

PRELIMINARY TRIALS DETERMINING THE VALUE OF AERATED STEAM IN CARNATION CULTURE

By Ralph Baker

In a recent review (1), some considerations were presented on the use of steam-air mixtures for treatment of greenhouse soils. This paper pointed out several factors requiring investigation before determining whether aerated steam would be desirable in carnation culture for control of *Fusarium* stem rot.

During the fall and winter of 1963-64, preliminary tests with aerated steam were undertaken at the University of California (Berkeley) to determine whether a "residue" population of nonpathogenic but antagonistic microorganisms might be retained after treating soil. The advice and encouragement of Carl Olsen and K. F. Baker is gratefully acknowledged.

A soil obtained from Salinas Valley in California was steamed for half an hour at 140° F. or 190° F. The latter treatment duplicated current recommendations for treatment of greenhouse soils. After treatment, these soils were placed in petri dishes at a temperature of approximately 74° F. and infested with conidia of *Fusarium roseum* f. *cerealis* at two densities (depending upon how easily the organism could be reisolated). Following infestation, populations of *F. roseum* in the soil were determined at intervals using the method of Snyder et al., (2).

A temperature of 140° F. eliminated all fungi capable of growing on the test medium. Changes in population of *F. roseum* following reinfestation of treated soils are recorded in table 1. The population almost doubled in soil steamed at 190° F. after 28 days. The same trend was noted in soils treated with 140° F. aerated steam and infested at a relatively low inoculum density. Populations were reduced in both the nontreated control and in soil treated with 140° F. aerated steam after 10 days; however, *F. roseum* increased to its original level after 28 days in the latter treatment.

There is little doubt that *F. roseum* can be eliminated from greenhouse benches using aerated steam at 140° F. The true value of aerated steam, however, would be to allow retention of organisms after steaming which would discourage reinfestation by *F. roseum* after treatment. These experiments would indicate that this pathogen increases at the same rate in both aerated and conventionally steamed soils. Also it increased much more in steamed soil than in nontreated soil after 1 month.

On the basis of these experiments, it would not seem desirable at present to recommend the use of aerated steam in a program of control for *Fusarium* stem rot of carnations. Experience would indicate, however, that different soils may have different antagonists. Thus surveys are now being made in attempts to find a soil with a population antagonistic to *F. roseum*.

While it is still too early to evaluate fully the merits of aerated steam in a disease control program, growers should consider the possible economic benefits. Mixtures of air and steam may well cut down fuel costs and thus be desirable from this standpoint.

Table 1.--Populations of *Fusarium roseum* at various intervals after steaming soils at 190° F. or 140° F. The fungus was introduced after treatment with steam.

Treatment	Colonies/g of <i>Fusarium roseum</i>		
	0 days	10 days	28 days
190° F. ^a	54	49	103
140° F. ^a	48	44	98
140° F. ^b	2,607	1,181	2,487
Nontreated control ^b	1,663	1,320	1,422

^aInfested after treatment with a relatively low inoculum density.

^bInfested after treatment with a relatively high inoculum density.

LITERATURE CITED

1. Baker, R. 1963. Current considerations for insuring that "clean stock" is absolutely pathogen-free. Colo. Flo. Grow. Bul. 158:1-2.
2. Snyder, W. C., Shirley Nash, and E. E. Trujillo. 1959. Multiple clonal types of *Fusarium solani* phaseoli in field soil. Phytopathology 49: 310-312.