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ORIGINAL RESEARCH ARTICLE

Effect of *Moringa oleifera* against Stannous chloride Toxicity in Rats (*Rattus norvegicus*)

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ABSTRACT

Moringa oleifera Lam (Moringaceae) is a highly valued medicinal plant, distributed in many tropical & subtropical countries. It is generally known in the developing world as a vegetable, medicinal plant and also a source of vegetable oil. Besides, the plant was reported to have various biological activities, including regulation of thyroid hormone, rich antioxidant, antidiabetic, antigastric ulcers, anti-tumor and hypotensive agent. It is also used for treating various diseases, such as inflammation, cardiovascular and liver disease. Taking a clue from the above literature reports, the effect of stannous chloride on mammals was studied because stannous chloride ($SnCl_2$) is widely used in human life in soft drinks, in food manufacturing and biocides preparations. Therefore, the present experiment was carried out to determine the effectiveness of *Moringa oleifera* in alleviating the toxicity of stannous chloride ($SnCl_2$) on biochemical parameters in male white rats, (*Rattus norvegicus*) which was an animal model. Animals were grouped in four groups. Group-I served as control. Group-II was administrated with stannous chloride (200 mg/kg b.wt, for 30 days orally). Group-III and IV were administrated with aqueous powder seeds of *Moringa oleifera* 250 mg/kg, 500 mg/kg b.wt for 7 days after the administration of stannous chloride. It was observed that stannous chloride significantly increased Aspartate transaminase (AST), Alanine transaminase (ALT), Alkaline phosphatase (ALP) and Acid phosphatase (ACP) in blood serum, when compared to control groups. Animals treated with 250 mg/kg b.wt powder seeds of *Moringa oleifera* showed slight decreased in above components, while animal treated with 500 mg/kg the enzyme parameters decreased as significantly nearing the control values. Therefore, the present results revealed the treatment with *Moringa oleifera* could minimize the toxic effects of stannous chloride. The results are discussed in the lights of recent literature.

Key words: Aqueous powdered seeds extract, *Moringa oleifera*, Stannous chloride and Biochemical parameters.

1. INTRODUCTION

Tin compounds have been widely used in various applications. It is extensively used in tin plated containers and alloys. Inorganic tin compounds are used in a variety of industrial processes for the strengthening of glass, soft drinks, as a base for colors, as catalysts, as stabilizers in perfumes and soap and a dental cryogenic agent. Stannous chloride ($SnCl_2$) salt is widely used as a reducing agent to label radiotracers with technetium – 99 m [(99 m) Tc]. These radiotracers can be employed as radiopharmaceuticals in nuclear medicines procedures. According to [1], it was intravenously administrated in humans. The $SnCl_2$ is capable to promote the generation of reactive oxygen species (ROS) that are responsible for the oxidative stress which can damage DNA [2]. Various researchers investigated the alterations in the levels of free radicals and some enzyme activates and in different tissues of male rabbits and the activity of acid phosphatase in the femur of rats was increased by oral administration of stannous chloride solution [3].

Moringa oleifera (Lam) is a rapidly growing tree belonging to the family Moringaceae and popularly known as horseradish tree and drumstick tree [4]. It is an indigenous tree to northern India and Pakistan. The leaves and fruits of *Moringa* tree are rich in protein content, carotenoids, minerals and ascorbic acid (Vitamin -

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C) and also are used as food supplements for human and animals [5]. In addition to its use as a food supplements most of its parts are widely used for many medical applications. Seeds extracts of *Moringa* have established anti-inflammatory, anti-pasmodic, and rich antioxidant activities. In many countries root, bark, gum, leaf, fruit (pods), flowers, seed and seed oil have been used for ailments in the indigenous medicine of South Asia, including the treatment of inflammation and infectious diseases along with cardiovascular, gastrointestinal, hematological and hepatorenal disorders [6]. Studies of [7] have thrown light that *Moringa oleifera* but we as humans are taking in Stannous chloride or its related compounds their our fined products, not knowing the disease caused or the side effects of stannous chloride carried out *Moringa oleifera* the present study to know the capability of *Moringa oleifera* whether it minimize the harmful effects of stannous chloride on lipid profile and biochemical parameters of rats.

2. MATERIALS AND METHODS

Chemicals

Stannous chloride: AR, 97.0% [Tin (11) chloride] ($SnCl_2$. $2H_2O$) was purchased from S.D fine chem. Ltd. Mumbai – 400 025.

Plant material

Moringa oleifera (MO) was procured from local market and seeds were separated, shade dried, grounded with mortar and pestle and sieved to get fine powder.

Experimental animals and treatment

Adult male albino rats of Wister strain weighing 180 - 190g were obtained from the Animal house Tamil Nadu University of Veterinary and Animal Sciences, Chennai. Animals were maintained according to the principle and guidelines of the CPCSEA (No: 324) under the supervision of Animal Ethical Committee. They were fed with commercial pelleted chow obtained from Poultry Research Station Chennai. Animals were assigned one of four treatment groups. Six animals were housed in each group. Group-I served as control fed with animal feed and water was provided ad libitum. Group-II was administrated with Stannous Chloride (200 mg/kg b.wt. for 30 days orally). Group-III and IV were administrated with seeds of powdered *Moringa oleifera* 250 mg/kg, 500 mg/kg b.wt for 7 days after the administration of Stannous Chloride. The animals were starved prior to the day of the experiment; they were sacrificed by cervical dislocation. Blood samples were collected separately from individuals & stored for further analysis.

Serum biochemical parameters

The activities of Aspartate transaminotransferase (AST) and alanine transaminotransferase (ALT) activities were determined procedure of [8]. While, alkaline phosphatase (ALP) and acid phosphatase (ACP) activity were determined by the procedure of [9].

3. RESULTS AND DISCUSSION

The studies on liver marker enzymes due to the stannous chloride toxicity in rats were shown in (**Table 1**). The results indicate that there is a significantly increase in liver marker enzymes particularly ACP, ALP SGOT, and SGPT when compared to control animals and the increase is statistically significant as ($P<0.001$) indicating the role of $SnCl_2$. The rats, on treatment with stannous chloride followed by 250, mg/kg b.wt of *Moringa oleifera* showed a slight decrease of ACP, ALP, SGOT and SGPT when compared to the $SnCl_2$ treated rats, while rats treated 500mg/kg b.wt of *Moringa oleifera* was found to be more effective which brought the level of SGOT, SGPT, ACP and ALP when compared to stannous chloride toxicity treated rats alone, which indicates that *Moringa oleifera* was able to detoxify the effects of $SnCl_2$ Providing that *Moringa oleifera* has medicinal values which is already prompted by the studies of *Moringa oleifera*.

Treatment only with 500 mg/kg b.wt of *Moringa oleifera* Showed better result which did not alter in liver marker enzymes when compared to control animals.

Studies on enzymes of blood serum was considered as an indicators of hepatic dysfunction and damage of Transaminases enzymes such as (AST and ALT) which are important critical enzymes in the biological process [10]. According to [11], the increase in the activities of AST and ALT in plasma of rabbits treated with $SnCl_2$ was mainly due to the plasma leakage of these enzymes from the liver cytosal into the blood stream. The activity of AST was significantly increases in such cases and leakages to the plasma from the injured hepatic cells. In addition, ALT level was of value also indicating the existence of liver diseases as this enzyme was present in large quantities in the liver. It increased in serum when cellular degeneration (or) destruction occurs in this organ [12], this was confirmed by marked changes in hepatocytes as well, as proliferation of duct epithelium, dilation and congestion of blood

vessels as well as mono nuclear inflammatory infiltrate in rabbits treated with Stannous chloride. In this study, when the rats were treated with stannous chloride for a period of 30 days after which when they were treated with *Moringa oleifera* activity of these enzymes was brought towards near normal values in the antidotes treated rats, which was clear a manifestation of anti hepato-toxic effect of *Moringa oleifera* suggestive of antioxidant potential of vitamin - c also and other constituents of them. The protective effect of *Moringa oleifera* against stannous chloride induced hepato toxicity in rats was further supported by histopathological studies which revealed significant recovery from the fatty changes caused by stannous chloride.

According to Khan *et al.* [13], phosphatases are important and critical enzymes in biological processes as they are responsible for detoxification metabolism and biosynthesis of energetic macromolecules for different essential function. Any interference in these enzymes leads to biochemical impairment and lesions of the tissue and cellular function. The increases in alkaline and acid phosphates (ACP and ALP) in plasma caused by $SnCl_2$ are in accordance with the findings of [14] in rats. They reported that the changes in the activities of these enzymes in $SnCl_2$ treated rats were regarded as the biochemical manifestation of the toxic action of stannous chloride. According to [15], who reported that stannous chloride may bind with DNA and RNA and inhibit the activities of acid and alkaline phosphatases. In addition, [16] suggested that the increase in the activities of ACP and ALP in plasma might be due to the increased permeability of plasma membrane or cellular necrosis and this showed the stress condition of the treated animals.

It may be pointed out only ascorbic acid with stannous chloride decreased the induction of AST, ALT, ACP and ALP maintained the levels of these enzymes to the normal values [17]. In the present study, the protective effect of *Moringa oleifera* with Stannous chloride toxicity decreased the induction of AST, ALT, ACP and ALP as did by the ascorbic acid and maintained normal values.

Table 1: Changes in the activities of serum of male rats treated with *Moringa oleifera* (Mo), stannous chloride ($SnCl_2$) and (MO + $SnCl_2$)

Enzymes (U/I)	Control	$SnCl_2$	$SnCl_2$+MO (250 mg/kg)	$SnCl_2$+MO (5000 mg/kg)	MO (500 mg/kg)
SGOT	101± 6.05	145± 3.2	125±5.2	99±1.6	90.5± 4.5
SGPT	43.3± 7.17	63.3± 5.8	51± 2.9	37.5± 3.7	34.5± 4.8
ALP	225± 14.7	572± 5.8	319± 10.2	265±9.2	180± 10.2
ACP	5.3± 1.2	27.5± 1.1	17.5± 0.4	10.5± 0.6	9.5± 0.6

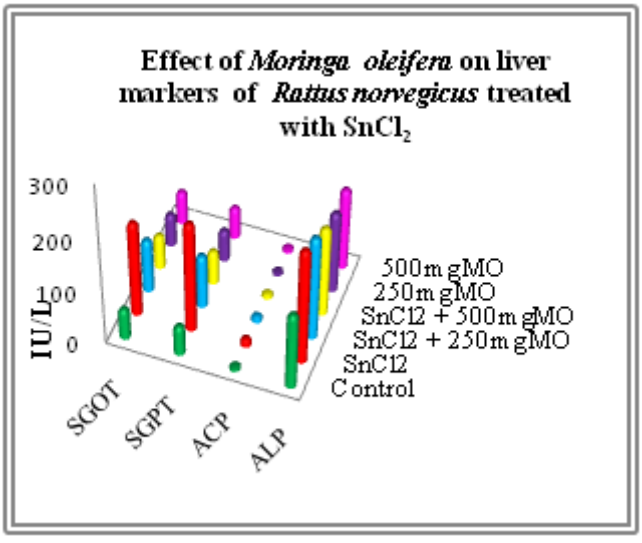

Fig 1: Effect of *Moringa oleifera* on liver markers of *Rattus norvegicus* treated with $SnCl_2$

4. CONCLUSION

From the present study, it can be concluded that use of *Moringa oleifera* and their combination have the capability to alleviate the harmful effects of Stannous Chloride.

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