

# Fusarium Stem Rot of Carnations

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The *Fusarium* stem rot disease of carnation has become increasingly important in New York during the past few years. It is not a new disease but the damage caused by it has been more readily recognized since the use of mother blocks and clean planting stock have given satisfactory control of the vascular wilt diseases.

*Fusarium* stem rot is caused by the fungus, *Fusarium roseum*, and is a separate and distinct disease from *Fusarium* wilt, caused by *Fusarium oxysporum* f. *dianthi*. *F. roseum* attacks the outer portion of the stem while *F. oxysporum* f. *dianthi* enters the plant through the root tips and grows throughout the water conducting tissue of the plant. *F. roseum* may attack the carnation plant at all stages of its growth but it usually causes the most damage to cuttings during propagation and to young rooted cuttings when they are benched. The disease is particularly favored by conditions of excessive soil moisture, high humidity and deep planting of young rooted cuttings. On Long Island the disease often causes a great deal of injury during late winter and early spring when soil in the benches fails to dry out properly and remains excessively moist for extended periods of time.

## *Symptoms of Stem Rot.*

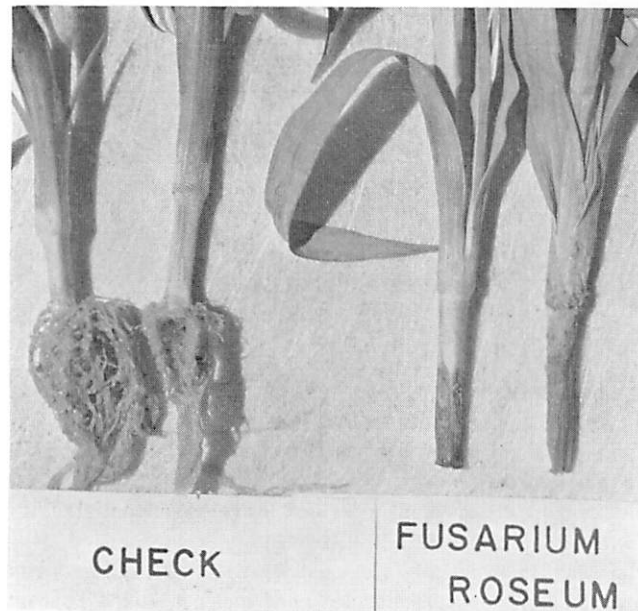
Unrooted cuttings may be attacked as soon as they are stuck in the propagation bench. The fungus attacks the cutting causing reddish brown lesions and rotting at the base. Sometimes the entire base of the cutting is rotted, as shown in Figure 1, or in other cases the lesions may form only on one side of the stem with roots forming on the opposite side. In many cases the lesions are too small to be detected when the cuttings are removed from the propagation bench and these are benched as healthy cuttings. After planting the lesions expand eventually girdling the stem and causing the young cuttings to wilt and die. In this way the soil in the bench becomes infested and other cuttings in the bench may be attacked.

The fungus can cause damage to mature flowering plants in several ways. One of the most commonly observed is killing back stubs left when flowers are picked or plants are pinched. The fungus grows down the stub, killing it, and then into the main stem or side break. It may girdle the main stem or side break causing the branch to wilt and die, thus cutting the productivity of the plant. It may also attack the stems of mature plants at the soil

(Continued on page 2)

## Carnations (Continued from page 1)

level, girdling the stem and causing the plant to wilt and die.



**Figure 1.** Healthy rooted carnation cuttings on the left and those attacked by *Fusarium roseum* on the right showing rotting of the entire bases.

### Work in Other States.

Most of the work on control of *Fusarium* stem rot of carnation has been done by Dr. Ralph Baker and his students at Colorado State University. The results of their work with fungicide sprays and dips and drenches have recently been published (1, 2). Since spores of the fungus are carried on the surface of cuttings, they tested a number of chemicals as sprays applied to mother blocks in an attempt to kill these spores. They concluded that of the commercial compounds available, Captan (orthocide, Captan 50-W) merited recommendation as a spray for carnation mother blocks (1). They also tested a number of chemicals as dips and drenches and found that, Pano-drench 4 and Ferbam were effective in controlling the disease. Although dips and drenches were effective in controlling the disease, sprays were just as effective and were easier to apply. They suggest that the use of dips and drenches be confined to situations where sprays are not feasible, for example, when cuttings for propagation are derived from cut flower stems (2). Other work in California has confirmed the effectiveness of Pano-drench 4 as a cutting dip and soil drench in control of the disease (3).

### Current Recommendations.

A successful control program against this disease consists of several steps, none of which can be ignored or slighted. The first and probably the most important recommendation is to spray the mother blocks regularly and to be certain that the mother block plants are adequately sprayed just before cuttings are taken. A protective coating of the proper fungicide will help protect cuttings from injury caused by *F. roseum* during propagation. Under New York conditions mother blocks should be sprayed every 14 days during the winter months and every 7 to 10 days during the summer months. Throughout the year

spray one time with Zineb (Parzate, Dithane Z-78, Ortho-Zineb, Thiodan-Powder) at the rate of 1½ to 2 pounds per 100 gallons of water and the following week use Captan (Orthocide, Captan 50-W) at the rate of 2 pounds per 100 gallons of water. A wetting agent should be included in each spray. Alternate spraying with these 2 materials is recommended for the following reasons. Zineb is recommended to control *Alternaria* leafspot and branch rot (*Alternaria dianthi*) and rust (*Uromyces caryophyllinus*). Captan is recommended to kill any spores of *F. roseum* that may be on the surface of the plant parts, especially on cuttings that may be taken for propagation. Therefore it would be best to apply the Captan spray just before cuttings are taken.

Cutting dips are not recommended under any conditions in New York because of the presence of bacterial wilt of carnation (*Pseudomonas caryophylli*). As long as this disease is present, even in small amounts, dips are dangerous since the bacteria from one infected cutting can infect many healthy cuttings during the dipping process. Recent results in California have shown the danger involved in cutting dips. Workers there found that the bacterial wilt organism was able to pass from infected cuttings to healthy cuttings during the dip treatment in Pangen 15. Consequently they recommended that cutting dips be discontinued in any ranges with a previous history of bacterial wilt (4). Since most carnation ranges in New York State have had bacterial wilt trouble at one time or another cutting dips are not recommended.

A sterilized rooting medium must be used throughout the propagating operation. This means that the rooting medium must be sterilized after each group of cuttings is rooted. Failure to do so may result in extensive losses from stem rot for the following reason. Often the first group of cuttings will show only a small amount of loss from stem rot. However, failure to steam before the next group of cuttings is rooted allows the fungus to multiply and build up to a level where losses in the second group may be extremely high.

Drenches applied to cuttings immediately after they have been stuck have shown some promise. More work must be done on this phase of the program before specific recommendations can be made. However, both Pano-drench 4 and Ferbam (Fermate, Karbam, Nu-Leaf Black, Ferradow) may be tried *experimentally*. Pano-drench 4 should be used at the manufacturers recommendations and Ferbam at the rate of 2 level tablespoons per gallon of water. Apply one gallon of either of the above materials to every 2 to 3 square feet of the propagating medium.

When rooted cuttings are removed from the propagation bench they should be carefully examined for any lesions at the base. Any cuttings showing such lesions or evidence of poor rooting should be discarded. Two weeks after benching drench with 1 pound of Captan per 100 gallons of water, using this to cover 400 square feet of bench area. This may be applied with the recommended drench of Terraclor. This treatment will aid in preventing reinfestation of the soil by *F. roseum* and help prevent spread of the fungus in the bench from infected cuttings to healthy cuttings. If the disease appears at a later date Pano-drench may be used as a spot treatment at the

(Continued on page 3)

## Carnations (Continued from page 2)

manufacturers recommendation. This will prevent further spread of the fungus in the bench but will not save plants already infected.

Strict sanitation measures are also a part of this program. Splashing of water and soil should be kept to a minimum during watering. Care should be taken to see that contaminated soil is not introduced into the steamed soil in the benches on dirty tools or on workers hands and feet. These precautions are just as essential to a successful control program as the recommended sprays and soil drenches.

### Summary.

The most important step in controlling *Fusarium* stem rot is to spray mother blocks regularly. This is a preventative spray program and is designed to provide cuttings with a protective fungicidal coating when they are taken for propagation. Dips and drenches during propagation are stop-gap measures and should not be necessary if the proper spray program is followed. The drench applied after young rooted cuttings are planted is also a preventative measure designed to help prevent reinfection of the steamed soil by *F. roseum*. Remember prevention is the key to success in this program. Don't wait until you can see damage from stem rot to begin your control program. By then you are already too late.

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