

Histoprotective Effect of Aqueous Extract of Cardamom against Cadmium Chloride Induced Toxic Effect in Mice

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ABSTRACT

Introduction: Elettaria cardamom [EC], recognized as “queen of spices”, relates the ginger family, Zingiberaceae. Seeds contains many plant chemicals substance like starch, phenols, terpinoids, flavonoids, tannins, proteins and sterols. These contents have been used to treat many infections in the mouth like gums, throat, teeth and also treat lung disease such as tuberculosis, pulmonary congestion, hypertension, heart disease and digestive system disorders. The anticancer benefits of cardamom are attributed to its identified mechanisms, which include anti-proliferative, anti-inflammatory, pro-apoptotic, and antioxidant actions.

Methods: In this study, 15 male mice were obtained from animal house at the Pharmaceutical Research and Control Center weighing between 30-45 g. The animals were divided in to 3 groups, 5 mice in each group. Group 1: was administered with 2.5 mg/kg of CdCl₂ with normal saline orally as control group. Group 2: was administered with 2.5 mg/kg of CdCl₂ and cardamom [200 mg/kg]. Group 3: was administered with 2.5 mg/kg of CdCl₂ with cardamom [300 mg/kg] for six weeks.

Results: The results showed the protective effect of cardamom against histological damage caused by substances like cadmium chloride and increase recovery of the histological characters in groups treated cardamom 200 and 300 mg/kg. The group treated 300 mg/kg cardamom showed better results than with 200 mg/kg.

KEYWORDS: Elettaria cardamom, Cadmium Chloride, Histological damage, antioxidant, cardamom, histoprotective.

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INTRODUCTION

Elettaria cardamomum Maton is the scientific name of cardamom it is one of the commonly used in spices and is referred to as “the queen of spices” [1].

The family of Cardamom [Zingiberaceae] is one of the most old and costly spices in the world [2]. This plant is appreciated for its dried fruits [3]. The Elettaria genus is a tiny and diminutive natural group originating from the

perpetual rainforests of South India and Sri Lanka, via whence they disseminated to other tropical zones [4]. This herb grows all year round, characterized by its foliage, it originates from Sri Lanka and India and is predominantly cultivated in India's south [5]. The valuable part is a non-perishable herbaceous perennial crop, These seeds are useful in spice mixtures in whole bean or powder, such as beverages, curries similar as coffee and team eat items, baked goods, confections, and biscuits flavors that are combined with custards, wines, and liqueurs. In the Middle East, cardamom and coffee are historically combined to make a beverage. Gahwa [6]. The small cardamom seeds are hold a triangular pod at the cross-section the thin papery black shell that covers [7]. The advantageous outcomes of cardamom upon the bacteria Gram positive and Gram negative [8,5], gums and teeth health [9], lung disorders, and finally gastrointestinal disorders [10,11]. The medicinal effects of cardamom stem from its pharmacological qualities, which include antioxidant, antimutagenic, antibacterial, antiinflammatory, antidiabetic, cardioprotective, hepatoprotective, and chemoprotective attributes. [12-16].

MATERIALS AND METHODS

Animal management:

In this study 15 male mice were obtained from animal house at the pharmaceutical research and control center weighing between 30-45 g. Firstly the mice were given a week to acclimatize to their new surroundings. In this study the animals were divided into 3 groups 5 male mice in each one. Group 1: administered with 2.5 mg/kg of CdCl₂ with normal saline treated orally as control group, Group 2: administered 2.5 mg/kg of CdCl₂ and cardamom [200 mg/kg], Group 3: administered the 2.5 mg/kg of CdCl₂ with [300 mg/kg] from cardamom for six weeks.

Preparation of Aqueous Extract Solution of Cardamom:

The aqueous plant extract prepared by putting dry powder of plant [100 g] and then placed on a conical flask with distilled water about [500 ml] in percentage 1:5 w: v then

after make shaken by an electric shaker to two hours and left at ambient temperature. Then was filtered the mixture after 24 hours, by gauze 4 layer and then placed in a container and centrifugation at [2000 rpm/10 min]. Then filter supernatant by filter paper. Crude extract was obtained through concentrating the filtrate mixture for 72 hours in an oven. Before being used, this extract was stored in a dark environment at 4°C, sterile screw-capped bottle [17].

Samples Collected: The mice were sacrificed at the end of experimental period by decapitation under anesthesia and then make incision in abdominal wall therefore make cutting to the liver, heart, kidney and testis. The specimen of these organs were instantly fixed with formalin 10% for histological examination.

This study was authorized by Scientific Ethical Committee at middle technical university [MEC 136].

RESULTS

In this study show comparative between four organs kidney, testis, liver and heart to explain the protective effect of cardamom on histological change after oral administration by cadmium chloride.

Kidney

The kidney show improvement in histological structure after oral administration of cardamom group [200 and 400] mg/kg compared with group treated by cadmium chloride only. The kidney in cadmium chloride group show necrosis in proximal convoluted tubule [cortex] and its found vacuoles in proximal convoluted tubules also found haemorrhage and degeneration in glomeruli. In cardamom 200 mg group appear significant decrease in necrosis and vacuoles less than cadmium chloride group, degeneration and haemorrhage in medulla [distal convoluted tubule] less than cadmium chloride group. Group with 300 mg/kg cardamom if compare with cadmium chloride group and 200 mg/kg cardamom group find decrease in the necrosis and vacuoles [less than other group] and medulla is normal [As shown in Figure 1].

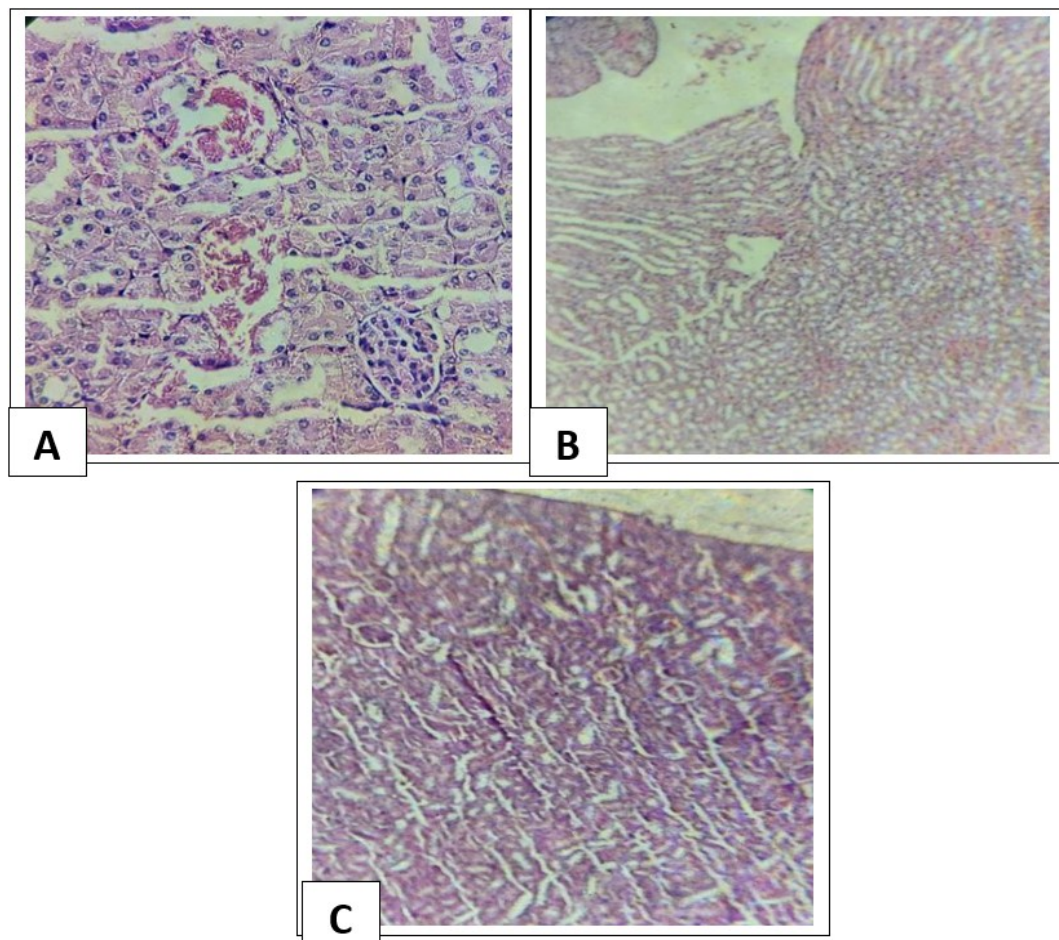


Fig. 1: [A] kidney treated with cadmium chloride only [H &E stain X400], [B] kidney treated with cadmium chloride and 200 mg cardamom [H &E stain X40], [C] kidney treated with cadmium chloride and 300 mg cardamom [H &E stain X400]

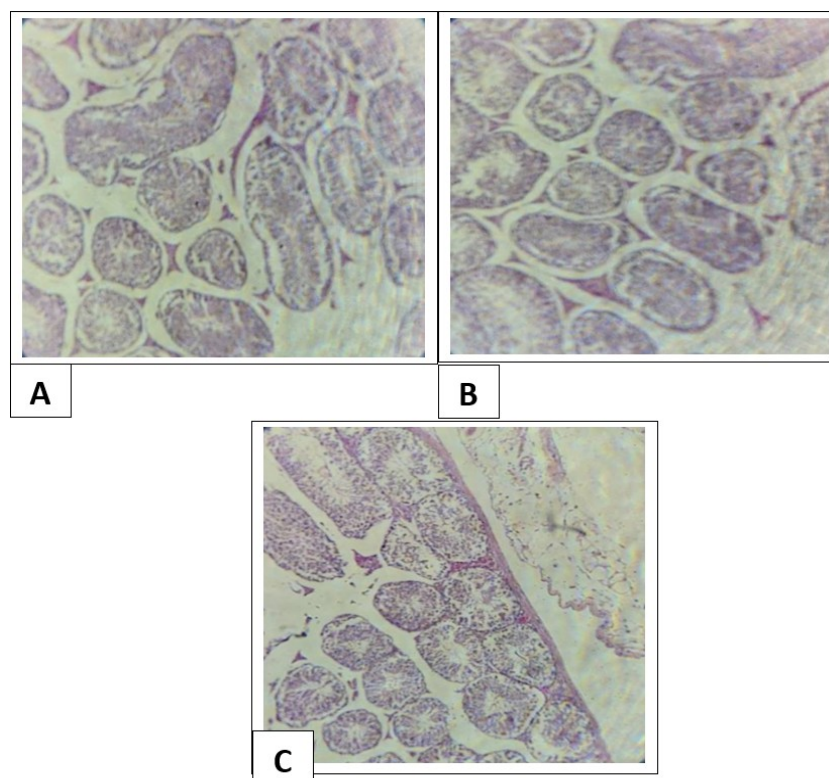


Fig. 2: [A] Testis treated with cadmium chloride only [H &E stain X400], [B] Testis treated with cadmium chloride and 200 mg cardamom [H &E stain X400], [C] Testis treated with cadmium chloride and 300 mg cardamom [H &E stain X400]

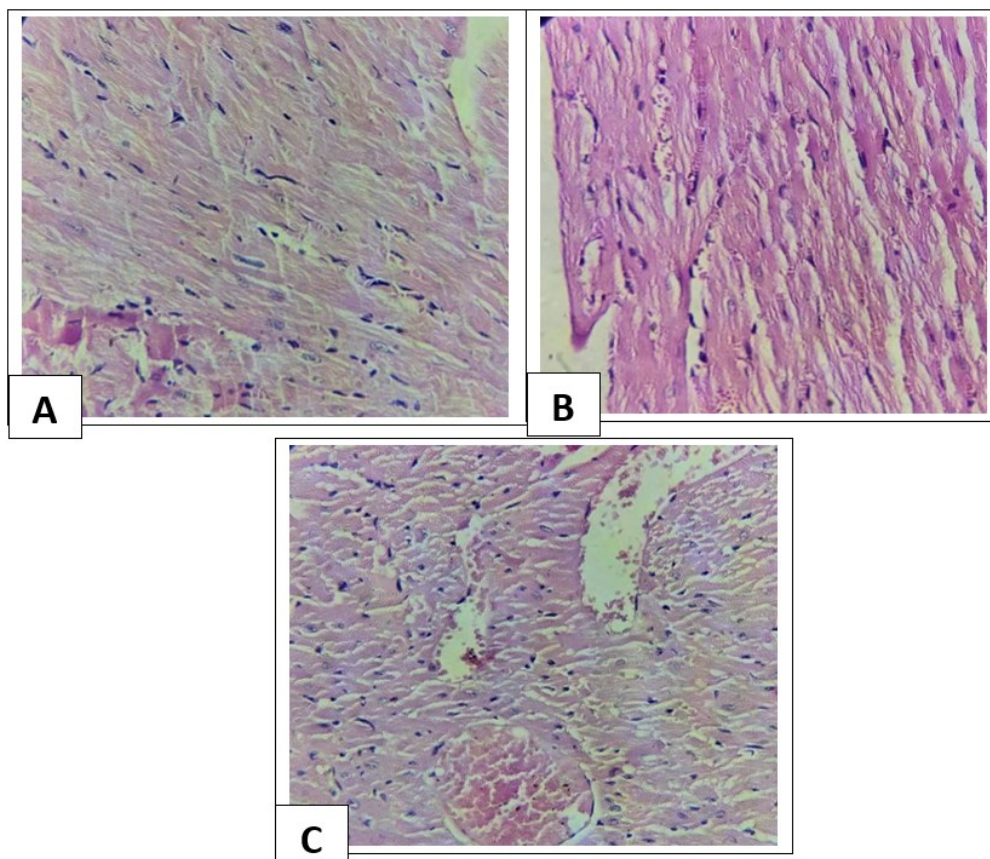


Fig. 3: [A] Heart treated with cadmium chloride only [H &E stain X400], [B] Heart treated with cadmium chloride and 200 mg cardamom [H &E stain X400], [C] Heart treated with cadmium chloride and 300 mg cardamom [H &E stain X400]

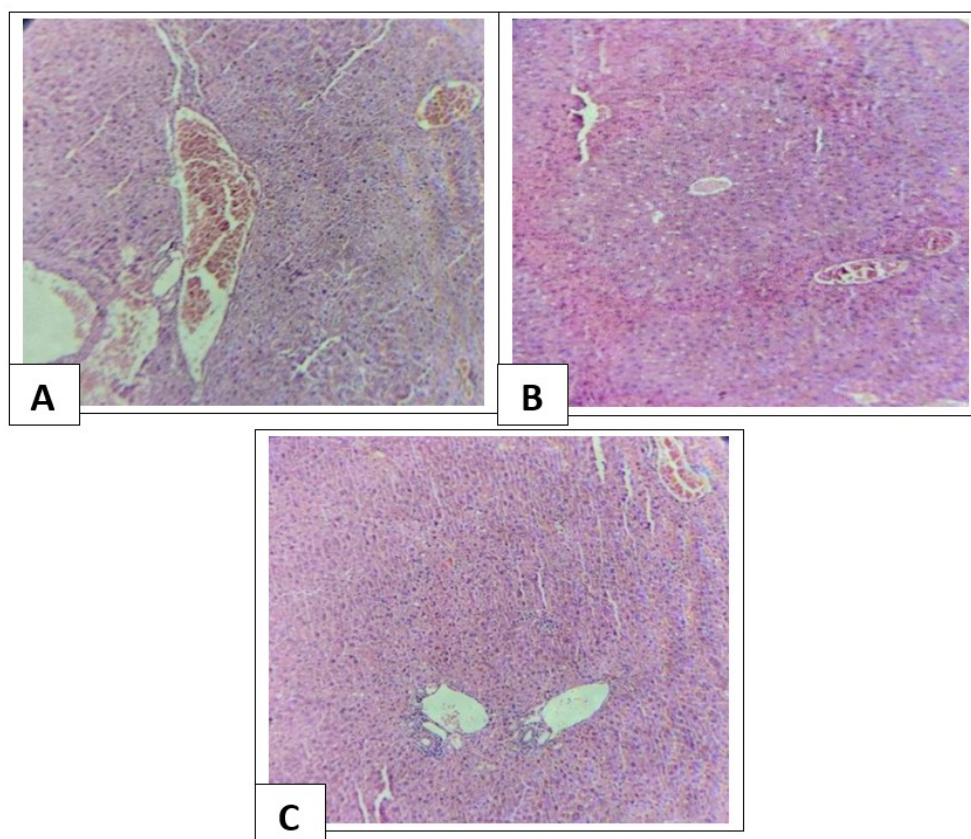


Fig. 4: [A] Liver treated with cadmium chloride only [H &E stain X100], [B] Liver treated with cadmium chloride and 200 mg cardamom [H &E stain X100], [C] Liver treated with cadmium chloride and 300 mg cardamom [H &E stain X100].

Testis

Testis in normal contain seminiferous tubules, leydig cell and other histological and anatomical part of testicle in this study treated with cadmium chloride [CdCl₂] to make histological damage in the testis then show loss of connective tissue inside the testis lead to the seminiferous tubule appear discontinuous, degeneration in spermatogonia, leydig cell is separated from seminiferous tubules if these results compare with treated group with cardamom [200 & 300 mg/kg] find in 200 mg/kg cardamom no significant differences between cardamom 200 mg/kg group and CdCl₂ group but in group with 300 mg cardamom show recover of connective tissue of testis and return of natural pattern of testis, leydig cell return in normal position between seminiferous tubule. [As shown in Figure 2].

Heart

Cardiac muscle tissue is characterized by its appearance is striated, branched cells, and it's have intercalated discs that allow for coordinated contractions. In group treated with CdCl₂ only show the nuclei are longitudinal in shape and cardiac muscle fiber is discontinuous and hemorrhage its present between them. The compare between treated group with cardamom [200 and 300 mg/kg] with CdCl₂ group find the nuclei is longitudinal and circular and its found in different level in 200 mg/kg group, discontinues and hemorrhage in muscle fiber but less than from CdCl₂ group. In 300 mg/kg group show the significant decrease longitudinal nuclei and return to normal form, normal in cardiac muscle fiber if compare with 200mg/kg cardamom group and CdCl₂ group. [As shown in Figure 3].

Liver

In group treated with CdCl₂ group show degeneration of hepatocyte and find haemorrhage, enlargement in hepatic artery in portal area, haemorrhage in central vein. If compare with 200 mg/kg cardamom treated group show the haemorrhage in hepatic vein less than CdCl₂ group. The haemorrhage in central vein is reduce, no arrangement in

hepatocyte, reduce in the enlargement of the hepatic artery. Then after group treated with 300 mg/kg cardamom the haemorrhage in central vein highly decrease compare with CdCl₂ group and cardamom 200 mg/kg group, hepatocyte normal strand, hepatic artery is normal and not found haemorrhage [As shown in Figure 4]

DISCUSSION

In this study we use the cardamom as protective effect after make histological damage by cadmium chloride. According to properties of cardamom, the different investigations using animals hold presented its antihypertensive, antioxidant, antispasmodic, gastro-protective effect, antimicrobial, against aggregation of platelet as well as anti-cancer features [18] also cardamom used for medicine to treat oral infection of the gums, teeth, and throat, Additionally, treat the lung congestion and pulmonary tuberculosis, hypertension, cardiac disease, and digestive tract disorders [19]. The properties of cardamom extracts knew as anti-fungal and antimicrobial properties [20,21]. The anticancer activities of cardamom extract shows in many studies [22]. Other studies show effect of cardamom as anti-proliferative, anti-inflammatory, pro-apoptotic [23] its antioxidant capabilities have been identified as the reasons behind cardamom's anticancer effects. Cardamom extract has found to be a potent macrophage modulator [24] and as a barrier against the dangers of uranium [25]. These study also agreed by Sameer N et al 2015 [26] that use the cardamom as protective substance to myocardial muscle damage proved by fall necrosis in cardiac muscle fiber, edema to minor signs of infection.

CONCLUSION

This study concluded that use the cardamom as protective effect against histological change by cadmium chloride and can use as antioxidant to prevent histological damage. And finally use the cardamom in 300 mg/kg concentration its more benefit than 200 mg/kg concentration.

Conflicts of Interests: None

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