NEW YORK STATE FLOWER INDUSTRIES, INC.

NYSFI

Number 125, February 1981

BULLETIN

Executive Secretary/Treasurer, Ann Reilly
210 Cartwright Blvd., Massapequa Park, NY 11762

TOMATO SEEDLING NUTRITION STUDY

Leonard P. Perry[A]

Greenhouses are used in many areas of the country for starting tomato transplants in the spring. Interest also has been shown in recent years, especially in the northeastern area of the United States, is the greenhouse production of tomatoes. Several fertilization programs are recommended for this purpose. A general approach is to use a 20-20-20 fertilizer at 3 pounds per 100 gallons of water when the plants are set, and once a week thereafter until the tenth week. At this time the frequency of fertilization is decreased to once every 2 weeks. An approach suggested for a fall crop of greenhouse tomatoes is to use 20-20-20 at 3 pounds per 100 gallons of water for the first 2 weeks, and then constant feed thereafter with a combination of calcium and potassium nitrate. (3).

The purpose of this study was to compare the effects of several commercial fertilizers used for greenhouse crops on greenhouse grown tomato seedlings. It was of secondary interest to determine if a lower analysis fertilizer could be used to produce the same effects as 20-20-20. By reducing the amounts of nutrients applied, the chance for high soluble salt injury to the seedlings and the costs to the grower would be reduced. A third item of interest was to determine the effects on the growth of seedlings of a preplant application of Unimix[B] (10-20-5)—a nutrient supplement for potting soils—either alone or in combination with other fertilizers. Unimix is a complex analysis solid fertilizer, claimed to get plants off to a good start, which contains trace elements in both slow release and chelated forms (1). By adding fertilizer when the potting medium is prepared, the labor and the chance to make mistakes in mixing and applying liquid fertilizers is reduced.

Treatments consisted of 9 supplemental liquid fertilizers and a control, both with and without the addition of Unimix. Fertilizers were chosen because of their availability and possible applicability for production of tomato seedlings. Rates of fertilization were those recommended on each bag of fertilizer and were applied once weekly.

Seeds of the tomato variety 'Glamour' were sown September 29, 1979 in styrofoam packs, 25 seeds per pack. The medium used was 1 sphagnum peat moss:1 horticultural vermiculite by volume, to which were added 5 pounds limestone and 3 ounces fritted trace elements (FTE 555) per cubic yard. From previous studies these supplements had been found needed for optimum growth in addition to a regular liquid fertilization program (2).

Seeds were germinated and seedlings grown in a double layer polyethylene covered greenhouse under natural light conditions for 2 weeks, then moved to a glass greenhouse under artificial lighting so that light would not be a limiting growth factor. Mercury vapor lamps spaced 5 feet above the bench and 6 feet apart provided supplemental irradiation of 2000 to 5000 additional lux for 16 hours a day, from 6 am to 10 pm. The greenhouse air temperature was controlled at a constant 75°F (23°C). Relative humidity was maintained at 50-70% by mist under the benches. The experiment was terminated after 4 weeks (transplant stage) at which time dry weights and soil tests were taken. Dry weights were determined from the first 15 seedlings of each pack. The soil test result for each treatment represents a composite sample of replicates. Treatments were replicated 4 times along the bench, each treatment consisting of one pack of seedlings. Within each replicate (block) a randomized split-plot design was used with whole plots for fertilizers and subplots for Unimix (4).

(continued on page 2)

Tomato Study (continued)

Significantly higher dry weights appeared in treatments containing Unimix than in those lacking Unimix (Table 1). When the different fertilizer treatments were compared, most of the plant dry weights were not significantly different. The highest mean dry weight was produced with the use of 15-15-15, although it was not significantly different from many of the others, including the 20-20-20. The use of fertilizer containing no phosphorus (15-0-15) resulted in lower dry weights, and the significantly lowest dry weights occurred when no fertilizer was used. When 15-0-15 was used, phosphorus deficiency symptoms of reduced growth and purple leaves were observed, underscoring the need of seedlings for much phosphorus. Phosphorus deficiency symptoms were not as evident on plants in the control treatment which were severely stunted and chlorotic—a combination of many deficiencies.

Table 1. Mean dry weights of tomato seedlings produced by several fertilizers and Unimix[z].

Fertilizer treatment	Rate (oz/12 gal water)	Dry weights (g) Unimix[y]	—	Mean[x]
20-20-20	4	3.89	3.96	3.92 ab
20-5-30	4	5.16	3.53	4.34 ab
15-0-15	6	5.23	2.23	3.73 ab
18-18-18	4	4.92	4.20	4.56 ab
15-15-15	6	4.85	5.43	5.14 a
25-9-17	4	5.28	4.07	4.68 ab
20-19-18	4	4.30	4.53	4.42 ab
15-11-29	6	4.87	4.07	4.47 ab
15-16-17	6	5.80	4.21	5.00 ab
none	—	2.97	0.95	1.96 c
Mean[x]		4.72 a	3.71 b	

[z]Fertilizers applied once weekly.
[y]Unimix[(R)]—potting soil nutrient supplement (10-25-5), applied at 4 pounds/cubic yard.
[x]Significant differences in means according to analysis of variance, 1% level, with mean separation by Tukey's *w* procedure, 1% level.

When the effects of these fertilizers on the nutrient content of the media are examined (Table 2), no striking differences due to treatments are evident for nitrates, potassium and calcium levels. As would be expected, phosphorus levels are higher for each fertilizer treatment when Unimix was used and in most cases are quite low when it was not used. Unimix also produced slightly lower pH levels for each fertilizer treatment from the acidifying effects of its urea nitrogen, potassium sulfate or phosphorus. The extra salts supplied by Unimix increased the soluble salts slightly except for 20-20-20 in which levels were equal, and 15-0-15 in which the Unimix treatment was lower in soluble salts. These inconsistencies may be attributable to sampling error.

This study indicates that no significant differences in dry weights of tomato seedlings resulted when a wide range of common commercial greenhouse fertilizers were used. A 15-15-15 analysis fertilizer can be used to produce the same effects as a 20-20-20 fertilizer. Dry weights which were significantly higher overall occurred when Unimix was used in addition to weekly liquid fertilization, although for most fertilizer treatments the differences were slight. Differences were greatest when either phosphorus or supplemental fertilization was lacking. When used alone Unimix was unable to meet the high nutrient requirements of tomato seedlings as determined by dry weight media.

Table 2. Nutrient element analyses of sowing media.[zy]

Treatment	Nitrates	P	K	Ca	pH	Soluble Salts (K x 10^{-5}) (1:12 dilution)
20-20-20	4	12	15	125	6.5	21
20-20-20 + U[x]	1	20	20	125	6.0	21
20-5-30	6	1	35	125	7.0	18
20-5-30 + U	1	18	25	110	6.1	22
15-0-15	5	1	12	135	6.9	54
15-0-15 + U	8	20	10	125	6.0	29
18-18-18	3	6	10	110	6.6	18
18-18-18 + U	6	40	15	125	5.5	47
15-15-15	8	8	10	135	6.5	36
15-15-15 + U	10	35	20	125	5.7	44
25-9-17	7	1	6	150	7.0	15
25-9-17 + U	4	25	20	125	6.2	18
20-19-18	5	10	5	125	6.5	21
20-19-18 + U	9	20	25	125	5.6	48
15-11-29	9	8	35	125	6.7	29
15-11-29 + U	10	25	20	125	5.7	39
15-16-17	5	12	12	100	6.5	20
15-16-17 + U	7	25	30	125	5.9	34
none	3	tr[w]	10	150	6.9	15
none + U	6	25	20	125	5.7	46

[z]Media tested at termination of experiment (4 weeks).
[y]As determined by modified Spurway method, NO_3-P-K and Ca figures are ppm in the extracting solution.
[x]Unimix (10-20-5).
[w]tr = trace.

[A]Graduate research assistant, Department of Floriculture and Ornamental Horticulture, Cornell University, Ithaca, NY. Appreciation is expressed to Jim Doss for technical assistance and E. E. Ewing for assistance with the statistics.

[B]Trade names are used in this publication solely to provide specific information and do not imply endorsement of products mentioned to the exclusion of others which may be suitable.

LITERATURE CITED

1. Anon. 1978. *Peter's fertilizers salesman's manual.* Robert Peters Co., Inc., Allentown, Pennsylvania.
2. Doss J. 1979. Personal communication. Department of Vegetable Crops, Cornell University, Ithaca, NY.
3. Sheldrake, R., Jr. and S. Dallyn. 1969. "Production of greenhouse tomatoes in ring culture or in trough culture." Department of Vegetable Crops mimeo no. 149, Cornell University, Ithaca, NY.
4. Steel, R. G. D. and J. H. Torrie. 1960. *Principles and procedures of statistics.* McGraw-Hill Book Company, New York.