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CROFT LILY LEAF SCORCH IN RELATION TO MEDIA, PHOSPHORUS AND CALCIUM

F. J. Campbell
University of Massachusetts
Waltham Field Station

Croft lily leaf scorch has been attributed to unbalanced nutrient conditions, and the reaction and fertility of the soil in which lily bulbs are grown. Stuart et al (6) found that identical treatments at two different localities produced different results, these differences being attributed to the pH of the soil and water used. It would appear that soil pH along with controlled fertilizing programs are essential in reducing leaf scorch. Such controlled programs have not always eliminated leaf scorch but have reduced its incidence considerably.

Various workers have demonstrated that applications of lime along with applications of organic nitrogen reduced leaf scorch (1,3,6). The incorporation of urea-formaldehyde fertilizer in the potting soil followed by subsequent liquid feedings of nitrogen and potassium reduced the percentage of leaf scorch (2). Yet the beneficial effects of nitrogen seemed to have been counteracted when phosphorus and potassium were used (1,3). Seeley et al (3) noted that nitrate fertilization resulting in a depressed pH also resulted in a reduction of leaf scorch. Conversely, Stuart et al (5) found that high nitrogen applications resulting in a low pH increased the average number of scorched leaves, and that the addition of high lime with high nitrogen nearly neutralized the soil and reduced leaf scorch considerably. In an effort to determine the effects of the media and combinations of phosphorus and calcium on leaf scorch in Croft lily, the following preliminary trials were established.

One hundred nine inch bulbs were divided into five groups of twenty and potted in the following media on December 27, 1956: (1) field soil; (2) field soil, peat moss, sand; (3) field soil, perlite, sand; (4) perlite, peat moss; and (5) perlite. Media No. 2 and 3 were mixed at the ratio of 3:1:1, and medium No. 4 at the ratio of 1:1. Each group was sub-divided to have five pots each of the following super-phosphate-ground limestone combinations: (2) no superphosphate, no lime; (b) superphosphate, no lime; (c) no superphosphate, lime; (d) superphosphate, lime; giving a total of twenty treatments. Superphosphate and ground limestone were added at the rate of six pounds per hundred square feet. Bulbs were started and grown at 60°F., watered when necessary, and fed every two weeks with ammonium nitrate and potassium nitrate at the rate of one pound each to 100 gallons of water.

Results and Discussion

The different media and superphosphate-ground limestone treatments are listed in Table 1 in order of their percentage leaf scorch reading from low to high. Based on the Duncan multiple range test, there is significantly less leaf scorch in treatments 1 to 5 than in treatments 13 to 20. There is no significant difference in the percentage leaf scorch between treatments 1 to 5 and 6 to 12. These comparisons are on a 1 percent level (see Table II).

While leaf scorch was experienced in all treatments and the relationship, of media, phosphorus and calcium are not distinct, some generalizations can be made on the basis of these trials.

In most media the addition of superphosphate alone resulted in more leaf scorch than if no superphosphate had been added. The addition of superphosphate and ground limestone resulted in less leaf scorch than if no additives were applied to the media, and the addition of ground limestone alone resulted in the least amount of leaf scorch in most media. There are, of course, exceptions to these trends depending on the media. These results, however, clearly indicate that phosphorus tends to increase leaf scorch and calcium tends to reduce leaf scorch. Phosphorus and calcium seem to invalidate each other. It is interesting to note that according to data in Table I field soil alone resulted in less scorch than soils amended with peat moss and sand but that when ground limestone was added leaf scorch was reduced. When both ground limestone and superphosphate were added the field soil had less scorch than the mixture of field soil, peat moss, and sand. Generally, the higher percentage of scorch occurred when either the pH and/or calcium levels were low. According to soil tests, calcium levels varied in different media even though the rate of application was the same (Table III). This would suggest that calcium varies in availability in the different media. This seems particularly so in the case of soils prepared with peat moss where the addition of ground limestone did not appreciably effect the calcium level but did raise the pH and reduce the percentage of leaf scorch significantly. This difference is not so distinct in the other media. Calcium levels may exceed phosphorus levels but if the pH is low apparently considerable leaf scorch results. Leaf scorch seems to be less when the calcium level exceeds the phosphorus level and the pH is more nearly neutral.

The average number of scorched leaves shown in Table II indicates that either field soil or the mixture field soil-perlite-sand would give a more consistent control media for leaf scorch than would field soil-peat moss-sand. The exception to this is field soil-peat moss-sand and ground limestone. Apparently, if peat moss is to be used as a soil amendment for Croft lilies, the elimination of superphosphate, or very moderate usage of superphosphate depending on soil tests along with an ample supply of calcium is desirable.

Tissue analyses were conducted on both scorched and normal leaves for all treatments and media. There was no relation between the amount of different elements in both scorched and normal tissues and the media, superphosphate, ground limestone treatments.

Conclusions

The indications are that leaf scorch on Croft lilies can be reduced so long as there is an ample supply of calcium resulting in high calcium levels coupled with a lower or medium supply of phosphorus at near neutral or slightly acid pH levels. The rate of superphosphate and ground limestone should be applied according to the nature of the media since the availability of phosphorus and calcium varies with the media. In this respect, the medium may have an effect on Croft lily leaf scorch. Therefore, calcium and phosphorus levels may be easier to control and maintain according to the nature of the media. It is only in the difficulty or ease in which these levels are maintained that the media has any effect on the incidence of leaf scorch. If soils are customarily prepared with peat moss and sand, then considerable attention should be given to applying adequate amounts of ground limestone and less than average amounts of superphosphate. Otherwise, considerable scorch may result.

These are preliminary trials and are in no way to indicate that a grower should make radical changes in soil amendments at this time. These studies are to be continued, considering different soil amendments in relation to varying phosphorus and calcium levels.

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TABLE I

Treatment Code	Treatment
4c	Peat moss, perlite, ground limestone
1d	Field soil, ground limestone, superphosphate
2c	Field soil, peat moss, sand, ground limestone
3d	Field soil, perlite, sand, ground limestone, superphosphate
1c	Field soil, ground limestone
3a	Field soil, perlite, sand
3c	Field soil, perlite, sand, ground limestone
2d	Field soil, peat moss, sand, ground limestone, superphosphate
3b	Field soil, perlite, sand, superphosphate
1a	Field soil
4a	Peat moss, perlite, ground limestone, superphosphate
5c	Perlite, ground limestone
1b	Field soil, superphosphate
2b	Field soil, peat moss, sand, superphosphate
4a	Peat moss, perlite
2a	Field soil, peat moss, sand
5c	Perlite, ground limestone, superphosphate
4b	Peat moss, perlite, superphosphate
5a	Perlite
5b	Perlite, superphosphate

Table II

Significant Differences between Treatments*
(Percent Leaf Scorch)

Least Significant Ranges		Treatment Code	Percent Leaf Scorch
1.		4c	10.07
2.	32.72	1d	10.91
3.	34.11	2c	11.75
4.	35.07	3d	14.54
5.	35.85	1c	16.53
6.	36.28	3a	22.91
7.	36.72	3c	26.61
8.	37.15	2d	31.36
9.	37.49	3b	33.17
10.	37.76	1a	39.14
11.	37.93	4a	44.63
12.	38.53	5c	46.58
13.	38.36	1b	54.98
14.	38.63	2b	74.04
15.	38.71	4a	76.86
16.	38.89	2a	85.13
17.	38.97	5c	90.13
18.	39.15	4b	100.00
19.	39.23	5a	100.00
20.	39.41	5b	100.00

* *Note*. Any two treatment means underscored by the same line are not significantly different. Any two treatment means not underscored by the same line are significantly different. Duncans New Multiple Range Test for 1 percent level.

Table III

Treatment Code	pH	P	Ca	Scorched Leaves (Ave.)	
		Field Soil			
1a	5.0	M	MH	27	Check
1b	4.9	M	VH	32.2	Superphosphate
1c	5.6	M	VH	9.75	Ground Limestone
1d	5.3	M	VH	12.2	Superphosphate, ground limestone
		Field Soil, Peat Moss, Sand			
2a	4.8	M	L	49.2	Check
2b	4.6	MH	L	49.75	Superphosphate
2c	5.3	M	H	7.4	Ground Limestone
2d	5.2	M	H	19.25	Superphosphate, ground limestone
		Field Soil, Perlite, Sand			
3a	5.8	VH	EH	14.6	Check
3b	5.8	EH	EH	17.2	Superphosphate
3c	6.3	EH	EH	18.8	Ground limestone
3d	5.9	EH	EH	14.8	Superphosphate, ground limestone
		Peat Moss, Perlite			
4a	4.7	L	VL	38.2	Check
4b	4.6	L	VL	100.00	Superphosphate
4c	5.7	L	VL	8.2	Ground limestone
4d	5.6	L	VL	40.2	Superphosphate, Ground limestone
		Perlite			
5a	6.2	L	VL	100.0	Check
5b	5.7	L	VL	100.0	Superphosphate
5c	6.6	L	VL	25.6	Ground limestone
5d	6.5	L	VL	55.6	Superphosphate, Ground limestone