SOIL TREATMENT FOR THE CONTROL OF FUSARIUM OF CARNATIONS, 1949-50 [a/]

W. D. Thomas, Jr.

Despite efforts of carnation growers to eliminate Fusarium diseases from their ranges, these diseases annually continue to take a large toll. This situation will no doubt continue until a satisfactory soil-treatment method has been devised. During the summer of 1947 efforts were made to control these diseases by means of soil treatments with antibiotic materials and in 1948 various fungicides were introduced, of which Dithane Z-78, Ceresan M, Calogreen, and Goodrite z.a.c. were outstanding. Both years eluates from the fungi Trichoderma lignorum and Aspergillus flavus poured on the soil gave promising results.

During the 1949-50 tests of the four most promising fungicides were conducted. This plot was maintained at the L. A. Kintzele Greenhouse, Denver, Colorado [b/], in cooperation with the Denver Wholesale Florists, representing the Colorado State Flower Growers Association. The soil in the bench was Table Mountain soil which had been steam-sterilized on March 14, and rototilled on March 15. On March 25 the soil was inoculated with mass oat cultures of Fusarium oxysporum f. dianthi and F. culmorum. The crop consisted of variety Wm. Simm carnations which had been dipped in Fermate, and potted in sterile soil prior to benching.

Using the materials as indicated in table 1, ten treatments were applied to triplicate plots, each with an area of 12.5 sq. ft. containing 4 rows of 7 plants each. Each treatment was applied at the rate of 12 gal. per 100 sq. ft. The materials were worked into the soil and watered. The first treatments were applied on March 16 prior to planting on March 17. The second treatment was applied on April 14, the third on April 18, and a fourth treatment was applied on September 20.

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Soil samples were obtained from each plot at monthly intervals for 9 months. Approximately 384 g. of each sample was suspended in 5 ml. sterile distilled water. 0.5 ml. of the sample was diluted in a plate of potato-dextrose agar which had been acidified with 0.25 ml. of 2 percent lactic acid to prevent bacterial growth. The number of Fusarium colonies appearing in each plate was recorded after incubation of the plates at 25°C. for 5 days. The outer rows of each plot served as buffer rows to neutralize any possible border effect of the treatments, and yield records of the two were maintained during the course of the test. Final readings of the incidence of branch rot in the middle two rows were made on March 22, 1950, one year after the start of the experiment.

Results of the soil isolations showed that the number of Fusarium colonies was significantly less in soil from plots treated with Goodrite z.a.c., Crag F531, and the fungus Trichoderma lignorum than in those treated with Fulex. Treatments with Goodrite z.a.c. and T. lignorum were more effective than with Ceresan M, and Goodrite z.a.c. was better than Crag F658. The greatest colony counts were obtained from plots treated with Fulex, Ceresan M, and Crag F658 in descending orders.

There were no significant differences in the yields for 12 months, except from plots treated with Dithane Z-78, which approached significance. Goodrite z.a.c., Aspergillus flavus, and Crag F531 also produced good yields. It was noted, however, that plots treated with the mercurial fungicides, Ceresan M and Calogreen, retarded the plants early in the test, caused them to harden, and delayed blooming.

After one year no branch-rot or root-rot symptoms were apparent in any of the blocks treated with Crag F531, Dithane Z-78, or Goodrite z.a.c. The average of 11.4 percent infection in the T. lignorum treatment was not significant over the check, which had an average of 30.7 percent. However, the difference was sufficiently large to warrant further testing with this material.

On the basis of this experiment, Goodrite z.a.c., Crag F531, and Dithane Z-78 could be rated as being quite effective in controlling Fusarium wilt of carnations. The extensive use of Dithane Z-78 by several growers has substantiated these results. As further testing of Crag F531 and Goodrite z.a.c. is needed, no recommendations concerning these materials can be made as yet. They are being tested on a commercial scale at the present time prior to the release of any recommendation.

Table 1. Results of soil isolations, yield, and incidence of branch rot in soil treatment plots in Denver, 1949-50.

Treatment	Composition[a]	Formulation[b] (oz/100 gal)	Ave. No.[c] Fusarium (colonies)	Ave.[d] yield (100 ft)	Pct.[e] Branch Rot
Fulex	mono-, di, trichlor napthalene, benzene hexachloride + copper 8-quinolinolate	12 (6+6)	28.7	24.6	30.7
Crag F531	calcium zinc copper cadmium chromate	32	7.3	25.4	9.0
Crag F658	copper (32%) zinc (15%) chromate (9%)	32	22.0	24.8	14.3
Trichoderma lignorum	eluate of isolate X6	9	6.3	22.9	11.4
Aspergillus flavus	eluate of isolate X10	9	17.3	26.0	16.4
Dithane Z-78	zinc ethylene bisdithio-carbamate	32	16.7	27.9	0.0
Ceresan M	ethyl mercury p-toluene sulfonanilide	32	22.7	24.3	16.4
Calogreen	mercuric chloride	6	19.3	24.6	16.4
Goodrite z.a.c.	zinc dimethyl dithio-carbamate	32	3.0	27.6	0.0
Check	untreated	--	16.7	23.4	30.7

a/ The materials were obtained from the following: Fulex, Fuller System, Inc., Crag, Union Carbide and Carbon Corp., Dithane Z78, Rohm and Haas, Calogreen, Mallinckrodt Chemical Works, Goodrite z.a.c., Goodrich Chemical Co., Ceresan M, E. I. duPont de Nemours and Co.

b/ Applied at rate of 12 gal. per 100 sq. ft.

c/ Soil dilution plates of potato dextrose agar 6 months after last treatment. Readings made 5 days after incubation at 25°C.

d/ No. salable blossoms, per plot (average).

e/ Based on no. plants showing symptoms per plot.

Second Crop Pompons

by

Roger Farmer

Discussion has often arisen as to the possibility of producing a second crop of pompons from the same plants used for the previous crop. This experiment was conducted to see if this were possible as well as to determine the quality and timing.

An Easter crop on the varieties Pinocchio, Masterpiece, Shasta, Gold Coast, Arcadia, Soprano, Little America, Seagull, and Golden Mensa was cut off by April 8, 1950. The plants were then given three hours of additional light per night until May 6, for the "76-day" and May 16, for the "66-day" varieties. As far as was possible, the plants were pruned to three stems. Black cloth was then applied until the plants flowered. Flowers were cut from early July to early August. The plants for this work were generously supplied by Yoder Bros. of Barberton, Ohio.

Results

The variety, Masterpiece, was too faded to be salable. Some plants of Arcadia and Shasta failed to produce vegetative shoots and were very uneven with low production. The average stem length, weight per stem and time to flower for this crop are presented in Table 1. The same data for these plants is presented for the first crop in Table 2.

Table 1: Second Crop Pompons in July-August

Variety*	Ave. Stem Length	Ave. wt. per stem in grams	Days to make crop	Blooming Period
Pinocchio	74.9	63.5	121	7-18 to 8-7 (20 days)
Gold Coast	35.5	55.2	108	7-11 to 7-25 (14)
Soprano	36.6	53.2	108	7-11 to 7-25 (14)
Sea Gull	33.6	55.3	114	7-7 to 8-1 (24)
Golden Mensa	34.7	62.2	114	7-7 to 8-1 (24)
Matchless	35.8	49.8	114	7-11 to 8-1 (20)
Arcadia	27.9	43.7	111	7-18 to 7-28 (10)
Little America	27.5	41.8	114	7-7 to 8-1 (24)
Shasta	41.5	52.8	121	7-25 to 8-7 (13)

*No records were kept on Masterpiece because it was unsalable.
In comparing results of these two tables, note that for the most part stems were too long on the summer crop. When the extra stem is removed, the weight per stem does not differ materially from that of the spring crop.

Table 2: First Crop from Same Plants

Variety*	Ave. Stem Length in in.	Ave. wt. per stem in grams	Days to make crop	Blooming Period
Pinocchio	27.18	46.52	114	Apr.3 - Apr.8 (5)
Gold Coast	26.25	25.03	114	Apr.3 - Apr.8 (5)
Soprano	27.37	46.54	110	Mar.31- Apr.5 (6)
Seagull	23.69	41.42	107	Mar.27- Apr.5 (9)
Golden Mensa	25.29	42.17	107	Mar.27- Mar.31 (4)
Masterpiece	27.01	39.18	116	Apr.5 - Apr.8 (3)
Arcadia	29.11	41.58	107	Mar.27- Apr.1 (5)
Little America	22.19	33.59	107	Mar.27- Apr.5 (9)
Shasta	36.91	38.27	111	Apr.1 - Apr.8 (7)

*Matchless was left out of this experiment because most of the plants did not grow normally.

Conclusions

1. It is possible to produce a second crop of pompons on first crop plants.

2. With the exception of Arcadia, Shasta, and Masterpiece, the quality was good and production was comparable.

3. The main objection to this method of growing pompons is that the blooming period is spread over a much longer period of time, making timing the crop difficult.

4. This method can not be recommended in a tight cropping schedule such as year-around-production of pompons.

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NEW MEMBERS

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Carnation Timing

Recent observations made at Rutgers University on the bud development of carnations are as follows: Buds 1/8, 1/4, and 1/2 inch in diameter require 4, 3, and 2 weeks respectively to flower. Eight to 12 days were required to flower a carnation bud from the time the color first showed.

Your editor,

W. D. Holley