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Effect of Coriandrum Sativum extract on Mercury Chloride (Hgcl2) inducedalterations, on glycogen content of fresh water Bivalve Lamellidens consobrinus

KEYWORDS

Lamellidensconsobrinus,toxicity, Mercury chloride,Coriander extract, glycogen

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ABSTRACT The salts of heavy metal, released from commercial, industrial sources passes into aquatic ecosystem. Heavy metals are most hazardous pollutants because of their non-degradable nature. The heavy metals enter into body of aquatic animals and reaches up to non-target animal i.e. man through the food chain. Glycogen content of animal changes indicate the stress in pollutant exposed animals. The present workconducted, to study the effect of coriander extract on Mercury induced toxicity on glycogen content in the fresh water bivalve *Lamellidensconsobrinus*. The effectwas studied under five groups. Bivalves of Group 'A' was maintained as Control, group 'B' Bivalves were exposed to chronic LC50/10 dose of Mercury chloride (0.170 ppm) ,while group 'C' Bivalves were exposed to respective chronic concentration of Mercury chloride along with 5 ml/lit of coriander extract for 18 days. Glycogen content in bivalves from all groups were estimated after 6, 12 and 18 days. After 18 days exposure to Mercury chlorideBivalves from 'B' group was divided into two groups into 'D'&'E' groups. Bivalves of 'D' group were allowed to cure naturally while those of 'E' were cured with coriander extract (5 ml/lit). Glycogen content in bivalves from these D & E groups was studied after 6, 12& 18 days. Significant decrease in Glycogen content was observed in 'B' group bivalves as compared to group 'A' (control). The group 'C' bivalves showed more Glycogen content thanthose group 'B' bivalves. The group 'E' bivalves showed fast recovery and more Glycogen content with coriander extract than those of group 'D' bivalves which were allowed to cure naturally. Glycogen content was estimated by anthrone reagent method.

Introduction:

The industrialization, urbanization, advancement in technology and human activities are causing rapid degradation of water quality affecting the vast freshwater sources. Migration of these contaminants into no contaminated areas as dust or leachates through the soil and spreading of heavy metals containing sewage sludge are a few examples of events contributing towards contamination of the ecosystems. Glycogen is a water-soluble polysaccharide, composed by polymerized glucose molecules joined through glycoside bonds, forming a network-like structure [1]. It represents the main form of energy storage in the animal bodies along with body fat. In particular, bivalves present higher percentage of glycogen compared to fat, and its contents are influenced by internal factors, such as growth and sexual maturation, and external factors, such as food availability and other environ-mental factors. Glycogen content varies depending on the physiological state of the organism, and it can be used to evaluate physiological condition in different bivalve Discharge of industrial effluents and runoff the comprising versatile chemicals exert their toxic effect on the living beings, depleting the glycogen content of the animals. Heavy metals are most hazardous pollutants because of their non-degradable nature and property to affect all kinds of ecological systems. The salts of metal, released from commercial, industrial sources passes into aquatic ecosystem. The heavy metals enter into body of animal and reaches up to non-target animal i.e. man through the food chain. These heavy metals have high biological activity and have tendency to accumulate in organism. Depletion of glycogen level indicate the stress in pollutant exposed animals. Mercury (atomic number 80) metallic mercury is shiny, silver-white odorless liquid metal with the chemical symbol "Hg".Mercury is highly toxic to living organisms. It is evident now that all forms of mercury may be converted biologically to the most toxic form methyl-mercury by micro-organisms activity in the environment. Glycogen is the primary energy reserve in bivalves drives many physiological processes & can be utilized at anoxia, scarcity of food (Bayne 1976; Gabbot 1983; Bayne et al. 1985; Hummel et al. 1988) [3,4]. Glycogen is utilized mainly as the source of energy in different invertebrates (Stetten & Stetten, 1960; Dezwaan & Zandee,1972; Hummel et al. 1989)[11] Glycogen have been used as an indicator of physiological conditions in mussels after the exposure to the different pollutants(Hemelraad et al. 1990)[5]. Due to the stresses there occurs depletion in this source followed by protein and lipid depots at the extremities.

The coriander is widely used as folk medicine as carminative, spasmolytic, digestive and; seed extract antimicrobial; with castor oil useful in rheumatism [7]. It works as diuretic and thus is used in urinary related disorders and diabetes. It is very effective in fever and also in avoiding the related symptoms in fever like dehydration, burning sensation and nausea. (Health and Lifestyle Food, US).While there is still limited understanding of the mechanism through which they act, initial research indicates that *corandrum sativum* is effective as both treatment and preventive agent for several chronic diseases. Coriander chelate with heavy metal can be excreted out by the biological system. However no attempt has been made to study the role of coriander on in heavy metal detoxification. In present research work, rate of Glycogen content is considered as tool to evaluate the toxic effect of heavy metal as salt of mercury chloride and effect of coriander extract on this physiological alteration.

MATERIALS AND METHODS:

Preparation of heavy metal solution - mercury chloride stock solution of 200 ppm was prepared and further dilutions were prepared from it.

Plant extract Coriander extract-Preparation of aqueous extract of *Coriandrum sativum*. The plant *Coriandrum sativum*(1 kg) was collected from a local market in Nashik (M.S.), India. The dried leaves of coriander 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 < 70ºC in a vacuum dryer. It was dissolved in distilled water whenever needed for experiments.

Treatment with heavy metal salt - The selected model animals, the freshwater Bivalves, *Lamellidensconsobrinus* were collected from Darana River, Nasik. After collection, the bivalves were acclimatized in the laboratory condition at room temperature for 2-3 days. The active acclimatized bivalves of approximately same size& weight were selected for experiment. Before starting the experiment; these bivalves were divided into 'A' set was maintained as control, 'B' set was exposed to the chronic dose of Mercury chlorideLC50/10. (0.170 ppm) while 'C' set Bivalves were exposed to the chronic dose of Mercury chlorideLC50/10with coriander extract (5 ml/lit) upto18days.after exposure of 18 days to heavy metal Mercury chloride, the bivalves from group B were divided into two sub groups'D'&'E'set. The glycogen content of bivalves were estimated from 'A','B'and'C'sets,at 6 days interval i.e.on 6thdays,12th days and

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on18th days. After 18 days, 'B' set bivalves were divided into 'D'&'E' set. Bivalves from 'D' set were allowed to cured naturally in normal water while bivalves of 'E' set were cured with Coriander extract(5 ml/lit) for next 18 days. During recovery again The glycogen content of bivalves were estimated from 'D' and 'E' set, at 6 days interval i.e. on 24th days,30th days and on36th days. During experimentation bivalves were fed on fresh water algae. The glycogen content was calculated by enthrone reagent method [4]. Tissues such as gills, digestive gland and whole body from above mentioned groups were removed and were dried at 60°C. Fine powder was made & 100mg of each tissue was taken for glycogen estimation of *Lamellidnes-consobrinus*. Comparing the results with control, the changes in the glycogen content from bivalves were calculated for Mercury chloride metal.

OBSERVATION AND RESULT:

Glycogen content in bivalves, *L. consobrinus* after exposure to mercury chloride (0.170 ppm), along with coriander extract and during recovery from all sets have been summarized in table no 1.Table no 1 shows that the Glycogen content in bivalve in presence of mercury chloride (0.170 ppm) decreased with increase in exposure period. The Glycogen content were more in heavy metal with coriander extract exposed bivalves as compared to those exposed to only heavy metal salts for the corresponding period of exposure. The decrease in Glycogen content was due to toxic metal. Animal required more energy to manage stress. The bivalves pre-exposed to heavy metal salts showed fast recovery in the Glycogen content in presence of coriander extract than those allowed to cure naturally.

TABLE 1

Glycogen content in *Lamellidensconsobrinus,* after chronic exposure to heavy metal salts Mercury chloride without & with Coriander extract.

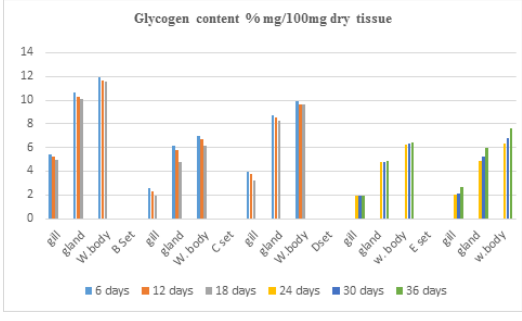
Sr. no.		Glycogen content mg/100mg of dry tissue±S.D.					
Treatment	**Tissue of animal**	**6 days**	**12 days**	**18 days**	**24 days**	**30 days**	**36 days**
A set (Control)	Gill	5.392 (±0.006)	5.270 (±0.04)	4.98 (±0.021)			
	Gland	10.67 (± 0.01)	10.28 (±0.03)	10.08 (±0.12)			
	W. Body	11.96 (±0.014)	11.67 (±0.017)	11.59 (±0.010)			
B Set (0.170 ppm Mercury chloride)	Gill	2.578 (±0.012) (-52.18)	2.318 (± 0.09) (- 6.015)	1.917 (± 0.01) (- 61.40)			
	Gland	6.106 (±0.028) (-42.79)	5.826 (± 0.02) (- 43.32)	4.789 (± 0.06) (-52.49)			
	W. Body	6.980 (±0.022) (-41.64%)	6.712 (±0.04) (42.49%)	6.112 (±0.02) (-47.26%)			
C Set (0.170 ppm Mercury chloride+coriander extract 5ml/lit)	Gill	3.980 (±0.011) (-26.2%)	3.770 (±0.04) (-28.5%)	3.200 (±0.03) (-35.6%)			
	Gland	8.712 (±0.013) (-18.37%)	8.502 (±0.01) (-17.30%)	8.231 (±0.02) (-18.34%)			
	W. Body	9.901 (±0.010) (-17.22%)	9.638 (±0.023) (-17.41%)	9.632 (±0.022) (-16.90%)			
(After 18 days exposure to	Gill				1.927 (±0.071) [+0.52]	1.948 (±0.010) [+1.62]	1.963 (±0.03) [+2.40]
to 0.170 ppm Mercury chloride)	Gland				4.792 (±0.012) [+0.63]	4.802 (±0.017) [+1.3]	4.890 (±0.021) [+2.12]
D Setcured with Normal water	W. Body				6.221 (±0.042) [+1.83]	6.348 (±0.03) [+3.91]	6.412 (±0.02) [+4.91]
E Set Cured with coriander extract 5ml/lit	Gill				1.986 (±0.012) [+3.60]	2.140 (±0.082) [+11.63]	2.689 (±0.05) [+40.3]
	Gland				4.823 (±0.001) [+0.71]	5.221 (±0.014) [+9.02]	5.994 (±0.023) [+25.2]
	W. Body				6.298 (±0.001) [+3.043]	6.800 (±0.015) [+11.256]	7.602 (±0.006) [+24.37]

Each value represents a mean of three observations ± standard deviation. The values in () Brackets indicate percent change over with respective days control value. Second () brackets indicate compared with respect to B. [] brackets indicate compared with respect to 18 days of 'B'.

Graphical representation of table no 1

Glycogen content after chronic exposure Scale–on Y-axis values (gm/wt)

X-axis 1 unit= 6 days



Discussion:

Under stressful conditions, bivalves show the change, in metabolic activities but also in the behavior. The bivalves react against this stressful condition by various ways in variable organisms. Hence the interpretation of the reduction in Glycogen content due to effect of heavy metal mercury. As bivalves are filter-feeders, the close contact of tissues with polluted water alters the Glycogen content. Coriander has been proven to chelate toxic metals from our bodies in a relatively short period of time combined with the benefits of the other ingredients. This coriander is a powerful tissue cleanser. These corianders extract removes heavy metal through excretion, removing these toxic metals from our bodies.

The depleted level of glycogen due to $Hgcl_2$ exposure showed the tremendous burden on the physiological actions leading towards the maximum use of energy to decipher the impact of $Hgcl_2$. Helle Wangensteen,[3] University of Oslo from, Norway,studied antioxidant activity in extract from coriander and conclude that, the leaves and seeds from coriander have concentration-dependant inhibitory activity towards 15-L0 and radical scavenging properties. However, the effects are more potent in extracts from leaves than in seeds from coriander and seem that compounds of medium polarity are most potent, even if their total antioxidant contribution in the plant is small. He also shows a co-relation between total phenolic content and antioxidant effect, thus a screening of phenolic content in coriander extracts will probably indicates the presence of compounds with antioxidant activity Various phytochemical components especially polyphenols, flavonoid, phenolic acids etc. are responsible for the free radical scavenging and antioxidant activity of the plants. Polyphenols possess many biological affects, mainly attributed to their antioxidant activities in scavenging free radicals,

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inhibition of perodixation and chelation of transition metals (Nickavar B. et al., 2006) [10].

Ullagaddimaheshwari, 2011 [12] suggested that, coriander contains active phenolic acid compounds, including Caffic and Chlorogenic acid. The flavonoids include quercetion, keampferol, rhamnetin and apigenin. Most of these compounds are known to inhibit free radicals generated in the cellular system, when they are obtained through the diet.

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