

Supplementary Material

Table S1 The main effects and interactions of manure, biochar, stake location, and species on the wood stake mass loss, moisture content, and nitrogen (N), phosphorus (P), and potassium (K) loss after six months of decomposition

Source of variation	Mass loss			Moisture content			Nutrient loss								
	df			df			N			P			K		
		F	<i>p</i> values		F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
Manure (M)	2	0.32	0.7389	2	1.44	0.3090	2	5.63	0.0420*	2	1.67	0.2024	2	1.06	0.3677
Biochar (B)	2	0.67	0.5320	2	4.40	0.0210*	2	0.05	0.9532	2	1.81	0.1786	2	3.57	0.0495*
Location (L)	1	871.76	0.0000***	1	853.89	0.0000***	1	860.19	0.0000***	1	169.66	0.0000***	1	11.24	0.0035**
Species (S)	2	1546.62	0.0000***	2	449.20	0.0000***	2	537.93	0.0000***	2	1564.00	0.0000***	2	142.11	0.0000***
M × B	4	1.57	0.2456	4	1.37	0.2691	4	13.66	0.0000***	4	2.30	0.0792	4	1.80	0.1729
M × L	2	2.77	0.0892	2	3.90	0.0313*	2	24.62	0.0000***	2	28.58	0.0000***	2	8.38	0.0027**
B × L	2	2.61	0.1012	2	5.33	0.0104*	2	1.70	0.2007	2	2.93	0.0672	2	6.43	0.0078**
M × S	4	9.30	0.0000***	4	9.63	0.0000***	4	10.39	0.0000***	4	28.35	0.0000***	4	5.43	0.0003***
B × S	4	6.11	0.0001***	4	3.52	0.0074**	4	10.56	0.0000***	4	16.84	0.0000***	4	3.27	0.0114*
L × S	2	646.38	0.0000***	2	442.91	0.0000***	2	273.27	0.0000***	2	57.24	0.0000***	2	295.67	0.0000***
M × B × L	4	1.12	0.3780	4	1.42	0.2529	4	15.20	0.0000***	4	7.66	0.0002***	4	3.48	0.0283*
M × B × S	8	4.06	0.0001***	8	4.38	0.0000***	8	21.93	0.0000***	8	5.48	0.0000***	8	13.09	0.0000***
M × L × S	4	23.05	0.0000***	4	8.89	0.0000***	4	24.68	0.0000***	4	82.42	0.0000***	4	14.67	0.0000***
B × L × S	4	6.56	0.0000***	4	4.13	0.0026**	4	9.02	0.0000***	4	5.65	0.0002***	4	4.96	0.0006***
M × B × L × S	8	4.22	0.0001***	8	4.52	0.0000***	8	11.66	0.0000***	8	26.55	0.0000***	8	14.47	0.0000***

Bold fonts with *, ** and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$.

Table S2 The main effects and interactions of manure, biochar, sample date, and soil depth on the soil nutrient contents and C: N at Shandong Province, China

Source of variation	Total nitrogen (N)			Total phosphorus (P)			Total potassium (K)			Soil organic carbon (C)			Available N			C: N		
	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
Manure (M)	2	0.79	0.4965	2	0.92	0.4183	2	0.91	0.4725	2	1.03	0.4127	2	1.13	0.3276	2	1.27	0.3742
Biochar (B)	2	0.52	0.6058	2	1.52	0.2483	2	0.05	0.9561	2	1.85	0.1649	2	0.04	0.9562	2	0.15	0.8604
Sample date (DT)	6	407.60	0.0000***	6	362.30	0.0000***	6	297.93	0.0000***	3	30.95	0.0000***	3	22.60	0.0000***	3	65.07	0.0000***
Soil depth (DP)	1	143.73	0.0000***	1	1.41	0.2381	1	1.32	0.2521	1	64.81	0.0000***	1	77.93	0.0000***	1	1.43	0.2352
M × B	4	0.36	0.8320	4	0.59	0.6736	4	1.18	0.3681	4	1.82	0.1348	4	2.22	0.0751	4	0.74	0.5652
M × DT	12	1.54	0.1219	12	0.96	0.4960	12	2.98	0.0007***	6	1.29	0.2762	6	0.86	0.5291	6	0.10	0.9960
B × DT	12	0.51	0.9036	12	1.07	0.3934	12	0.41	0.9577	6	0.63	0.7090	6	0.87	0.5185	6	0.86	0.5275
M × DP	2	0.48	0.6222	2	3.62	0.0297*	2	8.63	0.0002***	2	0.25	0.7764	2	1.52	0.2258	2	0.77	0.4647
B × DP	2	0.07	0.9368	2	1.16	0.3177	2	0.57	0.5674	2	1.45	0.2411	2	0.64	0.5301	2	0.84	0.4374
DT × DP	6	11.98	0.0000***	6	2.85	0.0122*	6	30.45	0.0000***	3	55.67	0.0000***	3	2.23	0.0915	3	49.14	0.0000***
M × B × DT	24	0.36	0.9971	24	1.66	0.0420*	24	3.99	0.0000***	12	1.18	0.3156	12	0.68	0.7640	12	0.49	0.9140
M × B × DP	4	0.29	0.8859	4	2.34	0.0591	4	0.72	0.5772	4	0.51	0.7257	4	1.66	0.1694	4	0.46	0.7682
M × DT × DP	12	0.99	0.4659	12	1.00	0.4552	12	14.35	0.0000***	6	3.64	0.0033**	6	1.28	0.2772	6	2.13	0.0606
B × DT × DP	12	0.70	0.7485	12	0.48	0.9230	12	3.99	0.0000***	6	1.10	0.3710	6	0.71	0.6437	6	0.34	0.9115
M × B × DT × DP	24	0.75	0.7901	24	1.51	0.0756	24	1.89	0.0091**	12	0.71	0.7370	12	1.12	0.3597	12	0.50	0.9093

Bold fonts with *, ** and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$.

Table S3 The main effects and interactions of manure, biochar, sample date, and soil depth on the soil enzyme activities at Shandong Province, China

Source of variation	Soil enzyme											
	Catalase			PPO			Urease			Invertase		
	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
Manure (M)	2	0.62	0.5677	2	2.22	0.1104	2	1.05	0.4054	2	5.74	0.0132*
Biochar (B)	2	0.00	0.9978	2	3.07	0.0481*	2	0.02	0.9768	2	5.81	0.0127*
Sample date (DT)	6	109.37	0.0000***	6	350.65	0.0000***	6	487.75	0.0000***	6	216.15	0.0000***
Soil depth (DP)	1	136.28	0.0000***	1	28.47	0.0000***	1	51.07	0.0000***	1	777.90	0.0000***
M × B	4	1.63	0.2306	4	0.39	0.8173	4	0.21	0.9275	4	9.69	0.0004***
M × DT	12	0.75	0.7027	12	2.72	0.0018**	12	1.38	0.1845	12	2.29	0.0091**
B × DT	12	0.52	0.8958	12	0.27	0.9931	12	0.48	0.9235	12	6.13	0.0000***
M × DP	2	1.91	0.1518	2	1.76	0.1747	2	2.47	0.0887	2	7.88	0.0005***
B × DP	2	1.69	0.1889	2	1.35	0.2617	2	0.82	0.4439	2	0.58	0.5583
DT × DP	6	5.36	0.0001***	6	14.40	0.0000***	6	7.88	0.0000***	6	45.80	0.0000***
M × B × DT	24	0.69	0.8557	24	0.71	0.8440	24	0.75	0.7899	24	4.53	0.0000***
M × B × DP	4	0.50	0.7343	4	2.13	0.0778	4	0.62	0.6476	4	3.34	0.0110*
M × DT × DP	12	2.59	0.0042**	12	2.44	0.0052**	12	2.26	0.0126*	12	2.59	0.0030**
B × DT × DP	12	1.04	0.4213	12	0.52	0.8986	12	1.13	0.3440	12	3.05	0.0005***
M × B × DT × DP	24	0.84	0.6830	24	0.46	0.9878	24	1.15	0.3057	24	2.34	0.0007***

Bold fonts with *, ** and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$. PPO, polyphenol

oxidase.

Table S4 Surface and mineral poplar, aspen, pine stake mass loss, moisture content, nitrogen (N), phosphorus (P), and potassium (K) loss responses to soil manure, biochar amendments and their interactions after six months of decomposition

Location	Species	Source of variation	Mass loss			Moisture content			Nutrient loss								
			df	F	<i>p</i> values	df	F	<i>p</i> values	N			P			K		
									df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
Surface	Poplar	Manure (M)	2	2.51	0.1971	2	2.22	0.1895	2	0.91	0.4516	2	15.19	0.0135*	2	11.28	0.0227*
		Biochar (B)	2	1.21	0.3018	2	2.67	0.0734	2	2.19	0.1163	2	23.33	0.0000***	2	0.49	0.6129
		M × B	4	5.69	0.0003***	4	0.61	0.6566	4	18.34	0.0000***	4	24.59	0.0000***	4	9.46	0.0000***
	Aspen	Manure (M)	2	22.13	0.0017**	2	0.66	0.5520	2	19.86	0.0084**	2	13.11	0.0175*	2	6.53	0.0549
		Biochar (B)	2	1.98	0.1425	2	5.69	0.0044**	2	4.20	0.0173*	2	1.47	0.2342	2	2.17	0.1183
		M × B	4	3.52	0.0094**	4	0.32	0.8614	4	3.36	0.0121*	4	7.10	0.0000***	4	5.37	0.0005***
	Pine	Manure (M)	2	0.24	0.7966	2	0.35	0.7159	2	1.90	0.2299	2	1.90	0.1542	2	3.74	0.0882
		Biochar (B)	2	10.32	0.0001***	2	3.73	0.0268*	2	6.37	0.0023**	2	1.67	0.1923	2	5.45	0.0054**
		M × B	4	4.28	0.0028**	4	1.36	0.2530	4	8.37	0.0000***	4	1.09	0.3641	4	8.49	0.0000***
Mineral	Poplar	Manure (M)	2	0.85	0.4726	2	0.65	0.5560	2	3.01	0.1595	2	12.42	0.0192*	2	0.91	0.4712
		Biochar (B)	2	1.22	0.2990	2	6.11	0.0030**	2	12.90	0.0000***	2	0.63	0.5351	2	1.68	0.1899
		M × B	4	1.67	0.1610	4	2.34	0.0587	4	23.01	0.0000***	4	8.41	0.0000***	4	13.83	0.0000***
	Aspen	Manure (M)	2	6.74	0.0292*	2	4.48	0.0954	2	7.40	0.0240*	2	5.07	0.0514	2	0.66	0.5652
		Biochar (B)	2	1.11	0.3317	2	25.23	0.0000***	2	6.74	0.0017**	2	13.99	0.0000***	2	44.94	0.0000***
		M × B	4	3.37	0.0119*	4	13.33	0.0000***	4	28.70	0.0000***	4	27.78	0.0000***	4	26.84	0.0000***
	Pine	Manure (M)	2	14.42	0.0148*	2	3.51	0.1320	2	1.11	0.3901	2	5.56	0.0700	2	8.87	0.0161*
		Biochar (B)	2	68.52	0.0000***	2	5.29	0.0063**	2	2.91	0.0581	2	3.25	0.0421*	2	27.73	0.0000***
		M × B	4	28.29	0.0000***	4	1.19	0.3167	4	20.12	0.0000***	4	21.94	0.0000***	4	26.01	0.0000***

Bold fonts with *, ** and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$.

Table S5 The main effects and interactions of manure and biochar amendments on the soil pH, EC and hydraulic properties at Shandong Province, China

Soil hydraulic properties	Source of variation								
	Manure (M)			Biochar (B)			M × B		
	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
pH	2	1.55	0.2425	2	0.57	0.5764	4	0.98	0.4455
EC	2	0.93	0.5168	2	3.05	0.0594	4	1.35	0.2693
Mass water content	2	1.27	0.3864	2	0.28	0.7551	4	0.2	0.9361
Bulk density	2	2.56	0.1950	2	1.86	0.1723	4	4.01	0.0095**
Volumetric water content	2	0.11	0.8960	2	0.2	0.8230	4	0.42	0.7916
Water storage	2	0.11	0.8960	2	0.2	0.8230	4	0.42	0.7916
Maximum water holding capacity	2	1.42	0.3424	2	1.26	0.2956	4	3.64	0.0144*
Capillary capacity	2	1.65	0.3020	2	1.31	0.2843	4	3.58	0.0155*
Field capacity	2	1.5	0.3285	2	1.27	0.2948	4	3.24	0.0236*
Non-capillary porosity	2	0.63	0.5673	2	1.27	0.2938	4	0.49	0.7435
Capillary porosity	2	2.31	0.1145	2	1.11	0.3422	4	2.16	0.0944
Total porosity	2	1.96	0.2235	2	1.04	0.3630	4	1.96	0.1227
Venting quality	2	0.48	0.6415	2	0.19	0.8262	4	1.1	0.3737
Lower limit of optimum moisture content	2	1.5	0.3285	2	1.27	0.2948	4	3.24	0.0236*
Drainage capacity	2	0.26	0.7733	2	< 0.01	0.9964	4	0.69	0.6071
Reasonable irrigation quota	2	1.86	0.1715	2	1.14	0.3317	4	1.95	0.1242

Bold fonts with * and ** denote significant effects at $p \leq 0.05$ and $p \leq 0.01$.

Table S6 Soil total phosphorus (P) content responses to soil manure, biochar amendments and their interactions at each sample date with soil depth combined at Shandong Province, China

Total P																					
Sample date																					
	Apr 2018			Jul 2018			Oct 2018			Dec 2018			Apr 2019			Jul 2019			Oct 2019		
Source of variation	df	F	<i>P</i> values	df	F	<i>P</i> values	df	F	<i>P</i> values	df	F	<i>P</i> values	df	F	<i>P</i> values	df	F	<i>P</i> values	df	F	<i>P</i> values
Manure (M)	2	0.47	0.6560	2	0.43	0.6791	2	2.58	0.1554	2	1.94	0.1555	2	0.67	0.5448	2	1.52	0.2288	2	1.18	0.3697
Biochar (B)	2	2.11	0.1346	2	0.54	0.5891	2	1.35	0.2702	2	1.55	0.2231	2	0.07	0.9287	2	4.85	0.0124*	2	0.67	0.5158
M × B	4	2.21	0.0857	4	0.97	0.4365	4	1.14	0.3521	4	1.37	0.2579	4	2.21	0.0857	4	4.28	0.0051**	4	1.20	0.3252

Bold fonts with * and ** denote significant effects at $p \leq 0.05$ and $p \leq 0.01$.

Table S7 Soil total potassium (K), and organic matter content responses to soil manure, biochar amendments and their interactions at each sample date and soil depth at Shandong Province, China

Sample date and soil depth	Source of variation	Soil nutrient					
		Total K			Organic carbon		
		df	F	<i>p</i> values	df	F	<i>p</i> values
Apr 2018							
0- 20cm	Manure (M)	2	0.03	0.9732	2	0.82	0.5042
	Biochar (B)	2	0.24	0.7869	2	7.79	0.0068**
	M × B	4	1.92	0.1721	4	2.83	0.0727
20- 40cm	Manure (M)	2	0.26	0.7829	2	0.94	0.4425
	Biochar (B)	2	0.59	0.5680	2	1.92	0.1889
	M × B	4	1.87	0.1800	4	1.11	0.3956
Jul 2018							
0- 20cm	Manure (M)	2	1.16	0.3384	2	1.27	0.3737
	Biochar (B)	2	0.05	0.9504	2	1.89	0.1939
	M × B	4	0.48	0.7511	4	0.79	0.5562
20- 40cm	Manure (M)	2	0.39	0.6911	2	0.33	0.7324
	Biochar (B)	2	0.14	0.8698	2	0.08	0.9237
	M × B	4	0.40	0.8032	4	0.28	0.8868
Oct 2018							
0- 20cm	Manure (M)	2	1.44	0.3385	2	7.88	0.0041**
	Biochar (B)	2	0.09	0.9148	2	1.39	0.2765
	M × B	4	2.68	0.0828	4	0.46	0.7638
20- 40cm	Manure (M)	2	0.04	0.9581	2	1.85	0.2372
	Biochar (B)	2	1.64	0.2211	2	0.49	0.6253
	M × B	4	1.11	0.3843	4	2.88	0.0694
Dec 2018							
0- 20cm	Manure (M)	2	1.61	0.3063	2	0.20	0.8243
	Biochar (B)	2	1.99	0.1796	2	0.78	0.4806
	M × B	4	0.49	0.7455	4	0.79	0.5526
20- 40cm	Manure (M)	2	1.51	0.2504	2	1.28	0.3443
	Biochar (B)	2	0.43	0.6585	2	1.41	0.2813
	M × B	4	2.32	0.1010	4	2.36	0.1116
Apr 2019							
0- 20cm	Manure (M)	2	0.67	0.5609	-	-	-
	Biochar (B)	2	0.13	0.8782	-	-	-
	M × B	4	0.95	0.4710	-	-	-
20- 40cm	Manure (M)	2	3.63	0.0475*	-	-	-
	Biochar (B)	2	0.38	0.6900	-	-	-
	M × B	4	0.92	0.4758	-	-	-
Jul 2019							
0- 20cm	Manure (M)	2	780.45	0.0000***	-	-	-
	Biochar (B)	2	88.77	0.0000***	-	-	-
	M × B	4	130.02	0.0000***	-	-	-
20- 40cm	Manure (M)	2	10.89	0.0101*	-	-	-
	Biochar (B)	2	221.23	0.0000***	-	-	-
	M × B	4	269.63	0.0000***	-	-	-
Oct 2019							
0- 20cm	Manure (M)	2	1.05	0.4299	-	-	-
	Biochar (B)	2	0.52	0.6058	-	-	-
	M × B	4	0.44	0.7783	-	-	-
20- 40cm	Manure (M)	2	0.83	0.4790	-	-	-
	Biochar (B)	2	1.56	0.2496	-	-	-
	M × B	4	3.21	0.0523	-	-	-

Bold fonts with *, **, and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$.

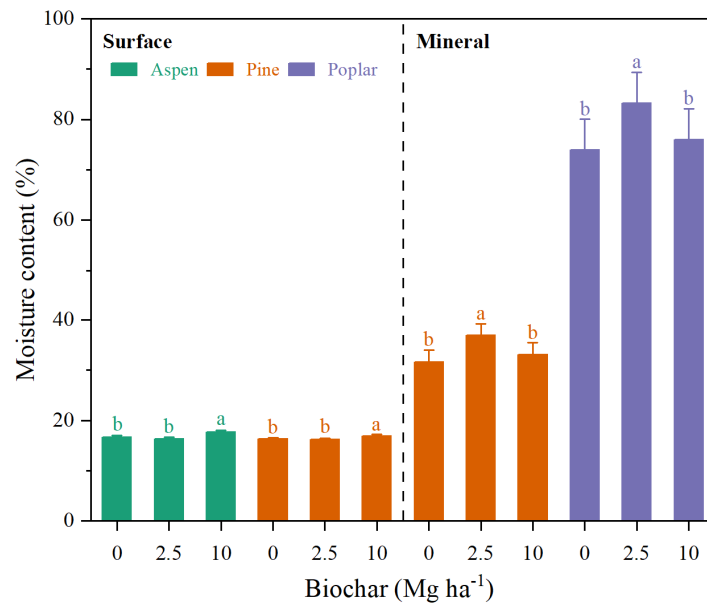


Figure S1 Wood stake moisture content (means± SE) as affected by the main effects of biochar amendments. Different letters indicate significant differences between soil treatments ($p \leq 0.05$).

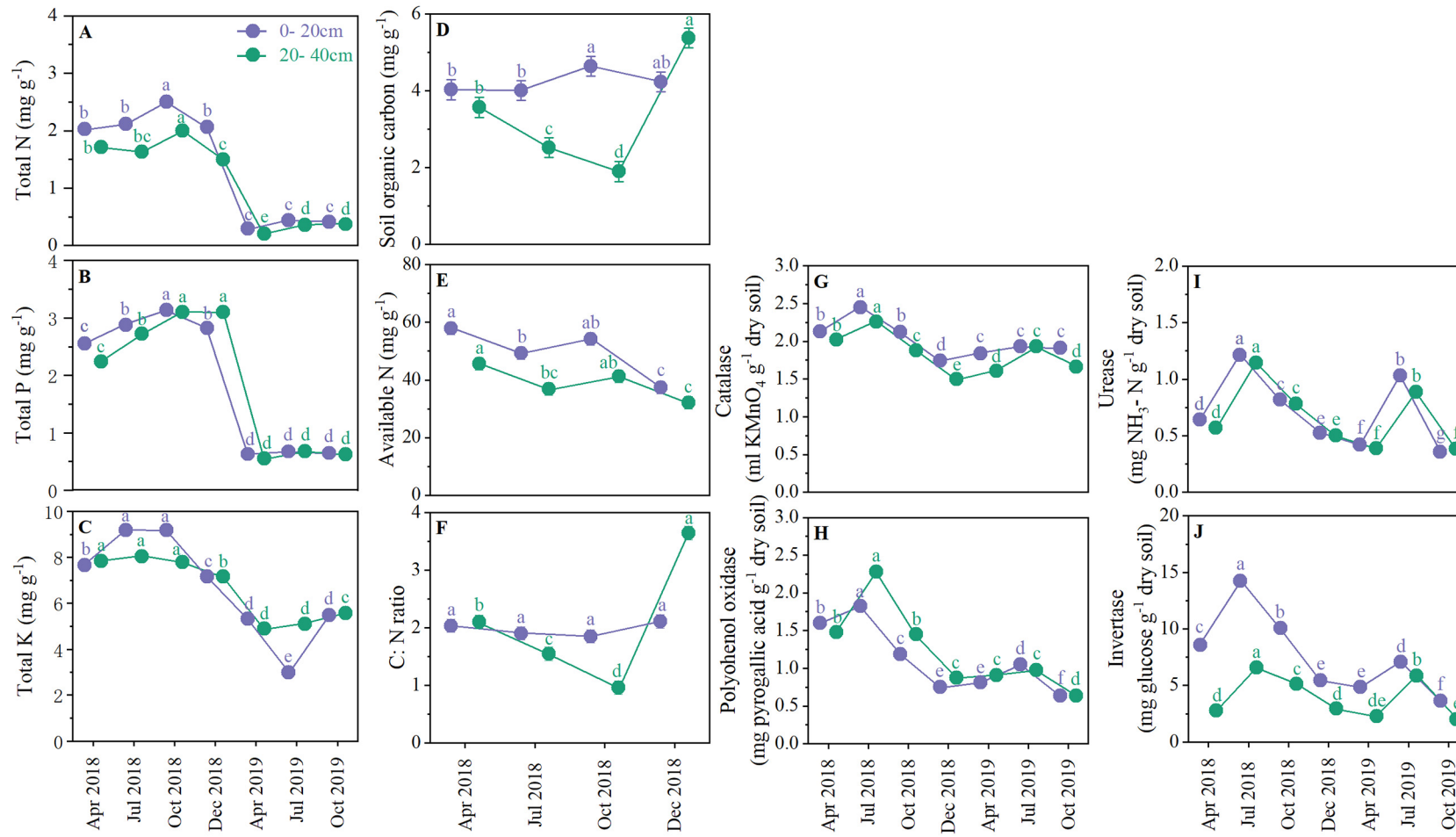


Figure S2. Soil nutrient content (A- F) and enzyme activity (G- J) dynamics (means \pm SE) in both 0- 20cm and 20- 40cm soil. Different letters within each soil depth indicate significant differences between sample dates ($p \leq 0.05$). Soil C: N was calculated as the ratio of soil organic C and total N. PPO, polyphenol oxidase.

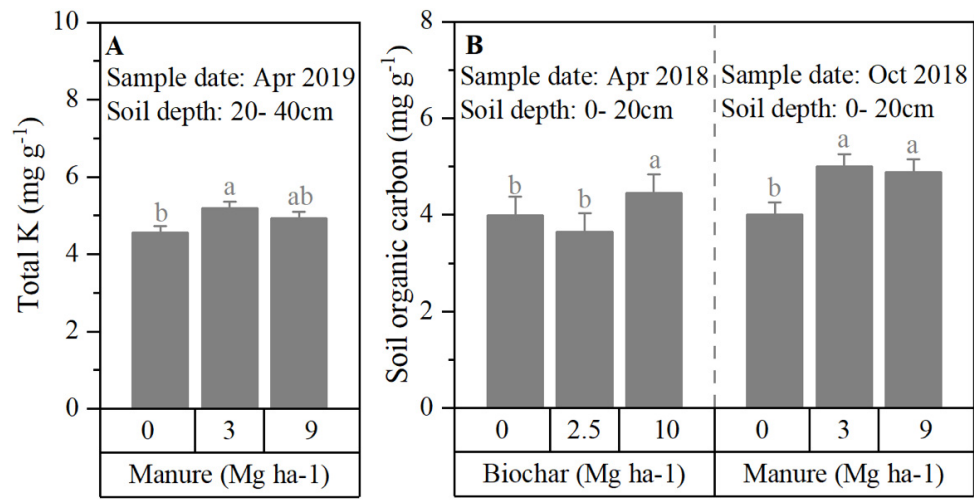


Figure S3 Soil total potassium (K) (**A**) and organic carbon content (**B**) (means \pm SE) as affected by the main effects of manure or biochar amendments. Different letters indicate significant differences between soil treatments ($p \leq 0.05$).

Table S8 Soil enzyme activity responses to soil manure, biochar amendments and their interactions at each sample date and soil depth at Shandong Province, China

Sample date and soil depth	Source of variation	Soil enzyme											
		Catalase			PPO			Urease			Invertase		
		df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values	df	F	<i>p</i> values
Apr 2018 0- 20cm	Manure (M)	2	0.53	0.6120	2	5.23	0.0162*	2	0.24	0.7924	2	2.68	0.0989
	Biochar (B)	2	1.37	0.2915	2	1.52	0.2460	2	0.72	0.4984	2	0.09	0.9143
	M × B	4	0.50	0.7358	4	0.62	0.6551	4	1.30	0.3069	4	4.21	0.0162*
20- 40cm	Manure (M)	2	0.27	0.7703	2	0.03	0.9719	2	0.66	0.5302	2	81.44	0.0000***
	Biochar (B)	2	1.30	0.3084	2	1.81	0.2062	2	0.05	0.9518	2	5.68	0.0123*
	M × B	4	0.16	0.9562	4	1.14	0.3848	4	0.35	0.8421	4	8.78	0.0004***
Jul 2018 0- 20cm	Manure (M)	2	0.24	0.7981	2	0.90	0.4255	2	2.23	0.1401	2	0.91	0.4738
	Biochar (B)	2	0.11	0.8937	2	0.01	0.9855	2	0.49	0.6218	2	34.07	0.0000***
	M × B	4	0.36	0.8357	4	0.48	0.7511	4	2.02	0.1399	4	8.39	0.0018**
20- 40cm	Manure (M)	2	1.09	0.4185	2	3.13	0.0713	2	0.00	0.9961	2	21.09	0.0000***
	Biochar (B)	2	0.72	0.5082	2	0.04	0.9571	2	4.03	0.0457*	2	9.78	0.0017**
	M × B	4	0.15	0.9600	4	0.92	0.4745	4	3.90	0.0297*	4	14.52	0.0000***
Oct 2018 0- 20cm	Manure (M)	2	0.23	0.7996	2	7.90	0.0034**	2	5.80	0.0127*	2	0.95	0.4610
	Biochar (B)	2	0.03	0.9745	2	0.23	0.7944	2	0.18	0.8404	2	1.00	0.3959
	M × B	4	0.98	0.4566	4	0.56	0.6945	4	0.99	0.4389	4	5.45	0.0097**
20- 40cm	Manure (M)	2	0.62	0.5678	2	2.84	0.1708	2	0.02	0.9767	2	18.92	0.0000***
	Biochar (B)	2	0.84	0.4540	2	1.33	0.3005	2	0.56	0.5835	2	23.92	0.0000***
	M × B	4	2.29	0.1197	4	0.72	0.5928	4	1.07	0.4123	4	7.39	0.0011**
Dec 2018 0- 20cm	Manure (M)	2	0.67	0.5627	2	6.16	0.0104*	2	0.37	0.6940	2	0.60	0.5903
	Biochar (B)	2	0.38	0.6908	2	0.50	0.6142	2	1.34	0.2888	2	3.94	0.0484*
	M × B	4	0.78	0.5598	4	1.55	0.2366	4	0.75	0.5704	4	5.27	0.0110*
20- 40cm	Manure (M)	2	0.56	0.6108	2	0.01	0.9913	2	0.05	0.9509	2	0.84	0.4482
	Biochar (B)	2	0.95	0.4122	2	1.36	0.2848	2	2.59	0.1163	2	0.85	0.4432
	M × B	4	1.95	0.1673	4	1.98	0.1464	4	6.56	0.0049**	4	4.04	0.0165*
Apr 2019 0- 20cm	Manure (M)	2	2.38	0.2082	2	5.05	0.0182*	2	1.78	0.2802	2	0.61	0.5556
	Biochar (B)	2	0.04	0.9606	2	0.11	0.9000	2	1.04	0.3818	2	1.42	0.2673
	M × B	4	0.65	0.6364	4	0.46	0.7669	4	0.18	0.9460	4	1.19	0.3492
20- 40cm	Manure (M)	2	0.36	0.7124	2	3.50	0.0984	2	1.24	0.3814	2	0.18	0.8405
	Biochar (B)	2	0.59	0.5717	2	0.71	0.5096	2	2.10	0.1654	2	2.99	0.0886
	M × B	4	0.58	0.6846	4	1.77	0.2003	4	1.90	0.1751	4	1.78	0.1986
Jul 2019 0- 20cm	Manure (M)	2	0.13	0.8840	2	8.01	0.0033**	2	0.76	0.5245	2	2.99	0.1255
	Biochar (B)	2	0.77	0.4839	2	0.29	0.7528	2	1.36	0.2927	2	0.79	0.4753
	M × B	4	1.04	0.4277	4	0.76	0.5663	4	0.29	0.8775	4	1.58	0.2432
20- 40cm	Manure (M)	2	1.75	0.2514	2	0.91	0.4523	2	6.93	0.0503	2	11.26	0.0007***
	Biochar (B)	2	1.95	0.1848	2	2.64	0.1119	2	0.78	0.4802	2	11.18	0.0007***
	M × B	4	3.55	0.0391*	4	0.26	0.8973	4	0.50	0.7350	4	21.60	0.0000***
Oct 2019 0- 20cm	Manure (M)	2	0.29	0.7563	2	0.74	0.5154	2	7.57	0.0436*	2	0.13	0.8854
	Biochar (B)	2	0.08	0.9191	2	5.14	0.0243*	2	0.64	0.5440	2	0.04	0.9636
	M × B	4	1.11	0.3949	4	5.88	0.0074**	4	0.47	0.7602	4	0.35	0.8382
20- 40cm	Manure (M)	2	0.75	0.5271	2	0.23	0.8068	2	0.96	0.4575	2	5.18	0.0777
	Biochar (B)	2	3.14	0.0801	2	2.36	0.1363	2	0.64	0.5459	2	8.56	0.0049**
	M × B	4	1.29	0.3285	4	2.01	0.1563	4	0.85	0.5231	4	4.29	0.0220*

Bold fonts with *, ** and *** denote significant effects at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$. PPO, polyphenol oxidase.

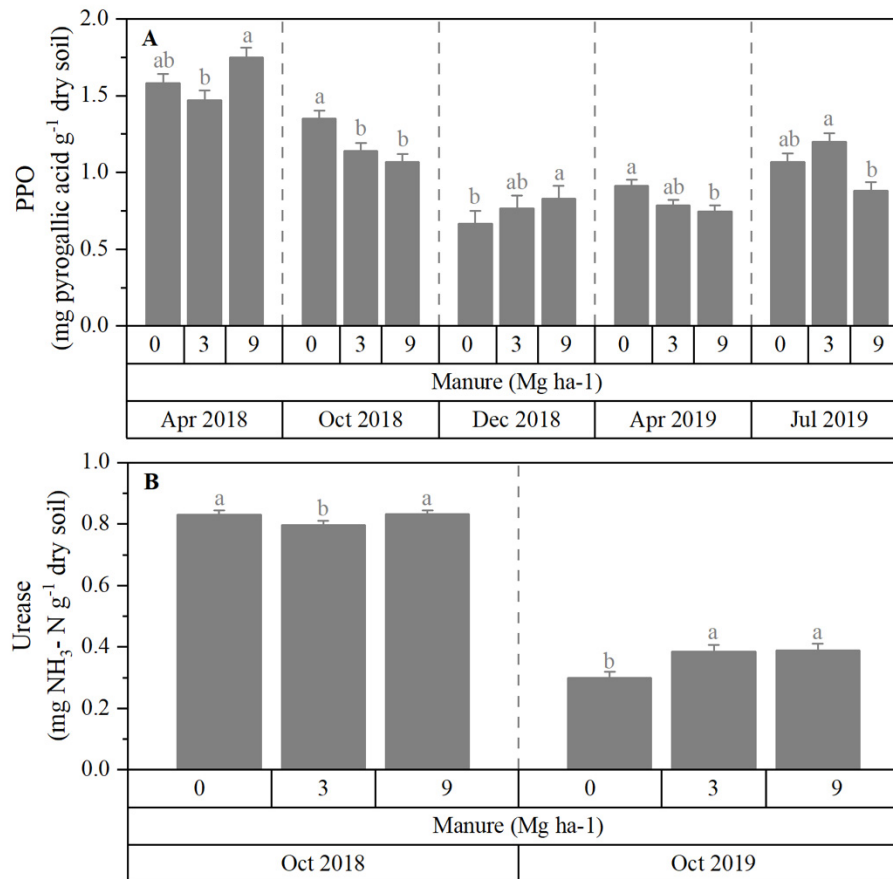


Figure S4 Soil polyphenol oxidase (PPO) (**A**) and urease activity (**B**) (means \pm SE) at 0- 20cm soil as affected by the main effects of manure. Different letters at each sample date indicate significant differences between soil treatments ($p \leq 0.05$).