



Cooperative Extension Service
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Influence of Iron on Phosphorus Leaching from a Container Medium¹

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NATURE OF WORK

A common phenomenon in field soils is that phosphorus (P) binds or chemically reacts with aluminum (Al) and iron (Fe) to form relatively insoluble and immobile complexes (1). However, little is known about the chemical reactions of P and Fe in soilless media, and the influence of Fe on P leaching. The objective of this research was to determine the influence of an Fe amendment on P leaching from a soilless container medium.

Columns (2 x 6 inches, 4 x 15 cm) of an incubated (77°F, 25°C 11% volumetric moisture for 30 days) 2 milled pine bark: 1 Canadian peat: 1 builders' sand (v/v/v) medium amended with 7 lb/yd³ (4.2 kg/m³) of dolomitic limestone, 5 lb/yd³ (270 g P/m³) of superphosphate and the equivalent of 0, 1.7, 10.4, or 62.0 oz Fe/yd³ (0, 64, 384, or 2300 g Fe/m³) from either iron citrate (16% Fe) or iron chelate (ethylenedinitrilo tetraacetic acid ferric sodium salt, FeEDTA, 15% Fe) were leached daily for 21 days with 0.5 inch (16 ml) of deionized water (pH 5.5). Leachate volumes and pH were determined on days 1, 2, 5, 9, 13, 17, and 21. Leachate P and Fe were determined by standard analyses (2).

RESULTS AND DISCUSSION

Leachate P on day 1 ranged from 850 ppm for 1.7 oz Fe/yd³ from iron chelate to 138 and 91 ppm for 10.4 and 62.0 oz Fe/yd³, respectively, from iron citrate (Table 1). Leachate P on days 1, 2, and 5 for 10.4 and 62.0 oz Fe/yd³ from iron citrate was lower than for iron chelate and on day 21, P concentrations for these rates of iron citrate were 28 and 11 ppm, respectively. The 62.0 oz Fe/yd³ from iron citrate resulted in the lowest leachate P concentrations at all sampling times, indicating iron citrate was more effective than iron chelate in reducing P leaching. Leachate Fe concentrations on day 1 for 10.4 and 62.0 oz Fe/yd³ from iron citrate were 0.3 and 5693 ppm, respectively. Leachate Fe for 62.0 oz Fe/yd³ from iron citrate decreased to 10 ppm on day 21, while leachate Fe remained at 0.3 ppm for 10.4 oz Fe/yd³ from iron citrate. Leachate Fe and P concentrations were not directly related to leachate volume or pH that ranged from 4.5 to 5.5.

These data indicate that Fe amendments result in decreased leachate P concentrations from a soilless medium. This indicates a chemical binding or complexing of Fe and P, as occurs with many native soils.

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LITERATURE CITED

- 1) Mengel, K. and E. Kirky. 1982. *Principles of Plant Nutrition*. 3rd Edition. Intl. Potash Inst., Bern, Switzerland.
- 2) Rhue, D. and G. Kidder. 1984. *Procedures used by the IFAS Extension Soil Testing Laboratory and interpretation of results*. Univ. of Fla. Ext. Cir. 596.

Table 1. Leachate P levels (ppm) from columns of a 2 pine bark: 1 Canadian peat: 1 builders' sand medium amended with 5 lb/yd³ (270 g P/m³) of superphosphate and the equivalent of 0, 1.7, 10.4, or 62.0 oz Fe/yd³ (0, 64, 384, or 2300 g Fe/m³)

Day	0 oz Fe/yd ³	1.7 oz Fe/yd ³		10.4 oz Fe/yd ³		62.0 oz Fe/yd ³	
		citrate ^z	chelate ^y	citrate	chelate	citrate	chelate
	Leachate, ppm P						
1	826	728	850	138	805	91	644
2	538	467	490	135	435	51	450
5	169	156	138	84	125	21	144
9	58	63	57	51	52	19	63
13	32	38	30	38	28	15	34
17	20	27	21	32	20	13	22
21	16	22	16	28	15	11	17
^z Iron citrate (16% Fe); ^y Iron chelate (FeEDTA, 15% Fe)							