

SULPHUR AND PHOSPHORUS NUTRITION IN RELATION
TO GROWTH AND SPORULATION OF *FUSARIUM*
MONILIFORME VAR. *SUBGLUTINANS*
WR. ET RG.

BY

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The present investigation has been made to provide some informations on the role of different phosphorus and sulphur salts on the mycelial growth and sporulation of *Fusarium moniliforme* var. *subglutinans* causing malformation of mango. Five different phosphorus salts, viz., potassium dihydrogen phosphate, potassium monohydrogen phosphate, sodium dihydrogen phosphate, sodium monohydrogen phosphate, ammonium monohydrogen phosphate and four sulphur salts, viz., magnesium sulphate, potassium sulphate, ammonium sulphate, sodium sulphate have been selected for the experiment. Of the five phosphorus salts, potassium monohydrogen phosphate was utilized extensively by the fungus in increasing mycelial weight and sporulation. On the other hand, magnesium sulphate is the form of sulphur supported best growth and sporulation of the test-organism.

INTRODUCTION

It is obvious that fungi have relatively large requirements for phosphorus, sulphur, potassium and magnesium for their normal development (Foster, 1939). The essentiality of sulphur and phosphorus in the nutrition of fungi has been reported by a number of workers (Agarwal, 1957, 1958; Tandon *et al*, 1958; Bhargava, 1945; Mann, 1944; Schade, 1940). The stimulatory effect of phosphorus is its role in the metabolism of fungi and in energy transfer. The deficiency of phosphorus hampers several metabolic activities of fungi of which the low rate of glucose utilization is more pronounced (MacLeod and Snell, 1950). Tandon *et al* (1958) and Agarwal (1958), have shown that sulphur sources act as stimulant for fungal growth. Barner and Cantino (1952) reported that media in common use incorporate excess sulphur as magnesium sulphate and the requirement of sulphur at moderate carbohydrate concentrations is about 0.0001–0.0006 M.

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With this end in view, the present investigation has been made to study the effect of various forms of sulphur and phosphorus sources in inducing growth and sporulation of *F. moniliforme* var. *subglutinans* in vitro.

MATERIAL AND METHODS

The test-fungus was isolated from malformed floral tissue of mango growing luxuriently every year in late season in different mango orchards of Burdwan, West Bengal. Czapek's synthetic solution was taken as the basal medium. The medium was purified as per the method of Steinberg (1950). Different phosphorus salts, viz., potassium dihydrogen phosphate, potassium monohydrogen phosphate, sodium dihydrogen phosphate, sodium monohydrogen phosphate, ammonium monohydrogen phosphate and sulphur salts, viz., magnesium sulphate, potassium sulphate, ammonium sulphate, sodium sulphate selected for the experiment were incorporated singly in the basal medium devoid of salt under study and the amount was adjusted to the quantity used in the same medium. The medium was adjusted to the optimum pH 6.8. 25 ml. of each of the medium was taken in each Erlenmeyer flask (250 ml.), plugged and sterilized at 15 lbs. p.s.i. for 15 minutes. Finally the flasks were inoculated with uniform discs of inocula (5 mm. diam.) and incubated for 6 days at 28°C in dark. A set of control flasks without the test chemicals was maintained identically. Three replications were made for each source. After incubation the mycelial mats were harvested, washed and dried to a constant weight at 60°C.

Spores were counted in hæmocytometer of 0.1 mm depth and the number was calculated in 1 ml of the original solution (Paul, 1929). The mean value of three replications were recorded.

RESULTS AND DISCUSSION

Average dry weight of mycelium and quantum of sporulation of the fungus after its growth on different sulphur and phosphorus sources are given in the Tables 1 and 2.

Table 1. Effect of different phosphorus sources on mycelial growth and sporulation of *F. moniliforme* var. *subglutinans*.

Phosphorus source	*Dry mycelial weight (mg)	*Sporulation (million/ml)
Potassium dihydrogen phosphate	70.0	2.32
Potassium monohydrogen phosphate	132.6	14.75
Sodium dihydrogen phosphate	88.3	8.75
Sodium monohydrogen phosphate	96.0	7.25
Ammonium monohydrogen phosphate	68.3	4.50
Control	52.3	0.32

* Average of three replicates.

It is evident from the Table 1 that phosphorus in any form of phosphate shows promotion in vegetative growth and sporulation of the test-fungus. Of the five phosphates tried, potassium monohydrogen phosphate shows maximum beneficial effect, followed by, in order of preference, sodium monohydrogen phosphate, sodium dihydrogen phosphate, potassium dihydrogen phosphate and ammonium monohydrogen phosphate. Phosphate which forms one of the most important inorganic anion, is probably taken up by the fungal cell by a mechanism similar to those of carrier-mediated active transport system. (Goodman and Rothstein, 1957). Such one-way movements have been observed also with plant cells and it is quite likely that in this fungus also such a system exists. It is also reported that monovalent form of H_2PO_4 is preferentially transported and potassium has a profound influence on its uptake (Rothstein, 1965).

Table 2. *Effect of different sulphur sources on mycelial growth and sporulation of F. moniliforme var. subglutinans.*

Sulphur source	*Dry mycelial weight (mg)	*Sporulation (million/ml)
Magnesium sulphate	89.6	4.86
Potassium sulphate	71.0	2.35
Ammonium sulphate	53.6	1.45
Sodium sulphate	64.6	1.01
Control	43.0	1.17

* Average of three replicates.

From the Table 2 it is evident that out of four sulphates tried, magnesium compound exhibits maximum growth and sporulation followed by potassium, sodium and ammonium compounds. In all cases, however, growth is much higher than that of the control.

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