

Preliminary Investigations on the Mycorrhizal Relationship  
Between Carnations and Fusarium oxysporum f. dianthi

by W. D. Thomas, Jr. and Nagayoshi Oshima

The term "mycorrhiza" is one new to carnation growers, but one which may be a household term in the future. In the process of living together between fungi and higher plants overgrowths sometimes develop either on the surface of roots or within the root cells. These overgrowths may be either abortions of the vegetative structure of the fungus, itself, or may be localized and stimulated host plant tissue. The exact mechanism of this formation is not clearly understood, nor is the true function of the phenomenon known. It is known, however, that the mycorrhizal structures are the result of an intimate relationship between the fungus and the higher plant. It is also known that this relationship, under delicately balanced environmental conditions, may be beneficial for both organisms, and that under conditions unfavorable for the growth of one the other may become parasitic.

Many plants have been reported to possess mycorrhizae but as far as we know such a phenomenon has never heretofore been observed in carnations. Fungi involved in mycorrhizal relationships are, by and large, mushrooms; very few disease-producing fungi have been found associated. Fusarium, however, has been found associated with orchid mycorrhizae and mycorrhizae of certain cereals. But this fungus has never been fully established as a true mycorrhizal fungus.

Because little is known concerning the nature of Fusarium carriers among carnation varieties, it was deemed possible that a mycorrhizal relationship may be involved. This preliminary study was undertaken to determine whether or not the wilt Fusarium may be involved in a mycorrhizal relationship in carnations.

Ten unrooted and 10 rooted Fusarium-free cuttings of Wm. Sim carnations were surface-sterilized in a 1:1000 solution of sodium hypochlorate and then placed in test tubes containing Knop's nutrient solution and a potato dextrose agar mush. When the unrooted cuttings started to develop roots, all cuttings were inoculated by adding small portions of spore suspensions of Fusarium oxysporum f. dianthi in sterile distilled water.

The rooted cuttings began to wilt within 2 weeks after inoculation. Some of the roots were cut off and sections were examined microscopically. *Fusarium* hyphae were observed between the cortical cells in longitudinal sections, but no penetration of the cells was evident.

After 6 weeks the remaining roots were cut off and examined. Hyphae were again evident between cells in the cortex, but the only visible penetration was expressed by the presence of an arbuscular type of mycorrhiza (Fig. 1). The unrooted cuttings failed to become established due to rapid evaporation of the culture medium.

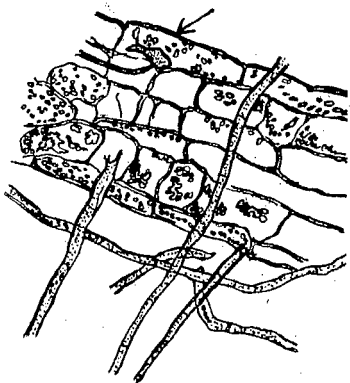


Fig. 1. Mycelium of *Fusarium* and an arbuscular mycorrhiza in the root cells of carnation (x320).

It must be borne in mind that these observations are purely preliminary in nature, but that they point to a very interesting field of investigation. If, as seems evident, the wilt *Fusarium* produces mycorrhizae in the roots of carnations, this may be an explanation of why certain varieties are able to serve as carriers despite evident injury to conducting tissues as evidence by discoloration: the mycorrhizal function in the nutrition of the fungus obviating debilitating injury to the conducting tissues. Nevertheless, wilt may develop if one or two conditions prevail: (1) under dry, hot conditions the host plant may be unable to support the mycorrhizal relationship, and hence the *Fusarium* may become parasitic, or (2) the *Fusarium* in infected cuttings, having no mycorrhizal benefit, must derive its total sustenance from the cutting, itself, causing rapid wilting in the nurse beds. This interesting hypothesis on the nature of the carrier problem is being pursued further.

#### The Need for Better Statistical Information in Floriculture

by Dr. Max Brunk, Dept. of Marketing, Cornell Univ.

#### Price Information

One severe lack in the industry is adequate price information. I am appalled by the lack of it. About the only information we get on prices are those reported in several trade journals and by small groups of growers comparing prices among themselves. Of course we will never have adequate price information until we have some form of standard grading. And we will never be able to maximize our returns from the market until we have adequate price reporting so that we can determine what alternative markets from day to day give us the best advantage.

This year the rose growers in and around New York City had very low prices while those in upstate New York fared quite well, but not nearly so well as those in the midwest; yet all of them are in easy reach of the same markets. There is absolutely no excuse for this kind of pricing structure.

#### Crop Reporting

Likewise there is need of crop reporting information. Only within organizations or among a few organizations is such information available. You people here in Colorado are again far out and ahead of the pack. Crop estimating is a very simple job for an industry as compact and large as yours. Most growers over the country haven't got the slightest idea of what expected productions are for any given period of time. We go on flying by the "seat of our pants" and hope we can outwit our neighbor and get a price for our stuff when it hits the market. National crop estimates are needed to avoid some of your wide day to day gluts and famines and the whole industry should be working together toward this end.

It would be a mistake in any discussion of statistical information to neglect mention of the first census of horticultural specialties completed this year. This census has really been a milestone in the flower industry. Steps should now be taken to see that this sort of thing is perpetuated. It's too late to wait until 1958 to decide that you want some kind of census in 1960. I do not say that we should go out and ask for a complete Sears and Roebuck Catalogue like we got this year. There is always a tendency to cover too much information in a first attempt like this. In the future, we may get more accurate information if we don't ask for so much, and certainly such an approach will

have better chances of being approved. Census information is valuable in pointing out the importance of your industry, in selling programs, in supporting your research program, and combating such things as freight rate cases and the like. It is difficult to appreciate the value of a thing like this until you need it for some such purpose.

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Your editor,

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