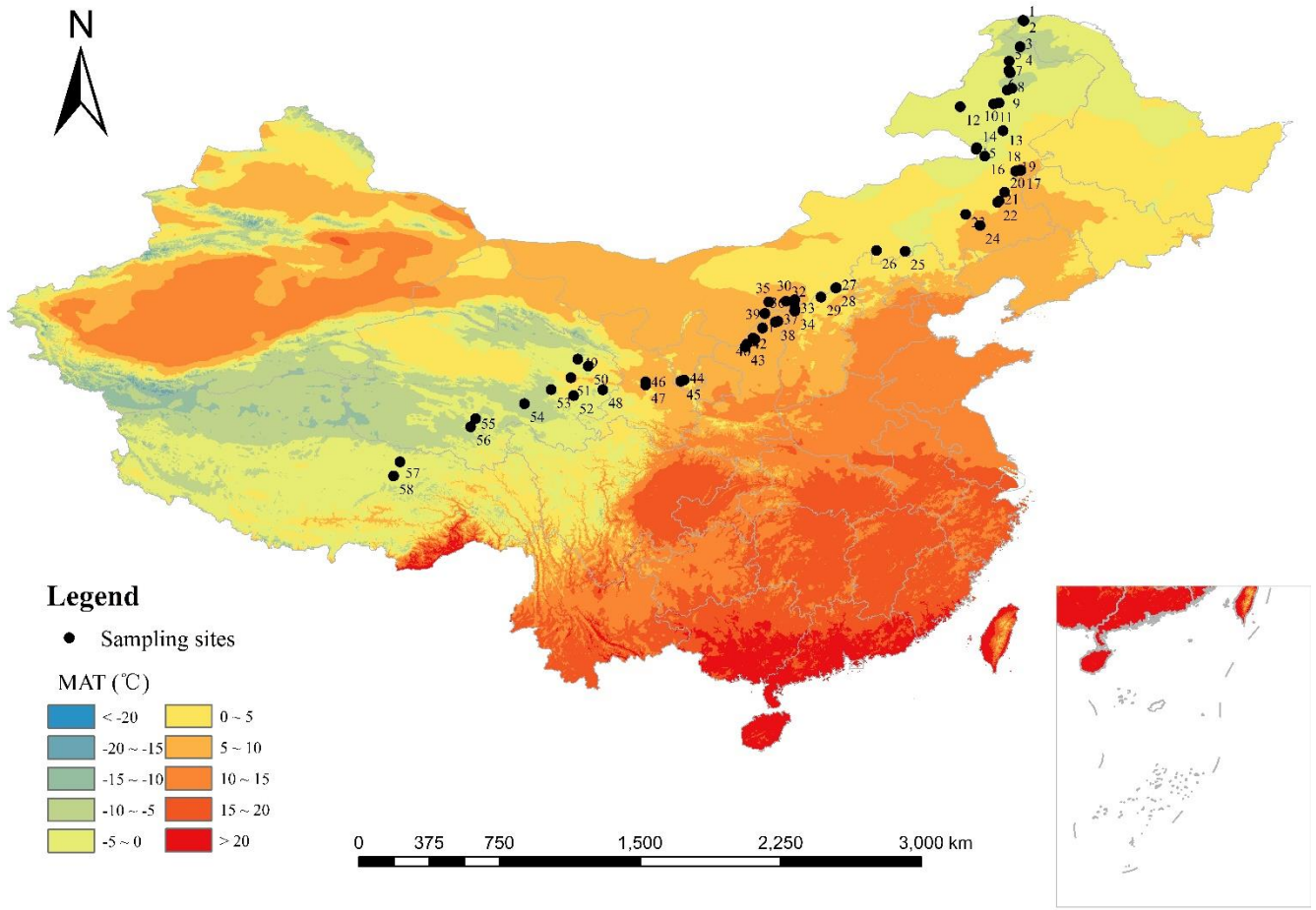

Figure S1. The sampling sites figured on the mean annual temperature map of China, provided by Data Center for Resources and Environmental Sciences, Chinese Academy of Sciences (RESDC) (http://www.resdc.cn). The detailed information of sampling sites was showed in Table S1.

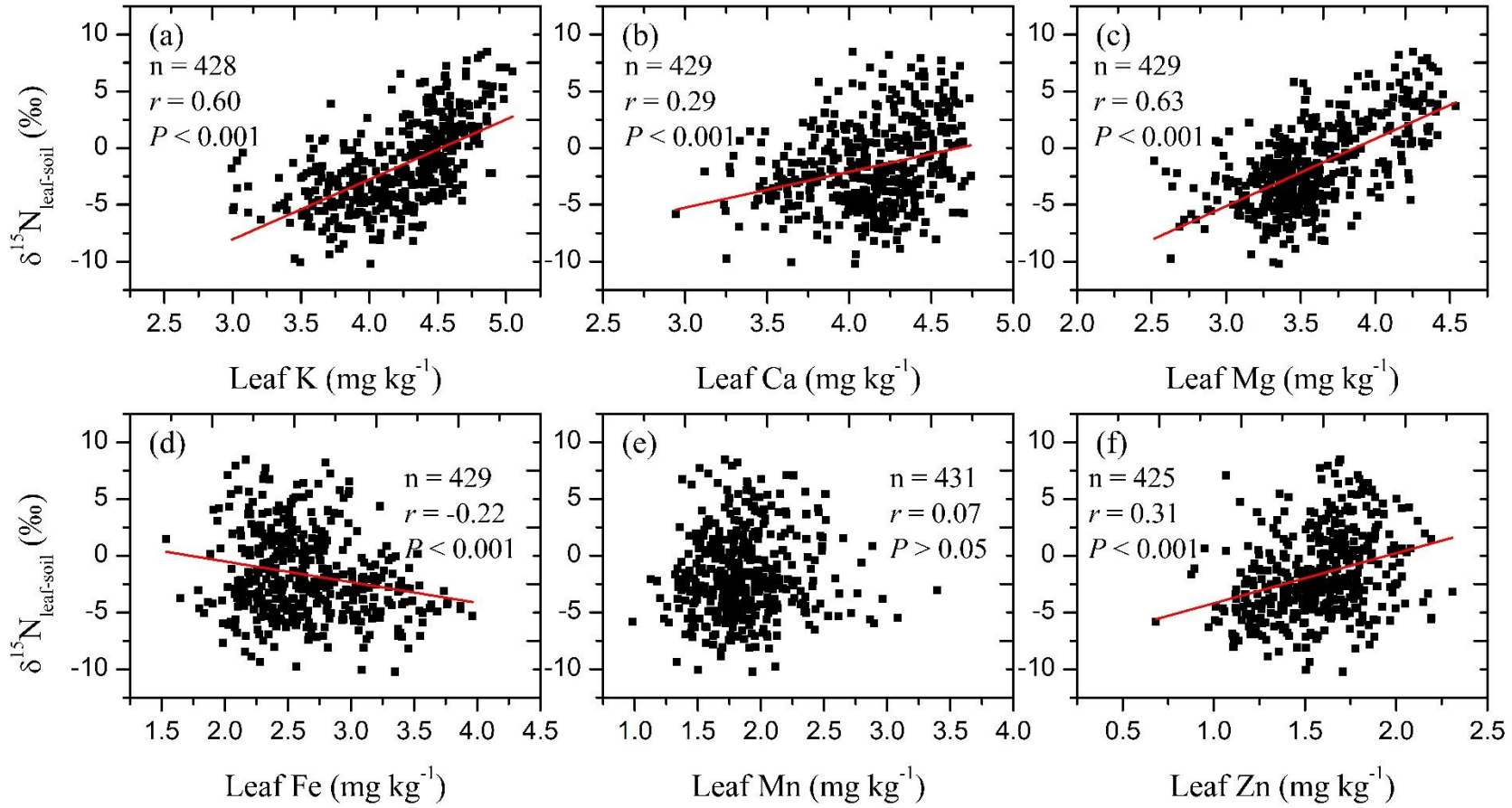

Figure S2. Relationships between $\delta^{15}N_{leaf\text{-}soil}$ and the contents of leaf K (a), Ca (b), Mg (c), Fe (d), Mn (e) and Zn (f) for all non-N_2-fixing species pooled together. The contents of leaf metallic elements were log-transformed.

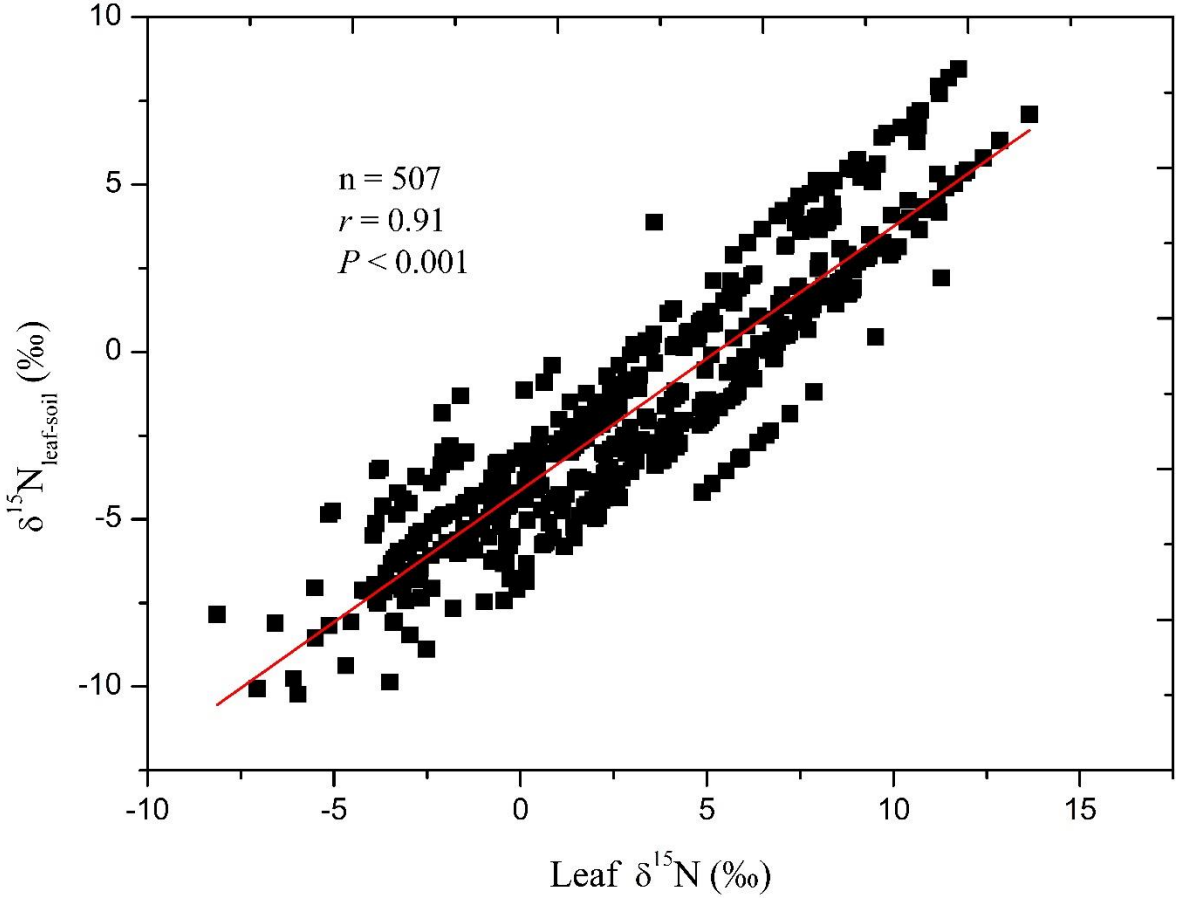

Figure S3. Relationships between $\delta^{15}N_{leaf\text{-}soil}$ and leaf $\delta^{15}N$ for all non-N_2-fixing species pooled together.

Table S1. Detailed information about the sampling sites along the 400 mm isohyet in China.

No.	Site name	Lon./ E°	Lat./ N°	Alt./ m	MAT/ ℃	MAP/ mm	Site-averaged leaf $\delta^{15}N$/‰	Vegetation type	Soil type
1	Luoguhecun	122.15	53.29	603	-4.9	451.6	-2.1±0.5	Frigid temperature coniferous forest	Umbrisols
2	Beijicun	122.19	53.26	457	-4.1	451.6	3.2±0.8	Frigid temperature coniferous forest	Umbrisols
3	Mangui-1	122.01	52.02	649	-4.2	444.4	3.4±1.2	Frigid temperature coniferous forest	Umbrisols
4	Mangui-2	122.01	52.01	655	-4.2	444.4	-3.1±0.9	Frigid temperature coniferous forest	Umbrisols
5	Jinhezhen	121.49	51.33	787	-4.5	440.7	5.3±1.0	Frigid temperature coniferous forest	Umbrisols
6	Genhe-2	121.47	50.88	800	-4.1	437.1	-1.1±0.4	Frigid temperature coniferous forest	Umbrisols
7	Genhe-1	121.53	50.77	718	-3.6	437.1	5.3±0.4	Frigid temperature coniferous forest	Umbrisols
8	Kuduer-1	121.62	50.02	834	-3.7	414.5	7.5±0.8	Frigid temperature coniferous forest	Umbrisols
9	Kuduer-2	121.40	49.94	829	-3.7	414.5	-0.9±1.0	Frigid temperature coniferous forest	Umbrisols
10	Yakeshi-2	121.00	49.33	634	-1.6	388.5	2.6±1.0	Frigid temperature coniferous forest	Umbrisols
11	Yakeshi-1	120.74	49.27	676	-1.8	388.5	4.3±0.8	Frigid temperature coniferous forest	Umbrisols
12	Hailaer	119.14	49.14	609	-0.2	352.1	7.2±0.8	Frigid temperature coniferous forest	Umbrisols
13	Taerqizhen	121.19	47.99	789	-3.2	470.2	7.7±1.2	Frigid temperature coniferous forest	Umbrisols
14	Aershan-1	119.93	47.17	997	-2.3	441.3	6.6±0.8	Frigid temperature coniferous forest	Umbrisols
15	Aershan-2	119.90	47.10	1240	-3.8	441.3	6.4±0.5	Frigid temperature coniferous forest	Umbrisols
16	Wuchagouzhen	120.31	46.77	801	0.6	437.4	5.2±0.7	Frigid temperature coniferous forest	Umbrisols
17	Wulanhaote-1	122.05	46.09	287	5.5	433.5	3.7±0.7	Temperature meadow steppe	Chernozems
18	Keyouqianqi	121.97	46.08	281	5.5	433.5	5.5±0.4	Temperature meadow steppe	Chernozems
19	Wulanhaote-2	121.80	46.05	366	5.0	433.5	-0.4±2.1	Temperature meadow steppe	Chernozems
20	Baiyinhushuo	121.27	45.04	280	6.5	361.9	6.1±1.1	Temperature typical steppe	Chernozems
21	Zhalute-2	121.00	44.61	332	6.7	361.9	-1.5±1.3	Temperature meadow steppe	Chernozems

22	Zhalute-1	120.93	44.55	265	7.1	361.9	2.7±0.8	Temperature meadow steppe	Chernozems
23	Balinzuoqi	119.40	43.97	477	5.9	369.7	6.8±0.5	Temperature typical steppe	Chernozems
24	Linxi	120.09	43.44	928	4.4	369.4	-1.5±0.8	Temperature typical steppe	Chernozems
25	Duolun	116.50	42.20	1238	2.8	378.0	2.9±0.5	Temperature typical steppe	Chernozems
26	Zhengxiangbaiqi	115.12	42.24	1405	2.4	351.2	7.7±0.7	Temperature typical steppe	Chernozems
27	Fengzhen-2	113.20	40.45	1236	5.3	377.2	0.4±0.5	Temperature typical steppe	Chernozems
28	Fengzhen-1	113.17	40.44	1195	5.5	377.2	4.9±1.1	Temperature typical steppe	Chernozems
29	Youyu	112.46	40.00	1358	4.2	407.0	3.6±0.9	Temperature meadow steppe	Calcisols
30	Zhungeerqi-2	111.20	39.87	1236	7.8	390.6	-2.8±0.6	Temperature meadow steppe	Calcisols
31	Zhungeerqi-1	111.18	39.74	1249	7.7	390.6	0.4±0.9	Temperature meadow steppe	Calcisols
32	Dongsheng-2	110.79	39.80	1180	8.8	368.0	--	Temperature meadow steppe	Calcisols
33	Hequ-1	111.21	39.42	875	8.1	382.2	-1.7±0.4	Temperature meadow steppe	Calcisols
34	Hequ-2	111.20	39.33	912	7.9	382.2	-3.3±1.2	Temperature meadow steppe	Calcisols
35	Dongsheng-1	109.96	39.77	1411	7.0	368.0	--	Temperature meadow steppe	Calcisols
36	Yijinhuoluoqi	109.77	39.21	1276	7.5	340.3	6.9±1.3	Semi-desert grasslands	Calcisols
37	Shenmu-2	110.40	38.84	1131	8.0	410.3	-2.4±0.5	Semi-desert grasslands	Calcisols
38	Shenmu-1	110.27	38.80	1226	7.4	410.3	0.9±1.7	Semi-desert grasslands	Calcisols
39	Yulin	109.66	38.51	1141	8.9	383.6	-3.0±0.3	Semi-desert grasslands	Calcisols
40	Hengshan-2	109.20	38.04	1131	9.1	355.9	-1.6±0.9	Semi-desert grasslands	Calcisols
41	Hengshan-1	109.29	37.98	1019	9.7	355.9	4.5±0.9	Semi-desert grasslands	Calcisols
42	Jingbian-2	108.90	37.74	1394	8.4	384.7	-2.7±0.3	Semi-desert grasslands	Calcisols
43	Jingbian-1	108.83	37.61	1333	8.8	384.7	2.5±1.0	Semi-desert grasslands	Calcisols
44	Xiji-2	105.90	36.02	1982	5.4	391.0	-2.0±0.4	Temperature meadow steppe	Calcisols
45	Xiji-1	105.74	35.96	1931	5.7	391.0	2.2±1.2	Temperature meadow steppe	Calcisols
46	Yuzhong-1	104.05	35.93	1896	6.8	372.4	1.2±1.0	Temperature coniferous and broad-leaved mixed forests	Luvisols
47	Yuzhong-2	104.05	35.78	2361	4.0	372.4	-2.8±0.6	Temperature coniferous and broad-leaved mixed forests	Luvisols

48	Tongren	102.00	35.55	2467	6.2	408.4	1.7±0.5	Subalpine grassland	Leptosols
49	Haiyan	100.80	37.02	3233	0.1	400.0	4.3±2.9	Subalpine grassland	Leptosols
50	Huangyuan	101.30	36.69	2725	3.6	426.9	1.5±0.8	Subalpine grassland	Leptosols
51	Gonghe	100.47	36.13	2937	3.9	324.7	1.1±0.3	Subalpine grassland	Leptosols
52	Tongde	100.60	35.27	3258	-0.1	418.5	3.7±1.1	Subalpine grassland	Leptosols
53	Maduo-1	99.52	35.56	4143	-2.6	332.5	-0.8±0.3	Alpine meadow	Cambisols
54	Maduo-2	98.24	34.88	4233	-3.1	332.5	6.3±1.1	Alpine meadow	Cambisols
55	Qumalai	95.90	34.16	4727	-5.1	422.2	0.9±0.9	Alpine meadow	Cambisols
56	Zhiduo	95.66	33.77	4360	-2.1	419.7	-0.2±1.0	Alpine meadow	Cambisols
57	Nierong	92.27	32.09	4731	-2.2	400.0	0.5±1.0	Alpine meadow	Cambisols
58	Naqu	91.96	31.41	4519	-0.7	449.6	0.2±0.2	Alpine meadow	Cambisols

Note: Lon., Lat., Alt., MAT and MAP are the abbreviations of longitude, latitude, altitude, mean annual temperature and mean annual precipitation. The longitude, latitude and altitude of each site were from the portable GPS; MAT and MAP represent the average values of more than 30 years and were from the local meteorological stations and the China Meteorological Data Sharing Service System (http://data.cma.cn/site/index.html). Because there are differences in altitudes between the sampling sites and the local meteorological stations, the data of MAT shown in the table have already been corrected for based on the coefficient of -0.60 ºC/100 m. However, we did not conduct the correction for MAP because there is not a general pattern of rainfall vs. altitude. Dominant soil and vegetation types were from "1:1,000,000 Vegetation Atlas of China"(2001).

Table S2. The correlations among six leaf metallic elements.

	Leaf K	Leaf Ca	Leaf Mg	Leaf Fe	Leaf Mn	Leaf Zn
Leaf K	1	0.283**	0.627**	-0.291**	-0.055	0.377**
Leaf Ca		1	0.630**	0.114**	0.151**	0.436**
Leaf Mg			1	-0.047	0.256**	0.431**
Leaf Fe				1	0.152**	-0.006
Leaf Mn					1	0.272**
Leaf Zn						1

Note: * * means that the relationships were significant at $P < 0.01$.

Table S3. Partial correlation analyses of leaf $\delta^{15}N$ vs. leaf metallic elements after controlling for leaf N concentrations.

Correlations	*r*	*P*
Leaf $\delta^{15}N$ vs. leaf K	**0.546**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Ca	0.043	> 0.05
Leaf $\delta^{15}N$ vs. leaf Mg	**0.378**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Fe	**-0.203**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Mn	-0.083	> 0.05
Leaf $\delta^{15}N$ vs. leaf Zn	**0.114**	< 0.05

Note: the *r* values in bold mean that the relationships were significant ($P < 0.05$).

Table S4. The correlations between leaf metallic elements and soil indexes.

	Soil $\delta^{15}N$	SOM	pH	Soil C/N	Soil N	Soil density	Soil sand	Soil silt	Soil clay	Soil silt/clay
Leaf K	0.438**	-0.088	-0.042	0.065	-0.167**	0.051	0.042	-0.044	0.013	-0.004
Leaf Ca	0.037	0.018	-0.054	0.066	0.002	-0.039	-0.043	0.043	0.014	-0.022
Leaf Mg	0.163**	-0.085	-0.064	0.049	-0.098*	0.001	-0.061	0.056	0.108	-0.012
Leaf Fe	-0.212**	0.014	0.129	-0.078	0.062	-0.025	0.064	-0.072	0.103	-0.169*
Leaf Mn	-0.054	0.394**	-0.568**	0.082	0.286**	-0.365**	-0.341**	0.331**	0.305**	0.075
Leaf Zn	0.207**	0.169**	-0.209**	0.055	0.117*	-0.090	-0.146	0.136	0.212**	-0.015

Note: * and * * means that the relationships were significant at $P < 0.05$ and $P < 0.01$, respectively.

Table S5. The correlations between leaf $\delta^{15}N$ and soil indexes.

Correlations	*r*	*P*
Leaf $\delta^{15}N$ vs. soil $\delta^{15}N$	**0.506**	< 0.01
Leaf $\delta^{15}N$ vs. SOM	-0.010	> 0.05
Leaf $\delta^{15}N$ vs. pH	**0.031**	> 0.05
Leaf $\delta^{15}N$ vs. soil C/N	0.120	< 0.05
Leaf $\delta^{15}N$ vs. soil N	-0.074	> 0.05
Leaf $\delta^{15}N$ vs. soil density	0.102	> 0.05
Leaf $\delta^{15}N$ vs. soil sand	0.007	> 0.05
Leaf $\delta^{15}N$ vs. soil silt	-0.010	> 0.05
Leaf $\delta^{15}N$ vs. soil clay	0.033	> 0.05
Leaf $\delta^{15}N$ vs. soil silt/clay	0.092	> 0.05

Table S6. Partial correlation analyses of leaf $\delta^{15}N$ vs. leaf metallic elements after controlling for soil $\delta^{15}N$.

Correlations	*r*	*P*
Leaf $\delta^{15}N$ vs. leaf K	**0.610**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Ca	**0.296**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Mg	**0.624**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Fe	**-0.209**	< 0.01
Leaf $\delta^{15}N$ vs. leaf Mn	0.084	> 0.05
Leaf $\delta^{15}N$ vs. leaf Zn	**0.302**	< 0.01