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# Effect of different sulphur sources on the growth and sporulation of *Fusarium moniliforme*

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Effect of eight sulphur sources on growth and sporulation of *Fusarium moniliforme* isolated from the fruit rot of *Coccinia indica* was recorded. Among the different sulphur sources tested managanese sulphate supported maximum growth and sporulation. No sporulation and poor growth were observed in control without sulphur. Sodium sulphate failed to support the mycelial growth of test pathogen.

**Key Words :** *Fusarium moniliforme*, growth, sporulation, sulphur sources, *Coccinia indica*

## INTRODUCTION

*Coccinia indica* Wight and Arn., has great economic importance (Chakravary, 1982) and is also used in cure of leprosy, asthama and jaundice (Singh *et al.*,1983). During the survey of local markets of Allahabad in year 2003-2004, the fruits of *C. indica* were found to be infected by *Fusarium moniliforme* (Sharma, 2004). Fungi like higher plants need carbon, nitrogen, hydrogen, oxygen, phosphorus, sulphur, potassium, magnesium, traces of certain metabolites and growth promoting substances for their growth and reproduction. Nutritional factors markedly influence the growth of microorganisms. In general, fungi differ in their preferences for different substances and are very selective in their choice of food.

The objective of this investigation is to evaluate the influence of various sulphur sources on the growth and sporulation of test pathogen. Sulphur plays a significant role in the metabolic activities of fungi. It is known to be essential for the biosynthesis of sulphur containing amino acides, besides being a component of the sulphahydryl or thiol group of many enzymes (Lilly and Barnett, 1951 ; Cochrane, 1958 ; Tandon, 1961 ; Bhargava and Tandon, 1963), coenzymes and vitamins, which in turn affect various other vital processes of fungi.

## MATERIALS AND METHODS

Single spore culture (Keyworth, 1959) of *F. moniliforme* obtained from diseased fruit of *C. indica* was employed for this study. The test pathogen was grown on number of media and on the basis of results it was decided to use modified Asthana and Hawker's medium 'A' (D-glucose = 10.0 g, $KNO_3$ = 3.50 g, $KH_2PO_4$ = 1.75 g, $MgSO_4.7H_2O$ = 0.75 g, Distilled water = 1000.00 ml) as basal medium for the evaluation of various sulphur sources. The amount of individual sulphur source was calculated as amount of sulpher present in 0.75 g of $MgSO_4.7H_2O$ and used in place of the same in the basal medium. A sulphur free medium served as control.

Each sterilized Erlenmeyer conical flask (150 ml) containing 25 ml of basal medium was autoclaved at 121°C for 15 min. The most suitable pH for the growth and sporulation of pathogen was found to be 5.5 and pH of the basal media was adjusted to this level in each case with the help of B.D.H. pH indicator paper. With the help of agar disc method (Garrett, 1966) ten to twelve days old culture were used to inoculate the flask containing different sulphur sources and incubated at 25 ± 2°C for 15 days in triplicate. Mycelial mats from each flask were harvested at the previously dried and weighed

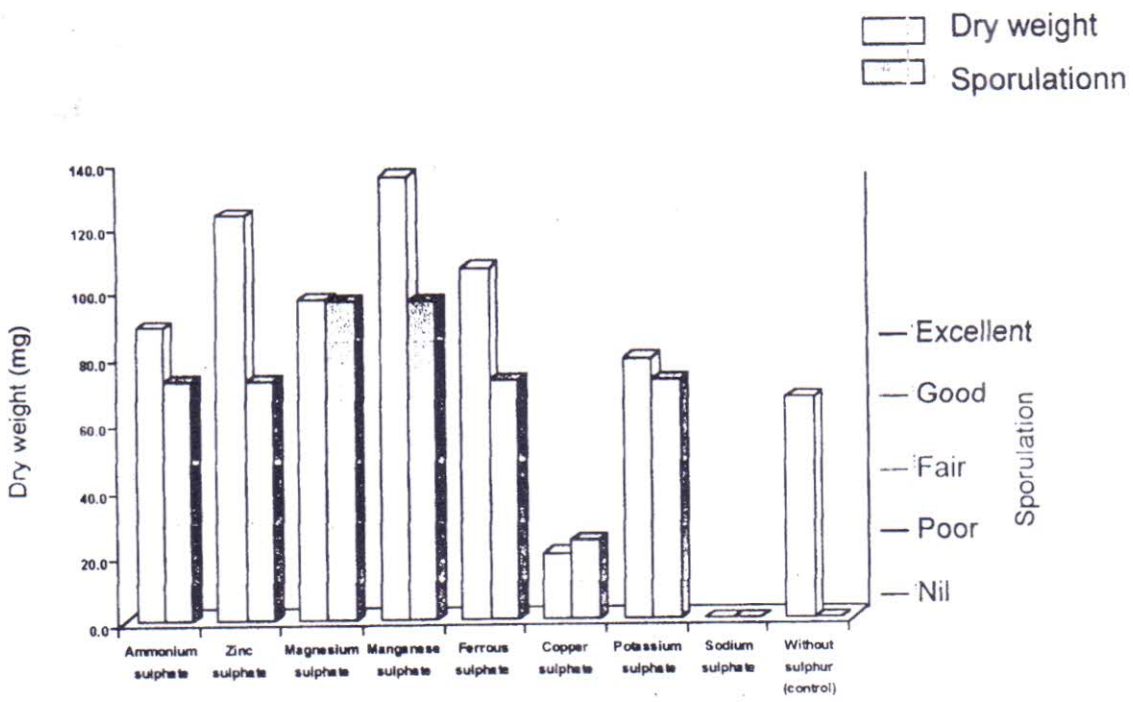


**Fig. 1 :** Histogram showing growth and sporulation of *Fusarium moniliforme* on different sulphur sources.

Whatman's filter paper No. 42, oven dried at 60°C for 72 hrs, then cooled in desiccator and again weighed. The difference between final and initial weight of filter paper indicated the dry weight (mg) of the mycelial growth. At the end of incubation period change in the pH of media was recorded.

The sporulation of the test pathogen was recorded by microscopic and visual observation and classified into five categories *viz.* nil (N), poor (P), fair (F), good (G) and excellent (E).

Statistical analysis of the dry weight (mg) of fungus mycelia was done through **ANOVA** method **'one way classification'** (Fisher ; 1947).

## RESULTS AND DISCUSSION

The dry weight of mycelia (mg) and sporulation of *F. moniliforme* on various sources of sulphur and change in pH was recorded in Table 1 and Fig. 1. Dry weight of the mycelial mat and degree of sporulation were considered as a measure of response of the organism to different treatment.

**Table 1 :** Average dry weight (in mg.) sporulation and final pH of the medium when *Fusarium moniliforme*, was grown on different sulphur sources.

| Sulphur Sources | Dry wt.(mg) | Sporulation | Final pH |
|---|---|---|---|
| Ammonium sulphate | 88.33 | G | 8.5 |
| Zinc sulphate | 123.33 | G | 9.0 |
| Magnesium sulphate | 96.66 | E | 8.0 |
| Manganese sulphate | 135.0 | E | 8.0 |
| Ferrous sulphate | 106.66 | G | 8.0 |
| Copper sulphate | 120.0 | P | 6.0 |
| Potassium sulphate | 78.33 | G | 7.0 |
| Sodium sulphate | 0.0 | N | 5.5 |
| Without sulphur (control) | 66.66 | N | 7.0 |
| G.M. | 90.55 | | |

Summary of the Dry Weight results and conclusions at 5% level of P.

| | |
|---|---|
| Replicates | Non Significant |
| Treatments | Highly Significant |
| Standard Error | 3.72 |
| Critical Difference | 6.38 |
| Treatment Nos. | 4 > 2 > 6 > 5 > 3 > 1 > 7 > 9 > 8 |

For grading the growth of the pathogen into three categories i.e. good, moderate and poor on different sulphur sources, general mean (G.M.), stanard error (S.E.) and critical difference (C.D.) at 5% level was calculated (Gupta and Kapoor, 2001). G.M. of the

dry weight ± C.D. at 5% level was designated as moderate, higher than this good and lower values were graded poor (Table 2).

**Table 2 :** Table showing parameter with their respective value obtained through ANOVA technique "one way classification".

| Parameter | Calculated value |
|---|---|
| Number of treatments (n) | 9 |
| Total number of observations (N) | 27 |
| Degree of freedom (*d.f.*) | 18 |
| General mean (G.M.) | 90.55 |
| Correction factor (C.F.) | 221408.33 |
| Total sum of square (T.S.S.) | 39666.67 |
| Treatment sum of square (S.S.T.) | 39416.67 |
| Error sum of square (S.S.E.) | 250 |
| Mean sum of error (M.S.E) | 13.88 |
| Standard error (S.E.) | 3.72 |
| Critical difference (C.D.) | 6.38 |
| G.M. ± C.D. | 96.93, 84.17 |

It can be deduced from the Table 1 that manganese sulphate supported maximum growth and excellent sporulation. Moderate growth was observed on ammonium sulphate and magnesium sulphate. Fungus failed to grow on sodium sulphate but poor growth was observed on sulphur deficient media. Figure 2 illustrated that among all the sulphur sources tested, 45% sources were good, 22% sources were moderate and 33% sources were proved to be poor for the growth of the test organism. No sporulation was recroded in control. This finding is at par with Agarwal (1955). Bhargava (1962) and Malviya (1992) who reported that medium devoid of sulphur was not able to support the sporulation of the organisms studied by them. Lal and Tandon (1974) reported poor growth and poor sporulation of different isolates of *Colletotrichum capsici* on medium devoid of sulphur. It was observed that pH of the medium drifted towards neutrality or alkalinity in each treatment at the end of the incubation period. It was interesting to observe that when growth was good the sporulation was poor and *vice-versa*.

Available data on sulphur nutrition of fungi also indicate that different fungal organisms differ in their capacity to grow without a sulphur source (Bilgrami and Verma, 1992). Fungi like *Fusarium coeruleum* (Agarwal ; 1957), *Phyllosticta* sp. (Tandon and Bilgrami ; 1958) and *Alternaria tenuis* (Hasija, 1969) failed to grow in sulphur dificient media. It was observed by earlier workers that fungi growing on sulphur deficient media either attained feeble growth or failed to thrive (Saksena and Sarbhoy, 1960 ; llaglund and king, 1962).

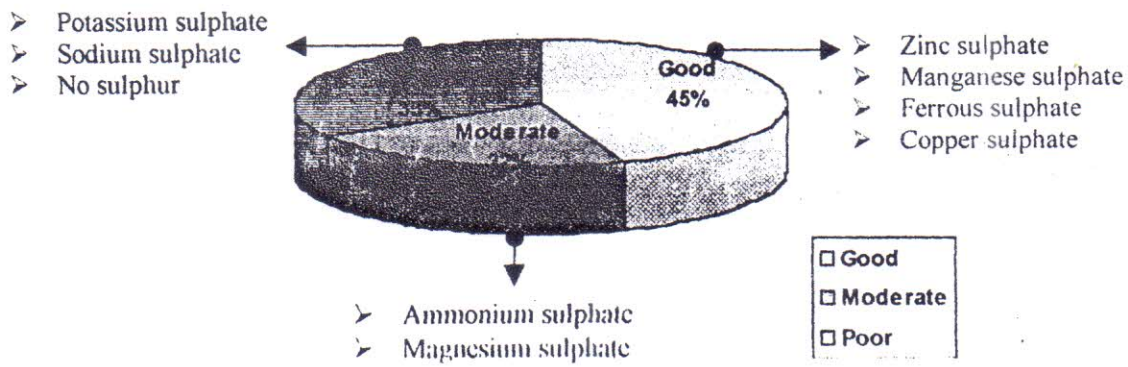


**Fig. 2 :** Pie graph showing grading of growth of *Fusarium moniliforme* into three categories (good, moderte and poor) on different nine sulphur sources.

The results clearly indicate wide variation between different sulphur sources on growth and sporulation of fungi properly. It is concluded from this investigation that the sulphur plays a decisive role on fungal growth and influence the sporulation of organism as well.

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