

Short Communication :

Effect of manganese on growth of fungi obtained from joda mines of Orissa

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Seven fungi were isolated from heavy metal mine soils of Joda (Orissa), India. These fungi exhibited tolerance to manganese salt in broth culture under laboratory conditions. The growth of *Aspergillus* sp. 3 and *Cunninghamella* sp. was found to be more in 0.2% concentration of manganese.

Key words : Manganese, Metal tolerance, Fungi, Bacteria, Growth.

SEVERAL bacteria and fungi from different soils have been reported as tolerant to metal ions^{1,2}. To obtain metal tolerant strains, an attempt has been made to isolate fungi from heavy metal contaminated soils of Joda mines of Orissa and observe its growth under metal stress in laboratory conditions.

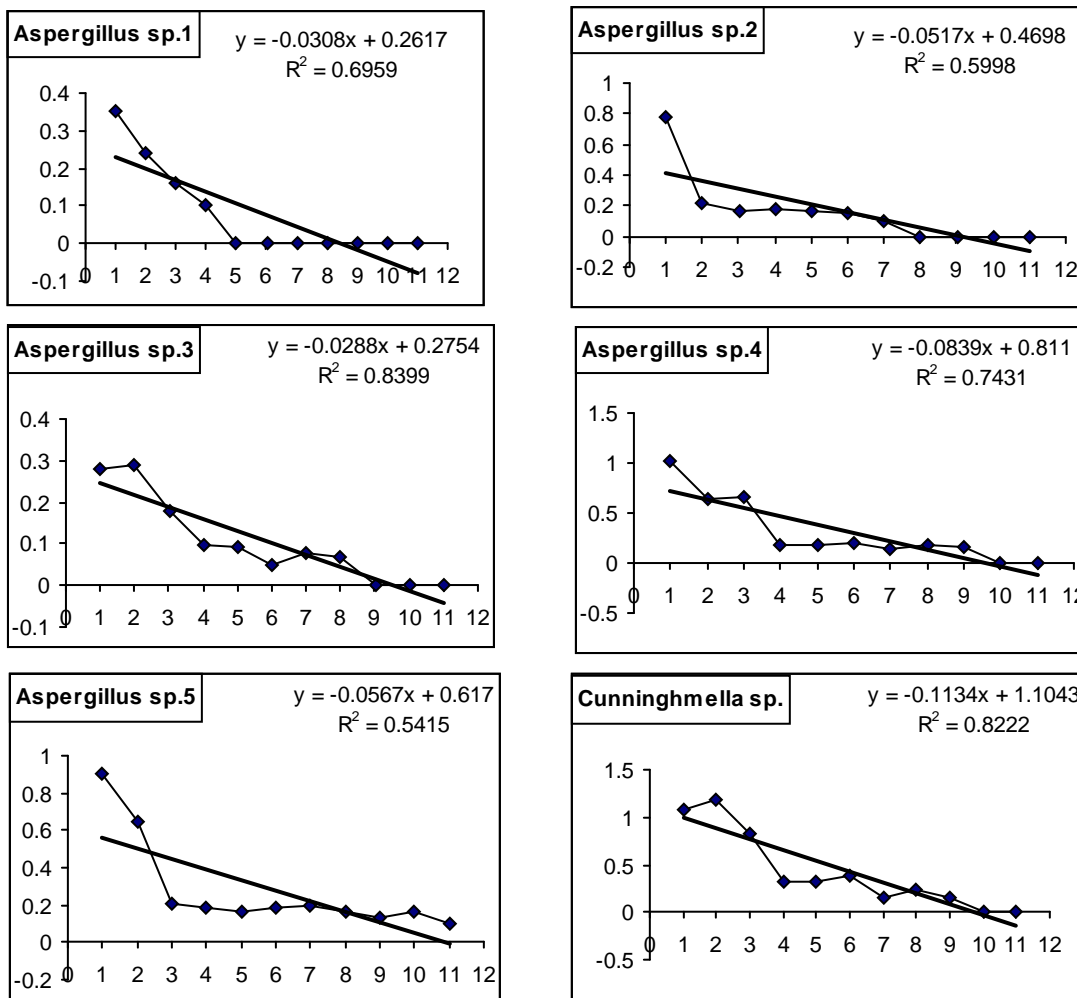
Total 45 soil samples were collected from different locations [A] open cast mine (5 samples), [B] approach to the Quarry (21), [C] upper layer dumping area (9), [D] loading point (1), [E] old plantations (10-15 years, 9 samples) of Joda mine of Orissa.

Serial dilution technique was followed for the isolation of

fungi on Mn Agar base (Hi media) consisted of Beef Extract 1g, yeast extract 0.075g, Manganese carbonate 2g, Ferrous ammonium sulphate 0.15g, Sodium citrate 0.15g. All fungal isolates were characterized morphologically.

Effect of manganese on all 7 fungi was studied by adding MnSO₄ in different concentration from 0.2% to 2% in Czapek's dox medium of 5.5 pH. The medium without MnSO₄ was treated as control. 10 mm fresh culture disc of the fungi was inoculated into the above 25 ml medium (in triplicate) and incubated for 15 days at 30°C. All experiments were set in triplicate. The dry

Fig. 1 : Effect of MnSO₄ on biomass (g) of fungi obtained from Joda mines



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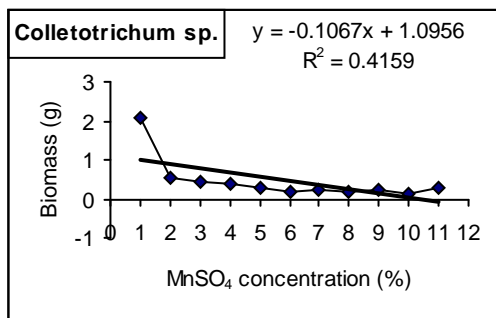
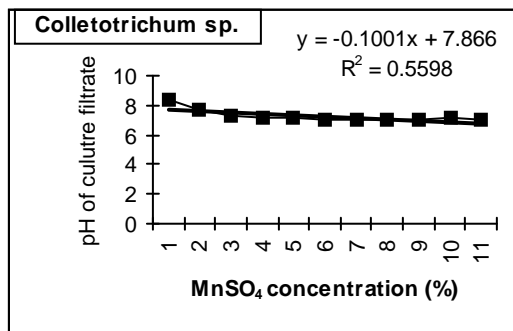
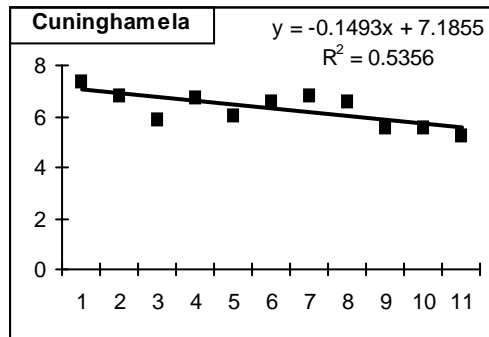
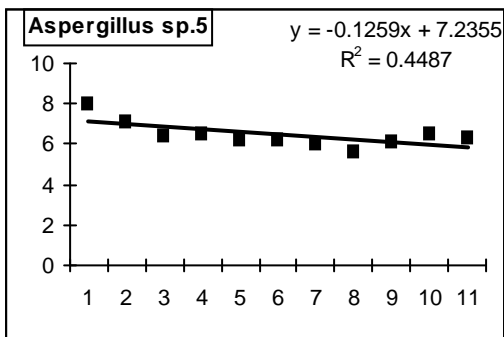
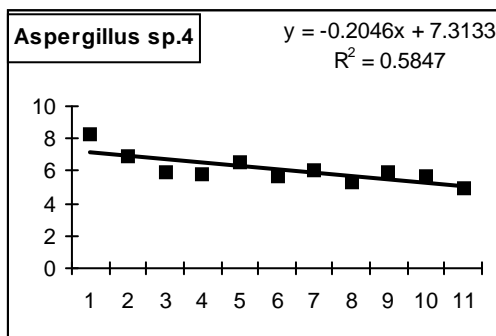
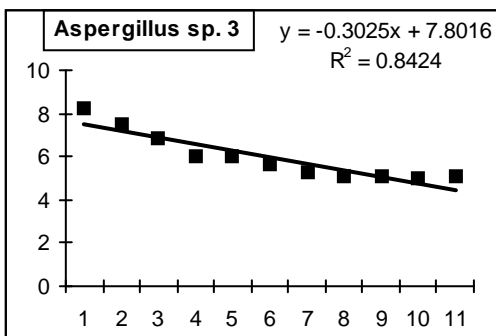
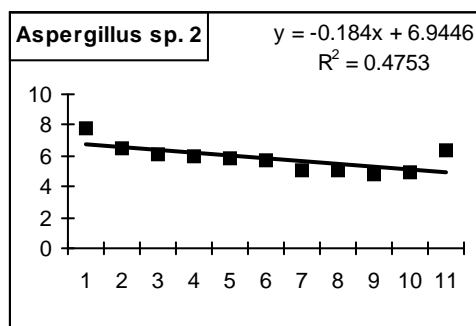
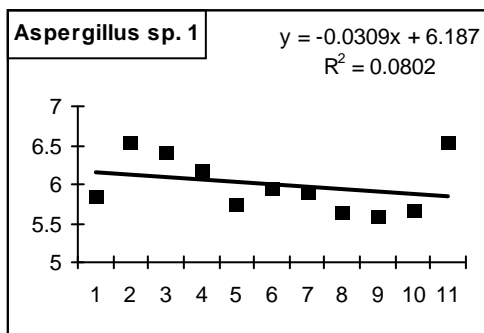


Fig. 2 : pH of culutre filtrate of fungi grown in different concentration of MnSO4



MnSO ₄ concentra	
1	0
2	0.2
3	0.4
4	0.6
5	0.8
6	1
7	1.2
8	1.4
9	1.6
10	1.8
11	2

biomass of fungi was measured by moisture analyzer. pH of the culture filtrate was also recorded.

In the present study, total 7 fungi belonging to *Aspergillus*, *Cunninghamella* and *Colletotrichum* were obtained. The results obtained on the effect of Mn salt on their growth have shown in fig. 1 and 2. In control condition i. e. without Manganese salt except two fungi all have shown decline in their growth and dry biomass. *Aspergillus* sp. 2 and *Colletotrichum* sp. showed very poor growth in presence of Mn salt. The gradual decrease in growth by following the higher concentration of manganese was observed in *Aspergillus* sp.1, *Aspergillus* sp.4, *Aspergillus* sp. 5 where as manganese at the concentration of 0.2% was found to be elicitor for growth of *Aspergillus* sp.3 and *Cunninghamella* sp.

Gradual decline in pH of the culture filtrate was also observed in all fungi grown under stress condition. Where as with out Mn Salt all fungi have shown the alkaline pH of the culture filtrate. There was not significant difference among all fungi tested in this regard. Consistency in pH was exhibited in presence of Mn salt. Our results corroborated with studies of enhancement in acid production through addition of Mn ions^{5,6}. In contrast, unusually it neutralizes the acidic medium also⁷.

Heavy metal resistance in fungi has been investigated in greater detail and a number of metal resistant fungi isolated from different environment⁸. It is known that naturally occurring microorganisms are known to be more tolerant to the metal present in their habitat⁹. It is to be noted that *Aspergillus* sp. 5 and *Colletotrichum* sp. could tolerated the Mn stress upto 2% concentration where as *Aspergillus* sp. 4, *Cunninghamella* sp., *Aspergillus* sp. 2 and *Aspergillus* sp. 3 have shown the tolerance of Mn upto 1.2 to 1.6 % level. Only one fungi *Aspergillus* sp.1 was found to be highly sensitive towards heavy metal and could not resist stress beyond 0.6%. It is exhibited that *Aspergillus* sp. 3 and *Cunninghamella* sp. are among the most metal tolerant fungi for which manganese, in trace quantities, is essential for growth^{3,4,8}.

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REFERENCES

- Altamirano FE, Correa N and Rosas SB** (2000). Tolerance to Mn and Al by soybean rhizobacteria. *Phyton- Int.J. Experiment.Bot.* **66** : 39-42
- Sasaki K, Konno H, Endo M and Takano K** (2004). Removal of Mn(II) ions from aqueous neutral media by manganese-oxidizing fungus in the presence of carbon fiber. *Biotechnology and Bioengineering.* **85** : 489-496
- Raccach** (1985). Manganese and lactic acid bacteria. *Journal of Food Protection.* **48** : 895-898
- Rousch JM and Sommerfeld MR** (1999). Effect of manganese and nickel on growth of selected algae in pH buffered medium. *Water Res.* **33** : 2448-2454
- Zaika L L and Kissinger JC** (1984). Fermentation enhancement by spices identification of active component. *Jof Food Sci.* **49** : 5-9
- Papagianni M, Matthey M, Berovic M and Kristiansen B** (1999). *Aspergillus niger* morphology and citric acid production in submerged batch fermentation: Effects of culture pH, phosphate and manganese levels. *Food Technol and Biotechnol.* **37** : 165-171
- Viet ATN, Senoo K, Mishima T and Hisamatsu M** (2001). Multiple tolerance of *Rhodotorula glutinis* R-1 to acid, aluminum ion and manganese ion, and its unusual ability of neutralizing acidic medium. *Journal of Bioscience and Bioengineering.* **92**: 366-371
- Rama Rao Vepachedu SKV, Akhtar N and Maruthi Mohan P** (1997). Isolation of a cadmium tolerant *Curvularia* sp. from polluted effluents. *Current Science.* **73** : 453-455.
- Rekha P, Kar RN and Mishra RK** (2001). Bioleaching of lowgrade manganese ore using *Penicillium citrinum*. *Indian Journal of Microbiology.* **41**: 33-36

