

Electronic supplementary information

C₆₀ treatment. C₆₀ (500 mg) was mixed with 50 g of air-dried soils and placed in a 50-mL large plastic centrifuge tube. The concentration of C₆₀ was 10.0 mg/g. Soils without C₆₀ was used as the control. The seeds of maize, wheat, and soybean were germinated. Healthy seedlings were selected and planted in centrifuge tubes, with buds facing up and roots facing down, 4 replicates per group (a total of 48 tubes). Seedlings were irrigated with water at soil water holding capacity of 70% and grown under a photoperiod of 12 h light/12 h dark at 25/20 °C day/night and 80% humidity for 10 days.

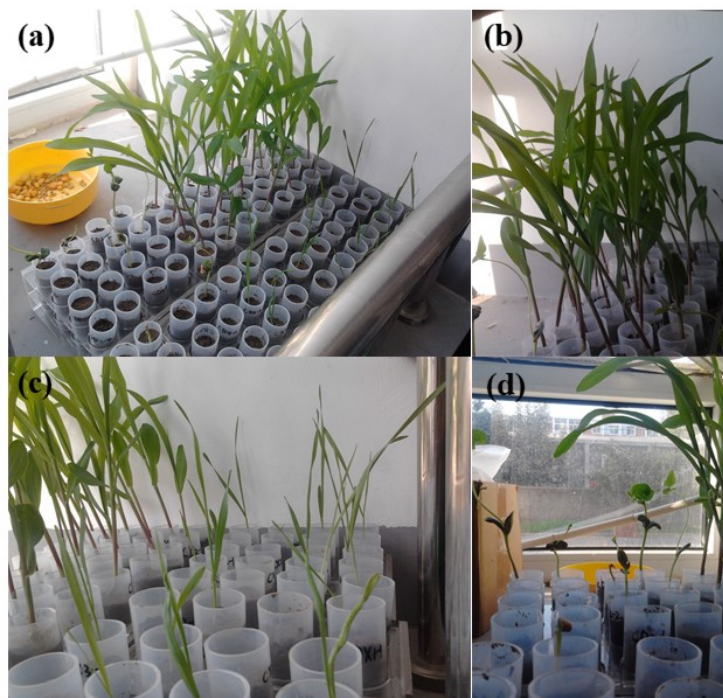


Figure S1 (a) Growth of maize, wheat and soybean plants in centrifuge tubes with four replicates per group (48 tubes in total)
(b) Growth of maize (c) Growth of wheat (d) Growth of soybean.

Table 1: Dry weight and ¹⁵N uptake rate of maize

	Dry weight (g)			¹⁵ N-uptake rate (µg N g ⁻¹ d.w.tissue h ⁻¹)		
	Underground d	Aboveground	Whole plant	Underground d	Aboveground	Whole plant
Ctrl-NH ₄ ⁺	0.2349	0.3640	0.5989	32.9347	3.3291	36.2637
C ₆₀ -NH ₄ ⁺	0.0981	0.3171	0.4151	34.4866	2.9212	37.4078
Ctrl-NO ₃ ⁻	0.1507	0.3085	0.4593	55.3715	23.3417	78.7131
C ₆₀ -NO ₃ ⁻	0.1586	0.4491	0.6077	29.6327	7.8550	37.4877
Ctrl-H ₂ O	0.1362	0.2562	0.3923	--	--	--
C ₆₀ -H ₂ O	0.0625	0.1896	0.2520	--	--	--

Table 2: Dry weight and ¹⁵N uptake rate of wheat

	Dry weight (g)			¹⁵ N-uptake rate (μg N g ⁻¹ d.w.tissue h ⁻¹)		
	Underground	Aboveground	Whole plant	Underground	Aboveground	Whole plant
	d			d		
Ctrl-NH ₄ ⁺	0.0308	0.1167	0.1475	6.1249	6.2669	12.3918
C ₆₀ -NH ₄ ⁺	0.0264	0.0843	0.1107	14.6525	36.271	50.9236
Ctrl-NO ₃ ⁻	0.0349	0.0973	0.1322	7.0437	24.9021	31.9457
C ₆₀ -NO ₃ ⁻	0.0254	0.0989	0.1243	7.4774	22.7378	30.2152
Ctrl-H ₂ O	0.0361	0.1147	0.1508	--	--	--
C ₆₀ -H ₂ O	0.0340	0.1279	0.1620	--	--	--

Table 3: Dry weight and ¹⁵N uptake rate of soybean

	Dry weight (g)			¹⁵ N-uptake rate (μg N g ⁻¹ d.w.tissue h ⁻¹)		
	Underground	Aboveground	Whole plant	Underground	Aboveground	Whole plant
	d			d		
Ctrl-NH ₄ ⁺	0.0097	0.1469	0.1566	148.78017	1.63015	150.41032
C ₆₀ -NH ₄ ⁺	0.0352	0.22915	0.26435	125.10295	6.96548	132.06844
Ctrl-NO ₃ ⁻	0.03057	0.147	0.17757	47.61186	23.57775	71.18961
C ₆₀ -NO ₃ ⁻	0.04233	0.29437	0.3367	11.64568	12.48156	24.12724
Ctrl-H ₂ O	0.03545	0.31115	0.3466	--	--	--
C ₆₀ -H ₂ O	0.0092	0.1256	0.1348	--	--	--

Table 4: Comparison of mineral elements in maize (Data are normalized)

	Underground		Aboveground	
	Ctrl-maize	C ₆₀ -maize	Ctrl-maize	C ₆₀ -maize
Ar	5.8333×10 ⁻⁴	5.7981×10 ⁻⁴	8.3409×10 ⁻⁴	8.1207×10 ⁻⁴
K	0.0087	0.0111	0.0391	0.0350
Ca	0.0343	0.0374	0.0259	0.0279
Ti	0.0060	0.0069	1.2762×10 ⁻⁴	2.0708×10 ⁻⁴
Cr	4.8612×10 ⁻⁴	3.9609×10 ⁻⁴	2.2599×10 ⁻⁵	7.0823×10 ⁻⁵
Mn	0.0092	0.0095	0.0039	0.0035
Fe	0.6679	0.6676	0.0093	0.0364
Ni	0.0014	0.0015	4.6416×10 ⁻⁵	9.9477×10 ⁻⁵
Cu	0.0027	0.0028	0.0016	0.0013
Zn	0.0078	0.0086	0.0101	0.0097
Ga	5.3176×10 ⁻⁴	5.375×10 ⁻⁴	5.9597×10 ⁻⁵	6.1938×10 ⁻⁵
As	0.0020	0.0024	0.0010	9.8641×10 ⁻⁴
Se	8.8232×10 ⁻⁴	0.0011	0.0015	0.0015
Br	0.0029	0.0039	0.0034	0.0031
Kr	0.0022	0.0042	0.0032	0.0030

Table 5: Comparison of mineral elements in wheat (Data are normalized)

	Underground		Aboveground	
	Ctrl-maize	C ₆₀ -maize	Ctrl-maize	C ₆₀ -maize

Ar	2.7813×10 ⁻⁴	2.9637×10 ⁻⁴	9.4970×10 ⁻⁴	0.0010
K	0.0055	0.0062	0.0536	0.0654
Ca	0.0242	0.0255	0.0179	0.0241
Ti	0.0108	0.0097	2.6701×10 ⁻⁴	2.5836×10 ⁻⁴
Cr	2.5942×10 ⁻⁴	3.5364×10 ⁻⁴	2.3106×10 ⁻⁵	2.0490×10 ⁻⁶
Mn	0.00493	0.0048	0.0031	0.0038
Fe	1.14133	0.9907	0.0356	0.0406
Ni	4.5408×10 ⁻⁴	4.2346×10 ⁻⁴	3.384×10 ⁻⁵	7.1163×10 ⁻⁵
Cu	0.0023	0.0022	0.0018	0.0020
Zn	0.0099	0.0104	0.0102	0.0131
Ga	0.0041	4.9933×10 ⁻⁴	5.6406×10 ⁻⁵	2.7647×10 ⁻⁵
As	0.0013	0.0010	9.8757×10 ⁻⁴	0.0011
Se	4.9633×10 ⁻⁴	3.2993×10 ⁻⁴	0.0014	0.0015
Br	0.00141	0.0019	0.0035	0.0041
Kr	0.0093	0.0073	0.0026	0.0032

Table 6: Comparison of mineral elements in soybean (Data are normalized)

	Underground		Aboveground	
	Ctrl-maize	C ₆₀ -maize	Ctrl-maize	C ₆₀ -maize
Ar	5.6910×10 ⁻⁴	4.6907×10 ⁻⁴	2.2737×10 ⁻⁴	2.4220×10 ⁻⁴
K	0.0103	0.0100	0.0273	0.0279
Ca	0.0343	0.04178	0.05734	0.04657
Ti	0.0082	0.0082	1.2662×10 ⁻⁴	1.0831×10 ⁻⁴
Cr	6.4057×10 ⁻⁴	5.0841×10 ⁻⁴	3.3030×10 ⁻⁵	1.9539×10 ⁻⁵
Mn	0.0098	0.0077	7.2204×10 ⁻⁴	0.0019
Fe	0.8712	0.8573	0.0274	0.0369
Ni	0.0012	0.0011	3.9698×10 ⁻⁴	3.3757×10 ⁻⁴
Cu	0.0024	0.0019	0.0018	0.0018
Zn	0.0067	0.0067	0.0087	0.0098
Ga	4.4415×10 ⁻⁴	5.1082×10 ⁻⁴	9.0237×10 ⁻⁵	7.327×10 ⁻⁵
As	0.0016	0.00167	0.0011	0.0011
Se	7.5629×10 ⁻⁴	6.9863×10 ⁻⁴	0.0014	0.0016
Br	0.0023	0.0021	0.0021	9.8081×10 ⁻⁴
Kr	0.0034	0.0084	0.0206	0.0124