

Systematic Characterization of Cow Manure Biochar and Its Effect on *Salicornia herbacea* L. Growth

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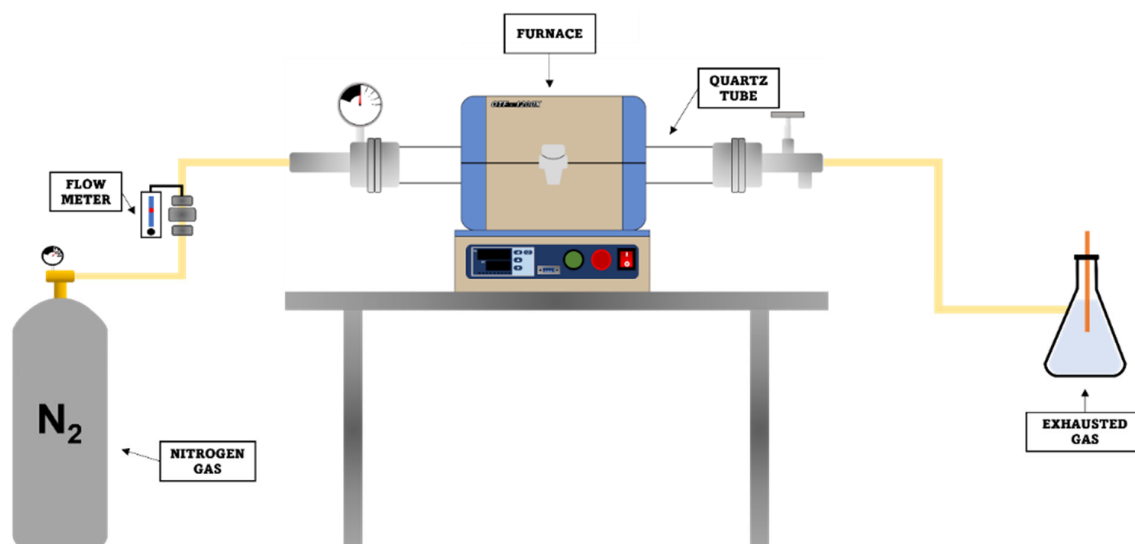


Figure S1. Schematic diagram of the pyrolysis reactor.

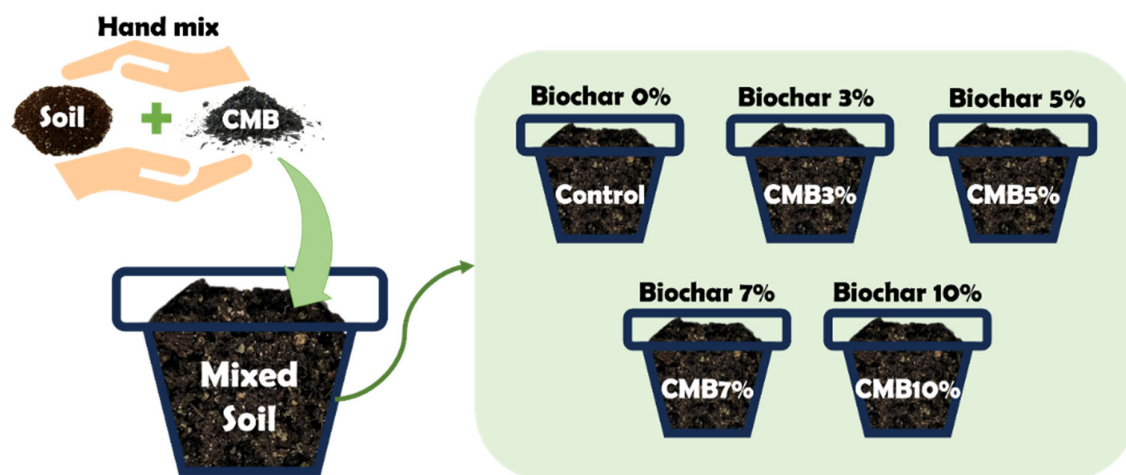


Figure S2. Diagram of the pots and soil used in this study.

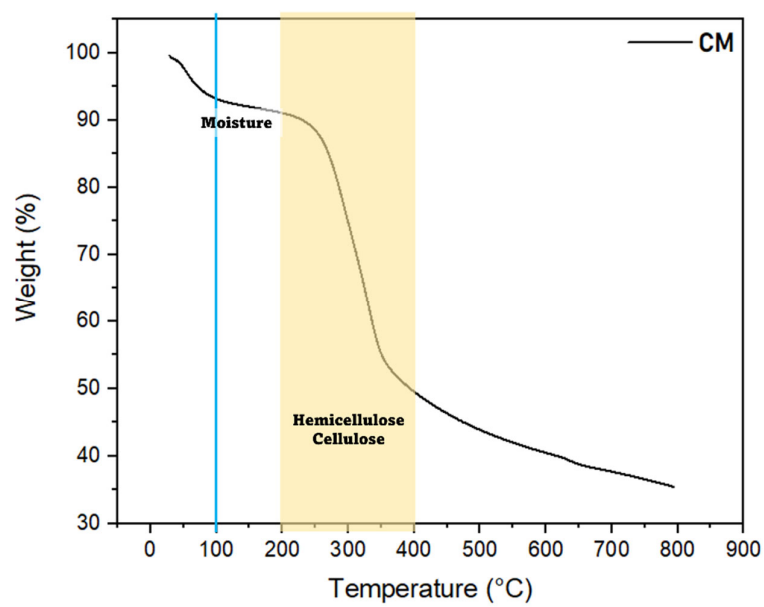


Figure S3. TGA curves of CM.

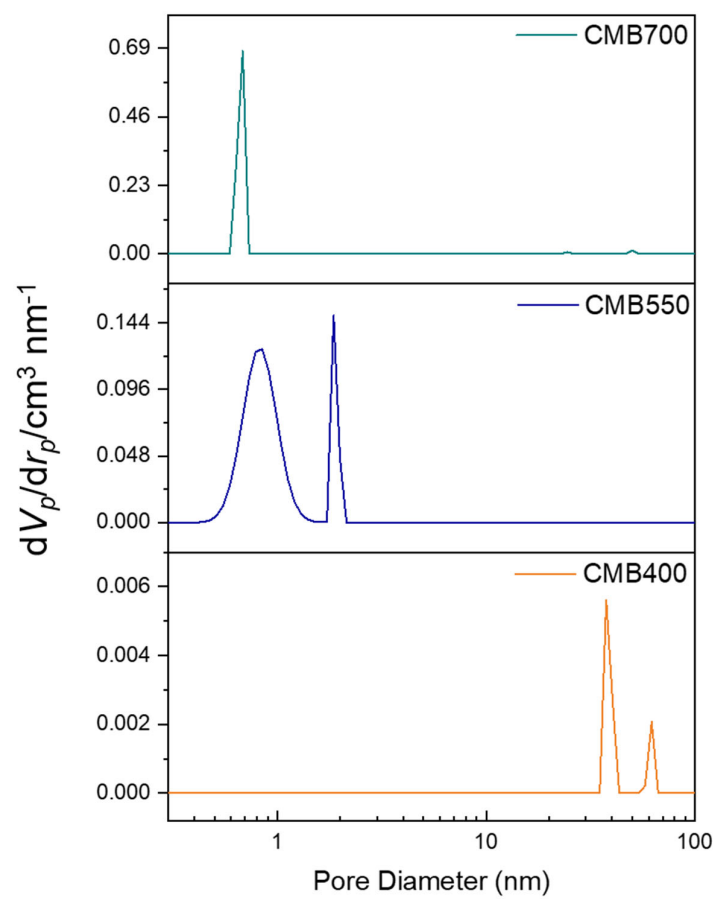


Figure S4. Pore size analysis of CMBs.

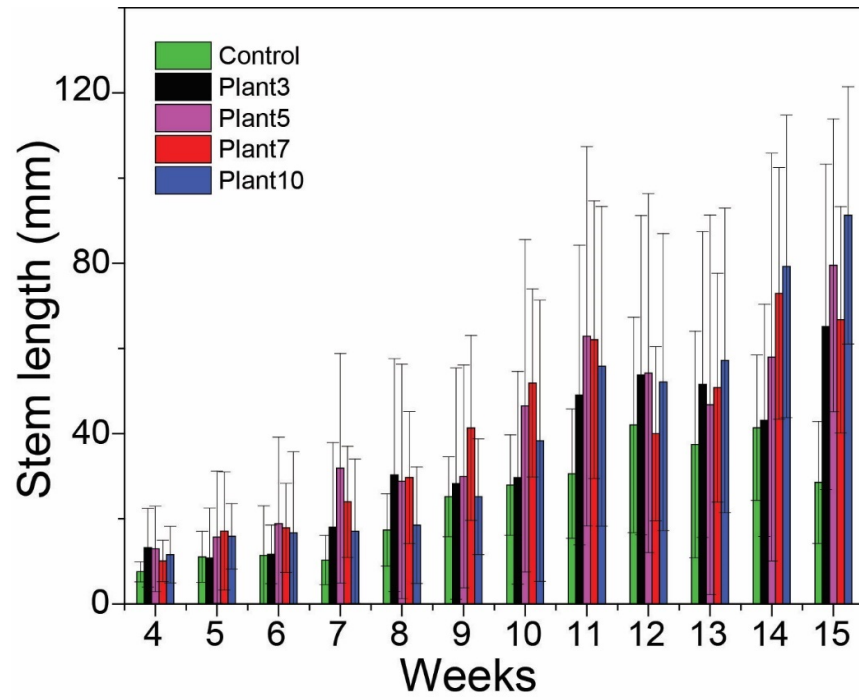


Figure S5. The stem-length results of the glasswort plants at 4 to 15 weeks.

Table S1. Elemental analysis of samples (CM, CMB400, CMB550, CMB700).

Samples	C (%)	H (%)	N (%)	S (%)	O (%)
Biomass (CM)	40.0	5.01	1.34	0	30.1
CMB400	33.2	2.18	1.75	0	13.8
CMB550	35.8	1.51	1.70	0	9.67
CMB700	39.6	1.07	1.14	0	4.92

Table S2. Heavy metal analysis of samples (CM, CMB400, CMB550, CMB700).

Sample	Zn	Cu	Ni	As	Cd	Mo	Pb
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
CM	100.596	20.351	12.743	non	non	non	non
CMB400	162.788	10.479	31.683	non	non	non	non
CMB550	286.237	32.687	44.545	non	non	non	non
CMB700	1022.702	114.013	12.639	non	non	non	non

Table S3. The functional groups of samples (CM, CMB400, CMB550, CMB700).

Literature	Wave number (cm ⁻¹)				Characteristic	Ref.
adsorption					vibrations	
band (cm ⁻¹)	CM	CMB400	CMB550	CMB700	(functionality)	
~3600	3604	3626	3904	3738	N-H Stretching	[27]
3570–3000	3378	3238	3568	3458	O-H Stretching	[26,28]
	3172	3008	3222	3016		
			3020			
2950–2800	2518	2932	2498	2970	C-H _n Stretching	[26,28,49]
~2400		2532			CO ₂ Band	[50]
2160–2120	2164	2158	2150		N=N=N Stretching	
2145–2120				2128	N=C=N Stretching	
2140–1990	2026	2024	2000	1994	C≡N Cyanide	
2000–1650		1974			C-H Bending	
1750–1700		1714	1738		C=O Stretching	
1632		1632			C=C Stretching	[26]
1650–1566	1560			1542	C=C Stretching	

1440–1400		1420	1444	1432	O–H Bending	[26]
1400–1350	1396	1364	1368	1368	C–H bending	[18]
1230–1210		1224	1218	1214	C–O–C Stretching	[18,26]
1120–1008	1054	1028	1062	1012	C–O Stretching	[18,26,51,52]
900–700	784		884	910	C–H Bending aromatic	[26,49]
			772	776		

Table S4. Analysis of properties of biochar-treated soil.

Sample	TC	TOC	CEC	OM	Zn	Soil
	(%)	(%)	(cmol Kg ⁻¹)	(g Kg ⁻¹)	(mg Kg ⁻¹)	pH
Control	15.21	15.20	67.9	262.22	32.30	7.00
CMB3%	14.04	14.00	62.50	242.05	45.51	7.41
CMB5%	18.67	18.51	64.75	321.87	76.92	7.56
CMB7%	18.84	18.75	69.18	324.80	88.71	7.78
CMB10%	21.40	21.30	64.83	368.85	111.41	7.65

Table S5. Heavy metal analysis of *Salicornia herbacea* L.

Sample	Cu	Zn	As	Cd	Mo	Ni	Pb
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Control	4.564	117.399	non	non	non	non	non
CMB3%	3.413	63.523	non	non	non	non	non
CMB5%	2.134	62.212	non	non	non	non	non
CMB7%	2.840	63.223	non	non	non	non	non
CMB10%	3.367	61.873	non	non	non	non	non