

## **MODERN VIEWS ON CONTROL OF FOLIAR DISEASES IN GREENHOUSES WITH SPECIAL EMPHASIS ON FAIRY RING SPOT OF CARNATION**

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Fairy ring spot on carnations has become a problem in a number of commercial greenhouses in Colorado. The strain found in this region appears to be associated in most instances with miniatures and is especially prevalent in 'Dani-lo' and 'Yandra'. 'Safari' and 'Yasmina' also appear to be susceptible. Italian research (2) indicates that 'Scania' is resistant. 'Elliot's White' planted in the middle of an epidemic on 'Safari' was not affected at all.

The amount of research literature related to the pathogen, (*Heterosporium echinulatum*) and the disease (Fig. 1) is not large, in fact extension circulars often do not cover control measures. It is known, however, that spores of the pathogens are disseminated in the air and must have high humidity to germinate, penetrate, and infect.

With this basic knowledge the first strategy for control usually advanced is application of fungicides to the foliage. In past years, due to the scant information available, application of zineb was recommended based on old research indicating that this fungicide was best for control of *Alternaria* leaf spot. Grower experience suggested that zineb was not very efficient in control of fairy ring spot, however. In a more recent study (3), California investigators reported that sprays of Daconil (chlorothalonil, 75 percent a.i. applied at 1.5 lb/100 gal water) provided excellent control of *Heterosporium* leaf spot of Sweet William induced by the same pathogen as on carnation. Other effective fungicides were Tribasic (53 percent Cu), Fore (80 percent mancozeb) and Dyrene (50 percent anilazine). Unfortunately, application of either chlorothalonil and/or zineb have not provided satisfactory control.

This is a classic example of a problem common to attainment of control of foliage and flower diseases of plants growing in covered structures; that is, in spite of the availability and application of potent fungicides, pathogens still induce considerable losses. Besides fairy ring spot, examples

of this phenomenon include powdery mildew of roses and *Botrytis* blossom blights on various hosts. The reason for such aggressive behavior on the part of these pathogens is that the environment is conducive for their activity and fungicides cannot reduce this activity to low levels. The chief control measure available to greenhouse operators to combat the problem is regulation of humidity. The fairy ring spot pathogen and others mentioned above require high humidities to be successful.

In general, water may be on the foliage of plants grown in the greenhouse from two sources. It may condense on greenhouse structures and drip on plants or it may condense directly on the foliage. Disease encouraged by both of these phenomena was observed in the recent epidemic of fairy ring spot.

The principles involved in greenhouse management of humidity are well-reviewed in numerous publications. Here, only a brief non-technical treatment is given.

Water is always being added to air in greenhouses from plant transpiration and other surfaces. The amount of water held by air without condensation is determined by the temperature; as the temperature decreases, the number of water molecules retained in the air is reduced. Thus, as temperatures fall at night in a greenhouse, water may precipitate and condense on the coldest objects in the vicinity.

During the fall and spring, the coldest objects in the greenhouse are usually the plants. In summer, adequate ventilation connected with cooling systems insures that the water evaporation from surfaces is carried outside.

### **A Rather Obvious Error**

In *Bulletin 426*, December, we spelled "Columbia" "Columbia". John Seeley pointed this out to your editor. Oh well. Glad you read the *Bulletin*, John.

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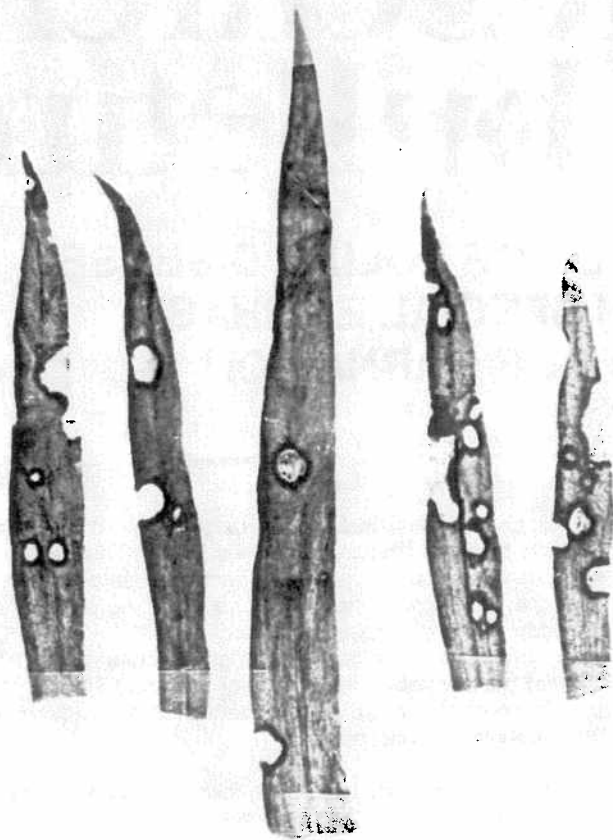


Fig. 1. Typical symptoms of fairy ring spot on leaves of carnation.

During the winter, the coldest objects are the covers of greenhouse structures and water condenses on these. Drips result and these may fall on plants. In ridge and furrow greenhouses, the highest amount of drip occurs on gutter benches. In "quonset hut" fiberglass structures, most drip occurs on the center beds of the greenhouse. Sun Clear is used to correct this situation.

In this era of high energy costs, growers have been reluctant to manage the environment to control plant diseases. A recent cost analysis (1), however, suggests that effective control of environment can be done for \$0.055 per sq. ft. of greenhouse based on need for 150 days per year.

Management of the greenhouse environment to control foliar diseases is more efficient, requires less labor, is easily accomplished by automation available in most installations, and now is demonstrated to be less costly than application of fungicides.

Appreciation is expressed to Jeanine Kwolek, Bill Crowley and John Rosa for their cooperation and advice in the preparation of this article. I promised them that I would not reveal where fairy ring spot is currently carrying on its activities.

1. Augsburger, N.D. and Powell, C.G. 1986. Correct greenhouse ventilation: the basics of excessive humidity control. *Ohio Florists Association. Bulletin No. 675:6-8.*
2. Grasso, S. 1979. Differenze di suscettibilita' nei confronti di *Heterosporium echenulatum* riscontrate in due CVV di garfano. *Technica Agricola, Italy.* 31:261-269.
3. Prence, L. Sciaroni, R.H. and McCain, A.H. 1982. Leaf spot of Sweet William. *California Plant Pathology.* 57:2-3.