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CHANGE IN pH AND SOLUBLE SALTS OF CONTAINER MIXES[1]

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Abstract. **As dolomite levels applied to peat and a peat: sand mix increased, pH increased. Pots irrigated with well water of pH 7.0 five times/wk had higher pH than pots irrigated once/wk. In a second experiment dolomite, calcium carbonate and calcium hydroxide increased pH immediately and maintained it for 8 wk. Container leachate pH was higher than soil pH. All liming materials increased soluble salts.**

Almost all growing media utilized for production of container grown plants are amended with some form of lime. Lime sources, such as calcitic ($CaCO_3$), hydrated [$Ca(OH)_2$] and dolomitic ($MgCO_3$, $CaCO_3$), are the most commonly used to increase pH. Poole and Conover (4) found that 3 to 6 kg/m³ of dolomite or calcium carbonate increased pH 1.5 to 2 units immediately after incorporation. Woltz (6) compared dolomite of various sized particles at 2.5 kg/m³ and found the rate of pH change increased as dolomite particle size decreased and pH increased slowly from 1 to 8 days. Freeman (1) tested rates of 0 to 7 kg/m³ dolomite and found that pH increased 1 to 1.5 units within 1 wk and increased slowly or remained stable during weeks 3 to 10. Griffin et al. (2) reported pH changed little between 7 or 50 days after incorporating 9 or 18 kg/m³ dolomite into a soil:vermiculite, 1:1 (v/v) mixture. The 2 experiments reported here were initiated to determine effects of dolomite and irrigation frequency on pH and soluble salts 10 wk after incorporation and effects of lime source on pH and soluble salts of container mixes and leachates during an 8-wk period.

Materials and Methods

Experiment 1. A 5 x 2 factorial experiment in randomized complete block design with 3 replicates was initiated March 22, 1979. Ten-cm pots filled with Florida sedge peat were placed in a glasshouse where they received approximately 175 $\mu E/m^2/sec^1$ maximum and temperatures of 17°C to 32°C. Treatments included amendments of 0, 1.8, 3.6, 5.4 or 7.2 kg/m² Florida dolomite, 95% passed through #32 mesh, and irrigations of 1 or 5 times/wk using water at pH 7.0 and 350 micromhos/cm with some leaching occurring at each application. On June 8, 1979, data recorded included salinity and pH of the container mix. Samples were prepared by combining 1 part peat to 2 parts water, mixing occasionally and determining measurements after 30 min.

Experiment 2. A 7-treatment experiment in a randomized complete block design with 4 replicates was established April 12, 1982, utilizing a potting medium composed of Florida sedge peat:builder's sand, 3:1 (v/v). Treatments consisted of amendments of either 0, 3 or 6 kg/m³ dolomite; 3 or 6 kg/m³ $CaCO_3$; or 3 or 6 kg/m³ $Ca(OH)_2$. Dolomite was the same as in Experiment 1, and $CaCO_3$ and $Ca(OH)_2$ were reagent grade. Forty-four pots each of the amended mixes for a total of 308 pots were placed in a glasshouse under cultural conditions similar to Experiment 1. Pots were irrigated 2 times/wk to the point of leaching. Four pots were selected for pH and salinity measurements at 1, 2 and 4 days and at 1, 2, 3, 4, 5, 6, 7 and 8 wk. Samples were also analyzed immediately after mixing of ingredients. Soil samples were analyzed as described in Experiment 1. Salinity and pH determinations were also made of the leachate obtained by irrigating with sufficient water to collect 50 to 100 ml leachate.

Results and Discussion

Salinity and pH increased with increased levels of dolomite. As dolomite levels increased in pots irrigated once/wk, pH increased from 3.8 to 6.5 with the largest increase occurring at the 1.8 kg/m³ level and the smallest increase (0.1) occurring between 5.4 and 7.2 kg/m³ levels (Table 1). When considering actual hydrogen ion concentration ($[H^+]$) the differences were even more evident. When 1.8 kg/m³ dolomite was added to the peat, $[H^+]$ changed from 16 x 10^{-5} to 1.3 x 10^{-5}. When dolomite level was increased from 5.4 to 7.2 kg/m³, $[H^+]$ decreased from 4.0 x 10^{-7} to 3.1 x 10^{-7}.

Table 1. Watering and dolomite affect pH and soluble salts of peat.[z]

Dolomite (kg/m³)	X Irrigations/wk	pH	mhos x 10^{-5}
0.0	1	3.8	4.3
1.8	1	4.9	21.0
3.6	1	5.5	21.0
5.4	1	6.4	31.7
7.2	1	6.5	33.3
0.0	5	5.9	0.0
1.8	5	6.4	0.0
3.6	5	6.8	0.0
5.4	5	7.3	0.0
7.2	5	7.4	1.3
0.0	—	4.1	2.2
1.8	—	5.2	10.5
3.6	—	5.8	10.5
5.4	—	6.6	15.8
7.2	—	6.8	16.5
—	1	4.5	22.3
—	5	6.3	0.3
Significance level			
Dolomite		.001	.001
Watering		.001	.001
D x W		.001	.001

[z]Treatments started March 22, 1979. Determination, June 8, 1979.

The pH was higher in pots irrigated 5 times/wk, but changes in pH due to treatment were less than in pots irrigated once/wk. There was also a large increase in mhos with the initial addition of dolomite, and then a reduction in the rate of increase as levels of dolomite increased. When pots were irrigated 5 times/wk, all traces of salts were removed, except for a small amount at the 7.2 kg/m³ level. Change of pH was immediate in soil and leachate, with $Ca(OH)_2$ having the greatest effect, followed by $CaCO_3$ and dolomite (Table 2).

Previous research (1, 2, 3, 6) reports pH increases at the first time of analysis, but initial determinations were made 1 to 8 days after lime incorporation. Soil pH did not change

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Table 2. pH of sedge peat:mason sand 3:1 (v/v) and leachate at various intervals with lime incorporated April 12, 1982.

Amendment	kg/m^3	Soil pH 4/12	4/13	4/14	4/19	4/26	5/10	5/24	6/8
Control	0	5.8	5.7	6.4	6.2	5.8	5.8	6.0	6.0
Dolomite	3	6.4	6.4	6.5	6.6	6.7	6.4	6.6	6.4
Dolomite	6	6.6	6.6	6.5	6.7	6.9	6.7	6.8	6.7
$CaCO_3$	3	6.9	6.8	6.5	6.8	6.9	6.7	6.7	6.7
$CaCO_3$	6	7.2	6.9	6.6	7.2	7.2	7.1	7.0	6.9
$Ca(OH)_2$	3	6.8	6.5	6.6	6.9	7.0	7.1	7.0	6.9
$Ca(OH)_2$	6	7.3	6.9	6.6	7.2	7.4	7.4	7.1	7.1

Amendment	kg/m^3	Leachate pH 4/13	4/14	4/19	4/26	5/10	5/24	6/8
Control	0	4.8	4.7	6.6	5.5	5.5	5.7	6.1
Dolomite	3	7.2	7.1	7.0	7.1	6.9	7.0	7.2
Dolomite	6	7.5	7.4	7.1	7.5	7.3	7.3	7.4
$CaCO_3$	3	7.6	7.6	7.3	7.3	7.4	7.4	7.4
$CaCO_3$	6	7.8	7.6	7.4	7.6	7.6	7.5	7.5
$Ca(OH)_2$	3	7.6	7.4	7.3	7.5	7.5	7.5	7.6
$Ca(OH)_2$	6	7.8	7.8	7.2	7.6	7.7	7.5	7.6

Table 3. Salinity of sedge peat:mason sand 3:1 (v/v) and leachate at various intervals with lime incorporated April 12, 1982.

Amendment	kg/m^3	Micromhos/cm—soil 4/12	4/13	4/14	4/19	4/26	5/10	5/24	6/8
Control	0	188	185	235	187	208	202	200	210
Dolomite	3	272	300	271	305	335	345	342	381
Dolomite	6	292	328	291	342	365	376	391	422
$CaCO_3$	3	372	400	338	391	401	400	454	442
$CaCO_3$	6	420	556	376	446	455	445	452	510
$Ca(OH)_2$	3	376	450	391	392	468	538	425	400
$Ca(OH)_2$	6	405	456	424	435	469	680	442	480

Amendment	kg/m^3	Micromhos/cm—leachate 4/13	4/14	4/19	4/26	5/10	5/24	6/8
Control	0	242	288	379	370	360	332	390
Dolomite	3	350	370	420	498	480	585	514
Dolomite	6	345	362	415	445	494	532	475
$CaCO_3$	3	412	375	464	550	498	540	502
$CaCO_3$	6	430	470	519	615	515	598	586
$Ca(OH)_2$	3	468	495	552	648	538	610	575
$Ca(OH)_2$	6	502	482	580	840	680	610	692

appreciably during the 8 wk following initial incorporation. Leachate pH was slightly higher than soil pH, but also remained relatively constant throughout the experiment. Soil salinity increased slightly during the 8 wk period with $Ca(OH)_2$ and $CaCO_3$ producing slightly higher readings than dolomite (Table 3). Salinity of leachate was higher than soil salinity.

These results demonstrate that introduction of liming materials into a potting medium causes an immediate influence on pH and salinity. Although pH changes appear minor because of lime concentration, actual $[H^+]$ changes were 4×10^{-7} vs. 2.5×10^{-7} for dolomite at 3 vs. 6 kg/m^3, 13×10^{-8} vs. 6.3×10^{-8} for $CaCO_3$, and 16×10^{-8} vs. 5×10^{-8} for $Ca(OH)_2$ when samples were analyzed immediately. Results of these experiments also suggest that there is a difference between soil pH and leachate pH. Earlier work (5) also showed a difference of 1 unit (5.7 and 6.7) when comparing pH of leachate to soil extracted by the water: soil method. The question remaining is whether the root hairs in the 3 kg/m^3 dolomite mix, as on April 13, 1982, are in a pH of 6.4 as indicated by soil analysis, or a pH of 7.1 as indicated by leachate analysis. Mixing soil with water and allowing the solution to reach equilibrium allows more time for salts to become soluble, unlike the natural environment of plant roots which has less available water at constantly changing volumes.

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INFLUENCE OF SHADE AND FERTILIZER LEVELS ON YIELD OF CROTON STOCK PLANTS[1]

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Abstract. **Increasing shade level from 0 to 60% decreased number and weight of cuttings produced from** Codiaeum variegatum **L. Blume 'Bravo' and 'Oakleaf', while increasing fertilizer level had little effect. Increasing shade level decreased cutting yield and fresh weight of 'Gold Dust' and interacted with fertilizer level on both cultivars. Cutting yield was greater for the narrowleaf than the broadleaf forms of 'Gold Dust'. 'Norma' and 'Elaine' also produced greater numbers of cuttings under less shade with higher fertilizer levels.**

In recent years, crotons have become more popular as interior foliage plants because of their colorful foliage and tolerance of interior conditions. Movement of croton stock

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