Steel Slag Raises pH of Greenhouse Substrates

The primary component in greenhouse potting substrates is sphagnum peatmoss with solution pH of 4.0 to 4.5 when nonamended. However, for most economically important floriculture crops the ideal pH ranges is 5.8 to 6.2. Dolomitic lime (DL) is typically used to increase pH in peatmoss-based media to the recommended range of 80 and 30 mg·L^{-1} Ca and Mg, respectively. Steel slag (SS) is a byproduct of the steel manufacturing industry that has been observed to elevate field soil pH in different studies and has the potential as a liming agent in the greenhouse industry. The objective of this research was to determine the pH response of a peatmoss-based greenhouse substrate to varying rates of DL or SS.

Two experiments were conducted with an 85 peatmoss : 15 perlite substrate. In the first experiment, the substrate was amended with 0, 2.4, 4.8, or 7.1 kg·mL^{3} of either DL or SS. Half of the containers remained fallow and the other half were potted with a single sunflower (*Helianthus annuus L. 'Pacino Gold'*). In the second experiment, only fallow containers were used with the substrate amended with 0, 2.4, 4.8, 9.5, or 14.2 kg·mL^{3} DL or SS. Sunflower were measured for relative foliar chlorophyll content, shoot mass, root ratings, and foliar nutrient concentrations. Substrate electrical conductivity (EC) and pH were measured weekly using the pour-through procedure (Figure 1).

All plants grew vigorously, although nonamended controls had less shoot dry weight than those amended with DL or SS. There were minor differences in foliar concentration of N, Ca, Mg, and Mn. Summarizing across both experiments, EC was affected by treatment and time, and EC readings were within the recommended range for floriculture crop production (1.0–4.6 mS·cm^{-1}). Substrate pH differed slightly in Expt. 1 between fallow and planted containers. Substrate pH increased exponentially with increasing rates of either DL or SS (Table 2). Maximum pH in fallow DL and SS amended substrates was 6.57 and 6.93, respectively, in Expt. 1 and 6.85 and 7.67, respectively, in Expt. 2. The SS used in this experiment resulted in a greater pH response than DL with higher application rates. SS is a viable material for raising pH of soilless substrates.

Fig. 1. Relationship between dolomitic lime (DL) or steel slag (SS) rate and substrate pH at 1 week after potting (WAP) (and 8 WAP in a 85 peatmoss : 15 perlite substrate in Expt. 2.

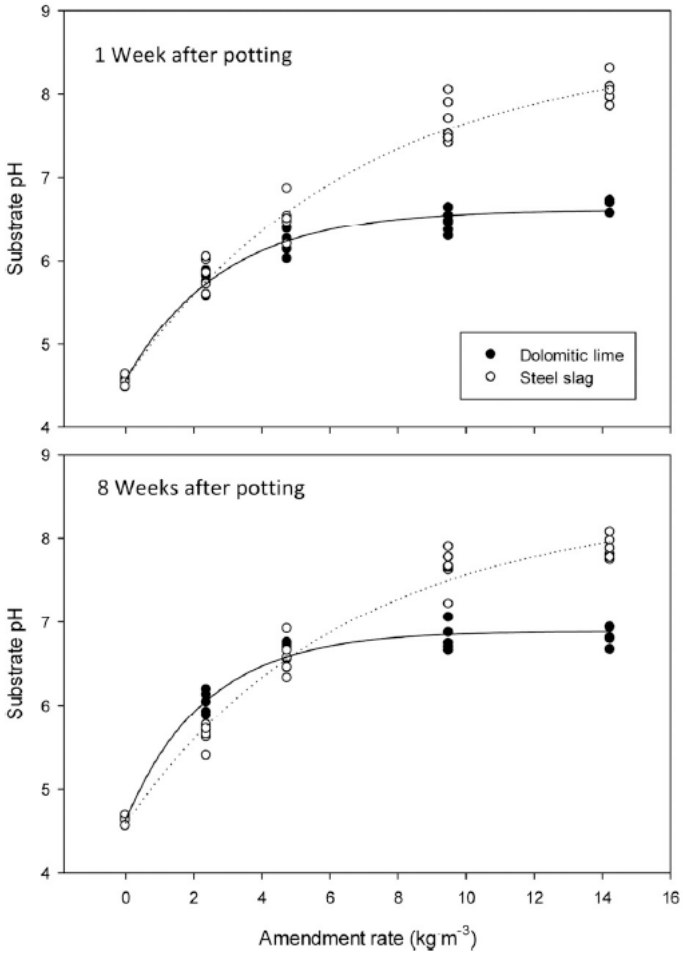

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Table 1. Substrate pH of a 85 peatmoss : 15 perlite substrate amended with three rates of either dolomitic lime (DL) or steel slag (SS), in containers that were either fallow or planted with a single sunflower (Helianthus annuus 'Pacino Gold') plant, Expt. 1.

		1 WAP[z]		2 WAP		3 WAP		4 WAP		5 WAP		6 WAP	
Amendment	Rate (kg·m^{-3})	Fallow	Planted	Fallow	Planted	Fallow	Planted	Fallow	Planted	Fallow	Planted	Fallow	Planted
Nonamended	0	4.49	4.46	4.67	4.58	4.77	4.55	4.89	4.79	4.94	4.57	5.07	4.56
DL	2.4	5.92	5.90	5.99	5.90	6.12	5.82	5.92	5.87	5.88	5.79	5.76	5.81
	4.7	6.31	6.29	6.31	6.21	6.34	6.13	6.05	6.28	6.22	6.26	6.21	6.26
	7.1	6.51	6.53	6.47	6.36	6.56	6.23	6.42	6.35	6.56	6.40	6.57	6.36
SS	2.4	5.47	5.48	5.67	5.55	5.83	5.41	5.80	5.44	5.57	5.36	5.41	5.38
	4.7	6.49	6.44	6.52	6.45	6.44	6.27	6.07	6.37	6.27	6.29	6.19	6.34
	7.1	6.95	6.95	6.98	6.82	6.77	6.63	6.65	6.76	6.84	6.70	6.93	6.65

[z]Weeks after potting (WAP), 17 Oct. 2013.

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