International Journal of Innovative Research and Review ISSN: 2347 – 4424
Online, International Journal, Available at http://www.cibtech.org/jirr.htm
2022 Vol.10, pp.16-21/Mahajan
***Research Article** (Open Access)*

BIOEFFICIENCY OF EXTRACT FROM CORIANDER ON MERCURY INDUCED PROTEIN CONTENT IN GILLS OF FRESH WATER BIVALVE, *LAMELLIDENS MARGINALLIS*

***P. R. Mahajan**
Department of Zoology, Sardar Vallabhabhai Patel Arts and Science College,
Ainpur, Tal - Raver, Dist. Jalgaon - 425509
**Author for Correspondence: prmahajan1971@gmail.com*

ABSTRACT
Bioefficency of extract from coriander in the detoxification due to mercury chloride intoxication in the protein content in gills tissues of fresh water bivalve, *Lamellidens marginallis* has been studied.The effect of $HgCl_2$ and bioefficency of extract of coriander were studied under three groups. Group A bivalves was maintained as control, Group B was exposed to chronic cocentration of 96 hours ($LC_{50}/_{10}$ doses of $HgCl_2$,0.169 ppm) for 12 days, while group C bivalves were exposed to respective chronic concentrations of heavy metals with 5 ml/lit extract of *coriandrum sativum* L. Protein content from gills of control and experimental bivalves from different group were estimated after 4, 8, 12 days. After 12 days mercuric chloride treated bivalves were allowed to recover in normal water with and without extract of coriander upto 24 days and protein content was estimated. Total protein was estimated by Lowry et al method (1951). Protein content was found to be more with gills tissues exposed to extract with $HgCl_2$ as compared to those exposed in without extract. Bivalves showed fast recovery with extract of *coriandrum sativum* in comparison to normal water recovery.

Keywords: *Bivalve, Lamellidens marginalis, Coriandrum sativum, Bioefficency, Protein*

INTRODUCTION

In agricultural practice and Industrial revolution is taking place in today's world to fulfil the needs of food the rising population. The increase demand of synthetic chemicals such as pesticides, fertilizers, biocides and many industrial by products are increasing as population is increasing and creating pollution problems. Therefore freshwater organisms are affected by anthropogenic activities.It causes a reduction in the quality of the aquatic environment that results in impaired level of dissolved oxygen (DO), pH, temperature, biological oxygen demand, and chemical oxygen demand (Robert, 2001). Due to this activities aquatic life is always under stress (Kaplan *et al.*, 2011; Turja *et al.*, 2013).

Mercury is a naturally occurring metal. It is the only metal on earth which is liquid at room temperatures. Metallic mercury is the pure form of mercury. It is a shiny, silverwhite, odorless liquid, much heavier than water. Metallic mercury is used in oral thermometers, barometers, sphygmomanometers (devices used to test blood pressure), wall thermostats for heating and cooling, fluorescent light bulbs/tubes, some batteries, electric light switches, some indoor gas meter regulator.It is one of most dangerous non essential heavy metal. It exists in environment in varieties of forms with different toxicity (Clarkson and Magos, 2006). Levels of mercury in bivalve molluscs are not likely to pose a risk to the health of consumers (Jozef Szkoda,2015).

Heavy or toxic metals are trace metals with a density at least five times that of water. As such, they are stable elements meaning they can not be metabolized by the body and bio-accumulate, usually react with proteins and interfere physiological activities and thus increases the risk of life in various ways. They are difficult to remove from body. Heavy metals have high biological activity and have a tendency to accumulate in organism, Making adverse effects possible at very low levels of expossure. Chelation therapy involves injecting a type of medication called a chelator or chelating agent. Some common

chelators include ethylenediaminetetraacetic acid (EDTA), dimercaptosuccinic acid, and dimercaprol. Chelators work by binding to metals in the bloodstream. Once they're injected into the bloodstream, they circulate through the blood, binding to metals. In this way, chelators collect all the heavy metals into a compound that's filtered through the kidneys and released in urine.

Coriandrum sativum L. (Coriander), belonging to family Umbelliferae, is a herb that is widely cultivated in India and is recognized for its carminative and cooling properties (Sairam, 1998). It is well known that herbs and spices possess antioxidant activity (Schwarz et al., 2001; Tanabe et al., 2002), It was shown that coriander extracts have phenolic compounds and flavonoides, suggesting that these compounds contribute to the antioxidative activity (Helle Wangensteen, 2004).A sorbent prepared from coriander was found to have good efficiency in removing organic and methyl mercury from aqueous solutions (Karunasagar et al., 2005). The leaves and dry fruits of coriander are used as spice in various food preparations. Traditionally coriander seeds (dry fruits) are also used to cure indigestion, cough, bronchitis, vomiting, diarrhea and dysentery, against worms,

Coriander has been reported to exhibit several pharmacological effects such as as antifertility (Al-Said et al., 1987). Antioxidant activity of aqueous extract of coriander on carotene and linoleic acid oxidation has been studied (Melo E.A,2005).The free radical scavenging and antibacterial activity in the extracts of coriander leaves and stem. (Wong and Kitts ,2006). Free radical scavenging and lipid per oxidation inhibition activity in the dichloromethane and aqueous extracts of coriander leaves and seeds (Wangensteen, et al,2004).

This study was carried out to investigate the probable bioefficiency of extract from *coriandrum sativum* L (coriander) extracts on protein content of mercuric chloride intoxicated in an experimental model, the fresh water bivalve, *Lamellidens marginallis.*

MATERIALS AND METHODS

Preparation of aqueous extract of Coriandrum sativum

The plant *Coriandrum sativum* L (1 kg) *was* collected from a local market in savda,Tal – Raver,Dist - Jalgaon (M.S.), India. The dried coriander leaves were ground to a fine powder and were extracted with boiling water (5 L) for 30 min by Soxhlet technique. The filtrate was evaporated at < 70 ^{0}C in a vacuum dryer to give a final yield of 108.69 g. was stored at 4 ^{0}C. It was dissolved in distilled water whenever needed for experiments.

Healthy active animals of approximately same size and weight were chosen. The acclimatized active bivalve, *Lamellidens marginallis* were divided into three groups, such as group A, B, and C. The group A of acclimatized bivalve was kept as control set. The group B of acclimatized bivalve was exposed to chronic concentrations (LC_{50} value of 96 hr/10) of heavy metal salt $HgCl_2$ (0.169 ppm) as chronic doses up to 12 days, while group 'C' of acclimatized bivalve was exposed to chronic concentration (LC_{50} value of 96 hr /10) with 5 ml/lit extract from *coriandrum sativum* L. up to 12 days. After 12 days mercuric chloride treated bivalves were allowed to recover in normal water with and without extract of coriander upto 24 days After 4 days exposure the control and experimental the bivalves were sacrificed to their tissues of gills were separated . The tissues were weighed and they were then kept in hot air oven at 80^{0C} till constant weights were obtained. The dried product was ground to obtain fine powder. From the replicates of three samples the total protein was analyzed by using Lowry's method (Lowry *et al.* 1951) using bovine serum albumin as standard from each powder. The amount of protein was calculated by regression equation and expressed in terms mg/100mg dry powder. During experimentation bivalve were fed on fresh water algae.

RESULTS

The biochemical content of any edible organisms is extremely important since the nutritive value is reflected due to heavy metals.Protein contents in gill tissues of *Lamellidens marginallis* after exposure to

$LC_{50/10}$ concentration of mercuric chloride (0.169 ppm) and $LC_{50/10}$ concentration of mercuric chloride (0.169 ppm) along with extract from *coriandrum sativum* have been summarised in table.Table.1 and 2 shows that the protein contents in gill tissues of *Lamellidens marginallis* in presence of mercuric chloride (0.169 ppm) were decreased with the increase in exposure period. The protein contents were more in heavy metal with extract from *coriandrum sativum* exposed bivalves as compared to those exposed to only heavy metal salts for the corresponding period of exposure.
The bivalves preexposed to heavy metal salts showed fast recovery in the alteration of protein in presence of caffeine than those allowed to cure naturally.Therefore after studies the effect of extract from *coriandrum sativum* on heavy metal it is proved that the extract binding site to connect heavy metal salts and due to this effect of heavy metal is less in animals those exposed in extract of coriander as compared to those exposed only in heavy metal salts.

Table 1: The protein content in tissues of gills of fresh water bivalves,Lamellidens marginallis after chronic exposure to heavy metal salt, $HgCl_2$ with and without 5ml/lit. extract of *Coriandrum sativum.*

Treatment	The protein content (%) ± S.D.		
	4 Days	**8 Days**	**12 Days**
(A) Control	**43.12 ±0.432**	**42.51 ±0.543**	**40.23 ±0.441**
(B) $HgCl_2$ (0.169 ppm)	**37.67 ±0.654 (-12.639 %)**	**34.29±0.546 (-19.336 %)**	**29.45 ±0.409 (-26.795 %)**
(C) $HgCl_2$ (0.169 ppm) + 5ml/lit. extract of coriander	**39.32 ±0.453 (-8.812 %)**	**36.65±0.665 (-13.784 %)**	**31.73 ±0.439 (-.21.302 %)**

Table 2: After 12 days bivalves from group B allow to cure naturally upto 24 days

Treatment	The protein content (%) ± S.D.		
	16 Days	**20 Days**	**24 Days**
(D) Normal water	**31.41 ±0.209 (6.655 %)***	**32.45 ±0.419 (10.186 %)***	**33.43 ±0.334 (13.514 %)***
(E) Normal water with 5ml/lit. extract of coriander	**32.33 ±0.239 (9.779 %)***	**34.73 ±0.489 (17.928 %)***	**36.13 ±0.241 (22.682 %)***

Figure in bracket indicates percent variation in the protein content with respective control
** value compared with value of protein conent after 12 days of group B.*

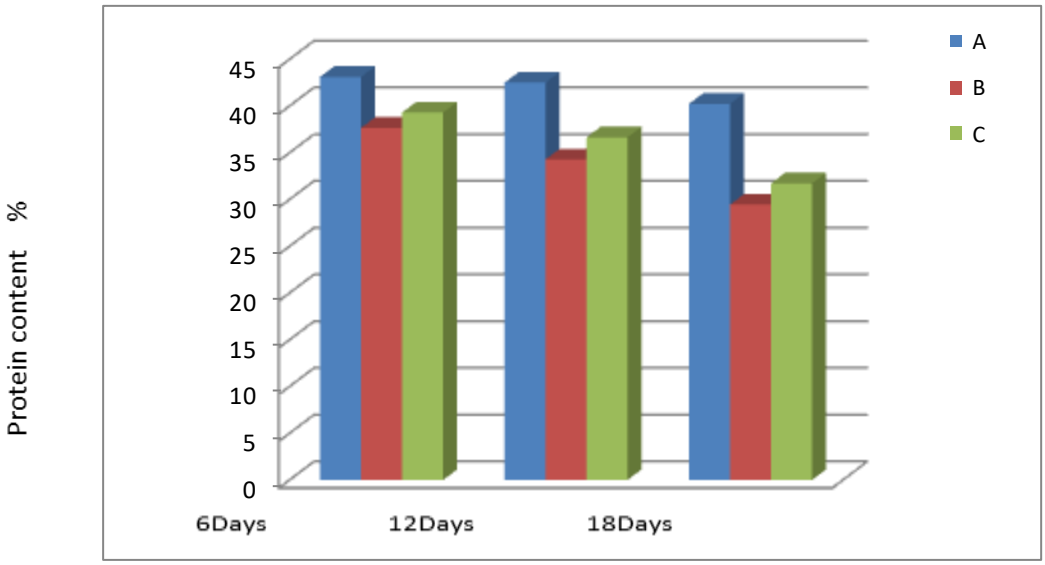

Figure 1

DISCUSSION

Heavy metals affect the metabolism of the freshwater bivalve, *Lamellidens marginallis* . Alterations in metabolic processes following exposure to heavy metal stress have always been used as indicator of stress. But there is a vast difference in the pattern of metal induced physiological alterations from metal to metal & animal to animal. Proteins play a significant role in cellular metabolism, because as a constituent of cell membrane proteins regulate the process of interaction between intra and extra cellular media. A decrease in the protein level in all tissues indicates a rapid initiation of breakdown of protein. To meet energy demands during toxic stress, mobilization of protein might have taken place (Lomte etal, 1982).

The present investigation, in the gill protein content had decreased whereas increased at exposure periods.After 12 days preexposed bivalves to $HgCl_2$ allowded to cure naturally innormal water and normal water along with extract of coriander. The protein content in tissues of gills was more in bivalve those exposed in normal water along with extract of coriander as compared to bivalve expose in normal water.The same trend of reduction in protein content was observed which suggests an increase in the proteolytic activity and possible utilization of its products for metabolic purpose (Mundhe and Pandit, 2014; Shandilya, 2010; Vijayavel, 2006 and Waykar, 2012) . *L.corrianus* showed decrease in protein levels, in proportion with the period of exposure (Nagpure and zambare, 2005).

Leena Kansal et *al* (2011) Studed the protective role of Coriandrum sativum extract against lead and suggests that aqueous and ethanolic extracts of *Coriandrum sativum* can prevent or slow down the oxidative damage induced by lead in mice. The effect of lead on LPO level, GSH concentration, antioxidant enzyme activity and some biochemical variables were reversed by treatment with plant extracts. Chaudhry & Tariq (2006) was found that decoction of *C. sativum* does not have antibacterial potential against G +ve and G -ve bacteria. Similarly, aqueous decoction of coriander was found to have no bactericidal activity against *Helicobacter pylori* (O'Mahony *et al.,* 2005). In contrast, some workers have found that *C. sativum* has strong antibacterial activity against G +ve and G –ve (Al-Jedah *et al*., 2000). Similarly, the compounds aliphatic 2E-alkenals and alkanals, isolated from the fresh leaves of *C. sativum* were found to possess bactericidal activity against *Salmonella choleraesuis* (Isao *et al.*, 2004) Dr. Yoshiaki Omura (1995), has discovered that the herb cilantro will detoxify mercury from neural tissue., is used to help stimulate the appetite and relieves minor digestive irritation. This is a remarkable discovery. It is a novel technique, which greatly increased our ability to clear up recurring infections, both viral and

bacterial. Bioactive Cilantro blend is an inexpensive, easy way to remove (or chelate) toxic metals from the nervous system and body tissues.Coriandrum sativum (coriander) has been reported to have a number of possible medicinal attributes including antispasmodic, carminative and stomachic properties (Alison and Peter, 1999).

In present study, in the fresh water bivalve, *Lamellidens marginallis* , the protein content in gills tissues observed to be decreased in chronic concentration of $HgCl_2$ as compared to the control and $LC_{50}/_{10}$ $HgCl_2$ with 5 ml/lit of aqueous extract of *Coriandrum sativum.* Due to mercuric chloride doses may cause severe disturbances of the metabolism in the bivalves,They required more energy and for that increase the breakdown rate of protein. Those bivalve exposed in $LC_{50}/_{10}$ $HgCl_2$ with 5 ml/lit of aqueous extract of *Coriandrum sativum* showed, more protein content in tissues of gills.

CONCLUSION

In conclusion the current study suggests that aqueous phytoextracts (*Coriandrum sativum)* can protect or slow down the oxidative damage induced by mercuric chloride in *Lamellidens marginallis* . The effect of mercury on protein content in tissues of gills is variables were decrease by treatment with phytoextract. This is indicates to that, The *Coriandrum sativum* extract posses protective ability.

REFERENCES

Al-Said M S , Al-Khamis K I , Islam M W , Parmar N S , Tariq M and Ageel A M (1987). Post-coital antifertility activity of the seeds of *Coriandrum sativum* in rats. *J. Ethnopharmacol* (21) 165-73.

Al-Jedah J H , Ali M Z, and Robinson R K (2000). The inhibitory action of spices against pathogens that might be capable of growth in a fish sauce (Mehiawah) from the Middle East.*International Journal of Food Microbiology* (57) 129-133.

Alison M Gray and Peter R Flatt (1999). Insulin releasing and insulin activity of the traditional anti diabetic plant Coriandrum sativum. *Brit. J. Nut* (81)203- 209**.**

Clarkson T, and Magos (2006). The toxicology of mercury and its chemical compounds. *Critical Reviews in Toxicology* (36) 609-662.

C**haudhry N M A and Tariq P (2006).** Bactericidal activity of black peeper, bay leaf, aniseed and coriander against oral isolates. *Pak. J. Pharm. Sci* (19) 214-218.

Helle Wangensteen, Anne Berit Samuelsen and Karl Egil Malterud (2004). Antioxidant activity in extracts from coriander. *Food Chem* (88) 293-297.

Isao K , Ken-Ichi F, Aya K , Ken-Ichi N and Tetsuya A (2004) . Antibacterial activity of coriander volatile compounds against *Salmonella choleraesuits*. *J. Agric Food Chem* **52**(11) 3329- 3332.

Jozef Szkoda et al (2015): Mercury concentration in bivalve molluscs,Bulletin- Veterinary Institute in Pulawy 59(3):357-360.

Kaplan O, Yildirim N C, Yildirim N and Cimen M (**2011).** Toxic elements in animal products and environmental health. *Asian J. Anim. Vet. Adv*. (6) 228-232.

Karunasagar D, Krishna M V, Rao S V and Arunachalam J (2005). Removal and preconcentration of inorganic and methyl mercury from aqueous media using a sorbent prepared from the plant *Coriandrum sativum. J. Hazard Mater 14(1-3)* 133-9.

Lomte V S and Jadhav M L (1982). Effect of toxic compounds on oxygen consumption in the fresh water bivalve *Corbicula regularis ,comp. physiol Ecol*. 7(1) 31-33.

Leena Kansal 2011): protective role of coriandrum sativum (coriander) extracts against lead nitrate induced oxidative stress and tissue damage in the liver and kidney in male mice, *International Journal of Applied Biology and Pharmaceutical Technology* 2(3) July-Sept -2011 65-83.

Melo E A, Filho J M and Guerra N B (2005). Charact erization of antioxidant compounds in aqueous coriander extract. *Lebensenmittcl Wissenshaft Tech* (38) 15-19.

Mundhe A Y and Pandit S V (2014). Assessment of toxicity of Monocrotophos in freshwater , bivalve *Lamellidens marginallis,* using different markers. *Toxicol Int* 21(1) 51-56.
Nagpure M P and Zambare S P (2005). A study on the impact of tetracycline and chloramphenicol on protein content in different tissues of the freshwater bivalve, *Lamellidens corrianus* (Lea), *J. Comp. Toxicol. Physiol* Vol. 2 (I & II)81-85.
O'Mahony R, Al-Khtheeri H , Weerasekera D, Fernando N, Vaira D, Holton J and Basset C (2005). Bactericidal and anti-adhesive properties of culinary and medicinal plants against *Helicobacter pylori*. *World J Gastroenterol.,* 11(47) 7499-7507.
Roberts R J (2001). Fish Pathology, 3rd Ed. W.B. Saunders, *Philadeiphia*, Pennsylvania, pp. 472.
Shandilya M V, Lomte V S and Patel S I (2010). Biochemical studies on fresh water bivalves *Parreysia favidens* exposed to the distillery effluent. *Bionanofrontier* 3(2) 201-204.
Sairam T V (1998). Home remedies; a hand book of herbal cures for common ailments. (Penguin Books, India), 75.
Schwarz K , Bertelsen G , Nissen L , Gardner P T , Heinonen M I , Hopia A , Huynh-Ba T , Lambelet P, McPhail D , Skibsted L H and Tijburg L (2001). Investigation of plant extracts for the protection of processed foods against lipid oxidation. Comparison of antioxidant assays based on radicalscavenging, lipid oxidation and analysis of the principal antioxidant compounds. *European Food Research and Technology* (212) 319–328
Tanabe H , Yoshida M and Tomita N (2002). Comparison of the antioxidant activities of 22 commonly used herbs and spices on the lipid oxidation of pork meat. *Animal Science Journal* (73) 389–393.
Turja R, Soirinsuo A, Budzinski H, Devier M H, and Lehtonen K K (2013). Biomarker responses and accumulation of hazardous substances in mussels (*Mytilus trossulus*) transplanted along a pollution gradient close to an oil terminal in the Gulf of Finland (Baltic Sea). *Comparative Biochemistry and Physiology C: Toxicology and Pharmacology* **157** (1) 80–92.
Vijayavel K (2006). Interactive effect of monocrotophos and ammonium chloride on the freshwater fish *Oreochromis mossambicus* with reference to lactate/pyruvate ratio Pesticide Biochemistry and Physiology (86) 157-161.
Wong P Y Y and Kitts D D (2006). Studies on the dual antioxidant and antibacterial properties of parsley and cilantro extract. *Food Chem* (97) 505-515.
Wangensteen H, Sa muelsen B A and Malterude EK(2004). Antioxidant activity i n extracts from coriander. *Food Chem* (88) 293-297.
Waykar Bhalchandra and Pulate Prakash (2012). Ameliorating effect of L-ascorbic acid on profenofos induced alterations in the protein contents of the freshwater bivalve,
Lamellidens marginalis (Lamarck). *The Bioscan* 7(1) 35-38.
Yoshiaki Omura (1995). The Heart Disease Research Foundation, New York, NY, USA (Acupuncture Electrotherapy Res. 96; 21 (2) 133-60 and *Acupunct Eletrother Res*. Aug-Dec. 20 (3-4) 195-229.