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*Review Paper*

# A Review on the Cardio Protective Activity of an important Medicinal Plant *Inula racemosa* Hook. F.

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***Abstract***
*Cardiovascular disease (CVD) is a spectrum of diseases involving the heart and blood vessels, and the first cause of mortality worldwide. Allopathic medication provides short time relief from symptoms or severity but there is no specific or permanent treatment for the cure of heart related diseases so medication for cardiovascular diseases still needs exploration and research at a larger level. Medicinal plants have been used for thousands of years to treat CVD. The phytoconstituents of Inula racemosa Hook. F.posses effective pharmacological effects against cardiovascular diseases. The best part of Ayurvedic medicine, is that you have none of the negative side effects found in allopathic prescriptions.*

***Keywords:*** *Cardiovascular diseases, Allopathic medication, Medicinal plants, Inula racemosa Hook. F.*

**Introduction**

Globally, cardiovascular diseases (CVD) are the number one cause of death and they are projected to remain so. An estimated 17 million people died from cardiovascular disease in 2005, representing 30% of all global deaths. If current trends are allowed to continue, by 2030 an estimated 23.6 million people will die from cardiovasclar disease (WHO, 2015). CVD is a group of disorers/diseases of the heart and blood vessels, including heart attack and stroke. Cardiovascular diseases include: coronary heart disease (heart attacks), cerebrovascular disease, raised blood pressure (hypertesion), peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure1. The variety and scope of cardiovascular drugs have increased tremendously in the past few decades, and new drugs are being added annually. Therapeutic drug categories in CVD include antianginal drugs, anticoagulants, diureics, antiarrhythmic drugs, hypotension and anticholesterol drugs (WHO, 2011). Cardioprotection includes "all mechanisms and means that contribute to the preservation of the heart by reducing or even preventing myocardial damage". Defining "cardioprotection" as "preservation of the heart" has also great theoretical implications, because all adative and compensatory mechanisms that directly or indirectly contribute to myocadial preservation have to be classified as"cardioprotective" (Kübler and Haass, 1996).

**Cardio Protective Activity**

*Inula racemosa* has been indicated for its use in cardiac disorders. Hence, petroleum extract of the roots and alantolactone, which has been isolated from the roots of *Inula racemosa*, were subjected for evaluation of their cardio protective activity in myocardial ischemia (100 mg/kg body weight). Myocardial ischemia was induced in the rats by isoproterenol administration (20 mg/100 g subcutaneously twice at an interval of 24 hrs.). Lipid peroxides and glutathione contents were estimated. It was found that the alantolactone effectively reduced the lipid peroxide levels in the ischemic rats and brought down the glutathione content to near normal level as compared to the petroleum ether extract (Chabukswar *et al.*, 2010).

According to Arya *et al.*, 2011, Hepatic Ischemia-Reperfusion (I/R) injury contributes to organ injury and dysfunction after hepatic surgery and transplantation. I/R Induce Kupffer cell activation, leading to release of pro-inflammatory cytokines that promote injury, increase adhesion molecules expression and facilitate b-polymorphonuclear neutrophil injury. *Innula racemes* contains high concentration of the flavnol glycosides, which has been shown effect on the cardiac function and oxidative stress against Isoproterenol-induced myocardial infarction. Historically, the roots were reputed to have anti-inflammatory and analgesic effects. The hepatoprotective activity of the drug against hepatic Ischemia-Reperfusion injury has not been reported yet. To study the hepatoprotective effect of hydro alcoholic extract of *Inuula racemosa* at 200 and 400 mg/kg against hepatic ischemia-reperfusion injury. In this study 24 male wistar rats were divided into four groups. The normal control group, model control group and extract treated group at a dose of 200 and 400 mf/kg were orally fed with distilled water as vehicles for 21 days followed by Ischemia-Reperfusion on twenty second day. Blood and liver samples were obtained from all the animals on 22$^{nd}$ day for biochemical analysis of AST, ALT, ALP and LDH and histopathological studies were also performed. Results showed that the Ischemia-Reperfusion injury causes significant increase in the levels of AST, ALT, ALP and LDH in model control group indicating the cell damage and tissue injury whereas supplementation with hydro alcoholic analysis showed high degree of congestion and mild necrosis in model control group which was reduced tp minimum levels in drug treated grous. *Innula racemosa* increased the free radicals scavenging activity in the early period of hepatic IR injury in rats. So it is concluded that the

reduced level of liver enzymes and histopathological studies evident that *Innula racemosa* possesses beneficial effects on the hepatocytes in hepatic I/R injury (Arya *et al*., 2011).

Prathyush *et al*., 2013, investigated the cardioprotective potential of *Innula racemosa* root hydro alcoholic extract against isoproterenol-induced myocardial infractio in rats. The rats treated with isoproterenol (85 mg/kg s.c.) exhibited myocardial infarction, as evidet by significant (P<0.05) decrease in mean arterial pressure, heart rate, contractility, relaxation along with increased left ventricular end diastolic pressure, as well as decresed endogenous myocardial enzymatic and non- enzymatic antioxidants. Isoproterenol also significantly (0.05) induced lipid peroxidation and increased leakage of myocyte injury marker enzymes. Pretreatment with *Innula racemosa* extract (50, 100, 200 mg/kg per day, p.o.) for 21 consecutive days, followed by isoproterenol injections on days 19$^{th}$ and 20$^{th}$ significantly (P<0.05) improved cardiac function by increasing the heart rate, mean arterial pressure, contractility and relaxation along with decreasing left ventricular end diastolic pressure. Pretreatment with *Innula racemosa* also significantly (P<0.05) restored the reduced form of glutathione and endogenous antioxidant enzymes superoxide dismutase, catalase, glutathionine peroxidise from the heart, which were depleted after isoproterenol administration. In addition to the restoration of antioxidants, *Innula racemosa* significantly (P<0.05) inhibited lipid peroxidation and prevented the leakage of myocytes specific marker enzymes creatine phosphokinase-MB and lactate dehydrogenase from the heart. Thus, it was concluded that *Innula racemosa* protects heart from isopreterenol-induced myocardial injury by reducing oxidative stress and modulating hemodynamic and ventricular functions of the heart. Present study findings demonstrate the cardioprotective effect of *Innula racemosa* and support the pharmacological relevance of its use and cardioprotection mechanism is ischemic heart disease as well as substantial its traditional claim (Prathyush *et al*., 2013).
The cardioprotective potential of hydroalcohol extract of roots of *I. racemosa* was evaluated against isoproterenol-induced myocardial infarction in rats. The rats were treated with isoproterenol (85 mgkg−1, subcutaneous) exhibited myocardial infarction, like decrease in arterial pressure, heart rate, contractility, relaxation along with increased left ventricular end diastolic pressure, as well as decreased endogenous myocardial enzymatic and non-enzymatic antioxidants. Isoproterenol also significantly induced lipid peroxidation and increased leakage of myocyte injury marker enzymes. Pretreatment with *I. racemosa* extract (100 and 200 mgkg−1 per day, per oral) for 21 consecutive days, significantly restored the reduced form of glutathione and endogenous antioxidant enzymes superoxide dismutase, catalase, glutathione peroxidase from the heart, which were depleted after isoproterenol administration (Ojha *et al.,* 2011).

In another experiment it has been found that ethanol roots extract of *I. racemosa* possess cardioprotective activity against isoproterenol induced myocardial infarction treated wistar rats by restoring electrocardiographic, histopathological and biochemical changes. Myocardial infarction was induced in the wistar rats by isoproterenol administration (200 mgkg−1 subcutaneously twice at an interval of 24 h). Ethanol roots extract of *I. racemosa* markedly restrained isoproterenol-induced electrocardiographic changes indicative of its cell membrane protecting effects. At a dose of 400, 600 and 800 mgkg-1 daily for a period of 10 days, it improved cardiac function, decreased oxidative stress, cardiac injury, maintained cell membrane integrity and lipid peroxidation process in a dose dependent manner. In addition, it has normalized histopathological changes caused by isoproterenol administration (Shirole *et al.,* 2013).

In another experiment myocardial ischemia was induced in rats by isoproterenol administration (20 mg / 100 g subcutaneously twice at an interval of 24 h). The petroleum ether extract of roots of the plant *I. racemosa* and alantolactone, which have been isolated from the roots of the plant were subjected for evaluation of their cardioprotective activity in myocardial ischemia. Lipid peroxides and glutathione contents were anticipated. It has been found that the alantolactone as well as petroleum ether extract effectively reduces the lipid peroxide levels in the ischemic rats and brings the glutathione content to near normal level (Chabukswar *et al.,*2010).

A combination of the plant *C. mukul* and *I. racemosa* in 1:1 ratio was studied in 200 patients suffered with ischemic heart disease. The major symptoms included chest pain, with ST-segment and T-wave changes on the electrocardiogram (ECG), suggested myocardial ischemia in about 80 percent of the patients. Pretreatment with combination of the plant *C. mukul* and *I. racemosa* in 1:1 ratio to the patients caused improvement in precordial pain and dyspnea, restoration of normal ECG patterns, and significant reductions in cholesterol, triglycerides and total lipid levels (Batliwala *et al.,*1993). The isolated compound from *I. racemosa* was evaluated for the cardioprotective activity on isolated frog heart at a dose 40 µgmL−1 showed that alantolactone decreased heart rate and force of contraction. The study indicated that the alantolactone produces a negative ionotropic and negative chronotropic effect on frog's heart ( Lokhande *et al.,*2006).

Cardioprotective activity of ethanol root extract of *I. racemosa* was evaluated in wistar male albino rats having myocardial ischemic reperfusion injury. The extract at a dose of 100 mgkg-1 for 30 days appreciably restored the myocardial antioxidant status evidence by increased superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), reduced glutathione (GSH) and prevented leakage of cardiomyocytes specific enzymes, creatine phosphokinase isoenzyme and lactate dehydrogenase (LDH). The result suggested cardioprotective effect of *I. racemosa* likely resulted to improve antioxidant status, haemodynamic and left ventricular contractile function subsequent to suppression of oxidative stress (Ojha *et al.,* 2010). *Pushkar Guggal* (2 g), a mixture of *Commiphora* and *Inula*, was administered three times daily for 4 months in angina pectoris and in the management of ischaemic heart diseases. By this treatment periodical pain, discomfort and dysphonia were controlled. It decreased mean serum cholesterol (Sharma and Gupta, 1983, Tripathi *et al.* 1984b, Sharma *et al*. 1986a, Singh *et al.* 1991, 1993). Dwivedi *et al*. tried a polyherbal preparation containing *pushkarmul*, *Saussurea lappa* and *Terminalia arjuna* for heart diseases. It enhanced the aortic prostaglandin E2 (Dwivedi *et al*. 1987). Sati and Sharma (1990) tried it for congestive cardiac failure. Arora *et al.* evaluated the cardioprotective activity of the drug in coronary artery diseases, hypertension and diabetes mellitus (Arora *et al.,*1995)

**Conclusion**

Today world is facing many severe health problems, cardio vascular disease (CVD) in one of them. CVD has become one of the most common causes of mortality now a day. It accounts for approximately 30% of death worldwide. Cardio Vascular disease comprises the most prevalent serious and a rapidly growing health problem in developing nations like India. According to the World Health Organization, cardio vascular disease causes 12 million deaths in the world each year. It appears from this fact that there is still an urgent need to improve on the concept as well as the practice of medicine in this area. Ayurvedic system of medicine can be great help for controlling the heart disease, as the system is a votary of plant based approach. Medicinal plant has essential curative and preventive measures for heart diseases. From the past few decades world has again started inclining towards medicinal plants based treatment as it is cheap and has side effects. *Inula racemosa* Hook. F. is one such plant which plays a very important role in heart disease. The phytoconstituents of the plant posses' high cardio protective activity. *Inula racemosa* Hook. F. has been proving a promising medicine for treating heart related diseases in natural way with less or no side effects unlike allopathic treatment.

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