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EFFECT OF CORIANDER *(CORIANDRUM SATIVIUM L.)* EXTRACT ON ACCUMULATION AND DEPURATION OF THE HEAVY METAL LEAD IN GASTROPOD SNAIL *(BELLAMYA BENGALENSIS L.).*

First Author Details :

S.G.Chinchore[1]
[1]Shri. V.S.Naik College Raver,Dist.Jalgaon(M.S.).

Co - Author Details :

A.G.Patil[2] and P.R. Mahajan[3]
[3]S.V.Patel Arts & Science College,Ainpur,Tal.Raver (M.S.)

ABSTRACT

Present study aimed to examine the usefulness of Coriander *(Coriandrum sativium L.)* extract for elimination of heavy metal bioaccumulated in the whole body tissue of the experimental model animal gastropod snail *Bellamya bengalensis (L.)* The accumulation and elimination of Lead (Pb) was examined by exposing the snail *Bellamya bengalensis(L.)* to 7.350 ppm lead nitrate with and without Coriander *(Coriandrum sativium L.)* extract for 7, 14, 21 days. After 21 days treatment the snails were allowed to cure naturally in normal water and with coriander extract up to 21 days separately. The whole body tissue samples were taken out after every 7 days for metal analysis.There was a gradual increase in heavy metal content with increase in exposure period for lead. The concentration of lead during depuration was found to be decreased with increase in period. However the recovery was faster in those which are treated with coriander extract as compaired to those which are allowed to cure naturally in normal water. The aim of present study was to highlight the antioxidation, heavy metal detoxification, elimination and chelating aspects of coriander.

KEY WORDS: Coriander, Heavy Metal, Lead, Bioaccumulation, Depuration, Gastropod, *Bellamya bengalensis L.).*

INTRODUCTION :

Heavy metal pollution in aquatic ecosystem has been recognized as a serious environmental

problem .In many cases heavy metals occurs in natural water bodies at levels bellow their toxic threshold, however due to their non degradable nature, such low concentrations may still pose risk of damage via uptake and subsequent bioaccumulation by organisms, which cannot effectively metabolized and excrete the absorbed metals (Wayker et al. 2013). Metal bioaccumulation can be of importance of public health point of view, especially when a human consumes the accumulators. Secondly, this phenomenon is now being exploited in assessment of environmental quality, in addition to chemical survey of water and sediments (Javanshir and Shapoori 2011).Heavy metals are persistent and non biodegradable and may pose high toxicity on the aquatic organisms. Lead is considered as toxic metal that causes environmental problems and can be very harmful even at low concentration (Devagi Kanakraj et al. 2009).

As the concentration of metal increases, the accumulation of metal and its damage effect increases (Cain and Louma 1986; Buschiazzoa et al. 2004). Cumulative effects of metals or chronic poisoning may occur as a result of long term exposure.

The gastropod snail Bellamya bengalensis (L.) was chosen to determine the ability for the bioaccumulation of lead nitrate (PbNO3) in their soft parts and to show the extent of their tolerance towards these pollutants in the fresh water ecosystem.

Coriander is a well known herb for its antioxidant properties and contains compounds that are free radical scavengers .Coriander contains the active phenolic acid compounds like caffic acid, chlorogenic acid, vanillic acid, p-coumatic acid, ferulic acid (cis and trans forms) (Rajeshwari *et al.*, 2010, Nambir *et al.,*2010). The flavonoids in coriander leaves have been identified as quercetin (an important free radical scavenger), kaemferol and acaetin (Rajeshwari *et al.*, 2011, Nambir *et al.,* 2010, Deepa et al., 2011). The research of Dr.Yashiki Omura showed that consumption of clientro lowered the level of Mercury in patients via chelation mechanism(Omura,1996).Coriander's antioxidant properties are seen as treatment with SOD, CAT, GPx levels in the tissue of liver and kidney (Sharma , 2011).

In the light of above mentioned medical properties of coriander, this study was carried out investigate the possible protective properties of coriander extract against heavy metal bioaccumulation and elimination from the whole body tissue of model animal Bellamya bengalensis during chronic toxicity treatment of lead nitrate.

Material and Methods:

Selection and collection of experimental animals:

The gastropod snail *Bellamya bengalensis* (Viviparus) were collected from the suki dam near Garbardi village Tal.Raver Dist.Jalgaon (M.S.). The gastropods were acclimatized to laboratory condition for 2 to 3 days, before setting the experiments. Water was changed after every twelve hours. Healthy and active animals of approximately same size (25 to 30 mm) and weight were chosen.

Preparation of aqueous leaves extract:

The fresh green leves of *Coriandrum sativium* (L) (1kg) were collected from a local market in Raver. The leaves were dried at atmospheric temperature .After complete drying the leaves were ground to a fine powder 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 min. in the water bath at 65°c. The extract was filtered, concentrated by heating over the water bath at (65°c). The extract was stored at 4°c and used to treat animals as needed.

Experimental design:

Healthy and active animals of approximately equal size (25 to 33mm) and weight were selected to avoid the experimental bias during the research work. The acclimatized active gastropods were divided in to three groups as A, B and C. The group 'A' gastropods was maintained as control. The group 'B' gastropods was exposed to chronic concentration of heavy metal salt lead nitrate (7.350 ppm) up to 21 days treatment, The group 'C' gastropod was exposed to chronic concentrations of respective heavy metal and 5 ml/lit. of *coriandrum* extract up to 21 days.

After 21 day's exposure, the gastropod snails from group 'B' were divided in to two sub groups as group 'D' and group 'E'. The snails of group 'D' were allowed to self cure naturally in normal water. The snails of group 'E' were allowed to cure in 5 ml/lit extract of *Coriandrum sativium* (L.) up to 21 days. During experimentation the snails were fed on fresh water algae.

Collection and processing of tissue samples:

The tissue mass of whole body of the gastropod snail, *Bellamya bengalensis* (L.) were collected after every seven days and were dried at 80^{oc} in an oven till constant weight was obtained and stored in air tight specimen bottles by waxing the cork outside. The 50 mg sample was taken for digestion. The tissue was digested in 10 ml of acid mixture of Hcl: HNO3 in (3:1) ratio on hot plate till dryness. The digested mixture was kept in water bath for 5-7 hour until the samples were cooled. Cool digested samples were filtered (Whatman grade 541). The samples were analyzed on the instrument atomic absorption spectrophotometer (A.S.).

Observation table:

Bioaccumulation of lead (Pb) in the whole body tissue mass of the gastropod snail, *Bellamya bengalensis (L.)* after chronic exposure to lead nitrate (7.350 ppm) with and without coriander extract and recovery in normal water and in coriander extract has been summarized in table 1.1 and 1.2

Table 1.1. Lead content (µgm /Kg dry weight) in whole body tissue of Bellamya bengalensis (Lamark) after chronic treatment .

Treatment			Pb content µgm/Kg dry weight		
			7 days	14 days	21 days
During 21 days exposer	A	Control	736	736	732
	B	7.350ppm $PbNo_3$	1806 +59.246•	2678 +72.516•	3663 +80.016•
	C	7.350ppm $PbNo_3$ +5 ml /lit coriander extract	1409 +47.977• -28.176?	2012 +63.419• -33.101?	2534 +71.112• -44.554?

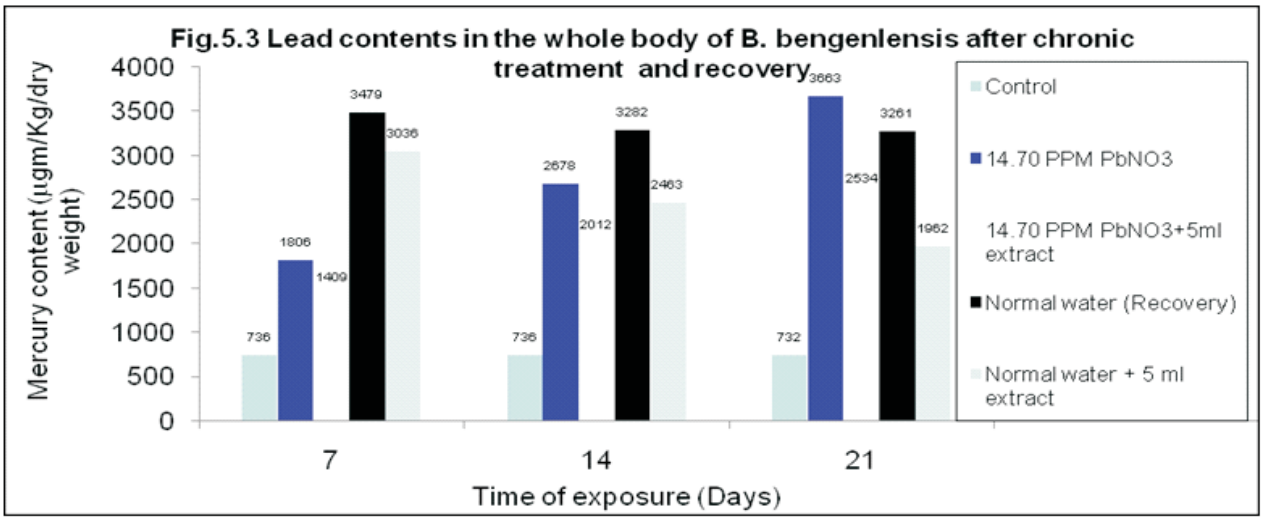
Table 1.2. Lead content (µgm /Kg dry weight) in whole body tissue of *Bellamya bengalensis* (Lamark) after chronic treatment during recovery.

Treatment			Pb content µgm/Kg dry weight		
			287days	35 days	42days
After 21 days exposer to 7.350 $pbno_3$	D	Normal water(recovery)	3479 +78.844• -5.288*	3282 +77.574• -11.608*	3261 +77.552• -12.327*
	E	Normal water+5 ml/lit coriander extract (recovery)	3036 +75.757• -20.652*	2463 +70.117• -48.721*	1962 +62.691• -86.697*

•-Compaired with respect to A

Δ - Compaired with respect to B.

*-Compaired with respect to 21 days of B.



Result:

The bioaccumulation data from Table no. 1.1 indicates that the amount of lead nitrate (PbNo3) accumulated in whole body tissue of animals on exposure to lead nitrate (7.350 ppm), gets increased with increase in exposure period from 7, 14 and 21 days as compaired to control group 'A'. The lead nitrate (Pbno3) contents are expressed in µgm/kg dry weight. The control groups of animals showed minute quantity of lead nitrate ($PbNo_3$) as compaired to the experimental group 'B' and 'C'.

The control group of animals showed 736.0 µgm/kg lead in whole body tissue, while the amount of accumulation of lead in Presence of lead nitrate (7.350 ppm), in the snails group 'B' for 7 days was 1806.0 µgm/kg. The concentration in the tissue was raised after 14 days which was 2678.0µgm/kg. While after 21 days the rate of accumulation was 3663.0µgm/kg. There was a minute change in the accumulation in control group animals. The rate of accumulation was lower in Pbno3 and coriandrum sativium extract (5 ml/lit) exposed snail groups 'C' as compaired to those exposed to only PbNo3 treated group 'B' in respective period of exposure and for 7 days it was 1409.0 µgm/kg, after 14 days it was 2012.0 µgm/kg, while after 21 days it was 2534.0 µgm/kg.

The gastropod snail, Bellamya *bengalensis (L.)* pre -exposed to lead nitrate (7.350 ppm), showed fast detoxification and recovery in presence of *Coriandrum sativium* extract (5 ml/lit.) than those allowed to cure naturally in normal water. The accumulation as observed after 28 days was 3036.0 µgm/kg. after 35 days was 2463.0 µgm/kg., while after 42 days the amount of lead was 1962 .0 µgm/kg. and those allowed to cure naturally in normal water, the rate of accumulation observed for 28 days was 3479.0 µgm/kg., after 35 days , it was 3282.0 µgm/kg. While after 42 days the concentration of accumulated Pb was 3261.0 µgm/kg .

Discussion:

Many workers found that the accumulation patterns of heavy metals are dependent on both uptake and elimination rates (Hakman 1984, Goma *et.al*. 1995).The accumulation of metals in aquatic invertebrates can be divided in to three phases 1) Metal intake, 2) Metal transport, distribution , and sequestration (detoxification) with the organism and 3) Metal excretion (present/ absent).Accumulation strategies of invertebrates vary intra specifically between metals and inter specifically for the same metal in closely related organisms (Rainbow; 2002).

High cost modern medicines and many side effects of these medicines lead people to switch around from modern medicines to herbal medicines for the treatment of many infectiocious diseases (Ambuja s.k.s.; 2012). Mitra *et.al* (2012) reported that the coriander leaves are rich in photochemical such as poly phenol, carotinoids and essential oils like linalool which shows higher free radical scavenging activity .

In present study the accumulation of heavy metal Pb in the whole body tissue of *Bellamya bengalensis (L.)* was found to have similar pattern to that report previously for several gastropod species exposed to various concentrations of heavy metals. In response to increased concentrations of lead nitrate, high level of Pb was observed as compaired to control group of animals. The gastropod snail *Bellamya bengalensis (L.)* pre exposed to chronic concentration of PbNo3 along with 5 ml/lit *Coriandrum sativium (L.)* extract showed the poor bioaccumulation as compaired to exposure of chronic concentration of respective heavy metal only. *Bellamya bengalensis (L.)* pre exposed to PbNo3 showed fast detoxification recovery in presence of *Coriandrum sativium (L.)* than those allowed to cure naturally in normal water.

Significance of study:

The present proposed research work would be useful as, to provide protective and curative measures against heavy metal toxicosis ,to provide the knowledge about interaction of coriander extract with heavy metals in to the body, to provide the knowledge about importance of coriander in preparation of food,to provide the safe remedy to the peoples living in heavy metals affected areas. In city's automobile exhaust release lead and hence content in air is high . This study may give protective and curative use of coriander.

Conclusion:

The coriandrum sativium extract shows free radical scavenging and chelating activity against heavy metal bioaccumulation and removes the heavy metal bioaccumulated in the body.

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REFERENCES:

1. Ambuja S.S., Shah R.K. (2012): *Int. J. Pharm. Inn*, 2(2):17-18.
2. Buschiazzoa E, Metian M, Borne V, and Warnu M (2004):Influence of ambient dissolved metal concentration on their bioaccumulation in two trophical oysters . International conference on isotope in environmental studies. Monte Carlo (Monaco), 25-29.
3. Bhat S., Kaushal P,. Kaur M,. and Sharma H.K. (2014) Coriander (Coriandrum sativium L.):Processing , nutritional and functional aspects. African journal of plant science 8(1) 25-33.
4. Cain D.J. and Louma S.N.(1986): Effect ofseasonally changing tissue weight on trace metal concentrations inn the bivalve Macoma balthica in San Rrancisco Bay . Mar. Ecol. Prog. Ser, 28: 209-217.
5. Devaji Kanakaraju and Arfiziah Anur (2009): Accumulation and depuration of lead and chromium using *Nerita Lineata.* World Appl. Sci. J. 6 (9): 1205-1208.
6. Deepa B. and Anuradha C.V. (2011): Antioxidants potential of *coriandrum savium (L)*. Seed extract. *Ind. J. of experimental biology, Vol*.49:30-38.
7. Gomma M.N.E., Badawy A.E.and Nagnib K. (1995): Level of some heavy metals in different Egyptian fishes from fresh and marine environments. J. Envoiron. Arab Biol. 3(4): 177-195.
8. Hakanson L. (1984): Metals in fish and sediment from the river Kolbackson water system Sweden Ach, *Hydrobiol.* 101:173-400.
9. JavanshirA and ShappooriM (2011): Influence of water hardness(Calcium concentration)on the absorption of cadmium by mangrove oyster Crassostrea. J. Food ,Agriculture and environment .9(2):725-727.
10. Mistra E., Ghosh A.K., Ghosh D., Datta S. (20112): *Food Chem. Toxicology,* 50:1340-1353.
11. Leena Kansal , Arti Sharma ,Sweta lodhi (2012): Remidial effect of Coriandrum sativium (coriander) extract on lead indused oxidative damage in soft tissues of swiss albino mice . Int. Jar. Pharmaceutical Science .4(3)729-737.
12. Omura Y. , Shimotsuura Y. , Fukuoka A. , Fukuoka H. and Nomoto T.(1996): Significant mercury deposites in internal organs following the removal of dental amulgum and development of pre-cancer on the gingiva and the sides of tongue and their represented organs as a result of invedertent exposure to strong curing light (used to solidify synthetic dental filling material) and effective treatment: A clinical case report, along with the organ representation areas for each tooth ., *Acupunct Electrothr* Res. , 21(2): 133-160.
13. Rainbow P.S. (2002): Trace metal concentrations in aquatic invertebrates: Why and so what, Environ. Polut, 120:497-507.
14. Sharma V., Sharma A, Kansal L., Lodhi S. (2011): Protective role of coriandrum sativium extract against lead nitrate indused oxidative damage in the liver and kidney in malle mice .Intr Appl Bio Pharma Tech .2:21 -24
15. Wayakar Bhalchandra and Petare Ram (2013): Bioaccumulation of heavy metals in fresh water snail Bellamya bengalensis and Lymnea accuminata from Malegaon wet land of dhule district (M.S.) India.The bioscan, 8(3): 1043-1047.