THE EFFECTS OF VARIOUS LEVELS OF FLUORIDE ON CHLOROPHYTUM AND PLECTRANTHUS

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Fluoride has been listed as the cause of tip burn and foliar chlorosis on a number of horticultural crops. Among those listed are Easter lily and Dracaena as well as Chlorophytum and Plectranthus, which have been used a great deal for baskets. However, when the leaves are scorched, the plants are not very attractive.

A study was undertaken to determine what levels of fluoride would be needed to produce toxic symptoms on Chlorophytum and Plectranthus.

Six treatments were used for this study. Sodium fluoride was used as the source of F^-. The treatments (expressed as ppm F^-, not NaF) were: 0 ppm; 3.16 ppm; 10 ppm; 31.6 ppm; 100 ppm; and 316 ppm with 3 plants per treatment.

2 1/2" plants of Chlorophytum and Plectranthus* were shifted to 4" standard clay pots on October 7, 1977. The soil mix was a 3 (soil): 2 (peat): 1 (sand) with Osmocote 14-14-14 (5 lbs.), 0-20-0 (3 1/2 lbs.), dolomitic limestone (5 1/2 lbs.) and Electra 5-10-3 (1 lb.) added per cubic yard. The plants were allowed to grow for two weeks before the treatments were started.

*Donated by Woodland Gardens, Manchester, Conn.

A stock solution of NaF was used to prepare the various levels. It contained 2000 ppm F^- (4.44 gms. NAF/l). Plants were treated once a week, by irrigating with 150 cc (approx. 5 oz.) of solution per 4" pot.

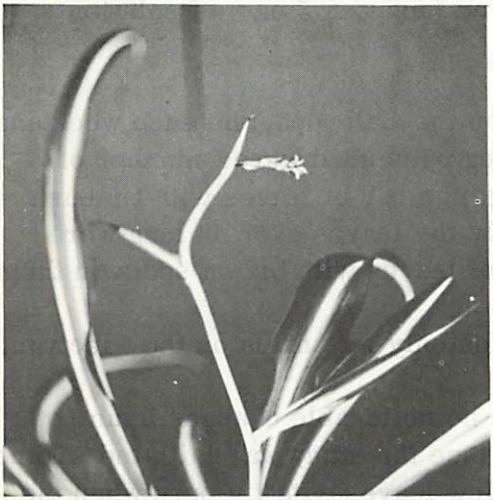
Data was taken on the Chlorophytum each week and recorded. The categories used were: number of leaves over 4" long; number of leaves with tip burn more than 1/4" (only the leaves over 4" long were used); and number of leaves with brown spots on them.

Visual observation only was made on the Plectranthus.

There have been no noticeable changes in any of the Chlorophytum since the study was initiated. Some of the plants had a few leaves with tip burn when the tests were begun. There has not been any increase in the number of leaves that have tip burn on them since treatment. As would be expected, there are more leaves on the plants as time increases, but none of the new leaves exhibit any tip burn even with treatment of 316 ppm F^- weekly for 6 weeks.

Since there had been no increase in tip burn, two Chlorophytum plants were treated with 2000 ppm F^- each week. This was started on December 2. After six treatments, the plants had weakened runner internodes, and the 'pups' were dying. The collapse of the cells occurred for 1/2-1" beyond the node and may have been due to sodium toxicity rather than fluoride (Figure 1).

On December 9, the Plectranthus exhibited some marginal chlorosis on the older leaves of plants that had been treated six times weekly with 319 ppm F^- and, to a lesser extent, 100 ppm. The chlorosis did not intensify during the five weeks after treat-



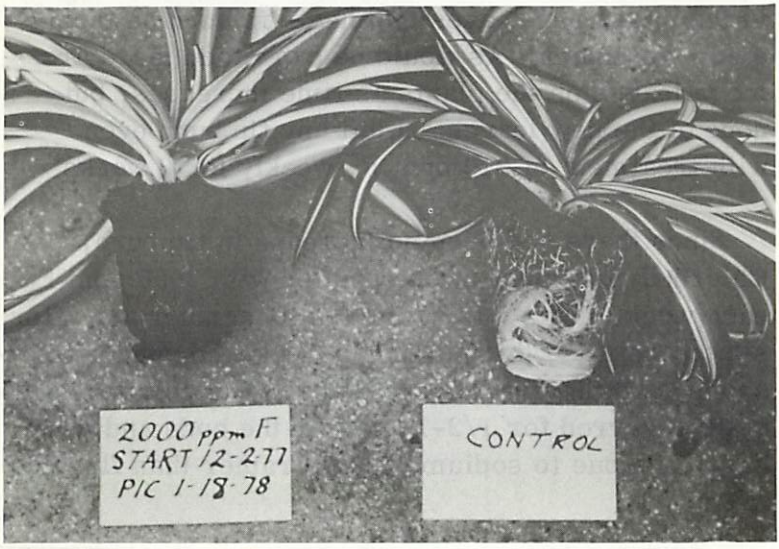


Figure 1. Internode collapse and dead roots on Chlorophytum caused by extremely high sodium fluoride applications (6 treatments, 2000 ppm F^-, 5 oz. per 4" pot). Six treatments at 316 ppm F^- caused no damage.

ment stopped (Figure 2). None of the plants in any other treatment showed any signs of foliar chlorosis. The chlorosis was not severe enough to affect marketability. Again, this may not have been F^- toxicity but some other physiological disorder such as potassium uptake suppression by excessive sodium.

Figure 2. Slight marginal chlorosis on Plectranthus after 6 applications (5 oz. per 4" pot) of 316 ppm F^-.

The soil used in the growing medium may explain these results. High calcium in the medium may render fluoride insoluble because of the formation of CaF (3) and related compounds. This is in accord with work by Self and Washington (6) where they showed a decrease in tip burn as limestone was increased up to 20 lbs. per cubic yard. Clays and other soil minerals also have the ability to absorb large amounts of F^- from a solution (5).

The reason that the Chlorophytum did not show any toxicity, while the Plectranthus did, may be related to the root systems of each. Plectranthus has

a very fibrous root system that might not be able to store as many minerals as the Chlorophytum which has much enlarged roots. Perhaps the Chlorophytum was able to 'store' the excess F^- in its roots, while the Plectranthus could not. Perhaps Chlorophytum does not absorb F^- as readily as does Plectranthus. At the higher levels of F^-, the soil may not have been able to make all of the F^- unavailable to the plants, so the leaves of Plectranthus received sufficient F to develop the symptoms. Keep in mind that the symptoms may be related to sodium phytoxicity or sodium induced nutrient or physiological disorders.

In conclusion, even with massive sodium fluoride treatment, Plectranthus showed only a slight marginal chlorosis while Chlorophytum showed no phytotoxicity.

References

1. Marousky, F.J. and S.S. Woltz. 1976. Incidence of Leaf Scorch in Hybrid Lilies as Influenced by Fluoride and Superphosphate. Florida Flower Grower 13(3):1-5. March.
2. Matkin, O.A. 1977. Chlorophytum Susceptibility to Fluoride Injury. Florist Review 160 (4159):38, 80-81. August 18.
3. Peterson, John C. 1975. Toxic Fluoride Levels in Growing Media. New Jersey Florists Notes, June, Part II.
4. Poole, Richard T. and Charles A. Conover. 1974. Foliar Chlorosis of Dracaena deremensis Engler cv. Warenckii Cuttings Induced by Fluoride. Hort. Science 9(4):378-379. August.
5. Schekel, K.A. 1977. A Review of Fluoride Injury on Ornamental Horticultural Crops. Washline, Washington Floricultural Associations Publication, March.
6. Varholak, Mildred and J.S. Koths. 1977. Fluoride and Easter Lily Scorch. CT Greenhouse Newsletter 81:9-11.