

Original Research Article

## ***Pandanus odoratissimus*: A Potential Cardioprotective Herb against Isoproterenol Induced Myocardial Infarction in Rats**

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**Abstract:** Present study was conducted to evaluate the cardioprotective activity of *Pandanus odoratissimus* leaf extract in rats. 24 Sprague – Dawley rats were used in the study and divided in to 4 groups of 6 each. Isoproterenol (85mg/kg,ip) was used to induce the myocardial infarction in rats. Lipistat (350mg/kg) was used as reference control and 200mg/kg of ethanolic leaf extract of *Pandanus odoratissimus* was used as evaluate the cardioprotective effect. All the test drugs were administered orally by suspending in 0.1% carboxy methyl cellulose solution once daily for 15 days. On 16<sup>th</sup> day blood was collected by sinus puncture under anesthesia to estimate cardiac biomarkers Creatinine Phosphokinase and Lactate Dehydrogenase. Animals were sacrificed by excess phenobarbitone, heart was dissected out, homogenized and estimated superoxide dismutase and catalase. Result showed that, the animals pretreated with 200 mg/kg of *Pandanus odoratissimus* leaf extract significantly decreased the cardiac marker enzyme CPK (P<0.01) and LDH (P<0.05) and increased the levels of SOD (P<0.05) and CAT (P<0.01). form the result it was concluded that, the ethanolic leaf extract of *Pandanus odoratissimus* exhibited cardioprotective activity against Isoproterenol induced cardiac damage in rats and it may be due to the presence of Isoflavone and carotenoids and its free radical scavenging property.

**Keywords:** *Pandanus odoratissimus*, Cardioprotective, Isoproterenol, Antioxidant.

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### **INTRODUCTION**

Cardiovascular diseases have been gaining importance in India recently because of increased incidence of the disease. It is the first among top 5 causes of deaths in Indian population. In 2011, World Health Organisation (WHO) reported the age standardized CVD mortality rates among males and females in India (per 100,000) at 363–443 and 181–281, respectively [1]. Cardiovascular diseases include: coronary heart disease (heart attacks), cerebrovascular disease, raised blood pressure (hypertension), peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure. Since the beginning of human civilization, herbs have been an integral part of society, valued for both their culinary and medicinal properties. Herbal medicine has made many contributions to commercial drug preparations manufactured today including ephedrine from *Ephedra sinica*, digitoxin from *Digitalis purpurea*, salicin (the source of aspirin) from *Salix alba*, and reserpine from *Rauwolfia serpentina*, to name just a few. A naturally occurring  $\beta$ -adrenergic blocking agent with partial

agonism has been identified in an herbal remedy. The recent discovery of the antineoplastic drug paclitaxel from *Taxus brevifolia* stresses the role of plants as a continuing resource for modern medicine [2]. *Pandanus odoratissimus*, commonly known as kewda, belongs to the family Pandanaceae. It is widely distributed in India over coastal districts of Orissa, Andhra Pradesh, Tamilnadu and to some extent in parts of Uttar Pradesh [3]. *Pandanus odoratissimus*, is said to restore health, strength and over all well-being of an individual. Essential oils are extracted from the highly scented male inflorescence of *Pandanus odoratissimus*. As per Ayurveda, it is useful in treating headaches, earaches and rheumatic pains. It is commonly used as breath freshner and is also used for flavouring foods since ancient time[4].

It is traditionally recommended by the Indian Ayurvedic medicines for treatment of headache, rheumatism, spasm, cold/flu, epilepsy, wounds, boils, scabies, leucoderma, ulcers, colic, hepatitis, smallpox, leprosy, syphilis, and cancer and as a cardiotoxic,

antioxidant, dysuric, and aphrodisiac. It contains phytochemicals, namely, lignans and isoflavones, coumestrol, alkaloids, steroids, carbohydrates, phenolic compounds, glycosides, proteins, amino acids as well as vitamins and nutrients [5]. *Pandanus odoratissimus* reported to possess anticonvulsant [6], antioxidant [1], analgesic and anti-inflammatory [8,9], antidiabetic [10], hepatoprotective [11] and anthelmintic [12] activities. Only few of its, ethnobotanical claims were scientifically proven, so effort has been taken to evaluate the cardioprotective activity of *Pandanus odoratissimus* against isoproterenol induced cardiac damage in rats.

## MATERIALS AND METHODS

### Plant Material

The leaves of *Pandanus odoratissimus*, Linn. were collected from the outskirts of Salem, in the month of February. The plant samples were identified and authenticated by the Scientist D, Botanical Survey of India, Southern Regional Center, Agricultural University, Coimbatore, India. The voucher specimen (BSI/SRC/14/66/15-16/Sci - 057) was deposited in Herbarium for further reference.

### Preparation of Extract

The leaves were washed with water and shade dried at room temperature. The dried leaves were crushed to get coarse powder. Dried coarse powders of the leaves were extracted with 70% ethanol by cold maceration for 7 days. The extracts were then concentrated by evaporation, dried and stored in desiccators.

### Animals

Healthy male Sprague – Dawley (SD) rats weighing between 180 - 220 gm were used for this study. The animals were obtained from animal house, Nandha College of Pharmacy, Erode. The animals were placed at random and allocated to treatment groups in polypropylene cages with paddy husk as bedding. Animals were housed at a temperature of  $24 \pm 2^\circ\text{C}$  and relative humidity of 30 – 70 %. A 12:12 light: day cycle was followed. All animals were allowed to free access to water and fed with standard commercial pelleted rat chaw (M/s. Hindustan Lever Ltd, Mumbai). All the experimental procedures and protocols used in this study were reviewed by the Institutional Animal Ethics Committee (688/02/c/CPCSEA) and were in accordance with the Institutional ethical guidelines.

### Pharmacological Activity

#### Cardioprotective Activity [13]

The rats were divided into 5 groups of 6 animals each. Group I served as normal control, administered with 1ml/kg of 0.1% CMC solution for 15 days. Group II served as induced control, administered with isoproterenol (85mg/kg, bw) intraperitoneally twice at an interval of 24 hours on 14<sup>th</sup> and 15<sup>th</sup> day. Group III served as reference control, administered

orally with Lipistat (350 mg/kg, bw), once daily for 15 days. Group IV administered orally with 200 of ethanolic leaf extract of *Pandanus odoratissimus*. Group III and IV along with test drugs, the animals administered with isoproterenol (85mg/kg, bw) as mentioned earlier. All the test drugs were administered orally by suspending in 0.1% CMC solution.

On 16<sup>th</sup> day blood was collected in heparinized tube by retro orbital sinus puncture, under thiopentone sodium anaesthesia. The collected blood samples were centrifuged for 10 minutes at 2000 r.p.m. and plasma was separated. The separated plasma was subjected to various biochemical tests like estimation of cardiac biomarkers Creatinine Phosphokinase (CPK) and Lactate Dehydrogenase (LDH) [14,15].

After blood collection, the animals were sacrificed by excess Phenobarbitone sodium and heart tissue was quickly dissected out and washed in ice cold saline. A weighed quantity of each heart was taken from all the groups and a 30% w/v homogenate was prepared in 0.9% buffered KCl (pH 7.4) for the estimation superoxide dismutase (SOD) and catalase (CAT) [16,17].

### Statistical Analysis

Results were expressed as mean  $\pm$  SEM. The data were analyzed by using one way analysis of variance (ANOVA) followed by Dunnet's t test. P values  $< 0.05$  were considered as significant.

## RESULT AND DISCUSSION

*Pandanus odoratissimus* leaf extract was studied for its cardioprotective activity against Isoproterenol induced myocardial infarction in rats and the results were shown on table 1. Ethnomedical information of *Pandanus odoratissimus* recommends the presence of lignans and isoflavones, coumestrol, alkaloids, steroids, carbohydrates, phenolic compounds, glycosides, proteins, amino acids [5]. *Pandanus odoratissimus* contains carotenoid (provitamin-A) rich food may protect against diabetes, heart disease, and cancer and alleviate these serious emerging problems [18]. The cardioprotective effect of *Pandanus odoratissimus* was evaluated by assessing the marker enzymes CPK, LDH and the levels of SOD and catalase in myocardial tissue against the Isoproterenol challenge in rats. In Isoproterenol treated animals, the cardiac enzyme levels (CPK and LDH) were increased and the free radical enzymes (SOD and CAT) were decreased, when compared to the levels of normal control animals, which confirms the damage of cardiac tissues. Pretreatment of Lipistat, the reference control, significantly reduced the cardiac marker enzymes CPK ( $P < 0.001$ ) and LDH ( $P < 0.01$ ) and increased the levels of SOD and CAT ( $P < 0.01$ ). The animals pretreated with 200 mg/kg of *Pandanus odoratissimus* leaf extract significantly decreased the cardiac marker enzyme CPK ( $P < 0.01$ ) and LDH ( $P < 0.05$ ) and increased the levels of SOD

( $P < 0.05$ ) and CAT ( $P < 0.01$ ). Isoproterenol is a  $\beta$  – adrenergic, synthetic catecholamine which induces severe stress in the cardiac muscle leading to Myocardial Infarction. Studies suggest that free radical

plays a crucial role in the pathogenesis of Isoproterenol induced Myocardial Infarction. *Pandanus odoratissimus* reported to have antioxidant property [7], which was evident in this study by increasing the SOD and CAT.

**Table-1: Effect of ethanolic leaf extract of *Pandanus odoratissimus* against Isoproterenol induced myocardial infarction in rats**

Groups	Drug Treatment	Plasma		Cardiac Tissue Homogenate	
		CPK (IU/L)	LDH (IU/L)	SOD (units/mg of protein)	CAT (units/mg of protein)
I	Vehicle Control 0.1% CMC	142.56 $\pm 5.40$	147.79 $\pm 6.62$	36.32 $\pm 2.39$	61.04 $\pm 2.42$
II	Isoproterenol (85 mg /kg)	271.33 $\pm 8.52$	217.66 $\pm 7.98$	21.59 $\pm 1.83$	35.31 $\pm 2.94$
III	Lipistat (350mg/kg) + Isoproterenol (85 mg /kg)	181.59 $\pm 9.74^{***}$	166.82 $\pm 8.47^{**}$	32.50 $\pm 2.41^{**}$	53.69 $\pm 3.05^{**}$
IV	<i>Pandanus odoratissimus</i> (200mg/kg) + Isoproterenol (85 mg /kg)	205.93 $\pm 7.63^{**}$	189.04 $\pm 6.66^*$	27.90 $\pm 2.22^*$	46.64 $\pm 2.16^{**}$

Values are in mean  $\pm$  SEM (n=6),

\* $P < 0.05$  , \*\* $P < 0.01$ , \*\*\* $P < 0.001$  Vs Isoproterenol Control

## CONCLUSION

From the result, it was concluded that, the ethanolic leaf extract of *Pandanus odoratissimus* exhibited cardioprotective activity against, Isoproterenol induced Myocardial infarction in rats. The probable mechanism of action of *Pandanus odoratissimus* may be due to its free radical scavenging activity and presence of Isoflavone and carotenoids.

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