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Evaluation of cardioprotective activity of maceration extract of *Elettaria cardamomum* in doxorubicin induced cardiotoxicity in rats

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ABSTRACT

The plant *of Elletteria cardamom* was collected and phytochemical studies were made with different solvents using ethanol and water. The extracts showed different extractive values (2.0 and 9.0 respectively) and showed the presences of different bioactive compounds like Alkaloids, Saponins, flavonoids, Terpenes, Glycosides steroids. Based upon the literature this given us the positive signal which may induce cardio protective activity.

Treatment with *Ellettaria cardamom* extract high dose 500mg/kg.b.w lowers the LDH levels, SGOT levels, SGPT levels, Total protein levels, Serum albumin levels, Alkaline phasphatase levels and Triglycerides in doxorubicin induced cardiac rats. Treatment with low dose 100mg/kg.b.w of *Elletteria cardamom* extract lowers the Triglycerides levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *Elletteria cardamom* extract lowers the total cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *Elletteria cardamom* extract improves the HDL Cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *Elletteria cardamom* extract lowers the LDL Cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *Elletteria cardamom* extract lowers the VLDL Cholesterol levels in doxorubicin cardiac rats. Treatment with *Elletteria cardamom* extract high dose 500mg/kg.b.w lowers the total chloride levels in doxorubicin induced cardiac rats.

1. INTRODUCTION

The drug consists of maceration extract of seeds of *Elettaria cardamomum* belongs to the family Zingiberaceae. Cardiovascular disease (CVD) has the same meaning for health care today as the epidemics of centuries had for medicine in earlier times: 50% of the population in developed countries die of cardiovascular disease. So, for this purpose the medicinal use of cardomom seeds extract is effectively done here on this project research to evaluate the cardio protective activity.

Chemical constituents: Constituents of the fruits of greater cardamom (*Elettaria cardamomum*) were analyzed, and protocatechualdehyde, protocatechuic acid, 1,7-bis(3,4-dihydroxyphenyl)hepta-4E,6E-dien-3-one and 2,3,7-trihydroxy-5-(3,4-dihydroxy-E-styryl)-6,7,8,9-tetrahydro-5H-benzocyc loheptene were identified.

The volatile oil of *E. cardamomum* (L.) Maton seeds contain trace waxes; alpha-terpinyl acetate, 42.3%; 1,8-cineole, 21.4%; linalyl acetate, 8.2%; linalool, 5.4%; limonene, 36.4% ; terpinolene, 8.6% and Myrcene, 6.6%. It also contains Mg, Al, Si, P, S, Cl, K, Ca, Ti, Mn, Fe, Cu and Zn, with varying concentrations. The volatile oil also includes cineole.

Pharmacological uses of *Elettaria cardamomum*:

Antibacterial Activity: Ethanolic extract of *E. cardamomum* possess antibacterial effect at the dose of 512µg/mL11.

Toxicity of the extract was observed at 0.3 mg/g, which showed inflammation in brain, oxidative stress and cells necrosis in heart. The use of *E. cardamomum* as spice should not exceed the 0.003 mg/g since at this amount no negative effects were observed.

Gastro protective Activity: Gastro protective activity of *E. cardamomum* was best found in the petroleum ether soluble extract which inhibited lesions by nearly 100% at 12.5 mg/kg in the aspirin-induced gastric ulcer. Methanolic extract also possess gastro protective effect.

Blood Pressure Lowering Activity: powdered *E. Cardamomum* possess antihypertensive activity. At a dose of 3g, it significantly decreases diastolic pressure. It enhances fibrinolysis and improves antioxidant status, without significantly altering blood lipids and fibrinogen level in hypertensive patients exhibits gut excitatory and inhibitory effects. These effects are mediated through cholinergic and Ca++ antagonist mechanisms respectively and lowers BP via combination of both pathways.

Anti-inflammatory, Analgesic & Antispasmodic Activity: Seeds of *E. cardamom* possess anti-inflammatory, analgesic and antispasmodic. In Carrageenan-induced rat paw edema the oil extract of *E. cardamomum* seeds, in doses of 175 and 280 microliters/kg were found to reduce the inflammation. Analgesic activity was evaluated by p-benzoquinone induced writhing method but antispasmodic activity was evaluated in-vitro. Studies reveal that antispasmodic action is produced through muscarinic receptor blockage.

Antioxidant activity: Cardamom oil is effective as an antioxidant and can increase levels of glutathione, a natural antioxidant in body. The effect is increased by increasing the content of the oil from 100 to 5000 ppm.

2. METHODS & MATERIALS

Plant materials: Small cardamom(*Eletteria cardamom*) belongs to Zingiberaceae obtained in the vicinity were collected and authenticated by Prof. Dr. Sathyanarayana Raju HOD of Department of Botany, Acharya Nagarjuna University, Guntur district.

Animals: Male Wister Albino rats (200-250g) were obtained from Mahaveer enterprise Hyderabad, habituated for a week and maintained in the institutional animal house at 25 ±2o C temperature with 12 hour light and dark cycle, fed with standard pellet of diet and water *ad libitum* throughout the experiment study. The experimental protocol including treatment and surgical procedures was approved by IAEC with the approval no: 004/NCP/IAEC/2015.

Acute toxicity: As per the OECD guidelines 423, the acute toxicity of the hydro extract of *E.cardamom* was tested on different groups of 10 mice. Each receiving different doses of 50, 100, 300, 500, 1000, and 2000 mg/kg body weight. The number of deaths and behavioral changes were observed in each group and recorded with in 48hours upto 2000mg/kg, there were no signs of toxicity and mortality. Based on these studies, 100, 300 and 500mg/kg body weight of *E. cardamomum* were selected for the present experimental study.

Table.1.Acute toxicity

Groups (n=10)	Treatment (mg/kg)	No of animals dead	No of animals alive	Behavioral Changes within 48 h
1	100	0	10	None
2	300	0	10	None
3	500	0	10	None
4	1000	0	10	None
5	1500	0	10	None
6	2000	0	10	None

Dose selection: Doses were selected based on the cute toxicity studies. Up to 1000mg/kg body weight, there were no signs of toxicity observed. So $1/10^{th}$ and $1/5^{th}$ of 1000 mg/kg dose i.e. 200mg/kg and 300 mg/kg were chosen for the study. First dose of the extract was selected as 100 mg/kg, followed by 300 mg/kg and 500 mg/kg for second and third doses respectively.

Table.2.Grouping of experimental animals

Group No	Code	Description
I	N	Normal
II	D	Diseased
III	S	Proponolol 10 mg/kg was given as standard drug
IV	LDEC	Low dose *Eletteria Cardamom* (100mg/Kg)
V	MDEC	Medium dose *Eletteria Cardamom* (300mg/Kg)
VI	HDEC	High dose *Eletteria Cardamom* (500mg/Kg)

Allotment of animals: Male albino rats were divided into 6 groups of 6 rats each. Allotment of animals into groups was done by computerized randomization method.

3. RESULTS AND DISCUSSION

The cardiac problems are major health issues in recent times. Cardiac problems include myocardial infraction, atherosclerosis and hyperlipidemia. Our study with the *E. cardamom* focuses on these cardiac health problems. The phytochemical constitutes present in the *E. cardamom* plant gives the scope to do the experiment and we are successful by its results.

The plant of *E. cardamom* was collected and phytochemical studies were made with different solvents using ethanol and water. The extracts showed different extractive values (2.0 and 9.0 respectively) and showed the presences of different bioactive compound

(Alkaloids, Saponins, flavonoids, Terpenes, Glycosides steroids. Based upon the literature this given us the positive signal which may induce cardio protective activity.

Treatment with *E. cardamom* extract high dose 500mg/kg.b.w lowers the LDH levels in doxorubicin induced cardiac rats. Treatment of *E. cardamom* extract high dose 500mg/kg.b.w. lowers the SGOT levels in doxorubicin induced cardiac rats. Treatment with high dose of *E. cardamom* extract 500mg/k.g.b.w lowers the SGPT levels in doxorubicin induced cardiac rats. Treatment with *E. cardamom* extract high dose 500mg/kg.b.w lowers the total proteins levels in doxorubicin induced cardiac rats. Treatment with Elletteria cardamom extract high dose 500mg/kg.b.w lowers the serum albumin levels in doxorubicin induced cardiac rats. Treatment with high dose 500mg/kg.b.w of *E. cardamom* extract lowers the alkaline phasphatase levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *E. cardamom* extract lowers the triglycerides levels in doxorubicin cardiac rats. Treatment with low dose 100mg/kg.b.w of *E. cardamom* extract lowers the triglycerides levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *E. cardamom* extract lowers the total cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *E. cardamom* extract improves the HDL Cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of *E. cardamom* extract lowers the LDL Cholesterol levels in doxorubicin cardiac rats. Treatment with high dose 500mg/kg.b.w of EC extract lowers the VLDL Cholesterol levels in doxorubicin cardiac rats. Treatment with *E. cardamom* extract high dose 500mg/kg.b.w lowers the total chloride levels in doxorubicin induced cardiac rats.

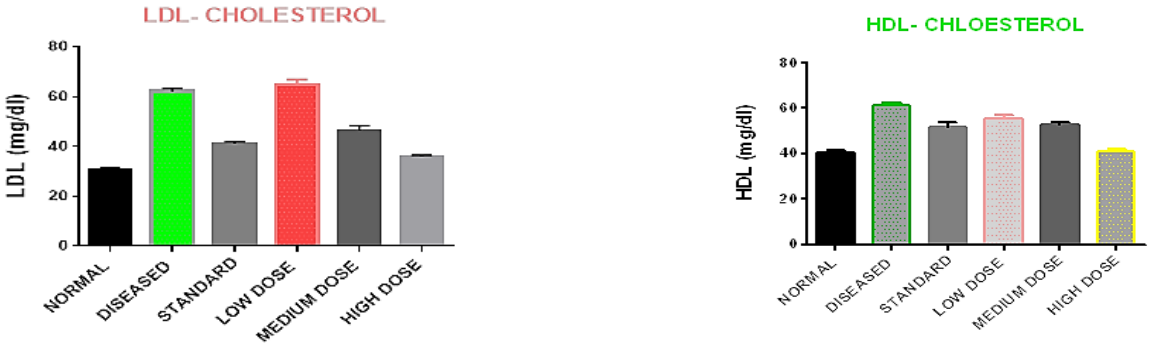

Figure.1.Effect of *Elettaria cardamom* extract on HDL and LDL levels

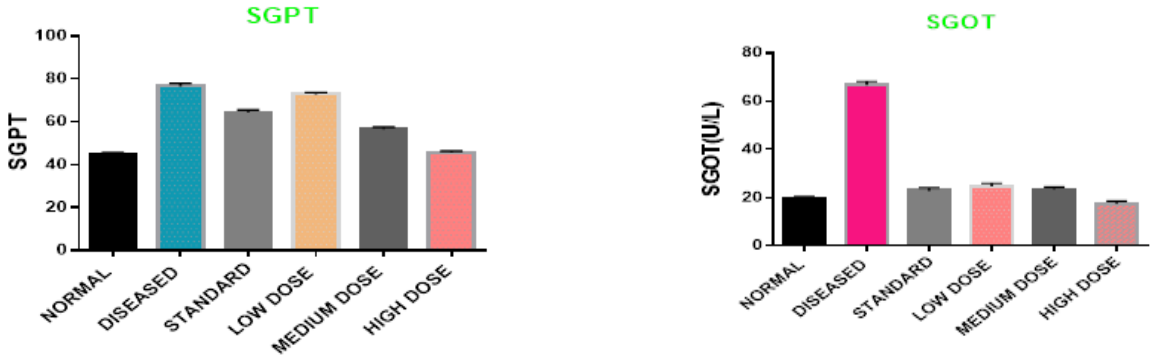

Figure.2.Effect of *Elettaria cardamom* extract on SGOT and SGPT levels

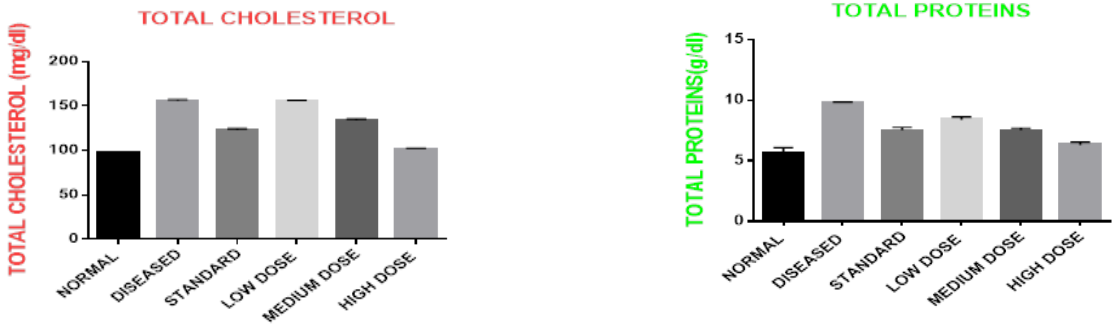

Figure.3.Effect of *Elettaria cardamom* extract on total cholesterol and total proteins

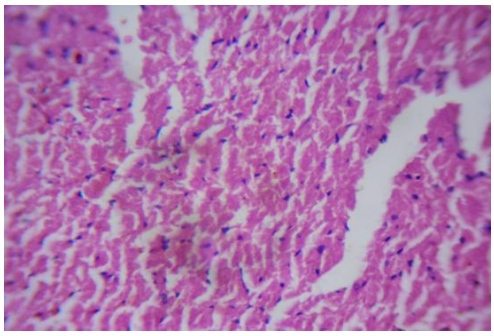

Figure.4.Histology of heart section showed restoration of the injured heart to the normal (Normal)*

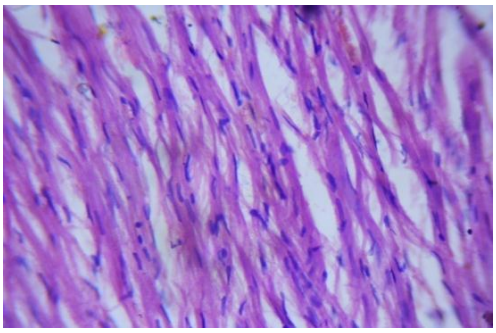

Figure.5.Histology of heart section showing damage of myocardial architecture with myocardial necrosis, extensive vascularization fatty changes and inflammation (Diseased)*

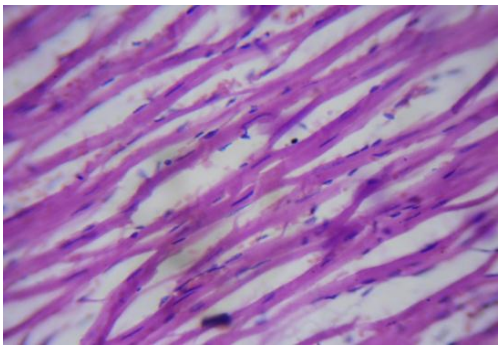

Figure.6. Histology of heart section showed potential recovery of the normal myocyte recovery (Standard)*

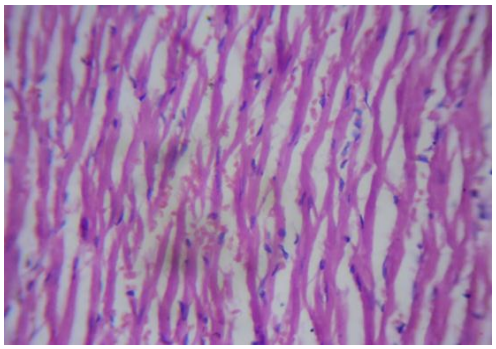

Figure.7. Histology of heart section showed slight changes in myocytes and vascularization compared with diseased (Dose:100mg/kg of body weight)*

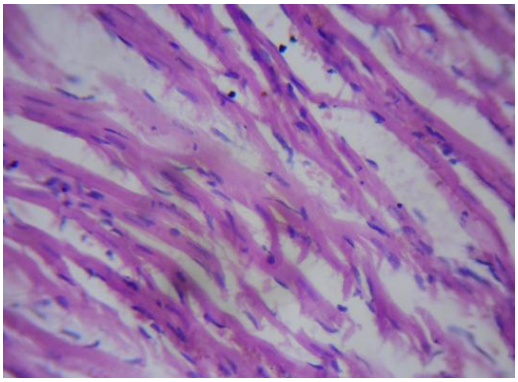

Figure.8.Histology of heart section showed significantly changes in myocytes and vascularization(Dose:300mg/kg of body weight)*

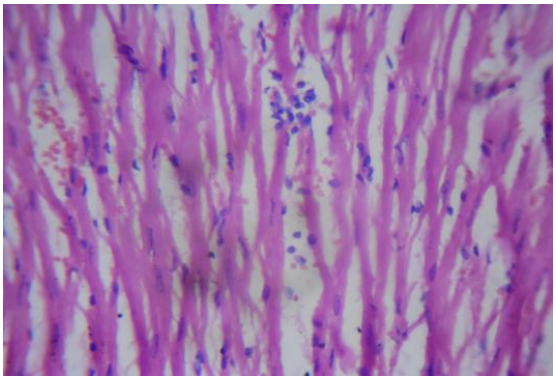

Figure.9. Fig: Histology of heart section showing normal myocardial cells each with well-defined myoplasma, prominent nucleus and clear vascularization (Dose:500mg/kg of body weight)*

*** Magnification: 400 times of the original**

4. CONCLUSION

The cardio protective study shows there is significant reduction in LDH levels *Ellettaria cardamom* extracts. In cardiac rats it improves the lipid metabolism. In our present investigation we have find out that there are many bioactive compounds in the plant extract mainly Saponins, flavonoids, Terpenes, volatile oils, glycosides and steroids for pharmacological evaluations. From our Studies it is evident that these bioactive compounds in group (or) individually from *Elletteria cardamom* extract exerted potential mechanism of action with speculating against cardio protective activity.

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