

Herbal Interventions in Cardiovascular Disorders: Bioactive Compounds, Pharmacological Activities and Therapeutic Potential

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Abstract

Cardiovascular diseases (CVDs) continue to be a major global source of morbidity and mortality, posing a serious threat to public health. Herbal therapies have received more attention in recent years as complementary and alternative therapeutic techniques for the management and prevention of cardiovascular disorders. Numerous bioactive substances found in medicinal plants, including flavonoids, alkaloids, phenolic acids, tannins, saponins, terpenoids, and glycosides, have important cardioprotective qualities. Antioxidant, anti-inflammatory, antihypertensive, hypolipidemic, antithrombotic, and vasodilatory properties are among the pharmacological actions of these phytoconstituents. Numerous herbal plants have been extensively researched for their positive effects on cardiovascular health, including *Cissus quadrangularis*, *Terminalia arjuna*, *Allium sativum*, *Camellia sinensis*, and *Curcuma longa*. Quercetin, catechins, allicin, curcumin, and triterpenoids are among the substances that are essential for lowering oxidative stress, controlling lipid metabolism, enhancing endothelial function, and stopping platelet aggregation. Major CVDs like hypertension, atherosclerosis, myocardial infarction, and heart failure are prevented in part by these systems. Furthermore, compared to traditional synthetic medications, herbal remedies frequently have fewer adverse effects and better patient compliance. To ensure safety, effectiveness, and quality control, more carefully planned clinical trials and standardization of herbal formulations are necessary, notwithstanding encouraging experimental and clinical findings. Thus, the investigation of herbal bioactive components offers a significant chance for the creation of innovative cardioprotective drugs and integrated therapeutic approaches in the treatment of CVDs. This review includes 50 medicinal plants with activities against various CVS disorders such as Hypertension, Atherosclerosis and Heart failure. Plant species were chosen on the basis of availability of pharmacological evidence on cardiovascular activity, and citation in ethno medicinal sources.

Keywords: Medicinal plants, Flavonoids, Phytochemical, Anti-hypertensive, Cardioprotective agents, Atherosclerosis

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Introduction

The cardiovascular system is a vital organ system responsible for the circulation of blood throughout the body. It consists of the heart, blood, and a network of blood vessels including arteries, veins, and capillaries. The heart functions as a muscular pump that maintains continuous blood flow, ensuring the delivery of oxygen and nutrients to tissues. At the same time, it helps remove metabolic waste products such as carbon dioxide and urea. This system plays a crucial role in maintaining homeostasis by regulating body temperature, pH balance, and fluid levels. Proper functioning of the cardiovascular system is essential for cellular metabolism and overall survival. Any disturbance in this system can lead to serious health complications [1].

The cardiovascular system also plays an important role in defense and communication within the body. Blood transports hormones from endocrine glands to target organs, enabling coordination of physiological activities. It also carries immune cells and antibodies that help protect the body against infections. Regulation of blood pressure and blood flow allows the body to adapt to different conditions such as exercise, stress, and rest. The heart rate and vessel diameter adjust according to the body's oxygen demand. Disorders of the cardiovascular system, such as hypertension and atherosclerosis, are among the leading causes of morbidity and mortality worldwide. Therefore, understanding this system is fundamental in medical and pharmaceutical sciences [2]. The development of CVDs follows a common pathological cascade, as illustrated in fig. 1.

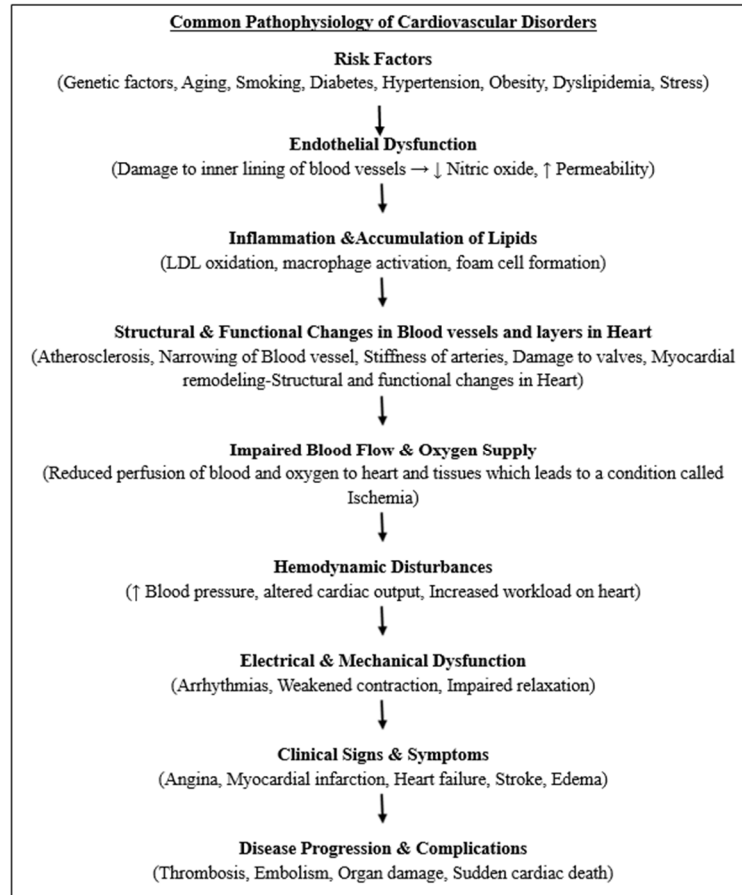


Fig. 1: Pathophysiological cascade of cardiovascular diseases.

The fig. illustrates key mechanisms including endothelial dysfunction, lipid accumulation, oxidative stress, and inflammation leading to cardiovascular disorders. Adapted from Hall JE (2021) and Libby P (2021).

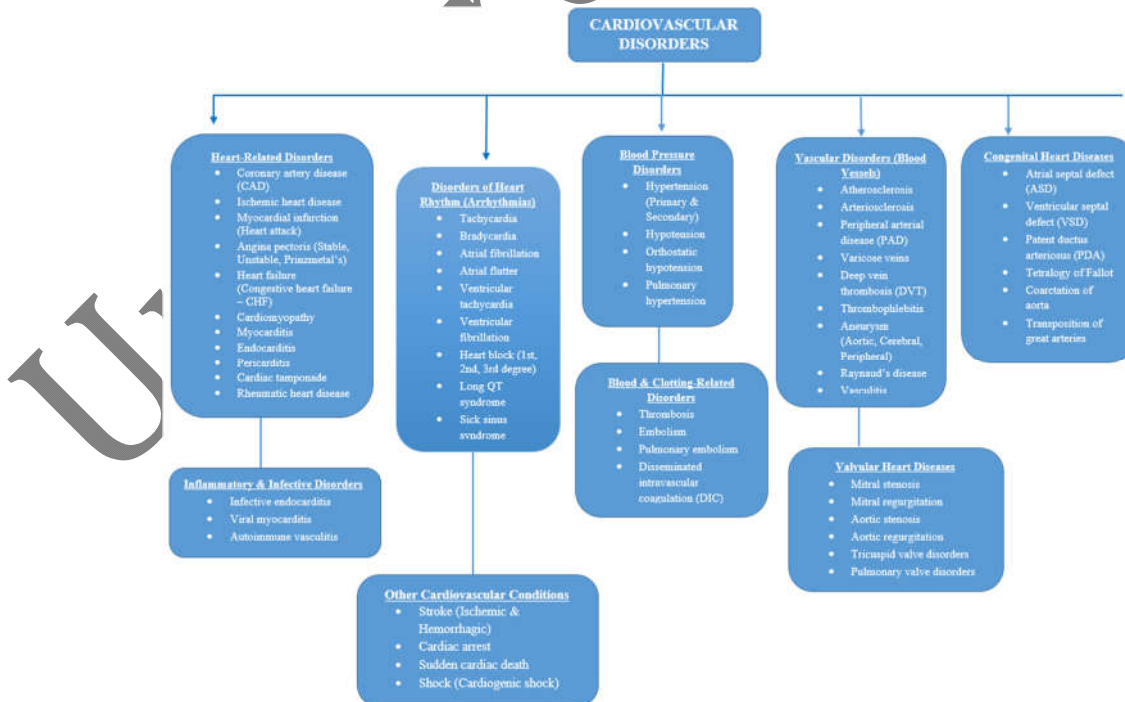


Fig. 2: Types of cardiovascular disorders (Harrisons principles of internal medicine).

Methods

Search engines: PubMed, Scopus, Google Scholar

Keywords: "cardioprotective plants", "antihypertensive herbs"

Inclusion: Pharmacological studies

Exclusion: unrelated/non-peer-reviewed

Table 1: List of medicinal plants with cardioprotective effects, active phytoconstituents, mechanism of action and level of evidence Data from published sources; level of evidence varies (*in vitro*, *in vivo*, clinical).

S. No.	Scientific name common name	Family	Phytoconstituents	Plant part	Mechanism	Type of evidence	Reference
1	<i>Terminalia arjuna</i> Arjuna	Combretaceae	Arjunolic acid Terminic acid Arjungenin Arjunone Arjunetin Arjunolone Ellagic acid Gallic acid Quercetin	Bark	Myocardial infraction: Terminalia arjuna strengthens cardiac muscle and enhances coronary artery flow, improving myocardial oxygen supply. It reduces the frequency and severity of angina attacks by producing antioxidant and nitric oxide-modulating actions. Hypertension: Terminalia arjuna bark extract improved heart pumping efficiency and reduce heart chamber enlargement. Regular use increase the heart's ejection fraction and stroke volume, showing stronger cardiac performance. Rheumatic heart disease: Terminalia arjuna aids in pumping of heart more efficiently, increasing ejection fraction. Additionally, it reduced heart enlargement, supporting overall heart health.	Clinical <i>In vivo</i>	[3]
2	<i>Crataegus oxyacantha</i> Hawthorn	Rosaceae	Procyanidins Vitexin Hyperoside Triterpenes Epicatechin Chlorogenic acid Rutin Quercetin Ursolic acid	Fruit Leaves and Flowers	Anti-inflammatory Effect: The treatment suppresses iNOS (Inducible Nitric oxide synthase) expression, which simultaneously reduce nitrite levels, COX-2 activity, lipid peroxidation and cytochrome c release. Antiplatelet: The extract showed antiplatelet activity at low doses of 100, 200, and 500 mg/kg, as evidenced by a prolonged bleeding time, reduced platelet aggregation (measured using PFA-100), and lowered serum levels of thromboxane B ₂ . Antiarrhythmic Effect: Hawthorn extract helps in regulating heart rhythm by prolonging heart action potential and reducing abnormal beats, though its exact mechanism is still unclear.	Clinical	[4]
3	<i>Digitalis purpurea</i> Foxglove	Plantaginaceae	Digoxin, Digitoxin (Cardiac glycosides)	Leaves	Heart Failure: It blocks the Na ⁺ /K ⁺ pump, causing accumulation of sodium inside the cell which activates sodium-calcium exchanger. The exchange pump also pushes calcium inside the cell which has stronger contractions (Positive Inotropism). That extra calcium makes the heart squeeze stronger. Atrial Fibrillation: It slows down the action potentials (signals) passing through the AV node. This naturally lowers the heart rate, reduces oxygen demand, and helps in controlling fast rhythms like atrial fibrillation.	Clinical	[5]
4	<i>Allium sativum</i> Garlic	Amaryllidaceae	Allicin, Ajoene (Sulfur compounds) Quercetin Kaempferol Steroidal saponins	Cloves	Anti-Platelet: Garlic and its active compounds reduces the tendency of platelets to over clot by blocking key enzymes like cyclooxygenase and reducing calcium movement inside the cells. Fibrinolysis: The plant helps in breaking down of existing clots and keep blood flowing smoothly. Aged garlic extract protects red blood cells from oxidative damage and improves their	Clinical	[6]

5	<i>Ginkgo biloba</i> Ginkgo	Ginkgoaceae	Ginkgolides (A, B, C, J) Bilobalide Isorhamnetin	Leaves	flexibility, especially in high-cholesterol conditions. Hypertension: Garlic extracts help blood vessels to relax by increasing nitric oxide and reducing constricting factors like Endothelin-1. Its γ -glutamylcysteine compounds may also lower blood pressure by blocking ACE, similar to some hypertensive medicines. Atherosclerosis: Ginkgo biloba restores the balance between free radicals and antioxidants, reducing oxidative stress that leads to vascular injury and atherosclerotic plaque formation. It scavenges free radicals and slows down their generation, preventing progression of CVD, especially atherosclerosis. Hypertension: Its flavonoids and terpenoids inhibit ACE, improve endothelial function, and widen blood vessels. These combined effects lower blood pressure, offering protection against hypertension and related cardiovascular complications. Atherosclerotic Plaque Rupture: Ginkgo reduces inflammatory markers (MCP-1, ICAM-1, VCAM-1), suppresses NOX-derived ROS, inhibits MAPK/TLR-4 activation, and lowers enzymes like MMP-1 that cause plaque rupture. This slows down plaque progression and protects against atherothrombosis and coronary artery disease.	Clinical	[7]
6	<i>Panax ginseng</i> Ginseng	Araliaceae	Ginsenosides (saponins) Panaxans A, B, C, D (Poly saccharides) Phenols - Vanillic acid, Salicylic acid	Roots	Myocardial Infarction: Korean red ginseng extracts inhibit platelet aggregation and reduce blood clot formation, lowering the risk of thrombosis and myocardial infarction. Compounds like dihydroginsenoside Rg3 raise intracellular cAMP and reduce platelet coagulation, preventing clot-induced cardiovascular damage. Coronary Heart Disease: Ginseng's Ginsenosides (like Rb1, Rg1, Rg2) neutralize free radicals and reduce oxidative stress, preventing damage to macro molecules like lipids, proteins, and DNA. By lowering oxidative injury and inflammation, ginseng slows the development of atherosclerosis and protects against coronary heart disease.	In vivo Clinical	[8]
7	<i>Camellia sinensis</i> Green tea	Theaceae	Polyphenols- Epigallocatechin gallate (EGCG) Alkaloids - Theobromine, Theophylline Flavonoids - Quercetin, Kaempferol, Myricetin Tannins- Ellagitannins	Leaves	Atherosclerosis: Green tea Catechin (especially EGCG) neutralize reactive oxygen species, reduce pro-oxidant enzymes, and boost antioxidant enzymes. This prevents oxidation of LDL, reduces oxidative injury in blood vessels, and slows the formation of atherosclerotic plaques which is a major cause of CAD and stroke. Vascular Inflammation: Catechin suppress inflammatory markers like MCP-1, IL-8, ICAM-1, VCAM-1, and E-selectin, and inhibit NF- κ B, the key inflammatory transcription factor. This reduces monocyte adhesion to the endothelium, lowers vascular inflammation, and protects against atherosclerosis and coronary heart disease.	Clinical	[9]
8	<i>Hibiscus sabdariffa</i> Roselle	Malvaceae	Anthocyanins - Delphinidin-3-sambubioside, cyanidin-3-sambubioside Hibiscus acid, Flavonoids - Quercetin, Hibiscetin,	Calyces	Hypertension: Vasodilation-HS boosts nitric oxide production. NO relaxes blood vessels and reduces resistance. This leads to reduction in systolic and diastolic BP. Atherosclerosis: HS polyphenols prevents LDL from oxidizing. This prevents plaque formation in arteries. Overall, it slows down the progression of	Clinical	[10]

9	<i>Nigella sativa</i> Black seed	Ranunculaceae	Gossypetin Volatile oils- Thymoquinone, Thymol Alkaloids – Nigellidine Saponins – α-hederin	Seeds	atherosclerosis. Hypertension: N. sativa increases nitric oxide availability, improving vessel relaxation. Better vasodilation lowers vascular resistance. This directly reduces SBP and DBP. Atherosclerosis: N. sativa lowers harmful lipids (LDL) and raises protective HDL (Good Cholesterol). This slows plaque buildup in arteries. On a whole, it reduces risk of CAD and plaque progression.	Clinical	[11]
10	<i>Rauwolfia serpentina</i> Indian snakeroot	Apocynaceae	Alkaloids- Reserpine, Ajmaline, Serpentine, Yohimbine Sterols – Beta-Sitosterol	Leaves	Coronary Artery Disease: Plaque builds up inside coronary arteries. This narrows the lumen and restricts oxygen-rich blood reaching the heart muscle. The reduced perfusion leads to ischemia and angina symptoms. Hypertension: ACE Inhibition → Reduced Angiotensin II → Lower BP The extract combination significantly reduced ACE activity in kidney and lung tissue. Lower ACE means less angiotensin II, a powerful vasoconstrictor. As a result, blood vessels relax and blood pressure drops.	Clinical	[12]
11	<i>Olea europaea</i> Olive plant	Oleracea	Phenols – Oleuropein, Hydroxytyrosol Flavonoids – Luteolin, Apigenin, Rutin Triterpenes – Oleanolic acid, Maslinic acid	Leaves	Anti-atherosclerotic action: Phenolic compounds in olive (especially Oleuropein and Hydroxytyrosol) scavenge free radicals, inhibit LDL oxidation and suppress inflammatory signaling in vascular tissue, reducing foam-cell formation and atheroma progression. Hypertension: Olive leaf constituents improves endothelial abundance of Nitric oxide, which promotes vasodilation and produce L-type Ca ²⁺ channel antagonism in vascular muscle, lowering peripheral resistance and blood pressure.	Clinical	[13]
12	<i>Apium graveolens</i> Celery	Apiaceae	Flavonoids – Luteolin, Apigenin, Kaempferol Coumarins – Umbelliferone	Seeds	Atherosclerosis: The seeds will reduce triglyceride and serum cholesterol levels through inhibition of lipid absorption and synthesis. Its flavonoids and phenolic compounds prevent LDL oxidation, thereby slowing down of plaque formation in the walls of arteries. Hypertension: Phthalides in the plant lowers blood pressure by vasodilation, which relax vascular smooth muscle and reduce peripheral resistance. It also blocks influx of calcium into smooth muscle cells, decreasing contraction same as calcium channel blockers.	In vivo	[14] [15]
13	<i>Berberis vulgaris</i> Barberry	Berberidaceae	Alkaloids-Berberine, Palmatine Oxyacanthine Phenolic acids	Roots	Myocardial Ischemia: The Root extract will reduce oxidative stress and inflammation due to ischemia, thereby preventing damage to cardiac tissue. It improves coronary blood flow and mitochondrial function. Cardiac Arrhythmias: Modulates the activity of cardiac ion channels, particularly sodium and potassium channels. It prolongs action potential duration and refractory period, helping stabilize cardiac electrical activity. This leads to suppression of abnormal cardiac impulses and prevention of ventricular arrhythmias.	Clinical	[16] [17]
14	<i>Curcuma longa</i> Turmeric	Zingiberaceae	Polyphenols- Curcumin, Turmerone, Desmethoxycurcumin	Rhizome	Arrhythmias: Modulating sodium, calcium, and potassium ion channels normalize action potential duration. It reduces oxidative stress-induced electrical instability in cardio myocytes. This prevents abnormal impulse generation and lowers the risk of ventricular arrhythmias. Cardiac Hypertrophy:	Clinical	[18] [19]

	<i>cordifolia</i> Guduchi	ae	Berberine, Magnoflorine Diterpenoid Lactones- Cordifolioside Tinosporaside Steroidal saponins	Stems	<i>Tinospora cordifolia</i> provides cardio protection by scavenging free radicals and reducing lipid peroxidation during ischemia-reperfusion, injury. It preserves myocardial antioxidant enzymes (SOD, catalase, glutathione) and stabilizes cell membranes. Cardiomyopathy: <i>Tinospora cordifolia</i> reduces cardiac inflammation by inhibiting pro-inflammatory cytokines such as TNF- α and IL-6. Its immunomodulatory constituents protect cardio myocytes from immune-mediated and oxidative damage.		[31]
21	<i>Azadirachta indica</i> Neem	Meliaceae	Flavonoids- Quercetin, Myrcetin Limonoids – Azadirachtin, Nimbin Alkaloids – Margosine, Nimbandiol Phytosterols – Beta – Sitosterol, Stigmasterol	Bark	It reduces atherosclerosis by lowering oxidative modification of LDL cholesterol through its potent antioxidant flavonoids and Limonoids. It suppresses vascular inflammation and foam cell formation, slowing plaque progression. Myocardial Ischemia: Exerts cardioprotective effects by scavenging ROS generated during myocardial ischemia. It prevents lipid peroxidation and stabilizes myocardial cell membranes, reducing tissue injury.	<i>In vivo</i>	[32]
22	<i>Gymnema sylvestre</i> Gymnema	Apocynaceae	Alkaloids – Gymnamine Triterpenoid Saponins- Gymnemic acids	Leaves	Provides cardioprotection by enhancing antioxidant defense mechanisms in myocardial tissue. It reduces lipid peroxidation and oxidative damage during myocardial ischemia. These actions help preserve myocardial cell structure and improve post-ischemic cardiac function. Atherosclerosis: Improves lipid metabolism by reducing total cholesterol, LDL, and triglycerides, thereby lowering Atherogenic risk. Its antioxidant constituents prevent LDL oxidation and vascular oxidative stress, which are key steps in plaque formation.	Clinical	[35]
23	<i>Bacopa monnieri</i> Brahmi	Plantaginaceae	Triterpenoid Saponins – Bacosides A, B Flavonoids – Luteolin, Apigenin Betulinic acid, D-Mannitol	Whole plant	Lowers blood pressure by enhancing endothelial nitric oxide (NO) release, causing vasodilation. Its Bacosides reduce oxidative stress in vascular endothelium and improves vessel functions. Myocardial Ischemia: Protects the myocardium by scavenging free radicals and inhibiting lipid peroxidation during ischemic injury. It preserves endogenous antioxidant enzymes and stabilizes cardiomyocyte membranes.	<i>In vivo</i>	[37]
24	<i>Centella asiatica</i> Gotu kola	Apiaceae	Triterpenoid Saponins – Asiaticoside, Madecassoside Alkaloids – Hydrocotyline Phenols – Chlorogenic acid, Caffeic acid	Leaves	Improves venous tone by stimulating synthesis of collagen and strengthening venous connective tissue. Its triterpenoids (Asiaticoside, Madecassoside) reduce capillary permeability and edema, improving microcirculation. Endothelial Dysfunction: Protects blood vessels by enhancing endothelial nitric oxide availability, leading to improved vasodilation.	<i>In vivo</i>	[39]
25	<i>Vitis vinifera</i> Grape	Vitaceae	Polyphenols- Resveratrol, Catechin, Epicatechin Tannins- Proanthocyanidins Triterpenoid Saponins	Seeds	Polyphenols like (Resveratrol, Proanthocyanidins) inhibit LDL oxidation, a key step in atherosclerotic plaque formation. They reduce vascular inflammation by modulating inflammatory signaling pathways. Hypertension: Polyphenols enhance endothelial nitric oxide (NO) production, leading to vasodilation. They reduce oxidative stress-mediated endothelial damage, improving vascular system.	Clinical	[41]
26	<i>Piper nigrum</i> Black pepper	Piperaceae	Alkaloids-Piperine, Piperidine	Fruits	Thrombosis: Inhibits platelet aggregation and synthesis of	<i>In vitro</i>	[43]

			Steroidal Saponins Volatile oils		Thromboxane. It reduces platelet activation and clot formation, improving blood flow. This antithrombotic effect lowers the risk of myocardial infarction and stroke. Atherosclerosis: The major alkaloid of <i>Piper nigrum</i> , inhibits LDL oxidation and lipid peroxidation, key steps in atherogenesis. It reduces vascular oxidative stress and inflammatory cytokines.	[44]
27	<i>Ocimum sanctum</i> Tulsi	Lamiaceae	Flavonoids – Orientin, Eugenol, Ursolic acid	Leaves	Myocardial Ischemia: Protects the myocardium by scavenging free radicals and reducing lipid peroxidation during ischemic injury. It enhances endogenous antioxidant enzymes and stabilizes cardiac cell membranes. These effects reduce myocardial damage. Thrombosis: Eugenol present in the leaves interferes with platelet activation pathways, improving blood flow. This antithrombotic action lowers the risk of myocardial infarction and stroke.	<i>In vivo</i> [45]
28	<i>Citrus limon</i> Lemon	Rutaceae	Flavonoids- Hesperidin, Naringin, Quercetin Vitamin C Essential oils – Limonene Phenols – Ferulic acid Chlorogenic acid Caffeic acid	Fruit peel	Hypertension: Enhances endothelial nitric oxide (NO) production, leading to vasodilation and reduced peripheral resistance. They reduce oxidative stress in vascular endothelium, improving arterial elasticity. This helps in lowering of blood pressure. Atherosclerosis: Flavonoids from lemon inhibit LDL oxidation and lipid peroxidation, key steps in atherosclerotic plaque formation. They suppress vascular inflammation and foam cell formation, protecting arterial walls. Vitamin C further supports antioxidant defense and integration of endothelium.	<i>In vitro</i> [47]
29	<i>Coriandrum sativum</i> Coriander	Apiaceae	Essential oils- Linalool, Geraniol, Flavonoids – Apigenin, Quercetin, Rutin Coumarins – Umbelliferone, Scopoletin	Seeds Leaves	Hyperlipidemia: Seed extract reduces total cholesterol, LDL, and triglycerides while increasing HDL levels. Its antioxidant constituents inhibit lipid peroxidation and LDL oxidation, reducing the plaque formation. Hypertension: Lowers blood pressure by blocking calcium channels in vascular smooth muscle, leading to vasodilation. It reduces peripheral vascular resistance and improves arterial relaxation. The mild diuretic effect also contributes to blood pressure reduction.	<i>In vivo</i> [49]
30	<i>Cinnamomum zeylanicum</i> Cinnamon	Lauracea	Volatile oils- Cinnamaldehyde, Eugenol Phenolic comp – Cinnamic acid Coumarin Monoterpenes Sequesterpenes	Bark	Dyslipidemia: Polyphenols reduce total cholesterol, LDL, and triglycerides while increasing HDL levels. They inhibit lipid peroxidation and LDL oxidation, preventing foam cell formation. These effects slow atherosclerotic plaque development and protect arterial walls. Hypertension: The extract causes vasodilation by blocking calcium influx into vascular smooth muscle cells. Cinnamaldehyde relaxes blood vessels, thereby reducing peripheral vascular resistance. This leads to a sustained reduction in systolic and diastolic blood pressure.	Clinical [51]
31	<i>Trigonella foenum-graecum</i> Fenugreek	Fabaceae	Saponins – Diosgenin Flavonoids – Vitexin, Isovitexin Alkaloids – Trigonelline, Choline	Seeds	Myocardial Ischemia: The extract protects the heart by enhancing antioxidant defense enzymes such as (SOD, catalase, glutathione) during ischemic stress. It reduces lipid peroxidation and myocardial cell damage, preserving cardiac membrane integrity. This leads to improved cardiac function after ischemia. Thrombosis: It inhibits platelet aggregation and thromboxane synthesis, reducing abnormal clot formation. Its saponins and flavonoids interfere with platelet activation pathways,	Clinical [53]
						[54]

					conduction and action potential stability, lowering arrhythmogenic risk. This protects the heart from stress or toxin-induced rhythm disturbances.		
39	Phyllanthus emblica Indian Gooseberry	Phyllanthaceae	Vitamin C, Ellagic acid	Fruit	Thrombosis: They decrease oxidative platelet activation and vascular inflammation, improving blood flow. This antithrombotic effect lowers the risk of myocardial infarction and stroke. Atherosclerosis: Inhibits LDL oxidation through its potent antioxidant tannins and vitamin C. It reduces vascular inflammation and foam cell formation, protecting endothelial integrity. These actions slow atherosclerotic plaque progression and improve arterial health. Myocardial Ischemia: Amla provides cardio protection by scavenging free radicals and reducing lipid peroxidation during ischemic stress. It preserves endogenous antioxidant enzymes and stabilizes cardio myocyte membranes.	Clinical	[68] [69]
40	Mentha piperita Peppermint	Lamiaceae	Menthol, Menthone	Leaves	Hypertension: Provides vasodilation by blocking calcium channels in vascular smooth muscle. Menthol relaxes blood vessels and reduces peripheral vascular resistance. These effects contribute to a reduction in blood pressure. Myocardial Ischemia: Peppermint extract protects the myocardium by scavenging free radicals and reducing lipid peroxidation during ischemic stress. It enhances endogenous antioxidant enzymes and stabilizes cardio myocyte membranes. These actions reduce myocardial damage and improve cardiac function.	<i>In vitro</i>	[70] [71] [72]
41	Santalum album Sandalwood	Santalaceae	Santalol, Sesquiterpenes	Stem	Cardiac Arrhythmias: Sandalwood oil exerts a central sedative and anxiolytic effect, reducing sympathetic over activity that triggers arrhythmias. α - and β -santalol help stabilize autonomic control of the heart, improving heart rate variability. This reduces stress-induced electrical instability. Thrombosis: Sandalwood constituents show anti-inflammatory and antioxidant activity, reducing platelet activation triggered by oxidative stress. They suppress pro-thrombotic mediators, improving blood fluidity. This lowers the risk of thrombus formation	<i>In vitro</i>	[73] [74]
42	Tamarindus indica Tamarind	Fabaceae	Tartaric acid, Polyphenols	Fruit pulp	Atherosclerosis: Tamarind constituents regulate lipid metabolism and lower circulating LDL and total cholesterol. They inhibit oxidative damage to lipoproteins and vascular lipids. This reduces plaque initiation and progression in arterial walls. Hypertension: Tamarind enhances endothelium-dependent relaxation of blood vessels. Its antioxidants decrease vascular oxidative stress and stiffness. These actions lower systemic vascular resistance and blood pressure.	<i>In vivo</i>	[75] [76]
43	Curcuma aromatica Wild Turmeric	Zingiberaceae	Curcuminoids, Essential oils	Rhizome	Myocardial Ischemia Curcuminoids neutralize ischemia-induced free radicals in cardiac tissue. They suppress inflammatory mediators and membrane lipid damage. This protects cardio myocytes and limits ischemic injury. Atherosclerosis Curcuminoids prevent oxidative modification of LDL cholesterol. They downregulate vascular inflammatory pathways. This slows atheroma formation and preserves endothelial function.	<i>In vitro</i>	[77] [78]
44	Ananas comosus	Bromeliaceae	Bromelain, Vitamin		Thrombosis:		

Data summarized from published studies, with varying levels of evidence (*in vitro*, *in vivo*, clinical). The studies are mostly *in vitro* and animal models, and in clinical practice, only a few plants including *Terminalia arjuna*, *Allium sativum* and *Hibiscus sabdariffa* have been investigated.

Conclusion

Herbal medicines have the potential to prevent and treat CVDs because they contain phytoconstituents with lipid-lowering, antioxidant, anti-inflammatory and vasoprotective properties. These effects may prevent the development of hypertension, atherosclerosis, myocardial infarction, and heart failure. Herbal remedies are generally better tolerated and less toxic than conventional medications. But they can be dangerous, such as *Nerium oleander*, which can produce severe arrhythmias and heart problems. While there is promising pharmacological evidence, most studies are *in vitro* and animal models, and few are in humans. Hence, proper clinical studies, formulation standardization and safety testing are crucial. Herbal medicines may be used in combination with conventional therapies. In conclusion, herbal medicines have promising properties but need to be scientifically tested to guarantee safe and effective use in cardiovascular disease.

AI Use Statement

The author used ChatGPT for proofreading and enhancing clarity. The author edited the content and is responsible for the manuscript.

Authors Contributions

Data collection by Ch. Maneesh. Analysis, Conceptualization, Writing the original draft, Review and editing by Pasumarthy Sree Mahalakshmi.

Conflict of Interests

Declared none

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