



COLORADO FLOWER GROWERS ASSOCIATION, INC.

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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CONTROL OF FUSARIUM AND PHIALOPHORA WILT DISEASES OF CARNATION WITH SYSTEMIC FUNGICIDES

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Before pathogen-free propagative operations were initiated, *Fusarium* wilt of carnation was a serious problem (1). During the last decade in Colorado, however, incidence of the disease has diminished so that it is now confined to ground benches. Here, steaming may eradicate the pathogen only in the upper soil layer. Subsequently, roots of the new crop may invade the lower layers of the infested soil. Penetration of the pathogen through the root tips is then possible. In such cases losses have been substantial.

Phialophora wilt was probably introduced into Colorado over a decade ago with propagative material from Europe. For a while it was confined to three or four greenhouses which had exchanged cuttings from this propagative material. A few years ago, it suddenly appeared in other areas. As many as 25 greenhouses or more may have been involved in this outbreak. Subsequently, sanitation coupled with eradication by steaming has reduced the incidence of *Phialophora* wilt until today it is seldom found except in ground beds.

While proportionately very few ground beds are being used in Colorado for carnations, it is desirable to control the wilt diseases present in these cases if possible.

Preliminary experiments established that there are differences in resistance between host cultivars to *Fusarium* wilt (3). Red Sim is relatively resistant, pink is susceptible, and white is intermediate. Further, there are differences in resistance between

clones of the same variety. Extensive screening tests are now underway to investigate further the possibility of using this approach in control.

The new systemic fungicides also hold promise for the control of wilt diseases. Mertect[®] (thiabendazole), which has been used by veterinarians in England as a sheep dip, has been used in control of both *Phialophora* and *Fusarium* wilts (2). Benlate[®] has also been recommended.

On May 19, 1970 test plots were set up at Gordon's Greenhouse in ground beds having a previous history of *Fusarium* wilt. The bench was steamed and cooled; Benomyl was then applied to 20-ft. plots along the length of the bench. Similar alternate plots were left as controls. Mertect[®] was also applied to another 20-ft. plot at the end of the bench.

Applications were made using the appropriate fungicide in water suspension applied evenly over the plot. Benlate[®] 50 w was applied at the rate of 5.5 lbs./1000 sq. ft. Mertect[®] 60 w was applied at 2 lbs./1000 sq. ft. Both were chopped into the soil and carnations were planted. Each plot (allowing for two rows at each end as buffers) contained 864 plants. Later, on January 22, 1971, Mertect[®] was again applied at the rate of 1 lb./1000 sq. ft. as a drench to the plot previously supplied with the same chemical.

On November 18, 1971 records were taken of the numbers of plants with symptoms of *Fusarium*

wilt. Due to the sporadic appearance of the disease along the length of the bench, variations were large. However, 27.8% of the plants in the controls were dead, 5.2% in the plots treated with Benlate[®] were dead, and 1.0% in the plots treated with Mertect[®] were dead.

Phytotoxicity was apparent at first in all treatments with the systemics but this did not particularly affect production. Since the initiation of these tests, however, further recommendations have been communicated from Europe which apparently combine good control with minimum phytotoxicity. These indicate that significant control of the wilts of carnation can be achieved using Benlate[®] 50 w at the rate of 30-60 grams per square meter per year (40-60 grams being required for control of *Phialophora*). This translates to approximately 6-12 lbs. per 1000 square ft. per year. Mertect[®] is more phytotoxic but perhaps is as effective at lower rates; not much work has been done with it. It may be tried at about one-half to one-third of the rate per year of Benlate[®] but not at more than 1 lb. per 1000 sq. ft. at any one time.

Practically, the systemics might be supplied over a period of time in staggered amounts. For instance, Benomyl might be applied at 4 lbs./1000 sq. ft. just before planting and chopping in. Later during the first year (perhaps after 6 months) the other 2 lbs./1000 sq. ft. could be applied as a drench. If second-year production is contemplated, the systemic could be applied at 3-4 month intervals as a drench to a total of 6 lbs./1000 sq. ft.

Growers will, of course, want to use conventional proportioning and irrigation systems to apply drenches. It must be emphasized, however, that Benlate[®] and Mertect[®] are almost completely insoluble. Thus, during application, wettable powders will have to be continuously agitated. After prolonged usage, we have found that proportioners at Colorado State University have become clogged and must be cleaned even though the chemicals are micronized.

When does it become economically advantageous for a grower to use the systemics in wilt controls? First, he must determine whether the disease problem is due to one or more of the wilt diseases. The control measures recommended above apply only to these. At current prices and at the above minimum rates, Benlate[®] can be applied at \$.05/square foot/year and Mertect[®] is probably somewhat lower in cost (because it would have to be applied at a lower concentration). Some idea of the economics involved can be projected by assum-

ing the following: (1) gross returns from sale of flowers equal to \$3.00/square foot per year after grading and marketing costs; (2) two-year culture with significant losses only the second year; and (3) minimum labor costs for applying the systemics. In the experiment described above, the loss (approximately 25%) would be \$.75/square foot over a two-year period. Cost of Benomyl® would be \$.10/square foot during the two years. Thus, control could be profitably applied. The figures on profit and disease losses are conservative, so it is possible that some growers may find it economically advantageous to apply control measures.

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