COLORADO FLOWER GROWERS ASSOCIATION, INC.

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Bulletin 271

December 1972

FUSARIUM STEM ROT OF CARNATIONS: CONTROL USING SYSTEMIC FUNGICIDES IN ROOTING HORMONE

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Fusarium stem and branch rot continue to cause the most loss due to plant disease in the Colorado Carnation Industry. To this time recommendations for control have included periodic sprays with Captan to mother blocks (2, 3, 12), sanitation measures (1, 6), shoot tip culture (5), and decrease in moisture on producing plants with drip or modern irrigation systems (4). Recently a new family of systemic fungicides has been introduced that may offer some means for improved control.

The systemics, if effective, could be applied strategically to a number of different points in the sequence of events in carnation culture. These include incorporation in the rooting hormone applied to cuttings to be propagated and in sprays to mother blocks, to nutrient solutions supporting mother plants, and to mature flower producing plants to control the branch rot phase of the disease. Results of experiments designed to test the possibility of applying systemic fugicides with the rooting hormone are presented here.

Two fungicides were used. Mertect® (thiabendazole or TBZ) has been an effective systemic fungicide against a number of plant pathogens (7). Benlate® (methyl 1-(butyl-carbamoyl-z-benzimidazole carbamate, Benomyl) has been used on cuttings to prevent disease during the propagative period. Manning and Glickman (9) used Benomyl plus rooting hormone successfully in rooting poinsetta cuttings. It has also been used to treat chrysanthemum (10) and rhododendron cuttings (8). McCain and Farnham (11) reported that cuttings of carnation dipped in hormone powder plus either Benomyl or TBZ was effective in control of Fusarium stem rot.

The fungicides were added to rooting powder (Hormodin) at a concentration of 5% (active) and applied to the wounded surfaces of cuttings. These were propagated in a bench with bottom heat (70 F). Propagation under mist was accomplished in perlite in plastic containers separated by cuprinol treated plywood barriers to prevent cross contamination. Cuttings were inoculated by thoroughly mixing conidia of *Fusarium roseum* with propagative medium at 1000 propagules/cm³ perlite.

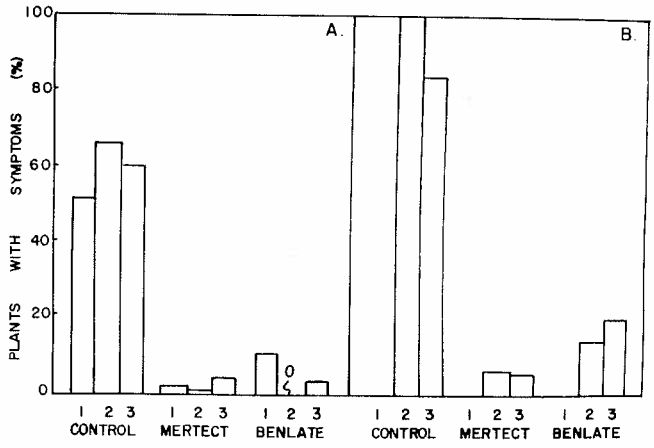

Figure 1. Plants with symptoms at (A) the end of 2 weeks propagative period and (B) 4 weeks after transplanting into nurse beds. Figures 1, 2, and 3 refer to repeated experiments. In the first experiment cuttings were not transplanted.

Control of Fusarium stem rot was achieved in repeated experiments by treating cuttings with rooting hormone powder containing either fungicide (Figure 1). Two percent of the cuttings in all experiments treated with TBZ had symptoms at the end of the propagating period compared with 59% in the inoculated controls. In plants treated with Benomyl, 5% had symptoms. No phytotoxicity was observed; indeed, increased rooting occurred in cuttings treated with the systemic fungicides (Figure 2).

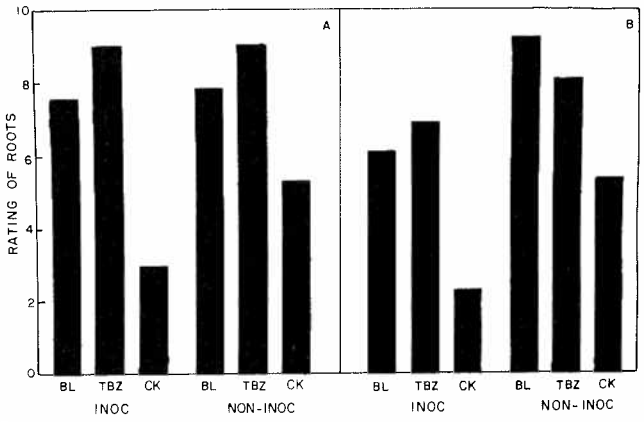

Figure 2. Rooting at the end of the propagative period resulting from application of Benomyl (BL) and TBZ in root promoting hormone compared with control (CK) treated with rooting hormone only. A and B are repeated experiments.

Subsequently, with the cooperation of Larry Taylor and the Denver Wholesale Florists Company Foundation Range, commercial tests were performed using 5% (active) TBZ in the rooting hormone. Cuttings were propagated in the conventional manner and distributed to growers. These were observed over a six-month period for development of symptoms.

Table 1 lists observations. There was a 0.01% loss in plants originally treated with TBZ when propagated and a 0.08% loss in nontreated controls. Obviously other routine control measures (12) applied in the commercial propagation of the cuttings have reduced losses to almost the zero point. Thus the significance of this field data on control is questionable.

Experimental evidence indicates that substantial control of Fusarium stem rot in propagation can be achieved by incorporating either TBZ or Benomyl at a concentration of 5% (active) in rooting hormone powder. Non phototoxicity was observed and the data indicates a stimulation in rooting resulting from the treatments. While other control measures may reduce losses due to *F. roseum* substantially, the rooting hormone treatment may provide good insurance as well as an additional increment of control.

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Table 1. Losses caused by *Fusarium roseum* in plants propagated commercially and distributed to various greenhouses in Colorado.

Greenhouse	Treatment			
	TBZa		Control	
	Total number of cuttings	Loss	Total number of cuttings	Loss
Bailey	1150	0	1150	0
M. Elliot	1136	0	1136	4
Skyline	1548	1	1476	1
Adams City	1482	0	1482	0
Valverde	2000	0	2000	1
Totals	7316	1	7244	6

aCuttings treated with TBZ at a concentration of 5% (active) in the rooting hormone.