Antagonism Between *Rhizoctonia solani* KÜHN and Certain Soil Saprophytes: A Laboratory study

K. B. Deshpande

Botany Department, Osmania University, Hyderabad — 7 A. P. INDIA

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Antagonismus mezi *Rhizoctonia solani* KÜHN a určitými půdními saprophyty. Laboratorní studium


Summary

Antagonism of three saprophytes to the pathogen, *Rhizoctonia solani* was studied in plate cultures under different conditions of temperature, pH, and nutrition. The antagonists *Trichoderma viride* and *Chaetomium cochlioides* were found more effective in the inhibition of the growth of *R. solani* at temperatures 25 and 20°C and this conforms to their growth-temperature relationship. *T. viride* was found more effective in acid media as reported by others, whereas other antagonists and especially *C. cochlioides* was more effective in the alkaline medium. Hence the suggestion is made that soil amendments increasing the activity of *C. cochlioides* might be a good control measure against the pathogen in alkaline soils.
The most interesting result of the investigation is that, contrary to the previous reports, *R. solani* appeared to be more cellulolytic than *T. viride* and *C. cochlioides* and this result was unaffected by the use of NH₄Cl as N-source.

### Introduction

It is now a common knowledge that during the growth of pathogens in pure culture, contamination by other organisms frequently retards or prevents their growth. The discovery of this phenomenon has led to the study of antagonistic effects between organisms and also to the adoption of antibiotic therapy against human and plant diseases.

Fawcett (1931) was the first to emphasise the use of known mixtures of organisms in plant disease investigations and to suggest that the development of many plant diseases may be very much influenced by associated organisms. Thereafter, various workers like Weindling (1934), Sanford (1946) and Wood (1951) claimed in greenhouse studies that cultures of antagonists or their culture-filtrates added to the soil containing pathogens reduced or suppressed the development of disease. Although the success of the soil amendments or use of antibiotics for seed dressing is being realised, yet the value in understanding empirically the antagonistic phenomenon under different conditions cannot be overlooked. Hence in this paper the antagonism of saprophytic soil organisms, *Trichoderma viride*, *Penicillium clavariaeforme* and *Chaetomium cochlioides* against *R. solani* under different conditions of temperature, pH, and nutrition has been reported.

### Material and Methods

**Source of culture:** *T. viride* and *C. cochlioides* were obtained from stock culture collection of the Imperial College, London and originally isolated from soil. *P. clavariaeforme* was isolated from a contaminated culture of *R. solani*. They were all maintained on potato dextrose agar (PDA) slants. *R. solani* was isolated from a diseased seedling of Swede.

**Media:** The following media were used:

1. PDA: 20% peeled potato slices, 2% glucose & 2% agar, pH 5-9.
2. Glucose, starch, cellulose powder or sodium carboxy-methyl cellulose: 1%, NH₄Cl or NaNO₃: 0.144% and 0.227% respectively; KH₂PO₄: 0.1% and MgSO₄·7H₂O: 0.05% and agar 2%.

In order to prepare media distilled water was used. The initial pH of the glucose-NH₄Cl medium = 5.2; of glucose-NaNO₃ medium = 5.4, starch-NH₄Cl medium = 5.9, starch-NaNO₃ medium = 6.1, cellulose-NH₄Cl medium = 5.3, cellulose-NaNO₃ medium = 5.1, Na-carboxymethyl cellulose (CMC)—NH₄Cl = 5.2, CMC—NaNO₃ = 5.3.

An equal quantity (i.e. 15 ml.) of agar media was sterilised in tubes at 15 lbs. pressure for 20 minutes and plated in the sterile petri dishes.

**Method of Inoculation:** Spore suspension of the antagonists and 4 mm. disc from the 3-4 days old culture of the pathogen growing on PDA were used as inocula in all the tests.

**Ringing Method:** Three discs of culture of the pathogen were plated on each agar plate. A No. 12 cork-borer (12 mm. diameter) was dipped in spore suspension of the antagonists placed on the agar and then removed to leave a ring of spores around each disc. Observations were made every day to see under what conditions the pathogen could grow through the ring and to study the growth of antagonists. All treatments were in duplicate and the results after 4 days incubation are given below in the tables.