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The Carnation as a Carrier of Wilt-producing Fusaria  
by

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In 1950, while investigating the cause of wilt losses in cuttings of Virginia carnations, *Fusarium oxysporum* f. *dianthi* was isolated from apparently healthy mother plants. The same organism was obtained from the cuttings. *Fusarium* species have been isolated by Armstrong and Armstrong from several other types of plants showing no symptoms of infection, and other organisms have been isolated from purportedly sterile plant tissue by other workers. The possibility of the carnation serving as a carrier for wilt *Fusarium*, however, was an entirely new concept in the carnation disease complex.

Numerous isolations were made from 20 carnation varieties in order to determine whether or not the carrier phenomenon actually existed, and whether or not it was common among commercial carnation varieties. Due to the fact that some strains of the *Fusarium* were obviously present in the isolations, no attempt was made to separate them until pathogenicity tests were made. All samples were obtained from the Denver area.

Isolations were made only after the basal stem tissues were sterilized in mercuric chloride at 1:1000. All isolations were made and cultures maintained on potato dextrose agar medium at 24° - 1° C., and were incubated for 10 days prior to observing. The parent plants were rechecked 3 months after isolation, but no symptoms of wilt were evident.

Of 1790 isolations from as many plants, 107 (or 6%) were positive. These results are listed in Table 1. The Virginia variety yielded the greatest number of positive isolations (81%), and White Patrician, and Pink Patrician had 40% and 36.4% infection, respectively. Starlight, with 16% infection and Northland with 12.5% were noticeably high. William Sim and White Sim had a slight amount of *Fusarium*, but these varieties have far less tendency to serve as carriers than do those varieties listed above. No *Fusarium* was obtained from Flesh Pink Patrician, Light Pink Patrician, Weirich's strain of White Patrician, Louise, Sylvia, Princess Irene, and Lavender Rose.

In this Issue
-----
Carnation as a Wilt Carrier
-----
Wages for Labor
-----
Carnation Bud Rot
-----
Calyx Splitting

Table 1.--Summary of isolations of Fusarium oxysporum F. dianthi from different carnation varieties

Varieties	No. plants	Percent positive
Virginia	21	81.0
D. Pink Virginia	46	2.2
Donna Lee	219	7.8
Pink Patrician	11	36.4
Flesh Pink Patrician	33	9.0
Light Pink Patrician	111	0.0
White Patrician (East)	40	40.0
White Patrician (Weirich)	111	0.0
Northland	232	12.5
William Sim	403	0.5
White Sim	50	2.0
Pelargonium	110	3.6
Scarlet King	62	6.5
Miller's Yellow	116	5.2
Netta	46	4.3
Louise	13	0.0
Starlight	25	16.0
Sylvia	25	0.0
Princess Irene	100	0.0
Lavender Rose	16	0.0
Total	1790	6.0

Ten isolates of the fungus obtained from the isolations were purified by making single-macrospore cultures. These cultures were increased and were used to inoculate indexed White Patrician carnations which had been potted in sterilized soil for one month. Five plants were used for each inoculation, replicated five times. Resulting symptoms were classified by means of an arbitrary index whereby 1 indicated no infection, and 5, extreme infection. Isolations were made from heel cuttings from all plants 4 months after inoculation to regain the culture of the organism originally introduced.

The results of the pathogenicity test (Table 2) showed that isolate C37 was very pathogenic, its index of infection being 4.0. Isolates C142, C147, and C141 were strong pathogens, C126 was moderately pathogenic, and C162, C152, and C165 were weak pathogens. No infection was observed in uninoculated checks.

Table 2.--Results of pathogenicity tests with 10 isolates of Fusarium oxysporum f. dianthi against White Patrician carnations.

Isolate	Source variety	Index of infection <sup>1/</sup>
37	White Patrician	4.0
165	Donna Lee	2.2
142	White Patrician	3.8
141	Donna Lee	3.6
126	Pink Patrician	2.6
42	Pelargonium	3.8
152	White Patrician	2.4
162	Pelargonium	2.2
164	Virginia	3.2
147	White Sim	3.8
Check	-----	1.0

<sup>1/</sup> Index of infection: 1-None 2-Slight 3-Moderate 4-Severe 5-Very severe

An attempt to correlate weak pathogenicity with the carrier phenomenon was unsuccessful. It was concluded that factors other than the strain of the organism itself were responsible for this phenomenon.

In conclusion, it was apparent that carnations may serve as symptomless carriers of the wilt Fusarium, F. oxysporum f. dianthi, and that varieties differed in their ability to serve in such capacity. Symptoms may be variable, dependent upon the strain (or race) of Fusarium invading the plant. The existence of several races of this Fusarium may be responsible for erratic observations made by carnation growers. It is obvious, however, that one of the best means for controlling this disease is elimination of the organism through the use of indexed cutting stock.