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Evaluation of the Cardioprotective activity of aqueous prop roots extracts of Ficus bengalensis

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ABSTRACT: The most frequent symptom of ischemic heart disease is a heart attack, or myocardial infarction, which is a serious public health issue. Clinical syndrome caused by myocardial necrosis due to abrupt and prolonged reduction of blood flow. Lipid peroxidation, an increase in cardiac markers, and a changed lipid profile are only some of the pathophysiological and biochemical changes that follow. This study aimed to determine whether or not an aqueous extract of Ficus bengalensis prop-roots might prevent isoproterenol-induced heart damage in wistar rats. For 30 days, we gave one group 100 mg/kg, another 200 mg/kg, and a third group 500 mg/kg of aqueous extracts of prop roots. Isoproterenol (85 mg/kg body wt) was injected subcutaneously twice at a 24-hour interval at the conclusion of the treatment period in all groups of animals. The aqueous extract of Ficus bengalensis dramatically reduces the heart weight relative to the body weight, which may be attributable to the decrease in water content of the myocardial or may be an indication that the myocardium is protected from infiltration. In addition, the GSH and GPx and GST activities in the hearts of pretreated rats with aqueous prop-roots extract of Ficus bengalensis (APREFB) were significantly increased. Myocardial damage is greatly reduced and diagnostic marker enzyme levels are recovered in control rats after treatment of plant extracts. Aqueous extract of Ficus bengalensis at 200 mg/kg and 500mg/kg exhibited substantial results in all measures of cardioprotective action, including a reduction in the amount of myocardial damage and a restriction in the leakage of these enzymes from myocardium.

KEYWORDS: Myocardial Infarction, Aqueous extract, Isoproterenol, Cardioprotective activity, Ficus bengalensis

I. INTRODUCTION

The dose-limiting factor in cancer treatment or an unbalanced diet and lifestyle may be cardiotoxicity, a condition that arises during therapy with multiple cytotoxic medicines [1]. Herbal supplements' popularity has skyrocketed in recent years. Myocardial infarction is regarded as one of the worst cardiovascular disorders. Because the disease has so many potential causes, it is possible that the currently available treatment won't be enough to overcome the side effects brought on by the synthetic medicine. The use of medicinal herbs in conjunction with conventional treatment is warranted [2]. Heart and blood arteries make up the cardiovascular system, which pumps blood throughout the body. It brings oxygen, nutrients, and hormones to cells and carries away waste items from those cells. Myocardial infarction, angina pectoris, hypertension, stroke, and other circulatory disorders are all included under the umbrella term cardiovascular disease, which is widely used to describe a collection of conditions affecting the heart and its associated blood vessels. Heart conditions such as coronary artery disease, congestive heart failure, cardiac arrest, arrhythmias, and peripheral artery disease have all been reported [3]. Due to their abundance of useful secondary metabolites and therapeutic essential oils, medicinal plants have the potential to become new medication sources. Cardioprotective activity was shown to be the result of a number of different phytoconstituents found in plants [4]. Using an appropriate pharmacological screening technique, we determined that secondary metabolites such as

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carotenoids, triterpenes, flavonoids, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids, fatty acids, etc. were responsible for cardio-protective effect at a certain dosage.Banyan, banyan fig, and Indian banyan are all frequent names for the same tree, Ficus benghalensis. The tropical deciduous evergreen tree Ficus bengalensis belongs to the genus Ficus and the family Moraceae. F. benghalensis, the true banyan, has the potential to become a massive tree. As a spiritual or ornamental tree, F. bengalensis is sometimes referred to by its popular name, "Bargad." Many different aspects of F. bengalensis have been the subject of extensive pharmacological research, but there are still many traditional therapeutic uses that have not been proven scientifically. Pillar roots are another name for prop roots. These are the adventitious roots that grow from the bottoms of trees' large horizontal branches and make their way into the ground below. This causes them to resemble pillars. Plants like the rubber tree (Ficus benghalensis), the maize (Zea mays), and others have prop roots [5,6].

II. MATERIAL AND METHODS

Plant Material and Extraction

Plant prop-roots were collected from Nehru Garden, JAIPUR. The plant parts were authenticated as prop-roots of Ficus bengalensis by Botanical Survey of India Jodhpur, Rajasthan. Ficus bengalensis prop-roots powder was extracted by aqueous extraction method in soxhlet apparatus at 35-40^{0}C temperature. The mixture were filtered in Buchner funnel and dried over water bath till dryness. Then percentage yield were determined. This extract yielded 28.7% (w/w).

Experimental Animals

The experimental protocol was approved by the Institutional Animal Ethics Committee CPCSEA No. - 2005/PO/RcBT/S/18CPCSEA, and healthy adult Wistar rats of either sexe weighing 150-250 g were obtained. The animals were kept in standard conditions of temperature (242 C), relative humidity (30%-70%), and light:dark cycle (12:12). The animals were fed a standard pellet diet and had free access to water.

Chemicals

Isoproterenol was provided as a free sample by Samarth Life Science Pvt. Ltd. in Baddi, Himachal Pradesh, while ketamine hydrochloride injection was purchased from Neon Laboratories Limited in Mumbai, Maharashtra.

Phytochemical Screening

Alkaloids, carbohydrates, proteins, flavonoids, glycosides, saponins, phenolic compounds, and tannins were analysed in a preliminary phytochemical study of an aqueous prop-roots extract of Ficus bengalensis. Tabulated below are the phytochemical results (**Table 1**).

Acute Toxicity Studies

According to OECD guidelines 423, acute toxicity tests for an aqueous extract of the prop-roots of Ficus bengalensis were conducted on wistar rats. Each animal received an oral administration of the extract's aqueous solution. The animals were continuously monitored for any alterations for the first two hours and for mortality for up to twenty-four hours. For determining the LD50, the prop roots extract was dissolved in distilled water and orally administered to six groups of wistar albino rats containing five rodents each at various concentrations (250, 500, 750, 1000, 1500, and 2000 mg/kg body weight). The LD50 was determined by monitoring mortality within twenty-four hours [7].

III. EVALUATION OF CARDIOPROTECTIVE ACTIVITY

Isoproterenol Induced Myocardial Infarction

Wistar rats of either sex were separated into five different groups (n = 6). The plant extract had been treated for thirty days. At the end of the treatment period, all animals were subcutaneously administered isoproterenol at a dose of 85 mg/kg body weight twice at a 24-hour interval. Table2: Schedule of Isoproterenol Induced Myocardial Infarction model. Group I received distilled water referred as Normal Control, Group II was administered only isoproterenol at 85 mg/kg, s.c., Group III received isoproterenol (85 mg/kg, s.c.) and plant extract (100mg/kg), Group IV received isoproterenol (85 mg/kg, s.c.) and plant extract (200mg/kg), Group V received isoproterenol (85 mg/kg, s.c.) and plant extract (500mg/kg) [2].

Estimation of Plasma lipid profile in rats

High density lipoprotein (HDL), triglyceride (TG), and total cholesterol (TC) levels in plasma were measured using commercially available kits. The Abell Kendall technique was used to calculate levels of very low density lipoproteins (VLDL) and low density lipoproteins (LDL).

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Estimation of serum enzyme levels in rats

Blood was collected from the retro orbital sinus at the end of the trial, centrifuged to separate the serum, and then utilised to measure levels of CK-MB, LDH, SGOT, and SGPT using AGAPPE diagnostic kits.

Estimation Cardiac endogenous antioxidants in heart homogenates

Three hearts were selected from each group to assess lipid peroxidation and glutathione levels after the hearts had been removed via dissection. Weighed and homogenised (10%w/v) in cooled Tris buffer (10 mM, pH7.4), and centrifuged at10,000 g for 20 minutes in a high speed chilling micro centrifuge. The analysis of lipid peroxidation, superoxide dismutase (SOD), catalase (CAT), and reduced glutathione (GSH) utilised clear supernatant.

Statistical Analysis

The data was shown as a mean with a standard deviation. Graph Pad Prism version 5.03 was used for statistical analysis, and one-way analysis of variance (ANOVA) was used to determine statistical significance [8].

IV. RESULTS AND DISCUSSIONS

Preliminary Phytochemical Screening

Alkaloids, carbohydrates, flavonoids, glycosides, saponins, sterols, anthocyanins, terpenes, and tannins were all tested for in preliminary phytochemical analysis.

Table 3: Results of phytochemical tests of aqueous prop-roots extract of Ficus bengalensis (APREFB).

S.NO	NAME OF THE TEST	CONCLUSION	
I	Tests for Carbohydrates • Benedicts test • Fehling's Test • Molisch Test	 + + +	Carbohydrates were present in the aqueous extract
II	Tests for Tannins and Phenolic Compounds • 5% Fe Cl3 test • Bromine water test • Acetic acid solution test	 + + +	Tannins and Phenolic compounds were present in aqueous extracts
III	Tests for Alkaloids • Mayer's Test • Dragandraff's Test • Wagner's Test	 + + +	Alkaloids were present in aqueous extract.
IV	Tests for Flavonoides • Alkaline solution • Ferric chloride test	 + +	Flavanoids were present in aqueous extract
V	Tests for Saponins • Foam test	 +	Saponins were present in the aqueous extract.

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+ Present
- Absent

Effect of Acute Toxicity Studies

At the end of 24 hours of general observations, the test animals given doses of plant extracts up to 250 mg/kg did not exhibit any significant changes in behavioural pattern (such as trembling, diarrhoea, salivation, breathing, impairment in food intake, water consumption, postural abnormalities, hair loss, sleep, lethargy, restlessness) or physical appearance (such as eye colour, mucous membrane, salivation, skin/fur effects, body weight, injury).

Effect of in-vivo cardioprotective activity on Plasma Lipid Profile

Table 2 shows the effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on lipoproteins (TC, TG, LDL, VLDL and HDL) of control and experimental animals. Circulating levels of all lipoproteins significantly increased except HDL in isoproterenol group. Isoproterenol (IP) group recorded significant increment (P<0.05) in plasma TC along with a significant decrement in HDL level compared to control group. APREFB (100 mg/kg) + Isoproterenol treated group showed decrease level of plasma TC along with a significant increased in HDL level when compared to untreated isoproterenol group. APREFB (200 mg/kg) + Isoproterenol treated group showed decrease level of plasma TC along with a significant increased in HDL level when compared to untreated isoproterenol group. APREFB (500 mg/kg) + Isoproterenol treated group showed decrease level of plasma TC along with a significant increased in HDL level when compared to untreated isoproterenol group.

Table 2: Effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on plasma lipid profile in Isoproterenol induced myocardial infarction in rats.

Animal Group	**Total Cholesterol (mg/dl)**	**TG (mg/dl)**	**HDL (mg/dl)**	**LDL (mg/dl)**	**VLDL (mg/dl)**
Normal saline (5 (ml/kg)	64.54±1.44	41.24±0.78	32.2±1.02	35.24±1.14	5.87±0.64
Isoproterenol (IP) control (85 mg/kg, s.c.)	115.21±1.43^{C}	123.4±2.19^{C}	10.22±0.44^{C}	98.26±1.24^{C}	16.2±0.74^{C}
Isoproterenol (IP).+ APREFB (50 (100 mg/kg)	94.14±1.32^{c}	94.34±1.02^{c}	18.25±0.22^{a}	87.549±1.22^{c}	13.23±0.15^{c}
Isoproterenol (IP).+ APREFB (200 mg/kg)	78.22±1.42^{c}	77.27±1.22^{c}	24.03±0.42^{a}	65.29±1.04^{c}	11.13±0.15^{c}
Isoproterenol (IP).+ APREFB (500mg/kg)	72.22±1.44^{c}	66.27±1.12^{c}	25.16±0.52^{a}	42.49±1.02^{c}	07.66±0.25^{c}

Data were expressed as mean±S.D. (n=6) and analyzed by one way ANOVA followed by dunnets comparison test. a-(P<0.05), b-(P<0.01), c-(P<0.001) when ISO v/s extracts, A-(P<0.05), B-(P<0.01), C-(P<0.001) when Normal v/s ISO

Effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on Cardiac Antioxidants.

The effect of aqueous extract of the prop-roots of Ficus bengalensis (APREFB) on enzymatic antioxidants (SOD, GSH, CAT, and GST) in control and experimental animals is presented in Table 3. The cardiac SOD content of the isoproterenol-treated group decreased significantly (P.001), as did the activity levels of GSH, CAT, and GST. Compared to the untreated isoproterenol group, administration of APREFB significantly

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prevented all alterations in the antioxidant enzymes SOD, GSH, CAT, and GST. The antioxidant activities (SOD, GSH, CAT and GST) of rats treated with an aqueous extract of the prop-roots of Ficus bengalensis (APREFB) were comparable to those of untreated control rats.

Table 3: Effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on Cardiac antioxidants levels in Isoproterenol induced myocardial infarction in rats.

Animal Group	**SOD U/mg**	**GSH mg/g**	**CAT U/mg**	**GST U/mg**
Normal saline (5 ml/kg)	7.81±0.14	7.96±0.25	7.67±0.27	845.2±13.12
Isoproterenol (IP) control (85 mg/kg, s.c.)	2.82±0.24 ^{C}	3.22±0.23 ^{C}	3.12±0.34 ^{C}	458.2±12.24 ^{C}
Isoproterenol (IP).+ APREFB (100 100 mg/kg)	5.17±0.13 ^{b}	4.85±0.22 ^{a}	4.12±0.12 ^{b}	687.2±16.25 ^{a}
Isoproterenol (IP).+ APREFB (200 mg/kg)	6.25±0.23 ^{b}	5.26±0.22 ^{a}	5.82±0.24 ^{b}	702.8±10.15 ^{a}
Isoproterenol (IP).+ APREFB (500mg/kg)	6.82±0.23 ^{b}	6.95±0.22 ^{a}	6.94±0.28 ^{b}	758.7±18.25 ^{a}

Data were expressed as mean±S.D. (n=6) and analyzed by one way ANOVA followed by dunnets comparison test.
Unit for SOD: Units/mg protein, GSH: µg/mg protein, CAT: µmol of H_2O_2/min/mgpr, GST: µmol/min/mgpr
a-(P<0.05), b-(P<0.01), c-(P<0.001) when ISO v/s extracts,
A-(P<0.05), B-(P<0.01), C-(P<0.001) when Normal v/s ISO

Plasma Marker of Cardiac Damage

Table 4 displays the effects of isoproterenol and aqueous prop-roots extract of Ficus bengalensis (APREFB) on cardiac marker enzyme levels, including CK-MB, LDH, AST, ALT, and uric acid. The plasma markers CK-MB, ALT, AST, LDH, and uric acid were measured in the normal control group. The enzyme marker activities CK-MB, ALT, AST, LDH, and uric acid were significantly (P<0.001) elevated in isoproterenol-treated rodents compared to normal control rats. Pretreatment of isoproterenol-treated animals with APREFB decreased CK-MB, ALT, AST, LDH, and uric acid activities significantly (P<0.001) compared to the untreated isoproterenol group. Consequently, plasma levels of cardiac marker enzymes such as CK-MB, LDH, AST, ALT, and uric acid were comparable between rats treated with aqueous prop-roots extract of Ficus bengalensis (APREFB) and untreated control rats.

Table 4: Effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on plasma markers of cardiac damage in Isoproterenol induced myocardial infarction in rats.

Animal Group	**CK-MB (IU/L)**	**ALT (IU/L)**	**AST (IU/L)**	**LDH (IU/L)**	**Uric acid (mg/dl)**

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Normal saline (5 ml/kg)	110.27±3.26	62.22±6.45	54.42±3.22	102.22±3.21	1.82±0.22
Isoproterenol (IP) control (85 mg/kg, s.c.)	192.25±12.22^{C}	172.13±2.32^{C}	132.22±4.11^{C}	192.26±3.24^{C}	7.12±0.35^{C}
Isoproterenol (IP).+ APREFB (50 100 mg/kg)	170.15±3.19^{c}	115.15±3.26^{c}	98.2±2.18^{c}	156.22±3.32^{c}	5.28±0.16^{c}
Isoproterenol (IP).+ APREFB (200 mg/kg)	158.22±1.24^{c}	98.27±1.52^{c}	72.13±0.12^{a}	128.29±1.16^{c}	2.83±0.17^{c}
Isoproterenol (IP).+ APREFB (500mg/kg)	120.22±1.24^{c}	72.22±1.12^{c}	58.26±0.22^{a}	110.22±1.24^{c}	1.98.13±0.15^{c}

Data were expressed as mean±S.D. (n=6) and analyzed by one way ANOVA followed by dunnets comparison test. a-(P<0.05), b-(P<0.01), c-(P<0.001) when ISO v/s extracts, A-(P<0.05), B-(P<0.01), C-(P<0.001) when Normal v/s ISO.

Effect of Plants Extract on Heart Weight and Body Weight

Table 5 displays the changes in heart weight, body weight, and heart weight to body weight ratio as a result of isoproterenol and plant therapy. There was no statistically significant change in body weight between the groups studied, albeit animals given isoproterenol lost a little amount of weight. Rats given isoproterenol had substantially (P<0.01) higher heart weight and heart weight to body weight ratios than control rats. Both cardiac weight and ratio were significantly (P<0.01) lower in isoproterenol-pretreated rats fed an aqueous extract of the plannt than in isoproterenol-treated rats.

Table 5: Effect of aqueous prop-roots extract of Ficus bengalensis (APREFB) on heart weight, body weight and heart weight/body weight ration in isoproterenol induced myocardial infarction in rats.

Group	**Heart weight (g)**	**Body Weight (g)**	**Heart weight/body weight ratio**
Normal saline (5 ml/kg)	0.68±0.02	295.24±2.31	0.002±0.01
Isoproterenol (IP) control (85 mg/kg, s.c.)	1.84±0.02^{C}	145.14±4.25^{ns}	0.012±0.03^{C}
Isoproterenol (IP).+ APREFB (100 mg/kg)	1.38±0.01^{b}	201.16±2.21^{ns}	0.006±0.03^{b}
Isoproterenol (IP).+ APREFB (200 mg/kg)	0.98±0.02^{b}	242.26±2.18^{ns}	0.004±0.02^{b}
Isoproterenol (IP).+ APREFB (500mg/kg)	0.78±0.03^{b}	232.26±2.15^{ns}	0.003±0.02^{b}

Data were expressed as mean±S.D. (n=6) and analyzed by one way ANOVA followed by dunnets comparison test. a-(P<0.05), b-(P<0.01), c-(P<0.001) when ISO v/s extracts,

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A-(P<0.05), B-(P<0.01), C-(P<0.001) when Normal v/s IP

V. CONCLUSION

This study validates traditional use of this extract for treating heart ailments thus confirming its folklore claim. The present study demonstrated the dose-dependent cardioprotective activity of aqueous prop-roots extract of Ficus bengalensis (APREFB) in a rat model of isoproterenol-induced Cardiotoxicity. Pretreatment with plant extract dose-dependently prevented cardiac injury as evidenced by serum biochemical analysis and heart histopathology. It protects heart from heart cell injury. This confirms the utility of the plant in folk medicine against cardiotoxicity. In conclusion, aqueous prop root extracts of Ficus bengalensis is a potential cardioprotective agent against isoproterenol-induced Cardiotoxicity.

REFERENCES

[1]. Jayashree Kharat, Swapnali Patil, Swapnali Mohite, N. S. Mahajan. A Review on CardioprotectivePotential of Medicinal Herbs. Journal of current Pharma Research. 2022; Vol. 14 (2): 1-16.

[2]. Jay R, Umang H, Divyash K, Ankur K. Cardio-protective Effect of Methanolic ex-tract of Syzygium Aromaticum on Isoproterenol Induced Myocardial Infarction in Rat. Asian Journal of Pharmacology and Toxicology. 2014; 02(04):01-6.

[3]. Mohanty IR, Arya DS, Gupta SK. Dietary Curcuma longa protects myocardium against isoproterenol induced hemodynamic, biochemical and histopathological alternations in rats. International Journal of Applied Research in Natural Products. 2009; 1(4):19-28.

[4]. Prabhu S, Jainu M, Sabitha KE, Devi CSS. Cardioprotective Effect of Mangiferin on Isoproterenol induced myocardial infarction in rats. Indian Journal of Experimental Biology. 2006;44(3):209-15.

[5]. Nandave M, Ojha SK, Joshi S, Kumari S, Arya DS. Moringa oleifera Leaf Extract Prevents Isoproterenol-Induced Myocardial Damage in Rats: Evidence for an Antioxidant, Antiperoxidative, and Cardioprotective Intervention. Journal of Medicinal Food. 2009;12(1):47-55.

[6]. Ms. Swati Pirdhankar1 , Pratik S. Sadamate2 , Dr. Rupali Tasgaonkar3. Cardioprotective Herbal Plants: A Review. International Journal for Research in Applied Science & Engineering Technology. Volume 11 Issue 3 Mar 2023 1114-1118.

[7]. M. Dinesh Kumar, K. M. Maria John, S. Karthik. (2013) The Bone Fracture–Healing Potential of Ormocarpum cochinchinense, Methanolic Extract on Albino Wistar Rats. Journal of Herbs, Spices & Medicinal Plants 19:1, pages 1-10.

[8]. Fisseha N, Hammeso WW, Nureye D, Tesfaye T, Yimer T. In-vivo Wound Healing and Anti-Inflammatory Activity of the Solvent Fraction of Zehneria scabra L.F. Sond (Cucurbitaceae) Leaves. J Exp Pharmacol. 2022;14:367-377.