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Research Article

ASCORBATE EFFECT ON THE LEAD CHLORIDE INDUCED ALTERARTIONS IN THE PROTEIN CONTENTS OF THE FRESH WATER FISH, CHANNA ORIENTALIS (SCHNEIDER)

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ABSTRACT

Fresh water fishes, *Channa orientalis* were exposed to chronic dose of $PbCl_2$with and without ascorbic acid. Protein content from ovary and gills were estimated. Remarkable decrease in protein content was observed in lead exposed fishes as compared to control. Increase in protein content was observed in $PbCl_2$ along with ascorbic acid than those exposed to only lead. Fishes exposed in ascorbic acid showed fast recovery than those which were allowed to cure naturally.

INTRODUCTION

Heavy metals occur naturally in a fairly low concentrations in aquatic environment added principally through erosion, land drainage and volcanic activity. In recent years high concentrations of heavy metals are entering the aquatic system due to the injudicious and unprogrammed discharge of industrial wastes, agricultural effluents and sewage waters. Recently, the Ogba and Yangtze rivers which were considered safe for drinking water also contaminated by the heavy metals like Cu, Mn, Zn, Cd, Hg, Cr, Ni and Pb and the fishes in it higher levels of metals bio-accumulated in their tissues reported unsafe for human consumption, Yi and Zhang, (2012). More than permissible levels of heavy metals were reported in water and sediment, and plankton and fish tissues in lakes and seas, Luo *et al*., (2013).However, considerable amounts of cadmium accumulate in the gill, liver and kidneys mostly bound to an inducible low molecular weight protein called metallothionein by Vergauwen *et al*., (2013).

Fishes are widely used to evaluate the health of aquatic ecosystems because pollutants build up in the food chain and are responsible for adverse effects and death in the aquatic systems Borane *et al*., (2013). Nutritional value of fish depends on their biochemical composition which is affected by pollution reported by Gehan, (2012).The pollutant damage to different organs or disturbs the physiological and biochemical processes within the organism. Proteins are most important and complete group of biological materials performing different biological functions are essential organic constituent which play a vital role in the cellular metabolism. Rao *et al*.,(1994) studied the ascorbate effect on methyl mercury toxicity in reproductive organs of guinea pigs and found the recovery in the metabolic functions of the reproductive organs and beneficial effect of ascorbic acid against methyl mercury toxicity It indicate positive role of ascorbic acid in detoxification. Hence to study the role of ascorbic acid on protein metabolism in tissues of fishes, *Channa orientalis* after the exposure to lead chloride for chronic concentration.

MATERIALS AND METHODS

Medium sized fresh water fishes *Channa orientalis* were collected from Shiven river area Nandurbar Dist. Nandurbar. The physico-chemical parameters of the water used by the methods APHA and AWWA (2005). Fishes were divided in to three groups A, B and C. Group A fishes were maintained as a control. Group B fishes were exposed to $LC_{50/10}$ dose of Pb^{++}

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(2.867ppm) as lead chloride for 45 days, while group C fishes were exposed to chronic concentration of lead chloride with ascorbic acid for 45 days. Fishes from B groups were divided into two groups after 45 days exposure to Pb into D &E groups. Fishes of D groups were allowed to cure naturally while E groups were exposed to ascorbic acid. ovary and gills from A, B and C group fishes after 15, 30 and 45 days of exposure and from D and E groups after 5 and 10 days of recovery were removed and dried at 80 ºC in the oven till the constant weight of dry tissues were obtained. From dry tissue powders proteins were estimated by Lowry's *et al*, (1951). Bovine serum albumin as a standard.

RESULTS AND DISCUSSION

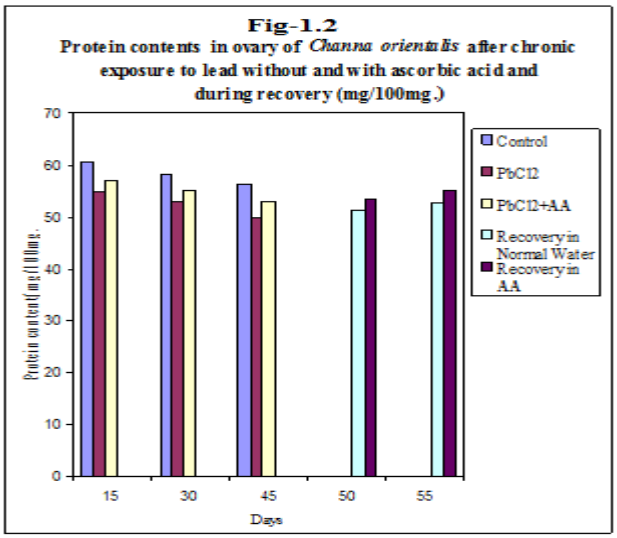
Proteins are importance organic substances require in tissue building and repair, under stress condition protein supplies energy in metabolic pathway and biochemical reaction. Decreased protein level in experimental tissues as compare to control may be due to stress induced by heavy metal. Depletion of protein content at chronic exposure of heavy metal to freshwater fish, *Channa orientalis* suggest the possible utilization of protein for various metabolic purpose of enhanced property proteolysis to meet under pollution stress condition. The high energy demand The physico-chemical properties given in Table No 1 while the protein contents in different tissues after exposure to lead with and without ascorbic acid and during recovery are given in the Tables 2 to 3. After chronic exposures to lead chloride, protein contents in the different tissues of *Channa orientalis* were found to be depleted. The changes in the protein contents of a tissue due to heavy metal stress indicate the changes in the activity of the organism. It reflects in the utilization of their biochemical energy to counteract the toxic stress. In the presence of ascorbic acid the protein depletion is less as compared to those of lead chloride intoxicated fishes.

The fishes pre-exposed to heavy metal salts showed fast recovery in the protein level in the presence of ascorbic acid than those allowed to cure naturally. Decline in protein may be due to enhanced protein catabolism, lead causes depletion of protein bound sulfhydryls with an increased oxidative stress to cell, Singh *et al*., (2005).The depletion in tissue proteins of *Labio rohita* may be due to impairment or low rate of protein synthesis under metal ion stress by Nanda and Behera, (1996). Bais and Lokhande, (2012), studied the cadmium chloridetoxicity in freshwater fish, *Ophiocephalus stiatus* and reported reduction in protein level in various tissue. Gopala Rao *et al*.,(2006), reported that protein serve as energy source during stress condition also showed decreasing trend in the tested organ, maximum depletion was observed in liver, muscle and gill followed by kidney and brain depletion was equal in liver and muscle. Waghmare and Wani, (2016), reported an insecticide confider induce changes in the normal level of protein in tissues of freshwater fish, *Channa gaucha*. It affect the natural food value of fish.

Ascorbic acid is a low-molecular weight antioxidant molecule that protects the cellular compartment from hydrophilic oxygen-nitrogen radicals; a property that makes it an efficacious antioxidant of the hydrophilic phase, Ogutcu *et al*., (2008). Ascorbic acid is essential for normal development and in most species it is produced endogenously, resembling a hormone. Lead is ubiquitous environmental toxin that induces physiological, biochemical, affects the structure and functions of various organs and tissues, Flora, (2002). In present study depletion of protein content in different tissues of lead chloride treated animals due to alterations of membrane permeability. The recovery of protein contents on ascorbic acid plays an important role against lead chloride toxicity in *Channa orientalis*. The effect of toxic metal can be protected by ascorbic acid not only confers protection against lead toxicity, but it can also perform therapeutic role against such toxicity.
Ascorbic acid is antioxidants, spares the other oxidants by forming the first line of defense against free radicals and peroxides that are generated during cellular metabolism, May,(2000).

Table 1 Physico-chemical parameters of water used for experimentation

Temperature	**25·1 ± 3·2^0**
PH	7 · 6 0 ± 0 · 3
Conductivity	140 ± 15.7 µ mho$^{-cm.}$
Free Co2	3·34 ±1· 3ml$^{-1.}$
Dissolved O2	6·3 ± 1·1ml$^{-1.}$
Total Hardness	204 ± 12·0mg $^{-1.}$
Total Alkalinity	585·6 ± 32.8 mg $^{-1.}$
Magnesium	31·67 ± 2.9 mg $^{-1}$
Calcium	30·46 ± 3.06 mg $^{-1}$
Chloride	107·92 ± 16.34 mg $^{-1.}$



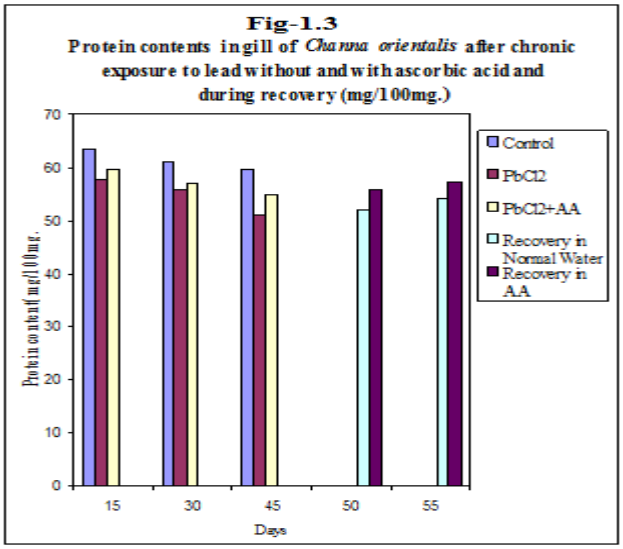


Table 2 Protein contents in the ovary of *Channa orientalis* after chronic exposure to Pb^{++} without and with ascorbic acid and during recovery. (Values represent % in dry wt.)

Treatment	15d	30d	45d	50d	55d
Control	60.47± 0.3907	58.22± 0.2531	56.24±0.2593	--	--
Pb^{++} (2.867ppm)	54.95 ± 0.3610*** (-9.12)	52.97 ± 0.2185*** (-9.01)	49.68 ± 0.2437*** (-11.68)	--	--
Pb^{++} (2.867ppm) + AA	57.02 ± 0.4586** (-5.70)	55.13 ± 0.1733*** (-5.30)	53.09 ± 0.1534*** (-5.60)	--	--
Recovery in Normal water	--	--	--	51.38± 0.4336 $^{\Delta}$ [+3.42]	52.63± 0.5577$^{\Delta}$ [+5.93]
Recovery in AA	--	--	--	53.44± 0.3243$^{\Delta\Delta\Delta}$ [+7.56]	55.06±0.2316$^{\Delta\Delta\Delta}$ [+10.86]

Table 3 Protein contents in the gill of *Channa orientalis* after chronic exposure to Pb^{++} without and with ascorbic acid and during recovery. (Values represent % in dry wt.)

Treatment	15d	30d	45d	50d	55d
Control	63.44± 0.3610	61.12± 0.2583	59.68±0.3682	--	--
Pb^{++} (2.867ppm)	57.58 ± 0.2860*** (-9.23)	55.68 ± 0.2315*** (-8.90)	51.18 ± 0.1735*** (-14.24)	--	--
Pb^{++} (2.867ppm) + AA	59.68 ± 0.1566*** (-5.92)	57.15 ± 0.1982*** (-6.49)	54.72 ± 0.3149*** (-8.31)	--	--
Recovery in Normal water	--	--	--	52.16± 0.2022 $^{\Delta}$ [+1.91]	54.28± 0.3057$^{\Delta\Delta}$ [+6.05]
Recovery in AA	--	--	--	55.67± 0.2501$^{\Delta\Delta\Delta}$ [+8.77]	57.18±0.1552 $^{\Delta\Delta\Delta}$ [+11.72]

AA = Ascorbic acid (50 mg/l., ± indicates S.D. of three observations.
Values in ( ) indicates percent change over respective control.
Values in [ ] indicates percent change over 45 days of respective B.
*indicates significance with the respective control. $^{\Delta}$ indicates significance with 45 days of respective B.
p<0.05 = * & $^{\Delta}$, p<0.01 = **& $^{\Delta\Delta}$, p<0.001 = *** & $^{\Delta\Delta\Delta}$, ^{NS} and $^{\Delta NS}$ = Not significant

Ascorbic acid reduces lead level in the body by decreasing the rate of intestinal absorption, Gurer, *et al.,* (2001). Lead poisoning in the kidney of rats was prevented of by calcium and ascorbic acid supplementation reported by Sumathi and Jeyanthi, (2005). L-ascorbic acid is an essential nutrient not only for humans, but for certain animal species. Ascorbate reacts with oxidants of the reactive oxygen species such as the hydroxyl radical, a product of hydrogen peroxides by Padayatty *et al*., (2003).

CONCLUSION

The study has shown that chronic role of lead causes an alteration in protein indicating damages to organs ovary and gills. Treatment with vitamin C along with lead shown increase in protein. Recovery of protein more in ascorbic acid than lead due to its antioxidant effect. It is clear indicate that lead affects the natural food value of fish.

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