

ภาคผนวก ก.

ข้อมูลดิบในการทดลอง

ตารางที่ ก-1 ข้อมูลปริมาณแคดเมียมในรากหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	0	0	0	0	0
Cd-soil (control)	300.75	301.75	303.25	301.9166667	1.258306
Cd-soil + pork bone (1%w/w)	156.78	158.56	158.54	157.96	1.021959
Cd-soil + chicken bone (1% w/w)	160.14	161.45	161.89	161.16	0.91033
Cd-soil + biochar derived from pork bone (1% w/w)	206.54	205.45	204.12	205.37	1.211982
Cd-soil + biochar derived from chicken bone (1% w/w)	200.14	201.58	201.78	201.1666667	0.894725
Cd-soil + pork bone (0.5 %w/w)	211.12	216.15	215.23	214.1666667	2.678289
Cd-soil + chicken bone (0.5%w/w)	219.56	220.45	222.89	220.9666667	1.724075
Cd-soil + biochar derived from pork bone (0.5%w/w)	240.12	242.14	239.75	240.67	1.286429
Cd-soil + biochar derived from chicken bone (0.5%w/w)	235.23	233.34	230.75	233.1066667	2.249096

ตารางที่ ก-2 ข้อมูลปริมาณแคดเมียมในลำต้นหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	0	0	0	0	0
Cd-soil (control)	109.2	112.4	113.5	111.7	2.233831
Cd-soil + pork bone (1%w/w)	22.45	21.58	23.14	22.39	0.781729
Cd-soil + chicken bone (1% w/w)	28.56	29.54	31.48	29.86	1.486069
Cd-soil + biochar derived from pork bone (1% w/w)	42.45	44.45	45.14	44.01333	1.397152
Cd-soil + biochar derived from chicken bone (1% w/w)	40.14	39.89	41.12	40.38333	0.650103
Cd-soil + pork bone (0.5 %w/w)	43.53	45.68	46.12	45.11	1.385893
Cd-soil + chicken bone (0.5%w/w)	46.75	48.96	50.12	48.61	1.712046
Cd-soil + biochar derived from pork bone (0.5%w/w)	54.23	54.68	55.45	54.78667	0.616955
Cd-soil + biochar derived from chicken bone (0.5%w/w)	50.12	52.14	51.36	51.20667	1.018692

ตารางที่ ก-3 ข้อมูลปริมาณแคดเมียมในเปลือกหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	0	0	0	0	0
Cd-soil (control)	12.58	13.58	14.21	13.45667	0.821969
Cd-soil + pork bone (1%w/w)	2.67	2.95	2.54	2.72	0.209523
Cd-soil + chicken bone (1% w/w)	3.14	3.98	3.14	3.42	0.484974
Cd-soil + biochar derived from pork bone (1% w/w)	6.75	6.54	7.01	6.766667	0.235443
Cd-soil + biochar derived from chicken bone (1% w/w)	5.51	6.04	6.35	5.966667	0.424774
Cd-soil + pork bone (0.5 %w/w)	6.81	6.95	6.99	6.916667	0.094516
Cd-soil + chicken bone (0.5%w/w)	7.12	7.35	7.69	7.386667	0.286764
Cd-soil + biochar derived from pork bone (0.5%w/w)	8.54	8.9	8.81	8.75	0.18735
Cd-soil + biochar derived from chicken bone (0.5%w/w)	8.12	8.26	8.28	8.22	0.087178

ตารางที่ ก-4 ข้อมูลปริมาณแคดเมียมในเมล็ดหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	0	0	0	0	0
Cd-soil (control)	3.51	3.62	3.98	3.703333	0.245832
Cd-soil + pork bone (1%w/w)	0.19	0.18	0.2	0.19	0.01
Cd-soil + chicken bone (1% w/w)	0.41	0.48	0.46	0.45	0.036056
Cd-soil + biochar derived from pork bone (1% w/w)	1.96	1.98	2.01	1.983333	0.025166
Cd-soil + biochar derived from chicken bone (1% w/w)	1.5	1.54	1.65	1.563333	0.077675
Cd-soil + pork bone (0.5 %w/w)	2.1	1.99	2.15	2.08	0.081854
Cd-soil + chicken bone (0.5%w/w)	2.45	2.56	2.76	2.59	0.157162
Cd-soil + biochar derived from pork bone (0.5%w/w)	3.3	3.15	3.2	3.216667	0.076376
Cd-soil + biochar derived from chicken bone (0.5%w/w)	2.89	2.92	2.94	2.916667	0.025166

ตารางที่ ก-5 ข้อมูลปริมาณแคดเมียมที่เหลือในดินหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	101.23	106.58	103.25	103.6867	2.701598
Cd-soil (control)	55.56	57.12	54.25	55.64333	1.436814
Cd-soil + pork bone (1%w/w)	81.12	82.14	80.21	81.15667	0.965522
Cd-soil + chicken bone (1% w/w)	76.89	75.45	74.14	75.49333	1.375512
Cd-soil + biochar derived from pork bone (1% w/w)	63.14	62.14	62.1	62.46	0.589237
Cd-soil + biochar derived from chicken bone (1% w/w)	67.15	68.14	67.54	67.61	0.498698
Cd-soil + pork bone (0.5 %w/w)	62.14	61.45	60.12	61.23667	1.026759
Cd-soil + chicken bone (0.5%w/w)	60.12	58.19	58.14	58.81667	1.128997
Cd-soil + biochar derived from pork bone (0.5%w/w)	55.14	56.14	54.14	55.14	1
Cd-soil + biochar derived from chicken bone (0.5%w/w)	57.89	58.15	57.14	57.72667	0.524436

ตารางที่ ก-6 ข้อมูลปริมาณน้ำหนักแห้งของต้นข้าวหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (g/pot)	SD
Normal soil (control)	19.86	20.23	20.08	20.05667	0.1861
Cd-soil (control)	13.58	13.92	13.75	13.75	0.17
Cd-soil + pork bone (1%w/w)	20.1	20.15	20.27	20.17333	0.087369
Cd-soil + chicken bone (1% w/w)	19.47	19.53	19.24	19.41333	0.15308
Cd-soil + biochar derived from pork bone (1% w/w)	17.48	17.63	17.4	17.50333	0.116762
Cd-soil + biochar derived from chicken bone (1% w/w)	18.5	18.43	18.35	18.42667	0.075056
Cd-soil + pork bone (0.5 %w/w)	17.12	17.08	17	17.06667	0.061101
Cd-soil + chicken bone (0.5%w/w)	17.01	16.98	16.99	16.99333	0.015275
Cd-soil + biochar derived from pork bone (0.5%w/w)	16.01	16.04	16.23	16.09333	0.119304
Cd-soil + biochar derived from chicken bone (0.5%w/w)	16.54	16.35	16.7	16.53	0.175214

ตารางที่ ก-7 ข้อมูลปริมาณแคลเซียมในรากหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	22356.75	22120.45	22312.15	22263.1167	125.5493
Cd-soil (control)	11365.45	11205.26	11398.45	11323.0533	103.3378
Cd-soil + pork bone (1%w/w)	20958.45	21000.52	21256.14	21071.7033	161.106
Cd-soil + chicken bone (1% w/w)	19750.17	19700.14	19700.14	19716.8167	28.88483
Cd-soil + biochar derived from pork bone (1% w/w)	18502.36	18654.28	18689.48	18615.3733	99.4423
Cd-soil + biochar derived from chicken bone (1% w/w)	18905.21	18950.12	18960.85	18938.7267	29.51793
Cd-soil + pork bone (0.5 %w/w)	18305.25	18400.35	18408.96	18371.52	57.55274
Cd-soil + chicken bone (0.5%w/w)	18201.56	18102.89	18185.45	18163.3	52.93306
Cd-soil + biochar derived from pork bone (0.5%w/w)	17780.25	17645.89	17896.56	17774.2333	125.4433
Cd-soil + biochar derived from chicken bone (0.5%w/w)	18000.69	18100.89	17998.6	18033.3933	58.46317

ตารางที่ ก-8 ข้อมูลปริมาณแคลเซียมในลำต้นหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	8500.56	8545.14	8598.56	8548.087	49.06641
Cd-soil (control)	4005.25	4025.89	4098.45	4043.197	48.951
Cd-soil + pork bone (1%w/w)	8100.25	8098.14	8100.98	8099.79	1.474822
Cd-soil + chicken bone (1% w/w)	7889.45	7888.48	7850.14	7876.023	22.42087
Cd-soil + biochar derived from pork bone (1% w/w)	7300.25	7360.25	7300.24	7320.247	34.6439
Cd-soil + biochar derived from chicken bone (1% w/w)	7550.56	7600.45	7559.56	7570.19	26.58948
Cd-soil + pork bone (0.5 %w/w)	7204.56	7102.58	7100.98	7136.04	59.34545
Cd-soil + chicken bone (0.5%w/w)	7000.15	6958.45	6898.56	6952.387	51.06569
Cd-soil + biochar derived from pork bone (0.5%w/w)	6456.56	6358.98	6354.89	6390.143	57.55486
Cd-soil + biochar derived from chicken bone (0.5%w/w)	6765.89	6700.89	6736.56	6734.447	32.55149

ตารางที่ ก-9 ข้อมูลปริมาณแคลเซียมในเปลือกหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	4100.56	4158.96	4200.14	4153.22	50.03753
Cd-soil (control)	2100.58	2089.25	2100.58	2096.803	6.541379
Cd-soil + pork bone (1%w/w)	3600.15	3651.25	3600.98	3617.46	29.26594
Cd-soil + chicken bone (1% w/w)	3495.47	3450.89	3500.14	3482.167	27.18685
Cd-soil + biochar derived from pork bone (1% w/w)	3198.25	3200.15	3158.12	3185.507	23.73657
Cd-soil + biochar derived from chicken bone (1% w/w)	3200.14	3200.09	3212.15	3204.127	6.948455
Cd-soil + pork bone (0.5 %w/w)	3000.56	2995.45	2900.53	2965.513	56.33519
Cd-soil + chicken bone (0.5%w/w)	2900.14	2801.23	2806.23	2835.867	55.71845
Cd-soil + biochar derived from pork bone (0.5%w/w)	2504.56	2456.56	2400.15	2453.757	52.26142
Cd-soil + biochar derived from chicken bone (0.5%w/w)	2705.65	2689.45	2700.15	2698.417	8.23792

ตารางที่ ก-10 ข้อมูลปริมาณแคลเซียมในเมล็ดหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	412.56	450.26	460.58	441.1333	25.2775
Cd-soil (control)	220.15	230.89	210.45	220.4967	10.22441
Cd-soil + pork bone (1%w/w)	380.12	370.14	371.25	373.8367	5.469756
Cd-soil + chicken bone (1% w/w)	358.453	359.45	357.98	358.6277	0.750404
Cd-soil + biochar derived from pork bone (1% w/w)	327.89	329.89	327.15	328.31	1.417463
Cd-soil + biochar derived from chicken bone (1% w/w)	338.45	335.26	335.98	336.5633	1.673091
Cd-soil + pork bone (0.5 %w/w)	320.14	318.45	322.56	320.3833	2.065777
Cd-soil + chicken bone (0.5%w/w)	315.14	310.45	309.45	311.68	3.037878
Cd-soil + biochar derived from pork bone (0.5%w/w)	288.56	280.25	281.45	283.42	4.491626
Cd-soil + biochar derived from chicken bone (0.5%w/w)	300.14	298.56	290.56	296.42	5.13603

ตารางที่ ก-11 ข้อมูลปริมาณแมงกนีเซียมในรากหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	5216.56	5300.28	5351.78	5289.54	68.24678
Cd-soil (control)	2512.14	2617.85	2600.14	2576.71	56.61603
Cd-soil + pork bone (1%w/w)	4800.12	4750.12	4700.58	4750.273	49.77018
Cd-soil + chicken bone (1% w/w)	4600.89	4598.15	4589.45	4596.163	5.973151
Cd-soil + biochar derived from pork bone (1% w/w)	4001.5	4015.36	4020.15	4012.337	9.68561
Cd-soil + biochar derived from chicken bone (1% w/w)	4300.15	4325.15	4312.15	4312.483	12.50333
Cd-soil + pork bone (0.5 %w/w)	3956.14	3900.1	3895.45	3917.23	33.77716
Cd-soil + chicken bone (0.5%w/w)	3728.45	3802.14	3758.56	3763.05	37.04962
Cd-soil + biochar derived from pork bone (0.5%w/w)	3254.65	3333.45	3156.78	3248.293	88.50637
Cd-soil + biochar derived from chicken bone (0.5%w/w)	3514.65	3645.56	3600.48	3586.897	66.50366

ตารางที่ ก-12 ข้อมูลปริมาณแมกนีเซียมในลำต้นหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	3525.15	3625.14	3500.47	3550.253	66.01731
Cd-soil (control)	1725.12	1700.12	1769.89	1731.71	35.34875
Cd-soil + pork bone (1%w/w)	3098.15	3100.58	3120.14	3106.29	12.05583
Cd-soil + chicken bone (1% w/w)	2800.1	2756.85	2725.25	2760.733	37.5758
Cd-soil + biochar derived from pork bone (1% w/w)	2289.15	2300.14	2312.25	2300.513	11.55452
Cd-soil + biochar derived from chicken bone (1% w/w)	2554.25	2500.14	2512.36	2522.25	28.37837
Cd-soil + pork bone (0.5 %w/w)	2212.45	2105.65	2100.48	2139.527	63.20634
Cd-soil + chicken bone (0.5%w/w)	2014.45	2001.58	2012.45	2009.493	6.925723
Cd-soil + biochar derived from pork bone (0.5%w/w)	1856.48	1805.45	1800.45	1820.793	31.00651
Cd-soil + biochar derived from chicken bone (0.5%w/w)	1925.6	1905.45	1904.56	1911.87	11.89885

ตารางที่ ก-13 ข้อมูลปริมาณแมกนีเซียมในเปลือกหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	2012.12	2000.12	2056.89	2023.043	29.91985
Cd-soil (control)	1025.69	1012.89	1000.58	1013.053	12.5558
Cd-soil + pork bone (1%w/w)	1800	1795.65	1790.25	1795.3	4.884414
Cd-soil + chicken bone (1% w/w)	1650.12	1635.56	1658.25	1647.977	11.49584
Cd-soil + biochar derived from pork bone (1% w/w)	1356.25	1350.12	1324.25	1343.54	16.98447
Cd-soil + biochar derived from chicken bone (1% w/w)	1500.45	1495.57	1497.68	1497.9	2.447427
Cd-soil + pork bone (0.5 %w/w)	1300.15	1295.89	1290.25	1295.43	4.966004
Cd-soil + chicken bone (0.5%w/w)	1251.14	1200.14	1200.47	1217.25	29.35006
Cd-soil + biochar derived from pork bone (0.5%w/w)	1000.45	1012.45	1015.45	1009.45	7.937254
Cd-soil + biochar derived from chicken bone (0.5%w/w)	1195.25	1180.45	1198.2	1191.3	9.51144

ตารางที่ ก-14 ข้อมูลปริมาณแมกนีเซียมในเมล็ดหลังจากปลูกข้าว 90 วัน

Samples	R1	R2	R3	AVG (mg/kg)	SD
Normal soil (control)	212.15	200.18	205.23	205.8533	6.009296
Cd-soil (control)	123.56	100.12	105.36	109.68	12.30265
Cd-soil + pork bone (1%w/w)	196.52	196.25	195.25	196.0067	0.669054
Cd-soil + chicken bone (1% w/w)	188.25	189.25	187.25	188.25	1
Cd-soil + biochar derived from pork bone (1% w/w)	173.52	172.15	173.28	172.9833	0.731596
Cd-soil + biochar derived from chicken bone (1% w/w)	178.56	177.25	179.23	178.3467	1.007092
Cd-soil + pork bone (0.5 %w/w)	170.12	169.58	168.45	169.3833	0.852193
Cd-soil + chicken bone (0.5%w/w)	165.47	167.45	166.48	166.4667	0.990067
Cd-soil + biochar derived from pork bone (0.5%w/w)	160.14	158.46	158.79	159.13	0.890112
Cd-soil + biochar derived from chicken bone (0.5%w/w)	162.45	163.45	161.25	162.3833	1.101514