SULPHUR REQUIREMENTS OF *HENDERSONULA TORULOIDEA* NATTRASS

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Effect of sulphur compounds on the growth of *Hendersonula toruloidea* Nattrass, causing brown rot of fruits of *Malus sylvestris* Mill. has been studied. Nine different sources of sulphur have been used and out of them ferrous sulphate is found to be the best. Zinc sulphate, sodium thiosulphate, potassium persulphate, magnesium sulphate and sodium sulphate support good growth of the organism and are identical sources for this fungus. Ammonium sulphate, potassium sulphate and zinc sulphite support poor growth of the fungus.

A review of available litrature shows that sulphur plays a vital role in the nutrition of fungi as investigated by several authors [1-12]. However, Steinberg[13] and Agarwal [14,15] found that the fungi investigated by them could grow without sulphur. Sulphur is of structural importance as a constituent of protein and also has a metabolic significance in certain enzymes. Generally, sulphate sulphur is the most favourable form for utilization by many fungi but Bhargava[2] has shown that few fungi fail to utilize this form of sulphur.

The present investigation deals with the effect of different sulphur compounds on the growth of *H. toruloidea* Nattrass, a causal organism of brown rot of fruits of *M. sylvestris* Mill[16].

MATERIALS AND METHOD

Single spore culture of *H. toruloidea,* isolated from diseased fruits of *M. sylvestris* was maintained on PDA medium. Asthana-Hawker's medium containing 50 gm glucose; 3·5 gm KNO_3; 1·75 gm KH_2PO_4; 0·75 gm $MgSO_4 . 7H_2O$ and distilled water 1 litre has been used as the basal medium. Various sulphur compounds have been substituted for magnesium sulphate in the basal medium so as to supply equivalent amount of available sulphur. 15 ml of nutrient medium is poured in 150 ml Erlenmeyer flasks and these are autoclaved at 15 lbs. *p.s.I.* for 15 minutes. The *pH* of media is adjusted to 7·0 before autoclaving. The inoculation in the media is done with one ml spore suspension of the fungus and incubated for 15 days at 30$\pm$3°C after which mycelium mat is harvested on whatman's filter paper No. 41. Three replicates are taken in each case and the results are statistically analysed.

OBSERVATIONS

The dry weights of the mycelium mat after 15 days have been recorded in Table 1.

TABLE 1

AVERAGE DRY MYCELIUM WEIGHTS OF *H. toruloidea* ON DIFFERENT SULPHUR SOURCES

Sulphur compounds	Dry weights (mg.)
Zinc sulphite	21·67
Ammonium sulphate	26·67
Magnesium ulphate	30·00
Potassium sulphate	23·33
Zinc sulphate	43·33
Potassium persulphate	31·67
Ferrous sulphate	60·00
Sodium thiosulphate	36·67
Sodium sulphate	28·33
Control (no sulphur)	18·33
General Mean	32·00

TABLE 2

STATISTICAL ANALYSIS : ANALYSIS OF VARIANCE

Variation due to	D.F.	Sum of squares	Mean square	F
Replication	2	5·00	2·50	***
Treatments	9	4046·67	449·63	18·89
Error	18	428·33	23·80	
Total	29	4480·00		

Results

Treatments	Highly significant
Replicates	Non-significant
S.E.	2·817
C.D. at 5% level of P	8·37

7 5 8 6 3 9 2 4 1 10

It is evident from Table 1 that the organism is able to grow even on media lacking any sulphur source. Best growth of the organism is found on ferrous sulphate. Zinc sulphate, sodium thiosulphate potassium persulphate, magnesium sulphate and sodium sulphate support good growth of the fungus. Ammonium sulphate, potassium sulphate and zinc sulphite show poor growth of the organism.

RESULTS AND DISCUSSION

It is evident from the present study that the organism under investigation is able to grow on a medium devoid of sulphur and in this respect it is similar to *Aspergillus niger*[13], *Curvularia lunata*[17], *C. penniseti*[15], *Pestalotia sp.*[18], *Pestalotiopsis glandicola*[12], and

Fusarium solani, *Botrydiplodia ananassae* & *Macrophomina phaseoli*[11]. The present organism differed from the organisms studied by Tandon[6] and Agarwal & Ganguli[7] because *Pestalotia malorum* and *Pestalotiopsis versicolor* respectively failed to grow on media lacking any sulphur source.

Sulphates have been reported to be good sources of sulphur for *Pestalotia psidii*[6], two strains of *Fusarium coeruleum*, *C. penniseti*[14,15] two species of *Phyllosticta*[4], *P. versicolor*, *P. glandicola*[12] and *F. solani*, *B. ananassae*, *M. phaseoli*[11]. In the present investigation, however, all the sulphate sources are not equally favourable for the growth of the fungus. Ferrous sulphate has been found to be the best in all. Zinc sulphate also shows good growth of the fungus and statistical analysis has revealed that it is an identical source to sodium thiosulphate. Potassium persulphate, magnesium sulphate and sodium sulphate also support good growth of the fungus and are identical sources. Tandon and Agarwal[19] while studying the influence of some micro-elements on the growth of three species of *Gloeosporium* concluded that ferrous sulphate and zinc sulphate showed maximum growth and sporulation of all the species. Tandon & Bhargava[12] did not record good growth of *P. glandicola* on ferrous sulphate and zinc sulphate. Magnesium sulphate has been found to be the best source for the organisms studied by several workers[6-12], but in the present investigation it does not prove to be best source of sulphur.

Potassium persulphate has been found to support good growth of the present organism but it is found to be a poor source for *P. glandicola* and *P. versicolor* by Tandon & Bhargava[12] and Agarwal & Ganguli[7] respectively.

Ammonium sulphate and potassium sulphate are also not good sources for the present organism. Ammonium sulphate is found to be a poor source for *P. glandicola*[12] and *Phyllosticta cycadina* and *P. artocarpina*[4]. However, Bhargava & Tandon[11] have regarded it to be a good source for the fungi studied by them.

Sodium thio-sulphate, potassium persulphate, magnesium sulphate and sodium sulphate are found to be identical sources of sulphur supporting good growth of the present organism. Thus the organism is similar to the fungi studied by Steinberg[13], Agarwal[14] and Tandon & Bhargava[11,12].

Steinberg[13] stated that sulphites are toxic to most fungi. The organism under study shows poor growth on zinc sulphite which is found identical with ammonium and potassium sulphates. Bhargava & Tandon[11] observed no growth of *F. solani*, *B. ananassae* & *M. phaseoli* on sodium sulphite. Tandon & Bhargava[12] however found that good growth of *P. glandicola* was supported by sodium sulphite, sodium bisulphite, sodium metabisulphite, sodium hyposulphite and potassium meta-bisulphite.

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