

Suitability of volcanic ash, rice husk ash, green compost and biochar as amendments for a Mediterranean alkaline soil.

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Supplementary Table S1. Comparative thermogravimetry (TG) parameters in samples summarizing: Total weight loss for the temperature interval 50–850 °C (% ± 1%), weight losses and relative weight losses for the temperature intervals, 50–175 °C, 175–400 °C, 400–625 °C and 625–850 °C.

	Temperature range	C	WB	GC	RA	VA
Total Weight Loss (%)	50-850 °C	11.1	88.2	67.0	8.0	-
Moisture and very labile OM	50-175 °C	5.5	2.3	8.9	2.0	-
Intermediate OM-W1	175-400 °C	1.5	1.5	32.3	0.9	-
Recalcitrant OM-W2	400-625 °C	2.5	38.9	16.8	1.9	-
Stable OM + minerals-W3	625-850 °C	1.6	45.5	9.0	3.3	-
Relative Weight Loss (%)						
Moisture and very labile OM	50-175 °C	49.5	2.6	13.3	24.7	-
Intermediate OM-W1	175-400 °C	13.7	1.6	48.2	10.6	-
Recalcitrant OM-W2	400-625 °C	22.6	44.1	25.0	23.7	-
Stable OM + minerals-W3	625-850 °C	14.2	51.6	13.4	41.0	-

Supplementary Table S2. Micronutrient and heavy metal concentrations of soils and barley plants at DAS 60.

Soils	C	WB 5	RA 5	VA 5	GC 5	WB+GC 2.5	RA+GC 2.5	VA+GC 2.5	VA+WB 2.5	RA+WB 2.5
Al	33470 ± 1194	30438 ± 1070	30092 ± 1363	34580 ± 1919	34812 ± 510	32130 ± 2336	31173 ± 1103	32389 ± 601	32841 ± 1136	32511 ± 1251
As	11.7 ± 1.8	9.8 ± 1.2	9.7 ± 1.7	13.1 ± 0.1	11.1 ± 1.0	9.3 ± 0.7	10.4 ± 2.1	8.1 ± 2.1	9.6 ± 1.8	9.8 ± 0.4
B	5.8 ± 1.6	4.7 ± 0.3	6.4 ± 0.0	5.2 ± 0.2	7.5 ± 1.3	7.0 ± 0.6	4.9 ± 0.8	6.2 ± 1.6	5.7 ± 0.1	7.6 ± 0.7
Ba	161.1 ± 10.4	143.2 ± 5.2	150.7 ± 4.1	163.2 ± 6.7	166.6 ± 11.4	156.1 ± 6.8	147.7 ± 1.4	155.6 ± 13.6	154.2 ± 3.0	158.6 ± 3.8
Ca	12497 ± 514	11803 ± 335	11676 ± 96	12988 ± 351	14914 ± 551	13760 ± 121	12927 ± 483	13289 ± 1957	11967 ± 105	13070 ± 1400
Cd	0.3 ± 0.0	0.1 ± 0.0	0.3 ± 0.0	0.2 ± 0.2	0.2 ± 0.1	0.2 ± 0.1	0.1 ± 0.1	0.2 ± 0.1	0.2 ± 0.1	0.2 ± 0.1
Co	11.2 ± 0.8	10.1 ± 0.3	10.2 ± 0.1	10.9 ± 0.6	11.1 ± 0.1	10.5 ± 0.1	10.1 ± 0.3	10.9 ± 2.0	10.5 ± 0.2	10.4 ± 0.1
Cr	42.7 ± 2.6	37.8 ± 1.0	39.3 ± 0.8	42.3 ± 1.9	43.0 ± 1.4	40.5 ± 1.3	38.7 ± 0.9	39.9 ± 1.0	40.4 ± 0.2	40.6 ± 2.5
Cu	7.5 ± 0.6	6.9 ± 0.6	7.3 ± 0.2	8.2 ± 0.1	16.1 ± 1.2	10.4 ± 0.8	10.0 ± 0.4	10.8 ± 2.1	7.2 ± 0.0	7.7 ± 0.9
Fe	30870 ± 1900	27416 ± 595	28461 ± 565	31000 ± 1954	30469 ± 619	29238 ± 596	27864 ± 626	28894 ± 1417	29320 ± 67	29549 ± 1689
Li	16.8 ± 1.0	15.1 ± 0.0	15.4 ± 0.2	16.4 ± 0.8	16.5 ± 0.5	16.0 ± 0.4	15.2 ± 0.0	15.1 ± 0.2	15.9 ± 0.0	15.9 ± 0.8
Mg	11517 ± 635	10303 ± 199	10605 ± 298	11573 ± 528	11632 ± 314	11049 ± 497	10556 ± 253	10942 ± 440	10959 ± 135	11040 ± 645
Mn	534.5 ± 48.9	474.3 ± 1.9	525.7 ± 20.8	535.4 ± 27.1	536.1 ± 9.2	501.3 ± 25.0	503.3 ± 13.0	507.0 ± 34.5	499.2 ± 11.6	538.8 ± 17.2
Mo	0.2 ± 0.1	0.3 ± 0.1	0.3 ± 0.1	0.2 ± 0.0	0.7 ± 0.3	0.1 ± 0.2	0.3 ± 0.0	0.2 ± 0.3	0.3 ± 0.0	0.2 ± 0.0
Na	174 ± 11	163 ± 2	185 ± 15	237 ± 57	253 ± 25	209 ± 16	196 ± 1	149 ± 68	180 ± 5	182 ± 3
Ni	6.2 ± 0.4	5.4 ± 0.1	6.0 ± 0.5	6.6 ± 0.1	7.5 ± 0.5	6.2 ± 0.5	6.5 ± 0.1	7.7 ± 1.4	6.0 ± 0.2	6.4 ± 0.7
Pb	1.6 ± 0.5	3.1 ± 2.5	2.4 ± 0.9	2.9 ± 0.1	3.4 ± 0.5	2.5 ± 0.2	4.0 ± 2.0	2.4 ± 0.5	2.6 ± 0.7	5.4 ± 3.7
S	227.8 ± 33.3	208.4 ± 13.0	325.2 ± 67.0	234.2 ± 10.5	396.0 ± 5.1	282.7 ± 15.9	307.4 ± 17.7	239.2 ± 27.3	228.2 ± 1.9	341.5 ± 140.8
Sr	19.7 ± 0.7	18.6 ± 0.3	19.0 ± 0.8	22.3 ± 0.9	26.7 ± 1.1	23.0 ± 0.1	20.4 ± 0.0	35.5 ± 21.4	18.9 ± 0.3	20.0 ± 1.4
V	63.5 ± 3.3	55.1 ± 1.8	57.4 ± 1.6	64.9 ± 5.2	63.7 ± 3.6	60.2 ± 2.3	61.8 ± 8.1	61.2 ± 5.9	59.5 ± 0.2	61.4 ± 4.0
Zn	60.0 ± 2.8	53.3 ± 1.7	86.9 ± 4.2	92.4 ± 17.5	79.7 ± 10.7	88.1 ± 1.7	60.2 ± 2.5	58.1 ± 1.0	56.5 ± 1.2	57.7 ± 4.1
Plants	C	WB 5	RA 5	VA 5	GC 5	WB+GC 2.5	RA+GC 2.5	VA+GC 2.5	VA+WB 2.5	RA+WB 2.5
Al	9.1 ± 2.4	45.5 ± 36.4	13.4 ± 9.1	195.1 ± 252.9	14.5 ± 1.5	51.6 ± 6.5	9.6 ± 1.6	12.4 ± 0.4	19.5 ± 9.9	13.4 ± 1.6
As	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l
B	6.7 ± 0.5	5.8 ± 1.0	7.2 ± 1.0	4.6 ± 1.1	6.3 ± 0.7	6.7 ± 0.4	6.6 ± 0.8	5.7 ± 0.1	5.4 ± 0.8	16.0 ± 12.8
Ba	6.2 ± 0.1	5.8 ± 0.2	5.7 ± 0.7	7.8 ± 2.5	4.8 ± 0.3	5.9 ± 0.2	4.9 ± 0.5	5.5 ± 0.6	6.3 ± 0.4	5.0 ± 0.4
Ca	5582 ± 368	4903 ± 155	4809 ± 705	5698 ± 888	4669 ± 438	5019 ± 277	4308 ± 530	4929 ± 435	5388 ± 311	4023 ± 357
Cd	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l
Co	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l
Cr	1.9 ± 1.4	1.7 ± 0.5	2.3 ± 0.7	2.3 ± 0.4	2.4 ± 0.6	2.5 ± 0.2	2.3 ± 0.5	2.5 ± 0.1	1.8 ± 0.4	1.1 ± 0.3
Cu	5.2 ± 0.4	4.6 ± 0.3	5.1 ± 0.4	5.2 ± 0.1	5.0 ± 0.7	5.3 ± 0.2	4.8 ± 1.4	5.3 ± 0.7	5.2 ± 0.1	4.6 ± 0.1
Fe	53.2 ± 12.1	97.3 ± 46.5	57.2 ± 16.9	288.3 ± 320.8	59.4 ± 10.2	103.7 ± 7.4	52.8 ± 8.1	57.1 ± 0.8	66.6 ± 8.3	49.1 ± 0.3
Li	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l
Mg	3278 ± 100	3186 ± 72	3012 ± 189	3437 ± 143	2624 ± 113	2932 ± 77	2605 ± 204	3027 ± 22	3258 ± 85	2732 ± 132
Mn	25.9 ± 2.0	25.8 ± 0.4	30.8 ± 4.0	28.7 ± 8.6	23.8 ± 0.5	24.9 ± 1.4	24.9 ± 2.4	22.2 ± 1.1	24.6 ± 0.4	23.4 ± 1.9
Na	6303 ± 66	5127 ± 59	4208 ± 440	6242 ± 41	4863 ± 718	4742 ± 183	4362 ± 168	4969 ± 155	5696 ± 34	4681 ± 41
Ni	b.d.l	1.0 ± 0.1	b.d.l	b.d.l	1.4 ± 0.3	b.d.l	1.4 ± 0.1	1.3 ± 0.0	b.d.l	b.d.l
Pb	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	1.4 ± 0.1	1.0 ± 0.1	b.d.l	b.d.l
S	3863 ± 217	3737 ± 319	3433 ± 360	4140 ± 100	2812 ± 58	3693 ± 147	2879 ± 189	3394 ± 160	4154 ± 68	2997 ± 202
Sr	7.1 ± 0.3	6.3 ± 0.1	6.3 ± 0.8	7.3 ± 1.0	6.4 ± 0.6	6.6 ± 0.3	5.6 ± 0.6	6.4 ± 0.5	6.7 ± 0.4	5.3 ± 0.5
V	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l	b.d.l
Zn	31.8 ± 0.8	21.6 ± 2.1	52.9 ± 8.4	55.6 ± 0.3	34.0 ± 3.0	47.3 ± 9.8	28.1 ± 2.6	27.5 ± 2.6	25.2 ± 1.1	21.9 ± 1.5

Values are given in mg kg⁻¹ (dry weight basis). Given error is standard error (*n* = 3)