

The Protective Effect of Vitamin-C against Mancozeb induced toxicity in accessory sex organ Seminal Vesicular Phosphatase in adult albino Rats

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Abstract

Mancozeb, an Inorganic-zinc dithiocarbamate is a typical fungicide with carbamate structure. It is chemically identified as ethylenebisdithiocarbamate (EBDC). It is commonly used for foliar application and seed treatment in agriculture. The present work was conducted to assess the protective effect of vitamin C against Mancozeb induced toxicity in the seminal vesicle of adult albino rats. 90 days old adult Male wister albino rats (*Rattus norvegicus*) were exposed to Mancozeb at the dose of 300mg/kg body weight, orally for 60 days. The control group received olive oil. Mancozeb treated significantly decreased the activities of ACP and ALP and also contains of fructose and citric acid in the seminal vesicle. Co-administration of vitamin-C with Mancozeb restored the activities of the enzymes to normalcy. The withdrawal group of Mancozeb toxic effect was reversible. The present study reveals the protective effect of vitamin-C on the Mancozeb induced seminal vesicular toxicity in adult rats.

Keywords: Mancozeb, Vitamin C, Acid Phosphatase, Alkaline Phosphatase, Seminal Vesicle

Introduction

Mancozeb a fungicide of ethylenebisdithio carbamate (EBDC's) group is a polymeric complex of 20% manganese with 2.5% zinc salt. Since mancozeb is used against variety of foliar fungal diseases and seed treatment. It is greyish yellow powder, normal storage condition but decomposes at higher temperature by moisture and acid (Worthing CR, 1991).

Mancozeb causes significant pathological changes were observed in Liver, Kidney, Heart and also slight enlargement and brain revealed few petechial haemorrhages (Hore et.al., 1997). Male and Female reproductive system in rats (Baligar and Kaliwal 2001). Mancozeb has been shown to produce

significant toxicological effect on thyroid gland in rat (kackar et al., 1997).

Evidence are available to suggest that the Mancozeb has deleterious effect on various aspects of Male reproduction. However, the information on the toxic effect of this fungicide on male reproductive accessory sex organs mainly seminal vesicle is restricted. The present examination was undertaken to elucidate the effect of mancozeb on the activities of phosphatases in the seminal vesicle of adult albino rats.

Materials and methods

Animals

Healthy Male adult albino rats of Wistar strain weighing 200-210 g were housed in

clean polypropylene cages and maintained in the air conditioned animal house with constant 12 h/12h dark and light cycle. The animals were purchased from the Tamil Nadu veterinary and Animal Sciences University, Chennai. The animals were maintained and handled as per the guidelines given by the committee for the purpose of control and supervision of experimental on animals (CPCSEA), Government of India and Animal Ethical Committee (UAEC). The animals were fed with Standard rat pellet diet and clean drinking water was made available ad libitum.

Experimental design

Adult male albino rats were divided into three groups and each group consists of six animals.

Group I – Control: Rats were given olive oil as vehicle orally, daily for 60 days.

Group II – Mancozeb treatment: Rats were treated with Mancozeb dissolved in olive oil at a dose of 300 mg/kg body weight ($1/10^{\text{th}}$ of LD_{50}) daily for 60 days, orally.

Group III – Mancozeb with Vitamin C treatment: Rats were treated with Mancozeb at a dose of 300 mg/kg body weight daily, orally along with Vitamin C (40 mg/kg body weight) for 60 days.

Group IV – Withdrawal of Mancozeb treatment: Rats were treated with Mancozeb at a dose of 300 mg/kg body weight in olive oil orally, daily for 60 days and withdrawal of the treatment for further period of 60 days.

Collection of tissues

The rats were weighed and sacrificed twenty-four hours after the last treatment, by anaesthetic ether. The accessory sex organ Seminal vesicle was removed cleaned of fat and adhering tissue, washed in cold physiological saline repeatedly weighed and kept on ice at 4°C for further analysis.

Biochemical Analysis

The Tissue was homogenised in Teflon homogeniser (Potter Elvehjem) in Normal Saline and the homogenate was centrifuged at $800 \times g$ for 30 min at 4°C. The Supernatant was used for various biochemical assays. Protein was determined according to the method of Lowry, *et al.*, (1951). The activity of Acid Phosphatase was estimated by the method of Andersch and Szezybinski (1947) as modified by Tenniswood *et al.* (1976). Alkaline phosphate was assayed following the method of Bessey *et al.*, (1946).

Statistical Analysis

Single way Analysis of Variance (ANOVA) was followed to analyse the data according to Zar (1974). If the 'F'-ratio was significant, Student-Neumann-Keul's (SNK) test was followed.

Results and discussion

Ethylene-bis-dithiocarbamate fungicide is toxic to the reproductive and endocrine system in different species (Corisini, *et al.*, 2005; Mills *et al.*, 2005). Body weight display of protein and fat metabolism. The effect of Mancozeb at the dose of 300mg/kg body weight for 60 days on the body weight and accessory sex organs seminal vesicle weight in adult albino rats has been presented in Figs (1 and 2). Administration of Mancozeb significantly decreased ($p < 0.05$) the body and seminal vesicle weights compared to control rats. Co-administration of vitamin-C registered normal body weight and seminal vesicle weight compared to Mancozeb treated rats. However, the withdrawal of Mancozeb, restored the normal weight in the body and seminal vesicle. The reduction in body weight may be due to high rate of protein breakdown, which might be needed to fulfill energy requirements during detoxification (Ananthan.G and Kumaran.B. 2013). The another reason for weight loss in animals

exposed to Mancozeb in the present study. Male accessory sex organ seminal vesicle are dependent in androgen (Willams-Ashman, 1972; Luke and Coffey, 1994). In the present study, seminal vesicle was decreased significantly which might be due to decreased bioavailability androgens and estrogenic and antiandrogenic activities of Mancozeb (Mills, 1990)

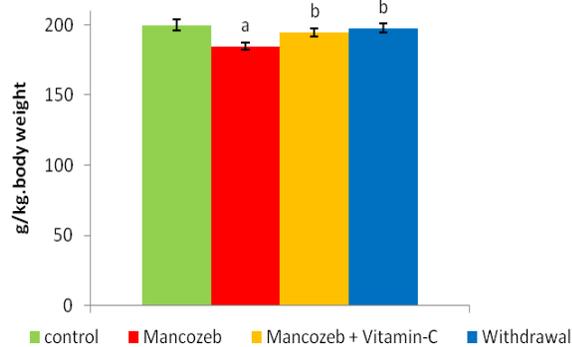


Figure 1: Effect of Mancozeb treatment, Co-administration of Vitamin C with Mancozeb and Withdrawal treatment on Body weight in adult rats.

Each value is Mean± SEM of 6 Animals. a and b represent statistical significant at P<0.05 compared with control and Mancozeb, respectively.

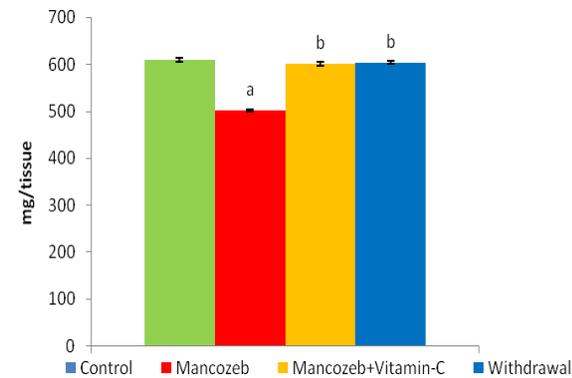


Figure 2: Effect of Mancozeb treatment, Co-administration of Vitamin C with Mancozeb and Withdrawal treatment on Seminal Vesicle Weight in adult rats.

Each value is Mean± SEM of 6 Animals. a and b represent statistical significant at P<0.05 Compared with Control and Mancozeb, respectively.

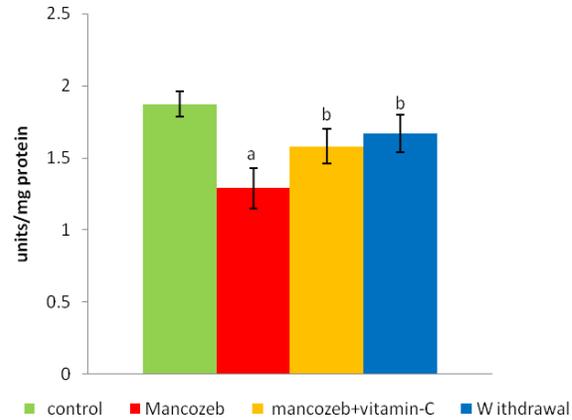


Figure 3: Effect of Mancozeb treatment, Co-administration of Vitamin C with Mancozeb, and Withdrawal treatment on Alkaline Phosphatase activity in Seminal Vesicle of the adult rats.

Each value is Mean± SEM of 6 Animals. a and b represent statistical significant at P<0.05 compared with Control and Mancozeb, respectively

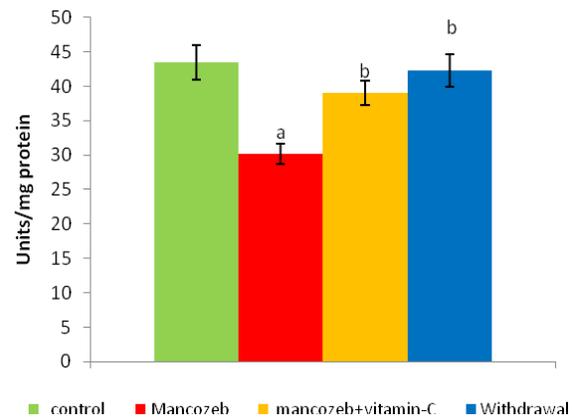


Figure 4: Effect of Mancozeb treatment, Co-administration of Vitamin C with Mancozeb, and Withdrawal treatment on Acid Phosphatase activity in Seminal Vesicle of the adult rats.

Each value is Mean± SEM of 6 Animals. a and b represent statistical significant at P<0.05 Compared with Control and Mancozeb, respectively

Mancozeb treatment for 60 days caused significant decrease (p < 0.05) in the specific activities of Acid Phosphatase and Alkaline Phosphatase in the Seminal vesicle

(Figures: 3 and 4). Though, Co-administration of Vitamin-C with Mancozeb maintained the normal activity of seminal vesicular Phosphatases. Withdrawal of Mancozeb restored the normal activities of these enzymes levels in the seminal vesicle of the adult rats.

The growth and function of the Seminal vesicle are androgen dependent (William-Ashman, 1972; Brandes, 1974). These organs exhibit high activities of phosphatases (Bialek and Pincus, 1967). In the present investigation exposure of rat to Mancozeb at the dose of 300mg/kg body weight for 60 days caused a significant decrease in the activities of both Alkaline and Acid Phosphatases in the Seminal Vesicle.

The results of the present study could therefore indicate that the Mancozeb induced cell damage resulted. In the release of phosphatases in to the blood stream. Hence reducing its level in the seminal vesicle. This effect is similar to the effect of other pesticide like Quinalphos (Pant and Srivastava, 2003) and Methylparathion (Prashanthi et al., 2006).

Co-administration of Vitamin C with Mancozeb resulted in complete prevention of the deleterious effect of Mancozeb in body weight, and Seminal vesicle weight studied in the present investigation. Vitamin C is a antioxidant found in both animals and plants (Smirnoff, 2001). Additionally, vitamin C is a tremendous essential scavenger (Sapper, et al., 1982; Upasani and Balaram, 2001) The restoration of activities of Alkaline and Acid Phosphatase in the present study also indicates the protective effect of Vitamin C. This effect may be due to the antioxidant property and antimutagenic activity of vitamin C. Its antimutagenic property might be due to its antagonistic action at all probable levels of pesticide genotoxicity (Goncharova, 1984).

Therefore, the present study reveals that the treatment of Mancozeb is capable of inducing adverse effects on the activities of Phosphatases in the Seminal Vesicle of adult rats. However, Co-administration of Vitamin C with Mancozeb imparts protective effect on the Seminal Vesicle phosphatases. It is note that all parameters that were affected by Mancozeb treatment. However, the clearly indicates that these effects are transient and reversible withdrawal of Mancozeb treatment.

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