

Bacterial Slow Wilt or Stunt of Carnations

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Bacterial slow wilt or stunt, a serious disease of carnation in Europe, was first found in the United States in 1954-55, on carnation plants grown in western New York. In April 1962 it was found on carnations in southeastern Pennsylvania and again in November 1967 in the same range.

The disease is caused by a bacterium which has been designated as a strain of *Erwinia chrysanthemi*. The disease and bacterium were first described in England and Denmark.

We studied the disease by inoculating rooted carnation cuttings and growing them in the greenhouse for periods of 7 to 9 months. The symptoms described below and illustrated in the accompanying photographs are from these plants. We have also observed most of these symptoms on infected carnation plants growing in a commercial range.

Two general types of symptoms develop on infected carnation plants. These are rapid wilting or a combination of wilting and stunting. Rapid wilt symptoms consist of a general wilting and gray-green coloration of the foliage followed by collapse and death of the plant (Fig. 1). In other plants the initial symptoms consist of wilting, "crook-neck" side shoots, and twisting, curling, stunting and wilting of lower leaves and side shoots. (Fig. 2, 3, 4). In some plants this is followed by a general wilting of the plant and firing of the basal foliage. Plants may wilt and recover several times before permanent wilting occurs or plants may collapse and die at the onset of general wilting symptoms. Plants often exhibit this severe wilt-collapse symptom at the time the second flower crop is cut.

In plants that become stunted the initial symptoms are followed by stunting and upright growth habit of existing shoots. (Fig. 5). Leaves on stunted shoots are narrower than those on healthy shoots and are light-green to yellowish-green in color in comparison with the dark-green color of healthy leaves. This is followed by severe stunting, wilting, and firing of foliage (Fig. 6, 7).

Initial symptom expression in Improved White Sim occurred over a period of 4-15 weeks after inoculation. In

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FIGURE 1-4. Symptom expression on carnation plants, cultivar Improved White Sim, inoculated with various isolates of the carnation strain of *Erwinia chrysanthemi*. 1) Plant showing wilting of foliage and side shoots 7 weeks after inoculation (left) and check plant (right). 2) Portion of inoculated plant showing "crook-neck" side shoot 7 weeks after inoculation. 3) Plant showing stunting and wilting of side shoots and general stunting 7 weeks after inoculation (left) and check (right). 4) Plant showing twisting, curling and stunting of basal side shoots 22 weeks after inoculation.

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FIGURE 5. Carnation plant cv. Improved White Sim, 10 weeks after inoculation with an isolate of the carnation strain of *Erwinia chrysanthemi*, showing stunting and upright growth habit of side shoots (left) and check plant (right).



FIGURE 6. Carnation plant, cv. Improved Sidney Littlefield, 10 weeks after inoculation with an isolate of the carnation strain of *Erwinia chrysanthemi*, showing severe stunting (left) and a check plant (right)

most cases the terminal symptoms of severe wilt-collapse (Fig. 8) or stunting (Fig. 9, 10) usually occurred about 25-30 weeks after inoculation.

Carnation cultivars vary in their susceptibility to the pathogen. In our tests the cultivars Improved White Sim, Improved Sidney Littlefield, Virginia Hercules and Apollo were tested. We found that Improved White Sim was the most susceptible, Improved Sidney Littlefield and Virginia Hercules were less susceptible and Apollo was the least susceptible of the carnation cultivars tested.

Experimental work indicates that the bacterium can be spread throughout the plant before symptoms appear. This means the organism probably can be spread from plant to plant on knives used in cutting flowers. It also may be spread in infested soil and possibly on tools used



FIGURE 7-10. Symptom expression on carnation plants inoculated with various isolates of the carnation strain of *Erwinia chrysanthemi*. 7) Plant of cv. Improved White Sim 10 weeks after inoculation, showing lack of development of side shoots and severe stunting of those that did develop (left) and a check plant (right). 8) Plant of cv. Apollo, 30 weeks after inoculation, showing severe wilt-collapse symptoms. 9) Plant of cv. Improved White Sim 22 weeks after inoculation, showing severe stunting (right) and a check plant (left). 10) Plant of cv. Virginia Hercules, 30 weeks after inoculation, showing some wilting of the foliage and general severe stunting.

in infested soil. The bacterium can also be spread in infected cuttings but culture-indexing will eliminate this possibility.

The disease can be prevented through the use of culture-indexed cuttings and by steam treatment of soil between carnation crops. In addition be sure all tools to be used in planting are treated at the time the soil is steamed. If you use a perimeter watering system be sure it is wiped off and flushed with a disinfectant such as 1:200 LF 10. Soils should be removed from the hurdles and then they should be soaked for 1/2 hour in 1:200 LF 10 or similar disinfectant.

References

1. Tammen, J., P. E. Nelson, and R. S. Dickey. 1964. A carnation disease resembling bacterial slow wilt or stunt. *Phytopathology* 54:610-611.
2. Nelson, P. E., and R. S. Dickey. 1968. Symptom expression and varietal susceptibility in carnation, *Dianthus caryophyllus*, inoculated with the carnation strain of *Erwinia chrysanthemi*. *Phytopathology* 58:142-146.
3. Hellmers, E. 1958. Four wilt diseases of perpetual-flowering carnations in Denmark. *Dansk. Bot. Arkiv.* 18(2):1-200.
4. Lelliott, R. A. 1956. Slow wilt of carnations caused by a species of *Erwinia*. *Plant Pathology* 5:19-23.