Whole		MAOM		POM		Whole	
	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	13.4	***	5.5	**	15.6	***	1.9		6.8	**	6.2	**
Compost (C)	0		0.0		0		1.7		0.5		2.4	
Depth (D)	79.5	***	26.5	***	85.9	***	61.0	***	62.3	***	86.3	***
N x C	0.7		0.3		0.8		4.5	*	1.0		1.9	
N x D	1		0.4		1		0.8		0.4		0.3	
C x D	2.3		0.2		2.4		0.4		0.0		0.6	
N x C x D	0.1		0.4		0.2		0.3		0.6		0.3	

Table S3: Type III test of fixed effects for fertilizer-derived nitrogen in MAOM, POM, and whole-soil fractions in both study years. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

	DOC		DON		Nitrate		Ammonium	
	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	0.5		1.4		1.8		0.2	
Compost (C)	18.9	***	0.1		0.6		1.6	
N x C	0.7		0.3		0.2		0.5	

Table S4: Type III test of fixed effects for dissolved organic carbon (DOC), dissolved organic nitrogen (DON), nitrate, and ammonium in the 0–15 cm layer of whole soil. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

	Leaf		Fruit		Stem	
	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	1.0		0.4		1.4	
Compost (C)	5.7	*	16.0	***	6.7	*
Date (D)	18.6	***	8.6	***	17.9	***
N x C	3.6	*	2.5		3.7	*
N x D	0.5		0.3		0.6	
D x C	0.2		0.7		0.2	
N x C x D	0.3		0.4		0.5	

Table S5: Type III test of fixed effects for nitrogen derived from fertilizer in olive tree tissues in the year following isotopically labeled fertilizer application. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

	2022-2023						2023-2024					
	Peak		Background		Total		Peak		Background		Total	
	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.	F Value	Prob.
N Level (N)	0.3		0.7		0.7		1.1		1.1		1.1	
Compost (C)	3.2		12.6	**	5.1	*	0.4		1.9		0.9	
N x C	0.4		0.5		0.9		2.4		0.8		2.2	

Table S6: Type III test of fixed effects for cumulative nitrous oxide emissions during “peak” and “background” emissions events in both years. Significance of the given F value is indicated by asterisks (*, >0.05; **, >0.01, ***, >0.001).

Depth	Compost	Bulk Density	Carbon Stock			Nitrogen Stock		
		Whole Soil	MAOM	POM	Whole Soil	MAOM	POM	Whole Soil
		$g\ cm^{-3}$		$Mg\ C\ ha^{-1}$			$Mg\ N\ ha^{-1}$	
0-15 cm	n	1.72 ± 0.04	15.81 ± 0.82	6.02 ± 0.43 b	20.01 ± 1.26 b	1.87 ± 0.09 b	0.20 ± 0.02 b	2.26 ± 0.13
	y	1.70 ± 0.04	18.08 ± 1.85	8.91 ± 0.76 a	27.02 ± 1.91 a	2.24 ± 0.12 a	0.36 ± 0.04 a	2.68 ± 0.18
15-30 cm	n	1.71 ± 0.05	10.90 ± 0.75	4.48 ± 0.25	13.23 ± 1.03	1.21 ± 0.07	0.08 ± 0.01	1.38 ± 0.11
	y	1.86 ± 0.05	11.36 ± 1.41	5.19 ± 0.24	14.77 ± 1.09	1.36 ± 0.10	0.10 ± 0.01	1.50 ± 0.09
30-60 cm	n	1.83 ± 0.04	15.35 ± 1.95	10.20 ± 0.59	16.60 ± 2.05	1.91 ± 0.19	0.15 ± 0.02	1.95 ± 0.19
	y	1.82 ± 0.04	13.50 ± 2.39	8.66 ± 0.63	17.80 ± 1.53	1.99 ± 0.16	0.13 ± 0.01	2.10 ± 0.16

Table S7: Bulk density of whole soil and total carbon and nitrogen stocks in whole soil and MAOM and POM soil fractions. Samples were taken in the second year of the study. Data are averaged across nitrogen fertilization rates. Values are means ± one standard error (n = 12). Lowercase letters indicate significant effects of compost within the fraction at the given depth ($\alpha = 0.05$).