Table 1. Timing of field operation for muskmelon studies at the Horticulture Research Station, Ames, IA in 2014-15 and 2015-16.

Event	Date	
	2014-15	2015-16
Cover crops seeded	18 Sept. 2014	16 Sept. 2015
Fall strip-tillage	22 Oct. 2014	23 Oct. 2015
Seedlings started in greenhouse	21 May	10 May
Glyphosate applied[z]	27 May	5 June
Cover crop sampled and terminated (CT)[y]	22 May	24 May
Cover crop sampled and terminated (ST)[x]	1 June	2 June
Final strip-tillage (ST)	7 June	9 June
Raised beds and plastic mulch installed (CT)	10 June	10 June
Drip tape installed in ST	11 June	9 June
Preplant fertilizer applied	11 June	9 June
Clomazone applied[w]	12 June	10 June
Muskmelon transplanted	16 June	13 June
Soil sampling	18 June	17 June
	17 July	19 July
	16 Sept.	14 Sept.
Lysimeter sample collection period	1 July-15 Sept.	30 June-9 Sept.
Weed biomass samples taken	8 July	15 July
Microbial biomass and CLPP soil samples	16 Sept.	14 Sept.
Vine length and SPAD measurements taken	31 Aug.	25 Aug.
Petiole sap measurements	---	18 Aug.
Harvest period	21 Aug.-15 Sept.	12 Aug.-13 Sept.

[z] No cover-ST plots only

[y]CT= conventional tillage

[x]ST= strip-tillage

[w]In-row area of all ST plots, and between row area of no cover-ST plots

Table 2. Cover crop dry weight biomass, carbon, and nitrogen content as affected by cover crop and tillage treatments at the Horticulture Research Station, Ames, IA in 2015 and 2016.

Treatment	2015				2016			
	Biomass ($Mg\cdot ha^{-1}$)	Percent C	Percent N	C:N	Biomass ($Mg\cdot ha^{-1}$)	Percent C	Percent N	C:N
Cover crop (C)								
No cover	-	-	-	-	-	-	-	-
Rye	8.2	37.2	1.2	33.1	12.1	41.6	0.9 B	48.8 A
Rye-vetch	7.8	34.1	1.2	30.8	12.0	39.1	1.0A [y]	40.0 B
Tillage (T)[z]								
CT	7.5	34.9	1.2	29.8	11.7	39.5	1.0	40.7 b
ST	8.6	36.4	1.1	34.2	12.4	41.3	0.9	48.1 a
Significance								
Cover crop	ns	ns	ns	ns	ns	ns	0.0075	0.0068
Tillage	ns	ns	ns	ns	ns	ns	ns	<0.0001
C × T	ns	ns	ns	ns	ns	0.0004	ns	ns

[z]CT= conventional tillage, ST= strip-tillage.

[y]Mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns based on least significant difference at $P < 0.05$. Within each column and factor labels not containing the same letter are different. ns = non-significant.

Table 3. Soil temperature at a 15 cm depth of the in-row areas of muskmelon crop as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016.

	2015			2016		
Treatment	Early[z]	Mid	Late	Early	Mid	Late
Cover crop (C)						
No cover	24.5 A[x]	21.6	20.6	26.7 A	23.7	21.1
Rye	23.7 B	21.5	20.2	25.0 B	23.6	21.1
Rye-vetch	23.8 B	21.6	20.2	24.3 B	23.2	20.7
Tillage (T)						
CT[w]	25.3 a	21.9 a	21.1 a	26.0 a	23.9 a	21.2
ST	22.8 b	21.3 b	19.6 b	24.7 b	23.0 b	20.7
Significance						
Cover crop	0.0025	ns	ns	0.0093	ns	ns
Tillage	<0.0001	0.0001	<0.0001	0.0258	0.0009	ns
No cover- CT	25.0 A	21.8 B	21.2 A	27.0	23.9	21.2
No cover-ST	24.0 B	21.5 BC	21.5 BC	26.3	23.5	20.9
Rye-CT	25.3 A	21.9 AB	20.9 A	25.5	24.0	21.2
Rye-ST	22.2 C	21.2 C	19.6 BC	24.6	23.1	20.9
Rye-vetch- CT	25.5 A	22.2 A	21.2 A	25.5	23.9	21.3
Rye-vetch- ST	22.2 C	21.1 C	19.3 C	23.0	22.5	20.1
Significance						
C × T	0.0001	0.0405	0.0145	ns	ns	ns

[z]Early: 26 June -26 July 2015, 24 June – 23 July 2016, Mid: 27 July -28 Aug. 2015, 24 July – 26 Aug. 2016, Late: 29 Aug. -26 Sept. 2015, 27 Aug. -28 Sept. 2016.

[x]Within each year mean separation of cover crop(uppercase letters) and tillage (lowercase letters) in columns based on least significant difference at *P* < 0.05. Within each column and factor labels not containing the same letter are different. ns = non-significant

[w]CT= conventional tillage, ST= strip-tillage

Table 4. Soil moisture ($m^3 \cdot m^{-3}$; Volumetric Water Content) at a 15 cm depth of the in-row areas of muskmelon plots as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016.

Treatment	2015			2016		
	Early[z]	Mid	Late	Early	Mid	Late
Cover crop (C)						
No cover	0.29	0.31	0.32	0.34	0.35	0.35
Rye	0.30	0.31	0.32	0.35	0.36	0.37
Rye-vetch	0.29	0.31	0.29	0.34	0.35	0.36
Tillage (T)						
CT[y]	0.29	0.30	0.29 b[x]	0.33 b	0.33 b	0.33 b
ST	0.30	0.33	0.33 a	0.36 a	0.37 a	0.38 a
Significance						
Cover crop	ns	ns	ns	ns	ns	ns
Tillage	ns	ns	0.0275	0.0267	0.0129	0.0116
C × T	ns	ns	ns	ns	ns	ns

[z]Early: 26 June - 26 July 2015, 24 June - 23 July 2016 Mid: 27 July - 26 Aug. 2015, 24 July - 26 Aug. 2016 Late: 27 Aug. - 26 Sept., 2015, 27 Aug. - 28 Sept. 2016.

[y]CT= conventional tillage, ST= strip-tillage.

[x]Within each year mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns based on least significant difference at $P < 0.05$. Within each column and factor labels not containing the same letter are different. ns = non-significant.

Table 5. Soil nutrient concentrations of muskmelon plots as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016.

Treatment	2015[z]											
	At planting				Mid-Season				End of Season			
	Nitrogen				Nitrogen				Nitrogen			
	NH_4^+-N	NO_3^--N	P	K	NH_4^+-N	NO_3^--N	P	K	NH_4^+-N	NO_3^--N	P	K
Cover crop (C)												
No cover	1.4[y]	3.3	77.7	286.7	0.6	3.2	73.0	232.7	0.1	2.4	66.9	193.4 B[x]
Rye	1.5	2.7	78.2	408.7	0.6	2.7	73.8	362.3	0.1	3.1	73.0	321.4 A
Rye-vetch	1.5	2.8	78.4	274.8	0.6	3.0	75.1	255.0	0.1	2.4	79.8	206.9 B
Tillage (T)[w]												
CT	1.4	4.3 a	78.0	337.9	0.6	4.3 a	80.3	294.5	0.1	3.6 a	75.9	257.8
ST	1.5	1.6 b	78.0	309.0	0.6	1.6 b	81.0	272.3	0.1	1.7 b	70.6	226.6
Significance												
Cover crop	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.0386
Tillage	ns	<0.0001	ns	ns	ns	0.0004	ns	ns	ns	<0.0001	ns	ns
C × T	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	2016[v]											
Cover crop (C)												
No cover	4.0 B	5.7	64.9	117.1	4.2	2.5	59.2	88.0 B	1.9	4.2	52.5 B	130.6
Rye	5.2 AB	5.3	58.4	117.8	2.3	2.0	53.5	121.4 A	2.2	4.0	67.1 AB	131.1
Rye-vetch	7.3 A	6.1	58.1	120.8	2.4	2.9	63.2	110.0 A	2.5	4.1	79.6 A	162.3
Tillage (T)												
CT	5.6	6.0	57.6	132.9	3.9	2.4	58.1	115.7 A	2.6 A	6.0 A	71.9	160.7 A
ST	5.4	5.4	63.4	104.3	2.1	2.4	50.2	97.2 B	1.8 B	2.1 B	60.9	122.0 B
Significance												
Cover crop	0.0447	ns	ns	ns	ns	ns	ns	0.0028	ns	ns	0.0260	ns
Tillage	ns	ns	ns	ns	ns	ns	ns	0.0144	0.0242	0.0007	ns	0.0165
C × T	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

[z]Soil samples were taken from the in row area on 18 June, 17 July, and 16 Sept. 2015.
[y]All measurements displayed as $mg \cdot kg^{-1}$
[x]Within each year mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns is based on least significant difference at $P < 0.05$. Within each column, year, and factor labels not containing the same letter are different. ns = non-significant.
[w]CT= conventional tillage, ST= strip-tillage.
[v]Soil samples were taken from the in-row area 17 June, 19 July, and 14 Sept. 2016.

Table 6. Concentration of nitrate-N in leachate collected from the in-row area of muskmelon plots as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016 in. Leachate was collected using suction lysimeters installed to a depth of 61 cm

Treatment	2015								
	1 July	10 July	17 July	31 July	12 Aug.	25 Aug.	4 Sept.	15 Sept.	30 Sept.
Cover crop (C)									
No cover	32.1[z]	56.2	80.5	34.4	4.1	3.5	9.4	10.4	12.5
Rye	38.8	63.8	66.7	8.6	1.4	2.6	10.0	14.7	16.0
Rye-vetch	41.8	54.7	68.0	26.2	4.9	3.1	5.7	14.5	17.5
Tillage (T)[y]									
CT	37.4	57.7	67.6	24.5	5.4 a[x]	3.7	8.5	15.4	17.2
ST	37.9	58.7	75.9	21.7	1.6 b	2.4	8.2	11.0	13.5
Significance									
Cover crop	ns	ns	ns	ns	ns	ns	ns	ns	ns
Tillage	ns	ns	ns	ns	0.0185	ns	ns	ns	ns
C × T	ns	ns	ns	ns	ns	ns	ns	ns	ns
	2016								
	30 June	6 July	13 July	22 July	8 Aug.	9 Aug.	16 Aug.	25 Aug.	1 Sept.
Cover crop (C)									
No cover	31.0	29.4	23.7	21.4	9.0	6.2	12.0 A	12.0	14.8
Rye	19.7	25.3	21.6	14.5	12.9	4.3	7.9 AB	7.2	10.9
Rye-vetch	16.8	18.5	25.3	17.1	4.0	1.6	2.9 B	7.3	16.5
Tillage (T)									
CT	24.7	32.8 a	32.0 a	24.3 a	6.2	3.8	8.5	10.5	16.4
ST	19.3	16.0 b	15.2 b	11.1 b	6.2	4.3	6.6	7.2	11.7
Significance									
Cover crop	ns	ns	ns	ns	ns	ns	0.0272	ns	ns
Tillage	ns	0.0005	0.0014	0.0260	ns	ns	ns	ns	ns
C × T	ns	ns	ns	ns	ns	ns	ns	ns	ns

[z] NO_3^--N ($mg \cdot L^{-1}$)

[y] CT= conventional tillage, ST= strip-tillage

[x] Within each year, mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns is based on least significant difference at $P < 0.05$. Within each column, year, and factor labels not containing the same letter are different. ns = non-significant.

Table 7. Measurement of plant growth (vine length, SPAD, and petiole sap) as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016

Treatment	2015[z] Vine length (cm)	2015[z] SPAD[x]	2016[y] Vine length (cm)	2016[y] SPAD[x]	2016[y] Petiole sap NO_3^--N ($mg \cdot L^{-1}$)	2016[y] Petiole sap K^+ ($mg \cdot L^{-1}$)
Cover crop (C)						
No cover	262.8	51.8	356.6	46.6	771.5 A[w]	2111.2 B
Rye	265.6	44.3	327.7	45.5	339.2 B	3572.2 A
Rye-vetch	243.1	51.0	316.9	47.9	318.0 B	3755.7 A
Tillage (T)[v]						
CT	282.4 a	46.3 b	356.9 a	48.2 a	566.3 a	2711.1 b
ST	231.9 b	51.8 a	301.6 b	45.1 b	386.1 b	3581.6 a
Significance						
Cover crop	ns	ns	ns	ns	0.0008	0.0005
Tillage	0.0015	0.0231	0.0005	0.0412	0.0003	0.0001
C × T	ns	ns	ns	ns	0.0023	ns

[z]In 2015 SPAD and vine length were measured on 25 Aug.
[y]In 2016 SPAD and vine length were measured on 19 Aug., petiole sap measurements were taken on 17 Aug.
[x]Data were log-transformed for analysis and converted to original values for presentation.
[w]Within each year mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns is based on least significant difference at $P < 0.05$. Within each column and factor labels not containing the same letter are different. ns = non-significant.
[v]CT=conventional tillage, ST=strip-tillage.

Table 8. Marketable muskmelon yield (weight and number of fruit) of muskmelon fruit as affected by cover crop and tillage treatments at the Horticulture Research Station, Ames, Iowa in 2015 and 2016.

Treatment	2015				2016			
	Marketable wt. (Mg·ha^{-1-})	Total wt. (Mg·ha-^{1})	Marketable no. (no.·ha-^{1})	Total no. (no.·ha^{-1})	Marketable wt. (Mg·ha^{-1})	Total wt. (Mg·ha^{-1})	Marketable no. (no.·ha^{-1})	Total no. (no.·ha^{-1})
Cover crop (C)								
No cover	17.4	44.4	2545	6770	40.2	58.3 A[z]	4831 AB	7146 A
Rye	23.7	46.2	3287	6871	34.7	44.3 B	4161 B	5408 B
Rye-vetch	17.4	43.3	3093	6734	43.3	51.5 AB	5461 A	6598 A
Tillage (T)[y]								
CT	23.8 a	48.6 a	3074	6755	42.5 a	59.3 a	5237 a	7484 a
ST	12.8 b	40.7 b	2876	6835	36.1 b	43.4 b	4398 b	5278 b
Significance								
Cover crop	ns	ns	ns	ns	ns	0.0062	0.0080	0.0016
Tillage	0.0250	0.0051	ns	ns	0.0341	<0.0001	0.0125	<0.0001
C × T	ns	ns	ns	ns	ns	ns	ns	ns

[z]Within each year mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns is based on least significant difference at $P < 0.05$. Within each column and factor, labels not containing the same letter are different. ns= non-significance.

[y]CT=conventional tillage, ST= strip-tillage.

Table 9. Density, shape, flesh thickness, and soluble-solids concentration (SSC) of marketable muskmelon frui as affected by cover crops and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016.

Treatment	Density ($g \cdot cm^{-3}$)	Fruit shape[z]	Flesh thickness (cm)	SSC (%)
		2015		
Cover crop (C)				
No cover	0.92	1.12	4.7	7.8
Rye	1.03	1.09	4.8	8.5
Rye-vetch	0.95	1.12	4.7	7.9
Tillage (T)[y]				
CT	0.96	1.11	4.7	8.3
ST	0.96	1.11	4.7	7.9
Significance				
Cover crop	ns	ns	ns	ns
Tillage	ns	ns	ns	ns
C × T	ns	ns	ns	ns
		2016		
Cover crop (C)				
No cover	0.89	1.12 A[x]	4.7 B	9.3 B
Rye	0.89	1.08 B	5.3 A	10.7 A
Rye -vetch	0.91	1.09 B	5.1 AB	9.7 A
Tillage (T)				
CT	0.89	1.13 a	5.0	9.3 b
ST	0.90	1.08 b	5.1	10.5 a
Significance				
Cover crop	ns	0.0059	0.0196	0.0301
Tillage	ns	<0.0001	ns	<0.0001
C × T	ns	ns	ns	ns

[z]Fruit shape = fruit length divided by fruit width.

[y]CT= conventional tillage, ST= strip-tillage.

[x]Mean separation of cover crop (uppercase letters) and tillage (lowercase letters) is based on least significant difference at $P < 0.05$. Labels within each column, year, and factor not containing the same letter are different.

[ns]Non-significant.

Table 10. Microbial functional diversity of the in-row areas of muskmelon plots as affected by cover crop and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016. Data obtained from Biolog-EcoPlate® incubated for 168 h.

Treatment	2015[z]				2016[y]			
	Shannon-Wiener Index	Evenness	Richness	AWCD	Shannon-Wiener Index	Evenness	Richness	AWCD
Cover Crop (C)								
No cover	1.49	1.00	16	0.01	1.26 B	0.85 B[x]	24	0.30
Rye	1.58	1.06	17	0.04	1.47 A	0.98 A	24	0.39
Rye-vetch	1.60	1.07	17	0.06	1.43 A	0.96 A	23	0.30
Tillage (T)[w]								
CT	1.54	1.03	17	0.04	1.39	0.93	24	0.37
ST	1.57	1.05	16	0.02	1.39	0.93	22	0.30
Significance								
Cover crop	ns	ns	ns	ns	0.0143	0.0143	ns	ns
Tillage	ns	ns	ns	ns	ns	ns	ns	ns
C×T	ns	ns	ns	ns	ns	ns	ns	ns

[z]Soil Samples collected on 16 Sept. 2015.

[y]Soil Samples collected on 14 Sept. 2016.

[x]Within each year mean separation of cover crop (uppercase letters) and tillage (lowercase letters) in columns is based on least significant difference at $P < 0.05$. Within each column and factor labels not containing the same letter are different. ns = non-significance.

[w]CT= conventional tillage, ST= strip-tillage.

Table 11. Winter survival of soilborne *Listeria innocua* in muskmelon plots as affected by cover crop and tillage at the Horticulture Research Station, Ames, IA in 2015 and 2016.

	Positive (%)	
Treatment	2015[z]	2016
Cover crop (C)		
No cover	100[y]	100
Rye-vetch	88	100
Rye	88	100
Tillage (T)[x]		
CT	92	100
ST	92	100
Significance[w]		
Cover crop	ns	ns
Tillage	ns	ns

[z]Soil was populated with *Listeria innocua* Oct. 2014 and 2015, soil was sampled May 2015 and 2016.
[y]Indicate the percentage of samples that were positive for *Listeria innocua*.
[x]CT= conventional tillage, ST= strip-tillage.
[w]Frequencies within a column and factor determined using logistic regression analysis. Significant differences ($P < 0.05$) were identified using automatic forward selection option.
[ns]Non-significant.

Table 12. Summer survival of soilborne *Listeria innocua* in muskmelon plots as affected by cover crops and tillage treatments at the Horticulture Research Station, Ames, IA in 2015.

	Positive (%)			
Treatment	May[z]	June	July	August
Cover crop (C)				
No cover	100	100	86	75
Rye-vetch	100	25	0	0
Rye	100	37	0	0
Tillage (T)				
CT	100	67	33	33
ST	100	42	33	9
Significance[y]				
Cover crop	ns	0.0055	<0.0001	0.0003
Tillage	ns	ns	ns	ns
C×T	ns	ns	ns	ns

[z]Soil was inoculated with *Listeria innocua* on 14 May 2015. Samples were collected on 17 May, 15 June, 15 July, and 18 August 2015.

[y]Frequencies within a column and for each factor were determined with logistic regression analysis. Significant differences ($P < 0.05$) were identified using automatic forward selection option.

[ns]Non-significant.

Table 13. Detection of *Listeria innocua* on the exterior of muskmelon fruits at the Horticulture Research Station, Ames, IA in 2015 and 2016. Treatment factors were cover crop, tillage, and the month soil was inoculated with *L. innocua*.

	Positive (%)	
Treatment	2015	2016
Cover Crop (C)		
No cover	20[z]	0
Rye-vetch	13	6
Rye	13	6
Tillage (T)[y]		
CT	10	4
ST	4	4
Inoculation month (M)		
Oct.	8	4
May	6	4
Significance[x]		
C	ns	ns
T	ns	ns
M	ns	ns
C×T	ns	ns
C×M	ns	ns
C×T×M	ns	ns
T×M	ns	ns

[z]Percentages of samples that were positive for *Listeria innocua*.
[y]CT= conventional tillage, ST= strip-tillage.
[x]Frequencies within a column were determined with logistic regression analysis. Significant differences ($P < 0.05$) were identified using automatic forward selection option.
[ns]Non-significant.

Table 14. Profitability (U.S. $/ha.) of muskmelon production in 2015 as affected by cover crop and tillage treatments at the Horticulture Research Station, Ames, IA.

	2015					
	No cover		Rye		Rye-vetch	
	CT[z]	ST	CT	ST	CT	ST
Muskmelon yield ($Mg\cdot ha^{-1}$)	21.0	13.9	26.6	20.9	23.8	18.6
Muskmelon yield ($no.\cdot ha^{-1}$)	2790	2301	3248	3326	3184	3001
Wholesale gross revenue[y]	8750	5792	11084	8708	9917	7750
Direct market gross revenue[x]	10128	8353	11790	12073	11558	10894
Inputs[w]	1328	1252	1394	1302	1507	1415
Equipment and ownership costs[v]	1349	1324	1506	1493	1506	1493
Pre-harvest labor[u]	1371	2671	1049	1436	1124	1038
Harvest costs[t]	4662	3086	5905	4640	5284	4129
Interest expense[s]	203	195	233	208	218	183
Total costs	8913	8527	10087	9079	9639	8259
Wholesale profit	-163	-2735	996	-370	278	-509
Direct market profit	1214	-175	1703	2995	1919	2635

[z]CT= conventional tillage, ST=strip-tillage.
[y]Three-year average (2014-16) U.S. prices ($416.65/Mg; USDA-NASS, 2017).
[x]Average price for cantaloupe from Iowa farmers markets($3.63/fruit; USDA-AMS, 2016).
[w]Pesticide, fertilizer, drip-tape, plastic mulch, potting mix, seedling trays, cover crop seed, and muskmelon seed
[v]Cost of farm machinery ownership and operation (Edwards, 2015), greenhouse overhead costs ($0.267/ft^2-wk.; Brumfield, 1992) irrigation equipment, and average cash rent rate for Iowa ($575/ha; Plastina et al., 2016).
[u]Labor for weeding, transplanting, and fertilizer application.
[t]Harvest costs were $0.222/kg marketable fruit (Ogbuchiekwe et al., 2004).

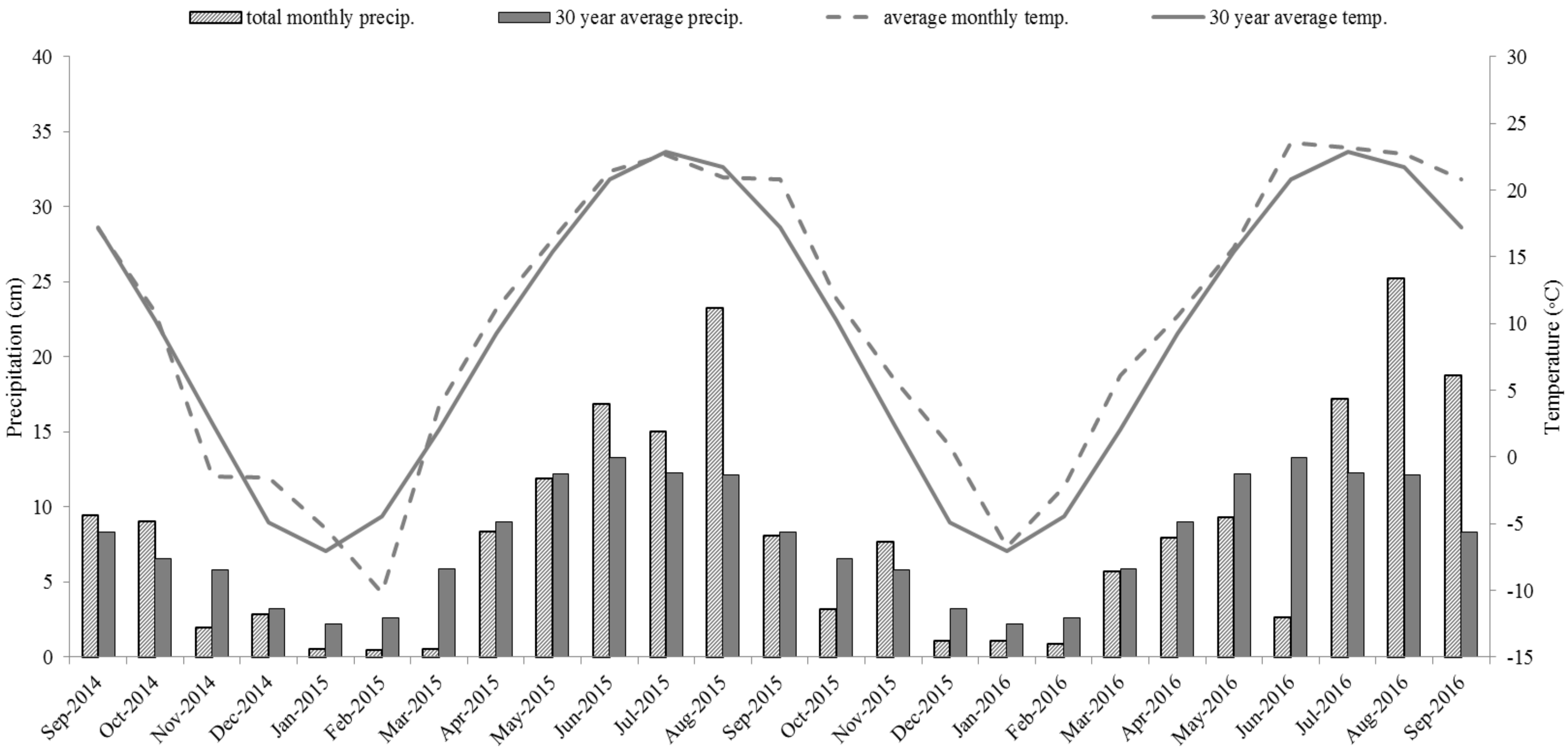

Fig. 1 Average monthly air temperature and total monthly precipitation from Sept. 2014-Sept. 2016 compared to 30-year averages in Ames, IA. Average monthly temperature and total monthly precipitation data obtained from Iowa Environmental Mesonet Network, Iowa State University. Data for 30-year averages obtained from National Centers for Environmental Information, National Oceanic and Atmospheric Administration.

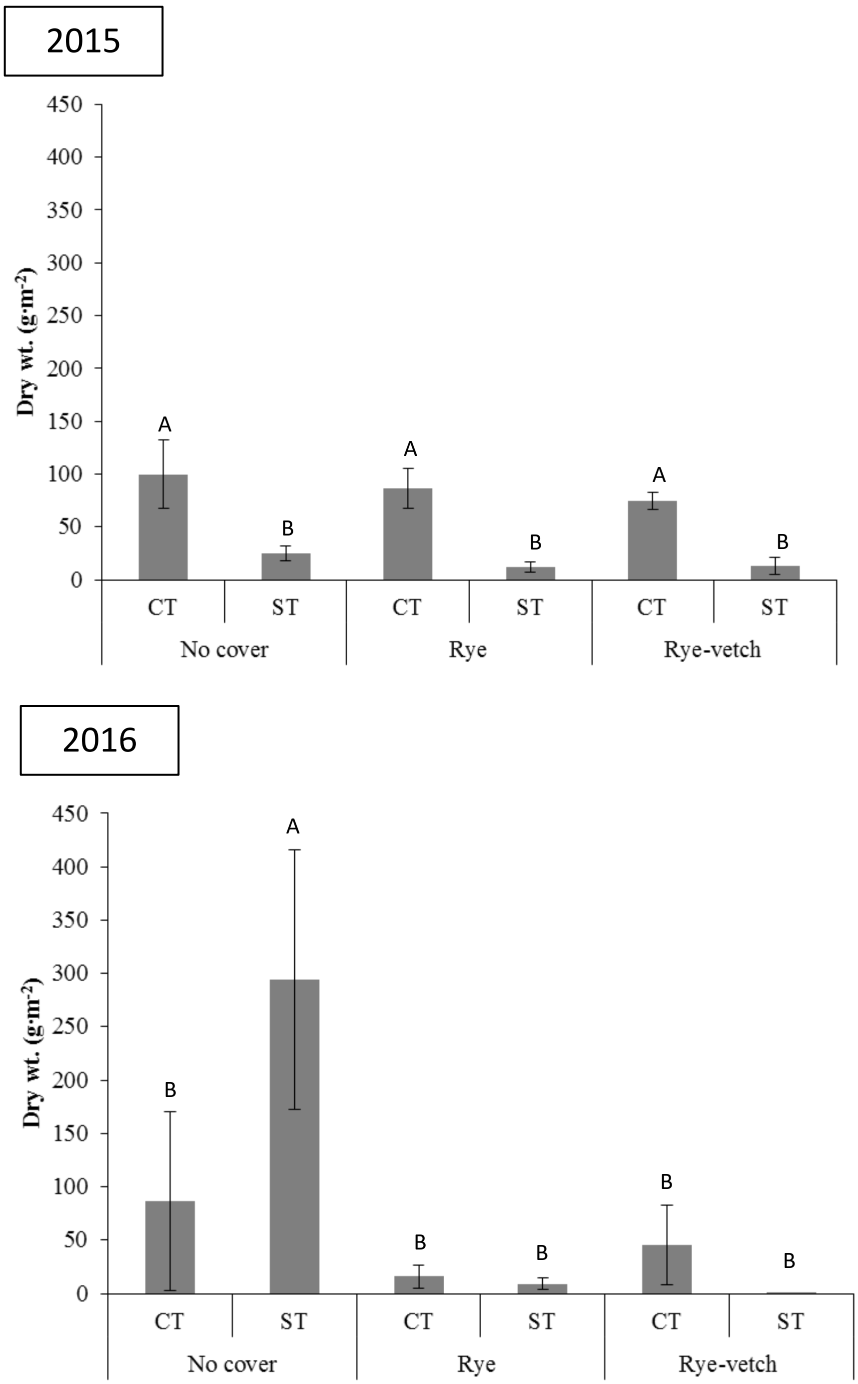

Fig. 2. Weed dry weight biomass from the between row area of muskmelon plots, as affected by cover crop and tillage (CT=conventional tillage, ST=strip-tillage) in 2015 (above) and 2016 (below), at the Horticulture Research Station, Ames, IA. Within each year mean separation based on least significant difference at $P < 0.05$. Within each year labels not containing the same letter are different. ns = non-significant. Error bars represent standard error of the mean.

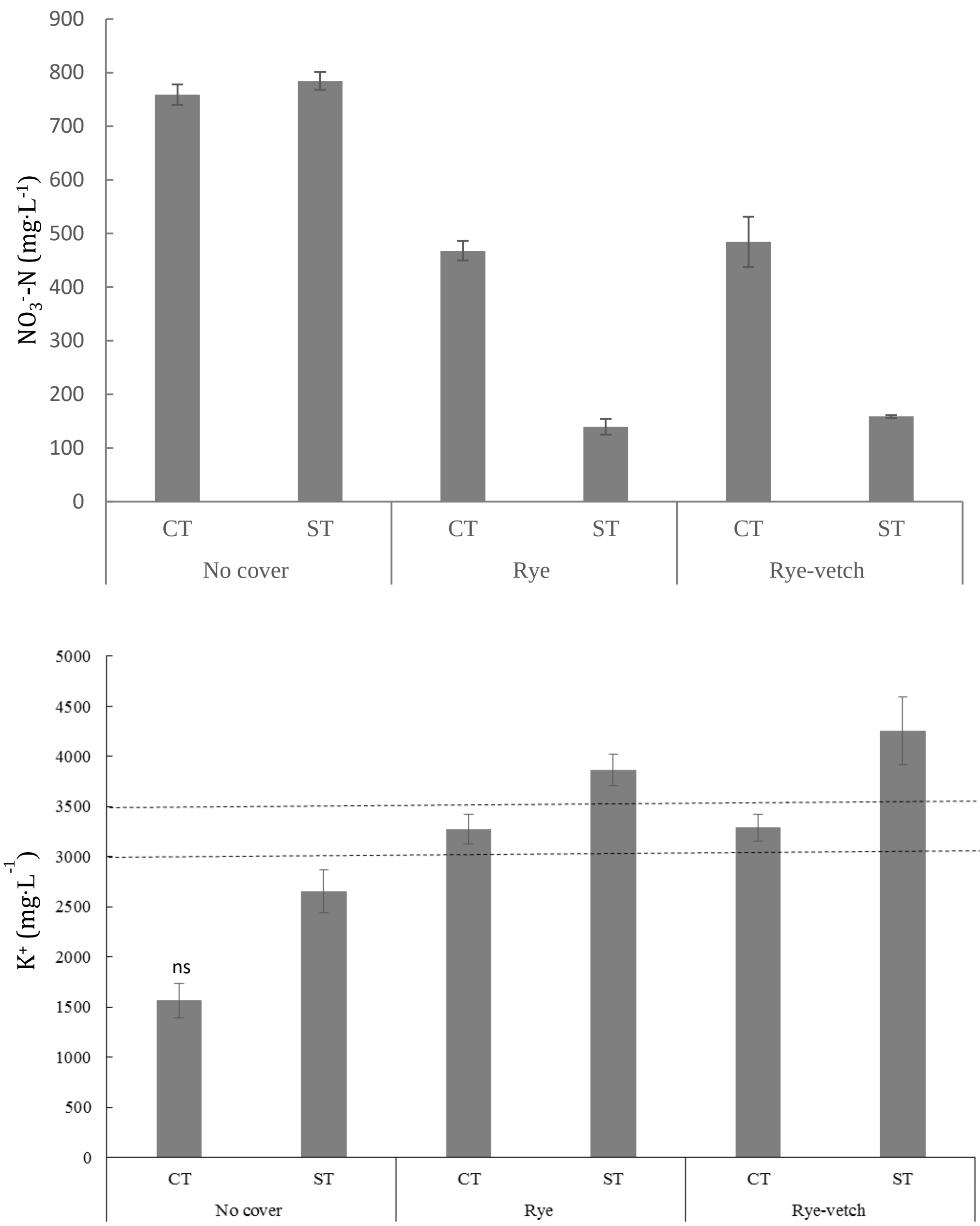

Fig. 3. Interaction effects of nitrate-nitrogen and potassium ion concentrations in muskmelon petiole sap as affected by cover crops and tillage (CT=conventional tillage, ST=strip-tillage) sampled on 18 Aug. 2016 at the Horticulture Research Station, Ames, IA. Mean separation of NO_3^--N (uppercase letters) and K^+ (lowercase letters) based on least significant difference at $P < 0.05$. Labels not containing the same letter are different. ns = non-significant. Error bars represent standard error of the mean. Horizontal dashed line represent upper and lower limits of sufficiency ranges for NO_3^--N (700-800 mg·L^{-1}) and K^+ (3000-3500 mg·L^{-1}) as recommended by Hochmuth et al. (1991) .

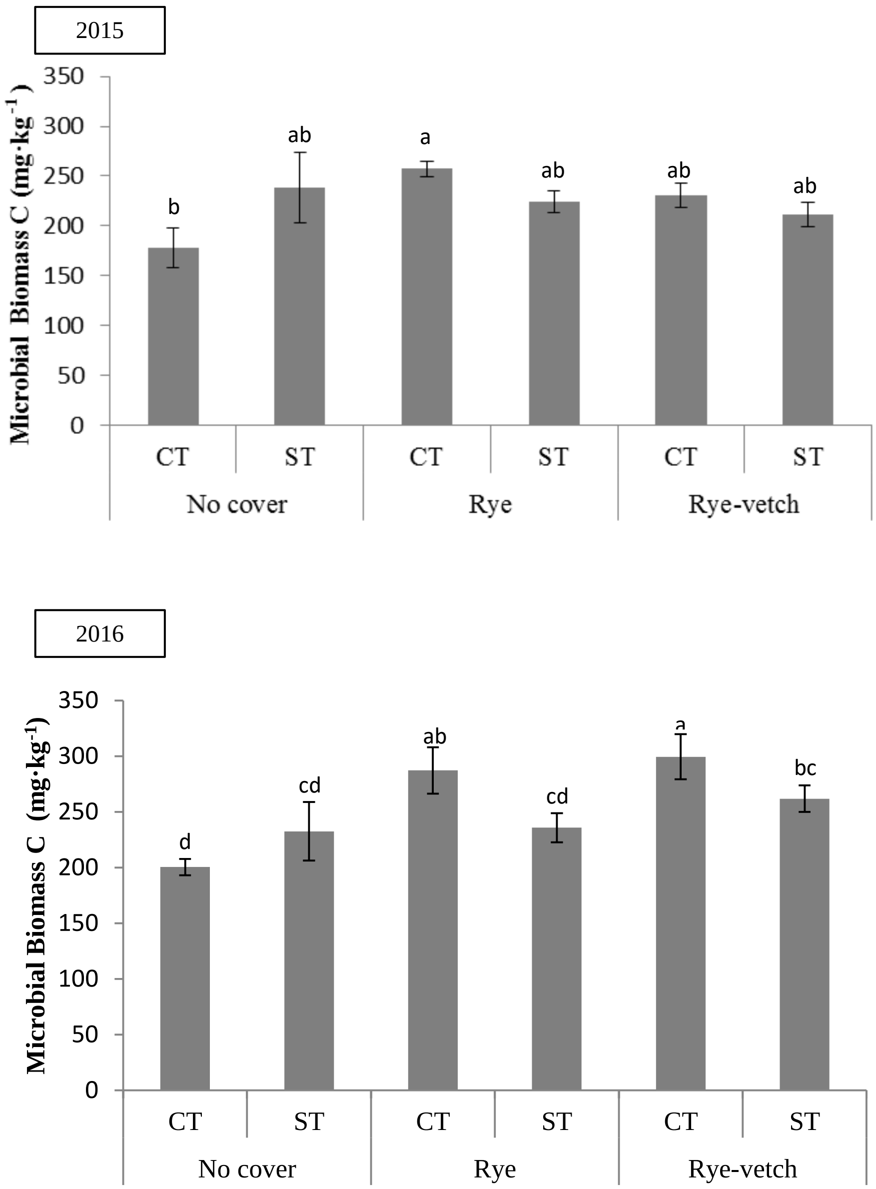

Fig. 4. Microbial biomass carbon of the in-row area as affected by cover crops and tillage (CT= conventional tillage, ST= Strip-tillage) in 2015 (left) and 2016 (right) at the Horticulture Research Station, Ames, Iowa. Within each year, bars with labels not containing the same letter are significantly different according to least significant difference ($P < 0.05$). Error bars represent standard errors of means.

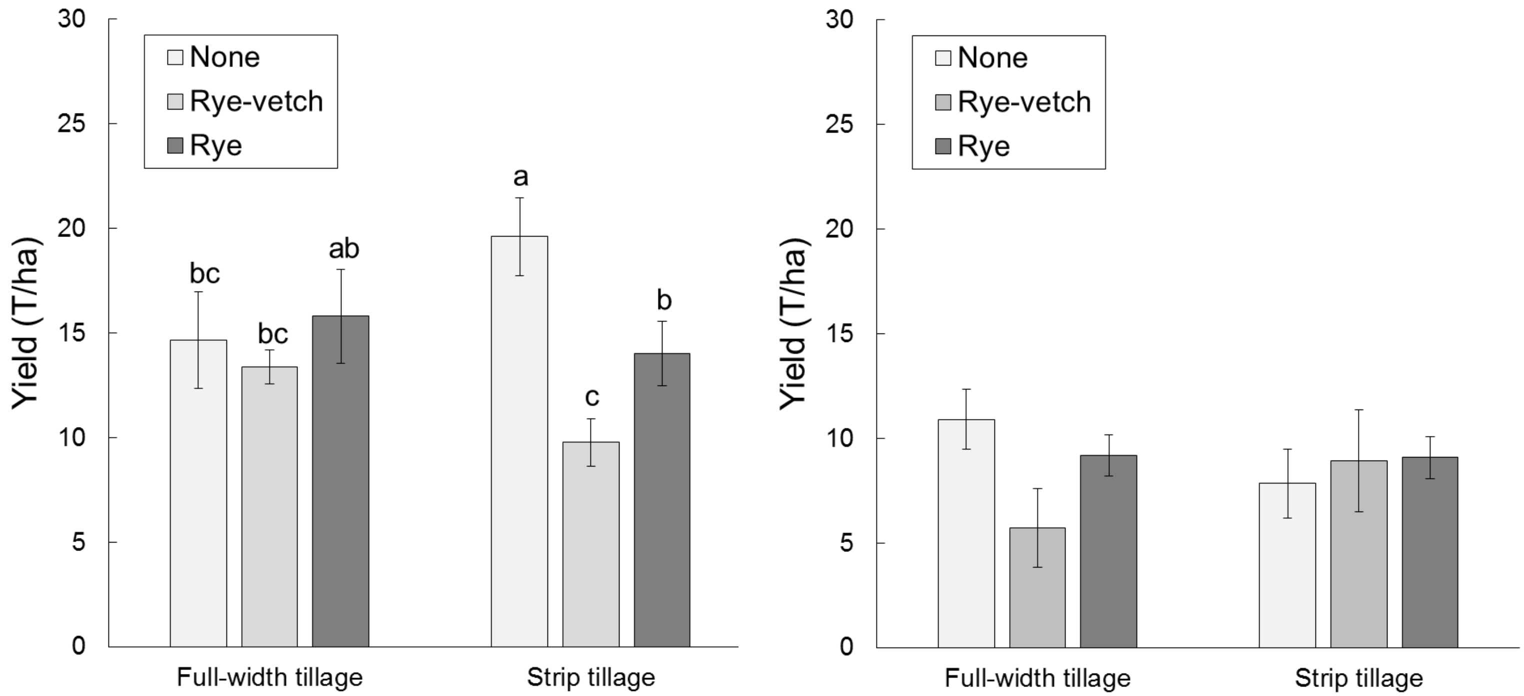

Figure MI.1. Effects of tillage and cover crop residue on pickling cucumber yield in long-term trial, SWMREC, 2014 and 2015. In 2014 (A), in the absence of cover crops, strip tillage improved yields relative to full-width tillage. However, when cover crops were used in strip tillage, cucumbers were suppressed. In 2015 (B), neither tillage nor cover crops had any detectable effects on yields, which were low and highly variable. Average commercial pickling cucumber yields in MI are approximately 11 T/ha (200 bu/acre; Zandstra and Talley, 2011).

Figure M.2. Cucumbers in strip-tillage + rye cover crop treatment, in the MI long-term tillage trial, SWMREC, 2015. Patchy chlorosis and stunting was visible in some cover crop plots.

Figure M.3. Soil erosion in full-width tillage treatment following heavy rain, SWMREC, 2014.

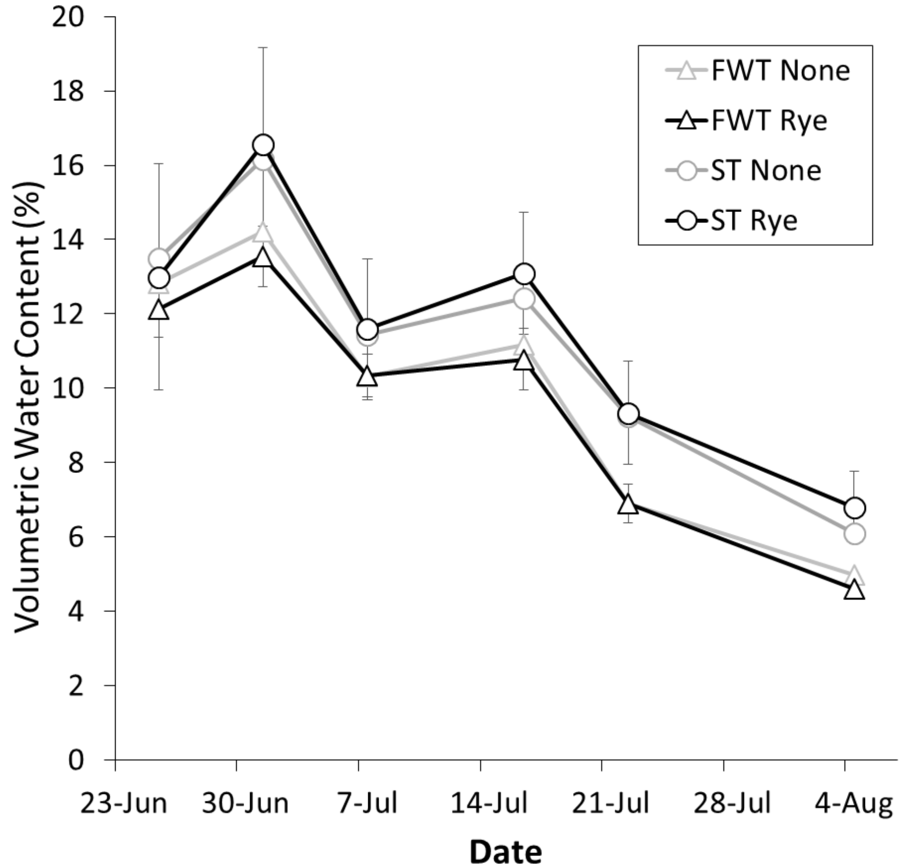

Figure M.4. Volumetric water content in full width tillage (FWT) and strip tillage (ST) treatments, with and without rye cover crop, 2014.

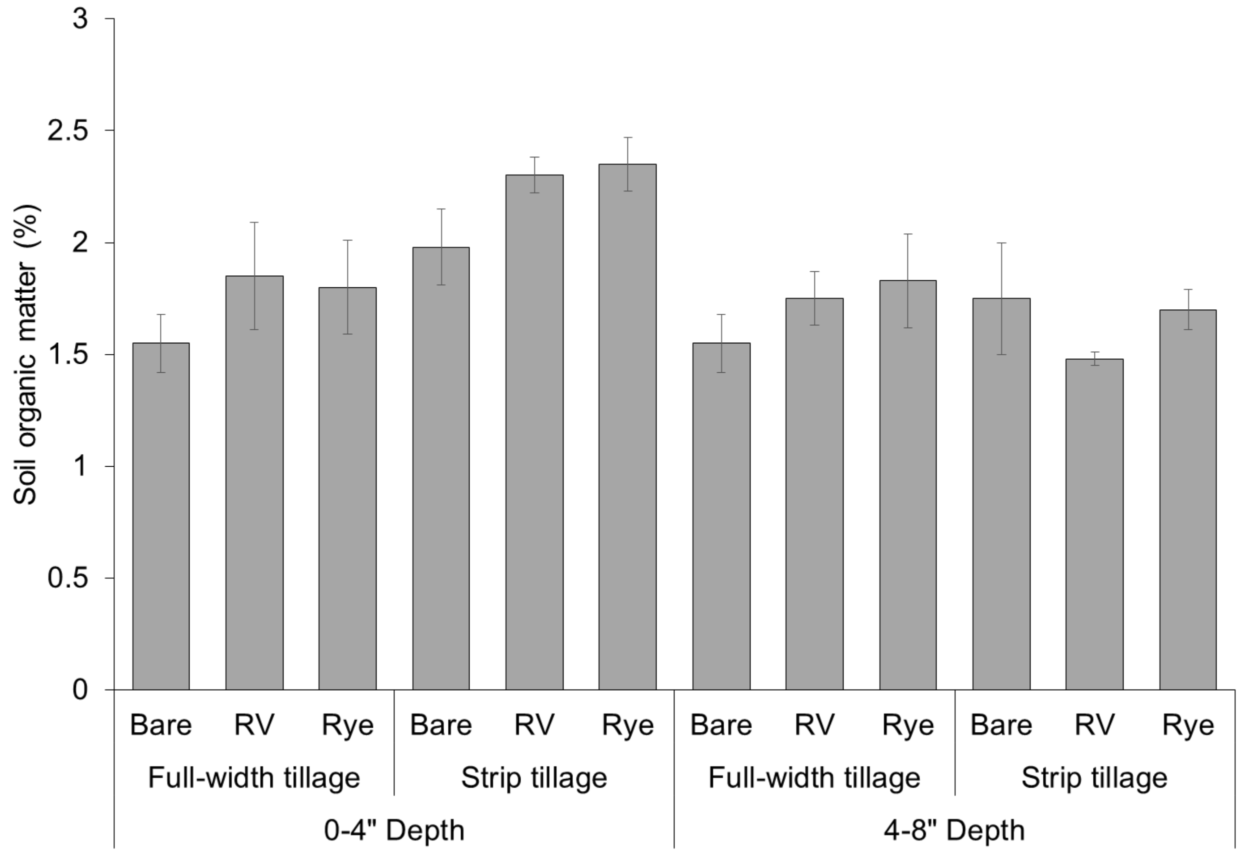

Figure M.5. Soil organic matter (SOM) at two depths following 6 years of strip tillage and cover cropping, SWMREC, 2015. Strip-tillage with either a rye or rye-vetch cover crop had approximately 50% more SOM in the top 4” of soil compared to full-width tillage with no cover crop. However, few differences were observed at the 8” depth. Cover crops had no effect on SOM in the full-width tillage treatments.

Table M.1. Effects of tillage and cover crops on weed emergence, SWMREC long-term trials, 2014-15.

Tillage	Summer Annual Weeds									
	CHEAL[ab]		AMAPO[ab]		DIGSA[ac]		TOTAL		SOLSA[ac]	
Cover	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
	---#/m²---									
Full-width										
Bare	0.38	0.70 b	0.38	0.31	0.25 c	0.04	1.01	1.06 bc	0.0	0.0
Rye	0.50	2.42 ab	1.00	1.32 A	0.38 bc	0.22	1.88	3.96 b	0.0 B	0.0
Rye-vetch	0.63	4.75 a	0.63	2.24	0.88 ab	0.22	2.14	7.22 a	0.0	0.0
Strip-tillage										
Bare	0.25	0.92 b	0.50	0.13	1.25 a	0.44	2.00	1.50 bc	0.94	0.01
Rye	0.50	0.57 b	0.38	0.18 B	1.50 a	0.13	2.38	0.88 bc	1.64 A	0.08
Rye-vetch	0.13	0.40 b	0.38	0.31	1.13 a	0.13	1.64	0.84 c	1.52	0.12
ANOVA	---Significance---									
Tillage	NS	0.084	NS	**0.033**	0.032	NS	NS	0.036	**0.024**	NS
Cover	NS	NS	NS	NS	NS	NS	NS	0.012	NS	NS
T x C	NS	**0.045**	NS	NS	**0.060**	NS	NS	**0.003**	NS	NS

Statistical significance (p = 0.05) is indicated by different letters within the same column.

[a]CHEAL = common lambsquaters; AMAPO = Powell amaranth; DIGSA = large crabgrass; SOLSA = horsenettle

[b] Weed seeds of this species were sown at planting

[c] Ambiant weed population

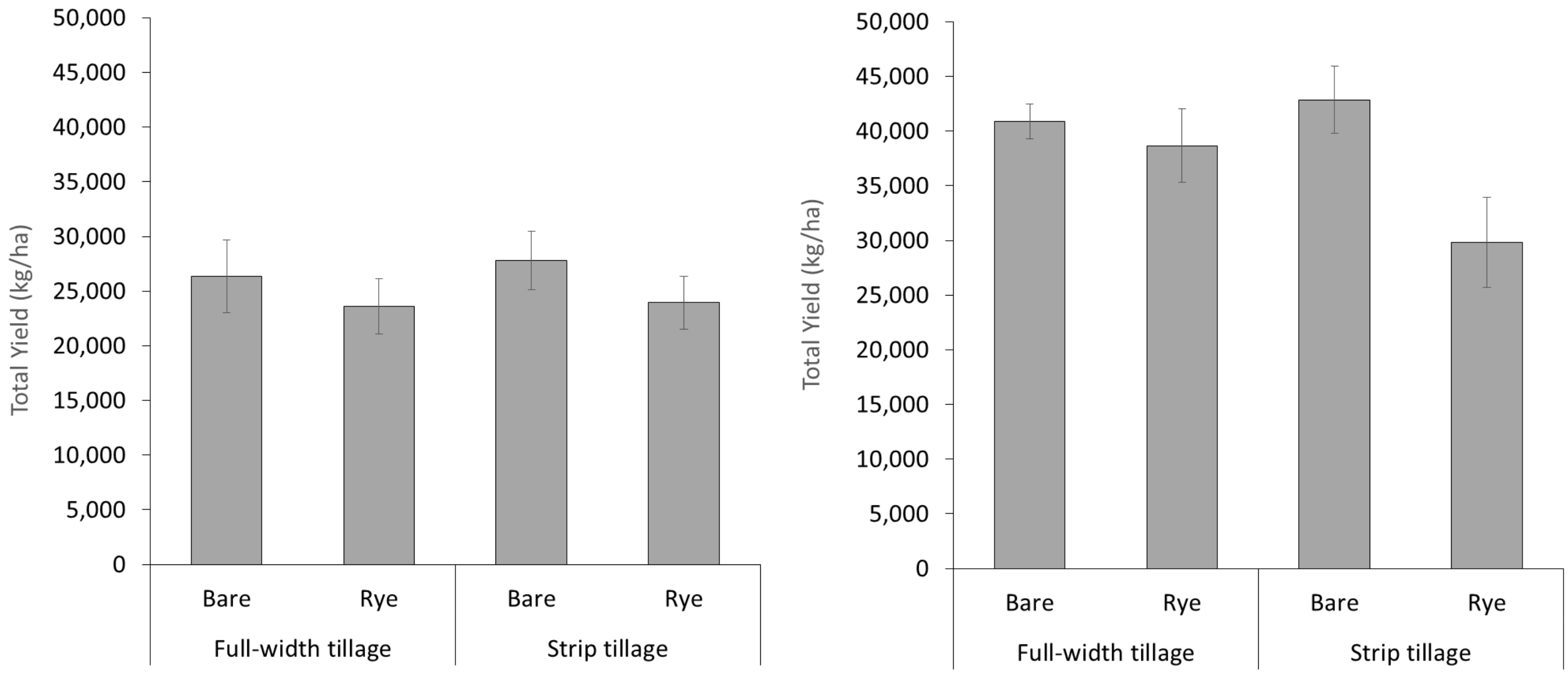

Figure M.6. Effects of tillage and cover crops on acorn squash yields, SWMREC, 2014 and 2015.

Table M.2. Effects of tillage on butternut squash yield and fruit characteristics, Forgotten Harvest, 2016. Full report available at https://ag.purdue.edu/hla/fruitveg/MidWest%20Trial%20Reports/2016/

Treatments	Tons/ acre	Plants/ acre	Fruit/ acre	Fruit/ plant	Weight/ fruit (lb)[1]	% Clean fruit
Tillage						
Strip-till	12.51 a	7498.03 a	10009.28 a	1.75 b	2.52	11.48 b
Bareground	9.70 b	5400.37 b	8116.92 b	1.99 a	2.36	2.25 c
No-till	8.72 b	4477.99 b	7248.10 b	2.29 a	2.39	19.64 a

Figure M.7. Butternut squash in strip tillage treatment, Forgotten Harvest, 2016.
Full report available at https://ag.purdue.edu/hla/fruitveg/MidWest%20Trial%20Reports/2016/