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PROTECTIVE ROLE OF *CORIANDRUM SATIVUM* (CORIANDER) EXTRACT ON LEAD INDUCED ALTERATIONS IN THE OXYGEN CONSUMPTION OF FRESH WATER GASTROPOD SNAIL, *BELLAMYA BENGALENSIS* (LAMARCK)

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ABSTRACT: The present study describes antioxident effect of *coriandrum sativum* extract against lead nirtate induced toxicity in an experimental model, the fresh water snail and *Bellamya bengalensis*. The effect of snail was studied under five groups. Group A was maintained as control, Group B snails were exposed to chronic $LC_{50/10}$ doses of lead nitrate (6.9ppm) for 21 days, while group C snails were exposed to respective chronic concentrations of heavy metals with 5 ml/lit of extract from *coriandrum sativum*. Rates of O_2 consumption from all groups were estimated after 7, 14 and 21 days. Snails from B groups were divided into two groups after 21 days exposure to heavy metals into D & E groups. Snails of D group were allowed to cure naturally while those of E were exposed to extract from *coriandrum sativum* (5 ml/lit) and their rates of O_2 consumption were studied after 7, 14 and 21 days. Remarkable decrease in rate of O_2 consumption was observed in lead exposed snails. The groups exposed to heavy metals along with extract from *coriandrum sativum* showed more rates of oxygen consumption than those exposed to heavy metals. Pre-exposed snails to heavy metals showed fast recovery and higher rate of oxygen consumption than those which were allowed to cure naturally. The probable antioxident role of extract from *coriandrum sativum* is discussed in the paper.

INTRODUCTION: Heavy metals are recognized as a strong biotoxicants, because of their persistent nature and cumulative action to the aquatic flora and fauna [1].

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In the aquatic invertebrate, Beaby and Eaves, observed that molluscs can accumulate higher concentration of metal ions than other groups of invertebrates [2].

According to the WHO (1995), the nonessential metal lead (Pb) occurs in the environment as a consequence of both natural and anthropogenic processes, with mining and smelting, coal burning, cement manufacturing, and use in gasoline contributing most to Pb contamination of aquatic environments. Lead (Pb) is a natural constituent of the Earth's crust, and is commonly found in soils,

plants, and water at trace levels. Occurrence of metallic lead in nature is rare[3]. The main ore minerals of lead are galena (PbS) and cerussite ($PbCO_3$); anglesite ($PbSO_4$) and pyromorphite (Pb5 $(PO4)_3Cl$) are less important, but occur frequently [4]. The heavy metal accumulation at the cellular level is capable of interacting with many biological legends and interferes with different mechanisms [5].Lead toxicity is currently one of the serious problem worldwide, there is still no specific, reliable and safe treatment.

Several metal chelators (CaNa2EDTA and DMSA) have been used to manage lead toxicity in the event of exposure but none are suitable in reducing lead body burden [6]. Heavy or toxic metals are trace metals that are at least five times denser than water. As such, they are stable elements in that they cannot be metabolized by the body, as well as bio-accumulative in that they are passed up the food chain to humans.

Thus, there has been an increased interest in the therapeutic potential of plant products or medicinal plants having antioxidant properties in reducing free radical-induced tissue injury [7].

Coriandrum sativum L. (Coriander), belonging to family Umbelliferae, is an herb that is widely cultivated in India and is recognized for its carminative and cooling properties [8]. It is well known that herbs and spices possess antioxidant activity [9, 10, 11] and caffeic acid derivates, flavonoids and terpenoids are suggested to be responsible for this effect[9]. Coriander seed is a popular spice and finely ground seed is a major ingredient of curry powder. The seeds are mainly responsible for the medical use of coriander and have been used as a drug for indigestion, against worms, rheumatism and pain in the joints [12].

Phenolic substances such as flavonoids, coumarins, cinnamic acid and caffeic acids are believed to have antioxidant properties, which may play an important role in protecting cells and any organ from oxidative degeneration [13]. Coriander suppresses the deposition of lead by chelating the metal [14]. It was shown that coriander extracts have phenolic compounds and flavonoids, suggesting that these compounds contribute to the antioxidative activity [15]. A sorbent prepared from coriander was found to have good efficiency in removing organic and methyl mercury from aqueous solutions [16].

Coriander has been reported to exhibit several pharmacological effects such as as antifertility [17], antihyperglycemic [18], anti-hyperlipidemic [19], anti-proliferative [20], hypotensive [21] and digestive stimulant [22].

This study was carried out to investigate the probable antioxident role and protective properties of extract from *coriandrum sativum* L (coriander) extracts on physiology of oxygen consumption of lead nirtate intoxicated in an experimental model, the fresh water snail, *Bellamya bengalensis (Lamarck)*.

MATERIALS AND METHODS:

Preparation of aqueous extract of *Coriandrum sativum*: The plant *Coriandrum sativum* (1 kg) *was* collected from a local market in Raver (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 snails were divided into three groups, such as group A, B, and C. The group A of acclimatized snails was kept as control set. The group B of acclimatized snails was exposed to chronic concentrations (LC_{50} value of 96 hr/10) of heavy metal salt $PbNO_3$ (6.9 ppm) as chronic doses up to 21 days, while group 'C' of acclimatized snail was exposed to chronic concentration (LC_{50} value of 96 hr /10) with 5 ml/lit extract from *coriandrum sativum* up to 21 days. After exposure to heavy metal for snails from group 'B' were divided into two subgroups, such as D & E groups. The snails of group 'D' were allowed to self cure naturally in normal water and the snails of group 'E' were exposed to 5 ml/lit extract from *coriandrum sativum* up to 21 days. During experimentation snail s were fed on fresh water algae. O_2 consumption by snails from all groups was determined by Wrinkler's method after every 7 days.

OBSERVATIONS AND RESULTS: *Bellamya bengalensis* after exposure to concentration of lead nitrate (6.9 ppm) along with extract from *coriandrum sativum* and during recovery have been summarised in **table 1(A).**

It was observed that after chronic treatment of lead nitrate upto 21 days to, *Bellamya bengalensis* the rate of oxygen consumption decreased significantly.

In the snails, the rate of oxygen consumption was measured after 7, 14 and 21 days exposure to 6.9 ppm lead nitrate as chronic treatment. It was observed that after chronic exposure there was a significant decrease in the rate of oxygen consumption, as compared to that of control snails is summarized in **table 1(B).**

Oxygen consumption data from table indicates that, the rate of oxygen consumption in presence of $PbNO_3$ (6.9 ppm) decreased with the increase in exposure period. The rate of O_2 consumption was more in $PbNO_3$ and extract from *coriandrum sativum* exposed snails as compare to those exposed to only $PbNO_3$ in respective period of exposure. The snails, pre-exposed to $PbNO_3$ showed fast recovery of rate of O2 consumption in presence of extract from *coriandrum sativum* than those allowed to cure naturally.

TABLE 1(A): THE RATE OF OXYGEN CONSUMPTION OF *BELLAMYA BENGALENSIS* (LAMARCK) AFTER CHRONIC EXPOSURE TO HEAVY METAL SALT, $PbNO_3$ AND $PbNO_3$ WITH 5ml/lit. EXTRACT OF *CORIANDRUM SATIVUM*

Treatment	Average O_2 consumed ml/gm/hr/lit. ± S.D.		
	7 Days	14 Days	21 Days
A. Control	0.117 +0.001	0.1121+0.002	0.1101+0.008
B. 6.9 ppm $PbNO_3$	0.1156+0.003 (-1.86 %)	0.1099+0.001 (-1.96 %)	0.1079+0.002 (-1.90 %)
C. 6.9 ppm $PbNO_3$+ 5ml/lit. extract from *C. sativum*.	0.1172+0.004 (-0.50 %)	0.1114+0.001 (-0.62 %)	0.1099+0.001 (-.018 %)

TABLE 1: (B)THE RATE OF OXYGEN CONSUMPTION OF PREEXPOSED *B. BENGALENSIS* TO LEAD NITRATE FOR 21 DAYS DURING RECOVERY.

Treatment		Average O_2 consumed ml/gm/hr/lit. ± S.D.		
		28 days	35 days	42 days
Snails preexposed to $PbNO_3$ (6. 9 ppm) for 21 days	(D) Normal Water	0.1111+0.004 (-8.23 %)	0.1117+0.001 (-0.35 %)	0.1158 +0.001 (+5.17 %)
	(E) Normal water + 5 ml/lit extract from *C. sativum*	0.1102 +0.004 (-6.45 %)	0.1121 +0.001 (+0.26 %)	0.1175 +0.003 (+6.72 %)

Figure in bracket indicates percent variation in the rate of O_2 consumption.

DISCUSSION: Hamadouche found that, Lead is known to cause oxidative damage in various tissues by bringing about imbalance in the generation and removal of reactive oxygen species [23]. Heavy metals affect the metabolism of the freshwater snail, *Bellamya bengalensis.* 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.

After chronic treatment, the rate of O_2 consumption was decreased in lead nitrate exposed animals. Lomte and Jadhav [24] showed in *Corbicula regularis* that the rate of O_2 consumption decreased in different concentrations of toxic compounds, such as $CuSO_4$, Sodium Cynide etc. Alam & Lomte [25] in *Viviparus bengalensis* showed the initial elevation in the rate of oxygen consumption.

It may be due to pollutant stress & may be an indicator of new steady state of metabolism to compensate the enhanced physiological activity. There was an increase in respiratory rate during lower concentration when the greatest demand was made on the respiratory system. The decline was greater in higher concentration which might be the result of reduced state of metabolism owing to toxicant stress.

The decrease might be due to the penetration of the pollutant molecules and their action on the alteration of metabolic cycles at the sub-cellular levels. Kapoor and Lomte [26] found inhibition in oxyregulatory mechanisms due to heavy metals. The decrease in respiration after long exposure was noted in *B. bengalensis*. Rao *et al* noted that in the bivalve *Indonaia caeruleus* when exposed to $HgCl_2$, the rate of respiration decreased in both normal and lethal concentrations.

In general the decrease was more at all exposure periods in lethal concentrations [27]. Sabahat saeed and Perween tariq Studied and suggested that, the antibacterial activities of aqueous infusion and decoction of *C. sativum* were also evaluated [28]. All tested isolates were found resistant to aqueous infusion and decoction of *C. sativum*. These findings are in fair correlation with the study carried out by Chaudhry & Tariq, who found that decoction of *C. Sativum,* does not have antibacterial potential against G +ve and G -ve bacteria [29]. Similarly, aqueous decoction of coriander was found to have no bactericidal activity against *Helicobacter pylori* [30]. In contrast, some workers have found that *C. sativum* has strong antibacterial activity against G +ve and G -ve [31]. 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* [32].

Helle Wangensteen; Norway, concluded that both seeds and leaves from coriander have concentration-dependent inhibitory activity towards 15-LO and radical-scavenging properties. However, the effects are more potent in extracts from leaves than in seeds from coriander and it seems that compounds of medium polarity are most potent, even if their total antioxidant contribution in the plant is small. We have also shown a correlation between total phenolic content and antioxidant effect; thus a screening of phenolic content in coriander extracts will probably indicate the presence of compounds with antioxidant activity.

Leena Kansal *et al.,* studied 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 [33]. The effect of lead on LPO level, GSH concentration, antioxidant enzyme activity and some biochemical variables were reversed by treatment with plant extracts. Dr. Yoshiaki Omura has discovered that the herb cilantro will detoxify mercury from neural tissue is used to help stimulate the appetite and relieves minor digestive irritation [34]. 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.

Cilantro blend contains yellow dock to help drain the mercury from the connective tissues. It is an excellent blood cleanser, tonic, and builder, working through increasing the ability of the liver and related organs to strain and purify the blood and lymph system. Achieves it's tonic properties through the astringent purification of the blood supply to the glands and acts as a cleansing herb for the lymphatic system.

Coriandrum sativum (coriander) has been reported to have a number of possible medicinal attributes including antispasmodic, carminative and stomachic properties [35].

In present study, in the *Bellamya bengalensis*, the rate of O_2 consumption was observed to be decreased in chronic concentration of $PbNO_3$ as compared to the control and $LC_{50}/_{10}$ with 5 ml/lit of aqueous extract of *Coriandrum sativum.*Due to lead nitrate doses may cause severe disturbances of the metabolism in the animal. After 21 days of chronic treatment of *Bellamya bengalensis*, these snails allowed to cure naturally and cure with 5ml/lit extract from *coriandrum sativu.* Those snails exposed in normal water with5ml/lit extract from *coriandrum sativum* showed, O_2 consumption is more as copared to those allowed in normal water only.

CONCLUSION: In conclusion, the current study suggests that aqueous extracts of *Coriandrum sativum* can prevent or slow down the oxidative damage induced by lead nitrate in *Bellamya bengalensis*. The effect of lead on oxygen consumption is variables were decrease by treatment with plant extracts. This is indicates to that, The *Coriandrum sativum* extract possess antioxidant activity.

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