

Supplementary materials

Table S1. Properties of initial substrates urban-natural-soil (CK), sewage sludge (SS) and sludge biochar (SB) of green roof before planting.

Substrate	SC	BD	MC	pH	TC	TN	TP	TK	EC
CK	28.9±	1.12 ±	19.60 ±	8.32 ±	11.36 ±	1.00 ±	1.21 ±	1.36 ±	0.16±
	0.26	0.07	9.80	0.01	0.13	0.02	0.03	0.01	0.03
SS	-	1.08 ±	66.6 ±	7.32 ±	156.66 ±	7.60 ±	9.60 ±	6.10 ±	6.62±
	-	0.12	6.81	0.16	0.68	0.32	0.08	0.03	0.15
SB	-	0.97 ±	52.7 ±	6.87 ±	243.38 ±	1.73 ±	1.71 ±	0.27 ±	5.18±
	-	0.09	6.23	0.02	0.38	0.03	0.03	0.01	0.21

Remarks: The soil series is the Huang Maqing of the Triassic, SB is sludge biochar which has been dehydrated before using; Soil Clay (SC, %), Bulk Density (10^3 kg m^{-3}), moisture content (MC, %), total carbon (TC, g kg^{-1}), total nitrogen (TN, g kg^{-1}), total phosphorus (TP, g kg^{-1}), total potassium (TK, g kg^{-1}), Electricity Conductivity (EC, mS cm^{-1}), \pm S.E. (\pm standard error).

Table S2. The physical and chemical properties of soil on the green roofs.

Note: The data was the last test. CK = natural soil, 5%SB, 10%SB, 15%SB and 20%SB = the

Treatment	pH	Soil total N (g kg ⁻¹)	Soil total P (g kg ⁻¹)	Soil total K (g kg ⁻¹)	Soil water (%)	Soil temperature (°C)	Soil air-filled porosity (%)	The consumption of sludge (kg)
CK	8.18±0.02	1.01±0.02	1.12±0.11	1.16±0.21	26.6±0.51	9.6±0.52	57.23±0.71	0.00±0.00
5%SB	7.66±0.01	1.16±0.05	1.23±0.13	1.32±0.27	29.8±0.56	11.1±0.31	59.29±0.30	126.25±0.13
10%SB	7.52±0.02	1.33±0.06	1.31±0.23	1.35±0.26	32.7±0.30	12.7±0.55	61.52±0.63	245.17±0.26
15%SB	7.46±0.03	1.57±0.05	1.39±0.32	1.39±0.13	36.2±0.53	13.2±0.28	62.24±0.51	356.25±0.57
20%SB	7.37±0.01	1.55±0.03	1.37±0.16	1.36±0.32	38.5±0.68	15.8±0.21	62.96±0.32	465.33±0.39
5%SS	7.27±0.02	1.19±0.02	1.31±0.29	1.30±0.22	27.6±0.25	10.1±0.18	57.66±0.23	12.75±0.63
10%SS	7.16±0.01	1.36±0.03	1.36±0.14	1.33±0.17	29.3±0.56	10.6±0.12	58.12±0.50	25.25±0.29
15%SS	7.11±0.02	1.58±0.02	1.41±0.22	1.36±0.12	32.1±0.31	11.8±0.20	58.25±0.58	37.13±0.52
20%SS	7.01±0.03	1.73±0.05	1.46±0.23	1.42±0.35	35.6±0.49	12.5±0.46	58.29±0.26	49.21±0.78

mixture of local natural soil and biochar with different ratios (v/v); 5%SS, 10%SS, 15%SS and

20%SS = the mixture of local natural soil and sludge with different ratios (v/v). Conversion

ratio of sludge pyrolysis into biochar was 10 : 1.