



Human Journals

Review Article

March 2022 Vol.:14, Issue:2

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A Review on Cardioprotective Potential of Medicinal Herbs



Journal of Current Pharma Research
(An Official Publication of Human Journals)
An International Peer Reviewed Journal For Pharmacy, Medical & Biological Science
DOI: 10.25166 CODEN: JCPRD6 NLM ID: 101744065



ISSN: Print: 2230-7834
Online: 2230-7842
SJIF Impact Factor: 6.913

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Submitted: 22 February 2022
Accepted: 28 February 2022
Published: 30 March 2022

Keywords: Cardioprotective, Cardiotoxicity, Myocardial Infarction.

ABSTRACT

Cardiotoxicity is a condition that occurs during therapy with several cytotoxic drugs and maybe the dose-limiting factor in the cancer therapy or imbalanced diet and lifestyle. The use of herbal supplements has become increasingly popular in recent years. Among all the cardiovascular diseases, Myocardial infarction is considered one of the most dangerous diseases. 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 need for natural therapy with the help of medicinal plants.



HUMAN JOURNALS

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INTRODUCTION

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

Doxorubicin is an important and effective anticancer 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 plant extracts were tested for their antioxidant capacity and cardioprotective effect against doxorubicin-induced cardiotoxicity^[2].

Plants are a pivotal source of traditional medicines being used in treating different ailments. 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 is being used for pharmaceutical purposes. About 80% of the worldwide population relies on traditional medicines for primary healthcare needs. Remedies of medicinal plants are most often being used as an alternative to allopathic medicines^[3].

Medicinal plants enriched with polyphenols, possessing free radical scavenging potential, may reduce the risk of heart diseases because of an inverse relationship between cardiovascular diseases and intake of polyphenols. Free radicals are reactive species generated in the body as a result of many endogenous (metabolic pathways) and exogenous (environmental pollution, pesticides, and exposure to radiation) sources. Different environmental factors elevate the level of free radicals and cells become unable to work efficiently against the free radicals leading to the accumulation of radicals and oxidative stress which is involved in cell damage, necrosis, and apoptosis and has a main causative role in the pathogenesis of cardiovascular diseases. Many antioxidants like Vitamins C and E and plant polyphenols are efficient 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 antioxidants as a protective strategy against cardiovascular-related problems such as ischemia-reperfusion [4].

Secondary metabolites like carotenoids, triterpenes, flavonoids, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids, fatty acids are responsible for cardio-protective activity [5].

A variety of medicinal plants and their bioactive phytoconstituents are well known for their minimal 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 [3].

The key facts of CVD

It was known that the number 1 cause of death globally is due to cardiovascular diseases because annually more people die from heart diseases than from any other ground.

- Approximately 17.5 million people died from CVDs in the year 2012, representing 31% of all global deaths. Of these deaths, 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 [6].

Types of cardiovascular diseases [CVD]

There are different types of cardiovascular diseases among them based on the prevalence of diseases across the world the most considerable CVD is Atherosclerosis, Myocardial infarction, Ischemia, Cardiomyopathy [7, 8].

TREATMENT

Various medications used to treat a heart attack:

- Blood thinners, Thrombolytics, Nitroglycerin
- Antiplatelet drugs, such as clopidogrel
- Beta-blockers, ACE inhibitors
- Pain reliever [9]

Methods of Pharmacological view of cardio protective plants

Phytoconstituents reported in cardioprotective 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), VLDL (very low-density lipoprotein), triglycerides (TGs), high-density lipoprotein (HDL), total cholesterol and antioxidant parameters including Superoxide dismutase (SOD), glutathione (GSH), catalase (CAT), Glutathione peroxidase (GPx), MDA (malondialdehyde) and glutathione reductase (GR) maintains within the normal limits. The 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 like carotenoids, triterpenes, flavonoids, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids, fatty acids were responsible for cardio-protective activity ^[10].

HERBS USED FOR CARDIOPROTECTIVE ACTIVITY

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

11. *Artocarpus heterophyllus*

1. *Azadirachta indica*



Common Name: Neem tree, Margosa tree.

Other Name: Vembu, kadunimba.

Family: Meliaceae.

Distribution: Throughout India deciduous forest, is also widely cultivated.

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

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

Properties and Uses: It is bitter, astringent, acrid, tonic. It is useful in conditions like skin diseases, anthelmintic, intestinal demulcent, antiperiodic, tuberculosis ^[11].

The leaf extracts *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 ^[12].

2. *Bacopa monnieri*



Common Name: Thyme-leaved gratiola.

Other Name: Nirpirami, bramhi.

Family: Scrophulariaceae.

Distribution: Throughout India in wet places.

Parts used: The whole plant.

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

Properties and Uses: It is astringent, tonic, bitter, laxative, carminative, cardioprotective, diuretic, bronchodilator. It is useful in epilepsy, leprosy, syphilis, elephantiasis ^[13].

The hydroalcoholic extracts contain 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 ^[14].

3. *Curcuma longa*



Common Name: Turmeric.

Other Names: Haldi, Manjal.

Family: Zingiberaceae.

Distribution: Cultivated throughout India.

Parts used: Rhizomes.

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

Properties and Uses: It is bitter, acrid, tonic, stimulant, anti-inflammatory, diuretic, haematinic. It is useful in inflammations, ulcers, dropsy, splenomegaly ^[15].

The hydroalcoholic extracts of *C. longa* contain curcumin, which has anti-oxidant and Cardioprotective activity ^[16].

4. *Terminalia arjuna*



Common Name: Arjun.

Other Name: Attrumarutu, Venmarutu, *Arjun* Sadada.

Family: Combretaceae.

Distribution: Throughout India.

Parts used: Bark.

Descriptions: A large evergreen tree with a buttressed trunk.

Properties and Uses: It is sweet, astringent, acrid, cardi tonic, styptic, tonic. It is useful in treating cardiomyopathy, hypertension, cirrhosis of the liver ^[17].

The bark extracts of *T. arjuna* contain polyphenols, anti-oxidants, myricetin, flavonoids (quercetin, kaempferol) possess a potential cardioprotective activity ^[18].

5. *Withania somnifera*



Common Name: Winter cherry

Other Name: *Ashwagandha*, Amukkira.

Family: Solanaceae.

Distribution: Throughout the drier parts of India. Particularly in waste places.

Parts used: Roots, Leaves.

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

Properties and Uses: It is bitter, acrid, stimulant, tonic, diuretic. It is good for tissue building, ulcers^[19].

The plant extracts of *W. somnifera* contains withaferin A, sitoindosides, withanolides with 25-50 mg/kg shows potent Cardioprotective activity against isoproterenol-induced cardiotoxin in rats^[20].

6. *Ginkgo Biloba*



Common Name: maidenhair tree

Other Name: silver apricot

Family: Ginkgoaceae

Distributions: Native to China.

Part used: Leaf

Descriptions: It is a large tree, normally reaching a height of 20-35m (66-115ft), with some specimens in China being over 50m (165ft).

Properties and Uses: Cardioprotective, antiasthmatic, antidiabetic, hepatoprotective, and potent CNS activities.

Ginkgo biloba leaf extract contains flavone glycosides (kaempferol, quercetin, and isorhamnetin), diterpene lactones namely Ginkgolides A, B, C, M, J and bilobalide and the biflavones ginkgetin, isoginkgetin, bilobetin with shows cardioprotective effects of *Ginkgo biloba* Phytosomes (GBP) in Isoproterenol (ISO) -induced oxidative damage may be due to an augmentation of the endogenous antioxidants and inhibition of lipid peroxidation of the membrane ^[21].

7. *Ocimum basilicum*



Common Name: Sweet basil.

Other Name: Tropical basil, Tiruniruppaccai.

Family: Lamiaceae.

Distribution: Cultivated throughout India.

Parts used: The whole plant.

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

Properties and Uses: It is bitter, stimulant, acrid, carminative, anti-inflammatory, diuretic. It is useful in treating cardiac debility, spasmodic affections, arthralgia [22].

The plant extracts of *O. basilicum* contain phenolic compound 5.36% (gallic acid), flavonoids 1.86%, rosmarinic acid 15.74% showing potent Cardioprotective activity against cardiotoxin isoproterenol in rats [23].

8. *Pongamia pinnata*



Common Name: Indian beech.

Other Name: Karanja, Punkumaram.

Family: Fabaceae.

Distribution: Throughout India, in Tidal and beech forest.

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

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

Properties and Uses: It is bitter, tonic, acrid, anthelmintic, carminative. It is useful in treating hemorrhoids, anemia, and beriberi [24].

The hydroalcoholic leaf extracts of *P. pinnata* contain flavonoids, carotenoids, triterpenes, cardiac glycosides, alkaloids, saponins, polyphenols, terpenoids are responsible for Cardioprotective activity against experimentally induced cardiotoxin in Wistar albino rats [25].

9. *hydrophila auriculata*



Common Name: Long-leaved barleria.

Other Name: Gokshur, Neermulli.

Family: Acanthaceae.

Distribution: Throughout India, in plains, marshy places, rice fields, margins of the tank, and canals.

Parts used: Roots, Leaves, Seed.

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

Properties and Uses: It is sweet, sour, bitter, tonic, diuretic, anti-inflammatory. It is useful in treating ascites, jaundice, arthralgia [26].

The methanolic extracts of *H. auriculata* leaves contain flavonoids, tannins, glycosides, anti-oxidants showing potent Cardioprotective activity against doxorubicin cardiotoxicity in rats [27].

10. *Nigella sativa*



Common Name: Black cumin.

Other Name: Kallejire, Karumciragam.

Family: Ranunculaceae.

Distribution: In Punjab, Bihar, is often cultivated.

Parts used: Seeds.

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

Properties and Uses: It is acrid, bitter, tonic, stimulant, anti-inflammatory, It is useful in treating diseases such as hemorrhoids, paralysis, inflammation ^[28].

The seed extracts of *N. Sativa* contain 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 ^[29].

11. Artocarpus heterophyllus



Common Name: Jack fruit.

Other Name: Phanas, Palau.

Family: Moraceae.

Distribution: Throughout India.

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

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

Properties and uses: It has acrid, carminative, tonic, diuretic, aphrodisiac, nervine, sedative [30].

The leaf extracts of *A. heterophyllus* contain ethyl acetate, flavonoids, sterols, proteins, tannins, phenolic compounds that possess a potential Cardioprotective activity on the lactose-induced arrhythmia in cladoceran [31].

CONCLUSION

The present review reveals the importance of medicinal plants in preventing and reversing cardiovascular diseases and makes an attempt to compile some of the cardioprotective 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 cardioprotective activity.

ACKNOWLEDGEMENT

We thank Dr. N. S. Mahajan, Principal, Adarsh College of Pharmacy, Vita for useful discussions.

REFERENCES

1. F. Zafar, N.Jahan, *et al.*, "Cardioprotective Potential of Polyphenolic Rich Green Combination in Catecholamine Induced Myocardial Necrosis in Rabbits", Evidence-Based Complementary and Alternative Medicine [2015]; Article ID 734903,p- 9.
2. S. K. Wattanapitayakul, L. Chularojmontri, *et al.*, "Screening of Antioxidants from Medicinal Plants for Cardioprotective Effect against Doxorubicin Toxicity", Basic & Clinical Pharmacology & Toxicology [2005]; vol-96, p- 80–87.
3. Shah, Syed Muhammad Ali, *et al.* "Cardioprotective potential of plant-derived molecules: a scientific and medicinal approach." *Dose-response* [2019]; vol-17(2), p-1-14.
4. Adegbola, Peter, *et al.* "Antioxidant and anti-inflammatory medicinal plants have a potential role in the treatment of cardiovascular disease: a review." *American journal of cardiovascular disease* [2017]; vol-7(2), p- 19-32.
5. Abinaya R *et al.*, "Cardioprotective Activity in Medicinal Plants – A Review" *International Journal of Pharmacy & Pharmaceutical Research* [2019]; vol-14(3), p-112-126.
6. .Kondlepu Harika, Sushama Mondi, Durvasu Jhansilakshmi Bai, *et al.*, "A Comprehensive Review on Cardioprotective Medicinal Plants", *International Journal of Inventions in Pharmaceutical Sciences*. [2014]; vol- 2[4], p-793-799.
7. Guyton, Arthur C, Hall, John E. *Textbook of medical physiology*. Philadelphia, Saunders Publisher. [2006]; vol- 11, p- 310.
8. Marieb & Elaine Nicpon. "Cardiotoxicity and cardioprotection during therapy". *J Curr Opin Oncol*. [2003]; vol-7, p-304-309.
9. Hertog MG, Feskens EJ, *et al.*, "Dietary antioxidant flavonoids and risk of coronary heart disease. The Zutphen elderly study". *Lancet*. [1993]; vol-342, p-1007–1011.
10. A. Kumar, *et al.*, "Indian plants with cardioprotective activity- A review", *Systematic Reviews in Pharmacy*. [2017]; vol-8(1), p-8-12.
11. Orient Longman, *Indian Medicinal Plants*, vol 1, 1993, p.206.
12. Gupta, Naveen Kumar *et al.* "The Antioxidant Potential of *Azadirachta indica* Ameliorates Cardioprotection Following Diabetic Mellitus-Induced Microangiopathy." *Pharmacognosy magazine* vol. 12, Suppl 3 (2016): S371-8.
13. Orient Longman, *Indian Medicinal Plants*, vol 1, 1993, p.209.

14. Ghatage, Apeksha J., *et al.* "Cardioprotective Efficacy of *Bacopa monniera* in Experimental Diabetes Mellitus: Biochemical and Histopathological Assessment." *MGM journal of medical sciences*, [2014]; p.8-10.
15. Orient Longman, *Indian Medicinal Plants*, vol 1, 1997, p.259.
16. Swamy, Agadihiremath Vishwanatha *et al.* "Cardioprotective effect of curcumin against doxorubicin-induced myocardial toxicity in albino rats." *Indian journal of pharmacology* [2012]; vol. 44(1), p-73-77.
17. Orient Longman, *Indian Medicinal Plants*, vol 5, p. 253.
18. Nazish Jahan, *et al.*, "Cardioprotective potential of gemmo modified extracts of *Terminalia arjuna* against chemically induced myocardial injury in rabbits", *Pakistan veterinary journal*, [2012]; vol-32(2),p.255-259.
19. Orient Longman, *Indian Medicinal Plants*, vol 5, p.409.
20. Mohanty, Ipseeta, *et al.* "Mechanisms of cardioprotective effect of *Withania somnifera* in experimentally induced myocardial infarction." *Basic & clinical pharmacology & toxicology* [2004];vol- 94(4), p-184-190.
21. Panda, Vandana S., and Suresh R. Naik. "Cardioprotective activity of *Ginkgo biloba* phytosomes in isoproterenol-induced myocardial necrosis in rats: a biochemical and histoarchitectural evaluation." *Experimental and toxicologic pathology* [2008]; Vol-60 (4-5), p-397-404.
22. Orient Longman, *Indian Medicinal Plants*, vol-4, p-160.
23. Fatemeh fathiazad, Phytochemical screening, and evaluation of Cardioprotective activity of ethanolic extract of *Ocimum basilicum* L. against isoproterenol-induced myocardial infarction in rats, *DARU Journal of pharmaceutical sciences*, [2012];vol-5.
24. Orient Longman, *Indian Medicinal Plants*, vol-4, p.331.
25. Behera Saiprasanna, Cardioprotective effect of *Pongamia pinnata* hydro-alcoholic leaf extract against isoproterenol-induced myocardial infarction in Wistar albino rats, *International Journal of medical and pharmaceutical science* [2012]; vol-2, p-1.
26. Orient Longman, *Indian Medicinal Plants*, [1996]; vol-3 p-191.
27. Vishnu Neharkar, Cardioprotective potential of *Hydrophila auriculata* [L.] leaves Methanolic extracts and its sub-fraction against Doxorubicin-induced rats, *World Journal of Pharmaceutical Sciences*, vol 5, p.1574-1590.
28. Orient Longman, *Indian Medicinal Plants*, [1997]; vol-4, p-139.
29. Hammad Shafiq, Cardioprotective and anti-cancer therapeutic potential of *Nigella sativa*, *Iranian journal of basic medical sciences*, [2014]; vol-17(12), p-967-979.
30. Orient Longman, *Indian Medicinal Plants*,[1993]; vol-1, p-188.
31. Periyanyagam. K, Cardio-protective effect of the leaves of *Artocarpus heterophyllus* L. on *Daphnia Magna*, *Innovare Journal of Health Sciences*, [2013]; vol-3(3), p-1.