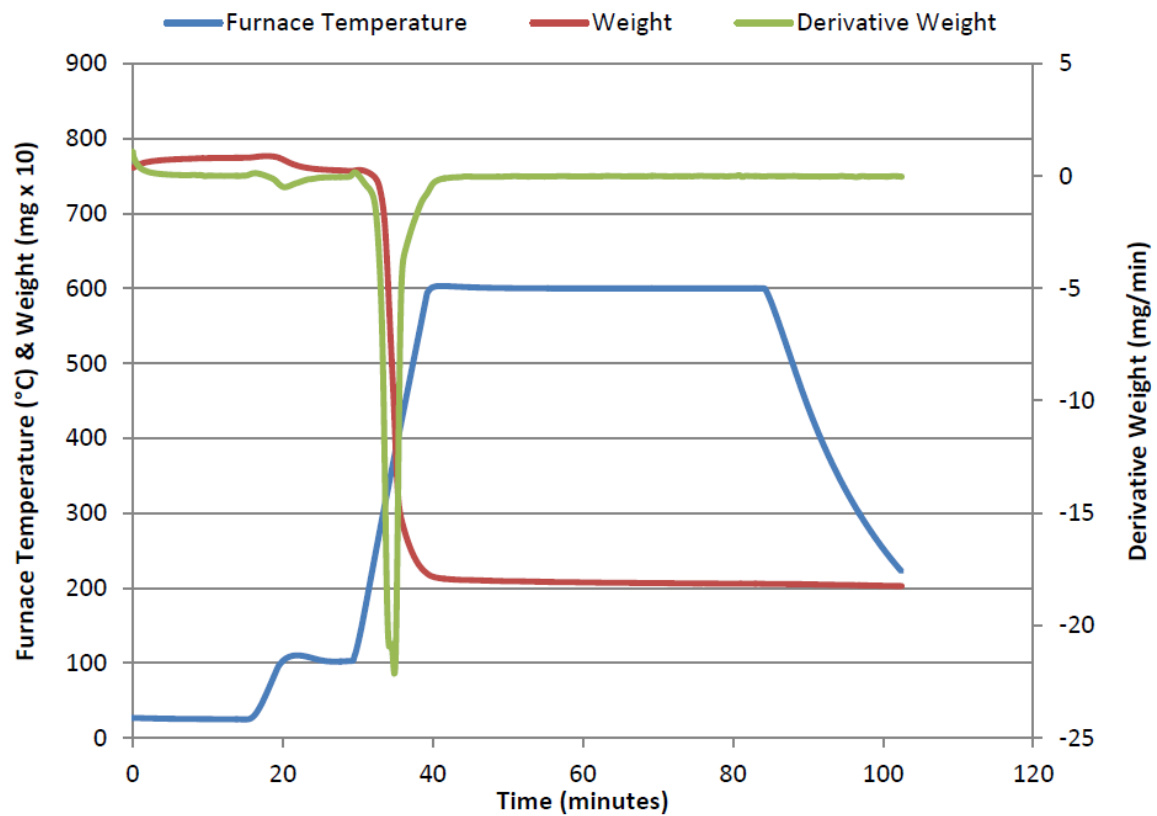
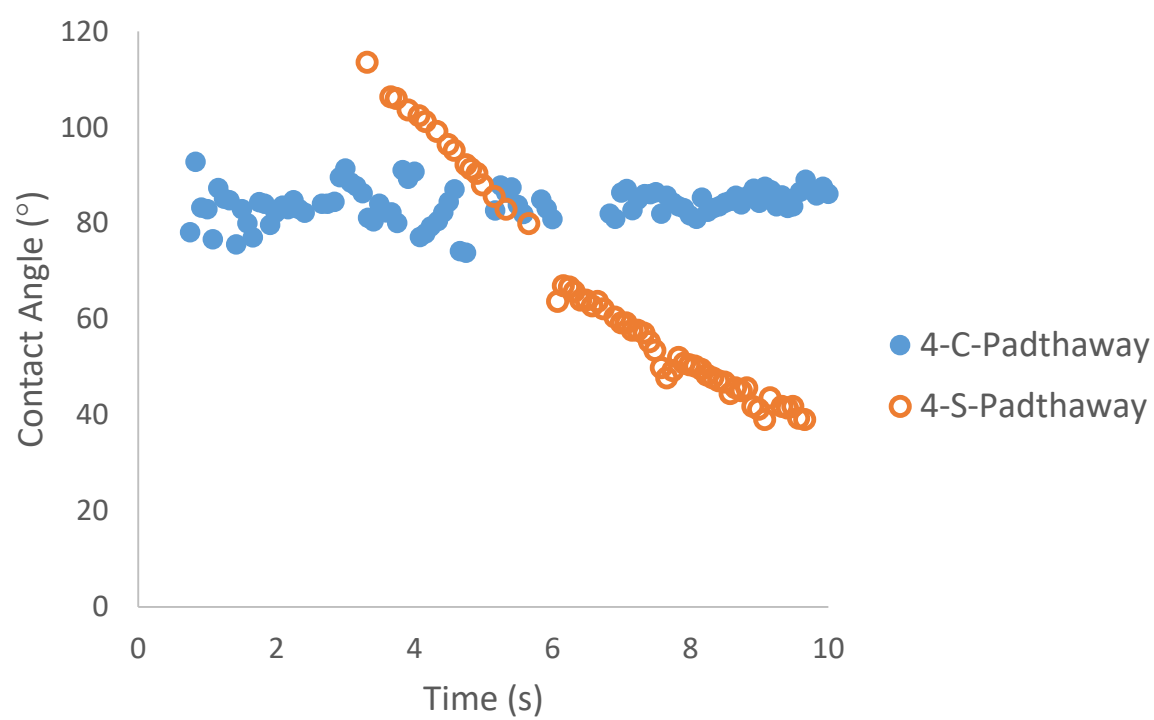
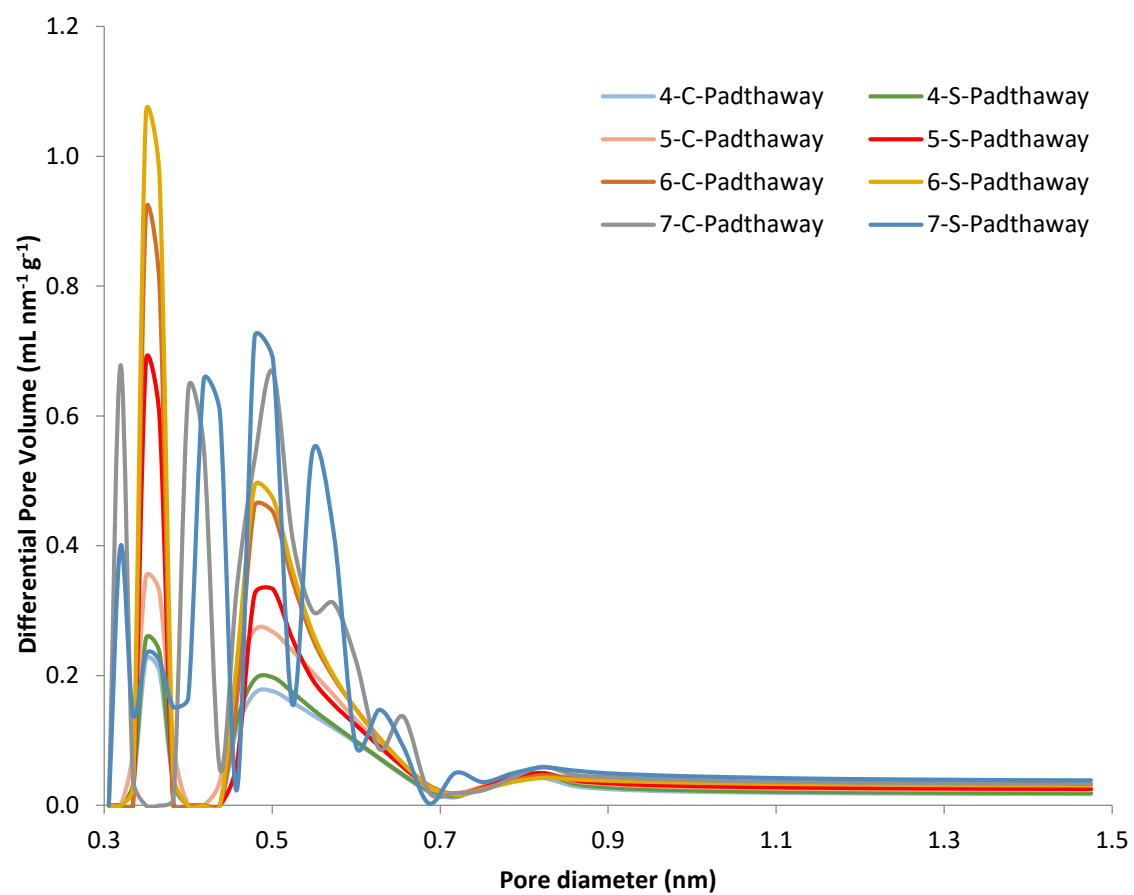




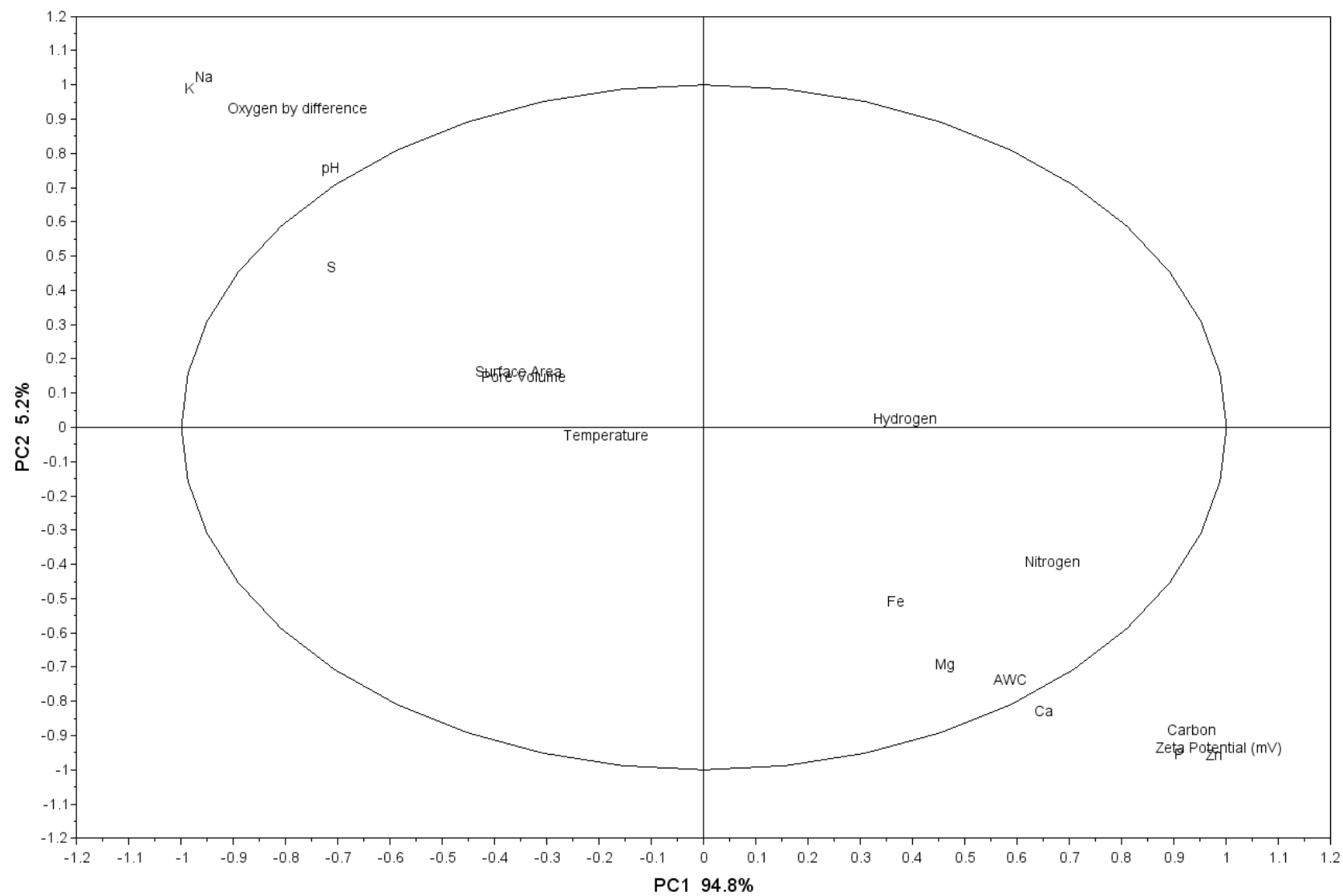
Supplementary Figure 1 Thermo-gravimetric analysis of grapevine cane



Supplementary Figure 2 Contact angle of 4-C-Padthaway and 4-S-Padthaway samples



Supplementary Figure 3 Biochar pore size distribution obtained by NLDFT CO₂ adsorption isotherms.



Supplementary Figure 4 PCA Correlation Map, showing relationships between AWC and biochar physical and chemical properties

Supplementary Table 1. Elemental analysis by CHN

Sample Identification	Carbon (% w/w)	Hydrogen (% w/w)	Nitrogen (% w/w)	Oxygen* (% w/w)
F-C-Padthaway	46.5	5.83	0.81	46.9
F-S-Padthaway	44.8	5.70	0.84	48.7
4-C-Padthaway	70.5	4.23	1.21	24.0
5-C-Padthaway	75.7	3.07	1.06	20.2
6-C-Padthaway	77.5	2.12	1.07	19.3
7-C-Padthaway	75.4	1.76	0.87	22.0
4-S-Padthaway	64.3	3.82	0.90	31.0
5-S-Padthaway	70.6	2.67	0.96	25.8
6-S-Padthaway	70.8	2.02	0.81	26.4
7-S-Padthaway	72.3	2.00	0.94	24.7

Sample Identification: F = Feedstock sample, C = Grapevine Cane, S = Stalks, 4 = 400 °C Biochar, 5 = 500 °C Biochar, 6 = 600 °C Biochar, 7=700 °C Biochar *Oxygen by difference

Supplementary Table 2. Elemental analysis by ICP-AES

Sample Identification	Fe	Zn	Ca	Mg	Na	K	P	S
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
F-C-Padthaway	25.9	40.2	7600	1690	970	8000	940	620
F-S-Padthaway	19.5	13.7	5400	1740	9600	19300	540	800
4-C-Padthaway	89.0	89.0	19800	4400	2600	18900	2800	480
5-C-Padthaway	98.4	120.9	18300	4300	2100	18300	3200	620
6-C-Padthaway	177.0	123.0	21000	4900	2100	21000	3500	780
7-C-Padthaway	149.2	123.9	26000	6000	2900	26000	3700	1220
4-S-Padthaway	79.3	34.4	12400	3000	14500	42000	1410	710
5-S-Padthaway	95.6	47.1	14700	3800	17200	48000	1670	980
6-S-Padthaway	80.7	41.6	15100	3800	18200	51000	1670	1060
7-S-Padthaway	140.7	46.2	16600	4600	19500	58000	1880	1330

Sample Identification: F = Feedstock sample, C = Grapevine Cane, S = Stalks, 4 = 400 °C Biochar, 5 = 500 °C Biochar, 6 = 600 °C Biochar, 7=700 °C Biochar. Co, Mo, Cd, Pb, As & Se all below detection limit.