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Original Article

Cardioprotective Potential of Polyherbal Formulations: A Critical Review

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ABSTRACT

Cardiovascular disease are the most common cause of death worldwide, , especially in developed and developing countries, it plays a major role in increasing mortality rates [1]. Hypertension, myocardial infarction, cardiomyopathy and heart failure continue to emerge as major public health problems that warrant the development of safer and more effective therapeutic strategies. While synthetic cardioprotective medicines including beta-blockers, calcium channel blockers, ACE inhibitors, and statins are commonly employed, the nonlinear administration of these medications is frequently accompanied by defects and toxicity. [1,2] Traditional medicinal systems rely on herbal drugs, especially polyherbal formulations for the management of cardiac disorders. Polyherbal therapy is based on the idea of synergism, where different herbs work together to improve effectiveness and reduce toxicity.The present systematically reviews commonly used medicinal plants in cardiac polyherbal formulations, their phytoconstituents, mechanisms of action, and experimental evaluation methods. Furthermore, issues related to standardization, quality control, and marketed formulations are discussed.Evidence suggests that polyherbal formulations exert cardioprotective effects through antioxidant, anti-inflammatory, antihyperlipidemic, and membrane-stabilizing mechanisms. However, the lack of large-scale clinical validation remains a major limitation. Future research should focus on molecular mechanism studies, clinical trials, and advanced drug delivery systems for improved therapeutic outcomes.

Keywords: Polyherbal formulation; Cardioprotective activity; Herbal medicine; Synergism; Cardiac evaluation; Phytoconstituents

INTRODUCTION

Cardiovascular diseases are a significant global health issue, and they're also a leading cause of death around the world. The World Health Organization reports that almost 17.9 million people die annually from these diseases, which represents about 32% of all deaths globally. A substantial number of these fatalities stem from heart attacks and strokes. The rising incidence of cardiovascular diseases is closely linked to lifestyle choices, including a lack of exercise, poor eating habits, smoking, obesity, and psychological stress. [3,4] Developing countries are grappling with a significant increase in non-communicable diseases, especially cardiovascular ones, in recent years. Recent epidemiological studies revealed that cardiovascular diseases are responsible for approximately one-fourth of total deaths in India. Urbanization, shifts in lifestyle, and the rising incidence of heart conditions among young adults have emerged as significant factors contributing to an increase in cardiovascular disease–associated morbidity and mortality. [3] Oxidative stress, inflammation, endothelial dysfunction, and dyslipidemia are among the various pathological factors involved in the initiation and progression of cardiovascular diseases. Various cardiovascular disorders like hypertension, atherosclerosis, myocardial infarction, heart failure interfere with the normal functioning of the heart. [31–34] Currently, traditional therapies such as statins, ACE inhibitors, β-blockers, and diuretics are utilized for the management and prevention of cardiovascular disorders. Despite reducing mortality rates and curing patients, several adverse effects associated with prolonged use are observed, including hepatotoxicity, renal dysfunction, and disturbances in electrolyte balance. In addition, drug interactions may occur when multiple medications are prescribed. Therefore, researchers are now focusing on alternative treatment options that are effective with fewer side effects. [30] Herbal medicines have been practiced since ancient

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times for the prevention and treatment of several diseases, including cardiovascular diseases, in traditional systems of medicine such as Ayurveda. Several herbs for the management of Hridroga (cardiac diseases) have been described in ancient Ayurvedic texts such as Charaka Samhita. Herbal drugs are composed of various phytoconstituents such as flavonoids, alkaloids, tannins, phenolic compounds, and glycosides that exhibit antioxidant, anti-inflammatory, antihyperlipidemic, and cardioprotective effects [24,25] Hence, this review will emphasize a critical evaluation of the cardioprotective activity of polyherbal formulations, highlighting phytochemical constituents, mode of action, experimental systems used for assessment, and future perspectives in the management of cardiovascular diseases

2. Concept of polyherbal formulation

Poly herbal formulation is the admixture of more than one medicinal plants in one dosage form. The rationale behind polyherbal therapy lies in the concept of synergism, where the combined effect of herbs is greater than the sum of their individual effects.

2.1. Ayurvedic Perspective

Ayurveda emphasizes "Yogavahi" and "Samskara" principles, where herbs enhance each other's potency and reduce toxicity.

2.2. Modern Scientific Perspective

Scientific studies demonstrate that multiple phytoconstituents target different pathways involved in cardiac pathology, such as oxidative stress, inflammation, lipid metabolism, and calcium regulation. [31–34]

Advantages

i. Multi-target mechanism
ii. Reduced side effects
iii. Lower dose requirement
iv. Improved patient compliance

3. Medicinal Plants Used in Cardiac Polyherbal Formulations

Several medicinal plants have demonstrated cardioprotective activity.

Table 1. Cardioprotective Commonly Used Medicinal Plant and Their Properties

Sr. No.	Scientific Name of Medicine	Common Name	Part Used	Major Phytoconstituent	Pharmacological Activity
1	Terminalia arjuna	Arjuna	Bark	Arjunolic acid, tannins	Anti-ischemic, antioxidant
2	Withania somnifera	Ashwagandh	Root	Withanolides	Anti-inflammatory
3	Allium sativum	Garlic	Bulb	Allicin	Hypolipidemic
4	Ocimum sanctum	Tulsi	Leaves	Eugenol	Antioxidant
5	Boerhavia diffusa	Punarnava	Root	Alkaloids	cardioprotective
6	Camelia Sinesis	Green tea	Leaves	Catechins, Caffeine, Epicatechin, Flavonoids	Antioxodent, Antihypertensive, Antiplatelet
7	Emblica Officinalis	Amla	Fruit	Vitamin C, Gallic acid, Ellagic Acid	Antiatherosclerotic, Hypolipidemic
8	Ginkgo Biloba	Ginkgo	Leaves	Ginkgolides, Flavonoids	Improves Circulation, Catdioprotective
9	Curcumin Longa	Turmeric	Rhizo-me	Curcumin	Anti-inflammatory, Antioxidant
10	Panax ginseng	Ginseng	Root	Ginsenosides	Cardioprotective, Anti-Stress
11	Rauvolfia serpentina	Sarpagandha	Root	Reserpine, Alkaloids, Glycosides	Antihypertensive, Cardioprotective
12	Tinospora terrestris	Guduchi	Stem	Tinosporin, Alkaloids, Glycosides	Antioxident
13	Nigella Sativa	Black seed	Seed	Thymoquinone	Hypolipidemic
14	Tribulus terrestris	Gokshura	Fruit	Saponins, Flavonoids	Hypolipidemic

15	Hibiscus rosa-sinensis	Hibiscus	Flower	Anthocyanins, Flavonoids	Anti-hypertensive, Antioxident

4. Phytochemicals in Phytotherapy with Effects on the Heart

1) Flavonoids - represent an important class of potent antioxidants that lower oxidative stress and lipid peroxidation.
2) Alkaloids - have hypotensive and vasodiolation properties.
3) Cardiac glycosides – increase myocardial contractility and regulates heart rate.
4) Saponins & Phenolic Compounds - positively influence lipid profile and stabilize cell membrane.

5. The Proposed Mechanisms for Cardioprotective Activity

1) Anti-oxidative Mechanism - reduction of myocardial damage occurs from scavenging reactive oxygen species.
2) Antihyperlipidemic Mechanism - lowering of low-density lipoproteins and triglycerides decreases risk of atherosclerosis.
3) Anti-inflammatory Mechanism - inhibiting cytokines such as tumor necrosis factor and interleukins decreases cardiac inflammation.
4) Calcium Channel Modulation - regulates intracellular calcium overload during ischaemia. 5) Stabilising Myocardial Membranes - decreases leakage of cardiac biomarkers.

CONCLUSION

Polyherbal formulations have significant cardioprotective activity with antioxidant, anti-inflammatory, antihyperlipidaemic, and stabilising characteristics. The combined use of multiple herbs increases effectiveness and reduces toxicity. However, due to inadequate clinical validation of the findings from the above studies, polyherbal formulations lack global acceptance. The future of this area of research should focus on standardisation, mechanistic studies, and well-designed clinical studies to confirm the safety and efficacy of polyherbal cardioprotective formulations.

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