Temperature Determines Wilt Expression by Fusarium Carriers

by W. D. Thomas, Jr.

The problem of controlling Fusarium wilt is one of the most important problems confronting the carnation industry. The vegetative method of propagation lends itself readily to the rapid, widespread dissemination of systemic diseases. The occurrence of microorganisms in the tissues of apparently healthy plants is not new, as various bacteria have been obtained from healthy potato tubers, onion bulbs, and roots of beets, carrots, parsnips and turnips. Moreover, Fusarium has been obtained from other types of plants. But the realization of the occurrence of wilt-inducing Fusarium in apparently healthy carnation plants is new and vitally important to carnation growers.

This condition first became apparent when it was noticed that carnations of the Virginia Hercules variety often died upon propagation despite the normal healthy appearance of parent plants. Isolations from 20 carnation varieties indicated an average infection of 6 percent, although the plants showed no evidence of infection (Colo. Flowers Growers Bull. 34).

Fusarium is generally favored by high temperatures. Because of this, it was believed that high temperatures might cause wilt in carnation varieties normally appearing healthy despite infection. In order to determine this, cuttings were taken from all plants of the White Patrician, Northland, White Sim, Pelargonium and Miller's Yellow plants which had yielded the wilt Fusarium during the original isolations. The number of plants from each variety are indicated in Table 1. These were propagaged in pasteurized soil and observed through the period of rooting and up to the production of the first breaks.

During this time greenhouse temperatures were maintained at two levels; (1) 65° F days, 55° F nights, and (2) 85° F days and 70° F nights. Five cuttings from each plant were used under each temperature condition. The data in Table 1 indicate that wilt was more prevalent in all varieties at the higher temperatures. The striking observation was, however, that White Sim and Pelargonium wilted less at the higher temperatures than did the other varieties.

Table 1.--Results of propagating 5 Fusarium-infected carnation varieties and growing them at 2 different temperatures.

Variety	Source[a/]	Pct. plant wilting	
		Temperatures (°F.)[b/]	
		65-55	85-70
White Patrician	16	45.0	92.3
Northland	29	31.2	43.1
White Sim	10	0.0	0.8
Pelargonium	4	2.5	25.3
Miller's Yellow	6	51.0	98.5

a/ 5 cuttings per source plant in each temperature test.
b/ Average day-night greenhouse temperatures.

This test was repeated using 26 cuttings each from the source plants of the White Patrician, White Sim, and Pelargonium varieties. The lower temperatures remained the same, but the higher temperatures provided 95° F days and 70° F nights. The results at the lower temperatures were similar to the previous test; no wilt resulted with the White Sim variety. At the higher temperatures, however, all White Patrician plants, 75.0 percent of the Pelargonium plants, and 61.5 percent of the White Sim plants wilted.

The temperature effect on the expression of wilt by different varieties carrying the wilt-Fusarium was very pronounced. The extreme susceptibility of the White Patrician and Miller's Yellow varieties is common knowledge among carnation growers. When such varieties are placed next to Sim varieties or Pelargonium in propagating beds, the latter varieties have been observed invariably to pass Fusarium to the former varieties. This apparent tolerance of these latter varieties to wilt under the conditions of this test justifies their being considered as symptomless carriers of Fusarium. The more susceptible varieties, upon any disturbance in their metabolism such as that caused by the propagation process, will always show some wilt if the pathogen is present; when greater stress is created by higher temperatures such as those encountered in later summer, more wilt will result even in the tolerant varieties. However, as carnations are normally propagated at the lower temperatures, it is probable that many carrier plants will serve as disseminators of the fungus over several generations until environmental conditions produce sufficient stress to cause wilt.