

ROLE OF CERTAIN MEDICINAL PLANTS ON CARDIOVASCULAR DISORDERS

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Abstract

Herbs have been used as medical treatments since the beginning of civilization and some derivatives (e.g., aspirin, reserpine, and digitalis) have become mainstays of human pharmacotherapy. For cardiovascular diseases, herbal treatments have been used in patients with congestive heart failure, systolic hypertension, angina pectoris, venous insufficiency, and arrhythmia. WHO reports indicate that around eighty percent of the global population still relies on botanical drugs and several herbal medicines have advanced to clinical use in modern times.

The selection of plants in the present study is primarily based on their chemistry and pharmacological properties including toxicology reported in various research articles and reviews. Some very interesting findings have been observed and thus recorded and reported. Rasona(Garlic),Arjuna and Gokshura are very effective drugs from clinical point of view.

Introduction

The cardiovascular system enables delivery of nutrients, oxygen, and prana to body systems, and directly impacts on the quality of the bodily tissues, organs, and mental state. ^[1]

Cardiovascular disease is a class of diseases that involve the heart or blood vessels (arteries, capillaries and veins).^[2] Cardiovascular disease refers to any disease that affects the cardiovascular system, principally cardiac disease, vascular diseases of the brain and kidney and peripheral arterial disease.^[3] Cardiovascular disease (CVD) is the number one cause of death worldwide. CVD covers a wide array of disorders, including diseases of the cardiac muscle and of the vascular system supplying the heart, brain, and other vital organs.^[4] The source for the health statistics is the association's 2015 Heart Disease and Stroke Statistics Update, which is compiled annually by the American Heart Association, the Centers for Disease Control and Prevention, the National Institutes of Health and other government sources. Cardiovascular disease is the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to more than 23.6 million by 2030. ^[5] Indians are known to be at major risk from heart diseases.

The causes of cardiovascular disease are diverse but atherosclerosis and/or hypertension are the most common. Besides, with aging come a number of physiological and morphological changes that alters cardiovascular function

and lead to subsequently increased risk of cardiovascular disease, even in healthy asymptomatic individuals.^[3] There is therefore increased emphasis on preventing atherosclerosis by modifying risk factors, such as healthy eating, exercise, and avoidance of smoking.^[6]

Lifestyle modifications have been shown to have a significantly beneficial impact on reducing the incidence and severity of cardiovascular events. Studies have shown a consistent inverse association between physical activity/fitness, and the incidence of heart disease and general risk factors. It has also been determined that regular, moderately intense activity, such as brisk walking for 30-60 minutes daily, is sufficient to reduce cardiovascular risk factors. However, Ayurveda offers many different herbal medicines which can play a role in treating and preventing different aspects of cardiovascular disease. A summary of these is given in the table below.^[1]

Table No: 1 Ayurvedic Herbs Used In Cardiovascular Disease

Conditions	Name of the Plants
Herbs Which Decrease Blood Pressure	Rauwolfia serpentina (Sarpagandha), Fumaria indica (Parpata), Daucus carota (Carrot seeds), Cassia absus (Chaksu), Acorus calamus (Vacha).
Herbs Which Are Diuretic	Tribulus terrestris (Gokshura, Small Caltrops), Boerhaavia diffusa (Punarnava, Spreading hogweed), Phyllanthus niruri (Bhumi amalaki), Tinospora cordifolia (Guduchi), Taraxacum officinale (Dugdha, Dandelion)
Herbs Which Reduce Serum Cholesterol	Commiphora mukul (Guggulu)
Herbs Which Act As Cardiac Tonics	Terminalia cordifolia (Arjuna), Saussurea lappa (Kushtha), Sida cordifolia (Bala), Digitalis purpurea (Hatapatri, Foxglove)
Herbs Which Decrease Platelet Aggregation	Allium sativum (Rasona, Garlic)
Herbs Which Possess Anti-Stress/ General Tonic Properties	Withania somnifera (Ashwagandha), Bacopa monniera (Brahmi), Evolvulus alsinoides (Shankhpushpi)

In the present context effect of certain medicinal plants on cardiovascular disorders are placed for discussion

1. Rasona⁷

- Latin Name** - Allium sativum
Family - Lilliaceae
Karama(action) - Raktotkleshaka, sothahara, vedanasthapana, hridayottejaka, kaphanissaraka and rasayana.
Pharmacological properties - Hypotensive, hypocholesteremic, hypolipidaemic, anti-coagulant, fibrinolytic, hepatoprotective, antioxidant, cardio-protective, and cardiovascular depressant.
Therapeutic evaluation -Garlic has an active role in systolic and diastolic arterial tension in hypertensive and atherosclerotic patient. It also decreases the blood cholesterol level.



Rasona or Garlic has been widely recognized as agents for prevention and treatment of cardiovascular and other metabolic diseases, atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes. Effectiveness of garlic in cardiovascular diseases was more encouraging in experimental studies as well as several clinical trials. Now medical fraternity is concentrating to validate its above mentioned properties on cardiovascular system. The beneficial effects of garlic on cardiovascular diseases are as follows:-

- Reduction in atherosclerosis
- Anti hyperlipidemic effect
- Inhibition of platelet aggregation
- Blood pressure lowering effect
- Significant Antiarrhythmic effect (both ventricular and supraventricular)
- Prevents oxidative stress and associated ultra structural changes induced by myocardial ischemic reperfusion injury.

Alliin (allyl 2-propenethiosulfinate or diallyl thiosulfinate) is the principal bioactive compound present in garlic responsible for the beneficial effect on cardiovascular system. When garlic is chopped or crushed, allinase enzyme present in garlic, is activated and acts on alliin (present in intact garlic) to produce Allicin. The enzyme allinase responsible for converting alliin to allicin is inactivated by heat. So garlic in raw form (crushed or chopped) is effective in imparting the therapeutic benefits on cardiovascular system.^[8]

Consumption of large quantities of fresh garlic (0.25 to 1.0 g/kg or about 5-20 average sized 4-g cloves in a person weighing 78.7 kg) has been shown to produce the beneficial effects mentioned earlier. In support of this, a recent double-blind cross-over study was conducted on moderately hypercholesterolemic men that compared the effects of 7.2 g of aged garlic extract with placebo on blood lipid levels. This study found that there was a maximal reduction of 6.1% in total serum cholesterol levels and 4.6% in LDL cholesterol levels with garlic compared with placebo.

However, despite positive evidence from numerous trials, some investigators have been hesitant to outright endorse the routine use of garlic for cardiovascular disease because many of the published studies had methodological shortcomings perhaps because constituent trials were small, lacking statistical power. Also, inappropriate methods of randomization, lack of dietary run-in period, short duration, or failure to undertake intention-to-treat analysis may explain the cautious acceptance of previous meta-analysis.

Consumption in excess of 5 cloves daily may result in heartburn, flatulence, and other gastrointestinal disturbances. Some people have reported allergic reactions to garlic, most commonly allergic contact dermatitis. Patch testing with 1% diallyl disulfide is recommended when garlic allergy is suspected. Because of its antithrombotic activity, garlic should be used with caution in people taking oral anticoagulants concomitantly.^[9]

2-Gokshura¹⁰

- Latin Name** -Tribulis terrestris
Family -Zygophyllaceae
Karma (action) - Hridya, sothahara, vrisya, mootral, kaphanissaraka.
Pharmacological activity - Hypotensive, cardio tonics, diuretic, hepatoprotective and muscle relaxant.
Therapeutic evaluation -Saponin of Tribulis terrestris has an action of dilating coronary artery and improving coronary circulation.



A study on *Tribulus terrestris* rats found that it improves Cardiac Function and attenuates myocardial Infarction in Rats. The possible underlying mechanism of the cardio protective effect of *T. terrestris* could be due to restoration of endogenous myocardial antioxidant status or free radical scavenging activity along with correction of the altered hemodynamic parameters and preservation of histoarchitectural and ultra structural alterations¹¹

T. terrestris possesses antihypertensive activity. The biological properties of Tribulus extracts include diuretic properties, increased release of nitric oxide from endothelium and nerve endings; it relaxes smooth muscles and increases angiotensin converting enzyme (ACE) inhibition. Hence reduces the hypertension.¹²

3-Arjuna¹³

- Latin Name** - Terminalia arjuna
Family - Combretaceae
Karma (action) - Raktastambhana, hridayottejaka, raktaprasadan, hridaya, sothahara, medohara.
Pharmacological properties- Cardio protective, spasmogenic, hepatoprotective and anti-angina.
Therapeutic evaluation -Decoction of bark powder was found more useful in hypertensive heart diseases as compared to congestive heart disease .Alcoholic decoction of bark was found to be beneficial in stable cases of ischemic heart disease.



Arjuna bark decoction is being used in the Indian subcontinent for anginal pain, hypertension, congestive heart failure, and dyslipidemia, based on the observations of ancient physicians for centuries. Most of the studies, both experimental and clinical, have suggested that the crude drug possesses anti-ischemic, antioxidant, hypolipidemic, and antiatherogenic activities.¹⁴

Many important biologically active chemical compounds have been isolated from *T. arjuna*. These include triterpenoids (arjunolic acid, AA, AG, arjunoglucoside), tannins (ellagic acid, gallic acid), flavonoids (leucocyanidin, luteolin) and minerals (magnesium, calcium, zinc and copper).

It has been extensively studied in animal models to demonstrate cardioprotective properties, ranging from positive inotropic, hypolipidemic, coronary vasodilatory and antioxidant effects to induction of stress protein in heart. A number of clinical studies have also reported its beneficial effects in patients of chronic stable angina, endothelial dysfunction, heart failure and even ischemic mitral regurgitation. Various extracts (water, hydroalcohol and alcohol) of the stem bark of *T. arjuna* and active compounds present in these extracts have been investigated in many experimental studies and has been reported to exhibit blood pressure (BP)-lowering effects, direct cardio protective effects in terms of induction of myocardial heat shock protein, antioxidant activities, antiplatelet effects, hypolipidemic and antiatherogenic effects.¹⁵

Its stem bark possesses glycosides, large quantities of flavonoids, tannins and minerals. Flavonoids have been detected to exert antioxidant, anti-inflammatory and lipid lowering effects while glycosides are cardiogenic, thus making *Terminalia arjuna* unique amongst currently used medicinal plants.¹⁶

In some experiment results shows the benefits of *Terminalia arjuna* in the treatment of coronary artery diseases, heart failure, and hypercholesterolemia. Reported work obtained from on *Terminalia arjuna* shows that its cardioprotective activity was due to its free radical scavenging activity. *Terminalia arjuna* was observed to be the most potent hypolipidemic, hypotriglycemic agent and also raised high density lipo-cholesterol. Experimental study conclude that the *Terminalia arjuna* have cardioprotective effect against the damage caused by caffeine administration.¹⁷

Conclusion

With the emergence of increasing number of heart disease in all age groups, it is the time to explore different herbs and its preparations so that it can be incorporated in our dinacharya (daily life) to reduce the morbidity and mortality due to heart diseases. Here single herb medicines are grouped based on their properties with special emphasis on Rasona, Arjuna and Gokshura which are used commonly. Rasona has Anti hyperlipidemic property, It inhibits platelet aggregation, lowers blood pressure and has significant Antiarrhythmic effect. Gokshura has diuretic property and increases release of nitric oxide from endothelium and nerve endings so that it relaxes smooth muscles and increases angiotensin converting enzyme (ACE) inhibition. Hence it is used in hypertension. Arjuna has anti-ischemic, antioxidant, lipid lowering, and antiatherogenic properties. There are many other herbs with has diuretic, lipid lowering, anti-platelet aggregation and blood pressure lowering properties. Some of them may be used as cardio tonics which has got a great scope of research.

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