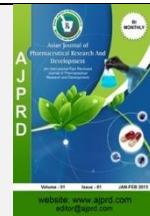


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Review Article

A Short Review on Role of Some Natural Herbs in the Treatment of Hypertension

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A B S T R A C T

The medical term for elevated blood pressure is hypertension (HTN). It's harmful since it strains the heart and increases the risk of heart disease and stroke as well as atherosclerosis (hardening of the arteries). Congestive heart failure, renal damage, and blindness are all possible outcomes of HTN. Many adverse effects are commonly associated with traditional antihypertensives. For the most part, people in underdeveloped nations prefer herbal medicines for primary health care since they are more tolerable by the human body and have less adverse effects. A great deal of effort has been made over the last three decades to discover native plants that have hypotensive and antihypertensive medicinal properties. It has been established that some of these medicinal herbs have hypotensive and antihypertensive properties, whereas others have been discredited. In order to evaluate the efficacy and clarify the safety profile of such herbal treatments for their antihypertensive potential, additional scientific study must be conducted to combine ayurveda expertise with modern medicine.

Keywords: Hypertension, Herbs, Medicinal plants, Pathophysiology

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INTRODUCTION

One of the most common chronic health problems, hypertension affects a large percentage of the world's population. It is associated with a higher risk of heart attack, arteriosclerosis, stroke, and kidney failure. It's

predicted that by 2025, 30% of the world's adult population would have hypertension^[1,2].

Nitric oxide (NO), neurological processes, and renal-endocrine systems all play a role in regulating blood pressure (BP). Treatment for hypertension involves the use of a variety of antihypertensive medications including diuretics, -blockers, calcium channel blockers, and

angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers, among other things^[3,4]. However, these medications have numerous side effects, such as decreased renal function, dry cough and angioedema^[5]. Chronically increased arterial blood pressure is referred to as hypertension (HTN) or high blood pressure (BP). It is either main (necessary) or secondary (optional). Primary HTN refers to high BP with no known medical aetiology in 90 to 95 percent of patients. In the remaining 5-10%, a disorder affecting the kidneys, blood vessels, heart, or hormone system is to blame for secondary hypertension. Strokes, heart attacks, heart failure, and arterial aneurysms are all made more likely by persistent high triglyceride levels, which are also a primary cause of chronic kidney failure. The life expectancy of a person with a little elevated systolic blood pressure is reduced. Dietary and lifestyle modifications, as well as the use of medications, can help lower blood pressure and reduce the risk of problems from it.

Causes of Hypertension

Essential Hypertension

Essential hypertension (HTN) is the most common kind of HTN, affecting 90% to 95% of individuals. A lack of exercise, stress, visceral obesity (obesity in the abdomen), potassium shortage (hypokalemia), obesity and salt sensitivity are all variables that enhance the chance of developing high blood pressure (HBP). Vitamin D insufficiency is also a risk factor. Having a family history of high blood pressure (HTN) also raises the risk. Renal enzyme renin increase and overactive sympathetic nervous system are both risk factors. HTN is hypothesised to be exacerbated by insulin resistance, which is a symptom of syndrome X, generally known as the metabolic syndrome. High fructose corn syrup (HFCS)-containing foods can raise one's chance of acquiring HTN^[6].

Secondary hypertension

Secondary hypertension is defined as a result of a known cause. Essential hypertension (HTN), on the other hand, is treated by addressing the underlying cause of high blood pressure. The pathophysiological processes that control blood plasma volume and cardiac function, such as the hormone-regulating endocrine system, are compromised or imbalanced as a result of HTN. Hypertension (HTN) is caused by a wide range of diseases^[7]. The overproduction of the stress hormone cortisol by the adrenal glands is a common and well-known secondary cause, such as Cushing's syndrome. Hyperthyroidism, hypothyroidism, and adrenal gland cancer all contribute to the development of hypertension. Kidney illness, obesity/metabolic problem, pre-eclampsia during pregnancy, the congenital defect known as coarctation of the aorta, and some prescription and illegal medicines are other prominent causes of secondary hypertension (HTN).

Pathophysiology

Most of the mechanisms underlying secondary HTN are now well-established. Those linked to essential (main)

HTN, on the other hand, are far less well-known^[8]. Early in the disease, cardiac output is elevated, but total peripheral resistance is normal (TPR). As cardiac output returns to normal, TPR rises as a result. There are three possible explanations for this:

- Natriuretic factors, such as atrial natriuretic factor, are released to increase salt excretion and raise TPR when the kidneys are unable to eliminate sodium.
- Vasoconstriction is caused by an overactive renal angiotensin system, which results in the accumulation of salt and fluid in the bloodstream. HTN is caused by an increase in blood volume.
- Increased stress responses are caused by an overactive sympathetic nervous system.
- A few candidate genes have been proposed as the aetiology of HTN, which is known to be heritable and polygenic (caused by more than one gene).
- Research on the link between essential hypertension and long-term endothelial damage has been increasingly prominent among HTN researchers. HTN development may be preceded by alterations in the endothelium, however it is not apparent if these changes are primarily the result of persistently high blood pressure^[9].
- Coronary artery disease, stroke, and kidney failure are all increased by HTN, which stands on its own as a considerable risk factor. This means that for every 20mmHg of increase in systolic and diastolic blood pressure, there is an additional 20% risk of a fatal coronary event. More aggressive blood pressure objectives have been recommended by the American Heart Association and other organisations in order to prevent these negative effects^[10].

CONCLUSION

With this data, it's clear to see how herbal medicine can be used to either prevent cardiovascular disease or treat it already. Numerous blood pressure-related characteristics, including but not limited to ROS production, cell type, gene expression, endothelial function, platelet activation, pro-inflammatory signalling and VSMC phenotype, appear to be positively modulated by the herbal or herbal isolates' pharmacological effects. In the next years, herbal medicines are likely to gain considerably more attention, perhaps highlighting the need for additional clinical trials and experiments. In fact, their current use is severely constrained due to a dearth of clinical trials. Additionally, patients should be properly informed about the benefits of herbs that have been used for thousands of years and have been backed by scientific evidence such as clinical trials involving large populations. Examples of these herbs include: black cumin, Chinese sage, coriander, ginger, ginseng, and tea. Those who are hypertensive should be aware that some herbs and plants might actually elevate their blood pressure.

Table: 1 Naturally occurring medicinal plants, herbs having hypotensive/antihypertensive potential

| Common name | Botanical name | Family | Medicinal uses |
|--------------------------|----------------------------|------------------------|--|
| Garlic | Allium sativum | Alliaceae or Liliaceae | When it comes to cardiovascular health, garlic has long been a popular treatment option. It is also hypotensive, according to reports. Smooth muscle relaxation and dilated blood vessels are hypothesised to arise from an increase in nitric oxide synthesis. For many of garlic's health advantages and its distinctive odour, allicin is a key active ingredient. Garlic has been shown to lower systolic pressure in patients with increased systolic pressure, but not in people without increased systolic pressure, in a meta-analysis of random literary data. Patients with hypertension responded better to garlic preparations than a placebo when it came to lowering their blood pressure. Antioxidative and antihypertensive effects of garlic have been reported in 20 patients with HTN and 20 individuals with normal blood pressure who have been taking garlic pearls for two months.. In terms of blood pressure, nitric oxide, and lipid peroxidation, 8-hydroxy-2-deoxyguanosin, nitric oxide level, and antioxidant vitamin levels, the results show a considerable reduction (C and E). Garlic has been shown to have cardioprotective properties in patients with essential hypertension (HTN) ^[11] . |
| Buchu | Agathosma betulina | Rutaceae | South African indigenous people have used it for millennia to treat a wide range of illnesses. It is a diuretic and an anti-inflammatory drug that works quite well. It was used to manufacture brandy in the early Dutch settlements, and it is still used today to cure a wide range of ailments. |
| Prickly Custard apple | Annona muricata | Annonaceae | For its edible fruits, A. muricata belongs to a custard apple tree family known as Annonaceae and a genus of the Annona genus. The tree is indigenous to the Caribbean and Central America. The plant's leaf extract has been shown to reduce blood pressure by reducing the resistance in the peripheral arteries. |
| Guan Mu Tong | Aristolochia manshuriensis | Aristolochiaceae | For the treatment of edoema and rheumatic pain, this Chinese plant is being utilised as a diuretic and antiphlogistic. Aristolochic acid, aristoloside, magnoflorine, oleanolic acid, hederagenin, and tannins have been found in this plant's extract. There is evidence that Magnoflorine can lower blood pressure ^[12] . |
| Breadfruit | Artocarpus altilis | Moraceae | The Malay Peninsula and the western Pacific Islands are the only places where this plant may be found naturally. According to one study, phenylephrine-stimulated isolated guinea pig aorta rings' tension was reduced by 15 to 35% using the plant's leaf extract. |
| Dietary Fiber, Green Oat | Avena sativa | Poaceae/Gramineae | The use of antihypertensive medication can be reduced greatly if a diet rich in soluble fiber-rich whole oats is followed. Increased consumption of whole oats may greatly reduce the risk of cardiovascular disease because of the improvements in cholesterol and glucose levels. In patients with hypertension, the addition of oat cereals to their typical diet has been proven to dramatically lower both systolic and diastolic blood pressure. HTN can be prevented and treated with the use of soluble fiber-rich whole oats ^[13] . |
| Indian plantago | Blond psyllium | Plantaginaceae | According to preliminary clinical studies, consuming 15 grammes of B. psyllium (Plantago species) daily can help lower blood pressure slightly, by roughly 8 millimetre Hg systolic and 2 millimetre Hg diastolic. |
| Tea | Camellia sinensis | Theaceae | Drinking tea may provide a variety of health benefits. Researchers are particularly intrigued by the potential cardiovascular health benefits of tea. There are conflicting findings in the research on the relationship between tea and high blood pressure ^[14-16] . In patients with hypertension, black tea (fermented tea) (Camellia sinensis) has no effect on blood pressure. Unfermented Camellia sinensis and partially fermented Camellia sinensis oolong tea have been linked in studies of the general population to lower rates of hypertension. |
| Lasaf | Capparis cartilaginea | Capparaceae | In rocky areas, it is a low-lying or scrambling shrub that often hangs from cliffs. C. cartilaginea crude extract has been shown to reduce blood pressure and heart rate in sedated rats. |
| Ajwain | Carum copticum | Umbelliferae | Anesthetized normotensive (NMT) rats' blood pressure and heart rate (HR) drop when given a crude extract of C. copticum (1-30 mg/kg). The resulting drop in blood pressure lasts only a few seconds before returning to normal. The crude extract has no effect on the heart rate at low doses (up to 1 mg/kg). At larger dosages (10-30 mg/kg), bradycardia has been documented ^[17] . |
| Coffee weed | Cassia occidentalis | Caesalpiniaceae | It's a tiny tree that can develop to a height of 5 to 8 metres. This plant's |

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|--------------------|--------------------------------|---------------|--|
| | | | leaf is utilised as an antihypertensive agent in local traditional medicine. The leaf extract has been demonstrated to have a calming effect on the aortic rings in in vitro experiments [18]. Cassia extract may be relaxing smooth muscle and lowering blood pressure by decreasing Ca ²⁺ influx through receptor-operated channel and voltage-sensitive channel, indicating its nonselectivity on these Ca ²⁺ channels. |
| Black bean | <i>Castanospermum australe</i> | Fabaceae | There has been evidence that a crude extract of <i>C. australe</i> can lower systolic and diastolic blood pressure in a dose-dependent manner (1-100 mg/kg). Due to the presence of saponin and glucoside of medicogenic acid, the BP has decreased. |
| Virginia dayflower | <i>Commelinia virginica</i> | Commelinaceae | It belongs to the dayflower family and is a perennial herbaceous plant. It is found primarily in the Mid-Atlantic and Southeast[19-21]. It has been observed that a whole plant extract can reduce the tension in guinea pig aorta rings induced with phenylephrine by 15% to 35%. |
| Chinese Hawthorn | <i>Crataegus pinnatifida</i> | Rosaceae | For thousands of years, it has been used in China as a decoction to alleviate hypertension. In both clinical and pharmacological studies, it has been found to reduce blood pressure. Flavonoids and oligomeric procyandins, two strong antioxidants, are the key ingredients in hawthorn's heart-healthy benefits. Inhibiting platelet aggregation and thrombosis, an alkaloid in cat's claw, has been shown to be useful in the prevention of strokes and heart attacks by lowering blood pressure, increasing circulation, and inhibiting both the formation of plaque on arterial walls and the formation of blood clots in the brain, heart, arteries, and coronary vessels by lowering BP. Intravenous treatment of the extract formulation decreased blood pressure in experimental rabbits under anaesthesia for up to three hours. An acid called Grataegeic acid was shown to be the hypotensive agent. <i>Crataegus</i> is a cure with a potentially wide-ranging effect on the cardiovascular system, according to the mechanisms of action currently theorized [22]. The hypotensive effects of nitrous oxide stimulation, considerable antioxidant activity, and a tonic influence on cardiac myocytes are only a few of the side effects. |
| Carrot | <i>Daucus carota</i> | Umbelliferae | Traditional medicine has used it to treat hypertension. <i>D. carota</i> aerial portions were subjected to activity-directed fractionation, which resulted in the separation of two coumarin glycosides referred to as DC-2 and DC-3. In NMT-anesthetized rats, intravenous treatment of these drugs decreased arterial blood pressure in a dose-dependent manner (1–10 mg/kg). There were dose-dependent inhibitory effects on the beating of guinea pigs' atria and the contraction of rabbit hearts at identical concentrations in the in vitro trials (10–200 g/ml). In the in vivo investigations, DC-2 and DC-3 were found to lower blood pressure by blocking calcium channels, and these findings suggest that this mechanism may be responsible for this impact. [23] Daucuside and daucusol, two novel guaiane-type sesquiterpene terpenoids with an intriguing epoxy unit, were discovered from <i>D. carota</i> fruits. |
| Osbeck | <i>Desmodium styracifolium</i> | Leguminosae | Injecting dried plant leaves and stems into sedated dogs boosted coronary circulation, lowered blood pressure, slowed the heartbeat, and reduced the heart's need for oxygen. In 1982, Ho et al. investigated the cardiovascular pharmacology of aqueous extracts of <i>D. styracifolium</i> (DSE) and <i>Clematis chinensis</i> (CCE) in rats [24-26]. Cholinergic receptor stimulation and alpha-adrenoceptor inhibition both contributed to DSE's hypotensive effects, which were further amplified by blocking of the autonomic ganglia. Only one hypotensive response was observed in CCE, which was mediated by histaminergic activity, in contrast to DSE. Separated methoxamine-preconstricted helicoidal tail artery strips from each extract were also shown to be relaxed. DSE demonstrated positive chronotropic effects without obvious impact on contractile force, while CCE had both negative chronotropic and inotropic effects on isolated atria. |
| Soybean | <i>Glycine max</i> | Fabaceae | Research shows that soybean can lower blood pressure. The results of one trial showed a slight decrease in blood pressure, whereas the results of another study showed no benefit. |
| Roselle | <i>Hibiscus sabdariffa</i> | Malvaceae | To date, this is one of the most thoroughly researched herbs for its potential antihypertensive qualities. All three parts of this plant are traditionally used for medicinal and culinary purposes in several West African countries. Various studies have examined the antihypertensive effects of this plant extract. Calyx of HS has been shown to have an antihypertensive impact in one investigation [27]. Similar findings were made in Lagos, Nigeria by Adegunloye et al., who worked independently of the study. Experimentally generated hypertension rats' blood pressure decreased after receiving an intravenous dose of 20 mg/kg of a water extract of dried HS calyx. Direct vasorelaxant action has been attributed |

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| | | | to the anti-hypertensive actions of the HS crude extract via acetylcholine and histamine-like dependent mechanisms. A previous study found that the same plant's petal crude extract relaxed the rat aortic smooth muscle directly. HS has been shown to reduce ventricular hypertrophy in rats with renovascular hypertension by administering an aqueous extract of HS. |
| Rompe piedra or Stone breaker | <i>Lepidium latifolium</i> | Cruciferae | Renal lithiasis in the Canary Islands has traditionally been treated using this plant's folk remedy. In rats, its diuretic activity was discovered to cause hypotensive effects. Both intraperitoneal and oral administration of 50 and 100 mg/kg of aqueous leaf extract resulted in considerable diuretic and hypotensive effects [28-30]. The researchers used furosemide's diuretic activity as a guide to extrapolate the extract's diuretic effects from rats to humans. <i>L. latifolium</i> was given to men in doses ranging from 3 to 5 grammes per day in the form of tea, or 43 to 71 milligrammes per kilogramme of body weight for a 70 kg participant. |
| Black Mangrove | <i>Lumnitzera racemosa</i> | Combretaceae | In India and on the Andaman and Nicobar Islands, it is a beautiful shrub or small tree. As a remedy for skin ailments and bug bites, the fruit of this plant is a popular folk remedy. Researchers say the plant's aqueous acetone extract has hypotensive properties. Tannins in <i>L. racemosa</i> leaves have been studied for its ability to reduce blood pressure. Corilagin, castalagin, and chebulinic acid were found to be the most active compounds in the screening of spontaneously hypertensive rats. |

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