

Table 1S: Biochar composition from proximate analysis and surface properties of corncob (CC) and miscanthus (MS) exposed to hydrothermal carbonization (HTC), slow pyrolysis (Slow), and flash carbonization (Flash) at designated highest treatment temperatures (HTT)^a

feedstock – method	HTT	yield	VM	fc	ash	pH	SA
	°C	%	%	%	%	in H ₂ O	m ² g ⁻¹
CC	105	100	81.1 (0.5)	17.5	1.5 (0.0)	5.3	1.8 (0.1)
CC-Flash	600	35	12.3 (0.1)	80.3	7.3 (0.7)	9.5	39.1 (2.9)
CC-HTC	230	63	67.2 (0.1)	31.3	1.5 (0.2)	4.1	3.8 (0.1)
CC-Slow	230	52	50.6 (0.1)	47	2.4 (0.0)	8.7	
CC-Slow	377	40	35.3 (0.2)	62.3	2.4 (0.4)	9.3	
CC-Slow	372	45	40.5 (0.1)	57.4	2.1 (0.0)	8.8	1.3 (0.4)
CC-Slow	369	40	34.8 (1.0)	62.7	2.5 (0.1)	9.2	1.5 (0.2)
CC-Slow	357	43	36.4 (0.5)	61.3	2.3 (0.2)	9.1	
CC-Slow	386	37	30.7 (0.3)	66.3	3 (0.3)	9.8	1.63 (0.4)
CC-Slow	416	34	26.4 (0.2)	70.5	3.2 (0.1)	10.1	3.6 (0.9)
CC-Slow	440	32	22.3 (0.2)	74.1	3.6 (0.3)	10.2	
CC-Slow	485	30	17.1 (0.2)	79.3	3.6 (0.4)	9.8	14.1 (3.0)
CC-Slow	562	30	12.7 (0.1)	83.9	3.4 (0.2)	9.4	44.9 (3.2)
CC-Slow	576	29	15.3 (4.1)	80.9	3.8 (0.1)	9.3	
CC-Slow	687	29	9.2 (1.2)	86.7	4 (0.1)	9.4	
CC-Slow	693	28	8.8 (0.7)	87.1	4.1 (0.1)	9.3	
CC-Slow	796	28	6.9 (0.1)	88.7	4.5 (0.1)	9.4	27.4 (2.8)
MS	105	100	78 (0.8)	13.5	8.5 (0.4)	6.3	2.1 (0.4)
MS-HTC	230	63	61.4 (0.9)	34.3	4.3 (1.1)	3.9	5.9 (0.1)
MS-Slow	272	70	62.9 (0.2)	28.7	8.4 (0.2)	7.8	
MS-Slow	235	88	72.4 (1.9)	18.6	9 (0.7)	7.2	2.9 (0.0)
MS-Slow	369	47	40.4 (0.3)	51	8.6 (0.9)	8.3	2.7 (0.2)
MS-Slow	385	42	31.5 (0.7)	59.1	9.4 (0.5)	8.7	5.3 (0.5)
MS-Slow	400	41	25.8 (0.2)	64.6	9.6 (0.4)	9.4	
MS-Slow	406	39	27.1 (0.2)	63.4	9.4 (0.4)	9.3	
MS-Slow	411	35	24.0 (1.5)	64.2	11.7 (1.7)	9.8	

MS-Slow	406	40	38.0	(9.3)	54.4	7.6	(0.6)	9.3		
MS-Slow	416	35	19.6	(0.4)	69.4	11.1	(1.6)	10.2	10.1	(0.5)
MS-Slow	442	36	18.9	(0.3)	68.9	12.2	(0.8)	10.2		
MS-Slow	503	36	15.8	(0.6)	70.9	13.3	(0.2)	10.3	40.1	(1.8)
MS-Slow	464	34	17.7	(0.2)	68.9	13.5	(0.3)	10.4		
MS-Slow	600	33	10.5	(1.3)	76.0	13.6	(0.8)	10.0	183.3	(23.2)
MS-Slow	590	32	11.1	(2.4)	75.1	13.7	(1.5)	10.0		
MS-Slow	693	29	7.4	(0.2)	78.4	14.1	(1.3)	10.1		
MS-Slow	682	31	6.4	(0.4)	77.7	15.9	(0.8)	10.3	62	(3.9)
MS-Slow	790	30	5.3	(1.2)	78.8	15.9	(0.4)	10.2		

Standard Deviations are shown in parentheses for analytical replicates; n=3 for volatile matter (VM), fixed carbon (fC), and ash which were obtained on a dry weight % basis, n=2–8 for surface area (SA), and n=1 for pH.

Table 2S: Cation exchange capacity (CEC) calculated from the sum of cations calcium (Ca), potassium (K), magnesium (Mg), sodium (Na), and hydrogen (H) where pH>7.

feedstock – method	HTT	CEC		Ca	K	Mg	Na	H
	°C	cmol _c kg ⁻¹						
CC	105	14.9	(0.5)	0.7	3.5	2.2	0.1	8.3
CC-Flash	600	13.4	(0.4)	0.6	11.0	1.7	0.1	0.0
CC-HTC	230	30.0	(0.5)	0.2	0.2	0.1	0.0	29.5
CC-Slow	230	16.3	(0.8)	0.3	15.1	0.7	0.2	0.0
CC-Slow	377	18.2	(0.6)	0.3	17.2	0.6	0.0	0.0
CC-Slow	372	14.9	(0.6)	0.2	14.4	0.3	0.1	0.0
CC-Slow	369	20.7	(0.2)	0.4	19.5	0.7	0.1	0.0
CC-Slow	357	16.8	(0.2)	0.7	15.2	0.7	0.2	0.0
CC-Slow	386	20.6	(0.3)	0.4	19.6	0.6	0.0	0.0
CC-Slow	416	16.2	(0.5)	0.2	15.7	0.3	0.0	0.0
CC-Slow	440	19.0	(1.4)	0.2	18.5	0.3	0.0	0.0
CC-Slow	485	18.9	(1.2)	0.2	18.5	0.2	0.0	0.0
CC-Slow	562	13.5	(1.3)	0.2	12.9	0.3	0.0	0.0
CC-Slow	576	13.7	(0.5)	0.2	13.2	0.2	0.0	0.0
CC-Slow	687	8.6	(0.3)	0.3	7.9	0.4	0.0	0.0
CC-Slow	693	11.2	(0.9)	0.3	10.6	0.2	0.1	0.0
CC-Slow	796	5.1	(0.0)''	0.3	4.5	0.3	0.1	0.0
MS	105	10.8	(0.2)	2.8	1.2	1.6	0.1	5.2
MS-HTC	230	33.8	(0.4)	0.4	0.3	0.1	0.1	33.0
MS-Slow	272	13.6	'	5.6	6.4	1.4	0.2	0.0
MS-Slow	235	11.1	(0.7)	5.3	3.6	1.8	0.1	0.3
MS-Slow	369	20.3	(0.4)	6.0	12.4	1.7	0.3	0.0
MS-Slow	385	20.8	(0.5)	6.5	12.4	1.5	0.3	0.0
MS-Slow	400	20.9	(0.2)	6.5	12.6	1.5	0.3	0.0
MS-Slow	406	20.5	(0.4)	5.6	13.2	1.4	0.2	0.0
MS-Slow	411	19.8	(0.2)	5.6	12.5	1.5	0.2	0.0
MS-Slow	406	18.6	(1.0)	4.7	12.2	1.4	0.2	0.0
MS-Slow	416	21.2	(0.5)''	6.4	13.0	1.6	0.2	0.0

MS-Slow	442	20.2	(0.3)	6.5	12.0	1.5	0.2	0.0
MS-Slow	503	17.7	(0.5)	5.9	10.5	1.2	0.2	0.0
MS-Slow	464	20.6	(0.9)	6.4	12.4	1.6	0.2	0.0
MS-Slow	600	14.3	(0.1)	5.5	7.7	1.0	0.1	0.0
MS-Slow	590	14.1	(0.4)	4.8	8.1	1.0	0.2	0.0
MS-Slow	693	15.5	(0.1)	5.2	8.8	1.3	0.2	0.0
MS-Slow	682	15.9	(0.3)	7.8	6.4	1.5	0.2	0.0
MS-Slow	790	14.5	(0.2)	8.5	4.4	1.4	0.2	0.0

Standard Deviations are shown in parentheses for analytical replicates; n=3 for cation exchange capacity (CEC) with the exception of two points, ' and ', where n=1 and 2, respectively.