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HERBAL MEDICINES INCLUDING CARDIO PROTECTIVE AGENTS

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Background:
Medicinal plants have been utilized for centuries to treat a variety of ailments, especially cardiovascular diseases (CVDs). These plants contain bioactive compounds known as phytochemicals, such as diosgenin, isoflavones, sulforaphane, catechins, and quercetin, which have shown significant cardioprotective effects. These phytochemicals possess antioxidant, anti-inflammatory, and vasorelaxant properties, which help reduce cardiovascular abnormalities and improve overall heart health. Several plants have demonstrated promising cardiovascular benefits. Hawthorn is well-known for enhancing heart function, while garlic is recognized for lowering cholesterol levels. Ginkgo biloba improves circulation, and turmeric is celebrated for its anti-inflammatory effects. Other plants like Nerium oleander, Amaranthus viridis, and Gingerol exhibit potent antioxidant and anti-atherosclerotic properties, offering protection against myocardial damage. Studies from sources such as PubMed and Science Direct reveal that these plants' mechanisms include reducing oxidative stress, preventing endothelial dysfunction, inhibiting platelet aggregation, and modulating lipid metabolism. These actions contribute to lowering the risk of heart diseases like atherosclerosis, hypertension, and myocardial infarction. Additionally, certain plants have shown potential in preventing myocardial damage caused by drugs like doxorubicin, which is used in cancer treatment. However, despite these promising results, further clinical research is needed to establish the safety and efficacy of these plants in cardiovascular care. Integrating herbal medicine with conventional treatments could offer a more holistic approach to managing and preventing CVDs. Exploring the wide range of medicinal plants and their phytochemicals could lead to the development of natural therapies, providing alternative or complementary options to traditional pharmaceutical treatments for heart disease.

Keywords: Herbal medicine, health management, cardiotoxicity, phytotherapeutic.

Introduction

Heart attack, also called myocardial infarction (MI), and related complications are the main causes of deaths throughout the world [1]. The use of herbal antioxidants is increasing as defensive agents against number of cardiovascular abnormalities. The bioactive agents from natural sources have gained fundamental importance in modern system of medicines, reducing the risks of cardiac ailments by scavenging the free radicals formation [2]. Cardiovascular Diseases (CVDs) affect many millions of individuals every year and they are the leading cause of death globally, with an estimate of 31 % [3]. Overall incidence of cardiovascular risk factors such as sedentary life-style, obesity, diabetes, smoking, alcoholism is increasing in the population. Endothelial cell dysfunction, oxidative stress, inflammation, vascular smooth muscle cell proliferation are the key pathophysiological causative factors underlying onset and progression of CVDs. Cardio protection includes all mechanisms and means that contribute to the preservation of heart by reducing or even preventing myocardial damage [4]. Historical Context of Herbal Medicine, herbs have long been a crucial part of therapeutic regimens in Traditional Chinese Medicine (TCM) and Ayurveda, providing insights into the treatment of cardiovascular diseases [5]. The use of herbal plants as an antioxidant is increasing as a defensive agent to the various cardiovascular abnormalities [6]. The oldest medicinal plant which is used for cardiac disease is digitalis lanata because the active constituent is present in

the steroid glycoside called digoxin. It is also used in the treatment of arrhythmia [7]. It contains the soluble phenolic compound is the caffeoyl shikimic acid [CFA]' other, phenolic acid include caffeic acid, protocatechuic acid [PCA], and p- hydroxybenzoic acid [PHBA] The anticancer drug causes cardiovascular disease i.e., doxorubicin, and epirubicin belonging to the anthracycline family, paclitaxel, docetaxel [plantalkaloid], and cyclophosphamide [alkylating agent] these drugs are included in the 5- fluorouracil. The OPP exhibit anti-inflammatory property, and prevent the cardiovascular mechanism include metabolic pathway and modulation of biochemistry. OPP has indicated its effect on atherosclerosis on the atherogenic rabbit models [8]. Cardioprotective Potential of Plant are shown in Figure 11 High blood pressure, often known as hypertension, is a significant risk factor for cardiovascular illnesses. Herbal medicines have been investigated as potential blood pressure management therapies, providing a more comprehensive approach to controlling this common illness [9].

Medicinal Plants with Cardioprotective Potential

- **Daucus Carota**: Daucus carota is a white-flowering herb belongs to Apiaceae plant family and is generally recognized as wild carrot. The phytochemicals present in this plant include daucosol, xanthophylls, carotene, sesquiterpenoids, and daucoside. They studied the cardioprotection by determining the activity of cardiac enzymes like transaminases, lipid peroxidases, cardiac protein, and lactate dehydrogenase (LDH)d The fruits are oval and flattened, with short style or hooked spines. It is very small, dry, and bumpy, it also protective to hair, to the surrounding. It is also used as the aphrodisiac for a nervine tonic and uterine pain. The roots are used for the insertion of threadworm.
- **Nerium Oleander**: It shows the cardioprotective effect [10]. Plant parts used in the pharmaceutical preparation are flower, root, leaves, and root bark. The plant is utilized to treat the patient with malignancies. Nerium oleander plant is used to treatment of ulcer, hemorrhoids, leprosy, herpes, abscesses, and ringworm. It is also used for a heart condition, leprosy, malaria, asthma, and cancer.
  Amaranthuviridis
  It is called as never fading flower in Greek. It is an annual herb [11]. This plant also contains variety of amino acids, including leucine, lysine, isoleucine, arginine, cystine, histidine, valine, phenylalanine, methionine, threonine, tryptophan, and tyrosine. Lower levels of cardiac enzymes were observed in plant-treated groups of rats, showing its cardioprotective activity. Amaranthus viridis
- **Ginkgo Bilob**: The active constituent is flavones, glycosides, ascorbic acid, diterpene lactones, catechin, flavanol. The plant shows biological activity such as antioxidant, antimicrobial, memory enhancer, anti-inflammatory, antidepressant, anticoagulant, antiulcer, cytotoxic, and anti-stress. It is used in the treatment for Alzheimer related dementia, Raynaud diseases compared to combined administration of O sanctum (50 mg/kg body weight) and G biloba (100 mg/kg body weight).

Figure 1. Ginkgo Biloba

- **Terminalia Arjuna**: Phytoconstituents are arjunetin, polyphenols, b-sitosterol, freidelin, arjunic acid, and triterpenes [12]. Cardioprotective potential of T arjuna alcoholic extract was investigated against isoproterenol-induced myocardial injury in Wistar rats by administering extract dose concentrations orally for a period of 28 days
- **Picrorhiza Kurroa**: The genus Picrorhiza in recent past has attracted the great interest and the promising role of P kurroa formulations has been revealed in much chemical and pharmacological investigation [13]. Chemical constituents found in this plant are berberine, kurrin, picrorhizetin, kutkisterol, sesquiterpene, apocynin, cathartic acid, and kutkin.65 Cardioprotective activity of P kurroa ethanolic extract was investigated in isoproterenol-induced MI using rats model. Significant cardioprotective activity of P kurroa extract was observed at dose concentration of 80 mg/kg body weight.
- **Salvia Miltiorrhiza**: Salvia miltiorrhiza belongs to Labiatae plant family that is widely used against cardiovascular abnormalities for disease prevention and treatment.In Asia, Europe, and the United States, the rhizome and roots of this plant are extensively used in treating cerebrovascular and cardiovascular diseases in the form of tablets, injection solutions, oral liquid, capsule, and slowrelease formulation.[14]
- **Tinospora Cordifoli**: Tinospora cordifolia (Wild) from genus Tinospora is a climbing shrub and is well known as "amrita" in Sanskrit and Hindi while "amudamor chindle" in Tamil. Surgical occlusion of coronary artery was performed to induce myocardial ischemia and then reperfusion for 4 hours. Results

showed that T cordifolia treatment reduces the infarct size and decreased the lipid peroxide level compared to control group, indicating the cardioprotective activity of this plant [15].

- **Bombax Ceiba**: Bombax ceiba L belongs to Bombacaceae plant family generally known as kapok tree or red silk cotton that grows in India and other countries such as Sri Lanka, Myanmar, and Indonesia [28].This plant contains tannins, flavonoids, b-sitosterol, lupeol, glycosides naphthoquinone, n-triacontanol, and sesquiterpenoids [29]. Reported the cardioprotective potential of B ceiba flowers aqueous extract against cardiotoxicity induced by adriamycin as compared to vitamin E.
- **Andrographis Paniculata**: Andrographis paniculata (AP) belongs to Acanthaceae family and is well known due to its medicinal importance [16] Chemical constituents found in this plant are sodium, potassium, glycosides, flavonoids, tannic acid, diterpene lactone andrographolide, kalmeghin, 14-deoxy andrographolide, and 14-deoxy-11,12-didehydro andrographolide cardioprotective activity of AP against reoxygenation/hypoxic injury in neonatal rat cardiomyocytes l [17] .

1. Phytoconstituents

Cyclovirobuxine D: It contains cyclovirobuxine-D, steroidal alkaloid, artemetin, 40 ,5- -3,30 ,7-tetra methoxy flavones, ()-(Z)-buxenone, ()-(E)-buxenone functions, hemodynamics, microcirculation, histology, and mortality assessments of experimental rats were recorded. They found that cyclovirobuxine D is useful for the management of cardiac failure due to occlusion of left coronary artery,[18]

Withanolides: Cardioprotective potential of Withania somnifera (300 mg/kg body weight) purified extract (withanolide 1.5%) was investigated using male Wistar rats. Rats were given doxorubicin (10 mg/kg body weight) to induce necrosis and apoptosis in cardiac tissues.

Flax lignin: Linum usitatissimum seeds extract (flax lignan concentrate) was studied for cardioprotective activity against isoprenalineinduced myocardial necrosis in rats [19]. Male Wistar rats (200-230 g) were divided into 3 groups as control group, isoprenaline group, and test (flax lignin treated) group. Test group rats were administered with flax lignin concentrate (500 mg/kg body weight) for 8 days, while isoprenaline was given to rats except control rats at a dose of 5.25 and 8.5 mg/kg body weight subcutaneously during 9th and 10th day of therapy [20].

Future Prospects: Screening of indigenous medicinal plants from local flora should be carried out to explore specific plant constituents with therapeutic potential against cardiovascular ailments as an alternative to allopathic treatment regimens. Furthermore, characterization of specific isolated compounds from potent indigenous medicinal plants may be considerably helpful in novel drug designing and drug development for the therapy of cardiovascular disorders. International collaboration may be encouraged by the government through financial support for improving the quality of research [21].

2. Cardioprotective Mechanism of Medicinal Plants

The cardioprotective effect of medicinal plants/herbal products during cardiovascular ailments has been demonstrated by attenuating the damage in cardiac muscle cells, suppression. In VSMCs, medicinal plants/herbal products beneficial effects have been shown through expression inhibition, or inhibition of structural and contractile proteins activities, modulating the extracellular matrix proteins/glycoproteins expression, regulation of calcium levels, alleviating inflammation, attenuating proliferation and migrations, and mitochondrial functional improvements.

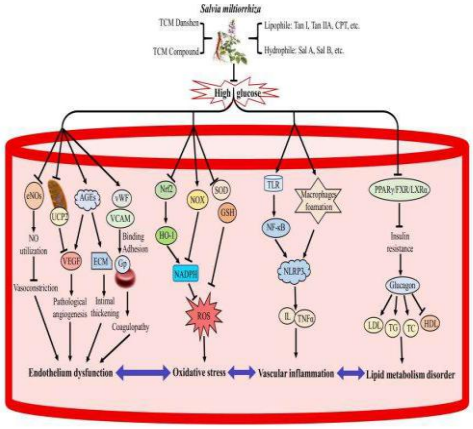

Figure 2: Mechanism of action of salvia miltiorrhiz

In macrophages and monocytes, protective effect of medicinal plants/herbal products has been shown through estrogen receptor activation, NOS-NO signaling pathway inhibition, and the activation of nuclear receptor peroxisome proliferator activated receptor since ancient times, numerous medicinal plants/herbal remedies have been used for the treatment of cardiovascular ailments. However, no scientific basis have been studied and reported the molecular mechanism of cardioprotective potential of medicinal plant remedies using cellular and molecular techniques. Medicinal plants discussed in this review article appear to show pharmacotherapeutic potential in vitro and in animal studies that may influence the cardiovascular ailments. These natural medicinal plants exert protective therapeutic effect through a series of processes, including the inhibiting, modulating, and regulating the expression of various proteins such as contractile and structural proteins, and glycoproteins. In VSMCs, medicinal plants/herbal products beneficial effects have been shown through expression inhibition, or inhibition of structural and contractile proteins activities, modulating the extracellular matrix proteins/glycoproteins expression, regulation of calcium

levels, alleviating inflammation, attenuating proliferation and migrations, and mitochondrial

Conclusion

Herbal medicine offers a promising complement to conventional cardiovascular treatments, with natural interventions that support heart health. Herbs like hawthorn, garlic, and Ginkgo Biloba help with vasodilation, blood pressure regulation, and circulatory function. Additionally, plant sterols and red yeast rice show potential in managing cholesterol levels, which is critical for reducing cardiovascular risk. In the case of heart rhythm disorders, herbs such as hawthorn and motherwort offer alternative treatments for arrhythmia, while adaptogenic herbs and mind-body approaches help reduce stress, which is important for cardiovascular health. experiences and case studies demonstrate the positive effects of these interventions on heart health. However, further research is necessary to fully understand the molecular mechanisms at play, especially concerning promising compounds like resveratrol.

Author Contributions

All authors are contributed equally

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Declaration of Competing Interest

The Authors have no Conflicts of Interest to Declare.

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