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INFLUENCE OF CADMIUM ON THE GROWTH OF *ASPERGILLUS FLAVUS* ISOLATED FROM SAUDI ARABIAN SOILS

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ABSTRACT

Influence of cadmium on the growth of *A. flavus* isolated from Riyadh city, Saudi Arabia was determined at different concentrations (0, 200, 300, 400 & 500 ppm). 200 and 300 ppm of Cd allowed the growth of the fungus, while 400 and 500 ppm Cd inhibited it. The results would be useful for Cd as pollution indicator.

INTRODUCTION

Toxic effect of heavy metals on the growth of fungi isolated from different places in the world have been well d scribed (Ashida, 1965; Ross, 1975; Gadd & Griffiths, 1980; El-Sharouny et al., 1988; Hashem, 1989, 1993, 1997). They have been also reported to grow in soil contaminated with higher levels of heavy metals as compared to higher plants (Laaksovirta, 1978; Tamamoto et al., 1985).

The main source of Cd pollution to the environment is metal smelters. In addition, roadside soils are polluted with Cd from tires and lubricant oil (Lagerwerff, 1972). The present study is a part of more extensive investigation on the influence of heavy metals on growth of fungi in Saudi Arabia.

MATERIALS AND METHODS

The soil dilution plate method was used for isolation of *A. flavus* to which six replicate plates of peptone dextrose agar containing rose Bengal and Streptomycin was used. For the soil sample, 1 ml portion of the proper dilution was plated. Dishes were incubated for 4 days at 37°C.

A. flavus was grown on (PDA) plates, discs of mycelium were cut from the margin of actively growing colonies using a 4 mm diam sterile cork borer, transferred to 100 ml conical flasks (1 disc/flasks) containing 40 ml malt extract medium to which cadmium had been added as Analar $3CdSO_4 8H_2O$ to give final concentrations of 0, 200, 300, 400 and 500 ppm. The medium was adjusted to pH 5.0 before being sterilized by filtration through millipore filters (0.45 µm). Flasks were incubated at 35°C, harvests were taken at 45 days, mycelia were transferred to preweighed filter papers, thoroughly washed with dionized water, oven-dried at 80°C for 24 h and weighed. Cadmium concentrations in the mycelia were determined by atomic

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absorption spectrophotometer after nitric acid digestion. The pH of the residual media was also measured.

RESULTS AND DISCUSSION

The growth of *A. flavus* at different concentrations of cadmium after 45 days is given in Table 1.

Table 1. Dry weight (mg) of mycelium cadmium concentration (μgg^{-1}), and the change in the pH of the filtered media of the test fungus (n=5, ± standard deviation).

Conc. (ppm)	Mycelium wt. (mg)	Cd conc. (μgg^{-1})	pH
0	30±0.93	0.0±0.0	4.31
200	45±1.01	100±2.31	4.01
300	48±1.35	2300±2.89	3.99
400	28±0.078	2668±3.01	3.71
500	23±0.38	3010±3.11	3.01

As compared to control there was stimulation of growth in 200 and 300 ppm/Cd. There was a significant reduction in the yield at 500 ppm/Cd, addition of Cd led to a greater reduction of yield. In the present study while the test fungus showed different levels of susceptibility to Cd at high concentrations, they showed an increased yield at lowest level of Cd. Therefore, Cd was presumably transported into the fungal cells at this concentration. The survival of *A. flavus* at higher concentration of Cd was due to an adaptation of the test fungus to these new habitats.

Hashem (1993) reported that *A. flavus* can survive in a liquid medium containing upto 300 ppm/Cd. The change in the pH's of the residual media is given in Table 1. The pH affects cadmium toxicity and influences the form and chemical mobility of Cd, a low pH increases the solubility of metals in soil (Hutchinson & Collins, 1978). In the present study, increasing Cd concentrations were associated with increasingly unfavorable pH's for fungal growth. The pH of the filtered media of all concentrations had decreased after 45 days of growth.

While the test fungus, examined showed different levels of susceptibility to Cd at high concentration, the yield of *A. flavus* was increased at 200 and 300 ppm/Cd as compared to control. This is probably because Cd is an essential element for all micro-organisms.

Cadmium concentrations (μgg^{-1}) in the mycelium of *A. flavus* after 45 days of growth are given in Table 1. It is clear from this table that there is some evidence for accumulation of Cd by the test fungus but it cannot be determined from the present study whether this arose from a wall binding or intracellular concentration. Hashem (1991) found that there are high levels of Cd tolerance in mycorrhizal fungi.

The present investigation showed that the resistance of the test fungus to Cd plays a role in exclusion of this metal from the soil. This could be useful as indicator of heavy metal pollution in Saudi Arabia.

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