

Supplementary Materials:

Table S1. Proportion of amino acid in epidermal mucus of *Eisenia fetida*.

Number	Amino Acid	Component Proportion (wt.%)	Number	Amino Acid	Component Proportion (wt.%)
1	Aspartate	10.27	9	Methionine	1.00
2	Threonine	3.58	10	Isoleucine	2.48
3	Serine	3.43	11	Leucine	2.9
4	Glutamate	13.26	12	Tyrosine	1.57
5	Proline	2.38	13	Phenylalanine	1.81
6	Glycine	5.02	14	Histidine	18.07
7	Alanine	4.00	15	Lysine	4.19
8	Proline	17.44	16	Arginine	8.6

Table S2. Nitrogen content of amino acids in mucus of *Eisenia fetida*.

Amino Acid	Total Molecular Weight	Nitrogen Atomic Weight	Nitrogen Atom Ratio (%)	Amino Acid Component Ratio (wt.%)	Nitrogen Ratio (wt.%)
Aspartic acid	133.10	14	10.52	10.27	1.08
Threonine	119.10	14	11.75	3.58	0.42
Serine	105.10	14	13.32	3.43	0.46
Glutamate	147.10	14	9.52	13.26	1.26
Proline	115.10	14	12.16	2.38	0.29
Glycine	75.10	14	18.64	5.02	0.93
Alanine	89.10	14	15.71	4.00	0.63
Proline	117.10	14	11.96	17.44	2.08
Methionine	149.20	14	9.38	1.00	0.09
Isoleucine	131.20	14	10.67	2.48	0.26
Leucine	131.20	14	10.67	2.90	0.31
Tyrosine	181.20	14	7.73	1.57	0.12
Phenylalanine	165.20	14	8.47	1.81	0.15
Histidine	155.20	42	27.06	18.07	4.89
Lysine	146.20	14	9.58	4.19	0.40
Arginine	174.20	28	16.07	8.60	1.38
Total					14.78

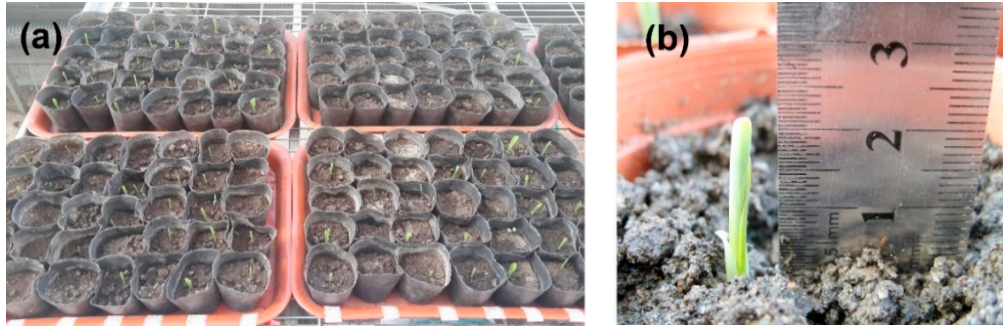


Figure S1. Maize sowing and emergence standards. (a) Apply liquid fertilizer to the nursery; (b) Maize seedlings with the height of 2 cm were used as the emergence standard.

Table S3. Physical properties and nutrient content of greenhouse soil.

Plough Depth (cm)	Moisture Content (% d.b)	Soil Bulk Density (g/cm ³)	Ammonium Nitrogen (mg/kg)	Quick-Acting Potassium (mg/kg)	Quick-Acting Phosphorus (mg/kg)	pH
0-10	16.36	1.34	63	52	30	6.30

Table S4. Liquid fertilizers application protocol.

CG	Urea 5	Bionic Fertilizer 3	Mucus 2	Urea 1	Mucus 3	Mucus 5	Bionic Fertilizer 3
bionic fertilizer 4	urea 4	mucus 3	CG	CG	bionic fertilizer 2	urea 4	bionic fertilizer 1
mucus 4	CG	urea 2	bionic fertilizer 2	mucus 3	CG	bionic fertilizer 1	bionic fertilizer 4
bionic fertilizer 2	urea 5	mucus 4	CG	mucus 1	CG	bionic fertilizer 3	urea 1
urea 2	mucus 4	CG	bionic fertilizer 2	CG	urea 2	bionic fertilizer 5	CG
mucus 3	CG	urea 3	CG	urea1	urea 5	mucus 2	mucus 2
CG	urea 1	urea 2	mucus 1	CG	mucus 5	CG	mucus 1
mucus 2	CG	CG	bionic fertilizer 4	CG	bionic fertilizer 5	bionic fertilizer 5	urea 3
bionic fertilizer 1	mucus 1	urea 5	bionic fertilizer 4	mucus 5	bionic fertilizer 1	bionic fertilizer 5	CG
urea 3	urea 4	CG	mucus 4	bionic fertilizer 3	mucus 5	urea 4	urea 3

Table S5. Three types of liquid fertilizer fertilization treatment within maize growth stage *.

Fertilization Treatment	Mucus Dosage (g/Plant)	Fertilization Treatment	Amino Acid Dosage (g/Plant)	Fertilization Treatment	Urea Dosage (g/plant)
mucus 1	120.00	Bionic fertilizer 1	12.00	urea 1	3.76
mucus 2	60.00	Bionic fertilizer 2	6.00	urea 2	1.88
mucus 3	30.00	Bionic fertilizer 3	3.00	urea 3	0.94
mucus 4	15.00	Bionic fertilizer 4	1.50	urea 4	0.47
mucus 5	7.50	Bionic fertilizer 5	0.75	urea 5	0.23

* The quality of each solution treated with liquid fertilizer in the table is 120 g.

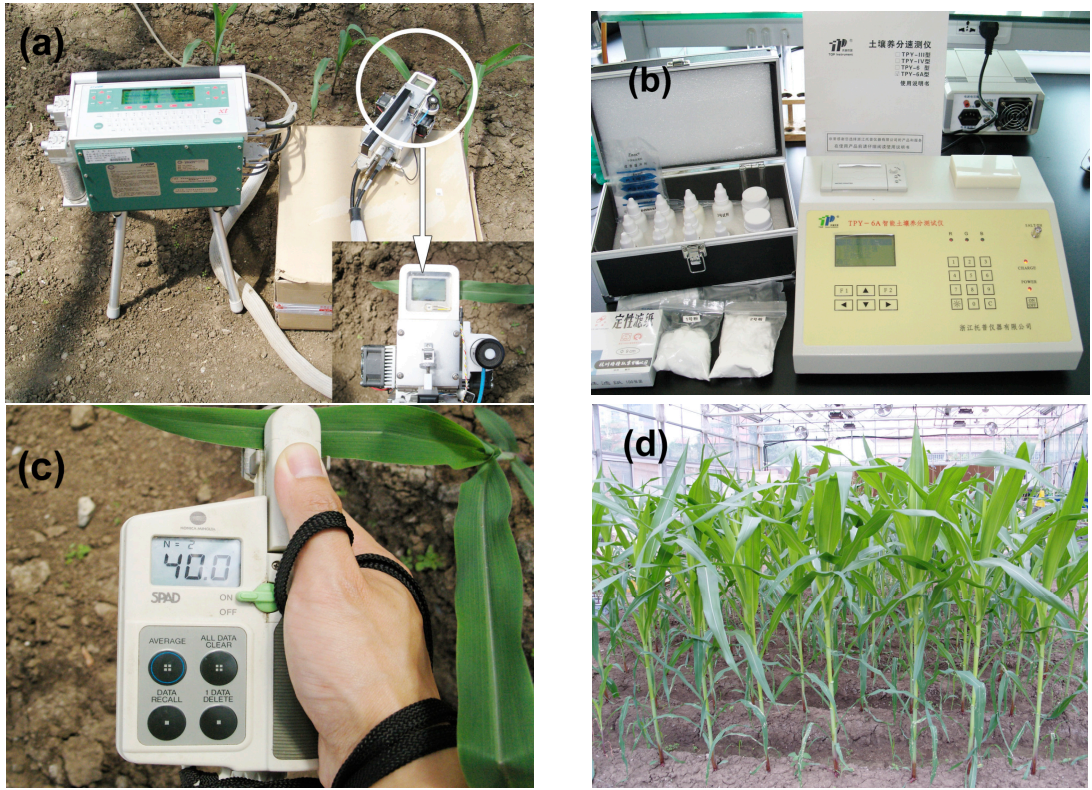
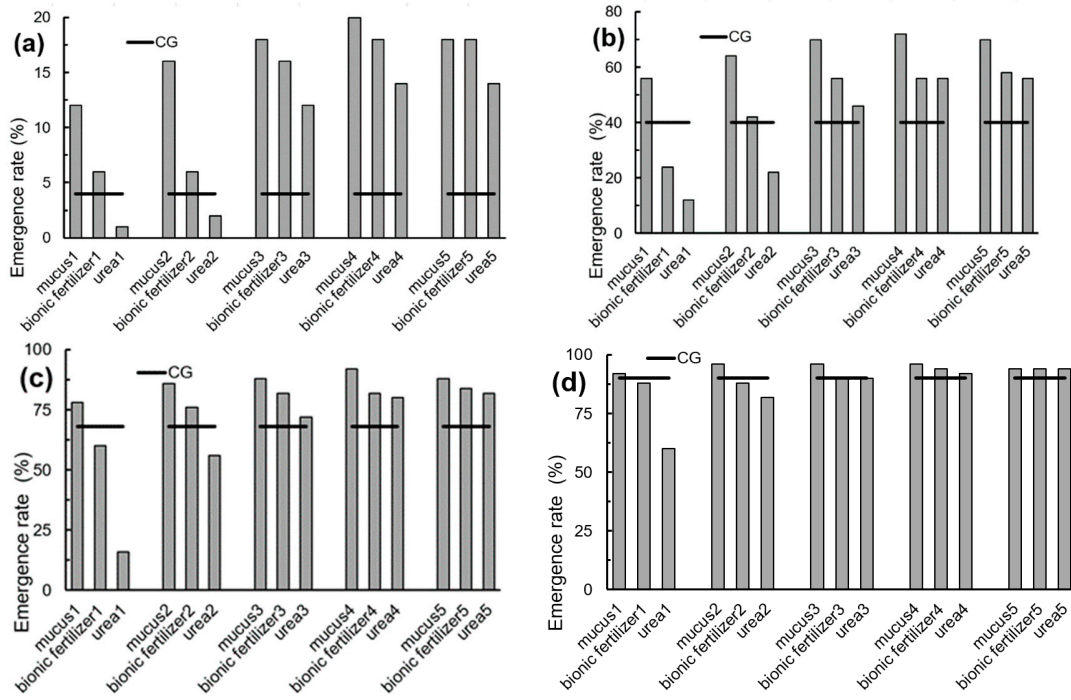


Figure S2. Maize growth index test. (a) Portable photosynthetic apparatus; (b) Soil nutrient meter; (c) Chlorophyll meter; (d) Maize growth measurement.



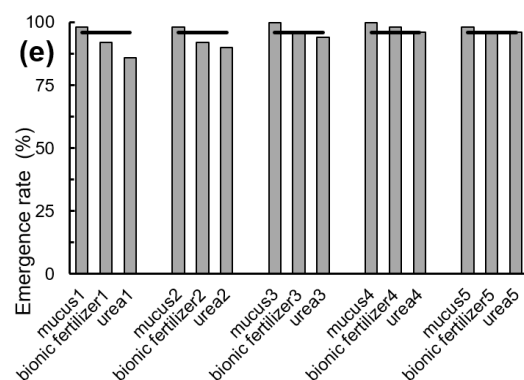


Figure S3. Effect of liquid fertilizer treatments on maize emergence rate and emergence index. (a–e) Maize emergence rate of 9–13 days after sowing; (f) Emergence index.

Table S6. Analysis of root growth morphology of maize seedlings*.

Treatment	Total Root Length (cm)	Total Root Surface Area (cm ²)
mucus 1	180.91 ± 17.44 ^{bcd}	8.60 ± 2.71 ^{acde}
mucus 2	187.30 ± 11.33 ^{bcd}	8.97 ± 1.79 ^{abcde}
mucus 3	219.09 ± 20.97 ^{bc}	10.60 ± 0.89 ^{bcde}
mucus 4	289.62 ± 58.70 ^a	12.35 ± 1.37 ^b
mucus 5	235.75 ± 46.57 ^c	10.80 ± 2.76 ^{bcde}
bionic fertilizer 1	144.00 ± 14.30 ^{de}	7.29 ± 0.41 ^{ae}
bionic fertilizer 2	148.44 ± 28.54 ^{de}	7.69 ± 2.80 ^{acde}
bionic fertilizer 3	169.02 ± 1.95 ^{bde}	8.02 ± 1.57 ^{acde}
bionic fertilizer 4	196.58 ± 68.01 ^{bcd}	9.04 ± 2.66 ^{abcde}
bionic fertilizer 5	214.88 ± 7.48 ^{bc}	11.27 ± 0.14 ^{bc}
urea 1	121.84 ± 23.70 ^e	6.94 ± 1.22 ^a
urea 2	125.61 ± 43.47 ^e	7.16 ± 2.38 ^{ae}
urea 3	170.29 ± 23.41 ^{bde}	8.56 ± 2.45 ^{acde}
urea 4	199.40 ± 14.88 ^{bcd}	10.36 ± 1.39 ^{abcde}
urea 5	219.96 ± 16.45 ^{bc}	11.01 ± 1.00 ^{bcd}
CG	165.32 ± 22.48 ^{bde}	7.42 ± 1.02 ^{ade}

* The data in the table indicate the mean ± standard deviation of the three measurements; the different letters in the same column indicate the significant difference ($p < 0.05$).

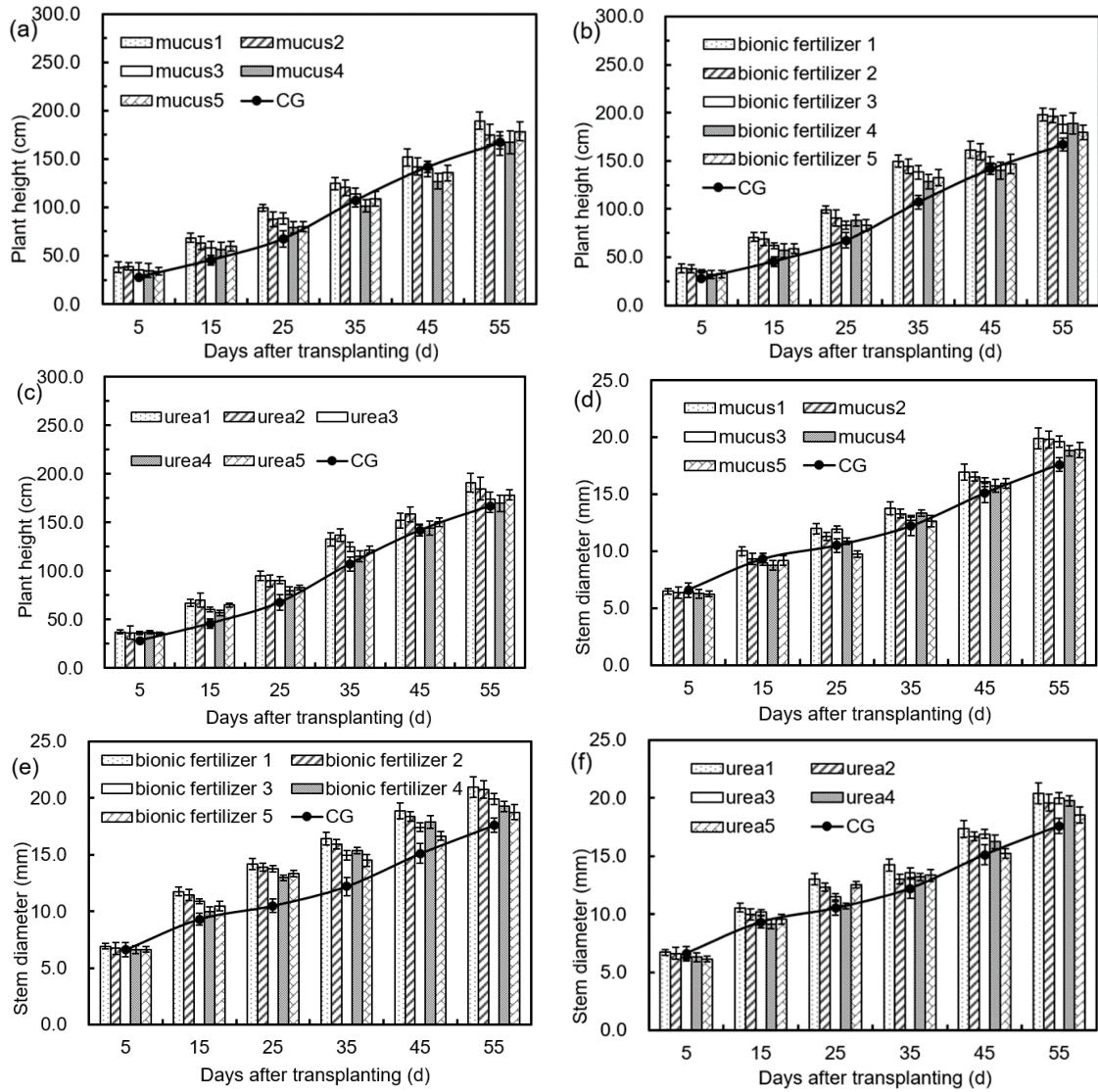


Figure S4. Effect of three liquid fertilizer treatments on maize plant height and stem diameter within maize growth stage. (a–c) Plant height variation; (d–f) Stem diameter variation (The error bar represents standard error).