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# The Distribution of *Fusarium Oxysporum* in Shoot-tips of Carnations

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*Fusarium oxysporum* f. sp. *dianthi* is systemic in diseased carnation plants. If the conditions for wilting are not present, *F. oxysporum* may spread throughout the plant. This is an obvious hazard, because cuttings from such plants may be symptomless carriers of the pathogen. That symptomless cuttings may harbor *F. oxysporum* was first demonstrated by Mangin in 1899. He tried to screen out diseased cuttings from healthy ones by placing them in water and observing fungal growth at the cut surface of the cuttings [3].

Disease indexing was suggested by Dimock [2] as a means of developing pathogen-free carnation plants, but when the aseptic shoot-tip culture technique [6] was applied to carnations [5], it was realized that wilt pathogens also would be eliminated. This could be expected because meristems do not have differentiated vascular tissue.

The present study of the distribution of *F. oxysporum* was carried out to determine how close to the meristem the pathogen would grow. Thomas and Baker [7] and Nelson [4] have studied systemic movement of *F. oxysporum* in carnations, but they do not mention anything about the presence of the pathogen in the shoot-tip region.

Twelve carnation cuttings, 6 inches long, with no external symptoms were taken from flowering CSU Pink Sim with symptoms of wilt on the main stems. The vascular ring of the cut surface of some of the cuttings was whitish, which is the internal symptom of Fusarium Wilt. Tips, 0.5 to 1.0 mm, were removed and placed on a Potato-Dextrose-Agar medium in Petri dishes, and then four one-mm sections were cut below the removed tip of each cutting and placed on the same medium. The knife was sterilized between each cut.

The results (Fig. 1) show that *F. oxysporum* had reached the section below the small shoot-tip in two cuttings and it was present in the tested sections of 5 out of 12 cuttings.

This result would be of practical concern, only if the shoot-tip medium did not support the growth of *F. oxysporum*, or if the tubes were kept at so low a temperature that *F. oxysporum* would not develop. However, the shoot-tip medium does support fungal growth, and pathogen-harboring tips would be discarded. The optimum temperature for carnation shoot-tip culture is about 75 F. At this temperature *F. oxysporum* f. sp. *dianthi* will grow out of the infected tissue, as its temperature range is 43 to 97 F with an optimum of 80 F [1].

The experiment shows the importance of using a medium that besides supporting good shoot-tip growth, also supports growth of pathogens, so that infected tips can be eliminated. A relatively resistant variety could possibly otherwise carry the pathogen through the shoot-tip growing phase of the nucleus program and carry it to the nucleus plant greenhouse.

## Literature Cited

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