COATED FERTILIZER STUDIES WITH POINSETTIAS[1]

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Many different fertilizer programs are used by commercial flower growers to produce the same kind of crop. In each instance good quality plants can be produced, provided the right quantities of the proper nutrients are available to the roots.

Some growers prefer applying fertilizer in solution to the soil because they feel that it is easier and the fertilizer is more uniformly distributed in the soil. They have a choice of (1) applying a concentrated solution at fairly regular intervals, such as two, three, or four weeks, or (2) applying a dilute solution whenever the plants require a watering. The second choice provides a steadier flow of nutrients to coincide with the needs of the plants.

Other growers prefer the application of dry fertilizer to the soil because no special proportioners are needed and they feel that the fertilizer may be available to the plant for a longer period of time. They have a choice of using (1) a quickly available material or (2) a slow-release material. The second type has the advantage of being less injurious to the plant if used at higher than recommended rates, and of lasting for a longer period of time. In the past, the slow-release fertilizers were primarily organic in nature and included materials such as bone meal, dried blood, and manure. In recent years new forms of slow-release fertilizers have been developed. They include urea-formaldehyde sources of nitrogen (6,7) exchange resin materials (Tydex C) (8) fritted fertilizers (6,7) metal ammonium, phosphates (1) and fertilizers coated with a resinous, polymeric membrane (4). Greenhouse operators have become intensely interested in the potential of materials which may provide a steady flow of nutrients for four to five months or more. If such materials may be safely mixed in the starting soil, the grower need not be concerned with any further applications of fertilizer for short-term crops such as bedding plants, Easter lilies, potted chrysanthemums, and poinsettias.

Widmer (5) reported that poinsettia cuttings rooted well in soil in 2½-inch pots under intermittent mist, at a minimum temperature of 70°F. This method resulted in less wilting, plant loss, and labor than when cuttings were rooted in sand and planted in 2½-inch pots after rooting occurred. Best results were obtained when a soil mixture of two parts sphagnum peat moss, one part loam and one part sand was used. Yellowing of the plants, leaf loss, and slow rooting followed, however, unless fertilizer was applied regularly. Widmer suggested the application of a complete soluble fertilizer at full concentration, twice weekly, after the first week.

Oertli and Lunt (4) stated, in reference to fertilizer coated with a resinous polymeric membrane, that in the presence of moisture the fertilizer moves slowly through the membrane into the soil solution. Speed of release of the nutrients is directly related to the thickness of the coating.

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Widmer (9) found that Croft Easter lilies fertilized solely with heavy-coated fertilizer mixed in the starting soil were of high quality, but taller than desired. The preferred rate of application was 1.3 pounds of actual nitrogen per cubic yard of soil. In studies with the geranium variety Minnetonka, Widmer (10) stated that plants in 4-inch pots fertilized with 2 pounds of actual nitrogen from a heavy coated 10-10-10 fertilizer per cubic yard of soil were of high quality.

Equivalent quantities of uncoated fertilizers were injurious to Croft lilies and geraniums. With both crops, fertilizer from the coated product was available for approximately four months.

Kofranek, et al (3) working with poinsettias and coated fertilizers suggested either a split application or a single application combined with " a liquid fertilizer of mild strength." Plants in their study were grown in the same pans from August 15 until Christmas.

Propagation

Studies were begun in 1961 to determine the effectiveness of heavy-coated fertilizers[2] in poinsettia production. The first objective was to ascertain whether incorporation of coated fertilizer in the propagation soil would eliminate the need for supplemental fertilization without hindering or retarding rooting under intermittent mist. The method used was the same as that described by Widmer in paragraph 4 on page 4. All plants in this and subsequent studies were of the Barbara Ecke Supreme variety unless otherwise indicated. Steam-sterilized soil was used throughout.

A study was begun on August 15, 1961 to compare several forms of fertilization. Treatments were as follows:

1. Unfertilized check.
2. Fertilized check-20-20-20 applied full strength in solution twice weekly after the first week.
3. Tydex C incorporated in the starting soil in the ratio of 1 part in 10 parts of soil.
4. Tydex C in a 1 in 20 ratio.
5. Ureaform incorporated in the starting soil at the rate of 4 pounds of actual nitrogen per cubic yard of soil.

6,7,8. Uncoated or regular 10-10-10 incorporated in the starting soil at the rate of 0.85, 1.6, and 3.2 pounds of actual nitrogen per cubic yard of soil respectively.

9,10,11. Coated 10-10-10 incorporated in the soil at rates equivalent to #6, 7, and 8 respectively.

12,13,14. A mixture of ½ uncoated and ½ coated fertilizer incorporated in the soil at rates equivalent to #6, 7, and 8 respectively.

There were 26 plants per treatment.

After 22 days under mist the unfertilized check plants were pale green, only partially rooted and had lost many leaves. The best quality plants from all viewpoints were those in treatment 3 (Tydex C, 1-10), 7 (regular 10-10-10 medium), 10 (coated 10-10-10 medium), and 13 (mixture, medium). Application of 20-20-20 regularly in treatment #2 produced plants of almost equal quality. Plants in treatments 8,11, and 14 which received the high rates of 10-10-10 and treatments 4 (Tydex C, 1-20) and 5 (ureaform) were less satisfactory. Plants which had the high rate of coated 10-10-10 in the soil were slower to root and smaller than were plants with the medium rate of coated 10-10-10. Plants

[2] Furnished by Archer-Daniels-Midland Corp., Minneapolis, Minnesota

with the high rate of regular 10-10-10 in the soil were quite irregular. Plants which received the low rate of coated 10-10-10, although a paler green than "medium" plants, rooted quicker and more uniformly than did those which had the low rate of regular 10-10-10, or the mixture, in the soil. These ratings were relative and all fertilized plants were superior to the unfertilized checks.

Four additional trials were conducted in 1962 comparing fertilized and unfertilized checks and three rates of coated and regular fertilizer. Propagation dates were July 30, August 24, September 4, and 12. In view of the previous season's results, rates of incorporation in the soil were decreased to 0.6, 1.2, and 2.4 pounds of actual nitrogen per cubic yard of soil.

Because all four groups responded similarly, only a summary of the main results is presented herein. Once again, unfertilized check plants were of relatively poor quality. Highest rates of fertilizer application delayed rooting. Best quality plants were those in the fertilized check and the medium rate coated fertilizer treatments.

In 1963, the rate of coated fertilizer was increased above the 1961 level to 1.2, 2.4, and 4.8 pounds of actual nitrogen per cubic yard of soil. Cuttings of Barbara Ecke Supreme and Elizabeth Ecke were stuck in pots on August 21. Treatments and results are shown in Table 1. The table shows that plant loss was greatest where the coated fertilizer was used at the highest (somewhat excessive) rate and in the fertilized check. Plant loss was attributed to a combination of fungus and fertilizer toxicity in some treatments.

Trials conducted during three seasons lead to the following conclusions:

1. Incorporation of coated fertilizer in the propagation soil of poinsettia cuttings under intermittent mist provided good results with a saving in labor.
2. Best results were obtained when the coated fertilizer was incorporated at the rate of 1.2 to 1.6 pounds of actual nitrogen per cubic yard of soil. Doubling the rate of application resulted in slower rooting and possible plant loss, but quality of the remaining plants was good and some fertilizer was still available when the plants were removed from the intermittent mist.

Panned Plants

Commercial growers usually plant three or more plants from 2¼-inch pots in the final pans during the period from late September through mid-October. Studies were conducted to determine whether coated fertilizer incorporated in the panning soil would adequately fulfill the fertilizer requirements of panned plants for the duration of the forcing season.

A group of plants was propagated in 2¼-inch pots on September 4, 1962 and planted four to a 6-inch pan on November 1. This panning date was later than ordinarily desired. There were five pans per treatment. The panning soil consisted of equal parts of loam, peat moss, and sand. The plants were light green in color when panned. Treatments are shown in Table 2. Analysis results of soil samples taken on November 1 and November 15 and comments on final plant appearance are also presented in the table. Although high rates of application of 20-20-20 and regular 10-10-10 adversely affected plant quality, no harmful effects were noted when the high rate of coated 10-10-10 was used.

A second group of plants propagated on September 12 and panned on November 2 was subjected to the same treatments as the preceding groups. There were six pans per treatment. Results including plant response and soil analysis are not presented as they were quite similar to those obtained with the first group.

Table 1. Poinsettia plants rooted in soil in 2½-inch pots under intermittent mist. Cuttings stuck August 21, 1963 and results recorded September 7.

Treatment	Variety			
	Barbara Ecke Supreme		Elizabeth Ecke	
	rooted	lost	rooted	lost
Unfertilized check	24	0	12	2
Fertilized check[1]	18	6	4	10
Coated fertilizer low rate[2]	20	4	13	1
Coated fertilizer medium rate[2]	22	2	13	1
Coated fertilizer high rate[2]	17	7	7	7

1 Soluble 20-20-20 applied full strength in liquid form twice weekly after the first week.

2 Fertilizer mixed in panning soil at rate of 1.2, 2.4, and 4.8 pounds of actual nitrogen per cubic yard of soil respectively for low, medium, and high treatments.

Table 2. Poinsettia plants panned November 1, 1962 and fertilized as indicated.

Treatment	Panning soil Nov. 1			Pan soil Nov. 15[4]			Comments on blooming plants
	Nitrate-nitrogen[3]	Potassium[3]	Ammonia-nitrogen[3]	Nitrate-nitrogen[3]	Potassium[3]	Ammonia-nitrogen[3]	
Unfertilized check	high	medium	medium	medium	low	low	Stiff stems-pale green Foliage
Soluble 20-20-20, low[1]				medium	low	low	Plants appear fuller than check
Soluble 20-20-20, medium[1]				medium	low	low	Good
Soluble 20-20-20, high[1]				medium	low	low	Stems a little soft and uneven bract fromation
Heavy coated 10-10-10, low[2]				medium	low	low	Good
Heavy coated 10-10-10, medium[2]				high	low	medium	Very good
Heavy coated 10-10-10, high[2]				excessive	medium	excessive	Very good, very full appearing plants
Regular 10-10-10, low[2]				high	low	low	Good
Regular 10-10-10, medium[2]				high	medium	high	Good, but a little soft
Regular 10-10-10, high[2]				high	medium	excessive	Too soft-stems broke when handled, some bract clusters undersized.

[1] Two applications totaling 0.5, 1.0, and 2.0 pounds of actual nitrogen per cubic yard of soil respectively for low, medium, and high treatments, and applied in solution November 15 and December 1.

[2] Fertilizer mixed in panning soil at rate of 0.5, 1.0, and 2.0 pounds of actual nitrogen per cubic yard of soil respectively for low, medium,and high treatments.

[3] Analyzed by University of Minnesota, Soil Science Department. Interpretation as follows:

Nutrient	low	medium	high	excessive
Nitrate-nitrogen	0-30ppm	31-80ppm	81-110ppm	111 up ppm
Potassium	0-20	21-70	---	---
Ammonia-nitrogen	0-2	3-10	10-15	16 up

[4] Prior to application of the 20-20-20 fertilizer

In 1963 again, two groups of poinsettias were grown with coated fertilizer mixed in the panning soil. The first group was propagated on July 31 and planted four to a 6-inch pan on September 27. Foliage color at the time of panning was good and nutrient levels in the panning soil were medium. There were 11 pans per treatment. Treatments and results are presented in Table 3. A second group of plants propagated on August 21 and panned on October 9 were in similar condition at panning, and plant response was approximately the same. There were four plants per pan and six pans per treatment.

Conclusions from the two years' work were as follows:

1. Coated fertilizer incorporated in the panning soil adequately fulfilled the nutrient requirements of poinsettias for the duration of the forcing season.

2. If panning was done in late September or early October, a coated fertilizer of 1-1-1 ratio gave best results when incorporated in the soil at the rate of 2 pounds of actual nitrogen per cubic yard of soil.

3. If panning was done around November 1, a lesser rate of incorporation such as 1 pound of actual nitrogen per cubic yard of soil was preferable.

Discussion

Incorporation of coated fertilizer in the special propagation soil and in the panning soil provided good results. This report leaves one possible void in the growing procedure, however, if propagation is early enough to allow two or more weeks after removal of plants from the intermittent mist and prior to panning. Supplemental applications of fertilizer may be required during this interval, especially if the weather is bright and hot. Earlier panning is not recommended as Widmer(11) reported that this procedure results in taller plants, even when growth regulators are used.

In 1961, ureaform was incorporated in the panning soil at the rate of 4 pounds of actual nitrogen per cubic yard of soil. Plants in this treatment were good but not of top quality. This quantity of fertilizer was higher than desirable even when the coated material was used. Lesser rates of ureaform may have been preferable, but were not included in the work reported here.

Because the fertilizer within the membrane moves slowly into the soil solution in the presence of moisture, incorporation of coated fertilizer in soil that is to be stock-piled is inadvisable. The available nutrients in the soil would tend to accumulate, reaching high and possibly excessive levels.

Nutrient content of the starting soil should not be high or excessive when incorporating coated fertilizer. Although large quantities of coated fertilizers are less toxic to plants than are regular fertilizers, good cultural practices are still required to produce good quality plants.

Poinsettias require larger quantities of potassium than do many other plants. A 1-1-1 ratio coated fertilizer provided good results in these studies where a starting soil with a medium potassium level was used. If the starting soil is low in potassium content, a coated fertilizer with a 1-1-2 or a 2-2-3 ratio may be preferable.

Table 3

Poinsettia plants propagated July 31,
panned September 27, 1963 and fertilized as indicated.

Treatment	Average height Dec. 17	Average bract diameter Dec. 17	Foliage color Dec. 17
Unfertilized Check	17.6 inch	11.5 inch	yellow green
Fertilized Check[1]	23.0	12.6	pale green
Heavy coated 14-14-14 low[2]	22.8	13.4	pale green
Heavy coated 14-14-14 medium[2]	25.0	12.5	medium green
Heavy coated 14-14-14 high[2]	23.8	13.4	dark green

1 Fertilized with 20-20-20 in solution at intervals

2 Fertilizer mixed in panning soil at rate of 0.5, 1.0, and 2.0 pounds of actual nitrogen per cubic yard of soil respectively for low, medium, and high treatments.

SUMMARY

1. Incorporation of coated fertilizer in the propagation soil of poinsettia cuttings under intermittent mist, and in the panning soil, adequately fulfilled the nutrient requirements of the crop with a saving in labor.

2. Best results were obtained when coated fertilizer was mixed in the propagation soil at the rate of 1.2 to 1.6 pounds of actual nitrogen per cubic yard of soil.

3. If panning was done in late September or early October, best results were obtained when the coated fertilizer was mixed in the panning soil at the rate of 2 pounds of actual nitrogen per cubic yard of soil.

4. If panning was done about November 1, best results were obtained when the coated fertilizer was mixed in the panning soil at the rate of 1 pound of actual nitrogen per cubic yard of soil.

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