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FUNGITOXICITY OF CULTURAL ANTIMETABOLITES OF *NIGROSPORA ORYZÆ* (B. & BR.) PETCH ON ITS CONIDIAL GERMINATION

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Substances produced by phytopathogenic organism in culture not only show phytotoxicity on higher plants but are often reported to be toxic even to the organism that produces the substance. *Nigrospora oryzae* (B & Br.) Petch isolated from infected *Oryza sativa* has been reported to produce metabolic by products which have phytotoxicity to rice plants. The present study has been undertaken to study fungitoxicity of the cultural antimetabolites of *N. oryzae* on different carbon and nitrogen sources and their effect on its conidial germination. The test-fungus produces some antimetabolites in culture filtrate which show inhibition in germination of conidia. Except in starch and ammonium sulphate as carbon and nitrogen sources respectively, the production of such substances is significant in other sources. Variation in antimetabolite production has been observed in different sources of carbon and nitrogen.

INTRODUCTION

Substances produced by plant pathogens as metabolic by-products in culture have frequently been observed by previous workers (Meehan and Murphy, 1947 ; Porter and Green, 1952 ; Wheeler and Luke, 1954 ; Luke and Wheeler, 1955 ; Pringle and Braun, 1957 ; Ludwig, 1960 ; Scheffer and Pringle, 1961 ; Deverall, 1964 ; Purkayastha, 1969) to show phytotoxicity and playing real causal role in disease development. Evidences are, however, meagre to show that such metabolites have toxic effect on the organism that produces the substance, thus leaving enough scope for further research in this line. Piricularin is reported to be not only toxic to higher plants but also about ten times more toxic to *Piricularia oryzae*, the fungus that produces the toxin (Ogasawara *et al*, 1961). Strong antifungal properties preventing spore germination in some fungi even at a low concentration 1μ g/ml has also been reported in alernaric acid (Brian *et al*, 1951). With this end in view, the present investigation is designed to study

the fungitoxicity of the cultural antimetabolites of *N. oryzae* on its conidial germination. The present investigators (Santra and Nandi, 1971) reported phytoxicity of the metabolic by-product of the fungus on some varieties of *Oryza sativa*.

MATERIAL AND METHODS

The test-fungus, *N. oryzae* was isolated from diseased leaves of *Oryza sativa* collected from rice fields in November, 1969 near Burdwan, West Bengal. In culture the fungus produces plenty of conidia from which monoconidial culture was grown on 2% malt-agar medium. For preparation of culture filtrate, the fungus was grown on liquid Czapek's medium and the PH was adjusted at 6.5 before autoclaving by adding N/10 HCl or N/10 NaOH. Three different carbon sources maltose, glucose and starch and three nitrogen sources asparagine, sodium nitrate and ammonium sulphate were used as substitute of the carbon and nitrogen sources of the medium. Compounds were so substituted that equivalent weight of the different carbon or nitrogen remained same. The medium (25 ml.) was taken in each Erlenmeyer flask (250 ml.) and sterilized. These were then inoculated with agar discs (2mm. diam.) containing mycelium of the testfungus punched out from rapidly growing culture on Czapek's agar medium in Petri-dishes. The inoculated flasks were incubated at $30 \pm 1^\circ\text{C}$ for seven days. Culture filtrate was then separated from the mycelium by filtration, the PH adjusted to 6.5 and sterilized.

Fungitoxicity of the culture filtrate of the test-fungus was tested against the conidial germination bioassay of the same fungus using hanging drop culture in Petri-dishes with culture filtrate as the substratum. A parallel set of control hanging drop cultures were maintained using Czapek's medium substituted with the same carbon and nitrogen sources. Five replicates were used for each treatment. These Petri-dishes were then exposed to a temperature shock treatment at 40°C for 5 minutes followed by incubation at 30°C for 48 hours as the present investigators observed considerable increase in percentage of germination by such treatment. The percentage of germination was worked out and the length of germ-tubes measured and recorded in the Table 1.

RESULTS AND DISCUSSION

Table 1. Effect of culture filtrate of *N. oryzae* on germination of its conidia after

48 hours of incubation at 30°C following temperature shock treatment at 40°C for 5 minutes.

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Media	Control		Culture filtrate	
	Germination*	Length of germ-tube*	Germination*	Length of germ-tube*
	(%)	(μ)	(%)	(μ)
Dist. water	1.0	1.5	0.5	1.0
Maltose	56.5	5.0	40.0	3.0
Glucose	45.5	3.5	33.0	1.5
Starch	40.5	1.5	39.0	1.5
No carbon	2.5	1.0	2.0	1.0
Asparagine	32.0	1.5	24.0	1.0
NaNO ₃	30.6	2.0	23.0	1.0
(NH ₄) ₂ SO ₄	20.5	3.5	19.0	3.0
No nitrogen	2.0	1.8	1.0	1.5

* Average of five replicates.

The results presented in the table show that the percentage of germination of the conidia vary in different sources of carbon and nitrogen. In distilled water and in absence of any carbon or nitrogen source in the medium, the percentage of germination is almost negligible. Of the different carbon sources, maximum percentage of germination has been observed in maltose (56.5%) followed by glucose (45.5%) and starch (40.5%), while amongst the nitrogen sources asparagine (32.0%) offers as the best followed by sodium nitrate (30.6%) and ammonium sulphate (20.5%) in descending order. Length of germ-tubes when taken into consideration shows maximum development in maltose and ammonium sulphate in carbon and nitrogen sources respectively.

In culture filtrate, however, conidia show considerable inhibition in percentage of germination except in starch and ammonium sulphate where it is negligible. The percentage of germination inhibition also show significant variations in different carbon and nitrogen sources used. Similar inhibition in length of germ-tubes has also been observed except in the aforesaid two cases.

From the results it can be concluded that the test-fungus produces some antimetabolites in the culture filtrate which have definite inhibitory effect on the germination of conidia of the same fungus. In case of starch as carbon source and ammonium sulphate as nitrogen source, however, production of such substances in the culture filtrate is probably very low as practically no inhibition of percentage of germination has been observed. It is also evident that production of antimetabolites also vary in different sources of carbon and nitrogen.

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