

Table S1. Data (% w/w referred to dry matter) for mass, C and N balance for fractions (Figure 2) isolated by membrane ultrafiltration of crude soluble matter listed in Table 2 obtained by centrifugation, hydrolysis and ozonisation of as collected MBW: i.e. the retentates at 750 kDa (R750), 100 kDa (R100), 20 kDa (R20), 0.2 kDa (R0.2) and the final permeate at 0.2 kDa (P0.2).

Mass yield	Centrifugation	Hydrolysis	Ozonisation
R750	3.6	27.1	13.1
R100		0.9	1.1
R20	0.3	0.9	0.8
R5	5.5	5.7	
R0.2			3.0
P0.2	90.6	65.4	82.0
C yield			
R750	5.6	40.6	26.6
R100		1.2	1.8
R20		1.0	1.8
R5	5.7	7.9	
R0.2			4.9
P0.2	88.7	49.3	64.9
N yield			
R750	8.1	30.9	86.9
R100		1.0	5.6
R20		1.5	2.6
R5	5.8	18.8	
R0.2			1.3
P0.2	86.1	47.8	4.3
Fractions content C			
R750	46.1	41.4	39.0
R100		38.1	33.8
R20		34.0	42.2
R5	30.7	38.6	
R0.2			30.17
P0.2	29.0	22.2	15.1
Fractions content N			
R750	5.33	1.80	6.58
R100		1.69	4.47
R20		2.82	3.20
R5	2.52	5.20	
R0.2			4.17
P0.2	2.24	1.15	0.48
C/N			
R750	8.6	22.9	5.9
R100		22.6	7.4
R20		12.1	13.2
R5	12.2	7.4	
R0.2			7.2
P0.2	12.9	19.3	31.4

Table S2. C types and functional groups^a relative composition^b as % mole/mole relative to total organic C for Table 1 MBW proximates, for crude soluble and insoluble products in Table 2 and for the retentates and permeates fractions of the crude soluble products in Figure 2 and 3.

Signal chemical shift (δ , ppm)	0-53	53-63	63-95	95-110	110-140	140-160	160-185
Product/C type ^a	Af	NR	OR	OCO	Ph	PhOY	COX
Lipids (Table 1)	92.7	0.82	0	0	2.74	0	3.70
Mono-/disaccharides (Table 1)	28.0	8.82	38.7	4.14	n.d. ^c	n.d. ^c	12.1
Hemicellulose/protein (Table 1)	34.9	6.39	16.1	4.28	13.4	n.d. ^c	22.4
Lignin (Table 1)	13.6	9.44	35.6	8.48	12.7	9.13	5.51
Pristine MBWS SM (Table 2)	32.6	6.05	28.9	2.92	8.24	n.d. ^c	17.1
Pristine MBWS IM (Table 2)	19.4	7.94	48.1	9.77	4.96	n.d. ^c	7.46
Hydrolysed SM (Table 2)	52.0	n.d. ^c	12.1	1.33	10.2	n.d. ^c	16.2
Hydrolysed IM (Table 2)	39.6	3.45	32.7	7.17	6.40	n.d. ^c	9.86
Ozonized SM (Table 2)	37.2	n.d. ^c	9.56	3.00	n.d. ^c	n.d. ^c	22.7
Ozonized IM (Table 2)	23.9	8.02	46.3	9.21	n.d. ^c	n.d. ^c	7.91
Pristine MBWS R750 (Table 3)	48.5	12.9	17.1	5.06	4.07	n.d. ^c	11.0
Hydrolysed R750 (Table 3)	43.1	6.08	30.1	6.18	6.55	n.d. ^c	7.22
Ozonised R750 (Table 3)	69.4	n.d. ^c	7.54	n.d. ^c	n.d. ^c	n.d. ^c	15.2
Ozonised R100 0 (Table 3)	46.4	8.29	20.1	4.10	4.02	n.d. ^c	16.6

^aData for aliphatic and/or cycloaliphatic (Af), amine (NR), alkoxy (OR), anomeric (OCO), aromatic (Ph), phenol and phenoxy (PhOY, Y = H and/or R), carboxylic and amide (COX, X = OR, OM, NR-) C, R = H, alkyl and/or aryl C. ^bsee Materials and Methods section. ^cnot distinguished from the background noise.

Table S3. Relative chemical composition of water soluble products (see Figure 4) obtained with the multistep treatment in Figure 1B [12, 21].

Signal chemical shift (δ , ppm)	0-53	53-63	63-95	95-110	110-160	160-185	MW
Product ^a /C type ^b and MW	Af	NR	OR	OCO	Ph/PhOY	COX	kDa
Hydrolysis crude soluble product from anaerobic digestate [21]	43	10	14	3	13	16	≥ 750
Hydrolysis soluble R ₇₅₀ from anaerobic digestate [21]	49	8	13	4	8	14	
Hydrolysis soluble R ₁₅₀ from anaerobic digestate [21]	42	10	15	4	11	18	
Hydrolysis soluble R ₁₀₀ from anaerobic digestate [21]	39	10	11	3	12	21	100-150
Ozonisation soluble R ₇₅₀ from anaerobic digestate [21]	74	1	3	3	9	6	≥ 750
Ozonisation soluble R ₁₅₀ from anaerobic digestate _s [21]	73	3	1	2	8	8	150-750
Ozonisation soluble R ₁₀₀ from anaerobic digestate [21]	50	6	8		7	26	100-150
Hydrolysis crude soluble product from CGD compost [12]	41	7	14	4	18	15	77
Hydrolysis soluble R ₃₅ from CGD compost [12]	22	9	9	3	33	23	279
Ozonisation crude soluble product from CGD compost [12]	20	6	3	2	20	48	487
Ozonisation soluble R ₃₅ from CGD compost [12]	62	5	9	5	5	13	
Hydrolysis crude soluble product from CG compost [12]	37	7	14	4	20	18	80

Hydrolysis soluble R35 from GG compost [12]	27	8	8	3	32	23	18
Ozonisation crude soluble GG compost [12]	17	6	7	3	22	44	
Ozonisation soluble R35 from CG compost [11]	50	10	13	3	5	18	223

^aLegends as for Figure 4.

Table S4. Surface tension (γ , mN m⁻¹)^a of products in Figure 3 and 4.

Product	γ , mN m ⁻¹
Centrifugation soluble R750 (Figure 3C)	47.1±0.2 a
Hydrolysis soluble R750 (Figure 3C)	42.2±0.2 b
Ozonisation soluble R750 (Figure 3C)	54.0±0.1 c
Hydrolysis soluble R35 from CGD compost (Figure 4A)	59.8±0.1 d
Hydrolysis soluble R35 from CG compost (Figure 4A)	59.2±0.2 e
Hydrolysis soluble R750 from anaerobic digestate (Figure 4A)	56.8±0.3 f
Ozonisation soluble R750 from anaerobic digestate (Figure 4B)	39.5±1.0 g
Hydrolysis soluble R150 from anaerobic digestate (Figure 4A)	57.3±0.2 f
Ozonisation soluble R150 from anaerobic digestate (Figure 4B)	36.8±0.6 g
Hydrolysis soluble R100 from anaerobic digestate (Figure 4A)	54.2±0.3 h
Ozonisation soluble R100 from anaerobic digestat (Figure 4B)	43.6±2.3 i

^aValues followed by different letters are significantly different at P<0.01 level