

Differential responses of bacterial and fungal community structure in soil to nitrogen deposition in two planted forests in southwest China in relation to pH

Table S1. Site characteristics of two forest types.

Forest types	Stand	Altitude/m	Age/a	H/m	DBH/cm	Canopy density	Slope/(°)
<i>Pinus yunnanensis</i> forest	1	2193	25	8.7	10.5	0.73	13
	2	2185	27	11.3	12.7	0.82	15
	3	2236	25	9.4	11.3	0.75	12
<i>Pinus armandii</i> forest	1	2339	24	12.1	24.1	0.75	12
	2	2337	23	11.0	17.0	0.79	13
	3	2336	24	9.5	20.5	0.80	15

Note: H, tree height; DBH, average diameter at breast height.

Table S2. Response to N addition at the bacterial/fungal phylum level in Pinus yunnanensis forest soil.

Treatment s	Bacteria										Fungi					
	Acidobacter	Proteobacteria	Chlorofle	Actinobacteri	Planctomycete	Verrucomicrobi	Bacteroidete	Firmicutes	unclassified_Bacteri	Other	Basidiomycot	Ascomycota	Mucoromycot	Mortierellomyc	Rozellomycot	Other
	ia		xi	a	s	a	s		a		a		a	ota	a	
CK	45.55(1.11) ^c	26.06(3.04) ^a	3.76(2.57) ^a	6.21(1.03) ^a	2.70(0.29) ^a	3.77(1.45) ^{ab}	1.03(0.19) ^a	0.99(0.75) ^a	8.13(4.89) ^a	1.80(0.72) ^a	79.02(1.21) ^a	14.52(1.30) ^b	1.28(0.04) ^b	3.85(0.74) ^a	0.97(0.43) ^a	0.36(0.17) ^a
N10	52.18(1.22) ^a	23.34(1.25) ^a	2.40(0.34) ^a	6.04(0.53) ^a	2.66(0.89) ^a	3.15(1.42) ^{ab}	1.07(0.59) ^a	0.86(0.52) ^a	6.51(3.56) ^a	1.79(0.50) ^a	66.73(1.16) ^b	27.34(1.72) ^a	1.05(0.19) ^b	3.68(2.25) ^a	0.90(0.31) ^a	0.28(0.18) ^a
N20	49.27(0.62) ^b	25.89(2.51) ^a	1.56(0.09) ^a	6.46(1.65) ^a	3.15(0.74) ^a	2.54(0.98) ^b	1.42(0.40) ^a	0.84(0.38) ^a	6.93(4.08) ^a	1.93(0.73) ^a	78.53(2.36) ^a	13.89(0.98) ^b	2.71(1.03) ^b	4.12(1.68) ^a	0.37(0.04) ^b	0.39(0.20) ^a
N25	46.25(1.37) ^c	26.88(0.79) ^a	2.05(0.05) ^a	5.82(0.42) ^a	3.74(0.23) ^a	4.79(0.11) ^a	1.43(0.55) ^a	1.09(0.31) ^a	5.60(0.64) ^a	2.35(1.14) ^a	76.14(4.71) ^a	11.73(2.42) ^b	6.17(2.86) ^a	5.58(1.57) ^a	0.21(0.11) ^b	0.17(0.04) ^a
N	0.000***	0.266	0.264	0.886	0.184	0.172	0.599	0.925	0.862	0.810	0.002**	0.000***	0.012*	0.513	0.019*	0.425

a. Data were presented as means (standard errors), and the different letters within columns indicate significant differences among treatments in the same stand ($P < 0.05$).
b. * indicated $P < 0.05$, ** indicated $P < 0.01$, *** indicated $P < 0.001$.
c. Abbreviations: CK, 0 g N·m⁻²·a⁻¹; N10, 10 g N·m⁻²·a⁻¹; N20, 20 g N·m⁻²·a⁻¹; and N25, 25 g N·m⁻²·a⁻¹.

Table S3. Correlation of soil bacterial/fungal phylum levels and soil chemical properties in Pinus yunnanensi forests.

Variab le	Bacteria																		Fungi													
	Acidobacteri a		Proteobacter ia		Chloroflexi		Actinobacter ia		Planctomycet es		Verrucomicro bia		Bacteroidete s		Firmicutes		unclassified_Bacte ria		Other		Basidiomycota		Ascomycota		Mucoromyco ta		Mortierellomyc ota		Rozellomyco ta		Other	
	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P
pH	0.045	0.890	0.170	0.598	- 0.450	0.143	- 0.175	0.587	0.589	0.044	0.071	0.827	0.423	0.171	0.122	0.705	-0.185	0.564	0.188	0.559	0.036	0.911	- 0.306	0.334	0.621	0.031	0.397	0.202	- 0.800	0.002	- 0.338	0.283
SOM	0.451	0.141	- 0.651	0.022	0.201	0.532	- 0.594	0.042	- 0.596	0.041	-0.496	0.101	0.109	0.735	0.616	0.033	0.473	0.120	-0.545	0.067	-0.431	0.162	0.423	0.171	- 0.120	0.711	-0.103	0.749	0.250	0.432	0.231	0.470
NH ₄ ⁺ - N	0.519	0.084	- 0.132	0.682	- 0.542	0.069	0.037	0.908	0.330	0.294	-0.293	0.355	0.300	0.343	- 0.025	0.938	-0.164	0.609	0.108	0.739	-0.214	0.505	0.072	0.824	0.299	0.346	0.158	0.623	- 0.581	0.047	- 0.103	0.749
NO ₃ -N	0.872	0.000	- 0.741	0.006	0.049	0.880	0.083	0.797	- 0.158	0.624	-0.520	0.083	- 0.177	0.583	- 0.027	0.934	0.021	0.949	-0.272	0.392	-0.609	0.036	0.815	0.001	- 0.471	0.122	-0.474	0.119	0.097	0.764	0.082	0.800
AP	- 0.257	0.420	- 0.148	0.647	0.121	0.709	- 0.485	0.110	0.096	0.768	0.539	0.070	- 0.217	0.498	0.353	0.260	0.193	0.549	-0.140	0.663	-0.257	0.420	- 0.036	0.912	0.578	0.049	0.210	0.513	- 0.208	0.517	- 0.007	0.984
K ⁺	- 0.028	0.931	0.367	0.240	- 0.273	0.391	0.364	0.245	- 0.085	0.794	-0.256	0.422	0.221	0.491	- 0.243	0.446	-0.104	0.748	0.058	0.859	0.563	0.057	- 0.437	0.155	- 0.101	0.754	-0.078	0.810	- 0.082	0.800	0.485	0.110
TN	0.196	0.542	0.012	0.972	- 0.332	0.292	0.092	0.775	0.370	0.237	0.198	0.538	0.323	0.306	- 0.184	0.567	-0.361	0.248	0.539	0.070	-0.267	0.401	0.200	0.534	0.082	0.801	0.102	0.753	- 0.160	0.620	- 0.568	0.054

Abbreviations: pH, pondus hydrogenii; SOM, soil organic matter; NH₄⁺-N, Soil ammonium N; NO₃-N, Soil nitrate N; AP, available phosphorus; K⁺, potassium ion; TN, total nitrogen.

Table S4. Response to N addition at the bacterial/fungal phylum level in *Pinus armandii* forest soil.

Treatment s	Bacteria										Fungi								
	Acidobacter ia	Proteobacter ia	Chlorofle xi	Actinobacteri a	Planctomy cetes	Verrucomicr obia	Bacteroi des	Firmicutes	candidate _division_ WPS-2	Cyanobact eria_Chlor oplast	Gemmatimo nadetes	unclassified _Bacteria	Other	Basidiomyc ota	Ascomycota	Mucoromycot a	Mortierello mycota	Rozellom ycota	Other
CK	26.72(2.35) ^{bc}	38.05(0.73) ^a	2.86(1.90) ^b	12.82(1.01) ^a	3.27(0.40) ^a	2.50(1.08) ^b	1.62(0.23) ^a	2.66(0.26) ^a	1.48(1.35) ^a	0.06(0.03) ^b	0.70(0.39) ^a	6.22(0.77) ^c	1.06(0.25) ^a	80.11(0.58) ^a	13.99(0.85) ^d	1.27(0.36) ^a	3.21(0.76) ^b	0.59(0.30) ^a	0.17(0.04) ^a
N10	33.52(1.11) ^a	30.69(1.21) ^{bc}	5.39(0.54) ^a	11.41(0.77) ^a	1.98(0.30) ^b	3.84(0.49) ^{ab}	1.80(0.50) ^a	1.46(0.20) ^c	0.77(0.01) ^a	1.05(0.06) ^a	0.22(0.09) ^b	6.87(0.66) ^{bc}	0.99(0.31) ^a	57.12(4.25) ^c	30.22(1.94) ^b	1.26(0.91) ^a	10.34(2.45) ^a	0.93(1.19) ^a	0.14(0.10) ^a
N20	28.55(1.26) ^b	29.79(0.61) ^c	6.75(0.26) ^a	10.77(0.54) ^a	1.70(0.51) ^b	4.74(0.60) ^a	2.23(0.05) ^a	2.04(0.27) ^{bc}	1.55(0.19) ^a	0.47(0.37) ^a	0.48(0.24) ^{ab}	9.79(0.72) ^b	1.15(0.25) ^a	69.59(2.23) ^b	20.70(3.17) ^c	1.60(1.02) ^a	7.39(5.06) ^{ab}	0.42(0.49) ^a	0.30(0.30) ^a
N25	24.58(1.31) ^c	31.82(0.42) ^b	3.28(0.99) ^b	10.82(3.24) ^a	1.82(0.91) ^b	5.43(1.26) ^a	1.94(0.89) ^a	2.37(0.48) ^{ab}	1.69(1.51) ^a	0.75(0.90) ^a	0.19(0.12) ^{bc}	13.93(3.49) ^a	1.37(0.50) ^a	57.45(0.54) ^c	37.79(1.24) ^a	1.02(0.61) ^a	2.39(1.95) ^b	1.03(0.48) ^a	0.32(0.08) ^a
N	0.001**	0.000***	0.008**	0.490	0.036*	0.022*	0.559	0.009**	0.700	0.158	0.104	0.004**	0.573	0.000***	0.000***	0.831	0.037*	0.697	0.473

a. Data were presented as means (standard errors), and the different letters within columns indicate significant differences among treatments in the same stand ($P < 0.05$).
b. * indicated $P < 0.05$, ** indicated $P < 0.01$, *** indicated $P < 0.001$.
c. Abbreviations: CK, 0 g N·m⁻²·a⁻¹; N10, 10 g N·m⁻²·a⁻¹; N20, 20 g N·m⁻²·a⁻¹; and N25, 25 g N·m⁻²·a⁻¹.

Table S5. Correlation of soil bacterial/fungal phylum levels and soil chemical properties in Pinus armandii forests.

Variable	Bacteria																								Fungi																
	Acidobact		Proteob		Chloroflexi		Actinobacte		Planctomyc		Verrucomicr		Bacteroidete		Firmicut		candidate_d		Cyanobacter		Gemmatim		unclassified		Other		Basidiomy		Ascomyc		Mucorom		Mortierello		Rozellom		Other				
	eria		acteria				ria		etes		obia		s		es		ivision_WP		ia_Chloropl		onadetes		_Bacteria				cota		ota		ycota		mycota		ycota						
	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P	r	P					
pH	0.35	0.2	0.6	0.0	0.44	0.14	-	0.91	-	0.00	0.62	0.03	0.05	0.87	-	0.4	-	0.65	-	0.20	0.50	0.09	-	0.00	-	0.24	0.69	0.0	0.8	0.0	0.0	0.8	0.14	0.65	-	-	0.1	0.5	0.3	0.2	
	8	54	01	39	9	3	0.03	0	0.80	2	3	0	3	1	0.2	29	0.14	4	0.39	8	0	8	0.86	0	0.36	5									9	0					4
SOM	-	0.9	-	0.2	-	0.54	-	0.83	0.44	0.14	-	0.33	-	0.28	-	0.5	-	0.91	0.42	0.17	-	0.02	0.46	0.13	0.13	0.66	-	-	-	-	-	0.06	0.85	-	-	-	-	-	-		
	0.00	92	0.3	16	0.19	1	0.06	7	7	5	0.30	8	0.33	3	0.1	98	0.03	8	1	3	0.63	7	3	0	9	6	0.83	0.0	0.8	0.0	0.2	0.3	1	1	0.4	0.1	0.1	0.6			
NH ₄ ⁺ -N	0.90	0.0	-	0.3	0.04	0.89	0.48	0.10	-	0.31	-	0.85	-	0.01	-	0.8	-	0.40	0.19	0.54	0.04	0.90	-	0.03	-	0.12	-	-	-	-	-	0.69	0.01	-	-	-	-	-	-		
	4	00	0.2	75	4	1	9	7	0.31	5	0.06	0	0.69	2	0.0	76	0.26	0.40	0.19	0.54	0	3	0.62	0	0.47	1	0.09	0.7	0.1	0.5	0.1	0.6	2	3	0.0	0.8	0.3	0.2			
NO ₃ ⁻ -N	-	0.2	-	0.0	-	0.15	0.26	0.39	0.79	0.00	-	0.02	-	0.98	0.3	0.2	0.22	0.48	0.18	0.56	-	0.26	0.81	0.00	0.33	0.28	-	-	-	-	-	0.60	-	-	-	-	-	-			
	0.37	30	0.6	16	0.44	0	8	9	9	2	0.65	0	0.00	5	91	09	3	6	6	2	0.35	2	5	1	8	3	0.46	0.1	0.5	0.0	0.0	0.8	0.16	7	0.0	0.9	0.4	0.1			
AP	0.18	0.5	-	0.0	-	0.56	0.71	0.00	0.41	0.17	-	0.11	-	0.15	0.4	0.1	-	0.94	0.19	0.53	-	0.10	0.18	0.55	0.40	0.19	-	-	-	-	-	0.38	0.21	-	-	-	-	-	-		
	1	73	0.7	04	0.18	7	1	9	5	9	0.48	0	0.43	6	45	47	0.02	3	7	9	0.49	4	9	7	3	4	0.46	0.1	0.3	0.2	0.2	0.4	7	4	0.2	0.5	0.3	0.2			
K ⁺	0.00	0.9	0.7	0.0	0.38	0.22	-	0.01	-	0.02	0.55	0.06	0.29	0.34	-	0.1	0.06	0.84	-	0.20	0.53	0.07	-	0.19	-	0.39	-	-	-	-	-	-	0.40	-	-	-	-	-	-		
	3	92	80	03	1	1	0.69	2	0.65	0	3	2	7	8	0.4	58	5	0.39	0.20	2	0	6	0.40	3	0.26	8	0.32	0.2	0.2	0.4	0.0	0.9	0.26	8	0.1	0.6	0.5	0.0			
TN	0.14	0.6	-	0.3	-	0.94	-	0.61	0.20	0.52	-	0.30	-	0.43	0.2	0.5	-	0.68	0.34	0.27	-	0.03	0.20	0.51	0.41	0.18	-	-	-	-	-	-	-	-	-	-	-	-	-		
	5	53	0.2	92	0.02	2	0.16	7	5	2	0.32	0.30	0.24	9	13	06	0.13	0	1	8	0.62	0	8	6	5	0	0.66	0.0	0.7	0.0	0.4	0.1	0.12	0.69	0.3	0.2	0.0	0.8			

Abbreviations: pH, pondus hydrogenii; SOM, soil organic matter; NH₄⁺-N, Soil ammonium N; NO₃⁻-N, Soil nitrate N; AP, available phosphorus; K⁺, potassium ion; TN, total nitrogen

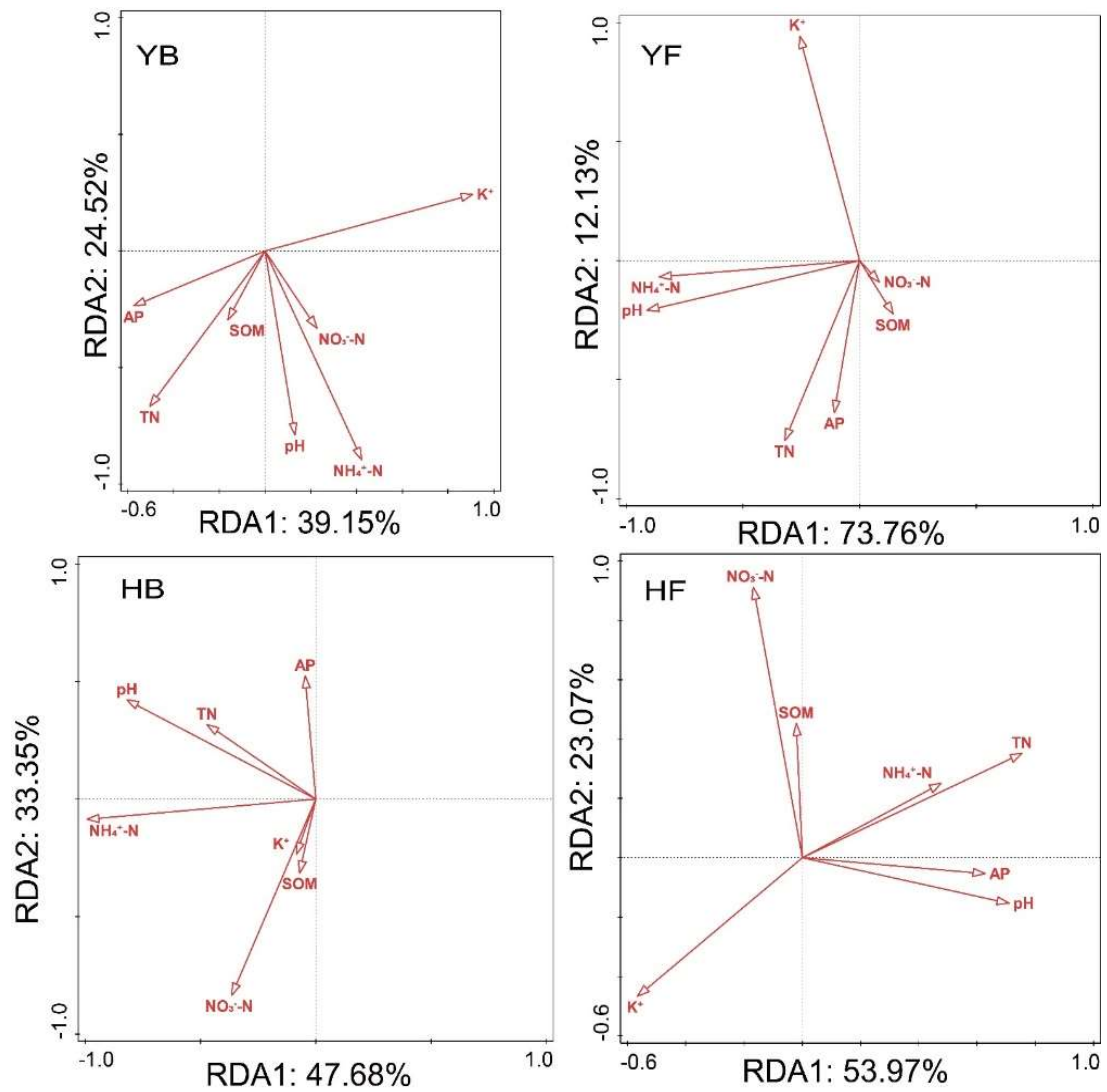


Figure S1. RDA analysis of bacterial and fungal community structure in relation to environmental factors. Abbreviations: pH, pondus hydrogenii; SOM, soil organic matter; NH_4^+-N , soil ammonium nitrogen; NO_3^-N , soil nitrate nitrogen; TN, total nitrogen; AP, available phosphorus; K^+ , potassium ion; YB: the bacterial community of *Pinus yunnanensis* forest; YF: the fungal community of *Pinus yunnanensis* forest; HB: the bacterial community of *Pinus armandii* forest; HF: the fungal community of *Pinus armandii* forest.