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Protective Effect of L-Ascorbic Acid (Vitamin C) on Mercury Detoxication and Physiological Aspects of Albino Rats.

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Abstract

The effect of dry materials of Azolla caroliniana and A. pinnata on controlling Meloidogyne javanica on tomato cv. Super Strain-B was carried out under greenhouse conditions 25±5°C. The treatments were applied at the rates 25 and 50 gm of dry materials of each species / pot. Application of A. caroliniana and A. pinnata succeeded in reducing the development and reproduction of M. javanica and improved the plant growth when compared with those of the check. A. pinnata was more efficient in reducing number of nematode stages based on galls, egg-masses, females, developmental stages in roots, as well as, number of juveniles in soil per plant at both rates as compared with A. caroliniana did. Also, the growth of tomato plants was affected due to the application of azolla. Addition of azolla to the plant soil caused remarkable increase in all plant growth parameters.The higher dose was more effective than the lower one. However, A. pinnata resulted in increasing the plant growth much more than A. caroliniana.

Key words
Hg, lipid profile, ascorbic acid, serum biochemical parameters.

Introduction

Food contamination by toxic trace elements is nowadays an evident health problem worldwide for general population (Fu et al., 2014). Mercury is the most dangerous trace element, which is originated from different anthropogenic sources. Acute or chronic mercury exposure can cause adverse effects during any period of known safe level of exposure. Ideally, neither children nor adults should have any mercury in their bodies because it provides no physiological benefit. Prenatal and postnatal mercury exposures occur frequently in many different ways (Stephan etal.,2010) Due to its physico-chemical properties, it is found in the air, water, soil and food, polluting, however, the different ecosystems. Mercury is found to alter the physiological and the biochemical functions of living organisms (Flora et al.,2008), and cause a wide range of clinical symptoms in occupationally exposed workers (Abdennour et al., 2002). The toxic effects of Hg on human and animal health have been reported extensively (Ma et al.,2013). When binding to cell components, mercury provokes the oxidative stress, leading to the formation of a number of toxic substances(Funk et al ., 2009) . (Moreira etal.,2012) support the concept of MeHg-induced cardiovascular toxicity.Thus, lipids are amongst the target molecules to be oxidised by mercury (Hussain et al., 1999; Mahboob et al. 2001). Consequently, mercury can alter membrane lipid structure and functions (Ganser & Kirschner, 1985) and even inhibits lipid synthesis in the nervous system (Cloez et al., 1987).

Ascorbic acid (vitamin C) is an essential nutrient in feeds, and is an indispensable nutrient required to maintain the physiological processes of different animals (Tolbert, 1979). Small amount of this vitamin is sufficient to prevent and cure scurvy; however, larger amount may be essential to maintain good health during environmental adversities, situation of physiological stress and conditions of infectious and parasitic diseases (McDowell, 1989; Lim, 1996). Ascorbic acid (vitamin C) is essential for producing collagen and bone minerals, assists in metabolizing iron and helps in activation of vitamin D. It also assists in reducing

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the harmful effects of hormones produced by the adrenal gland during prolonged periods of stress (Lovell, 1989; Navarre and Halver, 1989). Also, it has an important role in a great number of biochemical processes such as synthesis of collagen which is an intercellular protein and principal constituent of skin, scales, mucosa, cartilaginous tissues, bones and conjunctive tissue formation, which involves all the organs of the body (McDowell, 1989). Agrawal et al. (1978) reported that high levels of ascorbic acid are efficient to enhance tolerance to environmental stressors e. g. aldrin toxicity.

The objective of the present work is therefore, to evaluate the beneficial roles of asorbic acid on serum biochemical parameters in mercury contaminated diet of albino rats. Such parameters are generally representing the health status of the individuals.

Material and Methods

Twenty four male albino rats weighing 100-150g were divided into 3 groups. Animals were put in the animal house under standard conditions of temperature, light and humidity and food was given ad libitum. The control was fed a basic diet, while the other two groups were treated either by Hg (1g HgCl2/Kg food) or Hg-ascorbic acid (1g HgCl2/Kg food + 50g/Kg food of ascorbic acid). After five weeks continuous treatments, animals were decapitated and blood was received in dry test tubes, and then centrifuged at 5000 rpm/15 minutes. The automate apparatus METROLAB 2300 (Random Access Clinical Analyzer) was used to measure serum alkaline phosphatase (ALP), aspartate aminotransferase (ASAT), alanine aminotransferase (ALAT), urea, creatinine, uric acid, triglycerides, total cholesterol, HDL-cholesterol and LDL-cholesterol. Statistical analysis has been carried out by student t-test to compare between paired groups, whereas the one way analysis of variance (ANOVA) was used to compare between groups. Results are expressed as mean ±SD and the statistical test was considered significant at $p<0.05$ level.

Results

Results of the serum enzymes ALP, ASAT, ALAT are in Table (1)and Fig(1), urea, creatinine and uric acid presented in Table (2)and Fig(2) representing liver and kidney functions the results showed that the activity of ALP was significantly reduced in rats exposed to mercury alone compared to the control. Contrary, the serum ASAT activity was increased significantly in the mercury treated group compared to the control. Accordingly, serum urea concentration was also significantly increased in mercury group. When comparing between the three groups, ANOVA has revealed a significant variations in ALP, ASAT and urea. However, the ASAT, creatinine and uric acid were not significantly changed in all cases. Meanwhile, in the Hg-ascorbic acid group, the ALP, ALAT, ASAT, urea, creatinine and uric acid have not been varied significantly compared to the other two groups.

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