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PECTINOLYTIC PROPERTIES OF CERTAIN FUNGI ASSOCIATED WITH DISEASED COCONUT PALMS

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ABSTRACT

The fungi, *Rhizoctonia solani*, *Bipolaris halodes*, and *Pestalotia palmarum*, found constantly associated with diseased coconut palms, could grow in a medium containing pectin as the sole carbon source and also utilize the substrate. All the three organisms elaborated pectin methyl esterase, polygalacturonase and pectin *trans*-eliminase in culture filtrates, but in variable quantities.

INTRODUCTION

THE etiology of the root (wilt) disease of coconut may be attributed to various factors including fungi and nutritional imbalance. Radha and Menon (1954) found that the wilt fungus *Rhizoctonia solani* was constantly associated with the deterioration of the roots of wilt affected palms and could be isolated only from diseased ones. The constant occurrence of leaf rot in wilt affected palms caused by *Helminthosporium halodes* (Drechs), [*Bipolaris halodes* (Drechs) Shoemaker] adds to the severity of the wilt syndrome (Lily and Ramadasan, 1972). Frequent isolation of *Pestalotia palmarum* from necrotised leaf tissue of wilt affected palm and the partial control of necrosis by fungicides indicate its possible role in the root (wilt) disease. Although the association of these organisms in the root (wilt) affected palms is undisputed, no attempts have been made to elucidate the possible mechanism by which they induce abnormalities. This promoted a study of the enzymological aspect of pathogenesis.

MATERIALS AND METHODS

Pure cultures of *R. solani*, *B. halodes*, and *P. palmarum* isolated from root (wilt) affected palms using the procedure of Riker and Riker (1936) were maintained in potato-dextrose-agar slants.

The ability of the isolates to utilize pectin as the sole source of carbon and the extent of degradation of the substrate were determined by the method of Kaiser (1961) after cultivating the organisms in the basal medium described by Agate (1965). The concentration of pectin was 0·5% and the pH was adjusted to 5·5. Fifty ml aliquots of the same medium were inoculated in Erlenmeyer flasks with mycelial discs and incubated at room temperature for studying the *in vitro* enzyme activities.

Pectin methyl esterase (PME) was assayed by a method similar to Smith's modification (Smith, 1958). Polygalacturonase (PG) was determined by estimating the increase in reducing power by the modified procedure of Willstater-schudel (Jansen and MacDonnell, 1945). Pectin *trans*-eliminase (PTE) was detected by the method of Albersheim, Neukom, and Deuel (1960).

RESULTS AND DISCUSSION

All the three organisms could grow in a medium containing pectin as the sole source of carbon and also utilise the substrate. The extent of degradation of the substrate and rate of growth of the isolates are indicated in Fig. 1. Almost the entire concentration of pectin incorporated in the medium was utilised in a period of eight days of growth and there was a concomitant increase in mycelial dry weights. This trend is similar to the one seen by Waggoner and Dimond (1955) with the fungus *Fusarium oxysporum f. lycopersici.*

The organisms could elaborate PME, PG, and PTE in culture filtrates. The distribution of these enzymes in the three different organisms (Table I) indicates maximum PME activity,

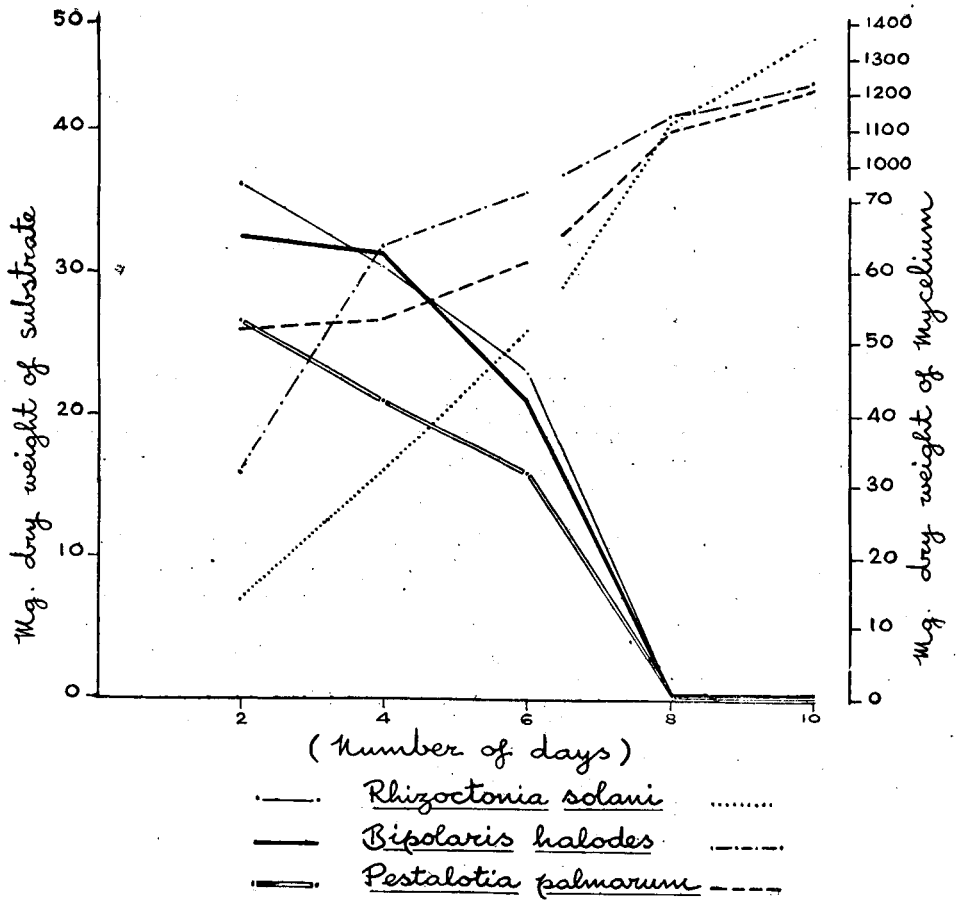

FIG. 1. Rate of growth of the fungal isolates and extent of degradation of pectin.

TABLE I

*Pectinolytic enzymes of fungal isolates**

Isolate	Pectin methyl esterase (PME)	Poly-galacturonase (PG)	Pectin *trans*-eliminase (PTE)
R. solani ..	0·05	0·3	0·025
P. palmarum ..	0·11	0·2	0·040
B. halodes ..	0·22	0·4	0·030

* The organisms were grown for a period of eight days. PME as the quantity (in ml) of 0·02 N sodium hydroxide required after three hours of incubation; PG as increase in reducing power in quantity (in ml) of 0·05 N sodium thiosulphate; PTE as units of OD at 540 mμ of the thiobarbiturate reaction mixture.

in *Bipolaris halodes*. It also had the maximum PG activity. PTE activity was more in *P. palmarum* followed by *B. halodes* and *R. solani*. The occurrence of these three pectinolytic enzymes in *R. solani* has been observed by some others also (Naqvi, 1969). The present report may perhaps be the first one on the occurrence of PTE in *B. halodes* and *P. palmarum*.

Attempts have been made in the past and are continuously being made now to correlate the pathogenecity of an organism with its ability to produce *in vitro* pectinolytic enzymes. The present findings represent a fresh attempt made in this direction.

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