Table 1. Site descriptions of matched pairs of organic and conventional blueberry farms. Gray shading designates conventional fields.

Soil taxonomic class	NRCS soil series	Cultivar	Location (°N, °W)	County	Years org. or conv. mgt in 2009	Within-row soil and soil surface observations
Coarse-loamy, mixed, superactive, mesic Typic Endoaquolls	Gilford sandy loam	Elliott	42.3, 86.0	Van Buren	10	Herbicide strip and wood mulch.
	Gilford sandy loam	Bluecrop	41.7, 86.1	St. Joseph, IN	20	Sod maintained at 1- to 6-cm height within rows. Blueberry roots mainly at > 5 cm soil depth, below dense grass sod roots.
Sandy, mixed, mesic Typic Endoaquods	Pipestone-Kingsville complex	Elliott	42.4, 86.3	Van Buren	20	Herbicide strip and wood mulch. Blueberry roots concentrated at < 5 cm soil depth. 2- to 4-cm blueberry leaf litter on soil surface.
	Pipestone sand	Elliott	42.2, 86.3	Berrien	6	Wood mulch. Blueberry roots concentrated at < 5 cm soil depth. Rodent tunnels in mulch and soil.
Sandy, mixed, mesic Typic Endoaquolls	Granby loamy sand	Elliott	43.0, 86.3	Ottawa	10	Herbicide strip, planting rows alternate between wood mulch and no mulch.
	Granby loamy fine sand	Elliott	42.2, 86.2	Berrien	6	Wood mulch and white clover. Anoxic, waterlogged soil at 5- to 30-cm depth on some sampling dates.
	Granby loamy sand	Bluecrop	42.8, 86.1	Ottawa	25	Herbicide strip. Blueberry roots concentrated at soil surface.
	Granby loamy sand	Bluecrop	43.0, 86.2	Ottawa	7	Cultivated soil. Few blueberry roots in upper 20 cm of soil.
	Granby loamy sand	Bluecrop	42.2, 86.3	Ottawa	20	Herbicide strip. Dense mat of blueberry roots at 0- 5-cm soil depth.
	Granby loamy sand	Duke	42.9, 86.1	Ottawa	6	Soil cultivated at 0- 20-cm depth 1 to 2 times per year. Comparatively few blueberry roots in upper 20 cm of soil.

Table 1 (cont'd).

Soil taxonomic class	NRCS soil series	Cultivar	Location (°N, °W)	County	Years org. or conv. mgt in 2009	Within-row soil and soil surface observations
Mixed, mesic Aquic Udipsamments	Morocco-Newton complex	Jersey	42.4, 86.0	Allegan	30	Herbicide strip. Blueberry roots concentrated near soil surface. Some soil mottling at shallow depth.
	Morocco complex	Bluecrop	41.7, 86.1	St. Joseph, IN	20	Sod maintained at 1- to 10-cm height.
Euic, mesic Typic Haplosaprists	Houghton muck	Rubel	42.6, 86.1	Allegan	25	Herbicide strip. Anoxic, water-logged soil at 5-30 cm depth.
	Houghton muck	Rubel	42.6, 86.1	Allegan	25	Sod mowed once per year. Few roots in upper 20 cm of soil. Anoxic, waterlogged soil at 5- to 30-cm depth.
	Houghton muck	Rubel/ Jersey	42.4, 86.0	Van Buren	25	Very few weeds. Up to 3 cm leaves and stems accumulated. Anoxic soil at 5-30 cm depth on some sampling dates.
	Houghton muck	Jersey	43.0, 83.0	St. Clair	12	Grass clippings beneath bushes. Patchy sod and bare soil within rows.

Table 2. Variables assessed in a comparison of organic and conventional blueberry farms in Michigan in 2008 and 2009.

Parameter	**Description**	**Unit**	**Dates**
H_2O	Soil water content at sampling	g H_2O g soil^{-1}	2008, 2009
SOM	Soil organic matter content	%	2008
SOC	Soil organic carbon	%	2009
Ca, K, Mg	Extractable K, Mg, K	mg kg soil^{-1}	2008
Bray P	Bray-extractable P	mg kg soil^{-1}	2008
Soil N	Total N	%	2009
Nmin	14- or 30-day potential N mineralization^{y}	NH_4^+-N + NO_3^--N kg soil^{-1} d^{-1}	2008, 2009
Nitr	14- or 30- day net nitrification^{y}	mg NO_3^--N kg soil^{-1} d^{-1}	2008, 2009
Rnitr	Relative nitrification^{y}	Nitr Nmin^{-1}	2008, 2009
LF-SOM	Light fraction soil organic matter	mg g soil^{-1}	2008
CO_2	Soil respiration^{y}	µg CO_2 g soil^{-1}d^{-1}	2008, 2009
CO_2 C^{-1}	Soil respiration per g SOC	µg CO_2 g SOC^{-1}d^{-1}	2009
C_l	Labile C determined by 460-day soil incubation	mg g soil^{-1}	2008
k	Decomposition constant of labile C	d^{-1}	2008
mrt	Mean residence time of labile C	d	2008
c	Respiration rate of slow + recalcitrant C	µg CO_2 g soil^{-1}d^{-1}	2008
BG	β-D-1,4-glucosidase	nmol h^{-1} g soil^{-1}	2008, 2009
CBH	β-D-1,4-cellobiosidase	nmol h^{-1} g soil^{-1}	2008, 2009
NAG	β-1,4-*N*-acetylglucosaminadase	nmol h^{-1} g soil^{-1}	2008, 2009
PHOS	Acid phosphatase	nmol h^{-1} g soil^{-1}	2008, 2009
TAP	Tyrosine aminopeptidase	nmol h^{-1} g soil^{-1}	2009
POX	Phenol oxidase	nmol h^{-1} g soil^{-1}	2008, 2009
PER	Peroxidase	nmol h^{-1} g soil^{-1}	2009
Enzyme g C^{-1}	Enzyme activity expressed per g soil C	nmol h^{-1} g SOC^{-1}	2009

Table 2 (cont'd).

Parameter	Description	Unit	Dates
ERM	Ericoid mycorrhizae	Hair-root epidermal cells containing hyphal coils (%)	2008, 2009
DSE	Dark septate endophytes	Hair-root epidermal cells containing microsclerotia (%)	2008, 2009
Fungi	Cultivable fungi	CFU[x] g $soil^{-1}$	2008, 2009
Trich	*Trichoderma* spp.	CFU g $soil^{-1}$	2008, 2009
Bact	Cultivable bacteria	CFU g $soil^{-1}$	2008, 2009
Baci	*Bacillus* spp.	CFU g $soil^{-1}$	2009
Pseu	Fluorescent *Pseudomonas* spp.	CFU g $soil^{-1}$	2009
Stre	*Streptomyces* spp.	CFU g $soil^{-1}$	2009

[z]2008 samples collected late Sept and early Oct; 2009 samples collected 6-7 Jul, 21-22 Aug, and 9-10 Oct.

[y]Soils incubated at 25°C and 60% water holding capacity (WHC) for 14 (Nmin, Nitr, Rnitr) or 100 days (CO_2) in 2008 and 30 days at 55% soil WHC for sands and 65% WHC for mucks in 2009.

[x]CFU=Colony forming units; assessed on the last sampling date in 2008 and 2009.

Table 3. Analysis of variance of the effects of organic and conventional management and year on anthracnose and Alternaria fruit rot of blueberries collected from farms in Michigan in 2008 and 2009. Bold font denotes significance at $P \leq 0.05$. ANOVA was conducted as a completely randomized design because the sampled field sites differed in 2008 and 2009.

	Num df[z]	**Den df[z]**	**Anthracnose fruit rot**	**Alternaria fruit rot**
Effect			***P > F***	
Management	1	24	**0.01**	**0.02**
Year	1	24	0.13	**0.006**
Management*year	1	24	0.37	0.65

[z]Numerator or denominator degrees of freedom.

Table 4. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on soil organic matter (SOM), water content (H_2O), calcium (Ca), magnesium (Mg), potassium (K), and Bray-1 extractable P (P) on sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25 and 26 Sept 2008. Bold font denotes significance at $P \leq 0.05$.

	Num df[z]	**Den df**[z]	**SOM**	**H_2O**	**pH**	**Ca**	**Mg**	**K**	**P**
Effect						***P > F***			
Management	1	5	0.12	0.10	**0.03**	**0.006**	0.94	0.93	0.25
Depth	1	10	-[y]	0.71	0.78	-	-	-	-
Management*depth	1	10	-	**0.05**	0.31	-	-	-	-
Preplanned contrasts									
Management at 0−5 cm	1	14	-	**0.03**	**0.02**	-	-	-	-
Management at 0−30 cm	1	14	-	0.22	0.16	-	-	-	-

[z]Numerator or denominator degrees of freedom.

[y]Not determined.

Table 5. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management, soil depth, and date on organic carbon (SOC), total N, C:N ratio (C:N), water content (H_2O), and pH of sandy soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Bold font denotes significance at $P \leq 0.05$.

	Num df[z]	**Den df**[z]	**SOC**	**Total N**	**Soil C:N**	**H_2O**	**pH**
Effect					***P > F***		
Management	1	7	0.43	0.51	0.29	0.26	0.17
Date	2	56	-[y]	-	-	**0.0002**	**0.005**
Management*date	2	56	-	-	-	0.80	**0.03**
Depth	1	14	**0.0001**	**0.0002**	0.21	**0.008**	0.44
Management*depth	1	14	0.92	0.69	0.87	0.78	0.32
Depth*date	2	56	-	-	-	0.44	0.73
Management*depth*date	2	56	-	-	-	0.80	0.77
Preplanned contrasts							
Management at 0−5 cm	1	14	0.61	0.58	0.20	0.34	0.09
Management at 5−30 cm	1	14	0.34	0.24	0.35	0.23	0.61

[z]Numerator or denominator degrees of freedom.

[y]Not determined.

Table 6. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on light fraction organic matter (LF), light fraction organic matter C content (LF C), light fraction organic matter N content (LF N), light fraction C as a percentage of soil organic carbon (LF C %), light fraction N as a percentage of total soil N (LF N %), light fraction organic matter C to N ratio (LF C:N ratio), 100-day CO_2 respiration, labile C (C_l), decomposition constant of C_l (*k*), mean residence time of C_l (mrt), and respiration rate of slow + resistant C pools (*c*) in sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25 and 26 Sept 2008. Bold font denotes significance at $P \leq 0.05$.

	Num df[z]	**Den df[z]**	**LF**	**LF C (μg g soil^{-1})**	**LF N (μg g soil^{-1})**	**LF C %**	**LF N %**	**LF C:N ratio**	**100-day CO_2**	**C_l**	***k***	**mrt**	***c***
Effect							***P* > *F***						
Management	1	5	0.49	0.60	0.58	0.65	0.71	0.36	0.12	0.12	0.33	0.33	0.39
Depth	1	10	**<0.001**	**<0.001**	**<0.001**	0.12	**<0.001**	**0.001**	**<0.001**	**0.006**	0.67	0.67	**0.02**
Management*depth	1	10	**0.02**	**0.009**	**0.004**	0.90	0.79	0.75	0.31	0.08	0.39	0.39	0.10
Preplanned contrasts													
Management at 0−5 cm	1	10	0.10	0.14	0.15	0.64	0.65	0.31	**0.03**	**0.04**	0.19	0.19	0.10
Management at 0−30 cm	1	10	0.66	0.59	0.68	0.72	0.81	0.42	0.71	0.68	0.81	0.81	0.50

[z]Numerator or denominator degrees of freedom.

Table 7. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on nitrate (NO_3^--N), ammonium (NH_4^+-N), inorganic N (NO_3^--N + NH_4^+-N), potential N mineralization (Nmin), nitrification (Nitr), and relative nitrification (Rnitr) in sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25 and 26 Sept 2008. Bold font denotes significance at $P \leq 0.05$.

	Num df[z]	**Den df[z]**	**NO_3^--N**	**NH_4^+-N**	**Inorganic N**	**Nmin**	**Nitr**	**Rnitr**
Effect					***P* > *F***			
Management	1	5	0.27	0.18	0.15	0.19	**0.02**	0.28
Depth	1	10	0.18	**0.05**	**0.01**	**0.03**	**0.001**	**0.05**
Management*depth	1	10	**0.001**	0.95	0.25	0.46	0.08	0.49
Preplanned contrasts								
Management at 0−5 cm	1	10	**0.005**	0.24	0.06	0.13	**0.008**	0.11
Management at 0−30 cm	1	10	0.22	0.27	0.50	0.51	0.09	0.54

[z]Numerator or denominator degrees of freedom.

Table 8. Mixed-model analysis of variance of the effects of organic and conventional management, soil depth, and date on nitrate (NO_3^--N), (NH_4^+-N), inorganic N (NO_3^--N + NH_4^+-N), potential N mineralization (Nmin), nitrification (Nitr), and relative nitrification (Rnitr) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Bold font denotes significance at $P \leq 0.05$. Preplanned contrasts of management at 0−5 and 5-30 cm soil depth averaged across sampling dates are not included because the management by sampling date interaction was significant for all variables.

	Num df[z]	**Den df[z]**	**NO_3^--N**	**NH_4^+-N**	**Inorganic N**	**Nmin**	**Nitr**	**Rnitr**
Effect					***P* > *F***			
Management	1	7	0.44	0.66	0.60	**0.02**	0.13	**0.04**
Date	2	56	**<0.001**	**<0.001**	**<0.001**	0.57	**0.001**	**<0.001**
Management*date	2	56	**0.01**	**0.002**	**<0.001**	**0.005**	**0.02**	**0.04**
Depth	1	14	**0.002**	**<0.001**	**<0.001**	**0.01**	**0.003**	0.29
Management*depth	1	14	0.54	0.08	0.16	0.09	0.33	0.70
Depth*date	2	56	**0.04**	**0.05**	0.19	0.56	**0.03**	0.14
Management*depth*date	2	56	0.83	0.10	0.87	**0.05**	0.08	0.23

[z]Numerator or denominator degrees of freedom.

Table 9. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on enzyme activity in soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms in late September and early October of 2008.

	Num df[z]	Den df[z]	BG g soil^{-1}	CBH g soil^{-1}	NAG g soil^{-1}	PHOS g soil^{-1}
Effect				***P* > *F***		
Management	1	7	0.28	0.43	0.10	0.69
Depth	1	14	0.16	0.21	0.08	0.17
Management*depth	1	14	0.85	0.97	0.82	0.65
Preplanned contrasts						
Management at 0−5 cm	1	14	0.40	0.52	0.07	0.55
Management at 5−30 cm	1	14	0.30	0.50	0.23	0.96

[z]Numerator or denominator degrees of freedom.

Abbreviations: BG (β -1,4-glucosidase); CBH (β-D-1,4-cellobiosidase); NAG (β-1,4-*N*-acetylglucosiminadase); PHOS (phosphatase).

Table 10. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management, soil depth, and date on enzyme activity and CO_2 respiration rate on a soil and soil organic carbon basis in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Bold font indicates significance at $P \leq 0.05$.

Effect	Num df[z]	Den df[z]	BG[y] g soil^{-1}	BG g C^{-1}	CBH g soil^{-1}	CBH g C^{-1}	NAG g soil^{-1}	NAG g C^{-1}	PHOS g soil^{-1}	PHOS g C^{-1}	TAP g soil^{-1}	TAP g C^{-1}	POX g soil^{-1}	POX g C^{-1}	PER g soil^{-1}	PER g C^{-1}	CO_2 g soil^{-1}	CO_2 g C^{-1}
			$P > F$															
Management	1	7	0.76	0.13	0.48	0.14	0.12	**<0.01**	0.55	0.46	0.69	0.53	0.52	0.60	0.58	0.84	0.53	**0.03**
Date	2	56	0.14	0.88	0.28	0.57	0.06	**0.02**	0.33	**<0.01**	**<0.01**	**<0.01**	0.05	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**
Management *date	2	56	0.27	0.98	0.92	0.98	0.33	0.33	0.76	0.14	0.31	0.66	0.65	0.37	0.17	**0.04**	0.67	0.74
Depth	1	14	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	0.99	**0.03**	0.30	0.34	0.56	0.43	**<0.01**	**<0.01**	**<0.01**
Management *depth	1	14	0.64	0.24	0.74	0.38	0.33	0.10	0.32	0.88	0.53	0.99	0.89	0.99	0.07	0.21	0.79	0.73
Depth*date	2	56	0.37	0.09	0.08	0.11	0.41	0.50	0.14	0.32	**0.05**	0.57	0.20	0.27	0.74	0.41	0.09	0.07
Management *depth*date	2	56	0.93	0.70	0.78	0.77	0.98	0.99	0.49	0.71	0.43	0.59	0.62	0.57	0.98	0.98	0.75	0.76
Preplanned contrasts																		
Management at 0−5 cm	1	14	0.65	**0.05**	0.39	0.07	0.06	**<0.01**	0.30	0.55	0.96	0.96	0.57	0.68	0.13	0.37	0.62	**0.05**
Management at 5−30 cm	1	14	0.94	0.58	0.64	0.47	0.25	**0.01**	0.99	0.63	0.52	0.52	0.72	0.72	0.30	0.58	0.55	0.09

[z]Numerator or denominator degrees of freedom.

[y]Abbreviations: BG (β-D-1,4-glucosidase); CBH (β-D-1,4-cellobiosidase); NAG (β-1,4-*N*-acetylglucosiminadase); PHOS (phosphatase); TAP (tyrosine aminopeptidase); POX (phenol oxidase); PER (peroxidase); CO_2 (soil respiration).

Table 11. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management, soil depth, and date on the ratio of C:N, C:P, and N:P enzyme activity, on a soil and soil organic matter basis, in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Bold font indicates significance at $P \leq 0.05$.

			Enzyme activity					
	Num df[z]	**Den df[z]**	**C:N[y] (g soil^{-1})**	**C:N[y] (g SOM^{-1})**	**C:P[y] (g soil^{-1})**	**C:P[y] (g SOM^{-1})**	**N:P[y] (g soil^{-1})**	**N:P[y] (g SOM^{-1})**
Effect			***P* > *F***					
Management	1	7	**0.05**	**0.03**	0.19	0.19	**0.04**	**0.03**
Date	2	56	**0.05**	0.20	0.25	0.19	**0.02**	**0.05**
Management*date	2	56	0.55	0.33	0.44	0.51	0.87	0.56
Depth	1	14	0.08	0.95	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Management*depth	1	14	0.69	0.92	0.09	0.07	0.14	0.07
Depth*date	2	56	0.91	0.77	0.41	0.28	0.80	0.79
Management*depth*date	2	56	0.61	0.73	0.74	0.53	0.52	0.46
Preplanned contrasts								
Management at 0−5 cm	1	14	0.11	**0.02**	**0.01**	**0.03**	**0.008**	**0.005**
Management at 5−30 cm	1	14	**0.05**	0.11	0.87	0.99	0.15	0.18

[z]Numerator or denominator degrees of freedom.

[y]C:N=[LN(β-D-1,4-glucosidase):LN(β-1,4-*N*-acetylglucosiminadase + tyrosine aminopeptidase], C:P=[LN(β-D-1,4-glucosidase):LN(phosphatase)], N:P= [LN(β-1,4-*N*-acetylglucosiminadase + tyrosine aminopeptidase):LN(phosphatase)].

Table 12. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on populations of cultivable soil microorganisms in soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms in late September and early October 2008. Bold font indicates significance at $P \leq 0.05$.

	Num df[z]	Den df[z]	Bacteria	Fungi	Trichoderma[y]
Effect				***P > F***	
Management	1	7	**0.04**	0.33	0.96
Depth	2	14	0.11	**0.001**	**0.004**
Management*depth	2	14	0.33	0.29	**0.04**
Preplanned contrasts					
Management at 0−5 cm	1	14	**0.04**	0.67	0.34
Management at 0−30 cm	1	14	0.10	0.26	0.16

[z]Numerator or denominator degrees of freedom.

[y]Only sandy soils included in analysis due to zero-values in three of four muck field soils.

Table 13. Mixed-model analysis of variance and preplanned contrasts of the effects of organic and conventional management and soil depth on populations of cultivable soil microorganisms in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 9-10 Oct 2009. Bold font indicates significance at $P \leq 0.05$.

	Num df[z]	Den df[z]	Bact[y]	Baci[y]	Pseu[y]	Stre[y]	Fungi	Trich[y]
Effect					***P > F***			
Management	1	7	0.62	0.29	0.07	0.83	0.52	0.87
Depth	2	14	0.22	**0.009**	0.27	**<0.001**	**0.002**	0.13
Management*depth	2	14	0.32	0.91	0.58	0.18	0.53	0.72
Preplanned contrasts								
Management at 0−5 cm	1	14	0.97	0.45	0.06	0.35	0.29	0.93
Management at 5−30 cm	1	14	0.12	0.15	0.15	0.50	0.73	0.48

[z]Numerator or denominator degrees of freedom.

[y]Bact (bacteria); Baci (*Bacillus* spp.); Pseu (fluorescent *Pseudomonas* spp.); Stre (*Streptomyces* spp.); Trich (*Trichoderma* spp.).

Table 14. Mixed-model analysis of variance of the effects of organic and conventional management and soil type (NRCS soil series) on ericoid mycorrhizal (ERM) and dark septate endophyte (DSE) colonization of hair roots collected at 0−30 cm depth from Michigan blueberry farms in late September and early October 2008. Bold font indicates significance at $P \leq 0.05$.

	Num df[z]	**Den df**[z]	**ERM**	**DSE**
Effect			***P > F***	
Management	1	3	0.12	0.43
Soil type	4	3	0.53	**0.001**
Management*soil type	4	3	0.11	0.06

[z]Numerator or denominator degrees of freedom.

Table 15. Mixed-model analysis of variance of the effects of organic and conventional management, date, and soil type (NRCS soil series) on ericoid mycorrhizal (ERM) and dark septate endophyte (DSE) colonization of hair roots collected at 0−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Bold font indicates significance at $P \leq 0.05$.

	Num df[z]	**Den df**[z]	**ERM**	**DSE**
Effect			***P > F***	
Management	1	3	**0.045**	0.53
Date	2	12	0.22	**0.003**
Management*date	2	12	0.93	0.92
Soil type	4	3	0.48	**0.04**
Management*soil type	4	3	**0.03**	**0.05**
Soil type*date	8	12	0.82	0.19
Management*soil type*date	8	12	0.47	0.77

[z]Numerator or denominator degrees of freedom.

Table 16. Nematode populations and mixed-model analysis of variance (ANOVA) of the effect of organic and conventional management on lesion, dagger, sheath, ring, spiral, stunt, and total plant-parasitic nematodes in soil and blueberry roots collected at 0−5 cm depth from blueberry farms on 7 and 8 June 2010. Bold font denotes a significant difference between organic and conventional fields at $P \leq 0.05$.

Management	**Soil**	**Pair (block)**	**Lesion**[z]	**Lesion (root)**[y]	**Dagger**[z]	**Sheath**[z]	**Ring**[z]	**Spiral**[z]	**Stunt**[z]	**Total plant-parasitic nematodes**[z]
Organic	sand	1	40	6	0	0	55	0	0	95
Conventional	sand	1	0	0	0	0	0	0	0	0
Organic	sand	2	10	33	0	0	50	15	0	75
Conventional	sand	2	0	0	0	330	0	0	0	330
Organic	sand	3	10	6	0	0	180	0	0	190
Conventional	sand	3	0	0	0	0	0	10	0	10
Organic	sand	4	30	4	5	0	70	5	0	110
Conventional	sand	4	0	0	0	0	10	0	0	10
Organic	sand	5	5	0	0	10	15	0	0	30
Conventional	sand	5	0	0	0	0	0	0	0	0
Organic	sand	6	0	0	0	5	5	10	15	35
Conventional	sand	6	5	0	0	5	35	30	0	75
Organic	muck	7	5	0	0	5	205	0	0	215
Conventional	muck	7	0	0	0	0	0	0	0	0
Organic	muck	8	10	0	0	0	20	20	10	60
Conventional	muck	8	0	0	0	0	0	0	0	0
Management $P > F$ (H_0: Org - Conv = 0)			**0.02**	-[x]	-	-	0.34	0.78	-	0.31

[z]Number of nematodes per 100 cm^3 soil

[y]Number of nematodes per g root tissue

[x]Insufficient non-zero observations for ANOVA

Table 17. Nematode populations and mixed-model analysis of variance (ANOVA) of the effect of organic and conventional management on non-plant-parasitic nematodes (tylenchs, aphelenchs, dorylaims, mononchs, and bacteria-feeding nematodes), total non-plant-parasitic nematodes, total nematodes, ratios of non-plant-parasitic to total nematodes, populations of oligochaetes, and number of arbuscular mycorrhizal (AM) fungi spores in soil collected at 0−5 cm depth from blueberry farms on 7 and 8 June 2010. Bold font denotes a significant difference between organic and conventional fields at $P \leq 0.05$.

Management	Soil	Pair (block)	Tylenchs[z]	Aphelenchs	Dorylaims	Mononchs	Bacterial feeders	Total non-plant-parasitic	Total	Ratio NPP: total[y]	Oligochaetes[z]	AM fungi spores[z]
Organic	sand	1	80	20	5	0	320	425	526	0.8	135	10
Conventional	sand	1	0	15	10	0	175	200	200	1.0	110	420
Organic	sand	2	55	5	10	10	1170	1250	1358	0.9	100	40
Conventional	sand	2	20	10	5	0	90	125	455	0.3	30	30
Organic	sand	3	110	40	50	15	425	640	836	0.8	45	15
Conventional	sand	3	5	70	15	5	375	470	480	1.0	45	35
Organic	sand	4	80	20	25	5	255	385	499	0.8	210	10
Conventional	sand	4	10	55	5	0	325	395	405	1.0	20	5
Organic	sand	5	10	35	15	10	305	375	405	0.9	70	15
Conventional	sand	5	5	10	0	0	135	150	150	1.0	50	50
Organic	sand	6	25	5	40	0	430	500	535	0.9	90	70
Conventional	sand	6	25	30	5	0	390	450	525	0.9	20	25
Organic	muck	7	70	35	15	10	280	410	625	0.7	30	50
Conventional	muck	7	80	10	5	0	40	135	135	1.0	135	135
Organic	muck	8	15	20	0	0	130	165	225	0.7	40	15
Conventional	muck	8	40	35	0	0	110	185	185	1.0	90	50
Management $P > F$ (H_0: Org - Conv = 0)			0.06	0.41	**0.02**	**0.01**	0.06	0.06	**0.04**	**0.05**	0.30	0.20

[z]Number per 100 cm^3 soil. [y]Ratio of non-plant-parasitic to total (plant-parasitic + non-plant-parasitic) nematodes.

Table 18. Pearson's correlation coefficient (r) for correlations among variables measured on sandy blueberry soils collected at 0−30 cm depth from organic and conventional blueberry farms (n=12) in late September and early October 2008. Variables are defined in Table 3.2. Bold-italic font indicates a significant relationship at $P < 0.05$.

	SOM	H_2O	pH	Ca	Mg	K	Bray P	Nmin	Nitr	Rnitr	LF-SOM	LF-C:SOM	LF C:N	CO_2	C_l	mrt	*c*	BG	CBH	NAG	PHOS	Bact	Fungi	Trich	ERM
H_2O	0.5																								
pH	0.1	0.3																							
Ca	-0.1	0.2	***0.7***																						
Mg	0.1	***0.6***	***0.7***	***0.6***																					
K	0.1	0.3	0.4	0.4	0.4																				
Bray P	-0.2	***-0.6***	-0.2	0.1	-0.2	-0.1																			
Nmin	-0.1	-0.5	0.1	-0.1	-0.4	-0.1	0.3																		
Nitr	-0.3	***-0.6***	0.2	0.2	-0.2	0.1	***0.6***	***0.8***																	
Rnitr	-0.5	-0.2	0.1	0.2	0.4	0.3	0.3	-0.4	0.2																
LF-SOM	***0.7***	0.1	-0.3	-0.3	-0.2	-0.5	0.0	-0.2	-0.3	-0.4															
LF-C:SOM	0.5	0.0	-0.2	-0.3	-0.2	***-0.6***	0.3	-0.1	-0.2	-0.2	***0.9***														
LF C:N	0.3	***0.9***	0.4	0.2	***0.6***	0.2	***-0.6***	-0.5	-0.6	-0.1	0.0	0.0													
CO_2	0.3	0.4	0.4	0.2	***0.6***	0.2	***-0.6***	***0.7***	-0.5	***-0.6***	0.1	0.1	-0.2												
C_l	0.0	0.5	0.2	***0.7***	0.5	0.2	0.1	-0.5	-0.2	0.0	0.0	0.0	0.3	-0.1											
mrt	-0.1	-0.5	-0.5	0.0	-0.3	-0.2	***0.7***	0.3	0.5	0.0	0.2	0.1	***-0.7***	-0.1	0.2										
c	-0.6	-0.3	-0.1	-0.2	-0.2	0.1	0.4	0.1	0.2	0.3	-0.5	-0.2	-0.1	0.3	-0.2	0.0									
BG	-0.1	0.4	0.3	0.5	0.3	0.2	-0.2	-0.4	-0.2	0.1	0.0	0.0	0.5	-0.1	0.6	-0.3	0.2								
CBH	0.4	0.5	0.1	0.4	0.1	0.5	-0.4	-0.1	-0.2	-0.4	0.1	-0.2	0.2	-0.1	0.5	0.0	-0.4	0.5							
NAG	0.0	0.4	0.2	0.5	0.2	0.0	-0.2	-0.3	-0.3	-0.3	0.1	0.1	0.5	-0.1	***0.7***	-0.1	-0.3	***0.8***	0.5						
PHOS	0.3	0.3	-0.2	0.0	-0.1	0.5	-0.4	-0.3	-0.4	-0.2	0.1	-0.3	0.1	-0.2	0.2	-0.1	-0.2	0.3	***0.8***	0.2					
Bact	-0.2	0.4	0.5	***0.6***	0.4	0.3	-0.3	-0.2	-0.1	0.1	-0.2	-0.2	0.5	0.1	0.5	-0.4	0.2	***0.9***	0.4	***0.7***	0.2				
Fungi	0.0	0.2	0.1	0.4	0.2	-0.2	0.0	-0.4	-0.2	-0.1	0.3	0.2	0.2	-0.3	0.6	0.1	0.0	***0.6***	0.2	***0.7***	0.2	***0.7***			
Trich	-0.2	0.5	0.3	0.4	0.4	-0.1	-0.3	-0.3	-0.4	-0.2	-0.1	0.0	***0.7***	-0.4	***0.6***	-0.3	0.3	0.7	0.2	***0.8***	-0.1	***0.7***	***0.7***		
ERM	0.0	0.3	***0.6***	0.4	0.4	0.4	-0.4	-0.3	-0.4	0.0	-0.4	-0.4	0.5	-0.4	0.2	***-0.7***	0.0	0.2	0.1	0.2	0.1	0.2	0.0	0.4	
DSE	-0.4	***-0.7***	-0.2	0.1	-0.3	0.1	0.4	0.3	***0.6***	0.3	-0.1	-0.2	***-0.7***	-0.4	-0.2	0.5	0.3	0.1	-0.1	-0.2	0.2	0.1	0.2	-0.4	-0.5

Table 19. Pearson's correlation coefficient (r) for correlations among variables measured on muck blueberry soils collected at 0−30 cm depth from organic and conventional Michigan blueberry farms (n=4) in late September and early October 2008. Variables are defined in Table 3.2. Bold-italic font indicates a significant relationship at $P < 0.05$.

	SOM	H_2O	pH	Ca	Mg	K	Bray P	Nmin	Nitr	Rnitr	CO_2	BG	CBH	NAG	PHOS	Bact	Fungi	Trich	ERM
H_2O	0.71																		
pH	0.63	0.84																	
Ca	0.82	0.68	0.89																
Mg	0.68	0.42	0.78	***0.95***															
K	0.16	-0.55	-0.57	-0.14	-0.01														
Bray P	***-0.99***	-0.80	-0.67	-0.80	-0.62	-0.05													
Nmin	0.68	0.84	***0.99***	0.92	0.81	-0.51	-0.71												
Nitr	0.85	0.87	0.94	0.95	0.81	-0.31	-0.88	***0.96***											
Rnitr	0.04	-0.18	-0.66	-0.54	-0.65	0.54	-0.05	-0.63	-0.42										
CO_2	0.39	0.84	0.44	0.17	-0.14	-0.57	-0.51	0.42	0.47	0.22									
BG	***0.97***	0.55	0.53	0.81	0.73	0.34	-0.93	0.59	0.78	0.04	0.18								
CBH	0.77	0.11	0.14	0.56	0.59	0.72	-0.68	0.21	0.43	0.21	-0.21	0.89							
NAG	0.83	0.22	0.11	0.49	0.45	0.69	-0.76	0.18	0.43	0.39	0.00	0.90	***0.97***						
PHOS	***0.95***	0.88	0.80	0.86	0.68	-0.14	***-0.98***	0.83	***0.95***	-0.12	0.57	0.87	0.55	0.62					
Bact	-0.72	-0.86	-0.47	-0.39	-0.09	0.23	0.80	-0.48	-0.63	-0.34	-0.90	-0.56	-0.23	-0.43	-0.79				
Fungi	0.67	0.61	0.13	0.17	-0.09	0.12	-0.72	0.16	0.38	0.66	0.74	0.56	0.39	0.60	0.63	-0.92			
Trich	0.34	0.52	-0.03	-0.14	-0.43	-0.10	-0.43	-0.03	0.13	0.71	0.84	0.19	0.00	0.25	0.37	-0.85	0.91		
ERM	0.68	0.91	***0.99***	0.87	0.71	-0.58	-0.73	***0.99***	***0.95***	-0.54	0.56	0.56	0.14	0.15	0.86	-0.59	0.27	0.12	
DSE	***0.98***	0.55	0.51	0.78	0.69	0.35	-0.94	0.56	0.76	0.09	0.21	***0.99***	0.89	0.91	0.87	-0.59	0.60	0.23	0.54

Table 20. Pearson's correlation coefficient (r) for correlations among variables measured on sandy blueberry soils at 0−30 cm depth (bulk-density-weighted average of 0−5 cm and 5−30 cm) collected from organic and conventional blueberry farms (n=12) on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (mean of three dates). Variables are defined in Table 3.2. Bold-italic font indicates a significant relationship at $P < 0.05$.

	H_2O	pH	C^{yz}	N^{yz}	$C{:}N^{yz}$	CO_2	CO_2 C^{-1}	NH_4^+-N	NO_3^--N	Inorg-N	N-min	Nitr	Rnitr	BG	CBH	NAG	PHOS	POX	PER	TAP	$Bact^z$	$Baci^z$	$Pseu^z$	$Stre^z$	$Fungi^z$	$Trich^z$	ERM
pH	0.2																										
C	***0.6***	0.2																									
N	0.4	0.0	***0.8***																								
C:N	0.5	0.2	***0.7***	0.1																							
CO2	0.1	0.0	0.4	0.1	0.5																						
CO2 C^{-1}	-0.5	-0.2	***-0.7***	***-0.7***	-0.3	0.4																					
NH4+	0.2	-0.4	0.4	***0.8***	-0.2	0.3	-0.2																				
NO3-	0.3	0.3	0.1	0.0	0.1	0.1	0.0	0.0																			
Inorg-N	0.3	0.1	0.2	0.3	0.0	0.2	0.0	0.4	***0.9***																		
Nmin	-0.5	0.1	-0.2	0.1	-0.5	0.2	0.3	0.2	-0.3	-0.2																	
Nitr	-0.5	-0.2	-0.2	0.3	***-0.6***	0.1	0.2	0.4	-0.4	-0.2	***0.9***																
Rnitr	0.1	-0.4	0.3	0.4	0.1	0.5	0.1	0.5	-0.3	-0.1	0.3	0.4															
BG	0.1	-0.2	0.5	0.4	0.4	***0.8***	0.1	0.4	0.3	0.4	0.2	0.2	0.5														
CBH	0.0	-0.1	0.4	0.3	0.3	***0.8***	0.2	0.3	0.2	0.3	0.4	0.4	0.5	***0.9***													
NAG	0.2	0.2	0.3	0.0	0.5	***0.9***	0.4	0.0	0.2	0.2	0.3	0.1	0.4	***0.8***	***0.8***												
PHOS	0.4	-0.5	***0.6***	0.5	0.4	0.2	-0.3	0.5	0.0	0.2	-0.2	0.0	0.5	0.5	0.3	0.2											
POX	0.5	-0.5	0.1	0.1	0.1	-0.1	-0.1	0.4	0.2	0.3	***-0.6***	-0.5	0.0	-0.1	-0.2	-0.3	0.4										
PER	0.3	-0.6	0.2	0.3	0.1	0.4	0.0	0.5	0.2	0.4	-0.3	-0.1	0.3	***0.6***	0.5	0.2	0.5	***0.7***									
TAP	-0.3	0.2	0.2	-0.2	0.4	0.2	0.0	-0.4	0.0	-0.2	0.1	0.0	0.2	0.3	0.3	0.3	0.1	-0.6	-0.4								
Bact	0.0	0.1	-0.3	-0.3	-0.2	0.1	0.3	0.2	0.1	0.2	***0.7***	0.6	0.4	0.0	0.1	0.2	-0.2	0.2	-0.1	-0.2							
Baci	-0.2	0.1	-0.1	0.0	-0.2	0.2	0.3	0.5	0.3	0.5	0.5	0.6	***0.6***	0.2	0.2	0.3	-0.2	0.0	0.2	-0.2	***0.7***						
Pseu	0.5	0.7	0.3	0.0	0.5	***0.6***	0.2	0.0	-0.1	0.0	0.0	-0.2	0.0	0.2	0.2	0.3	-0.2	0.1	-0.2	-0.1	0.4	0.3					
Stre	-0.1	0.2	-0.2	0.1	-0.3	0.1	0.3	0.4	0.2	0.3	0.2	0.3	***0.6***	0.1	0.2	0.3	-0.4	-0.2	0.0	***-0.7***	0.3	***0.6***	0.3				
Fungi	-0.1	0.5	-0.3	0.1	-0.5	-0.5	-0.2	-0.4	0.0	-0.1	-0.4	-0.3	-0.2	-0.5	-0.4	-0.4	***-0.7***	-0.5	-0.4	***-0.7***	-0.3	-0.3	-0.1	0.3			
Trich	0.5	0.1	0.2	0.0	0.3	0.2	0.1	0.6	-0.3	0.0	0.1	0.0	0.4	0.1	0.1	0.3	0.2	-0.3	-0.1	-0.1	0.3	0.3	0.2	0.4	-0.1		
ERM	0.0	***0.6***	-0.5	-0.6	-0.2	-0.3	0.3	***-0.6***	0.2	-0.1	0.0	-0.3	-0.4	***-0.6***	-0.5	-0.1	***-0.7***	-0.2	***-0.6***	-0.1	0.5	0.2	0.3	0.1	0.2	0.4	
DSE	0.0	0.4	0.4	0.4	0.2	0.2	-0.3	0.0	0.4	0.4	0.3	0.2	0.1	0.4	0.5	0.4	0.2	***-0.6***	-0.2	***0.6***	0.1	0.1	0.1	0.1	0.4	0.1	-0.1

[z]Measured only on samples collected 9-10 Oct 2009. [y]Assumed to be constant across sampling dates.

Table 21. Pearson's correlation coefficient (r) for correlations among variables measured on muck blueberry soils at 0-30 cm depth (bulk-density-weighted average of 0−5 cm and 5−30 cm) collected from organic and conventional blueberry farms (n=4) on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009. Variable names are defined in Table 3.2. Bold-italic font indicates a significant relationship at $P < 0.05$.

	H_2O	C[yz]	N[yz]	C:N[yz]	CO_2	CO_2 C^{-1}	NH_4^+-N	NO_3^--N	Inorg-N	Nmin	Nitr	Rnitr	BG	CBH	NAG	PHOS	POX	PER	TAP	Bact	Baci[z]	Pseu[z]	Stre[z]	Fungi[z]	Trich[z]	ERM
C	0.5																									
N	0.8	0.7																								
C:N	-0.7	-0.2	-0.8																							
CO2	0.9	0.9	0.8	-0.5																						
CO2 C^{-1}	***0.9***	0.6	0.8	-0.7	0.9																					
NH4+	0.9	0.5	0.9	-0.9	0.8	0.9																				
NO3-	-0.6	-0.8	***-0.9***	0.6	-0.8	-0.6	-0.8																			
Inorg-N	0.3	-0.7	-0.3	-0.3	-0.2	0.2	0.1	0.5																		
Nmin	0.9	0.8	0.9	-0.6	***0.9***	0.9	0.9	-0.8	-0.2																	
Nitr	0.4	***0.9***	0.5	0.1	0.8	0.5	0.2	-0.7	-0.7	0.7																
Rnitr	0.5	0.0	-0.2	0.1	0.3	0.5	0.0	0.3	0.6	0.2	0.1															
BG	0.8	-0.1	0.4	-0.8	0.4	0.7	0.7	-0.1	0.8	0.4	-0.3	0.4														
CBH	0.7	-0.2	0.2	-0.6	0.3	0.6	0.5	0.1	0.9	0.3	-0.3	0.7	***0.9***													
NAG	0.8	0.1	0.3	-0.5	0.6	0.8	0.6	-0.1	0.7	0.6	0.0	0.8	0.9	0.9												
PHOS	0.5	***0.9***	0.6	0.0	0.8	0.6	0.3	-0.7	-0.6	0.8	***0.9***	0.2	-0.2	-0.2	0.2											
POX	0.6	0.4	0.9	-0.9	0.6	0.6	0.9	-0.8	-0.1	0.7	0.2	-0.4	0.5	0.2	0.2	0.2										
PER	0.8	0.9	0.7	-0.2	***0.9***	0.8	0.5	-0.7	-0.3	0.9	0.9	0.4	0.1	0.1	0.5	***0.9***	0.3									
TAP	0.2	0.9	0.4	0.2	0.7	0.3	0.1	-0.6	-0.8	0.6	***0.9***	0.0	-0.4	-0.4	-0.1	***0.9***	0.1	0.8								
Bact	-0.9	-0.6	-0.6	0.5	***-0.9***	***-0.9***	-0.8	-0.2	-0.7	0.0	***0.9***	-0.6	-0.6	-0.6	-0.8	-0.7	0.1	-0.4	-0.9							
Baci	-0.8	-0.2	-0.8	***0.9***	-0.6	-0.8	-0.9	-0.6	***-0.9***	0.6	0.8	-0.1	-0.9	-0.8	-0.6	-0.1	-0.4	0.3	-0.2	0.6						
Pseu	0.8	-0.3	0.0	-0.4	0.3	0.7	0.4	0.9	0.5	-0.7	-0.6	0.8	0.8	0.9	1.0	0.0	0.7	-0.3	0.2	-0.6	-0.5					
Stre	-0.9	-0.5	-0.5	0.3	-0.9	-0.9	-0.6	-0.3	-0.6	0.0	0.9	-0.8	-0.5	-0.6	-0.9	-0.7	0.1	-0.5	-0.9	***0.9***	0.5	-0.7				
Fungi	***-0.9***	-0.3	-0.5	0.5	-0.8	***-0.9***	-0.7	-0.5	-0.8	0.3	***0.9***	-0.8	-0.7	-0.8	***-0.9***	-0.5	-0.2	-0.2	-0.7	***0.9***	0.7	-0.8	***0.9***			
Trich	0.2	***0.9***	0.7	-0.1	0.6	0.2	0.4	-0.7	0.2	0.7	-0.3	-0.3	-0.2	-0.4	-0.2	0.8	-0.8	0.7	0.7	-0.4	-0.1	-0.5	-0.3	-0.1		
ERM	0.8	0.3	0.3	-0.3	0.7	0.8	0.4	-0.1	0.4	0.6	0.3	0.9	0.6	0.7	0.9	0.5	0.0	0.7	0.2	-0.9	-0.4	0.8	***-0.9***	***-0.9***	0.1	
DSE	0.0	0.8	0.1	0.5	0.5	0.1	-0.2	-0.3	-0.7	0.3	0.9	0.1	-0.6	-0.5	-0.2	0.9	-0.3	0.7	***0.9***	-0.3	0.4	-0.4	-0.3	0.0	0.7	0.2

[z]Measured only on samples collected 9-10 Oct.

[y]Assumed constant across sampling dates.

Table 22. Repeated measures analysis of variance of the effects of fertilizer type, species of mycorrhizal inoculum, and sampling date on shoot length, root colonization by ericoid mycorrhizae (ERM) and dark septate endophytes (DSE), and container-leachate inorganic N concentration in container-grown plants of *V. corymbosum* 'Bluecrop'.

	Num df[z]	Den df	Shoot length	ERM	DSE	Leachate inorganic N[y]
			P < *F*			
Fertilizer	1	29	0.0003	<0.0001	<0.0001	<0.0001[x]
Inoculum	4	27	0.03	0.62	0.43	-
Fertilizer*inoculum	4	29	0.004	0.88	0.86	-
Date	4	237	<0.0001	-[x]	-	-
Fertilizer*date	4	237	<0.0001	-	-	-
Inoculum*date	16	237	0.78	-	-	-
Fertilizer*inoculum*date	16	237	0.75	-	-	-

[z]Numerator or denominator degrees of freedom

[y]Determined two weeks prior to the end of the experiment.

[x]Denominator degrees of freedom = 8.

[w]Not determined. ERM colonization assessed at termination of the experiment.

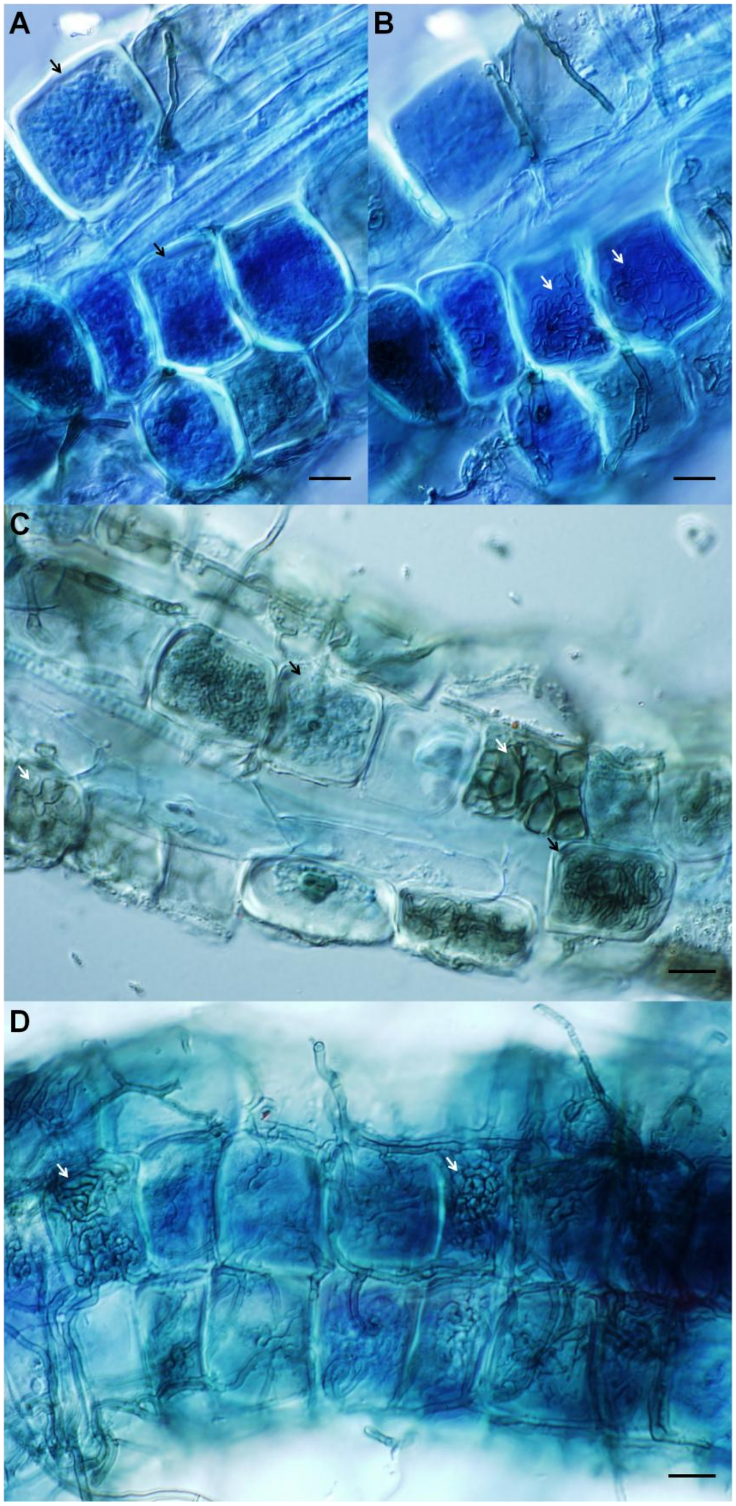


Figure 1. Morphology of ericoid mycorrhizae and dark septate endophytes (DSE) in hair roots of northern highbush blueberry *(Vaccinium corymbosum* L. 'Bluecrop') stained with methyl blue. A) Intracellular hyphal coils (black arrows), B) partial mantle on surface of mycorrhizal epidermal cells (white arrows), C) Intracellular hyphal coils (black arrows) and DSE microsclerotia (white arrows), D) Extensive partial mantle of hyphae on surface of hair root (white arrows). Scale bar = 12.5 µm

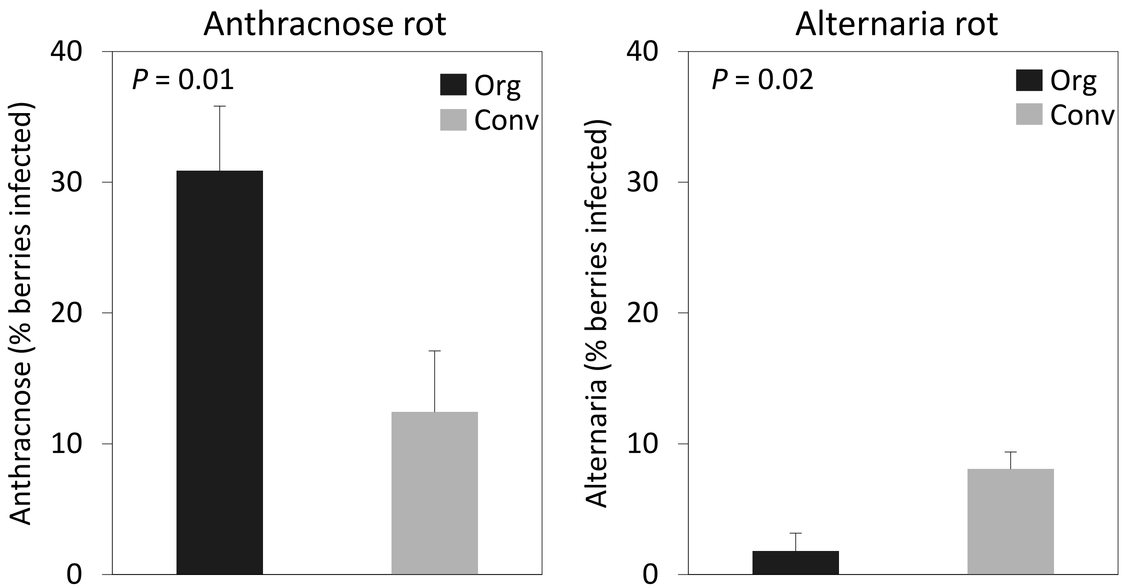


Figure 2. The effect of organic and conventional management on anthracnose and Alternaria rot incidence in blueberries collected from Michigan blueberry farms in 2008 and 2009. Error bars represent one standard error of the mean (n=8). Management types are considered significantly different when $P \leq 0.05$ (two-way ANOVA, management effect F-test).

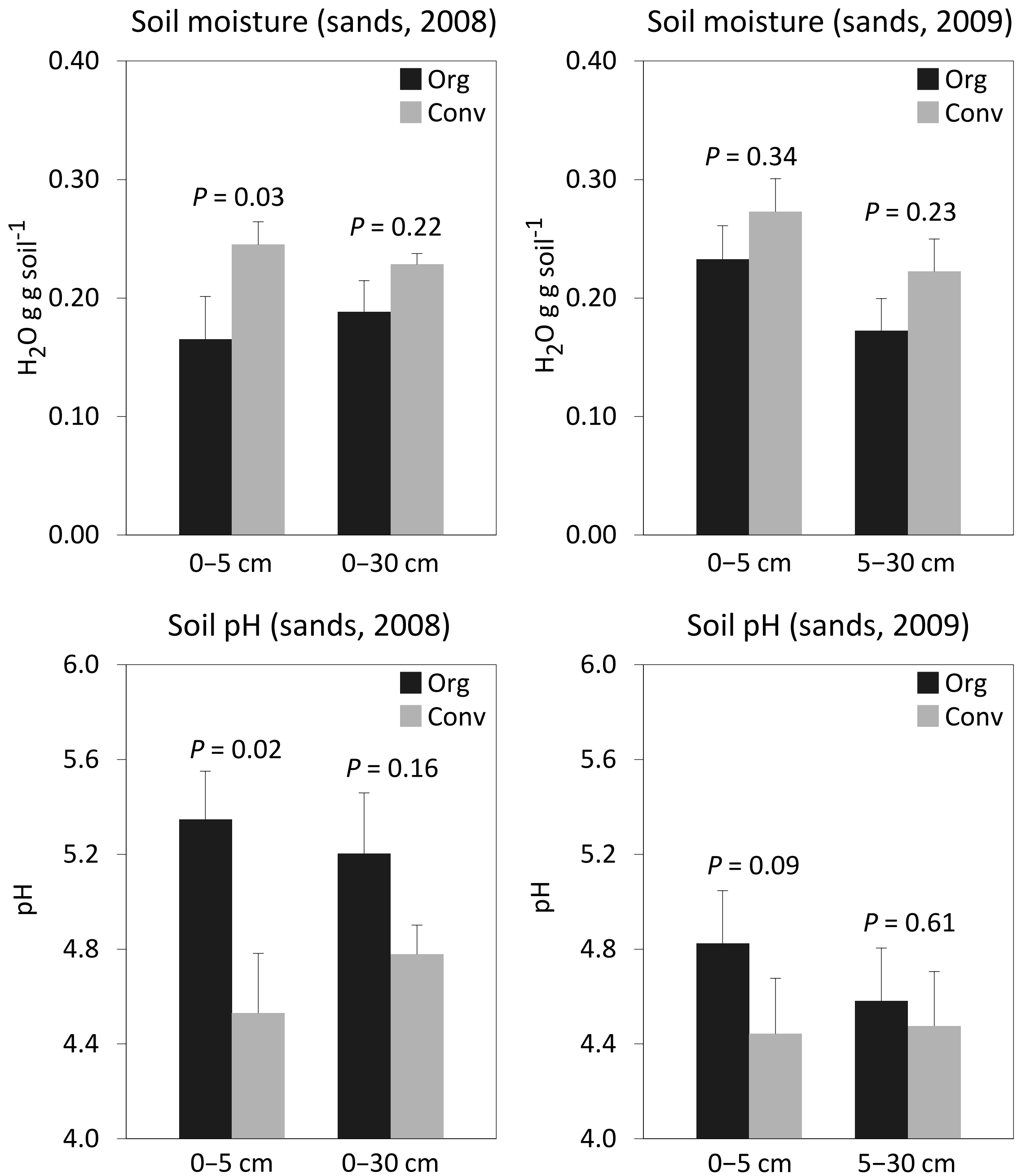


Figure 3. The effect of organic and conventional management on the pH and moisture content of sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25-26 Sept 2008. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

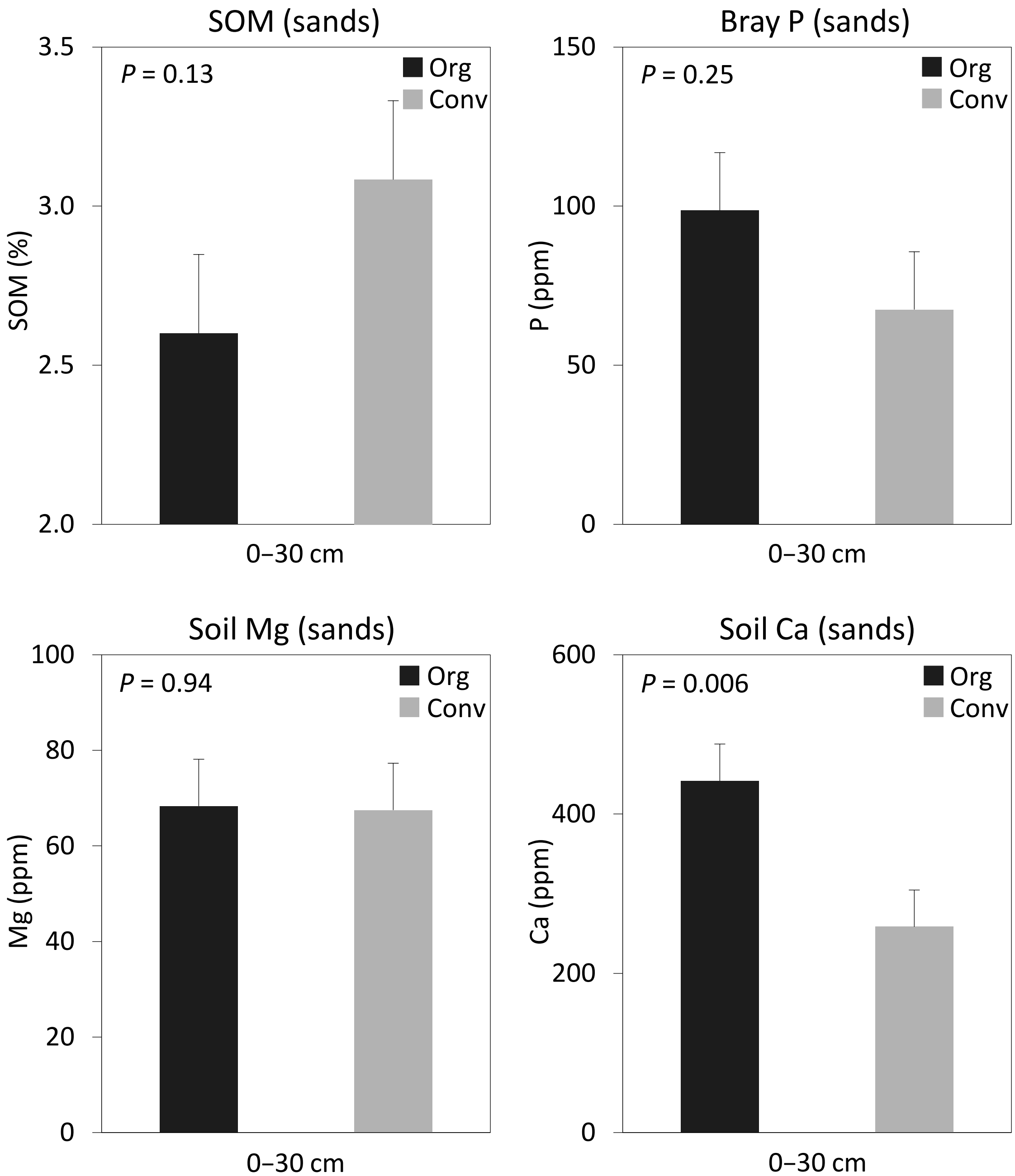


Figure 4. The effect of organic and conventional management on soil organic matter (SOM), P, Ca, and Mg content in sandy soils collected at 0−30 cm depth from Michigan blueberry farms collected on 25-26 Sept 2008. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different when $P \leq 0.05$ (one-way ANOVA F-test).

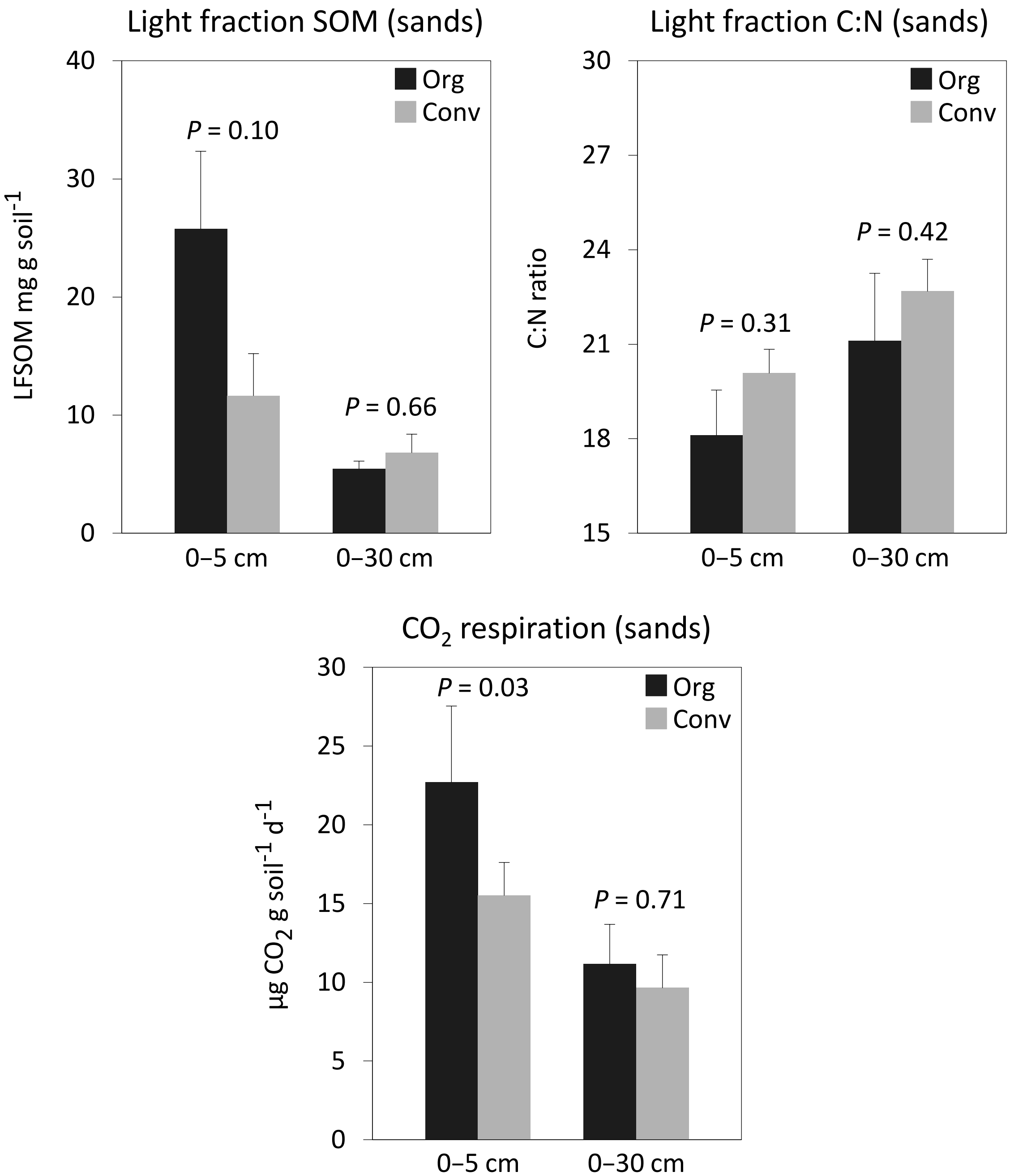


Figure 5. The effect of organic and conventional management on light fraction soil organic matter (SOM) content, light fraction C:N ratio and CO_2 respired in a 100-day laboratory incubation of sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25-26 Sept 2008. Error bars represent one standard error of the mean (n=6). Management types considered are significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

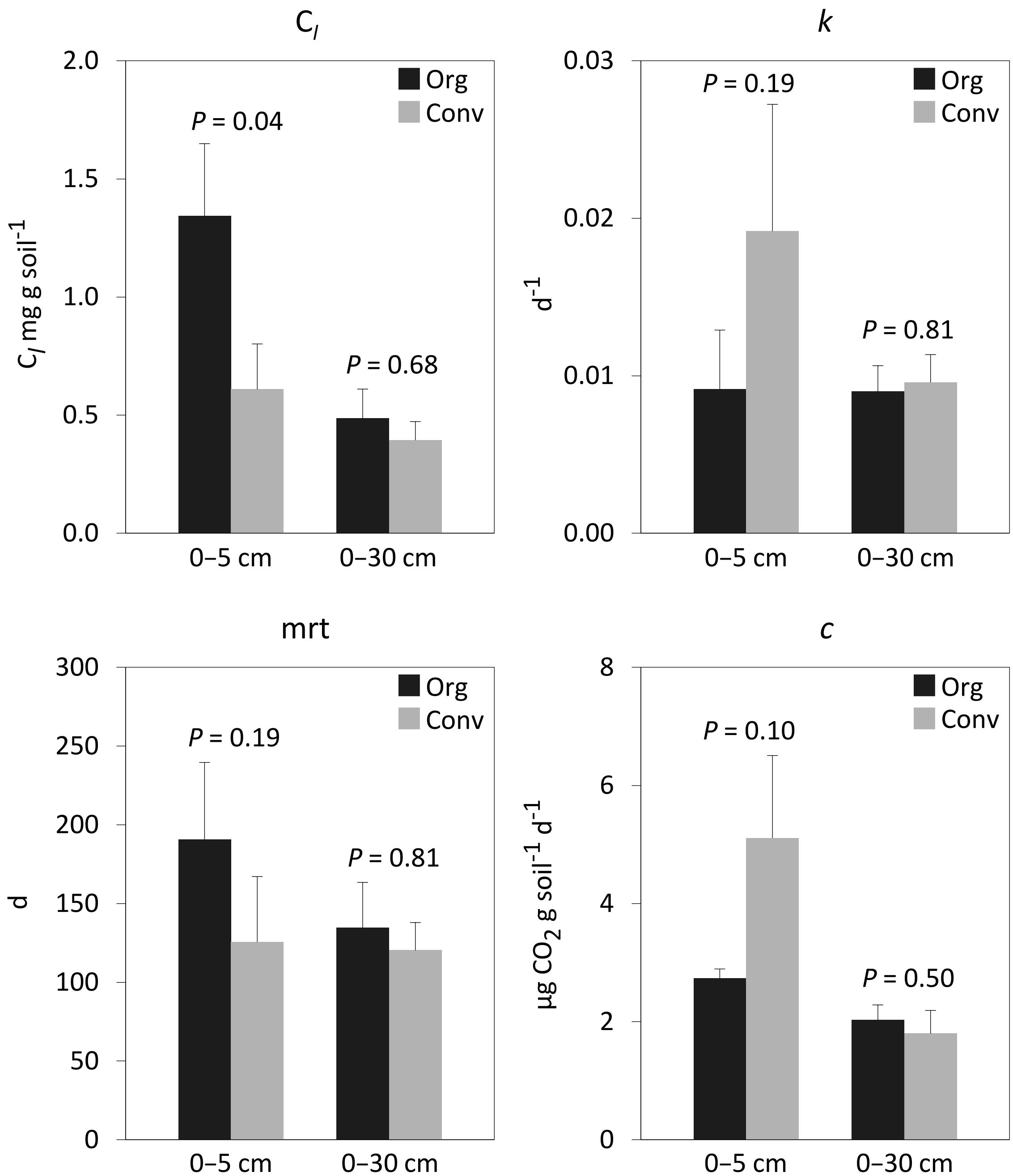


Figure 6. The effect of organic and conventional management on labile C (C_l) content, labile C decomposition constant (*k*), labile C mean residence time (mrt), and respiration of slow + resistant C (*c*) in sandy soils collected at 0−5 cm and 0−30 cm depth from Michigan blueberry farms on 25-26-Sept 2008. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

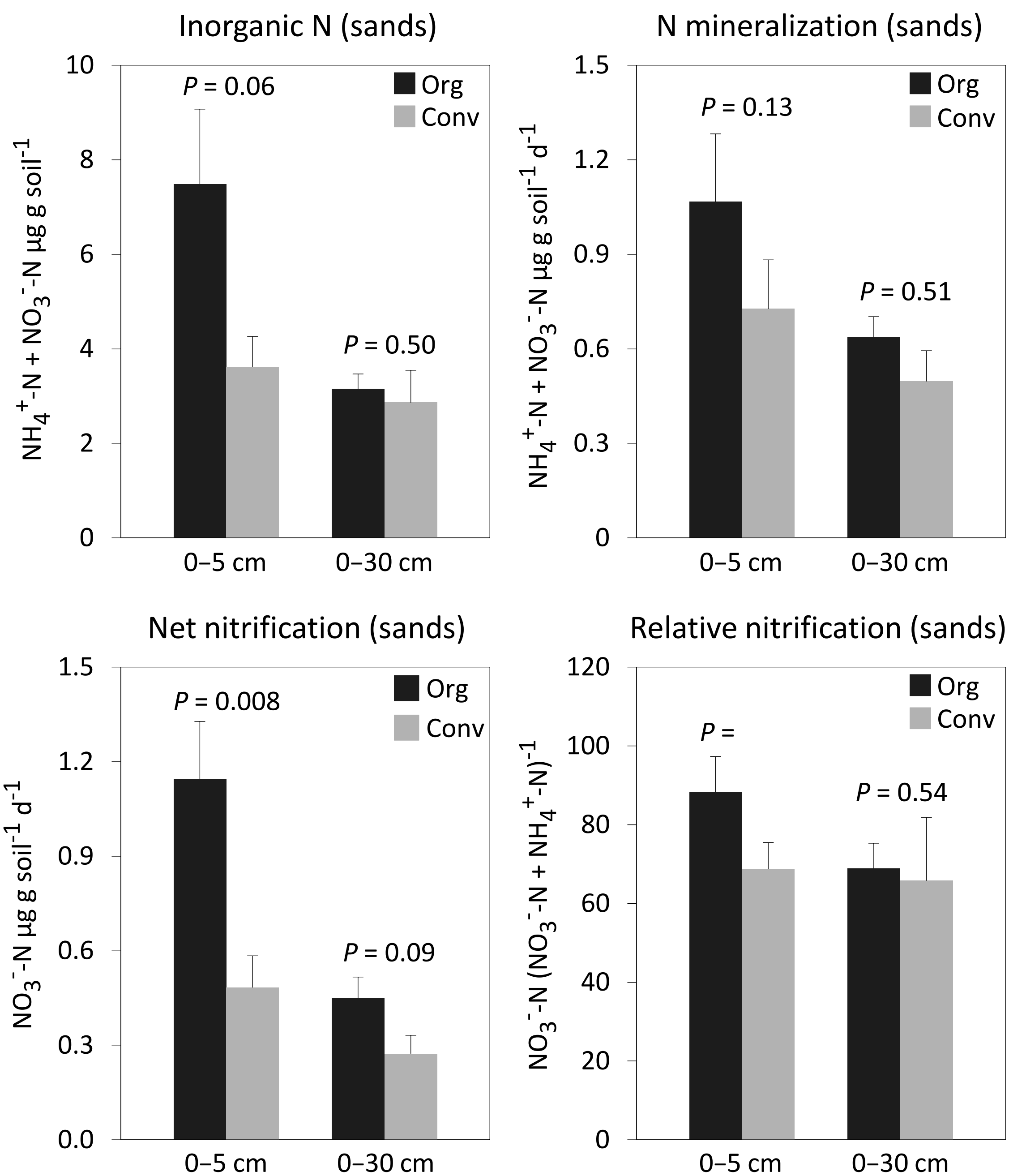


Figure 7. The effect of organic and conventional management on inorganic N at sampling, potential N mineralization, nitrification, and relative nitrification of sandy soils collected at 0−5 cm and 0−30 cm depths from Michigan blueberry farms on 25-26 Sept 2008. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

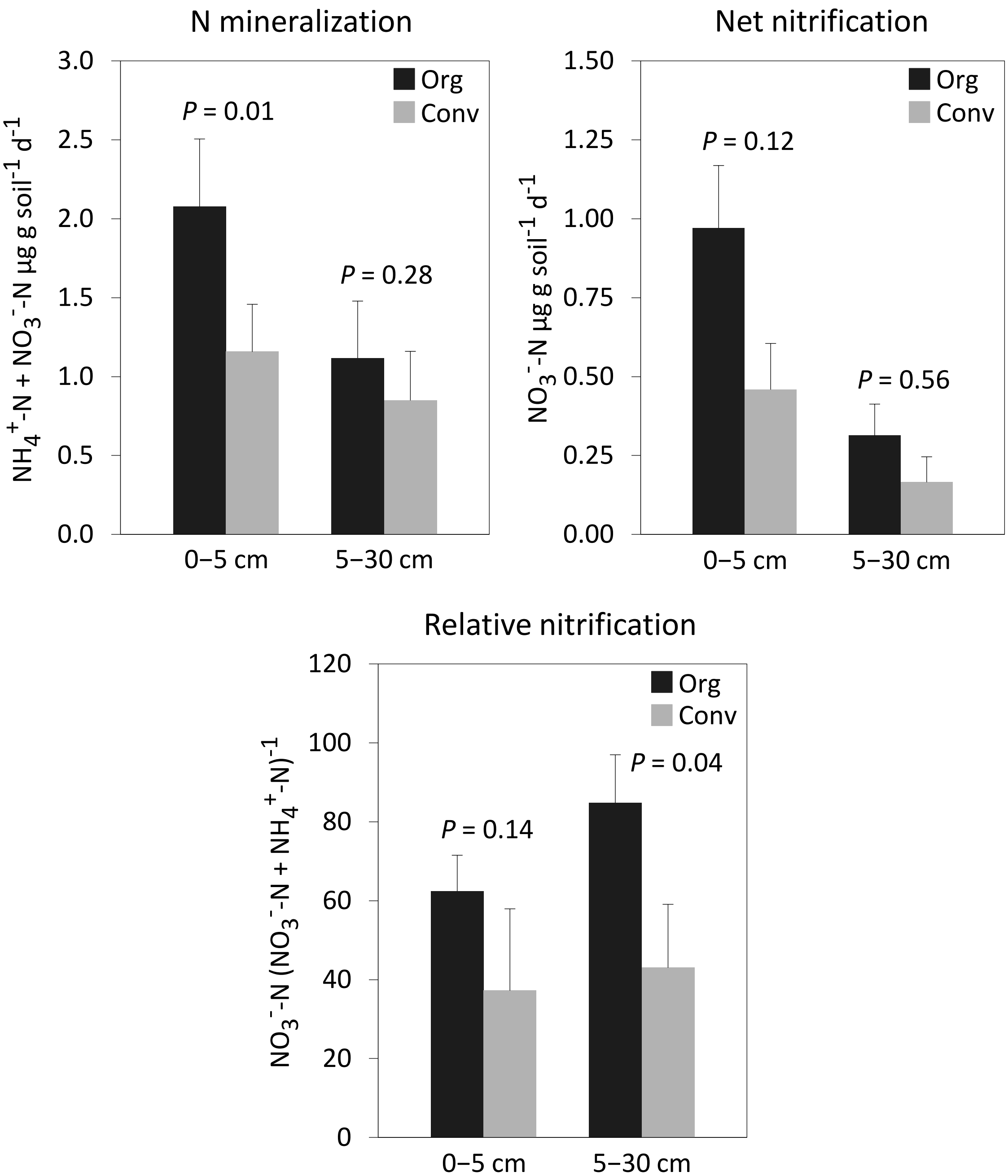


Figure 8. The effect of organic and conventional management on potential N mineralization, nitrification, and relative nitrification of soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 July, 21-22 August, and 9-10 October 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

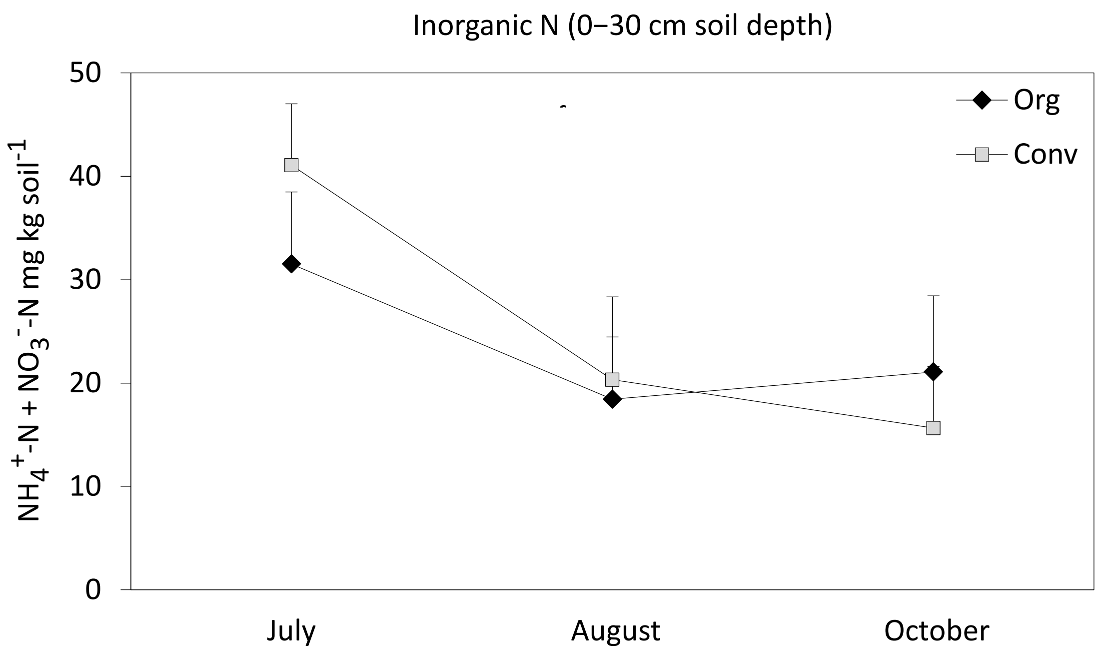


Figure 9. The effect of organic and conventional management on inorganic soil nitrogen (N) (nitrate + ammonium) collected at 0- to 30-cm depth (bulk-density-weighted average of 0−5 cm and 5−30 cm) from Michigan blueberry farms on 6-7 July, 21-22 August, and 9-10 October 2009. Error bars represent one standard error of the mean (n=8). The *P*-values for July, August, and October sampling dates are P=0.04, P=0.99, and P=0.001, respectively (pre-planned contrast *F*-test). Management types are considered significantly different when $P \leq 0.05$. Data were log-transformed prior to analysis; untransformed means and standard errors are shown.

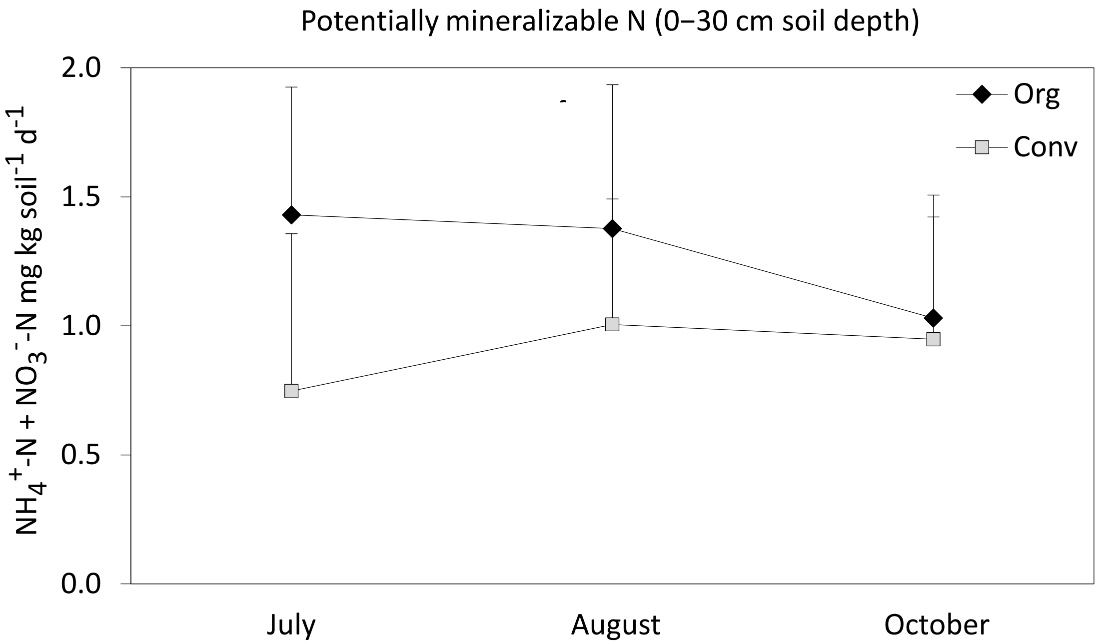


Figure 10. The effect of organic and conventional management on potentially mineralizable nitrogen (N) in soil collected at 0- to 30-cm depth (bulk-density-weighted average of 0−5 cm and 5−30 cm) from Michigan blueberry farms on 6-7 July, 21-22 August, and 9-10 October 2009 and incubated for 30 days at 25°C and 55% (sands) or 65% (mucks) water-holding capacity. Error bars represent one standard error of the mean (n=8). The *P*-values for July, August, and October sampling dates are *P*=0.003, *P*=0.48, and *P*=0.34, respectively (pre-planned contrast *F*-test). Management types are considered significantly different when $P \leq 0.05$. Data were (ln + 1)-transformed prior to analysis; untransformed means and standard errors are shown.

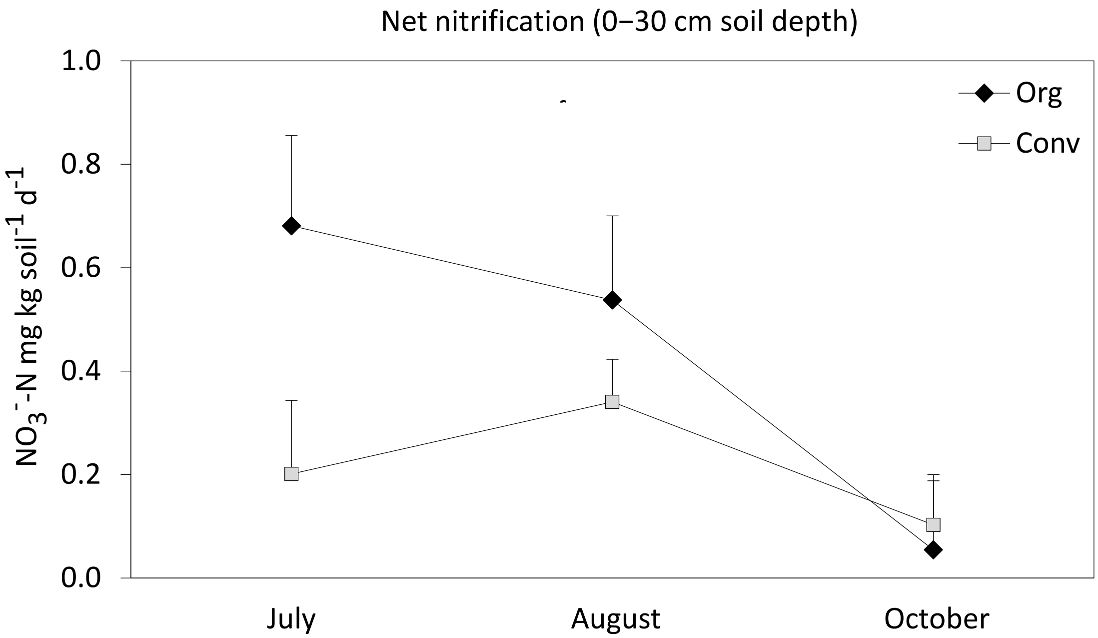


Figure 11. The effect of organic and conventional management on net nitrification in soil collected at 0- to 30-cm depth (bulk-density-weighted average of 0−5 cm and 5−30 cm) from Michigan blueberry farms on 6-7 July, 21-22 August, and 9-10 October 2009 and incubated for 30 days at 25°C and 55% (sands) or 65% (mucks) water-holding capacity. Error bars represent one standard error of the mean (n=8). The *P*-values for July, August, and October sampling dates are *P*=0.05, *P*=0.27, and *P*=0.62, respectively (pre-planned contrast *F*-test). Management types are considered significantly different when $P \leq 0.05$. Data were (ln + 1)-transformed prior to analysis; untransformed means and standard errors are shown.

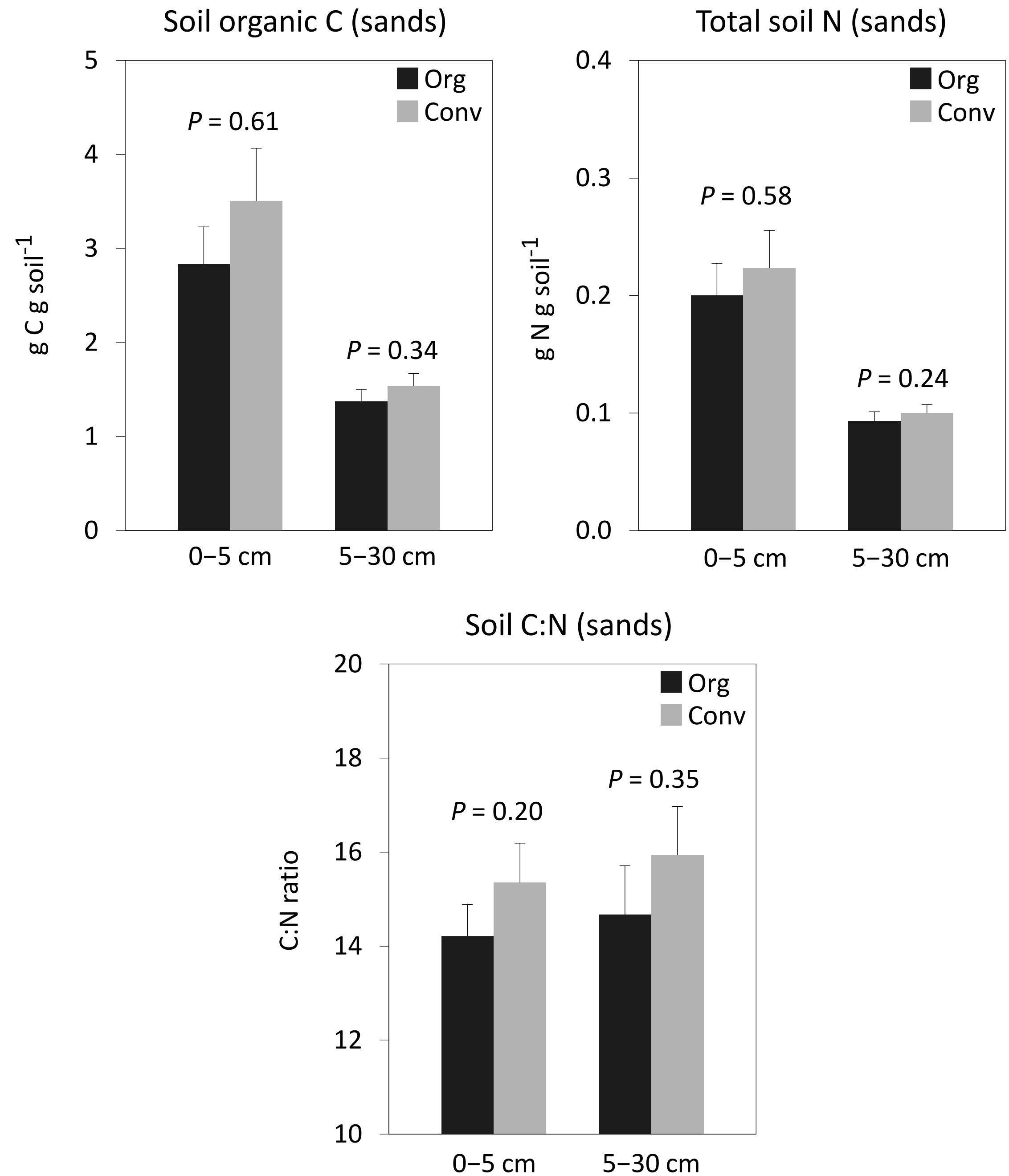


Figure 12. The effect of organic and conventional management on soil organic carbon, total N, C:N ratio, and water content of sandy soils collected at 0−5 cm and 5−30 cm depths from Michigan blueberry farms on 9-10 Oct 2009. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

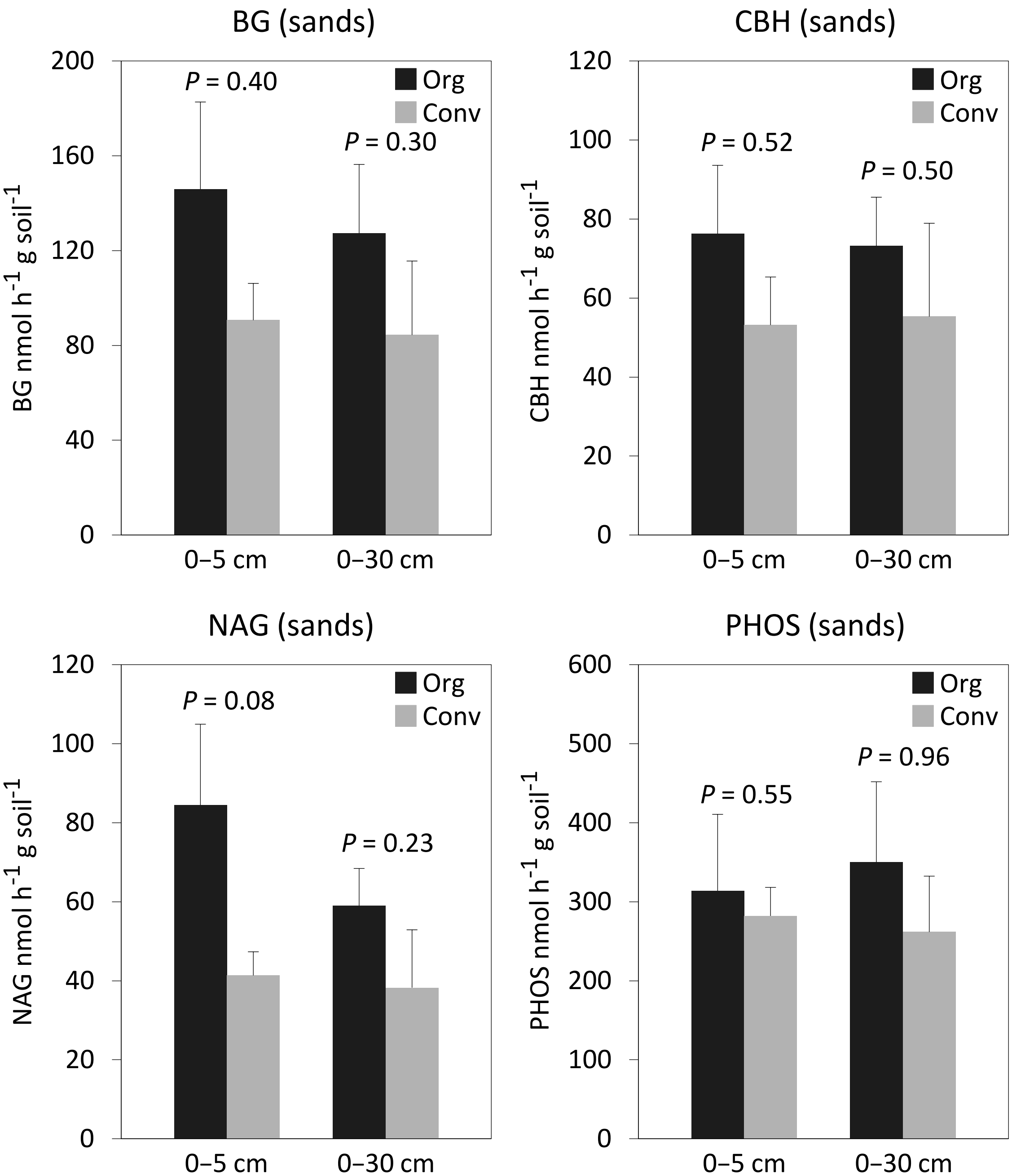


Figure 13. The effect of organic and conventional management on Beta-glucosidase (BG), cellobiosidase (CBH), N-acetylglucosaminidase (NAG), and acid phosphatase (PHOS) enzyme activity in sandy soils collected at 0−5 cm and 0−30 cm depth from organic and conventional Michigan blueberry farms on 25-26 Sept 2008. Error bars represent one standard error of the mean (n=6). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

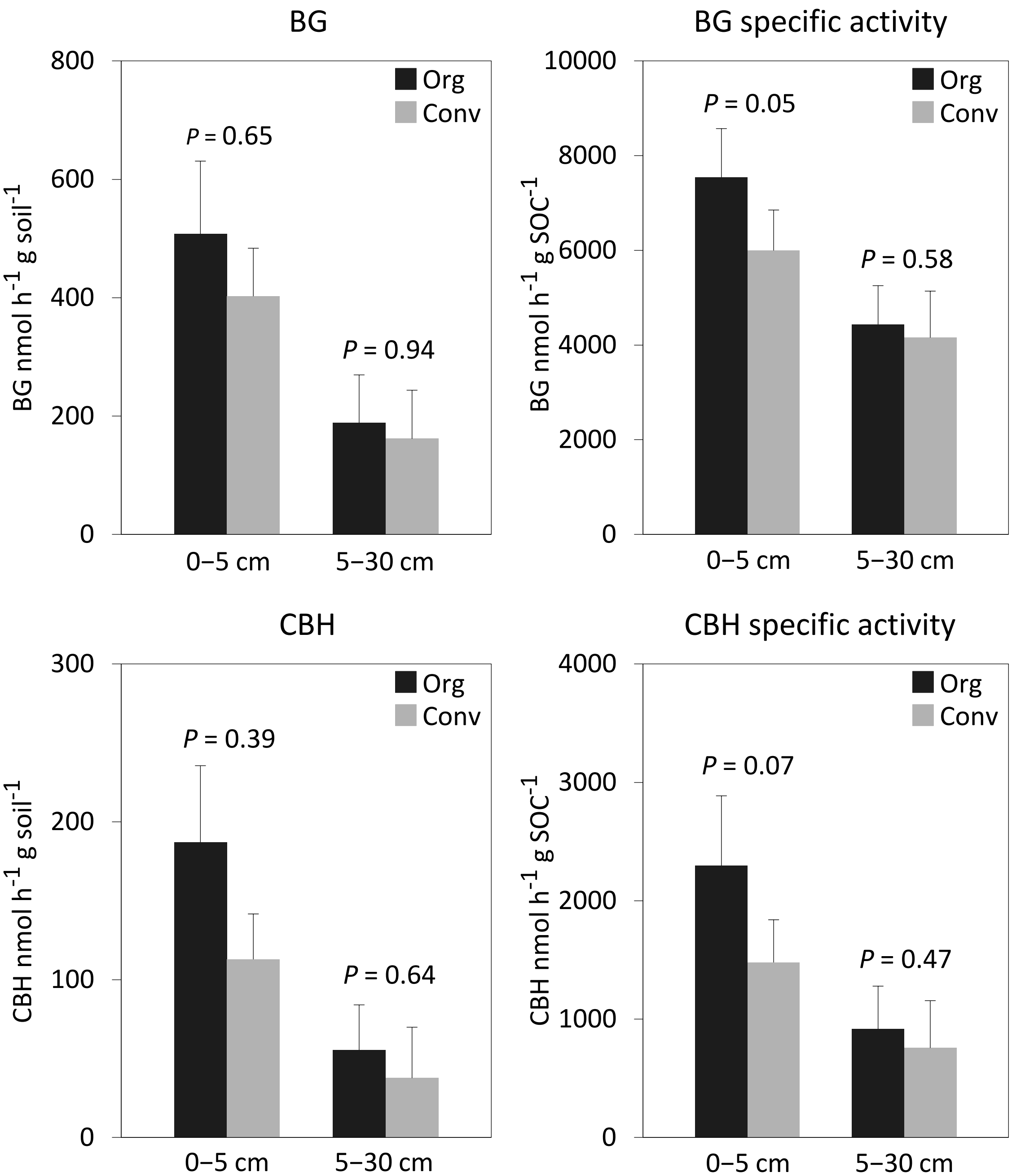


Figure 14. The effect of organic and conventional management on Beta-glucosidase (BG) and cellobiosidase (CBH) enzyme activity expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from organic and conventional Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

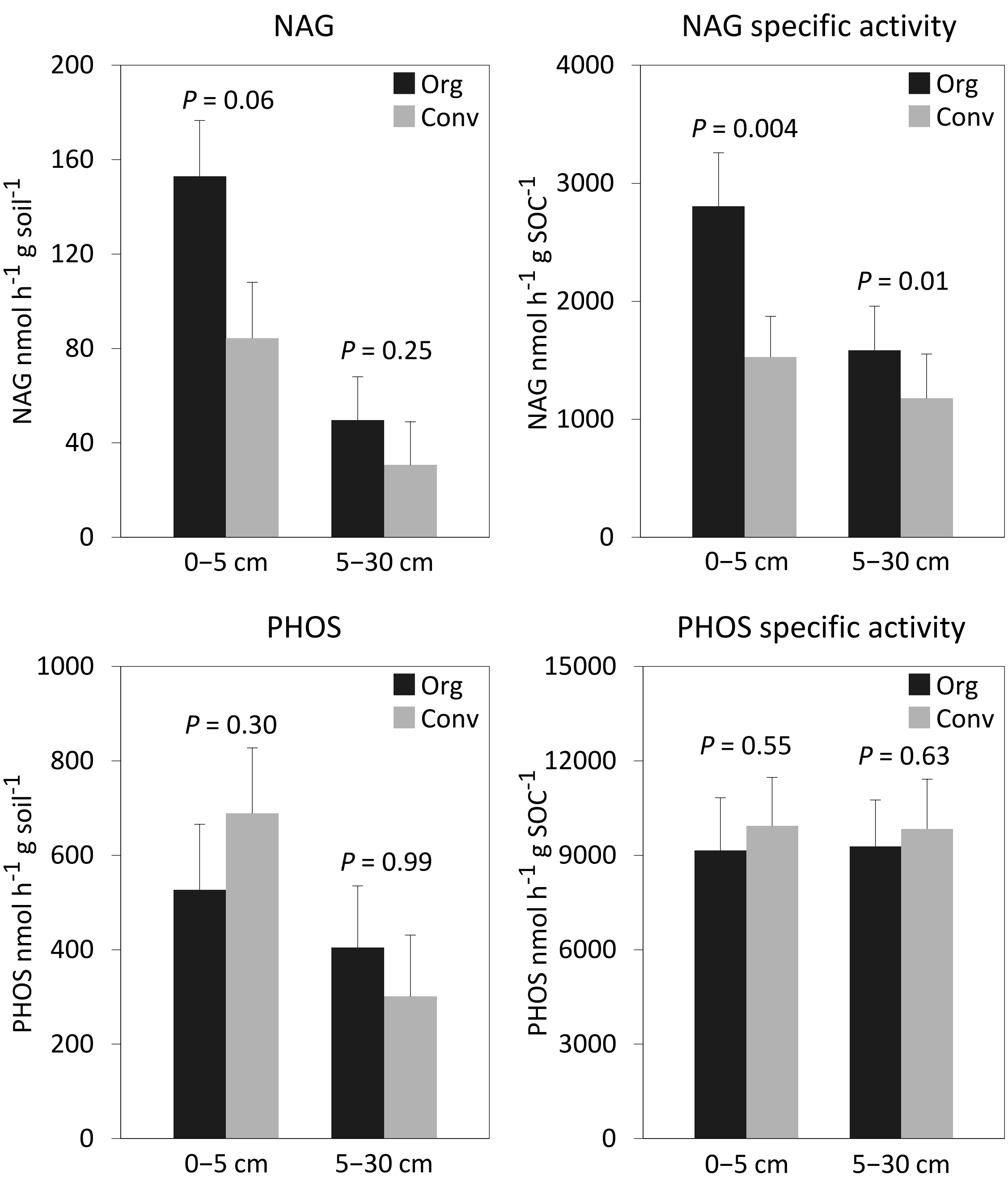


Figure 15. The effect of organic and conventional management on N-acetylglucosaminidase (NAG) and acid phosphatase (PHOS) enzyme activity expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

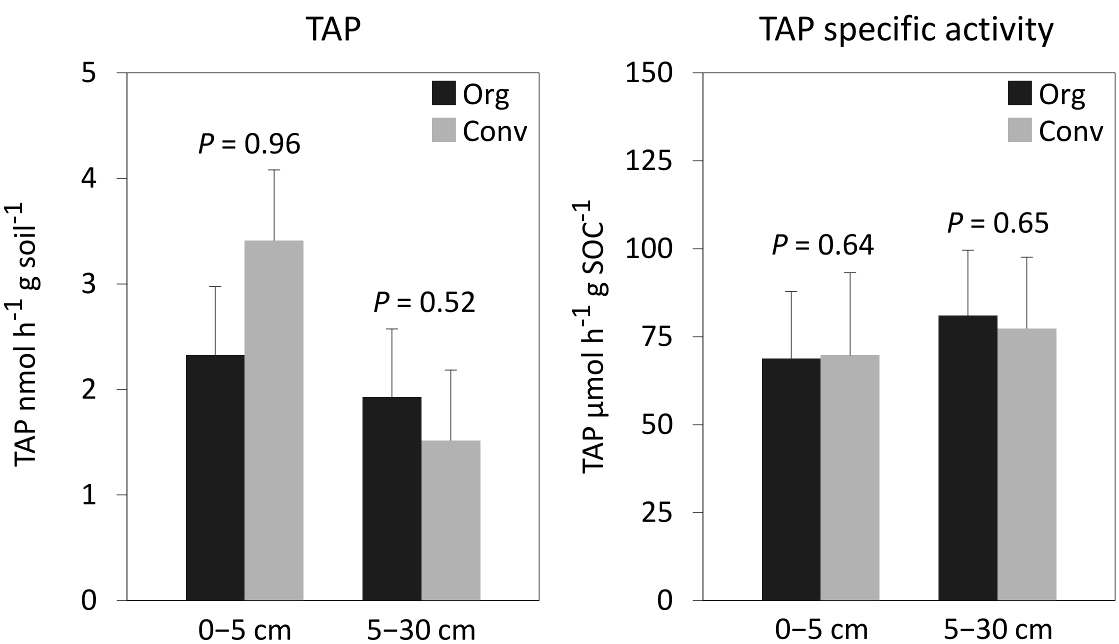


Figure 16. The effect of organic and conventional management on tyrosine aminopeptidase (TAP) enzyme activity expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

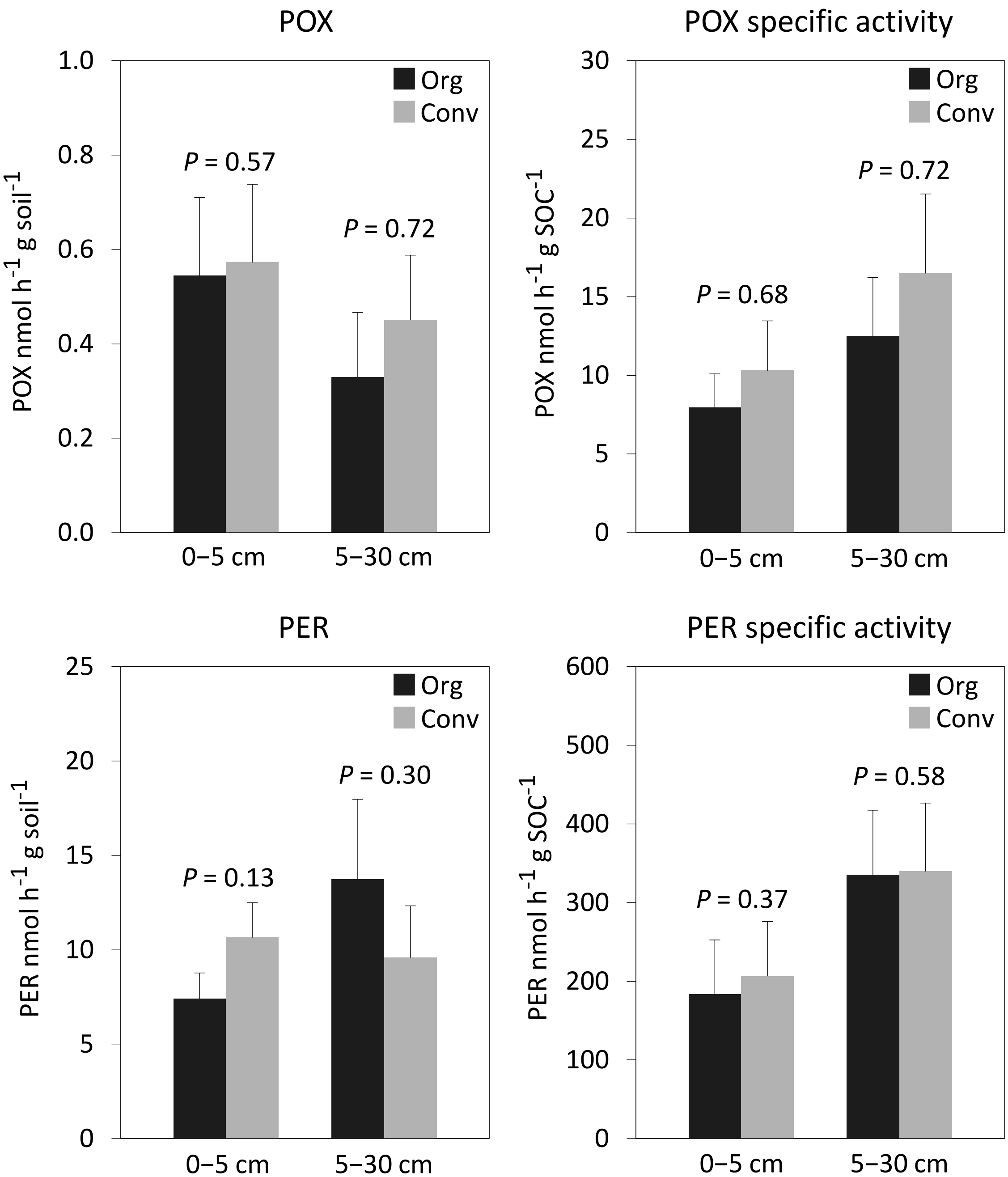


Figure 17. The effect of organic and conventional management on phenol oxidase (POX) and peroxidase (PER) enzyme activity expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

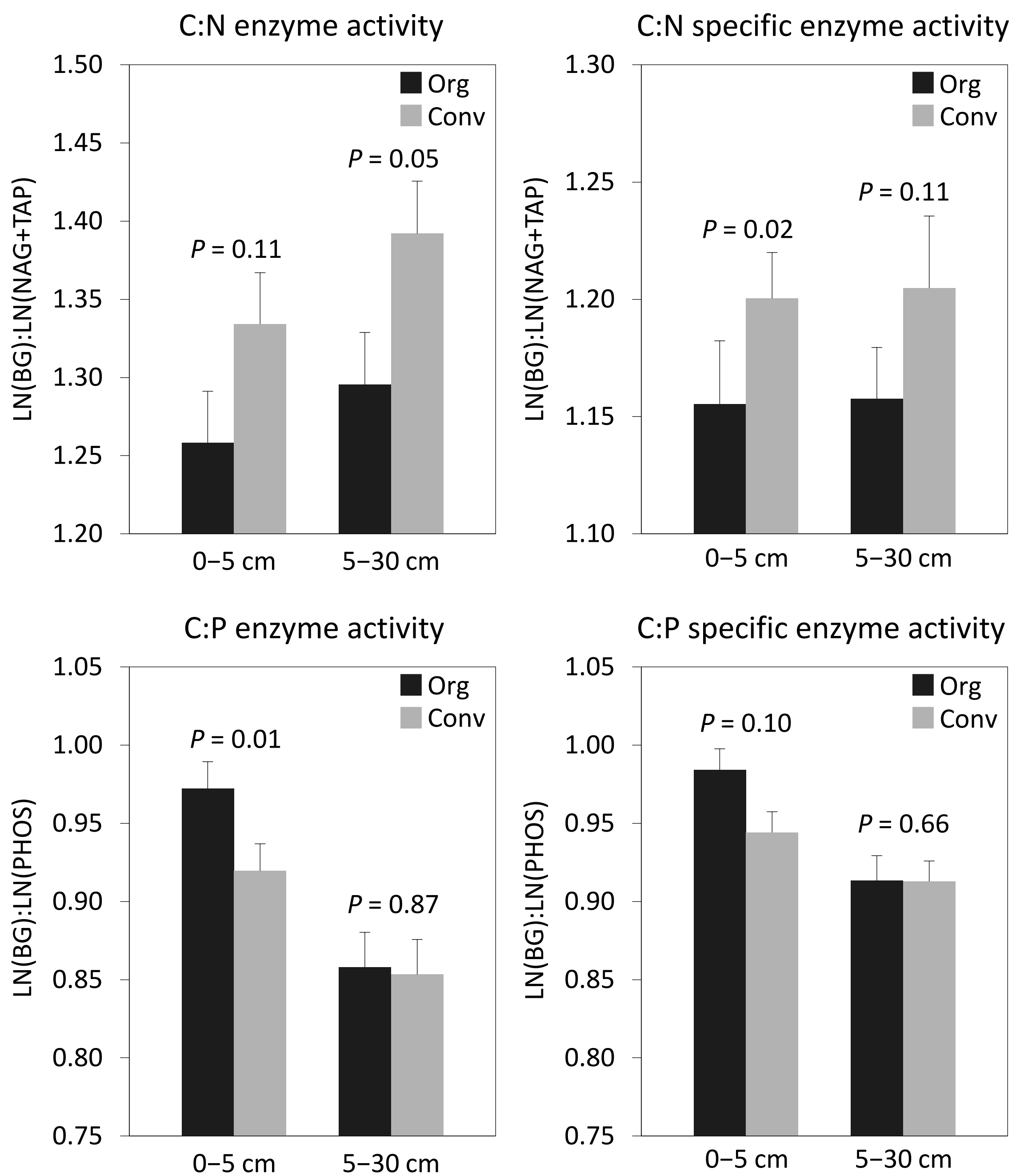


Figure 18. The effect of organic and conventional management on ratios of C:N enzyme activity [LN(β-D-1,4-glucosidase):LN(β-1,4-*N*-acetylglucosiminadase + tyrosine aminopeptidase] and C:P [LN(β-D-1,4-glucosidase):LN(phosphatase)] expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

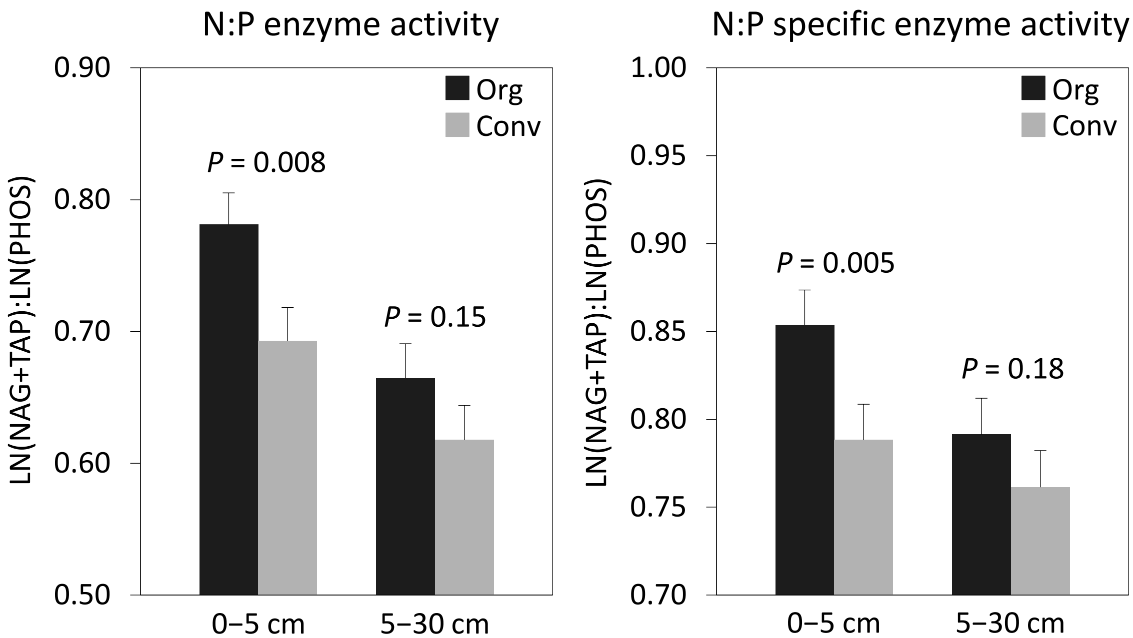


Figure 19. The effect of organic and conventional management on the ratio of N:P enzyme activity [LN(β-1,4-*N*-acetylglucosiminadase + tyrosine aminopeptidase):LN(phosphatase)] expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

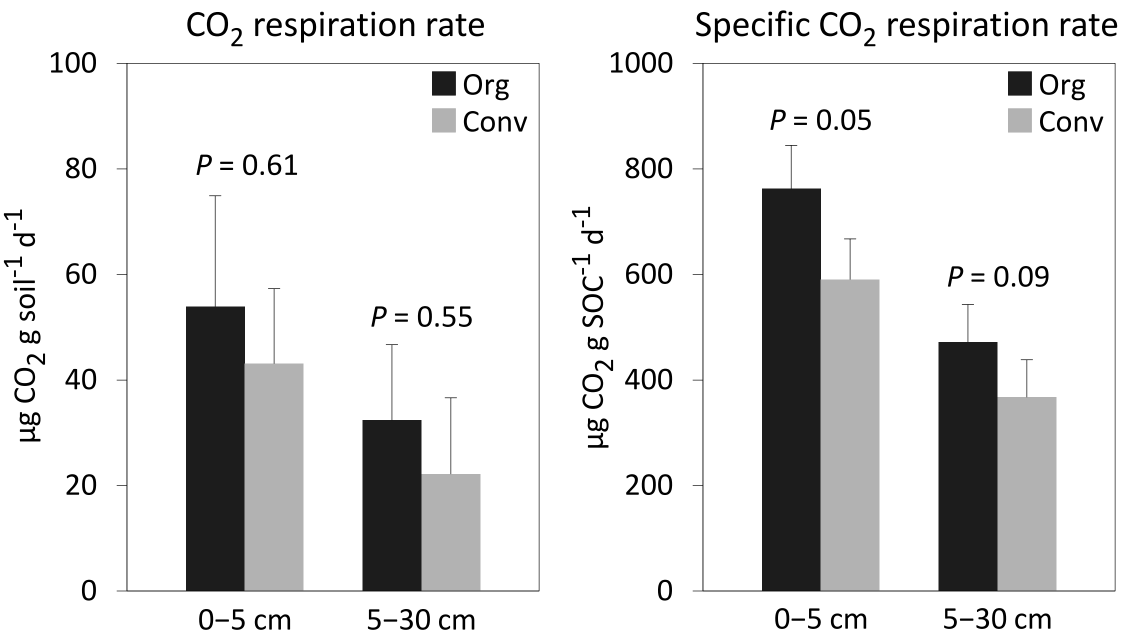


Figure 20. The effect of organic and conventional management on the CO_2 respiration rate in a 30-day incubation expressed per g soil and per g soil C (specific activity) in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates shown). Error bars represent one standard error of the mean (n=8). Management types considered are significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

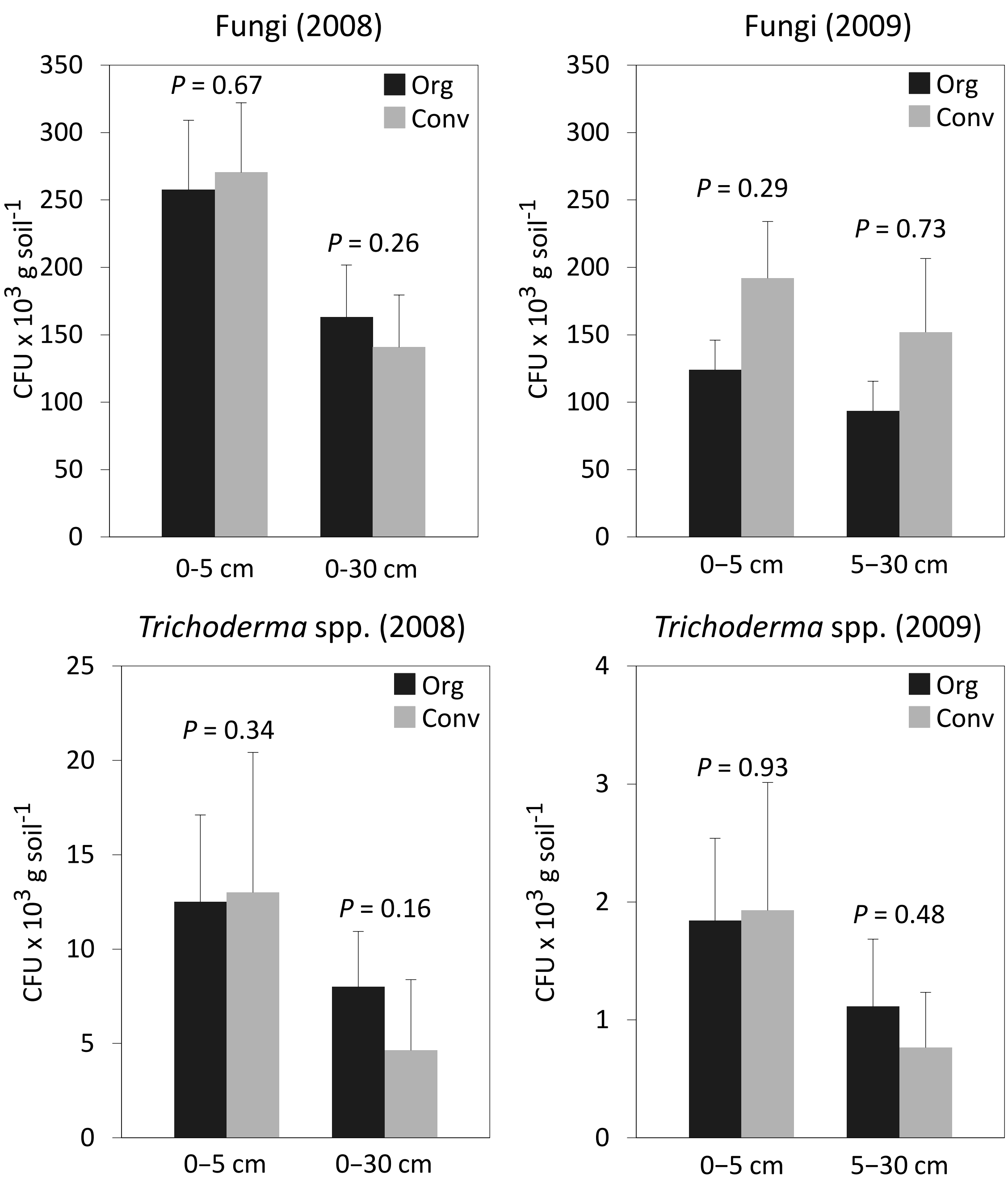


Figure 21. The effect of organic and conventional management on populations of cultivable fungi and *Trichoderma* spp. in soils collected at 0−5 cm and 0−30 cm (2008) and 0−5 cm and 5−30 cm (2009) depth from Michigan blueberry farms in late September and early October 2008 and 9-10 Oct 2009. Error bars represent one standard error of the mean (n=8 or n=6 for *Trichoderma* ssp.). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

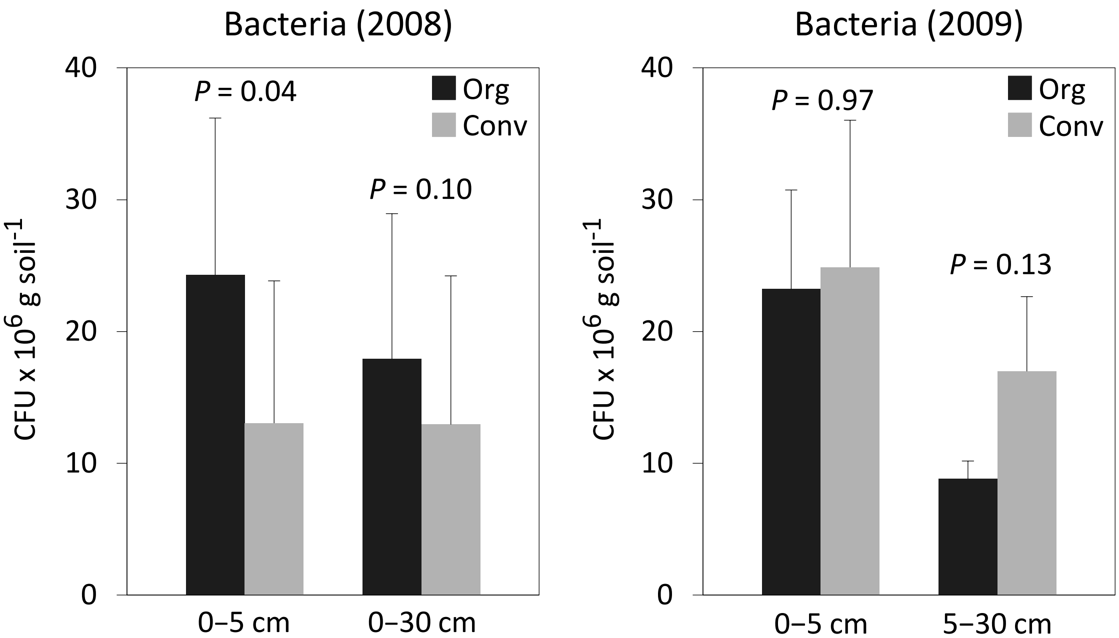


Figure 22. The effect of organic and conventional management on populations of cultivable bacteria in soils collected at 0−5 cm and 0−30 cm (2008) and 0−5 cm and 5−30 cm (2009) depth from Michigan blueberry farms on 25-26 Sept 2008 and 9-10 Oct 2009. Error bars represent one standard error of the mean (n=8). Management types considered are significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast *F*-test).

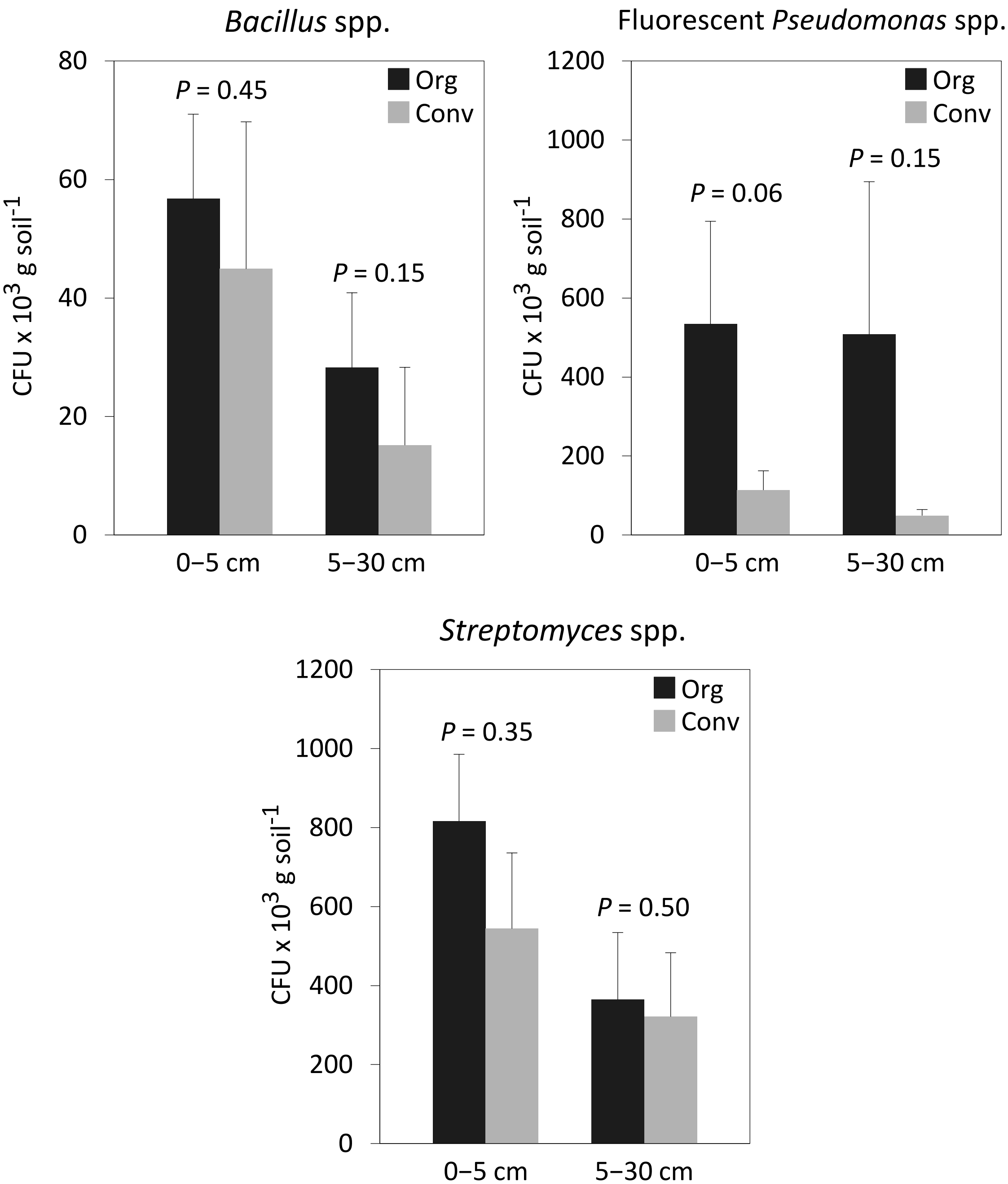


Figure 23. The effect of organic and conventional management on populations of *Bacillus* spp., fluorescent *Pseudomonas* spp., and *Streptomyces* spp. in soils collected at 0−5 cm and 5−30 cm depth from Michigan blueberry farms on 9-10 Oct 2009. Error bars represent one standard error of the mean (n=8). Management types are considered significantly different within a soil depth interval when $P \leq 0.05$ (preplanned contrast F-test).

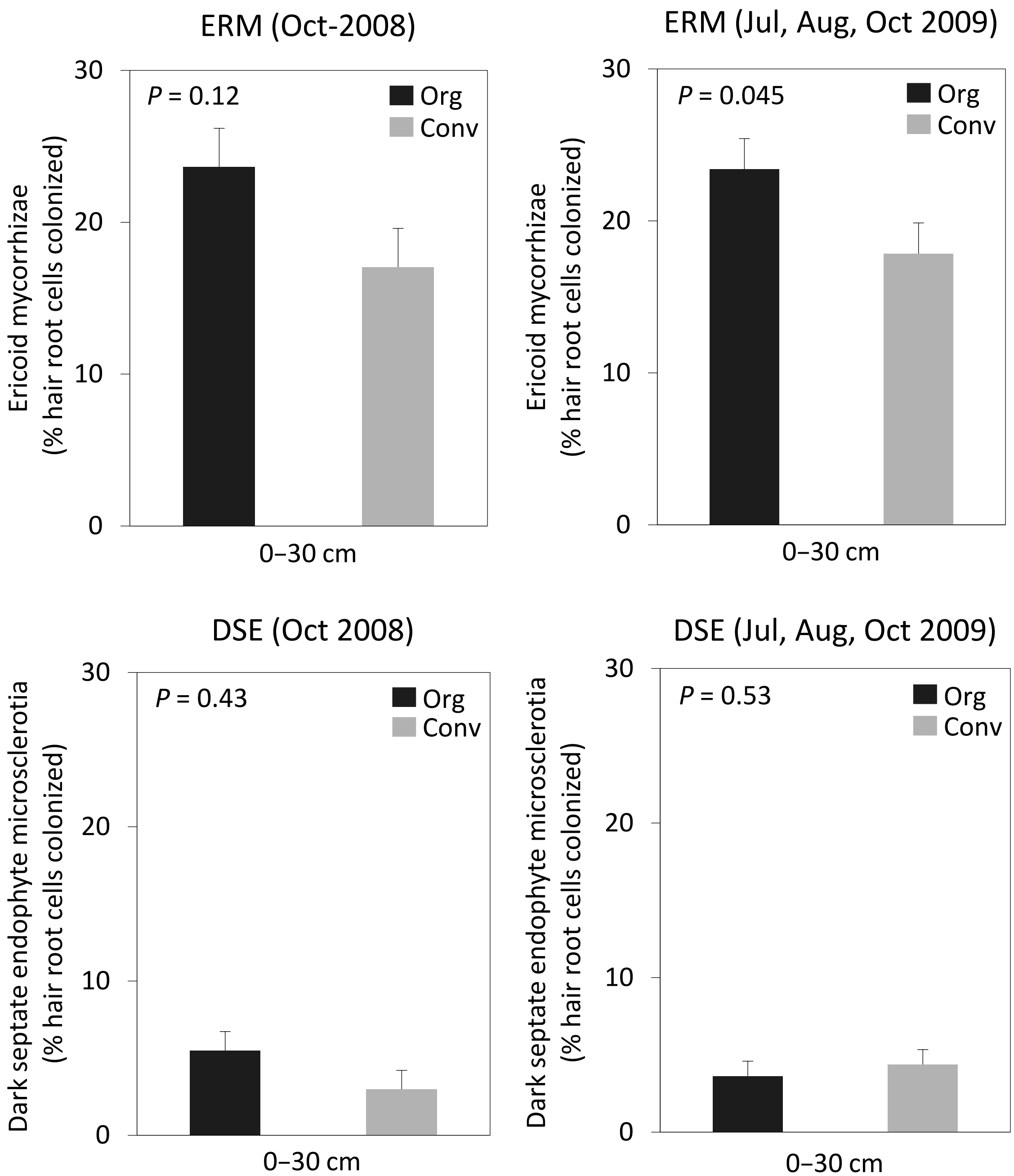


Figure 24. The effect of organic and conventional management on colonization by ericoid mycorrhizae (ERM) and dark septate endophytes (DSE) of roots collected at 0−30 cm depth from Michigan blueberry farms in late September and early October 2008 and 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009 (average of three sampling dates in 2009 shown). Error bars represent one standard error of the mean (n=8). Management types are considered significantly different when $P \leq 0.05$ (mixed model ANOVA, management effect F-test).

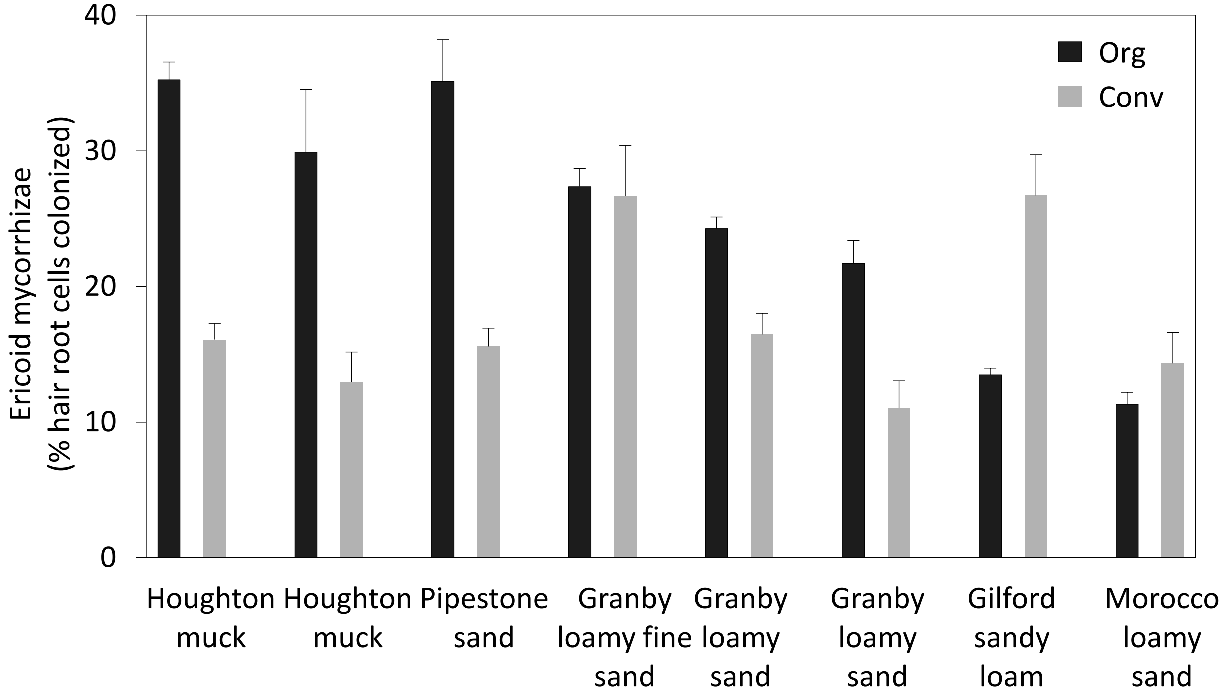


Figure 25. The percentage of hair root cells colonized by ericoid mycorrhizae on organic and conventional Michigan blueberry farms paired by NRCS soil series. Error bars represent one standard error of the mean of samples collected on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009.

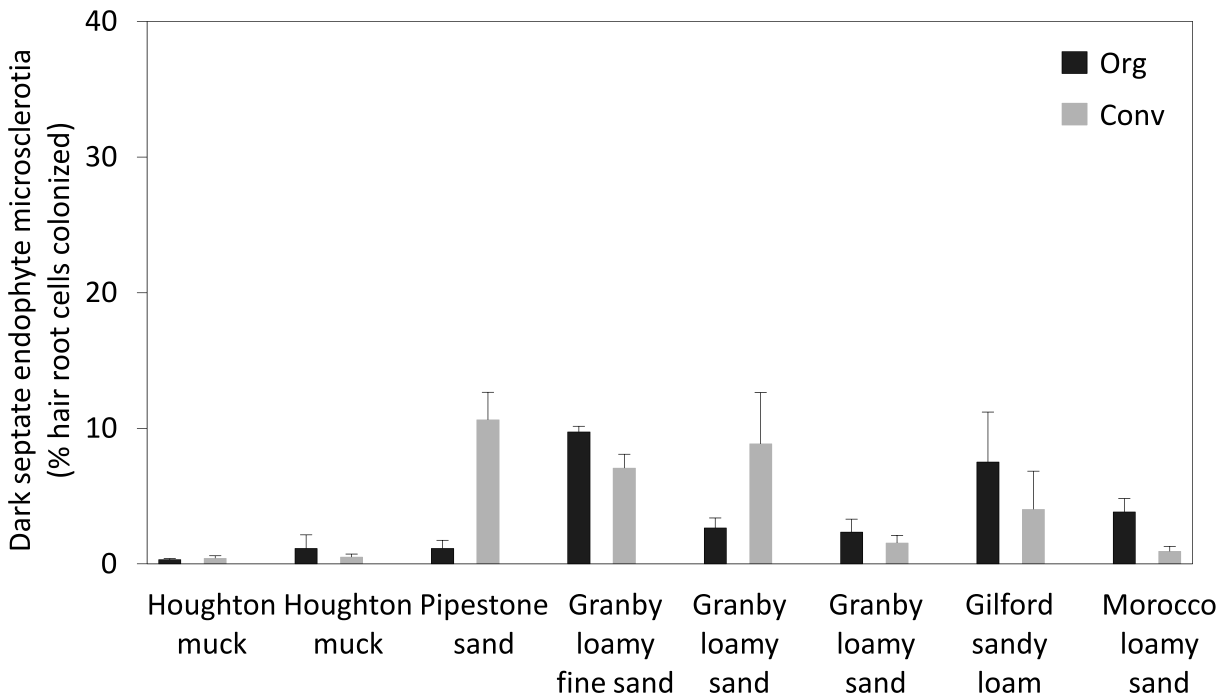


Figure 26. The percentage of hair root cells colonized by dark septate endophyte microsclerotia on organic and conventional Michigan blueberry farms paired by NRCS soil series. Error bars represent one standard error of the mean of samples collected on 6-7 Jul, 21-22 Aug, and 9-10 Oct 2009.

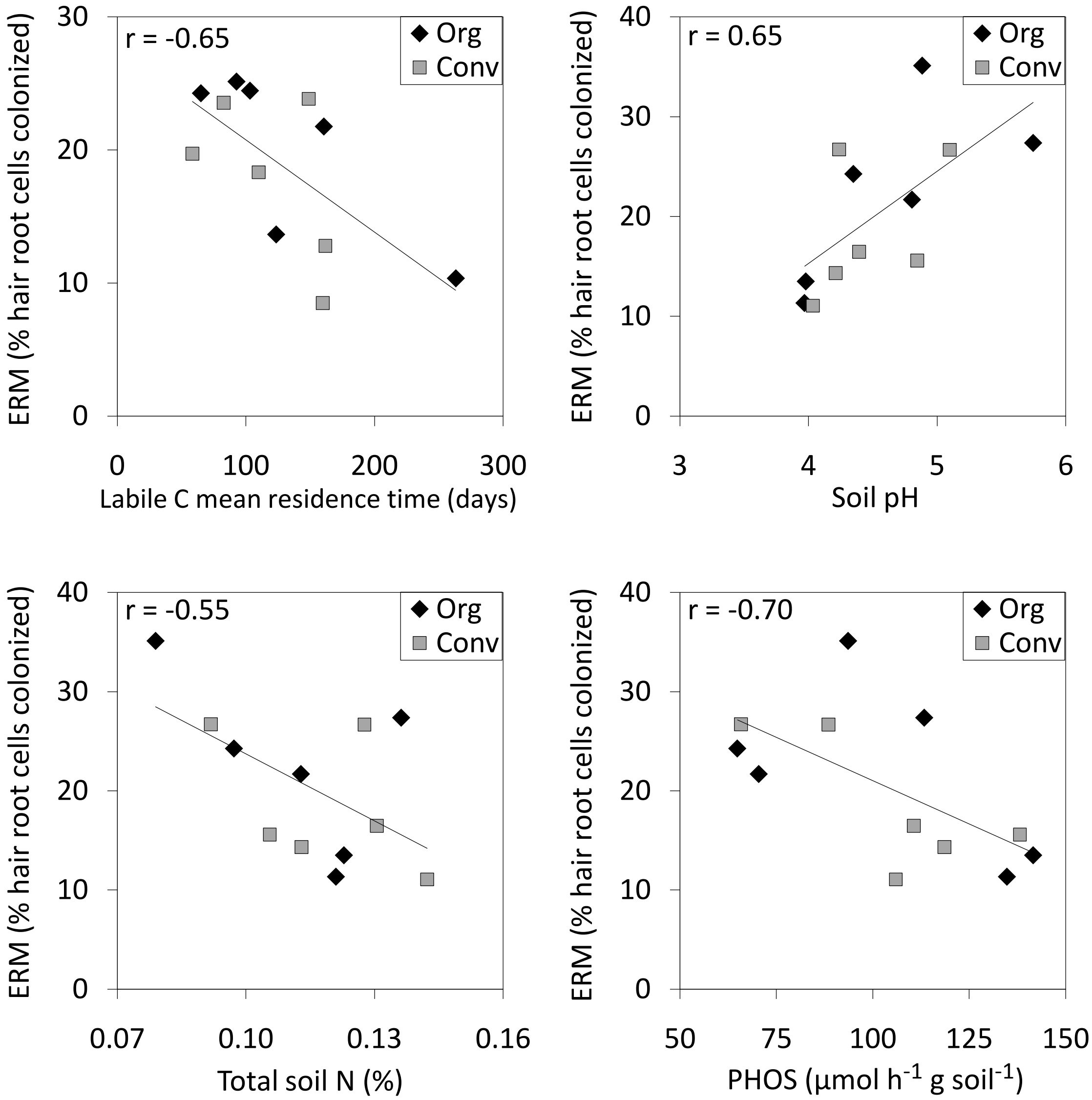


Figure 27. Correlations between ericoid mycorrhizal colonization (ERM) and labile C mean residence time (mrt), soil pH, total soil N, and acid phosphatase (PHOS) activity on organic and conventional blueberry farms (n=12; sands only) in Michigan. Root and soil samples were collected at 0–30 cm depth on 25-26 Sept 2008 (ERM and labile C mrt) and on 6-7 Jul, 21-22 Aug, and 9-10-Oct 2009 (ERM and soil pH, ERM and total soil N, ERM and PHOS, mean of three sampling dates).

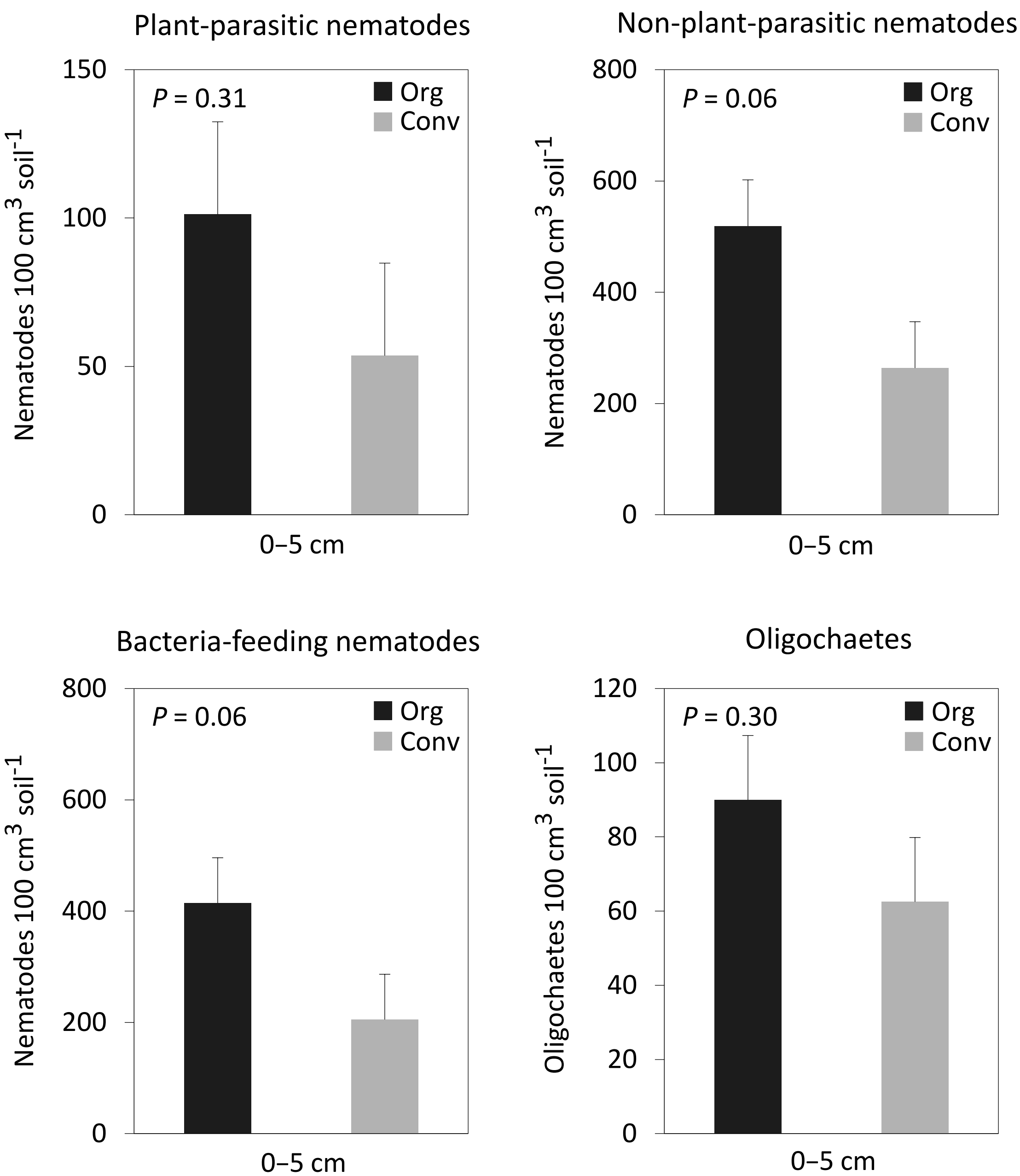
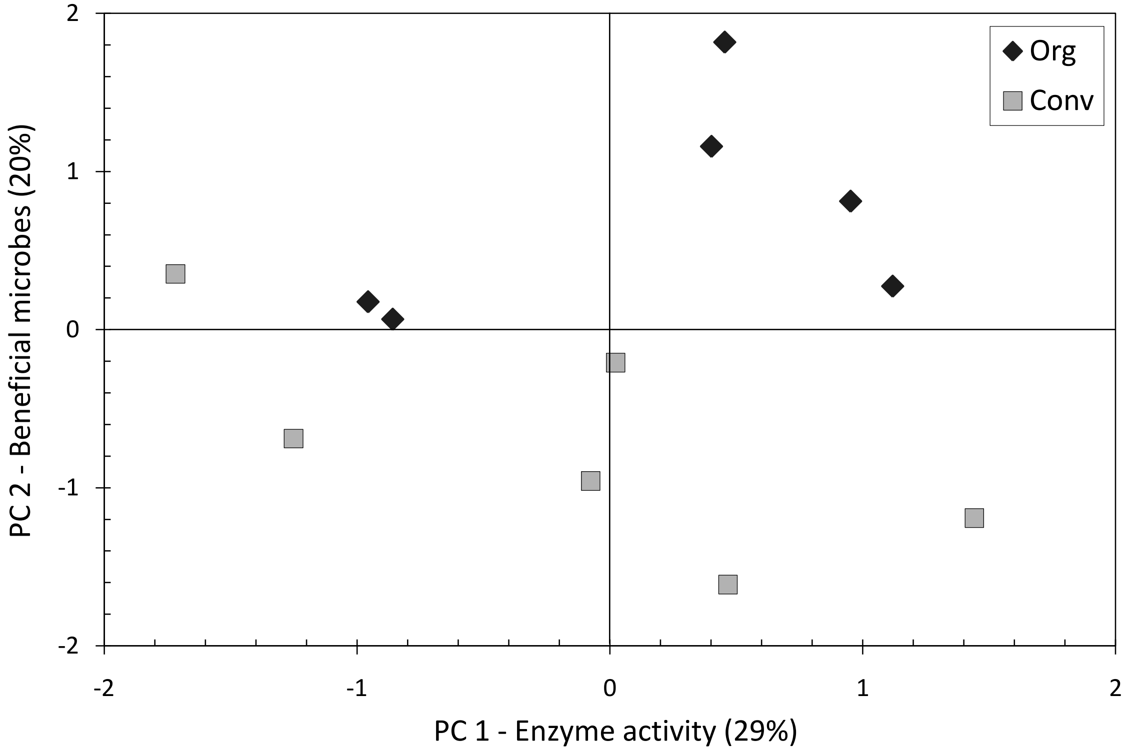


Figure 28. The effect of management on populations of plant-parasitic (sum of lesion, dagger, sheath, ring, spiral, and stunt nematodes), non-plant-parasitic (sum of tylenchs, aphelenchs, dorylaims, mononchs, and bacteria-feeding nematodes), bacterial-feeding nematodes, and oligochaetes (<0.2 mm-diameter earthworms) in soil collected at 0−5 cm depth from organic and conventional Michigan blueberry farms on 7-8 June 2010. Error bars represent one standard error of the mean (n=8). Management types are considered significantly different when $P \leq 0.05$ (Mixed-model ANOVA F-test).



Factor score coefficients

	Factor 1	Factor 2
H_2O	-0.05	-0.21
NAG	0.86*	0.17
BG	0.98*	-0.05
CBH	0.95*	-0.03
PHOS	0.51*	-0.67*
POX	-0.04	0.10
PER	0.83*	-0.14
TAP	0.38	-0.67*
CO_2	0.82*	0.09
Bact	-0.06	0.78*
Strep	0.17	0.75*
Pseu	0.20	0.47*
Baci	0.24	0.82*
Fungi	-0.54*	0.21
Trich	0.15	0.15
ERM	-0.35	0.49*
DSE	0.16	0.18

Figure 29. Principal component analysis (correlation matrix) of biological characteristics of sandy blueberry soils at 0−30 cm depth (bulk density-weighted average of 0−5 cm and 5−30 cm) collected from organic and conventional Michigan blueberry farms 9-10 Oct 2009. Variable abbreviations are defined in Table 3.2. Asterisks denote coefficients of variables which contribute > 0.4 to a principal component.

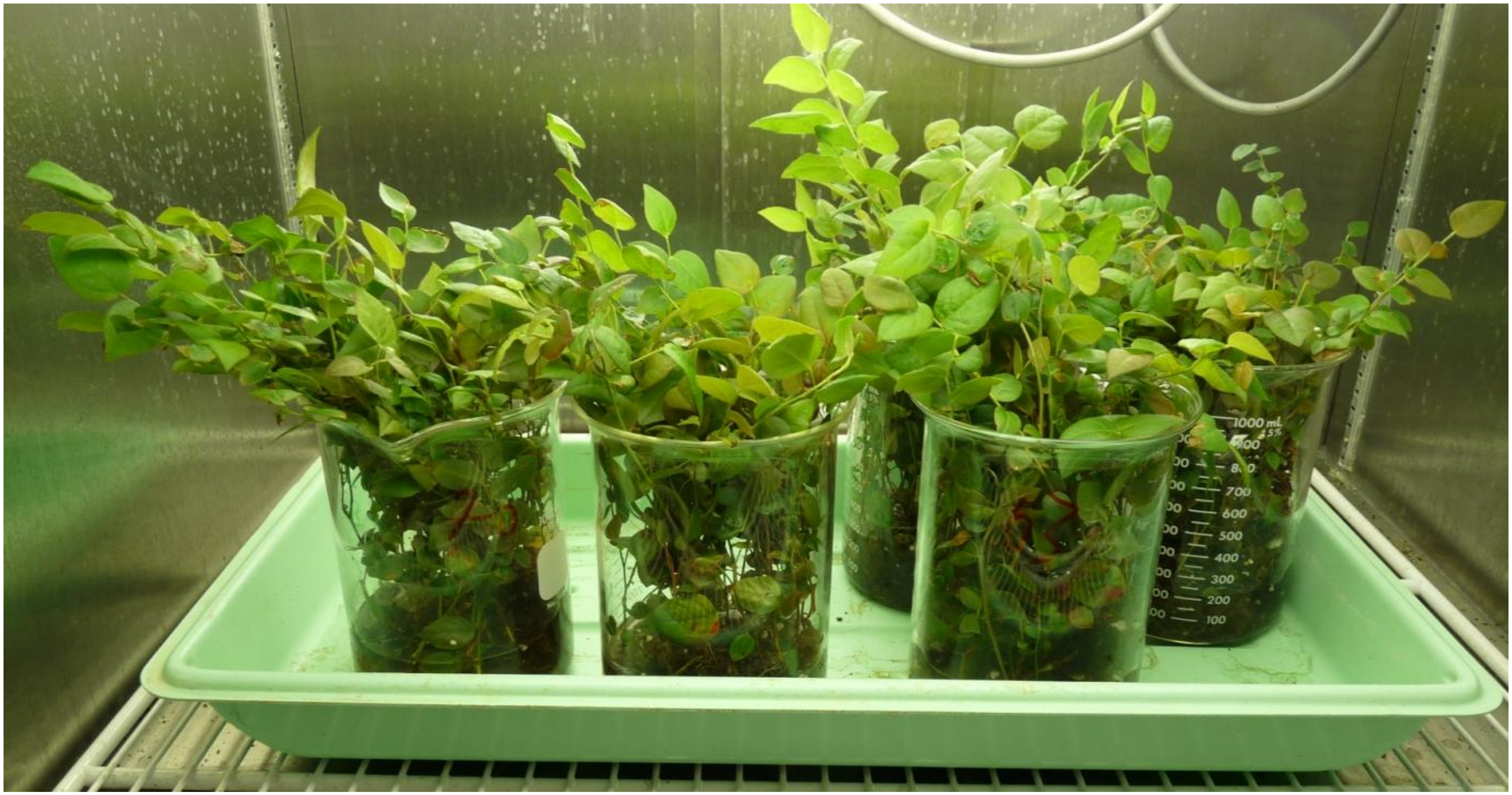


Figure 30. Rooted cuttings of *Vaccinium corymbosum* 'Bluecrop' inoculated with mycelial slurries of ericoid mycorrhizal fungi.

Figure 31. Surface of coir substrate of container-grown blueberry plants amended with feather meal (top) and compost (bottom).

Figure 32. Twelve-week-old rooted cuttings of *Vaccinium corymbosum* 'Bluecrop' grown under fluorescent lights in controlled-environment growth chamber used for an experiment.

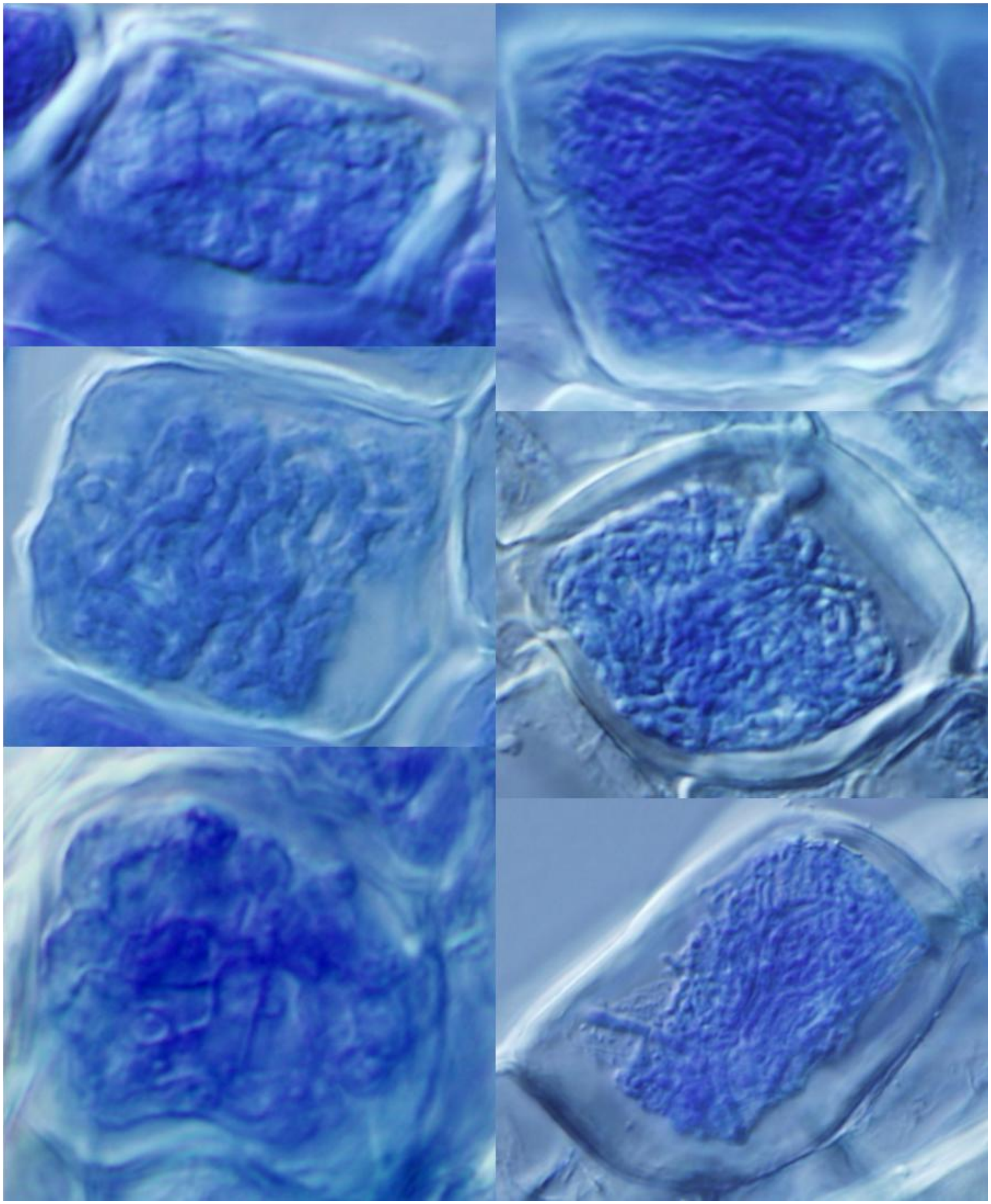


Figure 33. Morphological variation in ericoid mycorrhizal colonization of hair root epidermal cells of 180-day-old rooted cuttings of *Vaccinium corymbosum* ‘Bluecrop’ grown in a coir substrate amended with dairy compost as observed by differential interference contrast (DIC) microscopy at 960X magnification.

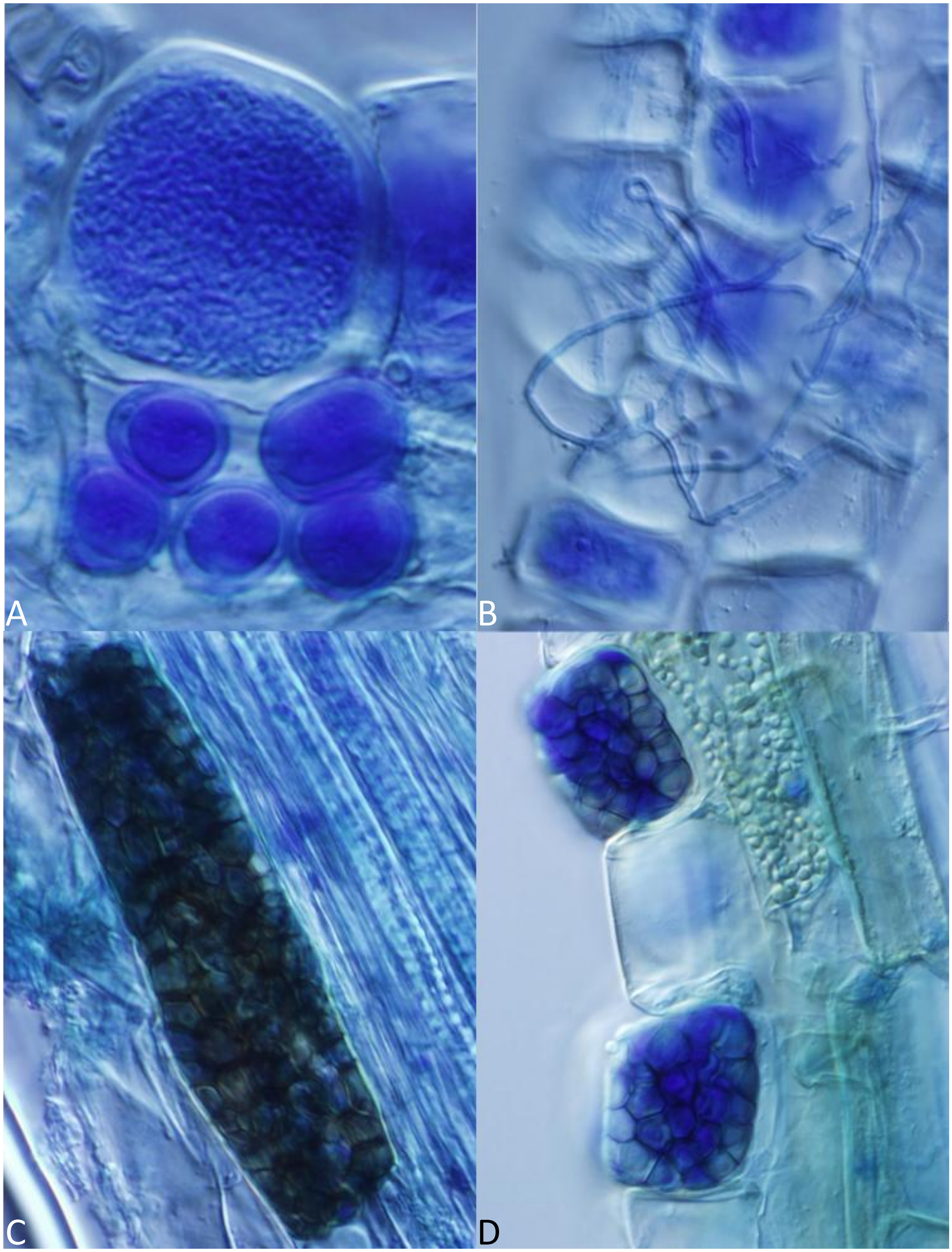


Figure 34. Fungal colonization of hair roots cells of rooted cuttings of *Vaccinium corymbosum* 'Bluecrop' plants grown in coir and provided with compost or feather meal as a nitrogen source as observed by DIC microscopy at 960X magnification. A) Ericoid mycorrhiza adjacent to blue-staining spore-like structures. B) Surface hyphae on mycorrhizal root. C) and D) Dark septate endophyte microsclerotia in root cells.

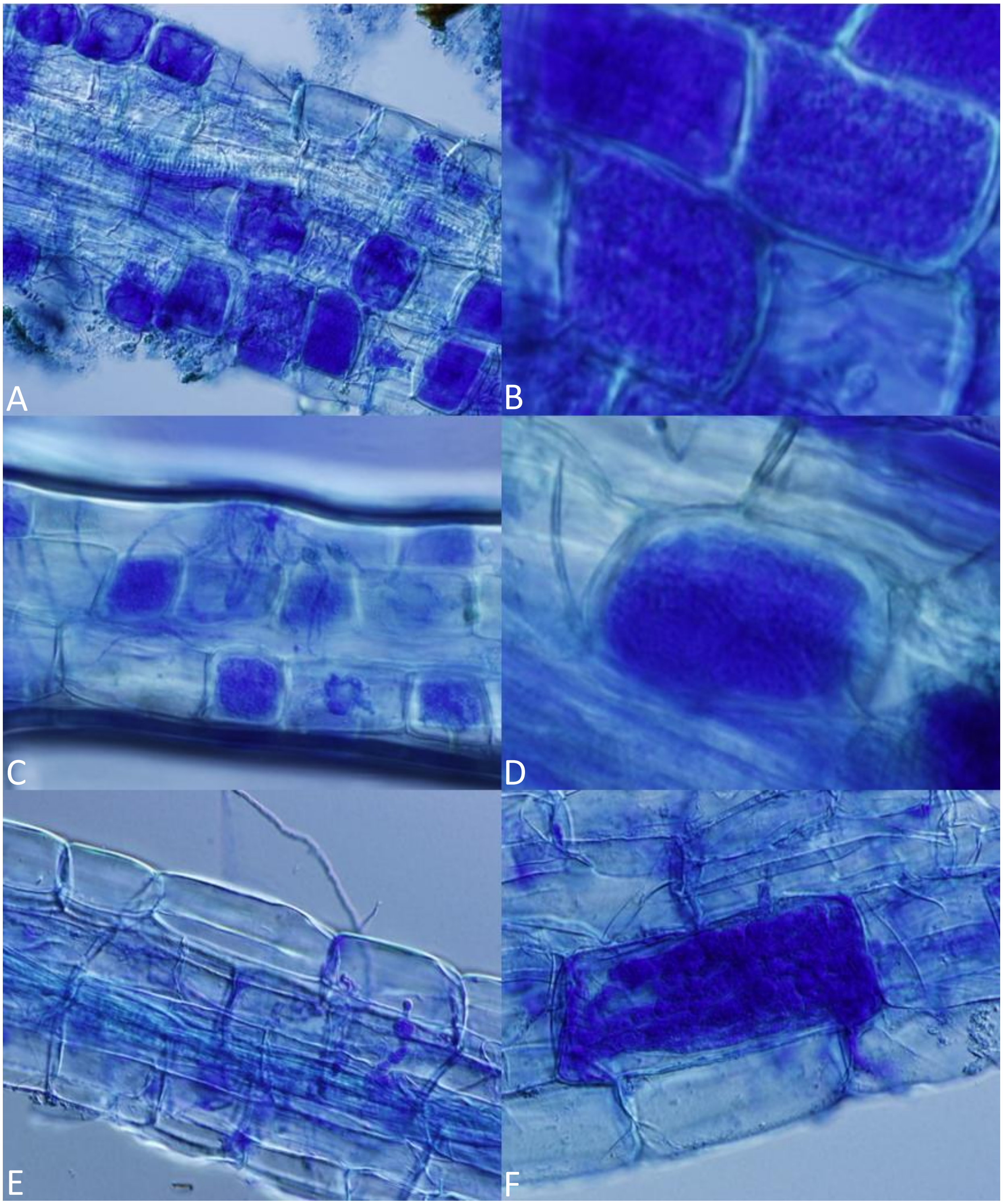


Figure 35. Squash-mounts of blueberry hair root epidermal cells 50 days after inoculation with ericoid mycorrhizal fungi as observed by DIC microscopy at 600 to 960X magnification. A, B) Ericoid mycorrhizae in roots inoculated with *Oidiodendron maius* (UAMH 9263). C, D) Ericoid mycorrhizae in roots inoculated with *Rhizoscyphus ericae* (UAMH 9270). Surface hyphae (E) and intracellular hyphae (F) in roots inoculated with a root-associated fungus of the Ericaceae (UAMH 9264).

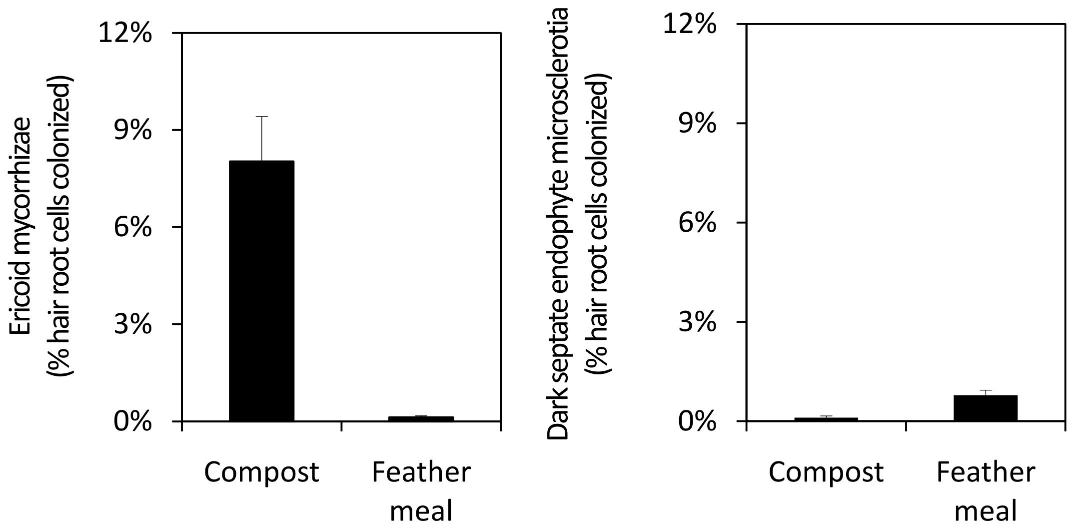


Figure 36. Ericoid mycorrhizae and dark septate endophyte colonization of container-grown rooted cuttings of *Vaccinium corymbosum* 'Bluecrop' grown in coir and fertilized with compost and feather meal 180 days after fertilizers were applied. Error bars represent one standard error of the mean.

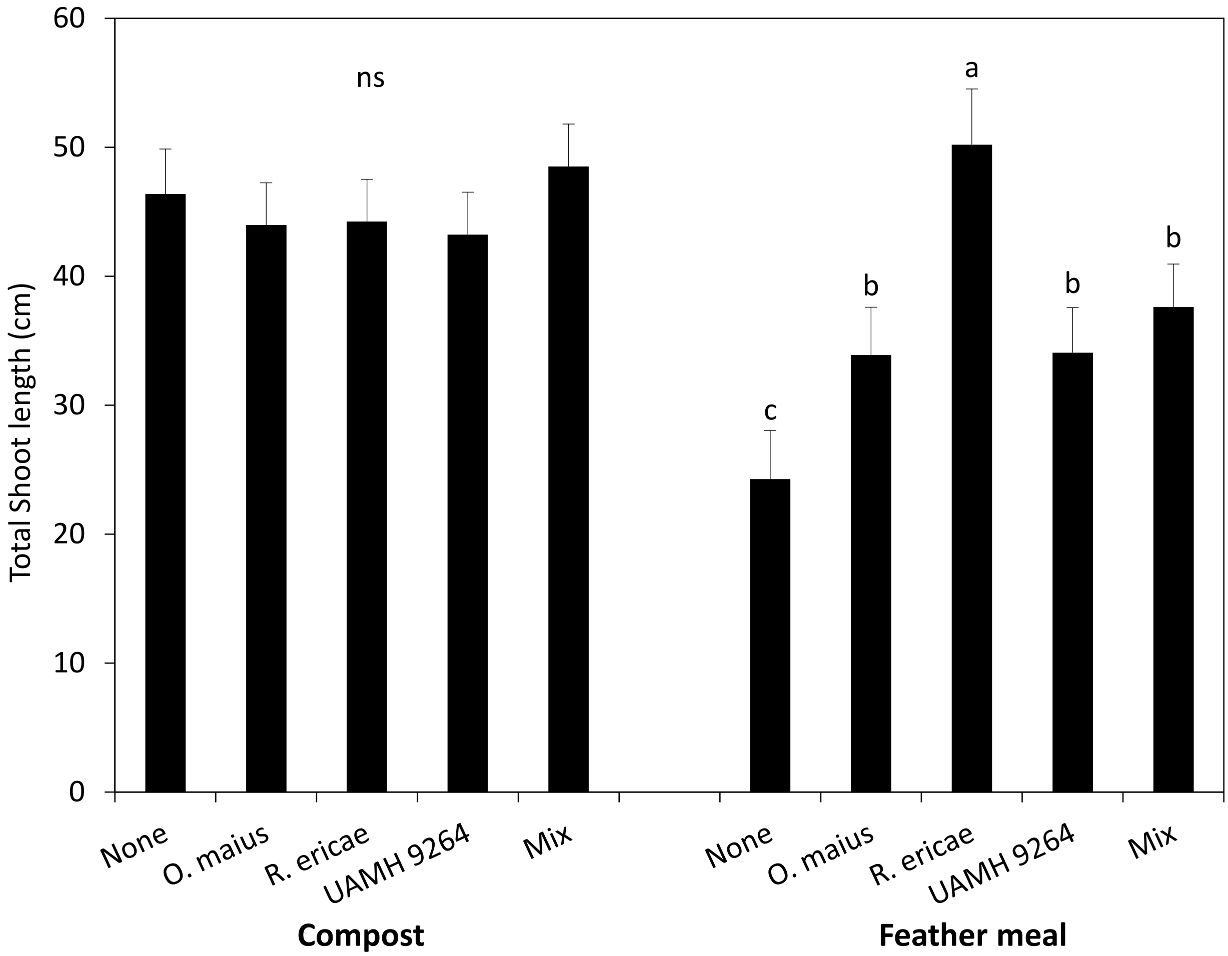


Figure 37. The effect of inoculation with mycorrhizal fungi *Oidiodendron maius* [University of Alberta Microfungus Collection and Herbarium (UAMH) 9263], *Rhizoscyphus ericae* (UAMH 9270), an unidentified root-associated fungus (UAMH 9264), or a mixture of all three fungi (*O. maius*, *R. ericae*, and UAMH 9264) on total shoot length per plant of container-grown rooted cuttings of *Vaccinium corymbosum* 'Bluecrop' grown in coir and fertilized with compost or feather meal. Data were averaged across measurement dates. Error bars represent one standard error of the mean of eight replicates per fertilizer × inoculum treatment combination. Same letters above bars denote no significant difference within each fertilizer treatment at $P<0.05$; "ns" indicates no significant difference.

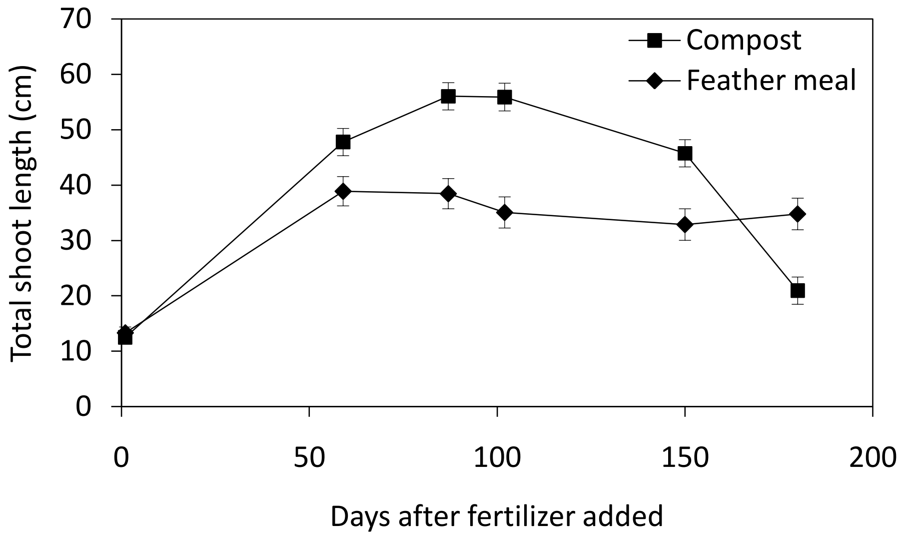


Figure 38. Total shoot length of container-grown rooted cuttings of *V. corymbosum* 'Bluecrop' grown in coir and fertilized with compost or feather meal over 180 days. Shoot length was significantly different between compost and feather meal treatments ($P<0.05$) on each measurement date except on the first measurement date. Error bars represent one standard error of the mean (n=40).

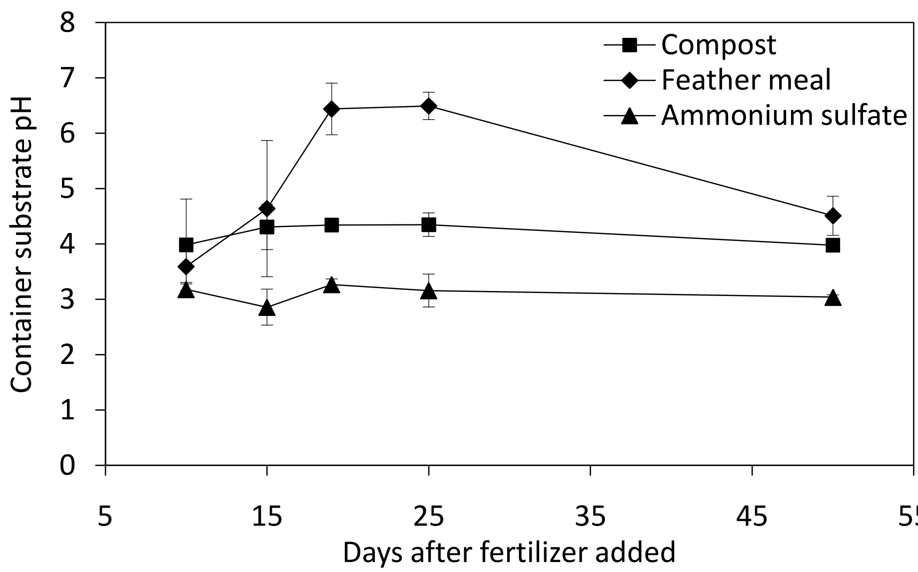


Figure 39. pH of leachate from container-grown rooted cuttings of *V. corymbosum* 'Bluecrop' plants grown in coir and fertilized with compost, feather meal, or ammonium sulfate as sources of nitrogen fertilizer in the first 50 days after fertilizers were added. Error bars represent one standard error of the mean (n=2).

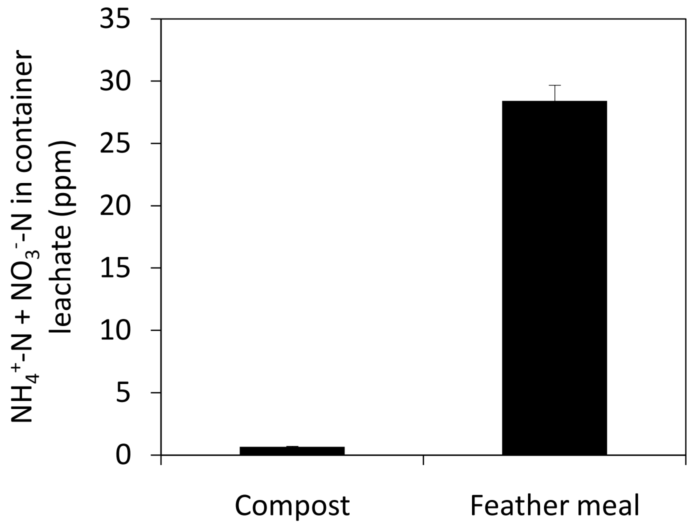


Figure 40. Ammonium- and nitrate-nitrogen in leachate collected from the container substrate of blueberry 'Bluecrop' plants grown in coir 165 days after compost and feather meal were applied. Error bars represent one standard error of the mean.