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Effect of Mercury on Growth and Total Proteins Produced In the Culture Filtrate of Different Fungi

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Abstract: *Five test fungi Aspergillus flavus, Aspergillus niger, Cladosporium herbarum, Curvularia lunata and Trichoderma viridae. Were subject to growth in mercury containing basal medium and level of tolerance was determined at 10, 20, 30, 40 and 50ppm Hg concentrations. The growth parameters adopted to study toxicity and physiological responses is the dry weight of fungi and total protein content in their culture filtrate. It was observed that mercury is highly toxic to the fungi it causes inhibition of growth. Maximum reduction in growth was observed in Cladosporium herbarum and Curvularia lunata. Sporulation was found to decrease in presence of mercury. The total protein content at different concentrations was studied. Maximum decrease in protein content of culture filtrate of all test fungi was observed at 50ppm concentration and maximum increase up to 30 ppm Hg*

I. Introduction

The contamination of agricultural lands caused by heavy metals in and around industrial areas is a serious problem. Such Contamination is due to largely injudicious anthropogenic activities such as indiscriminate use of pesticides containing heavy metals in agriculture, discharge of untreated industrial wastes and effluents, faulty waste disposal,, high rate of burning of fossil fuels, mining etc. (Foy et al., 1978; Mehera and Farago,1994; Vangronsveld and Clijsters, 1994; Prasad,1997). Mercury persists in the environment by its rapid uptake and accumulation, by food chain organisms and contribute potential environmental hazard. In the present investigation an attempt has been made to observe the effect of different concentrations of mercury on growth and total protein content in the culture filtrate of different fungi to evaluate the efficacy of organisms for accumulation of pollutants.

II. Materials And Methods

Estimation of Proteins

The protein content of extract was estimated by Lowry *et al.* (1951) using Bovine Serum albumin as standard. The culture filtrate or aq extract was heated with alkali, allowed to stand for 10 min and then allowed to react with Folin Phenol reagent. Absorbance of the reaction mixture was measured at 545 nm.The fungi *Aspergillus flavus, Aspergillus niger, Cladosporium herbarum, Curvularia lunata and Trichoderma viridae* were grown in the laboratory on potato dextrose broth. For the experimentation, concentration of mercury (as mercury chloride) and fungi were put in to Potato Dextrose Broth

III. Results And Discussion

From the results presented in table 1 to 5 it is observed that there was decrease in dry weight of all the test fungi with increase in concentration of mercury. But *Cladosporium herbarum* and *Curvularia lunata* (table 3 and 4) have shown maximum decrease in dry weight at 10ppm Hg as compared to other fungi. It indicates that even at low concentration of metal growth was inhibited greatly. It is evident from the results (Table 6) that the total protein content was found to be increased at initial concentration where as it is decreased at higher concentration of mercury. Maximum decrease (2.590-2.536=0.054mg, 2.181-0.390=0.791mg, 2.386-1.523=0.863mg, 2.324-1.628=0.696m and 2.142-2.051=0.091mg) in protein content of culture filtrate of *Aspergillus flavus, Aspergillus niger, Curvularia lunata, Cladosporium herbarum and Trichoderma viride* respectively was observed at 50ppm concentration of mercury and maximum increase (2.481-2.720=0.239mg, 2.448-3.000=0.552mg, 2.496-2.534=0.038mg,2.432-2.488=0.056mg, 2.461-2.502=0.041mg) at 30ppm concentration of Hg in the culture filtrate of all test fungi. Mercury is the heavy metal pollutant causing concern in contaminating agricultural lands, particularly in the vicinity of industrial areas, dumping grounds of industrial wastes and national highways which are enriched with mercury (De, 1994). Heavy metals today have a great ecological significance due to their toxicity and accumulative behavior. Mercury is one of the most important pollutants among many toxic elements. According to Paknikar et al., 1993, Fungal cultures are known to show higher towards heavy metals and hence are potential candidates for efficient metal sorption.

From these studies it may be concluded that heavy metals are known to exert harmful effects on the physiology and biochemistry organisms causing health hazards through food chain and also gives support to the study conducted by Bazzaz et al (1974), De (1994) and Prasad (1997). Present investigation emphasized that the test organisms like fungi can be chosen for their tolerance and can be used as accumulators of heavy metal pollution as these metals have a great impact on the biochemical produced by organism also by causing great imbalance in the ecobiological cycle.

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Table 1: Effect of Mercury on growth of *Aspergillus flavus* Link.

Sr. NO.	Mercury (ppm)	Dry weight of *Aspergillus flavus* in mg after days.			
		2	4	6	8
1	Control	150	245	338	430
2	10	50	120	180	210
3	20	50	120	180	210
4	30	40	100	140	190
5	40	40	100	140	190
6	50	40	90	120	170

Table 2: Effect of Hg on growth of *Aspergillus niger* van Tiegh.

Sr. No.	Mercury (ppm)	Dry weight of *Aspergillus niger* in mg after days			
		2	4	6	8
1	Control	60	100	180	270
2	10	50	90	180	260
3	20	50	80	175	258
4	30	40	70	165	250
5	40	35	65	160	200
6	50	30	65	150	220

Table 3: Effect of Mercury on growth of *Cladosporium herbarum* Link.

Sr. No.	Mercury (ppm)	Dry weight of *C. herbarum* in mg after days.			
		2	4	6	8
1	Control	250	390	790	1250
2	10	120	150	190	210
3	20	100	130	180	190
4	30	80	120	150	160
5	40	70	75	85	85
6	50	20	25	30	30

Table 4: Effect of Mercury on growth of *Curvularia lunata* (Wakker) Boedijn.

Sr. No.	Mercury (ppm)	Dry weight of *Curvularia lunata* in mg after days.			
		2	4	6	8
1	Control	200	600	1800	2560
2	10	150	200	220	280
3	20	40	80	140	180
4	30	30	60	90	120
5	40	0.00	20	60	90
6	50	0.00	30	60	60

Table 5: Effect of Hg on growth of *Trichoderma viride* Pers exS. F. Gray.

Sr. No.	Mercury (ppm)	Dry weight of *Trichoderma viride in mg* after days.			
		2	4	6	8
1	Control	80	214	360	555
2	10	180	210	260	410
3	20	60	150	260	380
4	30	50	160	240	380
5	40	40	120	230	330
6	50	60	100	200	250

Table 6: Effect of Mercury on Total Protein content in culture filtrate of different fungi.

Sr. no.	Fungi	**Total Protein content in mg at different concentrations of Hg (ppm) after 8 days.**					
		Control	10	20	30	40	50
1	*A. flavus* Link.	2.100	2.181	2.481	2.720	2.590	2.536
2	*A. niger* van Tiegh.	2.118	2.323	2.448	3.000	2.181	1.390
3	*C. herbarum* Link..	2.365	2.421	2.432	2.488	2.324	1.628
4	*C. lunata* (Wakker) Boedijn.	2.316	2.383	2.496	2.534	2.386	1.523
5	*T. viride* Pers. ExS. F. Gray.	2.218	2.352	2.461	2.502	2.142	2.051