

## A Review on Herbal Remedies for Treatment of Hypertension

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**ABSTRACT:** Hypertension is a common problem facing many peoples today. Although billions of dollars are spent annually for the treatment and detection of cardiovascular disease, current conventional treatments have done little to reduce the number of patients with hypertension . Alternative medicine offers an effective way to decrease the rising number of people with high blood pressure. Research has found a variety of alternative therapies to be successful in reducing high blood pressure including diet, exercise, stress, management, supplements and herbs. Every year, more and more studies are being performed on herbal remedies for high blood pressure. There are many herbal drugs like Punarnava, Barberry, Rauwolfia, Garlic, Ginger, Ginseng and Arjuna which can safely use for the treatment of hypertension. This review highlight the herbs proved scientifically for the treatment of hypertension. Hypertension is a major risk factor for corohary heart diseas , stroke and premature death and leading risk factor for global disease burder

**KEYWORDS:** Antihypertensive activity, herbal rededies

### INTRODUCTION:

Natural products from plants, animals and minerals have been the basis of the treatment of human disease. Today estimate that about 80 % of people in developing countries still relays on traditional medicine based largely on species of plants and animals for their primary health care. Herbal medicines are currently in demand and their popularity is increasing day by day. About 500 plants with medicinal use are mentioned in ancient literature and around 800 plants have been used in indigenous systems of medicine. India is a vast repository of medicinal plants that are used in traditional medical treatments[1] . There has been an increase in demand for the Phytopharmaceutical products of Ayurveda in Western countries, because of the fact that the allopathic drugs have more side effects. Many pharmaceutical companies are now concentrating

on manufacturing of herbal and Phytopharmaceutical products [2]. In India, around 20,000 medicinal plants have been recorded. Chemical principles from natural sources have become much simpler and have contributed significantly to the development of new drugs from medicinal plants[3-4] . There are many herbal drugs which are used for the treatment of hypertension

### A] Chemical Classification of Antihypertensive Herbs:

- Alkaloids- Rauwolfia, Papaver, Avis tolochladebis, Loptis, jayonica, Withenia, Golden seal, Bhringaraj
- Terpenoids- Jatamansi, Inula helenium, Arnica montana, Coleus, Jalbrahmi, Black cohosh forskohlii, Sania syriaca
- Steroid- Veratrum, Holarrhena pubescens, satavari, bhringraj, Clerodendron trichotomum
- Flavanoids -Devis scandens, Mitragyna ciliate, Yaroow, Olive leaf, Hawthorn, Arjuna, Ginkgo, Vitis vinifera, Alpinia
- Volatile Oil - Black cumin seed, Ginger
- Sterols - Cat's claw
- Tannin- African mistletoe, Arjuna

### B] Pharmacological Classification of Antihypertensive Herbs:

- Centrally Acting- Withania (CNS acting); Rauwolfia (catcholamine depeleters); Hypericum (dopamine and norepinephrine reuptake inhibitors); Black cumin seed (CNSacting and antioxidant)
- Diuretic –Punarnava
- Ace Inhibitors- Garlic (by allicin)
- Cholesterol Synthesis Inhibitors- Cat's claw, African mistletoe

### C] Specific Botanicals for treatment of Hypertension:

- 1) **Hawthorne (*Crataegus oxycantha* and *Crataegus monogyna*):** Hawthorne has been used traditionally for cardiovascular disorders in many cultures. It contains a number of active constituents including flavonoids, catechins, triterpene saponins, amines, and oligomeric proanthocyanidins (OPCs). Hawthorne has been shown to exert a mild blood pressure lowering effect that can take up to four weeks for maximal results[5]. It is believed that the herb dilates coronary blood vessels. One in vitro study on rat aorta found proanthocyanidins extracted from hawthorn relaxed vascular tone via endothelium-dependent nitric oxide-mediated relaxation[6].
- 2) **Olive Leaf (*Olea africana* and *Olea europea*):** Olive leaf extract is derived from the leaves of the olive tree. The entire leaf extract contains several phytochemicals, including 20-percent oleuropein, complex structure of flavonoids, esters, and multiple.  
One in vitro study on rat aorta found proanthocyanidins extracted from hawthorn relaxed vascular tone via endothelium-dependent nitric oxide-mediated relaxation. Iridoid glycosides, which acts as a vasodilator, lowering blood pressure and preventing angina attacks. Oleuropein is also being recognized as a potent antioxidant[7-8]. The hypotensive action of olive leaf has been studied for two decades. A clinical study of *Olea europaea* aqueous extract was conducted on two groups of hypertensive patients, 12 patients consulting for the first time, and 18 patients on conventional antihypertensive treatment. An aqueous extract was given for three months, after 15 days of placebo supplementation. Researchers noted a statistically significant decrease of blood pressure ( $p < 0.001$ ) for all patients, without side effects[9].
- 3) **European Mistletoe (*Viscum album*):** The use of mistletoe in medicine has become popular, not only because of its hypotensive activity, but also because of its anti-cancer properties. Mistletoe is known to possess hypotensive, cardiotoxic, vasodilatory, antispasmodic, tumor-inhibiting, and thymus stimulating activity. Its pharmacological effects, including diuretic and hypotensive activity[10], were studied using an alcohol extract of Japanese and European mistletoe. Both extracts showed blood pressure lowering effects when administered intravenously and orally to cats. Other researchers have reported similar hypotensive effects of mistletoe in experimental animal studies[11].
- 4) **Yarrow (*Achillea wilhelmsii*):** *Achillea wilhelmsii* (Asteraceae) has flavonoids and sesquiterpene lactone constituents, which have been found effective in lowering blood pressure and lipids. A double-blind, placebo-controlled trial examined the antihyperlipidemic and antihypertensive effects of *Achillea*. The researchers randomly selected 120 men and women, aged 40-60 years, and divided them into two groups: (1) moderate hyperlipidemic and (2) hypertensive subjects. Each study group was treated either with an alcohol extract of *Achillea* or placebo at a dose of 15-20 drops twice daily for six months[12].
- 5) **Forskolin (*Coleus forskohlii*):** *Coleus forskohlii* has been used in Ayurvedic medicine for many years. In 1974 the Indian Central Drug Research Institute discovered that forskolin, a component of this plant, has hypotensive and antispasmodic action. Forskolin's blood pressure lowering effects appear to be due to relaxation of arterial vascular smooth muscle. In a study with isolated heart tissue, forskolin activated membrane-bound adenylate cyclase and cytoplasmic cAMP-dependent protein kinase. The researchers postulated the positive inotropic effect was via an enhanced calcium uptake by the heart muscle cell. Another constituent from *Coleus*, diterpene coleonol, has been found to lower blood pressure in both rat and cat models[13].
- 6) **Indian Snakeroot (*Rauwolfia serpentina*):** *Rauwolfia* is cultivated for the medicinal use of its 30 alkaloids (particularly reserpine found in the root), many used in treating hypertension[14]. Besides reserpine, other alkaloids used in hypertension and other cardiac disorders are ajmaline, rescinnamine, serpentinine, sarpagine, deserpidine, and chandrine. *Rauwolfia* alkaloids work by controlling nerve impulses along certain pathways that affect heart and blood vessels, lowering blood pressure. *Rauwolfia* depletes catecholamines and serotonin from nerves in the central nervous system. In a controlled intervention trial, 389 subjects, ages 21-55 years, with diastolic blood pressures 90-115

mm Hg were examined for 7-10 years. Subjects were randomly assigned to either a combination of a diuretic and Rauwolfia serpentina, or an identical placebo. Diastolic blood pressure was reduced an average of 10 mm Hg and systolic by 16 mm Hg in the active treatment group, with no change in the placebo group [15].

7) **Ginseng (Panax Ginseng):** A very popular plant root grown originally in China and today also in Japan, Korea and North America. Ginseng is commonly used as an adaptogenic agent for fatigue insomnia, anxiety, depression and immune

It is also used for increasing resistance to environmental stress and as a general enhancer of well-being[16]. This herb is also used for improving physical and athletic performance, improving cognitive function, concentration and memory.

8) **Ginkgo (Ginkgo Biloba):** The fruit and leaves of the Ginkgo tree are commonly used orally for dementia, including Alzheimer's, vascular, and mixed dementia. Ginkgo leaf is also used for conditions associated with cerebral vascular insufficiency, especially in the elderly, including memory loss, headache, tinnitus, vertigo, dizziness, concentrating difficulty[17] mood disturbances and hearing disorders. It is also used orally for ischemic stroke. Ginkgo is also used for cognitive disorders secondary to depression and to improve cognitive behavior and sleep patterns

in patients with depression and chronic fatigue syndrome (CFS). eye problems, including muscular degeneration and glaucoma; attention deficit-hyperactivity disorder (ADHD)[18]; thrombosis; heart disease; arteriosclerosis and angina pectoris. The major active ingredients in the herb are flavonoids and glycosides. Ginkgo is marketed either as a single herb compound or in combination with other herbs[19]. The single herb compound is available in tablets. The vascular effect of Ginkgo extract is very well established. Considerable clinical as well as experimental evidence suggest that extracts from Ginkgo leaves induce vasodilation and improve vascular blood flow, particularly in the regions of the deep seated medium and small arteries[20]. Overall, ginkgo leaf acts to increase cerebral and peripheral blood flow microcirculation, and reduce vascular permeability[21-22]. Ginkgo also has a moderate blood pressure lowering effect. Evidence suggests that ginkgo leaf extract seems to increase pancreatic beta-cell function in response to glucose loading and modestly reduce blood pressure[23]. There is conflicting evidence about whether ginkgo induces or inhibits CYP3A4[24]. Ginkgo does not appear to affect hepatic CYP3A4 [25]. significantly affect levels of donepezil, a CYP3A4 substrate. Although the evidence regarding the effect of Ginkgo on cytochrome P450 is not conclusive.

TABLE 1: LIST OF PLANT USED AS ANTIHYPERTENSIVE AGENTS

COMMON NAME	BOTANICAL NAME	FAMILY	PART USED	CHEMICAL CONSTITUENT	OTHER USES
Snakeroot	<i>Rauwolfia serpentina</i>	Apocynaceae	root	ajmaline, rescinnamine, serpentinine, sarpagine, deserpidine, and chandrine	Also has been used for anxiety and psychosis, Cushing's Disease, dyskinesia
Garlic	<i>Allium sativum</i>	Liliaceae	Bulbils	sulfur containing compounds <b>alliin, ajoene, diallylsulfide, dithiin, S-allylcysteine,</b>	Antibacterial, insecticidal, used in digestive disorder, causes lowering of cholesterol level
Ginseng	<i>Panax ginseng</i>	Araliaceae	root	ginsenoside	Adeptogen, pherodisiac, stimulant
St. John's wort	<i>Hypericum perforatum</i>	Hypericaceae	aerial parts	hypericin and hyperforin	Antidepressant, sedative, relaxing nerve, anti-inflammatory. Used in anxiety, stress, depression, menopausal nervousness, menstrual cramps, neuralgia and rheumatism
African mistletoe	<i>Lorentus ben-wensis</i>	Lorentheaceae	leaves	Tender shoots—contain 10% tannins	Bark—astrigent and narcotic.
Scotch broom	<i>Cytisus scoparius</i>	Papilionaceae	Seeds	quinolizidine alkaloids; main alkaloids are (-)-sparteine, lupanine, ammodendrine and various derivatives; biogenic amines, including tryramine, epinine, dopamine; isoflavone glycosides including genistein, scoparin; flavonoids; essential oil; caffeic acid and p-coumaric acids; tannins. Seeds contain lectins	Diuretic and cathartic. Emetic in large doses the herb is used chiefly in the form of sulphate in tachycardia and functional palpitation
Black cohosh	<i>Cimicifuga racemosa</i>	Renanulaceae	Root	triterpene glycosides- cycloartanes	Osteoporosis, gynecological disorders, kidney problems and in premenstrual tension.

Cat's claw	<i>Uncaria tomentosa</i>	Rubiaceae	Leaves	Rhynchophylline, hirsutine, and mitraphylline. Rhynchophylline . Three sterols — beta sitosterol (80%), stigmasterol, and campesterol—	Analgesic, Antibacterial, Anticancerous, Anticoagulant, Antidepressant, Antidiarrhetic, anti-inflammatory, antileukemic, antimutagenic
Lotus	<i>Nelumbo nucifera</i>	Nelumbaceae	Aerial parts	alkaloids including liensinine, isoliensinine, referine, lotusine, methylcorypalline, and demethylcoclaurine. Among them, referine has been shown to have a vasodilating effect and liensinine has antihypertensive and antiarrhythmic abilities.	Tranquilizer, cardiotoxic and in kidney and skin diseases.
Ginger	<i>Zingiber officinalis</i>	Zingiberaceae	rhizomes	Volatile oil ; 3 sesquiterpenes: - bisabolone, zingiberene and zingiberol	Flavour, as a condiment, aromatic, carminative
Ginkgo	<i>Ginkgo biloba</i>	Ginkgoaceae	Seed, leaf.	Phenolic acids; ginkgolide acid, hydroginkgolide acid, ginkgolides Flavonoids. Biflavonoids; sciadopitysin, ginkgetin, bilobetin .	Asthma, sputum and cough, leucorrhoea.
Golden seal	<i>Hydrastis canadensis</i>	Ranunculaceae	Rhizomes and roots	3 alkaloid hydrastine, berberine, canadine	As an astringent in inflammation of mucous membranes
Hawthorn	<i>Crataegus laevigata/ Crataegus oxycantha</i>	Rosaceae	Dried flowers, fruits, leaves	flavonoids, catechins, triterpene saponins, amines, and oligomeric proanthocyanidins (OPCs)	In angina pectoris , hypertension

COMMON NAME	BOTANICAL NAME	BOTANICAL FAMILY	PART USED	CHEMICAL CONSTITUENT	OTHER USES
Satawari	<i>Asparagus racemosus</i>	Asparagaceae.	tuberous dried root	saponins—shatavarins I—IV. Shatavarin IV is a glycoside sarsasapogenin. root yields (dihydroxy-hydroxyisobutyl) benzaldehyde undecanyl cetanoate, and contains a large amount of saccharine matter, mucilage and minerals	Used as a galactagogue for disorders of female genitalourinary tract; as a styptic and healing agent; as an intestinal disinfectant and astringent in diarrhoea; as a nervous tonic, and sexual debility of permatogenesis.
Alpinia	<i>Alpinia zerumbet</i>	Zingiberaceae	Whole plant	flavonoids [(+)-catechin; (-)- epicatechin; rutin; quercetin; kaempferol 3-O-rutinosideo; kaempferol 3-O-glucoronide; kaempferol] and kava pyrones (dihydro-5,6-dehydrokawain and 5,6-dehydrokawain)	diuretic and 3-O-antiulcerogenic
Ma Huang (Herba Ephedra)	<i>Ephedra sinica, Ephedra intermedia or Ephedra equisetina.</i>	Ephedraceae	Stem	Contain the phenylproamine alkaloids, l-ephedrine, d-ephedrine. E. sinica contains 55-78% ephedrine and pseudoephedrine.	In bronchospasm, asthma, and bronchitis and in allergic Rhinitis.

Chinese Angelica	Angelicae Gigantis	Apiaceae	Driedroot	Root contains about 0.2-0.4% of essential oil, ferulic acid, ligustic acid, angelicide, brefeldin A, butylphthalide, nicotinic acid, succinic acid and coumarin constituents.	Gynaecological disorders and infertility. In rheumatism, ulcers, and constipation; and in the prevention and treatment of allergic attacks.
Forskolin	Coleus forskohlii	Lamiaceae.	Root	ditermene coleonol,	Antispasmodic
Hibiscus	Hibiscus sabdariffa	Malvaceae	calyxes	Oxalic, malic, citric, tartaric and hibiscic acid	Aromatic and mild laxative action
Raisins	Vitis vinifera	vitaceae	Seed extract	Grape skin produces endothelium dependent aorta relaxation possibly by its flavonoids (quercetin)	Antioxidant, hypolipidemic, uterine relaxant
Olive leaf	Olea africana and Olea europea	Oleaceae	Leaf	Oleuropein, a complex of esters, and iridoid glycosides,	Sore throat, kidney problems and backache. Leaf infusions are used to treat eye infections or a gargle to relieve sore throat, internally as a remedy for colic or urinary tract infections; powdered leaf is used as styptic.
Yarrow	Achillea wilhelmsii	Asteraceae	Dried aerial parts with flower.	flavonoids sesquiterpene lactone	Antihyperlipidemic diaphoretic and antipyretic, intestinal colic, diuretic and urinary antiseptic for urinary retention or cystitis, vulnerary and topical anti-inflammatory

9) **Garlic (Allium Sativum):** The bulb of garlic is commonly used for a variety of ailments. Garlic is used for hypertension, hyperlipidemia, coronary heart disease, age-related vascular changes and atherosclerosis, earaches, chronic fatigue syndrome (CFS), and menstrual disorders. Garlic is regarded as a potent platelet aggregation inhibitor. Many of the pharmacological effects of garlic are attributed to the allicin, ajoene, and other organosulfur constituents such as S-allyl-L-cysteine. Fresh garlic contains approximately 1% alliin [26]. One milligram of alliin is converted to 0.458 mg allicin which is regarded as the major active compound in garlic. Further conversion yields ajoene. The amount of

allicin in garlic preparations is dependent upon the method of preparation. Taking low doses of garlic powder orally, 300 mg per day seems to slow the age-related aortic elasticity decrease. Higher doses of 900 mg per day seem to slow development of atherosclerosis in both aortic and femoral arteries when used over a four-year period [27].

10) **Ma Huang (Ephedra sinica/Ephedra intermedia):** The dried herbaceous stem of Ephedra sinica, Ephedra intermedia or Ephedra equisetina. Small doses of this herb are commonly used in Traditional Chinese medicine for the treatment of asthma. All three Ephedra [28] herbs contain the phenylproamine alkaloids [29]. l-ephedrine, d- pseudoephedrine.

*E. sinica* contains 55-78% ephedrine and 12-23% pseudoephedrine. However, this herb is available for purchase in a variety of exercise performance enhancing formulas as well as weight loss formulas imported for private non commercial use[30-31]. Ephedrine having a similar structure to epinephrine, is a well known sympathomimetic agent, acting on both  $\alpha$  and  $\beta$  -adrenergic receptors. By its  $\beta$ -adrenergic action, it relaxes bronchial muscles and produces the antiasthmatic action. It produces myocardial stimulation by its  $\alpha$ -agonist effect. Ephedrine also constricts blood vessels by its  $\alpha$ -agonistic effect[32], causing an increase in blood pressure and heart rate and increasing myocardial contractility and cardiac output[68]. Use of this herb has been associated with severe adverse reactions, such as myocardial infarcts and cerebral accidents. The ability of Ma Hunag to increase BP should be emphasized as this herb may possibly interfere with blood pressure lowering medications[33].

**11) Dang Gui / Dong Quai/ Chinese Angelica**

**(*Angelica sinensis*):** Dang Gui is the dried root of *Angelica sinensis*[34]. Dang Gui is also used to manage hypertension, rheumatism, ulcers, anemia, and constipation; and in the prevention and treatment of allergic attacks. The root of Dang Gui contains about 0.2- 0.4% of essential oil. The major active ingredients include ferulic acid, ligusticidin, angelicin, feruloyl ferulic acid, butylphthalide, nicotinic acid, and succinic acid. The herb also contains several coumarin constituents[35]. Dang Gui is usually marketed as a single herb compound administered as powder extract in capsules. This herb is used extensively by the general population due to its potent effects on gynecological related disorders[36]. Dang Gui has a number of known cardiovascular and hematological effects: the essential oil caused an increase in coronary blood flow and decreased myocardial oxygen consumption; it also has mild antiarrhythmic effect[37].

**12) Punarnava (*Boerhavia diffusa*):**

*Boerhavia diffusa*, commonly called hog weed, is known as 'erimmirii' (which literally means water-food). Punarnava is found throughout India and Brazil. It is a very important plant for urinary system. Throughout the tropics, it is used as a natural remedy for Guinea worms. The roots and leaves are considered to have an expectorant action, to be emetic and

diuretic in large doses and are used in the treatment of asthma[38]. The thick roots, softened by boiling are applied as a poultice to draw abscesses. Punarnava contains  $\beta$ -Sitosterol,  $\alpha$ - 2-sitosterol, palmitic acid, ester of  $\beta$ - sitosterol, tetracosanoic, hexacosanoic, stearic, arachidic acid, urosilic acid, Hentriacontane,  $\beta$ -Ecdysone, triacontanol[39], Punarnavoside (antifibrinolytic glycoside, 0.03-0.05%); Boeravinones, Lignans (liriodendrin, boeravine & hypoxanthine deriv.); Flavones, Sterols; Root contains Alanine, Arachidic acid, Aspartic acid, Behenic acid, Boerhavic acid, Boerhavone, Pot. nitrate (6.5%), Oxalic acid, Punarnavine 1 and 2 etc.

**CONCLUSION:**

Lifestyle changes, including diet, exercise, and stress management, may contribute significantly to lowering of blood pressure. Supplements such as potassium, magnesium, CoQ10, omega- 3 fatty acids, amino acids Arginine and taurine, and vitamins C and E have been effectively used in the treatment of cardiovascular disease, including hypertension. They have proven effective in lowering blood pressure and improving heart functions. Among the most researched and frequently utilized for hypertension are Hawthorne, Arjuna, Olive leaf, European mistletoe, Yarrow, Black cumin seeds, Forskolin, Indian snakeroot, and Garlic. More research is indicated to determine the full potential that alternative medicine has to offer in the management of hypertension. With the increasing numbers of patients suffering from hypertension and conventional medicine failing to effectively control the problem, alternative therapies offer hope.

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