NYSFG New York State Flower Growers
INCORPORATED

BULLETIN 220 Secretary, Charles Wilton, Prattsburg, Steuben Co., N. Y. 14873 MARCH, 1964

Relation of Soil Temperature to Symptom Expression in Bacterial Wilt of Carnations

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The symptoms of the bacterial wilt disease of carnation, caused by *Pseudomonas caryophylli*, were first described in 1941 by Jones. The predominant symptoms are sudden wilting, production of grayish-green foliage, vascular discoloration, and rotting of roots. In addition, Hellmers observed in Denmark that deep longitudinal cracks often are formed between the nodes on the lower portion of affected plants. He observed the symptom after inoculating the lower internodes of carnation plants held in a greenhouse at a temperature of 60.8-68°F. The stem-crack symptom occasionally occurs in the United States, especially during the winter or early spring season.

The carnation varieties Improved White Sim, Mamie, Dark Pink Virginia, Virginia Supreme, Durango, Starlite, and Northland were used in experiments to determine the effect of soil temperature on symptom expression. Cuttings stuck under mist in a steam-treated rooting medium were inoculated 32-46 days later. The roots were washed free of the rooting medium and immediately placed in a bacterial suspension of one of 6 isolates of *P. caryophylli* for 1 hour. Roots of uninoculated plants were placed in sterile water for 1 hour. Three of the bacterial cultures were isolated from plants having stem cracks and 3 from plants without stem cracks. The cuttings were planted in 4-inch pots containing steam-treated soil and placed in soil temperature tanks. The soil temperatures were 47.5-52°, 57-64°, 64.5-67°, 67-72°, and 76.5-85.5°F The mean air temperature was 71.5-74.3°. Tests were conducted during all seasons of the year.

The typical stem-crack symptom, caused by *P. caryophylli*, commenced in the internodal area in the lower portion of the plant (Fig. 1) and usually was preceded or followed by wilting. The incidence of stem cracking was independent of the varieties and bacterial cultures used. The stem-crack symptom occurred most frequently when inoculated carnations were grown in a soil temperature of 57-64°F (Table 1). At this temperature, the stem cracks were first observed an average of 77 days after inoculation and the plants commenced wilting about 16 days later. Wilting generally occurred a few days before stem cracking commenced in plants grown at soil temperatures of 64-67° and 67-72°, and the cracks developed about 15 days earlier than at 57-64°F. The plants were removed from the pots when they wilted or at the termination of the test and stem pieces were cut from each node and internodal area of each plant and cultured. The pathogen was isolated from all plants showing characteristic symptoms.

Table 1. Occurrence of stem cracks and wilting in carnations inoculated with *Pseudomonas caryophylli* and grown at various soil temperatures.

Soil temperature (°F)	Percentage of plants wilted	Percentage of plants with stem cracks
47.5-52	0.0	18.2
57-64	78.4	48.6
64.5-67	90.9	18.2
67-72	100.0	7.4
76.5-85.5	100.0	5.5

Some longitudinal cracks were observed which originated in the nodal area at the base of the leaf and extended to the internodal area (Fig. 2). These cracks occurred in both inoculated and uninoculated plants of the tests; carnations in commercial plantings often exhibit such cracks. These cracks occur in the upper as well as lower stem areas of older nonwilted plants. Many thin stem sections were cut from the area of these cracks and cultured. The pathogen never was recovered from the cracked tissue, and nonpathogenic bacteria were present only in 19.4% of the sections. Therefore, this type of stem cracking (Fig. 2) is not a symptom of bacterial wilt of carnation.

The occurrence of stem cracks in 48.6% of the plants at soil temperature of 57-64°F and rarely in plants at soil temperatures above 67° explains why the symptom occurs during the winter and early spring months in commercial greenhouses in the U.S. Suggested air temperatures for growing carnations in New York are 57° for November 1 to February 15, 60° for September 15 to November 1 and February 15 to May 1, and 65° for May 1 to September 15, with night temperature varying between 50-54°F. Soil temperatures recorded from a greenhouse carnation bench on Long Island show that the average temperature is 2-5°F lower than the average air temperature. Plants naturally

(*continued on page 2*)

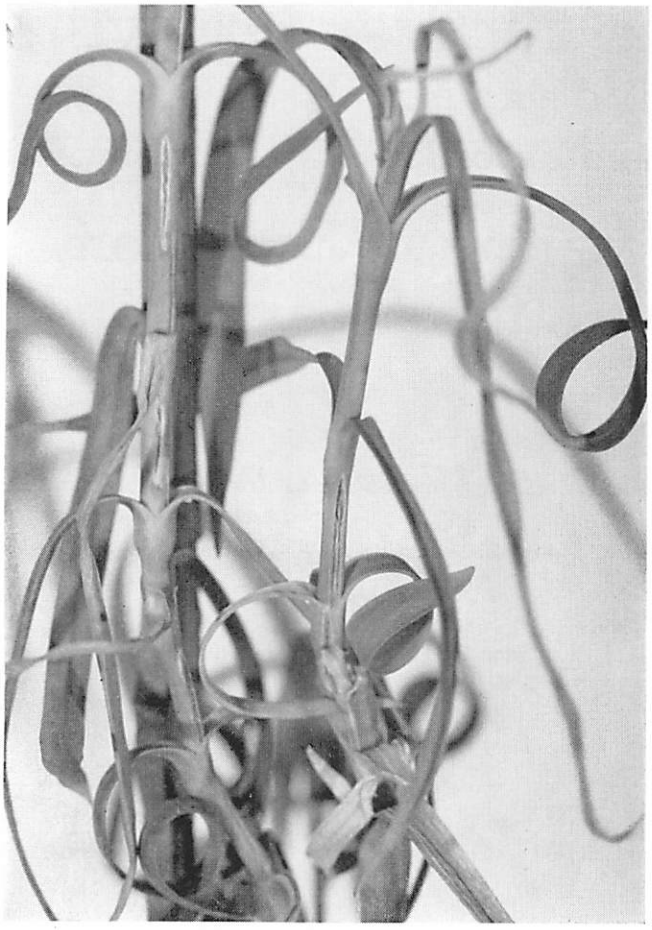

Fig. 1. Typical stem-crack symptom produced by *Pseudomonas caryophylli* in carnation var. Dark Pink Virginia, 83 days after inoculation, at a soil temperature of 57-64°F.

infected through the roots would be most likely to produce the stem-crack symptom when growing at lower soil temperatures during the winter season.

References

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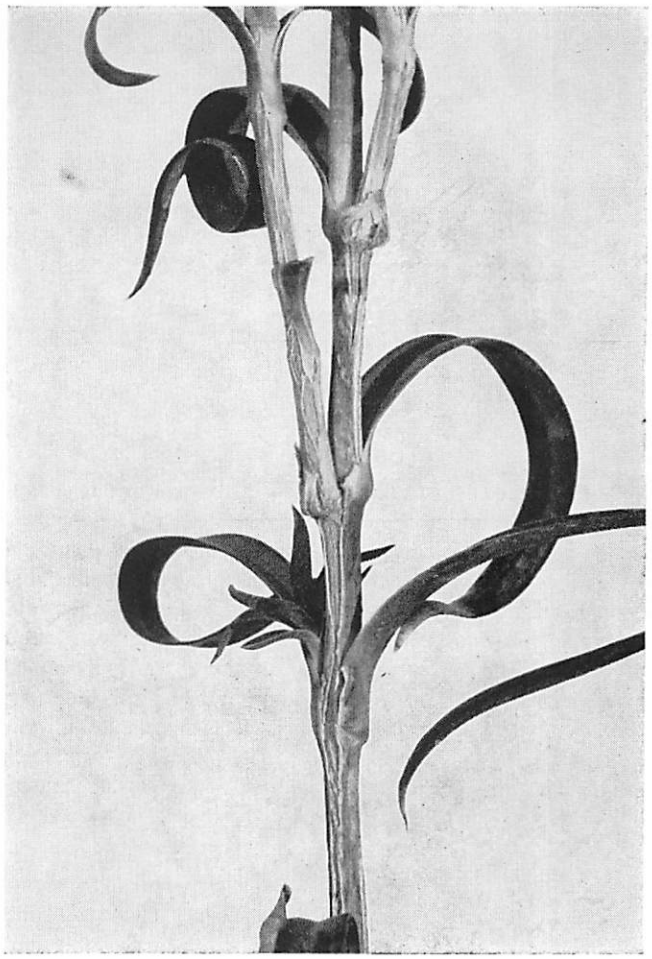

Fig. 2. Stem cracks occurring in uninoculated carnation var. Improved White Sim, 175 days after planting in steam-treated soil. This type of stem cracking is not a symptom of bacterial wilt.

U.S.D.A. to Survey Cut Flowers and Nursery Products

In early January, the Crop Reporting Board of the United States Department of Agriculture will undertake the collection of information covering the 1963 sales of 4 cut flowers and 8 classes of nursery products in 6 States. Grower reports will be collected by mail in California, Colorado, Florida, Illinois, Iowa, and New York. This is the same group of States surveyed a year ago. Continuous reporting in the 6 States will assist the industry in appraising trends within States and at the same time give some indications of national trends.

Commercial producers in the 6 States will be asked to report information on 1963 sales and value of sales. Growers will also be asked to report their intentions for 1964 flower production and the inventory of nursery products on hand January 1, 1964. The estimates will relate to commercial producers. A commercial producer is defined as one who *grows* and *sells* $2,000 or more of all nursery and cut flower products within one year. Only commercial producers having one or more of the classes being surveyed will receive the January questionnaire.

The continued success of the program of "Crop Reports" for the flower and nursery industry will be dependent upon the cooperation of the growers of these products. Individual reports are confidential and will be used only in developing State totals. Prompt response from each grower will reduce expenses and facilitate the completion of the report. Failure to answer the first request will necessitate additional mailings of the questionnaire and will delay the completion of the survey and the publication of the results.

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Two New Bulletins on Diseases of Florist's Crops

Within the past few months 2 new bulletins on diseases of florists' crops have been published. One of these is entitled "Diseases of Ornamental Plants" and was prepared by J. L. Forsberg of the Illinois State Natural History Survey, Urbana, Illinois (University of Illinois, College of Agriculture, Special Publication No. 3 $2.00). The other is entitled "Diseases of Commercial Florist Crops" and was prepared by L. P. Nichols and O. D. Burke of Pennsylvania State University (Circular 517, Pennsylvania State University, College of Agriculture, Extension Service, University Park, Pennsylvania).

Dr. Forsberg's 208-page bulletin is on up-dating and expansion of material originally published in 1946 when Dr. Forsberg was in Colorado. The author has provided 4 brief but excellent chapters on Causes of Plant Diseases, Control of Plant Diseases. Fungicides, and Soil Sterilization. I particularly like the very clear diagrams of plant structures on pages 14 and 15 which tell at a glance what we mean by cortex, phloem, petiole, axillary bud, sepal, etc.—those botanical terms which we have to use in describing diseases. The body of the book consists of a brief treatment of the major diseases of most of the commonly-grown florists' crops. The crops are listed alphabetically by common name, although the scientific name is also given. Symptoms and control are briefly described for each disease. The bulletin contains an excellent list of references, a concise glossary of terms, and a complete index. Dr. Forsberg has included an abundance of excellent illustrations. The entire job is very well done.

The 31 page circular of Dr. Nichols and Dr. Burke is more modest in scope, yet covers most of the important diseases of the commonly-grown ornamentals. Necessarily brief, the descriptions of symptoms and suggestions for control are nonetheless clearly presented and easy to follow.

While I would be inclined to suggest somewhat different control procedures for some of the diseases I believe that both of these bulletins should be part of the reference library of all commercial flower growers.—A. W. Dimock

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Chrysanthemum School

Chrysanthemum Manual

TO BE PRESENTED

JUNE 16 & 17, 1964

AT SARATOGA, N. Y.

MARK YOUR CALENDAR

Short Takes

Jim Boodley

Cornell Peat-lite mixes have found wide use by bedding plant and also pot plant producers. Last year some growers had problems with chlorosis developing on certain varieties of petunias. To help offset this condition we have modified the formula slightly. We have reduced the limestone and superphosphate both by half. The following is the 1964 recommendation for the mixes:

For one cubic yard—	
German or Canadian sphagnum peat moss	11 bushels
Vermiculite (#2 terralite) OR Perlite	11 bushels
Dolomitic limestone	5 pounds
20% superphosphate	1 pound
5-10-5	2 - 12 pounds

If the 2 pound rate of 5-10-5 is used then feeding with a complete fertilizer should be started two weeks after transplanting. With 12 pounds of 5-10-5 the plants will need no further fertilization. If you are just beginning to use the mix we suggest a trial for the last batches of seedlings to be transplanted.

Mix A which is peat moss, vermiculite, limestone and superphosphate in the above amounts has shown itself to be an excellent medium for starting seedlings. Be sure you add the limestone and superphosphate otherwise seed germination will be poor.

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As soon as the Easter rush is over growers have a tendency to let up on things. A rest is well deserved but don't extend it into a two month vacation on the job. Since the greenhouse will be fairly empty for a few days it is an excellent time to go through and take a critical look at what is left. Are there three or four pots of this and that that should have been consigned to the dump? Is someone spending time (your money) on watering these in the hope that they will "come back?" Take a close look at these plants and maybe you will find the source of many of your insect problems. As we said, now is a good time to clean house.

In This Issue (Bul. 220, MAR. '64)

YOUR EDITOR,

Bob Langhans