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CONTROL OF *PYTHIUM* ROOT ROT ON CARNATIONS PART I[1]

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Truban© controls Pythium root rot effectively, hence any timing delay for peak production does not occur. Effects using a biological control *Trichoderma harzianum* agent were not consistent. If *Pythium ultimum* was not present there was no difference in timing regardless of Truban© (etheridizole) or *T. harzianum* application.

Introduction

This is part one of a report discussing the results of the first of the six experiments which were recently completed at CSU Lake Street Greenhouses dealing with the control of Pythium root rot and timing in carnations. In part II of this report the remaining five experiments will be discussed.

Methods and results: Experiment one.

This experiment consisted of 12 different treatments utilizing *Trichoderma harzianum,* etheridizole and *Pythium ultimum* alone and in combination with each other. On October 22, 1984 the cuttings of cultivar 'CSU Red' were rooted. *T. harzianum,* T-12 strain, at a population density of 5×10^5 cfu*/g, was used in the propagation bench for four of the 12 treatments. T-12 was also used in the growing medium at 1×10^6 cfu/g in four treatments as was Truban® at the rate of 18 ounces/100 ft^2. *P. ultimum* was applied at a rate of 2×10^2 cfu/g to simulate the reinfestation that could occur in steam pasteurized media.

Six-inch azalea pots were used in this experiment, rather than planting directly into a bench, to provide better control of the growing medium at the desired moisture level and maintain the T-12 and *P. ultimum* population densities at the desired level. A 1:1 peat:perlite growing medium was used, which made it possible to maintain a fairly high moisture level, to favor *P. ultimum* activity. Cross contamination, among pots and treatments was also minimized through the use of a spaghetti tube irrigation system.

The 12 treatments used were:

1. Control.
2. Truban®.
3. T-12 in propagative bench.
4. T-12 in pot.
5. *Pythium.*
6. Truban® plus T-12 in propagative bench.
7. Truban® plus T-12 in pot.
8. Truban® plus *Pythium.*
9. T-12 in propagation bench plus *Pythium.*
10. T-12 in pot plus *Pythium.*
11. T-12 in propagative bench plus *Pythium* and Truban®.
12. T-12 in pot plus *Pythium* and Truban®.

Four pots were used for each treatment, with four replications. The treatments were set up in a randomized complete block design with six pots placed across the bench, with the outer two being buffer plants. Buffer zones were also set up between replicates and at each end of the bench.

All plants were pinched three weeks after planting, to four nodes. Starting six weeks after pinching, measurements including height, number of nodes and number and length of breaks were taken and recorded from representative plants in each treatment. This process was continued at two week intervals until plant development was such that damage to the plants was likely as a result of the measurement process.

As plants developed, they were disbudded. All elongated reproductive shoots were removed when the terminal bud reached a diameter of approximately 1 cm. When flowers finally developed, they were harvested on a daily basis, removing them at their origin on the main stem. Days to harvest from pinching, overall length, number of nodes and breaks, mean length of two uppermost breaks and grade were recorded. Each flower stem was then oven dried at

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**cfu = colony forming units.*

approximately 185°C for 48 hours, and its dry weight recorded.

Early in the experiment, differences could be seen among several of the treatments. Plants in peat-perlite which were infested with *Pythium* were shorter and showed less break development than those treatments which were either not infested or were treated with Truban® **(Fig. 1).**

An average delay of 10 days was seen between the time when the plants infested with *P. ultimum* came into flower and plants which were relatively free of the disease. In looking at peak flower production over the 200 day period of the experiment, Pythium root rot induced an average delay of 10 to 14 days. Plants inoculated with *P. ultimum* and treated with Truban® did not suffer this delay in flowering; however, those plants treated with *Trichoderma* were delayed. In general, those plants damaged by Pythium root rot were delayed in flowering, had fewer, lower quality, shorter stems of lower dry weights, and also had fewer less-developed axillary breaks than those plants which did not show the effects of the disease **(Table 1).**

Fig. 1: Representative plants, planted November 21, 1984, of four of the 12 treatments 12 weeks after the plants were pinched on December 14, 1984.

Conclusions: Experiment one.

The first conclusion to be drawn from this research is that overall flower production and quality can be greatly reduced through damage by Pythium root rot. It is important for the grower to control the disease, if it occurs, and also that a preventive fungicide application be made as a regular practice after steam pasteurization to prevent the reinfestation of the treated bed. Etheridizole, or products containing etheridizole, are effective fungicides for control and prevention of Pythium root rot at a rate of 18 ounces/1000 ft^2. This application should be repeated at six month intervals to maintain effectiveness. The second conclusion is that *T. harzianum,* though it did alter plant growth in some ways, was ineffective in controlling Pythium root rot, under the conditions of this experiment.

If one is currently having a problem with Pythium root rot, control can be achieved by use of etheridizole. Peak flower production can be expected to occur approximately 14 days sooner than it had been before control was instituted. Although it is difficult to determine an exact figure, 14 days should be a good approximation to use in calculating when various timing practices should be implemented.

Table 1: Flower production data of 'CSU Red' carnation plants planted November 21, 1984, for the 200 day period following pinching on December 14, 1984, for each of the 12 treatments in Experiment one. The numbered treatments, 1 through 12 refer to:

1. Control
2. Truban®
3. T-12 in propagation bench
4. T-12 in pot
5. *Pythium*
6. Truban® + T-12 in prop.
7. Truban® + T-12 in pot
8. Truban® + *Pythium*
9. T-12 in prop. + *Pythium*
10. T-12 in pot + *Pythium*
11. T-12 in prop. + *Pythium* + Truban®
12. T-12 in pot + *Pythium* + Truban®

PLANT AND FLOWER PRODUCTION

Total Flowers Cut[x] Trt. Number		Days to Flower Trt. Days		Mean Grade[y] Trt. Grade		Stem Length Trt. Length (cm)		Break Length[z] Trt. Length (cm)		No. of Breaks Trt. Number		Dry Weight Trt. Weight (g)	
7	14.5	12	156.4	12	3.8	1	98.9	7	44.0	7	5.2	4	17.6
12	14.5	7	158.4	1	3.7	4	96.9	2	43.9	12	5.2	3	17.2
1	14.3	4	158.5	3	3.7	3	96.2	6	43.8	8	5.0	7	17.1
3	14.3	8	159.1	7	3.6	2	94.5	4	43.0	2	4.7	1	17.0
2	14.0	11	159.4	4	3.6	8	93.8	8	41.7	6	4.6	6	16.2
4	14.0	2	159.6	8	3.6	6	93.7	1	40.0	11	4.6	2	16.0
11	14.0	1	159.9	2	3.5	7	93.0	12	39.9	4	4.6	12	15.6
8	13.8	3	160.4	11	3.5	12	91.7	3	39.8	3	4.2	8	15.5
6	13.5	6	160.4	6	3.4	11	89.8	11	39.9	5	4.2	11	14.4
5	9.5	5	169.8	10	3.4	10	87.9	5	27.0	1	4.2	10	12.4
10	9.0	9	169.9	5	2.9	5	84.9	10	26.8	9	4.2	5	9.9
9	8.5	10	172.7	9	2.6	9	82.5	9	22.7	10	4.0	9	8.3

[x]*Means not followed by the same vertical line differed significantly. P = 0.05. Four replicates were used in a randomized complete block design.*

[y]*Mean grade values, 1 through 4, are based on the standard grading system used for carnations.*

[z]*Measurements were made of two top-most breaks on plant.*