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PHYSIOLOGICAL OBSERVATIONS OF SOME COMPOST FUNGI

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Of the five different mushroom composts studied for the inhabiting microflora, two fungi namely, *Helminthosporium tetramera* (being reported for the firsttime from mushroom composts in India) and *Fusarium oxysporum* found to be predominant in all the composts. The effects of different media, temperatures, H ion concentrations, incubation periods, different carbon and nitrogen sources on nutrition were also studied.

INTRODUCTION

Although the mushroom growing is being highly practised in the Punjab State, still much information regarding the microflora and physiology of the inhabiting micro-organisms is not available. With this idea in mind microbiological studies on five different mushroom composts were carried out (Garcha and Usha Kiran, 1981).

Among the isolated organisms. physiological studies on *Helminthosporium tetramera* and *Fusarium oxysporum* have been carried out only in detail.

MATERIALS AND METHODS

Preparaiion of inoculum and inoculation : In all the physiological experiments a homogenous suspension of the inoculum was prepared by crushing the mycelial bits in 125ml concial flask fitted with a beater containing 25-30ml of sterilized distilled water. One ml of this suspension was used in every flask containing 50ml of sterilized liquid basal medium.

After inoculation, the flasks were incubated for desired period and cultural characters, final pH and sporulation were recorded. The average dry weight of mycelia was also noted.

RESULTS

Effect of different media : Temperature, pH and incubation period on the growth and sporulation of *H. tetramera* and *F. oxysporum* was studied.

The two fungi were grown on six different liquid media at five different temperatures in pH range of 4.0-8.0 to select the best one for growth. Two replicates were taken for each observation and the data are given below (Tables 1 and 2).

Table 1. *Growth of* H. tetramera *on different media, temperatures and H*ion concentrations*

Media	Temperatures			H*ion concentrations		
	Average dried mycelial dry wt. (mg)	Temp. (O. C.)	Average dried mycelial dry wt. (mg)	Initial pH	Final pH	Average dried mycelial dry wt. (mg).
Potato dextrose broth	627	15	459	4.0	4.0	—
Malt extract broth	523	20	544	4.5	4.5	187
Rose Bengal medium	172	25	593	5.0	5.0	431
Czapeck's medium	492	30	556	5.5	5.5	450
Glucose yeast extract medium	470	35	497	6.0	6.0	472
Peptone glucose broth	31			6.5	6.0	518
				7.0	6.5	532
				7.5	7.5	377
				8.0	8.0	304

Incubation period=8 days
(–) =Absence of growth.
* Tuite (1969)

Table 2. *Growth of* F. oxysporum *on different media, temperature and H*ion concentrations*

Lequid Media	Temperature			H*ion concentrations		
	Avarage dried mycelial wt. (mg)	Tempera-ture (°C)	Average dried mycelial wt. (mg)	Initial pH	Final pH	Average dried mycelial wt. (mg)
Potato dextrose broth	351	15	481	4.0	4.0	—
Tochnais solution	90	20	430	4.5	4.5	360
Malt extract broth	323	25	552	5.0	4.5	462
Park's medium	18	30	444	5.5	5.0	470
Bilay's medium	38	35	—	6.0	5.5	450
Czapeck's medium	149			6.5	6.0	375
				7.0	6.0	362
				7.5	7.0	350
				8.0	7.5	329

Incubation period=8 days
(-)=Absence of growth.
* Tuite (1969)

Carbon nutrition : Thirteen different carbon sources comparising of monosaccharides, disaccharides, polysaccharides and sugar alcohols were used to study their utilization by *H. tetramers* and *F. oxysporum*. As the liquid basal medium (Malt Extract Broth) contains 30g/l of malt extract, other carbon sources were used at the rate of 3g/100ml of the medium. After inoculation and incubation for 8 days dry weight of mycelia was determined. The results are given in the Table 3.

Table 3. *Growth of* H. tetramera *and* F. oxysporum *on different carbon sources*

Carbon source	H. tetramera		F. oxysporum	
	Final pH	Average dried mycelial wt. (mg)	Final pH	Average dried mycelial wt. (mg)
Monosaccharides				
Ribose	7.0	478	5.0	140
Dextrose	6.5	754	5,0	511
Galactose	7.0	567	5.0	550
Mannose	7.0	—	5.0	453
Fructose	6.5	744	5.0	260
Xylose	6.5	709	5.5	—
Disaccharides				
Lactose	6.5	645	5.0	445
Sucrose	7.0	301	5.0	206
Maltose	6.5	580	5.0	173
Polysaccharides				
Starch	6.5	680	5.0	488
Malt extract	6.5	504	5.0	185
Sugar Alcohols				
Mannitol	6.5	542	5.0	510
Sorbitol	6.5	668	5.0	413
Control	7.0	—	5.5	—

H. tetramera
Inltial pH=7.0
Incubation temperature=25°C
Incubation period=8 days
(−)=Absence of growth

F. oxysporum
Initial pH=5.5
Incubation temperature=25°C
Incubation petiod=8 days
(−)=Absence of growth

Nitrogen nutrition : As the liquid basal medium contained 5g peptone/ litre as the nitrogen source, so calculations were done as to provide 0.03g of N/100 ml. of different nitrogen sources. Results are given in Table 4.

Table 4. *Growth of* H. tetramera *and* F. oxysporum *on different nitrogen sources*

Nitrogen source	H. tetramera		F. oxysporum	
	Final pH	Average dried mycelial wt. (mg)	Final pH	Average dried mycelial wt. (mg)
Inorganic N-source				
Potassium nitrate	6.5	632	5,0	187
Sodium nitrate	7.0	380	5.0	252
Ammonium nitrate	7.0	458	5.0	280
Calcium nitrate	6.0	670	5.6	380
Ammonium chloride	7.0	—	5.5	I30
Ammonium phosphate	6.5	301	5.0	100
Ammonium sulphate	6.5	313	5.0	130
Organic N-source				
Peptone	6.0	649	5.0	189
Asparagine	6.5	475	5.0	293
Urea	6.5	466	5.0	335
Control	7.0	—	5.5	—

H. tetramera
Initial pH=7.0
Incubation temperature=25°C
Incubation period=8 days
(–)=absence of growth

F. oxysporum
Initial pH=5.5
Incubation temperature=25°C
Incubation period=8 days
(–)=absence of growth

DISCUSSION

Physiological studies of *H. tetramera* and *F. oxysporum* showed that malt extract broth supported the maximum growth at the 25°C. It may be noted here that Lilly and Barnett (1951) and Cochrane (1958) also recorded 25°C as the optimum temperature for supporting the growth of most of the fungi. Results reveal that pH 7 (Table 1) and pH 5.5 (Table 2) were found to support the maximum growth of H. *tetramera* and is to be *F. oxysporum*

respectively. 8 days incubation period was found to be favourable for the growth and sporulation in both the organisms (Tables 1 and 2).

Out of the 13 carbon sources used, glucose supported the best growth *H. tetramera* (Table : 2) followed by other carbon sources. Cochrane (1958) also reported that glucose is the best carbon source for different fungi. In case of *F. oxysporum*, galactose being one of the best carbon sources has also been reported by Cochrane (1958). of the ten nitrogen sources used, calcium nitrate was the best source for both the fungi. In addition all nitrate and ammonium salts supported the growth, which this results is in conformity with Chang and Hudson (1967) who suggested that nitrate nitrogen supports the growth of composting organisms. Urea and asparagine also proved to be the good nitrogen sources (Table : 3) growth was observed in ammonium chloride. It may be concluded that chloride ions inhibit the growth of the two fungi.

REFERENCES

Chang, Y. and H. J. Hudson, (1967). The fungl of wheat straw compost I. Ecological studies. *Trans. Brit. Mycol. Soc.* 50 : 649-666.

Cochrane, V. W. (1958). "Physiology of fungi". John Wiley and Sons. Inc. New York, pp 524.

Garcha, H. S. and Usha Kiran, (1981). Studies of mushroom composts under tropical conditions. *Mush. Sci. XI* (i) : 219–236.

Lilly, V. C. and H. L. Barnett (1951). "Physiology of fungi". Mc Graw Hill Book Co. Inc. New York. pp. 464.

Tuite, J. (1969). "Plant pathological methods". (Fungi and bacteria). Burgess Publ. Co., Minneasapolis. Minn. U. S. A. pp. 12-80.