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Review

Herbal Approaches to Hypertension Management: A Review of Phytotherapy

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	<p>Abstract</p>
<p>Published on: 12 Sep 2025</p>	<p>The effectiveness of several phyto-therapeutic approaches in treating hypertension, a major cause of cardiovascular disease and death globally, is investigated in this systematic review. Many cultures continue to rely heavily on traditional medicine, especially in developing nations where the prevalence of hypertension is rising. This essay addresses how phytochemicals, particularly polyphenols, flavonoids and carotenoids, which are present in plants like celery (<i>Apium graveolens</i>) and garlic (<i>Allium sativum</i>), might regulate blood pressure. In order to shed light on these natural compounds' antihypertensive qualities, the review summarizes evidence from experimental trials. It emphasizes how these compounds work by improving endothelial function and having antioxidant effects. Furthermore, the study describes the chemical components of many medicinal plants and their therapeutic uses, highlighting the possibility of creating natural antihypertensive drugs.</p>
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1.INTRODUCTION

Traditional medicine continues till the present day to form an integral part of human cultures in many remote and under developed parts of the globe where it is the conventional form of health care.⁽³⁾ Globally, cardiovascular disease is the major cause of mortality. One of the main heart conditions in underdeveloped nations is hypertension. The illness, which affects both sexes and is increasingly prevalent in younger individuals, is a serious public health concern. Hypertension is one of the most prevalent "non-communicable diseases" (NCDs) and a major cause of death globally. It is estimated that 24% of fatalities from coronary artery disease and 57% of deaths from stroke are caused by hypertension.⁽⁴⁾ Systolic blood pressure (SBP) >140 mmHg (millimeters of mercury) or diastolic blood pressure (DBP) >90 mmHg are the two measurements used to classify arterial hypertension. When a person's SBP falls between 120 and 139 mmHg or their DBP falls between 85 and 89 mmHg, they are categorized as having prehypertension, a condition that indicates a high chance of developing hypertension. Additionally, there is a variant of hypertension called "white-coat hypertension," which describes

the rise in blood pressure that is seen during medical consultations but stays normal outside of these settings in those not receiving antihypertensive medication. ⁽¹⁾ Consequently, all causes of cardiovascular mortality, such as sudden death, stroke, coronary heart disease, heart failure, atrial fibrillation, arterial disease, and kidney dysfunction, are decreased when hypertension patients' blood pressure is successfully controlled. In order to analyse the effects of the most popular phyto therapeutic interventions for the treatment of hypertension (A sativum, A graveolens, N sativa, P ginseng, and H sabdariffa) on blood pressure in prehypertensive and hypertensive adults, the goal of this systematic review was to collect and synthesize data from experimental trials that investigated these interventions.

Blood Pressure	Systolic (Upper#)	Diastolic (Lower#)
Normal	Under 120	Under 80
Prehypertension	120-139	80-89
Hypertension (Stage 1)	140-159	90-99
Hypertension (Stage 2)	Above 160	Above 100
Hypertensive Crisis	Above 180	Above 110

Fig 1: Stages of blood Pressure

2.ROLE OF PHYTOCHEMICALS IN HYPERTENSION ⁽⁴⁾

The scientific foundation required for the development and production of novel pharmaceuticals derived from natural sources is provided by the chemical characterization. Fruits, vegetables, medicinal plants, aromatic plants, leaves, petals, and roots all contain natural compounds known as phytochemicals. Based on their roles in plant metabolism, they are divided into two categories: primary metabolites, which include proteins, carbohydrates, and lipids, and secondary metabolites, which include steroids, polyphenols, alkaloids, and carotenoids. This review compiles the data demonstrating the impact of photochemistry on blood pressure. Overconsumption of fresh produce is likely associated with a lower risk of death from preventing hypertension.

2.1. Hypertension and Polyphenols

Natural plant substances called polyphenols can be found in plant foods such fruits, vegetables, dark chocolate, tea, spices, wine, and herbs. They increase your chance of developing diseases including diabetes, cancer, and cardiovascular disease by neutralizing the harmful free radicals that damage your cells. Secondary metabolites of aromatic plants that are extensively distributed in the herb kingdom are called polyphenols. Their aromatic benzene ring contains one or more hydroxyl substituents that come from the metabolism of phenylpropanoid or the Shikimate pathway. To date, more than 8,000 polyphenol structures have been identified. Polyphenol compounds include coumaric acid, gallic acid, chromogenic acid, and caffeic acid. acid, enterolactone, enterodiol, hesperetin, kaempferol, ishamhamnetin, quercetin, and naringenin. Polyphenols raise the bioavailability of endothelial nitric oxide and lower blood pressure because of their antioxidant properties and capacity to activate vascular endothelial nitric oxide synthase.

2.2. Hypertension and Flavonoids

Herbs and food plants are rich in flavonoids. Frequent flavonoid intake has slowed the onset or progression of numerous heart conditions, particularly high blood pressure. Flavones and isoflavones are components of flavonoids. Large amounts of them may be found in foods including soy, grains, legumes, fruits, and vegetables. These foods' color and flavor are greatly influenced by polyphenolic chemicals. In addition to their well-known hormonal effects, flavonols, flavones, and isoflavones are strong antioxidants and tyrosine kinase inhibitors.

2.3. Hypertension with Carotenoids

The family of pigmented chemicals is produced by microbes and carotenoid plants, but not by vertebrates. In plants, Carotenoids protect against photographic damage and support photosynthetic machinery. Fruits and vegetables are the primary sources of carotenoids in human diets. Fruits and vegetables contain trace levels of

carotenoids, which are responsible for their red, yellow, and orange colors.. They are thought to be in charge of fruits' and vegetables' advantageous ability to fend off illnesses like heart disease. Herbs and medicinal plants that grow naturally.

Table 1: Herbal drugs used for the treatment of hypertension

Botanical Name	Common Name	Family	Chemical constituents
<i>Agathosma betulina</i>	Buchu	Rutaceae	Flavonoids Mucilage Resins
<i>Alium sativum</i>	Garlic	Alliaceae	Allin Allicin Ajoenes Vinylthiols Flavonoids.
<i>Annona muricata</i>	Custard apple	Annonaceae	Murisolin Cis-annoreticuin Stigmasterol
<i>Apium graveolens</i>	Celery	Apiaceae	Flavonoids Hydroxycinnamic acids Tannins Ether Oil
<i>Avena sativa</i>	Green Oats	Poaceae /Gramineae	Ligans Anthocyanidins Avenanthramides Saponin
<i>Cassia absus</i>	Chaksu	Caesalpiniaceae	Antraquinone Proteins Sterols
<i>Coleus forskohlii</i>	Karpuravali	Lamiaceae	Forskolin Methylene Quinone Barbatusin Deoxycolenol
<i>Crataegus pinnatifida</i>	Chinese Hawthorn	Rosaceae	Monoterpenoids Sesquiterpenoids Triterpenoids
<i>Solanum sisymbriifolium</i>	Wild tomato/ Sticky Nightshade	Solanaceae	Glycosides Phenols Alkaloids

3.1. Naturally occurring medicinal plants, herbs having antihypertensive potential

3.1.1 *Agathosma betulina*

Common name: Buchu ⁽⁵⁾

Biological Source: Dried Leaves Obtained from the plants *Agathosma betulina*

Family: Rutaceae ⁽⁵⁾

Chemical Constituents:

- Flavonoids
- Mucilage
- Resins

Applications:⁽⁷⁾

- Antimicrobial Activity
- Anti-Inflammatory Activity



Fig 2: Dried Leaves of *Agathosma Betulina* ⁽¹⁷⁾

- Analgesic Activity
- Antioxidant Activity
- Anti-Diabetic Activity
- Anti-Obesity
- Anti- Hypertensive Activity

3.1.2. *Allium sativum*

Common Name: Garlic ⁽⁵⁾

Biological Source: The plant *Allium sativum*'s bulb

Family: Alliaceae or Liliaceae ⁽⁵⁾

Chemical Constituents:

- Alliin
- Allicin
- Ajoenes
- Vinyldithiins
- Flavonoids



Fig 3: Bulbs of *Allium Sativum* ⁽¹⁸⁾

Applications: ⁽¹⁰⁾

- Hepato-protective Activity
- Anti-Hypertensive Activity
- Cardioprotective Activity
- Anti-Diabetic Activity
- Anti-Microbial Activity

3.1.3. *Annona muricata*

Common Name: Custard apple ⁽⁵⁾

Biological Source: Different Parts of *Annona muricata* like fruits,leaves,seeds,roots.

Family: The Annonaceae ⁽⁵⁾

Chemical Constituents:

- Murisolin
- Anoreticuin-9-one
- Cis-annoreticuin
- Sabadelin
- β -sitosterol
- Stigmasterol
- Triglyceride

Applications :⁽⁹⁾

- Anti-Nociceptive Activity
- Anti-Hypertensive Activity
- Anti-Plasmodial Activity
- Anti-Parasitic Activity
- Anti-Arthritic Activity



Fig 4: Fruit of *Annona Muricata* ⁽¹⁹⁾

3.1.4. *Apium graveolens*

Common Name: Celery ⁽⁵⁾

Family: Apiaceae ⁽⁵⁾

Biological Source: Seed Extract of *Apium graveolens*

Chemical Constituents:

- Flavonoids
- Organic acids
- Hydroxycinnamic acids
- Ether oil terpenoids
- Tannins
- vitamins

Applications:

- Anti-inflammatory effects
- Anticancer properties
- Antidiabetic effect
- Antihypertensive properties



Fig 5: Leaves of *Apium Graveolens* ⁽²⁰⁾

- Anti-infertility effect
- Antibacterial effect
- Anti-fungal properties
- Anti-parasitic properties
- Anti-ulcer effect
- Anti-spasmolytic effect

3.1.5. *Avena sativa*

Common name: Green oats or dietary fiber ⁽⁵⁾

Biological Source: Seed of *Avena sativa*

Family: Poaceae/Gramineae ⁽⁵⁾

Chemical constituents:

- Lignans
- Saponin
- Anthocyanidins
- Avenanthramides

Applications:⁽¹²⁾

- Anti -thrombosis Activity
- Anti- Inflammatory Activity
- Anti-Hypertensive Activity
- Pro-apoptotic Activity



Fig 6: *Avena Sativa* ⁽²¹⁾

3.1.6. *Cassia absus*

Common Name: Chaksu ⁽⁵⁾

Biological Source: Seeds Extract of the plant *Cassia absus*

Family: The Caesalpiniaceae ⁽⁵⁾

Chemical constituents:

- Anthraquinone glycosides
- Flavonoids
- Tannins
- Sterols
- Proteins and gums.

Applications:⁽¹³⁾

- Anti-diabetic activity
- Antitrypsin activity
- Antihyperglycemic Activity
- Anti-bacterial activity



Fig 7: Seed Extracts of *Cassia Absus* ⁽²²⁾

3.1.7. *Coleus forskohlii*

Common name: Woolly plectranthus. ⁽⁵⁾

Biological Source: Seeds of the plant *Coleus forskohlii*

Family: Lamiaceae ⁽⁵⁾

Chemical Constituents:

- Forskolin
- Methylene Quinone
- Barbatusin
- Colenal B & C
- Deoxycolenol

Applications :⁽¹⁴⁾

- Antidepressant Activity
- Antiproliferative Activity
- Antimycotic Activity
- Antihypertensive Activity



Fig 8: Seeds Of *Coleus Forskohlii* ⁽²³⁾

3.1.8. *Crataegus pinnatifida*

Common name: Chinese Hawthorn ⁽⁵⁾

Biological Source: Dried fruit of the plant *Crataegus pinnatifida*

Family: Rosaceae ⁽⁵⁾

Chemical Constituents:

- Flavonoids
- Triterpenoids
- Steroids
- Monoterpenoids
- Sesquiterpenoids

Applications: ⁽¹⁵⁾

- Immunoregulating Property
- Osteoporosis inhibiting Property
- Anti- hypertensive Property
- Retina Protecting Activity
- Anti-platelet Activity
- Sperm Distortion Inhibiting Activity



Fig 9: Dried Fruit of *Crataegus Pinnatifida* ⁽²⁴⁾

3.1.9. *Solanum sisymbriifolium*

Common Name: Sticky Nightshade, Wild Tomato ⁽⁵⁾

Family: Solanaceae ⁽⁵⁾

Biological Source: Whole Plant Parts

Chemical Constituents:

- Alkaloids
- Phenols
- Terpenoids
- Glycosides,

Applications: ⁽¹⁶⁾

- Analgesic Activity
- Anti-hypertensive Activity
- Anti- Convulsant Activity
- Anti- microbial Activity
- Anti diarrhoeal Activity
- Anti Diabetic Activity



Fig 10: Fruits of *Solanum Sisymbriifolium* ⁽²⁵⁾

4.CONCLUSION

In conclusion, traditional medicine plays a significant role in addressing health concerns in underdeveloped regions, where it serves as the primary form of healthcare. The global prevalence of hypertension, a major contributor to cardiovascular disease and mortality, underscores the importance of exploring phytotherapeutic interventions for its management. Polyphenols, flavonoids, and carotenoids present in natural sources like fruits, vegetables, and herbs demonstrate potential in lowering blood pressure and preventing hypertension. Furthermore, the antihypertensive properties of specific medicinal plants and herbs, such as *Allium sativum*, *Apium graveolens*, and *Avena sativa*, provide promising avenues for addressing hypertension through natural interventions.

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