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Effect of *Coriandrum sativum* extract on Arsenic induced toxicity on Catalase content in the freshwater Bivalve *Lamellidens consorbinus*

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ABSTRACT
The salts of heavy metal, released from commercial, and industrial sources pass into aquatic ecosystems. Heavy metals are the most toxic pollutants because of their non-degradable nature. The heavy metals enter into the bodies of aquatic animals and reach up to non-target animals i.e. man through the food chain. Predictably, aerobic life leads to the formation of harmful reactive oxygen species (ROS) which participate in biomolecule oxidation, hence enhancing biomolecule turnover. Organisms have adapted to counteract the toxic effects of ROS by developing antioxidant defenses which comprise enzymes and low-molecular-weight scavengers. The present work was conducted, to study the effect of coriander extract on Arsenic induced toxicity on Catalase activity in the freshwater Bivalve Lamellidens consorbinus . The effect was studied under five groups. Bivalves of Group 'A' were maintained as Control, Group 'B' Bivalves were exposed to chronic LC50/10 dose of Arsenic trioxide (0.304 ppm), while Group 'C' Bivalves were exposed to chronic concentration of Arsenic trioxide along with 5 ml/L of coriander extract for 18 days. Catalase content in Bivalves from all groups was estimated after 6, 12 and 18 days. After 18 days of exposure to Arsenic trioxide bivalves from the 'B' group were divided into two groups into 'D'&'E' groups. Bivalves of the 'D' group were allowed to cure naturally while those of 'E' were cured with coriander extract (5 ml/lit). Catalase content in bivalves from these D & E groups was studied after 6, 12 & 18 days. A significant decrease in Catalase content was observed in 'B' group bivalves as compared to group 'A' (control). The group 'C' bivalves showed more catalase content than those group 'B' bivalves. The group 'E' bivalves showed fast recovery and more catalase content with coriander extract than those of group 'D' bivalves which were allowed to cure naturally.
Keywords: *Lamellidens consorbinus , toxicity, Mercury chloride Coriander, Catalase*

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INTRODUCTION

The excess contamination of organic and inorganic contaminants creates aquatic pollution, which has altered its water quality and adversely affected the biodiversity of the river. The heavy metals have prolonged persistence i.e. non-biodegradability in nature. Excess deposition of heavy metals and their accumulation in organisms causes a toxic effect on the body [5]. The major source of contaminants is untreated or partially treated effluents of the industries, which are directly discharged into the river streams [8]. Under normal physiological conditions, a balance is maintained between generation and neutralization of reactive oxygen species (ROS). However, when organisms are subjected to xenobiotic compounds, the rate of production of ROS, such as superoxide anion radicals (O2 •−), hydrogen peroxide (H2O2), hydroxyl radicals (•OH) and peroxyl radicals (ROO−) exceeds their scavenging capacity. All organisms have their own cellular antioxidative defense system (ADS), with both enzymatic as well as nonenzymatic components. An enzymatic pathway consists of the main enzyme, catalase (CAT). CAT catalyzes the molecular O2− molecules to H_2O_2 which is reduced to water. CAT is a very important enzyme of the ADS in freshwater organisms. Many studies have shown positive correlations between levels of antioxidant defenses and the influence of environmental conditions [7]. The digestive gland was selected according to its function in the regulation of body metabolism.

MATERIAL AND METHODS

a) Arsenic trioxide, phosphate buffer
b) freshwater bivalves (*Lamellidens consorbinus*),
c) *Coriandrum sativum* extract

METHODS

PREPARATION OF ARSENIC TRIOXIDE STOCK SOLUTION: - dissolve 1.320 gm AS2O3 in water containing 4 gm of NaOH – dilute to 1 litre. (1ml stock solution = 1mg Arsenic).

PREPERATION OF AQUEOUS EXTRACT: The aqueous extract of *Coriandrum sativum* (L) was prepared by purchasing fresh green coriander from local market in Nashik (M.S.) India. The leaves were finely chopped before extraction, the leaves were dried under shade and powdered with the mechanical grinder of which 100 gm powder was added to 500 ml distilled water. After 24 hours maceration was done at room temperature, the mixture was then heated for 30 minutes in the water bath at 650C. The extract was filtered, concentrated by heating over the water bath at 650C. The extract was stored at 40C and used to treat animals as needed. Bivalves were collected from Darana River Nasik and were acclimatized in the lab condition at room temperature for 2-3 days. The active acclimatized bivalves of around the same size and weight were selected for the experiment. Bivalves were divided into group 'A' animals were maintained as control; group 'B' animals have exposed to chronic doses of Arsenic trioxide (0.304 ppm) while group 'C' bivalves were exposed to the chronic dose of Arsenic trioxide (0.304 ppm) with coriander extract (5 ml/L) up to 18 days. After exposure of 18 days to Arsenic trioxide (0.304 ppm), the bivalves from group 'B' were divided into two subgroups 'D'and 'E' group. The bivalves of group 'D' were allowed to self-cure naturally in normal water and the bivalves of group E were exposed to 5ml/lit extract of *Coriandrum sativum* (L) up to 18 days. During experimentation, bivalves were feed on freshwater algae. Bivalves from group 'A','B','C', D'and 'E' bivalves were removed and were dissected on the ice after 6, 12 and 18 days. The hepatopancreas tissues were removed. The removed wet tissue of hepatopancreas was homogenate in the blender with M/150 phosphate buffer at 1-40c and centrifuge. Stir sediment with cold phosphate buffer and allows standing in the cold with shaking occasional then repeating the extraction once or twice and using the supernatant for assay of catalase by Aebi [11] method by observing absorbance of H_2O_2 at 240 nm as nkat/mg protein (1kat=1mol sec-1).

RESULT

The catalase content data from table 1.1 indicate that the catalase content in presence of Arsenic trioxide (0.304 ppm) in group 'B' animals was found to be decreased with increased in exposure period as compared to the controlled group 'A'. The Catalase Content of the controlled group 'A' bivalves was in the range of 50.2 to 49.6 nkat/mg protein. The catalase content data from table 1.1 Catalase content in presence of arsenic trioxide was in the range of 49.3 to 48.7 nkat/mg protein up to 18 days. The catalase content was more in bivalves exposed to Arsenic trioxide with *Coriandrum sativum* extract in group 'C' animals was noted in the range 49.5 to 48.9 nkat/mg protein. The catalase content of group 'D' was in the range of 49.7 to 50.9 nkat/mg protein and group 'D' animal was in the range of 49.9 to 51.9 nkat/mg protein.

DISCUSSION

Oxidative stress is caused when the balance between prooxidant and antioxidants is disturbed when the prooxidant is more than the antioxidant. DNA damage and lipid peroxidation can be induced by reactive oxygen species and lead to chronic health problems such as aging cancer Alzheimer's and Parkinsons disease. Antioxidants are compounds that act as inhibitors of the oxidation process that eliminate the threat of pathological processes. The ROS production is continuously balanced by natural antioxidative defence system in healthy individuals [2]. Therefore, in recent years the search for natural antioxidants of plant origin. The plant *Coriandrum sativum* extract contains oil linalool which consists of flavonoids, quercetin, monoterpene citronellol camphor, and geraniol analyzed [4]. The phytochemical analysis of *Coriandrum sativum* showed that it contained essential oil, tannins, and terpenoids, reducing sugars, alkaloids, phenolics, flavonoids, fatty acids, sterols and glycosides [3] also studied that, the aqueous extract of *Coriandrum sativum* leaf and shoots exhibited antioxidant activity in a β-carotene/linoleic acid model which contains antioxidant properties that protect cells from the adverse effects of oxidative stress caused by ROS. The digestive gland is the site of multiple oxidative reactions, therefore, be a site of free radical generation. The activities of the antioxidant enzyme, fresh juice of *Coriandrum sativum* lowers lipid peroxidation flavonoids are a major class of phenolic compounds that are present in Coriandrum sativum. Due to their lower redox potential flavonoids are thermodynamically ready to decrease greatly oxidizing free radicals by hydrogen atom donation. Therefore, it is confirmed that flavonoids in the compound have

antioxidant activity [6]. The catalase enzyme which is present in animal, plant cells and aerobic bacteria which is an important enzyme of the defense system against oxidative stress. It converts Hydrogen peroxide to water and molecular oxygen and acts as an oxidizing agent. In the present study, the fresh juice of *Coriandrum sativum* increases the level of catalases. Both leaves and seeds of coriander contain antioxidants but leaves contain more number of antioxidants than seeds [10]. The chemical compounds present in coriander extract attach to toxic metals and remove them from cells [1]. All organisms have their own cellular antioxidative defense system (ADS), one with enzymatic and the other with the non-enzymatic component. Catalase is part of the enzymatic antioxidative system. CAT reduces hydrogen peroxide to water and molecular oxygen. ADS plays an important role in maintaining cell homeostasis. Arsenic caused a significant decrease in antioxidant enzyme activity and this effect was reversed in groups treated with plant extract. In the present study enzyme catalase in hepatopancreas were found decrease after chronic exposure to Arsenic trioxide and were found more in chronic exposure to Arsenic trioxide with *Coriandrum sativium* (L) extract. The freshwater bivalves *Lamellidens consorbinus* showed fast recovery of tissue in presence of *Coriandrum sativium* (L) extract than those allowed to cure naturally in normal water

Table 1.1 Catalase content in Hepatopancreas of *Lamellidens consorbinus* , after chronic exposure to heavy metal salt Arsenic trioxide without & with Coriander extract.

Sr. no.		**Body tissue**	**Catalase content (nkat/mg protein)**					
Treatment			**6 days**	**12 days**	**18 days**	**24 days**	**30 days**	**36 days**
(A) Control		H	50.2	49.8	49.6			
(B) 0.304 ppm AS2O3		H	49.3	49.1	48.7			
(C) 0.304 ppm AS2O3 + coriander extract (5 ml/lit)		H	49.5	49.2	48.9			
Bivalves	(D)	H				49.7	50.7	50.9
Pre-exposed	Normal water							
to AS2O3	(recovery)							
(0.304								
ppm)	(E)	H				49.9	50.8	51.9
for 18 days	Water + coriander Extract (5 ml/lit)							

H.- Hepatopancreas

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