

1 **Supplementary Material**

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**Organic Fertilization Assembles Fungal Communities of
Wheat Rhizosphere Soil and suppresses the population
growth of *Heterodera avenae* in the Field**

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9 TABLE S1 | Richness and diversity estimation of the ITS sequencing libraries in CK, CF, and OF in the 1st year trial.

α		Wheat growth stages						
Diversity		Before sowing	Seedling	Wintering	Regreening	Jointing	Heading	Harvest
Sobs	CK	349±41	383±6	193±20	387±9	333±2	411±20	356±7
	CF	361±31	369±3**	226±12	302±13*	392±16*	361±13	412±19
	OF	384±30	314±11*	191±31	301±6*	358±20	320±24	355±26
Chao1	CK	466±40	549±12	277±39	501±6	424±5	550±44	532±15
	CF	467±31	486±10*	313±18	410±24	524±16*	501±35	548±37
	OF	504±27	430±20**	273±62	437±7*	474±33	428±30	486±31
Shannon	CK	2.29±0.45	3.63±0.03	1.25±0.28	3.73±0.05	3.68±0.05	3.46±0.10	3.19±0.13
	CF	2.64±0.66	3.35±0.09	2.13±0.13	3.10±0.19	3.52±0.19	3.36±0.06	3.49±0.18
	OF	2.59±0.53	2.87±0.39	1.87±0.48	3.35±0.09*	3.58±0.14	2.82±0.30	3.19±0.15
Simpson	CK	0.295±0.096	0.060±0.002	0.618±0.090	0.047±0.003	0.045±0.004	0.076±0.002	0.110±0.022
	CF	0.265±0.163	0.092±0.015	0.260±0.037*	0.106±0.026	0.066±0.016	0.087±0.013	0.085±0.016
	OF	0.274±0.123	0.202±0.075	0.396±0.134	0.066±0.009	0.054±0.008	0.192±0.066	0.110±0.023
Coverage	CK	0.997±0.001	0.996±0.001	0.998±0.001	0.997±0.001	0.997±0.001	0.996±0.001	0.996±0.001
	CF	0.997±0.001	0.997±0.001	0.998±0.001	0.997±0.001	0.996±0.001	0.996±0.001	0.996±0.001
	OF	0.997±0.001	0.997±0.001	0.998±0.001	0.997±0.001	0.996±0.001	0.997±0.001	0.997±0.001

10 CK: without fertilizer; CF: chemical fertilizer; OF: organic fertilizer. Asterisks indicate statistically significant differences compare to each diversity index in same

11 column by t-test: * $p < 0.05$.

TABLE S2 | Explanation of environmental factors affecting fungal community structure at wheat jointing stage in 2nd year trial.

	RDA1	RDA2	r²	p_values
pH	0.94	-0.35	0.755	0.020
OM	-0.68	-0.73	0.621	0.054
AP	-0.51	-0.86	0.905	0.010
TP	-0.52	-0.85	0.827	0.008
AK	-0.22	-0.97	0.744	0.014
TK	-0.97	-0.26	0.228	0.431
TN	-0.66	-0.75	0.734	0.010
Pf/Pi	0.98	0.20	0.678	0.045

OM, organic matter; AP, available P; TP, total P; AK, available K; TK, total K; TN, total N. Pf/Pi, index of cereal cyst nematode reproduction.

TABLE S3 | Relative abundance of the enriching genus observed in organic fertilizer treatment at wheat jointing stage in 2nd year trial.

Genus	Relative abundance %								
	CK1	CK2	CK3	CF1	CF2	CF3	OF1	OF2	OF3
<i>Hapsidospora</i>	n	n	n	n	n	n	0.006	0.104	0.139
<i>Pyxidiophorales_XX</i>	n	n	n	n	n	n	0.038	0.199	0.771
<i>Volutella</i>	0.003	n	n	0.006	0.016	0.006	0.120	0.158	0.265
<i>Geomyces</i>	0.003	n	n	0.006	0.016	0.006	0.114	0.054	0.126
<i>Mortierella</i>	2.570	4.308	4.286	10.231	3.164	4.289	19.881	23.718	15.054
<i>Lophotrichus</i>	0.190	0.313	0.490	0.825	0.626	0.686	3.562	7.042	6.312
<i>Schizothecium</i>	0.749	0.686	1.100	1.318	1.580	1.444	2.706	3.246	1.960
<i>Chaetomium</i>	0.727	1.805	1.015	4.087	2.756	2.456	4.412	6.799	3.578

CK: without fertilizer; CF: chemical fertilizer; OF: organic fertilizer. ‘n’ indicates no abundance.

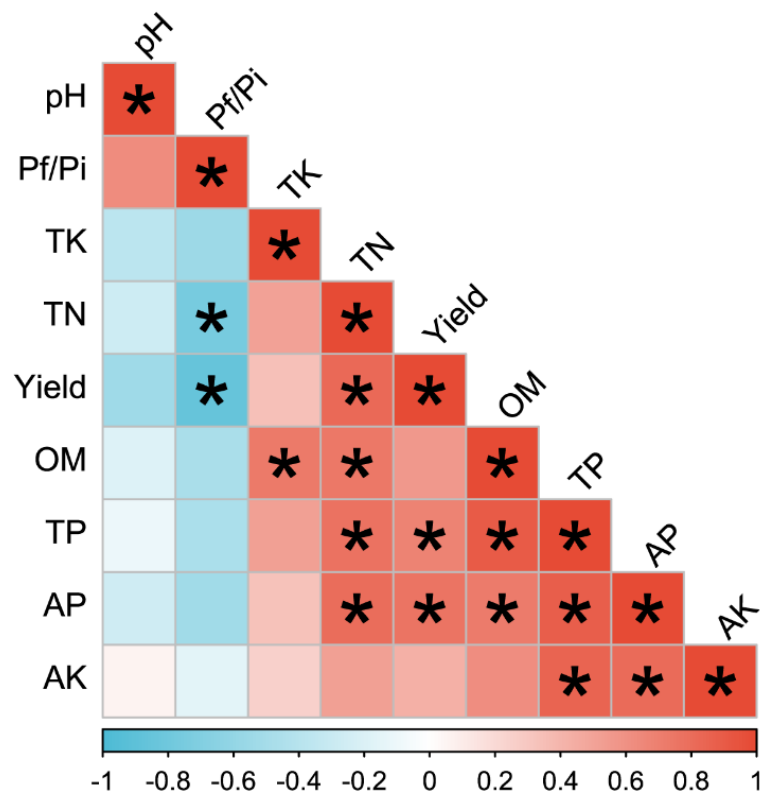
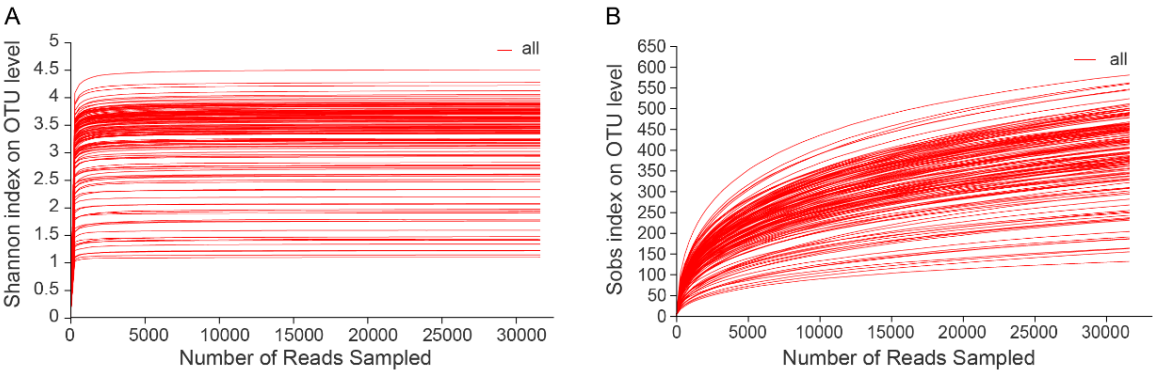


FIGURE S1 | Pearson relationship among soil properties, wheat yield and Pf/Pi of cereal cyst nematode. * represents the $p < 0.05$. TN: total N; TK: total K; TP: total P; AK: available K; AP: available P; OM: organic matter.

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73 FIGURE S2 | The rarefaction analysis of all samples within the Shannon index (A) and Sobs index
74 (B).

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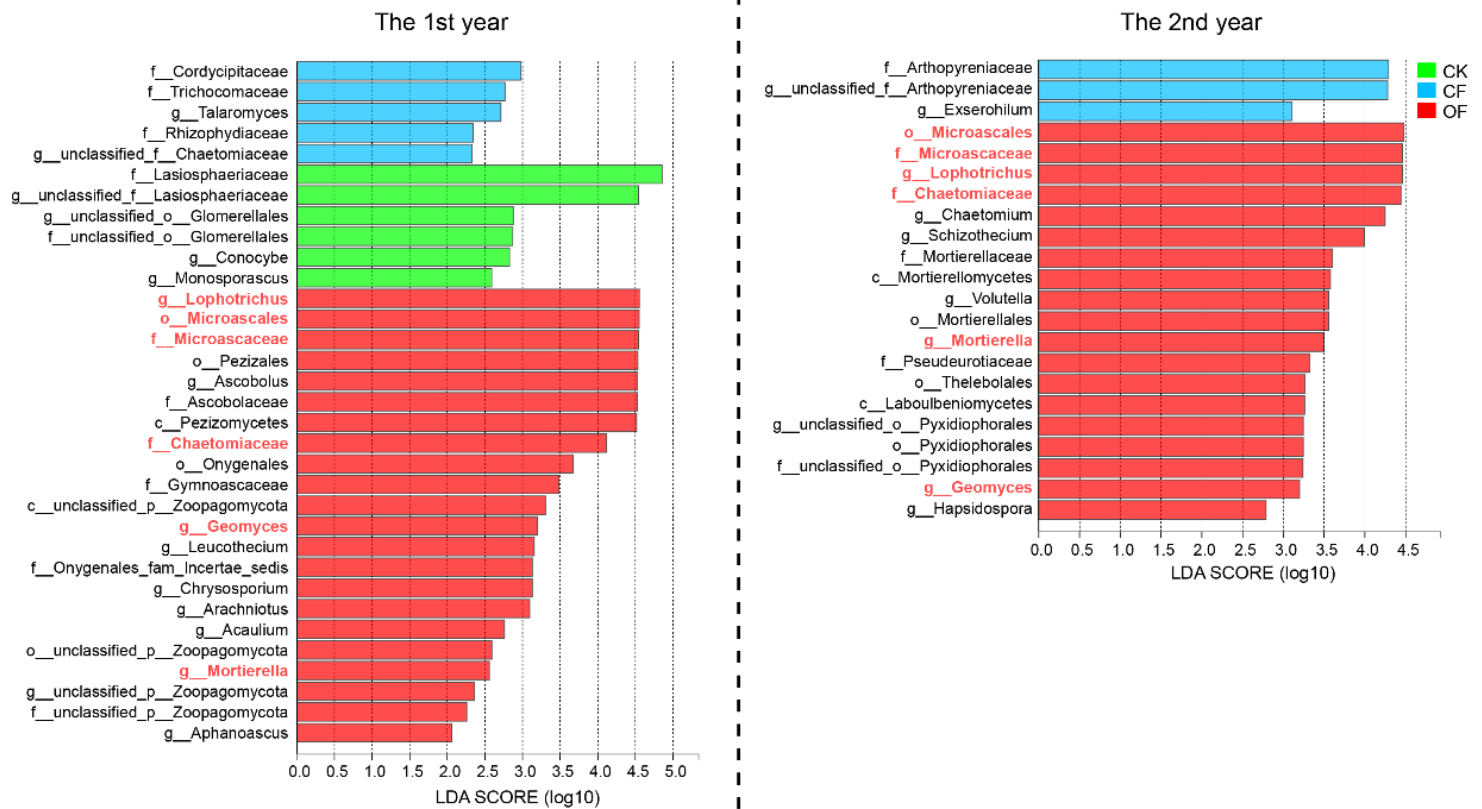


FIGURE S3 | A linear discriminant analysis effect size (LEfSe) method identifies the significant different abundant taxa of fungi in the soil of organic fertilizer (OF), chemical fertilizer (CF), or without fertilizer (CK) treatments at wheat jointing stage. The taxa with the absolute LDA scores > 2.5 and $p < 0.05$ are shown. Red letters indicate the same taxa enriched in two-year trials.