Evaluation of Cascade Minerals on Greenhouse Plants

Richard Affeldt, Agronomist, Central Oregon Basalt Products

Introduction

Cascade Minerals Remineralizing Soil Booster (CM) is finely ground basalt that is produced from a Miocene Columbia River formation near Madras, Oregon, USA. According to x-ray fluorescence and wet-chemistry analysis, the source of CM is high in calcium, magnesium, iron, and manganese. A greenhouse trial was conducted to determine if the plant nutrients revealed in the laboratory analysis of CM are indeed available for plant uptake.

Methods

The trial consisted of two different media that were amended with or without CM. The media used were (1) Madras sandy loam soil (MS) that was removed from a local agricultural field and (2) Cosmic Coir brand coconut peat (CO) purchased from a retail garden store. Cascade Minerals was mixed with each of these at 30% v/v prior to potting. Three-inch pots were used. In order to supply sufficient nitrogen (N), phosphorus (P), potassium (K), and sulfur (S) each pot was fertilized with Osmocote slow release fertilizer (19-6-12) at the rate specified on the label, which was 0.5 teaspoons per pot. The fertilizer was derived from coated ammonium nitrate, ammonium phosphate, calcium phosphate, and potassium sulfate. The coating provided 16% slow release N, 5% slow release P_2O_5, and 10% slow release K_2O.

Leaf lettuce (*Lactuca sativa*), spring wheat (*Triticum aestivum*), and summer squash (*Curcurbita pepo*) seeds were planted in each pot and thinned after emergence to 4 plants per pot for lettuce and wheat and 1 plant per pot for squash. Planting date was April 26, 2012. Treatments were arranged in 6 randomized complete blocks (reps).

Plants were harvested on June 8, 2012 when lettuce and wheat were starting to outgrow the 3-inch pots; wheat heads were beginning to emerge at this time. Harvested plant material was oven-dried at 70°C and sent to the Oregon State University-Central Analytical Laboratory for nutrient analysis. Nutrient analysis included N, P, K, calcium (Ca), magnesium (Mg), manganese (Mn), copper (Cu), boron (B), zinc (Zn), iron (Fe), sodium (Na), carbon (C, data not shown), and S (express as N:S ratio).

Results and Discussion

Plant tissue nutrient content is shown in Table 1. There was not adequate plant material to analyze each treatment separately by rep. To obtain enough plant material reps 1, 2, and 3 were combined as were reps 4, 5, and 6. Therefore, data shown in Table 1 is an average from 2 reps.

The addition of CM to CO notably increased growth of lettuce, wheat, and squash (Figure 1). Also, CO+CM compared to CO alone had higher Ca, Mn, and Fe content for all three species; and higher Mg and Zn content for wheat and squash. The additional plant growth from CM created a dilution effect that is probably the reason that P and B content is lower in CO+CM than in CO alone.

Coconut peat is sometimes high in Na. In this trial, lettuce grown in CO accumulated excessive Na. This suggests that the coconut peat used was indeed high in Na. However, the addition of CM to CO reduced Na content by 46%. The potting media was 30% CM by volume, but the measured reduction in Na suggests that available Ca and/or Mg from CM may have prevented excess Na from being taken up by lettuce.

In MS, response from the addition of CM on plant growth and nutrient content was not as great as it was in CO. However, Fe content of plants in MS+CM was greater than in MS alone for all three species. The amount of CM added to MS resulted is slightly poor water infiltration and aeration of the potted media. Plant growth was not notably impacted in MS+CM, but this may have led to slight reductions in Mn, Cu, B, and Zn for some species.

Conclusions

The Ca, Mg, Fe, Mn, and perhaps Zn present in CM are available for plant uptake and can increase nutrient content in the plant species evaluated here. Plant response to CM was greater in potting media with poor nutrient availability, such as coconut peat. Therefore, nutrient deficient soils are more likely to benefit from the addition of CM than soils with sufficient nutrition for plants.

Table 1. Plant tissue nutrient content from greenhouse evaluation.

Species	Treatment	N	P	K	Ca	Mg	Mn	Cu	B	Zn	Fe	Na	N:S
		------------------ % ------------------					------------------- ppm -------------------						Ratio
Lettuce	CO[1]	5.29	0.48	7.80	0.23	0.52	61	3.8	38.1	42	194	7,610	21
	CO+CM[2]	4.58	0.35	8.24	0.63	0.49	244	4.9	27.5	40	638	4,118	21
Wheat	CO	4.64	0.63	6.72	0.10	0.13	64	13.7	11.0	62	79	365	8
	CO+CM	3.72	0.42	5.09	0.25	0.19	97	7.3	6.3	33	112	234	9
Squash	CO	5.00	0.78	7.84	0.22	0.36	33	6.1	51.3	41	132	378	16
	CO+CM	4.69	0.49	5.73	1.04	0.65	125	7.3	44.2	35	223	342	17
Lettuce	MS[3]	5.31	0.33	5.71	0.85	0.50	108	7.4	22.1	40	213	2683	28
	MS+CM	5.15	0.32	5.49	0.80	0.46	91	5.7	22.4	26	569	2737	21
Wheat	MS	4.55	0.37	4.49	0.39	0.22	49	8.5	7.0	31	88	170	12
	MS+CM	4.13	0.32	4.40	0.42	0.23	52	7.3	5.8	24	99	165	11
Squash	MS	5.30	0.34	4.10	2.06	0.95	53	8.2	39.0	28	192	282	20
	MS+CM	4.93	0.32	3.89	2.13	0.95	58	7.7	40.5	24	276	307	18

Note: data shown are an average from 2 replications.

1 CO = Coconut peat

2 CM = Cascade Minerals Remineralizing Soil Booster added at 30% v/v.

3 MS = Madras sandy loam soil

Figure 1. Lettuce, wheat, and squash grown in coconut peat with Osmocote Plus fertilizer. Plants on right have Cascade Minerals added.