



A Review on Indian Cardioprotective Herbal Plants

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ABSTRACT:

Cardiotoxicity is a condition that occurs during therapy with several cytotoxic drugs and may be the dose limiting factor in the cancer therapy or unhealthy diet and lifestyle. The use of herbal supplements has been rising and getting popular in recent years. Among all the cardio vascular diseases, Myocardial infarction is considered as one of the most dangerous disease. The treatment available may not be sufficient to treat the disease as it is caused by many factors to overcome the adverse effects caused by the synthetic medicine available. There is a necessity for the natural therapy with the help of medicinal plants. That's why, we are taking the review of 10 cardioprotective plants.

Keywords: Cardio-protective, Myocardial Infarction, Cardiovascular Diseases (CVD).

INTRODUCTION:

Cardio-vascular diseases have become a global threat to life and are major reason of 17.1 million fatalities every year. It is expected that death toll due to cardiac diseases will reach up to 20 million in 2020. Currently available synthetic cardio-protective medicines have not only been related to a number of side effects but are also very costly. The easy availability, comparatively less side effects, and low cost of medicinal herbs make them more attractive therapeutic agents. ^[1]

Doxorubicin is an important & effective anti-cancer drug widely used for the treatment of various types of cancer but its clinical use is limited by dose-dependent cardiotoxicity. Elevated tissue levels of cellular superoxide anion/ oxidative stress are a mechanism by which doxorubicin-induced cardiotoxicity. Selected medicinal herb extracts were tested for their anti-oxidant capacity & cardio-protective effect against doxorubicin-induced Cardiotoxicity. ^[2]

Medicinal plants, also called medicinal herbs, have been identified and used in ancient medicine practices since prehistoric times. Plants synthesize hundreds of chemical compounds for functions including defense against insects, fungi, diseases, and herbivorous mammals. [3] There are four major biochemical classes of phytoconstituents found in plants which include alkaloids, glycosides, polyphenols, and terpenes. [4]

Plants are vital source of traditional medicines being used in treating different diseases. About 4,22,000 flowering plants have been reported all over the world, out of which above 50,000 plants are of medicinal importance that are being used for pharmaceutical purposes. About 80% of worldwide populations depend upon traditional medicines for primary health-care needs. Remedies of medicinal plants are often used as an alternative to allopathic medicines. [5]

Medicinal plants enriched with polyphenols, possessing free radical scavenging potential, might reduce the risk of heart diseases because of inverse relationship between cardiovascular diseases and intake of polyphenols. Free radicals are reactive species generated in the body as the result of many endogenous (metabolic pathways) and exogenous (environmental pollution, pesticides, and exposure to radiations) sources. Different environmental factors increase the level of free radicals and cells become unable to work efficiently against the free radicals leading to accumulation of radicals and oxidative stress which is involved in cell damage, necrosis, and apoptosis and has main contributory role in pathogenesis of cardiovascular diseases. Many antioxidants like Vitamins C and E and plant polyphenols are effective tools in oxidative stress and cardiovascular disorders as potential therapeutic agents. [1]

Antioxidant compounds are present in plants. Nowadays, interest has grown towards the use of natural anti-oxidants as protective strategy against cardiovascular related problems such as ischemia reperfusion. [6]

Secondary metabolites like carotenoids, triterpenes, flavonoids, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids and fatty acids shows cardio-protective activity. [7]

Variety of medicinal plants and their bioactive phytoconstituents are well known for their minimum side effects, providing alternative therapeutic potential against cardiac diseases. Some of the plants having cardioprotective molecules/agents are given below, and the plants having cardioprotective potential against cardiotoxicity induced by various agents. [5]

The key facts of CVD:

It was known that major cause of death globally is due to cardiovascular diseases because annually more people die from heart diseases than from any other grounds.

- Approximately 17.9 million people died from CVDs in the year 2015, representing 31% of all global deaths. Out of these, 7.4 million were due to coronary heart diseases and 6.7 million deaths were due to heart stroke.
- Out of the 16 million deaths under the age of 60 due to non communicable diseases, 85% are in low and middle income countries and 40% are caused by CVDs. [8]

Types of cardio vascular diseases [CVD]:

There are different types of cardio vascular diseases among them based on the prevalence of diseases across the world the most considerable CVD are like Atherosclerosis, Myocardial infarction, Ischemia, Cardiomyopathy. ^[9]

TREATMENT:-

Various medications used to treat a heart attack:

- Blood thinners, Thrombolytics, Nitroglycerin
- Antiplatelet drugs, such as clopidogrel
- Beta-blockers, ACE inhibitors
- Pain reliever. ^[10]

Methods of Pharmacological view of cardioprotective plants:

Phytoconstituents reported in cardio-protective herbs has altered the biochemical variation such as marker enzymes serum glutamate- pyruvate transaminase (SGPT) or alanine transaminase (ALT), serum glutamate oxaloacetate transaminase (SGOT) or aspartate transaminase (AST), creatinine phosphokinase (CPK), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), lipid profile including low density lipoprotein (LDL), very low density lipoprotein (VLDL), triglycerides (TGs), high density lipoprotein (HDL), total cholesterol and antioxidant parameters including Superoxide dismutase (SOD), glutathione (GSH), catalase (CAT), Glutathione peroxidase (GPx), malondialdehyde (MDA) and glutathione reductase (GR) maintains within the normal limits. Cardioprotective activity was evaluated with various methods like isoprenaline induced myocardial necrosis in rats, doxorubicin (DOX) induced cardiotoxicity in albino rats, cyclophosphamide induced oxidative myocardial injury in a rat model, ischemia-reperfusion-induced myocardial infarction in albino rats. Phytoconstituents likes carotenoids, triterpenes, flavonoids, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids, fatty acids were responsible for cardio-protective activity. ^[11]

HERBS USED FOR CARDIO-PROTECTIVE ACTIVITY:

1. *Artocarpus heterophyllus*
2. *Azadiracta indica*
3. *Bacopa monnieri*
4. *Curcuma longa*
5. *Hydrophila auriculata*
6. *Nigella sativa*
7. *Ocimum basilicum*
8. *Pongamia pinnata*
9. *Terminalia arjuna*
10. *Withania somnifera*

1. *Artocarpus heterophyllus* :

Biological Name: *Artocarpus heterophyllus*

Common Name: Jack fruit.

Family: Moraceae.

Parts used: Roots, Leaves, Fruits, Seeds, Wood, Latex.

Descriptions: A large monocious evergreen tree with 18 – 25 m in height, bark black mottled with green.

Uses: It has acrid, carminative, tonic, diuretic, aphrodisiac, nervine, sedative. ^[12]

The leaf extracts of *A. heterophyllus* contains ethyl acetate, flavonoids, sterols, proteins, tannins, phenolic compounds possess a potential Cardioprotective activity on the lactose induced arrhythmia in cladoceran. ^[13]

2. *Azadiracta indica* :

Biological Name: *Azadiracta indica*

Common Name: Neem tree, Margosa tree.

Family: Meliaceae.

Parts used: Bark, Leaves, Flowers, Seed oil.

Descriptions: Medium to large sized plant 15 – 20 m in height having greyish to dark grey tuberculed bark. Flowers are cream or yellowish white in axillary panicles.

Uses: It is bitter, astringent, acrid, tonic. It is useful in conditions like skin diseases, anthelmintic, intestinal demulcent, antiperiodic, tuberculosis. ^[14]

The leaf extracts of *A. indica* contains terpenoid, flavonoids, azadirachtin (ABDH), azadradiene, nimbolin, nimbolide, nimbinene, desacetylnimbin, azadirone, salanim. The leaf extracts of *A. indica* 600 mg/kg body weight stabilized the lipid profile. It reduced the LPO indices and increased the improvement of GSH content, and restoration of anti-oxidant enzymes and posses a Cardioprotective activity in cardiotoxin streptozoin induced rats. ^[15]

3. *Bacopa monnieri*:

Biological Name: *Bacopa monnieri*

Common Name: Thyme leaved gratiola.

Family: Scrophulariaceae.

Parts used: Whole plant.

Descriptions: A prostate or creeping, juicy, annual herb.

Uses: It is astringent, tonic, bitter, laxative, carminative, cardiostimulant, diuretic, broncho dilator. It is useful in epilepsy, leprosy, syphilis, elephantiasis. ^[16]

The hydroalcoholic extracts of *B. monnieri* contains Bacosides A and B with 150 mg/kg of *B. monnieri* produces a maximum Cardioprotection by significant restoration of endogenous anti-oxidants in cardiotoxin streptozoin induced rats. ^[17]

4. *Curcuma longa*:

Biological Name: *Curcuma longa*

Common Name: Turmeric.

Family: Zingiberaceae.

Parts used: Rhizomes.

Descriptions: A perennial herb, 60 – 90 cm in height, with short stems and erect leaves.

Uses: It is bitter, acrid, tonic, stimulant, anti-inflammatory, diuretic, haematinic. It is useful in inflammations, ulcer, dropsy, splenomegaly. [18]

The hydroalcoholic extracts of *C. longa* contain curcumin, which have anti-oxidant and Cardioprotective activity. [19]

5. *Hydrophila auriculata*:

Biological Name: *Hydrophila auriculata*

Common Name: Long-leaved barleria.

Family: Acanthaceae.

Parts used: Roots, Leaves, Seed.

Descriptions: A semi wood, annual with numerous fasciculate sub- quadrangular stem.

Uses: It is sweet, sour, bitter, tonic, diuretic, anti-inflammatory. It is useful in treating ascites, jaundice, arthralgia. [20]

The methanolic extracts of *H. auriculata* leaves contains flavonoids, tannins, glycosides, anti-oxidants shows a potent Cardioprotective activity against doxorubicin cardiotoxicity in rats. [21]

6. *Nigella sativa*:

Biological Name: *Nigella sativa*

Common Name: Black cumin.

Family: Ranunculaceae.

Parts used: Seeds.

Descriptions: A pretty small herb, 30-60 cm in height.

Uses: It is acrid, bitter, tonic, stimulant, anti-inflammatory, It is useful in treating diseases such as hemorrhoids, paralysis, inflammation. [22]

The seeds extracts of *N. sativa* contains thymoquinone which reduces the lipid level, flavonoids inhibit the cholesterol synthesis, alkaloids (pyrazole), saponins, carbachol, carvone, thymol, myristic acid, anti-oxidants shows a potent Cardioprotective activity against cardiotoxin induced in rats. [23]

7. *Ocimum basilicum*:

Biological Name: *Ocimum basilicum*

Common Name: Sweet basil.

Family: Lamiaceae.

Parts used: Whole plant.

Descriptions: An erect, aromatic, glabrous branching herb, 60- 90 cm in height.

Uses: It is bitter, stimulant, acrid, carminative, anti-inflammatory, diuretic. It is useful in treating cardiac debility, spasmodic affections, arthralgia. [24]

The plant extracts of *O.basilicum* contains phenolic compound 5.36% (gallic acid), flavonoids 1.86%, rosmarinic acid 15.74% shows a potent Cardioprotective activity against cardiotoxin isoproterenol in rats. [25]

8. *Pongamia pinnata*:

Biological Name: *Pongamia pinnata*

Common Name: Indian beech.

Family: Fabaceae.

Parts used: Root, Bark, Leaves, Flowers, Seeds.

Descriptions: A medium sized semi-evergreen glabrous tree with 18 cm height.

Uses: It is bitter, tonic, acrid, anthelmintic, carminative. It is useful in treating hemorrhoids, anemia, and beriberi. [26]

The hydroalcoholic leaf extracts of *P. pinnata* contains flavonoids, carotenoids, triterpenes, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids are responsible or Cardioprotective activity against experimentally induced cardiotoxin in Wistar albino rats. [27]

9. *Terminalia arjuna*:

Biological Name: *Terminalia arjuna*

Common Name: Arjun.

Family: Combretaceae.

Parts used: Bark.

Descriptions: A large evergreen tree with buttressed trunk.

Uses: It is sweet, astringent, acrid, cardiotoxic, styptic, tonic. It is useful in treating cardiomyopathy, hypertension, cirrhosis of liver. [28]

The bark extracts of *T. arjuna* contains polyphenols, anti-oxidants, myricetin, flavonoids (quercetin, kaempferol) posses a potential Cardioprotective activity. [29]

10. *Withania somnifera*:

Biological Name: *Withania somnifera*

Common Name: Winter cherry

Family: Solanaceae.

Parts used: Roots, Leaves.

Descriptions: An erect branching undershrub with 150 cm in height.

Uses: It is bitter, acrid, stimulant, tonic, diuretic. It is good for tissue building, ulcers. [30]

The plant extracts of *W. somnifera* contains withaferin A, sitoindosides, withanolides with 25-50 mg/kg shows a potent Cardioprotective activity against isoproterenol induced cardiotoxin in rats. ^[31]

CONCLUSION:

The present review reveals the importance of medicinal plants in preventing and reversing the cardiovascular diseases and makes an attempt to compile some of the cardio protective plants. Medicinal plants and their supplements can help in lowering the risk of cardiovascular diseases. Secondary metabolites such as carotenoids, cardiac glycosides, alkaloids, flavonoids, polyphenolic compounds, saponins, terpenoids [triterpenes], fatty acids which are present in medicinal plants were considered as the responsible agents for potent cardio-protective activity.

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