

## STUDY ON THE PATHOGENECITY OF *Pythium vexans* De Bary, *Phytophthora* spp. AND *Phytophthora cactorum*

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*Pythium vexans* De Bary, *Phytophthora* spp. and *Phytophthora cactorum* were compared for pathogenicity on carnations (*Dianthus caryophyllus*) variety Red Sim. *Phytophthora* spp. was most pathogenic followed by *Phytophthora cactorum* and *Pythium vexans*. Several methods of testing pathogenicity were used in the green house. One method in which the inoculum from potato dextrose agar was blended with sterile water and poured in the vicinity of root zone, gave the best and consistent result in repeated tests.

Many if not most fungi grow over a range of 16–28°C<sup>1-3</sup> and are more pathogenic at higher temperatures.<sup>1</sup> However, the information regarding the pathogenicity of *Pythium vexans* De Bary (P44), *Phytophthora* spp. (P14) and *Phytophthora cactorum* (P14A) on carnations (*Dianthus car yophyllus*) variety Red Sim, on comparative basis is very meagre. The present investigation concerns with the influence of temperature on the pathogenicity of these organisms.

The optimum for radial growth of mycelium on potato dextrose agar plates for all the three organisms was 24–28°C, whereas the dry weights of P44, P14 (18-day old culture in potato dextrose broth at 27°C were 0.367 g, 0.879 g and 0.171 g, respectively.

### Material and Methods

The inoculum was poured in the vicinity of the root zone and stem of the plant below the soil level in a 3-in pot. Five-day old cultures grown on PDA medium were taken, the cultures stripped off and mixed with sterile water in a waring blender for 1 min.

The pathogenicity tests were conducted for 8–15 days in the greenhouse at 65–75°F and at controlled temperatures of 80–90°F. At the conclusion of each experiment the plants were carefully removed from the soil, washed and measurements taken. The latter included stand counts, determination of length of shoot and root, symptoms severity of injury, weight of the plant and flowers. Recovery tests were made for confirmation. The experiment was repeated 3 times using 8 replicates in each test.

### Results

The relative pathogenicity of the three genera studied are given in Tables 1 and 2.

*Pythium vexans* was mildly pathogenic to carnations variety Red Sim. It caused discoloration of roots and stunting, but wilting was not noted. *Phytophthora* spp was the most virulent pathogen. It killed the plants at 80–90°F, and the plants that did not wilt were severely diseased. *Phytophthora cactorum* was a mild pathogen at all temperatures tested.

*Phytophthora* spp showed ability to infect the stem at the soil line, slightly above or further down below the soil level, and it caused typical wilting and collapse of the entire plant. The fungi invaded the stem where it grew systemically, causing stem collapse and eventual death. After infection,

TABLE 1.—INFLUENCE OF TEMPERATURES ON ROOT AND STEM INFECTION OF CARNATIONS INOCULATED WITH P-44, P-14 and P-14A.

Treatment	Total No. of plants tested	Total No. of plants infected	Total No. of plants wilted
75°F			
P-44	13	5	0
P-14	13	6	0
P-14A	13	3	0
Control	13	0	0
80°F			
P-44	7	4	0
P-14	7	7	0
P-14A	7	3	0
Control	7	0	0
90°F			
P-44	6	4	0
P-14	6	6	6
P-14A	6	2	0
Control	6	0	0

TABLE 2.—INFLUENCE OF TEMPERATURES ON PLANT GROWTH OF CARNATIONS INOCULATED BY P-44, P-14 and P-14A.

Pathogen	Root length in cm	Plant height in cm	Roots	Fresh weights in g	
				Tops	Total
<b>80°F</b>					
P-44	7.8 av	41.2 av	6.5 av	10.71 av	17.21
	4-12	39-44	3.59-8.95	8.29-12.71	
P-14	4.85 av	22.12 av	5.0 av	2.64 av	7.64
	3.0-6.0	14.5-28.0	2.27-46	2.33-2.99	
P-14A	11.0 av	45.5 av	7.31 av	12.6 av	19.91
	10-12	39-48	4.93-12.07	11.71-13.93	
Control	9.7 av	48.5 av	12.24 av	17.36 av	29.6
	8.5-12	45-51	7.89-15.96	12.45-21.53	
<b>90°F</b>					
P-44	8.0 av	44.0 av	8.31 av	12.40 av	20.71
	5.0-11.5	20-48	8.71-12.08	8.35-17.47	
P-14	7.3 av	30.6 av	6.28 av	2.9 av	9.18
	5-11	19-39	4.62-8.48	2.38-3.4	
P-14A	6.0 av	35.5 av	7.41 av	7.06 av	14.47
	4-9.0	25-43	3.48-21.93	2.21-17.27	
Control	7.9 av	42 av	7.61 av	13.98 av	21.59
	7.5-11.5	32-47	6.6-13.45	9.43-16.56	

Plate 1.

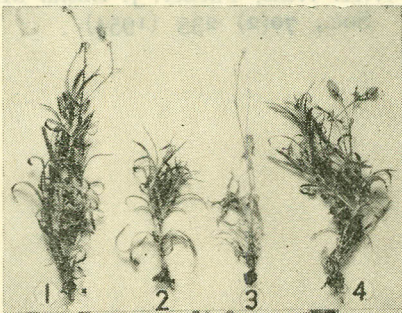


Plate 2.

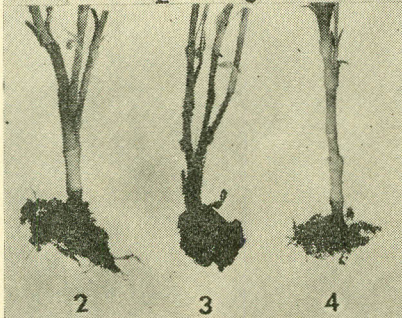


Plate 3.

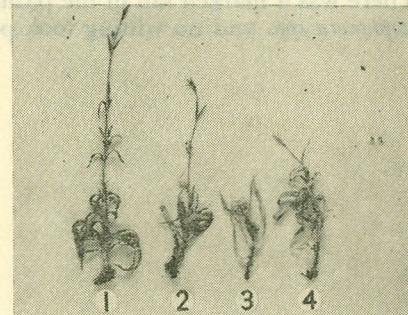


Plate 4.

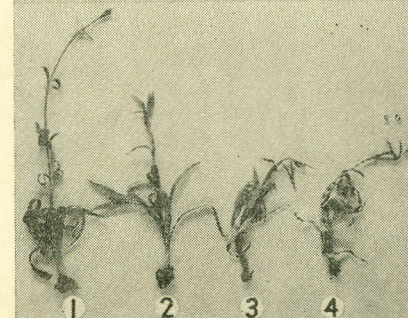
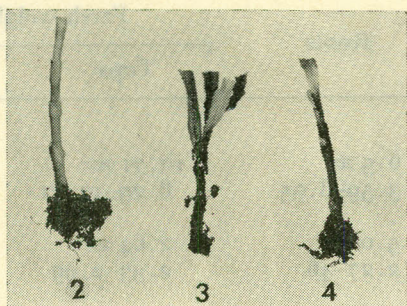


TABLE 3.—THE EFFECT OF INOCULATING MORE THAN ONE PATHOGEN IN THE FORM OF A MIXTURE, TO CARNATION VARIETY RED SIM. at 80°F.

Treatment	Total No. of plants infected	Av. root length in cm	Av. Plant height in cm	No. of plants tested	Total No. of wilted plants
P44+P14A	0	8.5	22.9	13	0
P44+P14	10	8.0	29.4	13	0
P14+P14A	13	6.4	22.6	13	0
Control	0	10.5	34.4	13	0

Plate 5.



the fungi grew rapidly upward or downward in the stem. The most common symptom was the wilting, collapsing and bleaching of upper ends of healthy shoots. The severity of the disease is shown in Plates 1-5.

Results in Table 3 show the change in pathogenicity of these fungi when 5-day old cultures were blended in the following orders:—

*Pythium vexans* + *Phytophthora cactorum*

*Pythium vexans* + *Phytophthora spp.*

*Phytophthora spp.* + *Phytophthora cactorum*

There was a marked fall in the pathogenicity of *phytophthora spp.* and no wilting took place.

### Conclusion

The results reported in this paper were obtained under pure culture conditions and consequently may or may not indicate the relative pathogenicity of these fungi under field conditions. It is possible that treatment with fungicides, adequate soil drainage, soil aeration and temperature control could protect the plants against infection.

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### References

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