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Review article

A Review on Anti-hypertensive herbs in Siddha system

Bavithra , V. Paheerathan

geethan1978@live.com

Abstract

Hypertension (*Pitha Aathikam*)has been globally considered as most predominant CVS disorder with life threatening complications, so need to control the hypertension (*Pitha Aathikam*) becomes critical. The conservative antihypertensive drugs have been associated with variousincidences of relapses, side effects and drug interactions. Though use of alternative medicines offers an effective way to reduce the high blood pressure (*Pitha Aathikam*) in the series of new hypertensive drugs in Siddha system and the search for innovative chemical compositions extends to medicinal herbs which produce effective and safer management.Research scientists proved that there are alternative therapies such as diet, exercise, yoga, meditation and the herbal treatments in reducing the rising blood pressure (*Pitha Aathikam*).Thus more and more studies are being performed in herbal medicine for high blood pressure (*Pitha Aathikam*). In this review article the attempt has been made about variousplants from siddha system of medicineassociate with scientifical evidence. Herbs include*Rauvolfia serpentina, Alliumsativum, Carom copticum, Ellataria cardamom,Hibiscus rosasinensis, Saesamum indicum, Raphus sativus, Punica granatum, Ocimum bacilum.Daucus carota,Cinnamum zeylanicum,Allium cepa.*

Key words: Hypertension (*Pitha Aathikam*), Herbal medicines, Anti-hypertensive

1. Introduction

1.1. Definition:

High blood pressure (*PithaAathikam*) is a chronic medical condition where blood pressure is the force exerted by the blood against the walls of blood vessels, and the magnitude of this force depends on the cardiac output and the resistance of the blood vessels (manual 2015).Hypertension (*PithaAathikam*) is having a blood pressure higher than 140 over 90 mmHg, (editorial n.d.).Means the systolic reading (the pressure as the heart pumps blood around the body) is over 140 mmHg or the diastolic reading (as the heart relaxes and refills with blood) is over 90 mmHg(Dallas, 2015).

1.2Epidemiology

Hypertension (*Pitha Aathikam*) is a worldwide epidemic; accordingly, its epidemiology has been well studied. Data from National Health and Nutrition Examination Survey (NHANES) spanning 1999-2002 in the United States found that in the population aged 20 years or older, an estimated 41.9 million men and 27.8 million women had prehypertension, 12.8 million men and 12.2 million women had stage 1 hypertension, and 4.1 million men and 6.9 million women had stage 2 hypertension.(Qureshi AI, 2005).

1.3. Etiology:

Blood pressure normally lowers during sleep & rises in response to excitement, anxiety, physical activity.(Bethesda, 2015).

The lifestyle factors which increase BP *(Pitha Aathikam*) are:

Physical inactivity, increased intake of salt, Alcohol consumption, Obesity, Stress, Impaired intra uterine growth.(Editorial n.d).

Some people have high blood pressure (*Pitha Aathikam*) caused by an underlying condition. This type of high blood pressure (*Pitha Aathikam*), called secondary hypertension (*Pitha Athikam*), tends to appear suddenly and cause higher blood pressure (*Pitha Aathikam*) than does primary hypertension (*Pitha Aathikam*). Various conditions and medications can lead to secondary hypertension, including:

1. Obstructive sleep apnea
2. Kidney problems
3. Adrenal gland tumors

4. Thyroid problems
5. Certain defects in blood vessels you're born with (congenital)
6. Certain medications, such as birth control pills, cold remedies, decongestants, over-the-counter pain relievers and some prescription drugs.
7. Illegal drugs, such as cocaine and amphetamines.
8. Alcohol abuse or chronic alcohol use.

1.4Risk factors are:

1. **Age:**

   The risk of high blood pressure increases (*Pitha Aathikam*) as you age. Through early middle age, or about age 45, high blood pressure (*Pitha Aathikam*) is more common in men. Women are more likely to develop high blood pressure*(Pitha Aathikam*) after age 65.

2. **Race:**

   High blood pressure (*Pitha Aathikam*) is particularly common among blacks, often developing at an earlier age than it does in whites. Serious complications, such as stroke, heart attack and kidney failure, also are more common in blacks.

3. **Family history:**

   High blood pressure (*Pitha Aathikam*) tends to run in families.

4. **Being overweight or obese:**

   The more you weigh the more blood you need to supply oxygen and nutrients to your tissues. As the volume of blood circulated through your blood vessels increases, so does the pressure on your artery walls. Not being physically active. People who are inactive tend to have higher heart rates. The higher your heart rate, the harder your heart must work with each contraction and the stronger the force on your arteries. Lack of physical activity also increases the risk of being overweight.

5. **Using tobacco**:

   Not only does smoking or chewing tobacco immediately raise your blood pressure temporarily, but the chemicals in tobacco can damage the lining of your artery walls. This can cause your arteries to narrow, increasing your

blood pressure. Secondhand smoke also can increase your blood pressure (*Pitha Aathikam*).

6. **Too much salt (sodium) in your diet**:

   Too much sodium in your diet can cause your body to retain fluid, which increases blood pressure.

7. **Too little potassium in your diet:**

   Potassium helps balance the amount of sodium in your cells. If you don't get enough potassium in your diet or retain enough potassium, you may accumulate too much sodium in your blood.

8. **Too little vitamin D in your diet**.

   It's uncertain if having too little vitamin D in your diet can lead to high blood pressure. Vitamin D may affect an enzyme produced by your kidneys that affects your blood pressure.

9. **Drinking too much alcohol**.

   Over time, heavy drinking can damage your heart. Having more than two drinks a day for men and more than one drink a day for women may affect your blood pressure.

   If you drink alcohol, do so in moderation. For healthy adults, that means up to one drink a day for women of all ages and men older than age 65, and up to two drinks a day for men age 65 and younger. One drink equals 12 ounces of beer, 5 ounces of wine or 1.5 ounces of 80-proof liquor.

10. **Stress**.

    High levels of stress can lead to a temporary increase in blood pressure. If you try to relax by eating more, using tobacco or drinking alcohol, you may only increase problems with high blood pressure (*Pitha Aathikam*).

11. **Certain chronic conditions.**

    Certain chronic conditions also may increase your risk of high blood pressure, Such as kidney disease, diabetes and sleep apnea.(Understand your risk for high blood pressure, 2015).

1.5. Management for Hypertension (*Pitha Aathikam*)

The lifestyle measures that are recommended by experts and shown to reduce blood pressure (*Pitha Aathikam*) are:(2013 ESH/ESC guidelines for the management of arterial hypertension, 2013).

1. Salt restriction with low fat and cholesterol.
2. Moderation of alcohol consumption.
3. High consumption of vegetables and fruits and low-fat.
4. Regular physical exercise.
5. Avoidance of cigarette Smoking.
6. Appropriate amounts of aerobic physical activity.
7. Adequate dietary intake of potassium, calcium, and magnesium.
8. Avoidance of the use of illicit drugs, such as cocaine

2. Findings and Discussion:

Ser.No	Botanical name	Tamil name	Sinhala name	English name	Family
1	*Rauwolfiaserpentina*	*Pampukala*	*Ekawarya*	Indian snake root	Apocynaceae
2	*Allium sativum*	*Ulli*	*Sudulunu*	Garlic	Liliaceae
3	*Carumcopticum*	*Omam*	*Asamodhagam*	Ajowan	Umbelliferae
4	*Hibiscus rosasinensis*	*Sevvarathai*	*Sappathumal*	Shoe flower	Malvaceae
5	*Sesamumindicum*	*Ell*	*Thala*	Gingelly	Pedaliaceae
6	*Raphanus sativus*	*Mullangi*	*Rabu*	Radish	Cruciferae
7	*Punicagranatum*	*madhulai*	*Delum*	Pomegranate	Punicaceae
8	*Ocimum Sanctum*	*Thulasi*	*Madurutala*	Sacred basil	Labitae
9	*Allium cepa*	*Periyavengayam*	*Rata lunu*	Bombay onion	Liliaceae

10	*Elettariacardamomum*	*Elam*	*Ensal*	cardamom	Zingiberaceae
11	*Daucus carota*	*Carrot*	*Carrot*	Carrot	Umbelliferae
12	*Cinnamumzeylanicum*	*Karambu*	*Karambu*	clove	Myrtaceae

2.1. *Rauvolfia serpentina*

Botany: An erect perennial shrub with a long, irregularly, nodular, yellowish root stock.

Leaves: In whorls of 3, thin, lanceolate, acute, bright green above and pale beneath.

Flowers: in irregular corymbose cymes, white, often tinged with violet.

Fruit: Drupe, single or didymius, shining black, the inflorescence with red pedicels and calyx and white corolla.

Flowering Time: March to May in Indian conditions.

1. Scientific Name : *Rauvolfiaserpentina*

2. Habitat : Moist forests shady places near rain-forest.

3. Parts used : Roots and leaves.

4. Chemical Compositions : Alkaloid, Resin, Ajmaline, Ajmalicine, Serpentine, Serpentinine,

Rauvolfia alkaloids work by controlling nerve impulses along certain pathways that affect heart and blood vessels, lowering blood pressure. *Rauvolfia* 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 *Rauvolfia 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.

In one study of 100 patients with essential hypertension, it was determined that serum cadmium levels were 43- percent higher and serum zinc levels 28- percent lower in hypertensives when compared with normotensive controls. When the patients were put on ajmaloon, a preparation from *Rauvolfia serpentina*, blood pressure was lowered significantly. It also appeared to decrease the elevated .serum cadmium levels in these individual(Obayashi K, 1976).

2.2.*Sesamum indicum*

1. Scientific name : *Sesamumindicum*

2. Parts Used : leaves, seeds.

3. Habitat : America, Southern States, and India.

4. Chemical Composition : Saccharose, pentose, lecithin, phytine, Tannin, sterol,sesamin, sesamolin.

Botany **:**Annual herb with erect stems, 30-60cm high, long ascending branch frombase, stems & quadrangular upper part and furrowed.

Leaves : opposite, below, alternate, upper lanceolate.

Flowers : Irregular, bisexual, short, erect, puberulous, pedicles, solitary short peduncles in axils of leaves.

Fruit :An oblong capsule with small oval yellowish seeds.

SI seed soaked in 70% methanol & kept in room temperature for 2 weeks. This procedure repeated twice & combined methanolic extract was evaporated under reduced pressure results in brown material.

Wister rats of either sex (200-250g) were anesthetized with Pentothal Na (80mg/kg). Trachea exposed & cannulated to facilitate spontaneous respiration, arterial BP was recorded from carotid artery via arterial cannula. Drugs and extracts were slowly injected via the

cannula inserted into external jugular vein followed by saline flush.Allowed to equilibrate for 30 min. As a result fall in systolic & diastolic BP in dose dependent manner(Anwar ul hasan, 2000).

2.3.Ocimum sanctum

1. Botanical Name : *Ocimum sanctum*

2. Part used : Leaves, Seeds and Root

3. Habitat : tropical and semitropical region of Asia

4. Chemical Composition : gallic acid, chlorogenic acid, alkaloids, glycosides, and saponins along with the volatile oil.

Botany **:** A much-branched aromatic herb, woody at the base, 30-60 cm high

Branches **:** sub quadrangular.

Leaves **:** 2.5-5 cm long, elliptic-oblong, obtuse or acute, entire or serrate, pubescent on both sides.

Flowers **:** 15-20 cm long in close whorls;

Corolla **:** 4 mm long, purplish. Nutlets 1.25 mm long, broadly ellipsoid, yellow with small black markings.

Ocimum sanctum fixed oil produced hypotensive effect in anaesthetized dog, which seems to be due to its peripheral vasodilatory action. The oil increased blood clotting time and percentage increase was comparable to aspirin and could be due to inhibitation of platelet aggregation.

The transient cerebral ischemia and long term cerebral hypoperfusion (causing cellular oedema, gliosis and perivascular inflammatory infiltrate) have been prevented by OS. The OS fixed oil administered intravenously produced hypotensive effect in anaesthetized dog, which seems to be due to its peripheral vasodilatory action Essential fatty acids like linoleic and linolenic acids,contained in the OS oil produce series 1 and 3 (PGE_1 and PGE_3) prostglandins and inhibit the formation of series 2 prostaglandins(PGE2) (M. D. Singh S Rehman HMS 1976)

The leaves of the plant were extracted with ethanol by maceration and subjected to colorimetric to determine flavonoids and phenolic compounds. High-performance TLC analysis and subsequent CAMAG's TLC scanning were performed to quantify rosmarinic acid content. Wistar rats were assigned to 6 groups of normal control, sham, isoproterenol, and treatment with 10, 20, and 40 mg/kg of the extract two times per day concurrent with MI induction. A subcutaneous injection of isoproterenol (100 mg/kg/day) for 2 consecutive days was used to induce MI. The results of the study demonstrate that *Ocimum basilicum* strongly protected the myocardium against isoproterenol-induced infarction and suggest that the cardio protective effects could be related to anti oxidative activities(Kelm MA, 2000).

2.4.*Punica granatum*

Botanical name	**:***Punicagranatum*
Part used	**:** fruits, leaves
Habitat	**:** Tropical temperate countries
Chemical Compositions	**:** pelleterine, isopelleterine, tannin, glucoside, gallic acid, Saccharose

Botany **:** A small multi-stemmed shrub/tree 5-10 m tall. Canopy open, crown base low. Stem woody and spiny, bark smooth and dark grey.

Leaves **:** simple, 2-8 cm long, oblong or obovate, glabrous, opposite lyplaced, short-petioled surface shining.

Flowers **:** regular, solitary or in fascicles at apices, 4-6 cm. Petals lanceolate, 5-7, wrinkled and brilliant orange-red. Hypanthium coloured, 5-8 lobed. Anthers numerous. Calyx persistent.

Fruit **:** a round berry, 5-12 cm, pericarp leathery. Interior compartmentalized with many pink-red sections of pulp-like tissue, each contains a seed grain. Fruits globose with persistent callipe and a coriaceous woody rind.

Seeds **:** numerous, angular with fleshy testa, 1.3 cm long.

Acute subcutaneous administration of Angiotensin II (Ang II) causes a rise in blood pressure in diabetic Wistar rats. Diabetes was induced using streptozotocin (70 mg/kg, i.v.). Chronic administration of pomegranate juice (PJ) extract (100 mg/kg and 300 mg/kg; p.o. for 4 weeks) obtained from *Punica granatum* (punicaceae) fruits reduced the mean arterial blood

pressure and vascular reactivity changes to various catecholamine's and also reversed the biochemical changes induced by diabetes and Ang II. PJ treatment also caused a significant decrease in levels of thiobarbituric acid reactive substances (TBARS) in kidney and pancreas while activities of enzymes superoxide dismutase (SOD), catalase (CAT), and glutathione reductase (GSH) showed significant elevation. The cumulative concentration response curve (CCRC) of Ang II was shifted towards right in rats treated with PJ using isolated strip of ascending colon. In histopathological examination, PJ treatment prevented the tubular degenerative changes induced by diabetes. The results suggest that the PJ extract could prevent the development of high blood pressure induced by Ang II in diabetic rats probably by combating the oxidative stress induced by diabetes and Ang II and by inhibiting ACE activity(Mahalaxmi mohan, 2010).

2.5. *Raphanus sativus*

1. Botanical name **:** *Raphanus sativus*

2. Part used **:** Root, leaves, seeds

3. Habitat : Asia

4. Chemical Composition **:** Alkaloid, Cytokinin, pyrrolidine, phenethylamine, N-methyl phenethylamine,

Botany **:** An annual or biennial herb with succulent taproot.

Taproot **:** Widely variable in colour, shape and size. Red, pink, white, yellow, purple or black externally, white to bright pink internally. Spherical, spindle- or turnip-shaped, tapering from top or bottom, 2 cm to 1m long and 60 cm in diameter.

Leaves **:** Lobed, with a larger, rounded, terminal lobe and smaller, paired lower segments. Irregularly toothed.

Flowers **:** Four white to pink or pale violet petals. Four sepals. Flowers borne on erect, many-flowered inflorescences up to 90 cm tall.

Fruit **:**A smooth, beaked, fleshy (fruit divided into two parts by a thin partition and opening by two valves to reveal seeds on central limb).

The study aim was to investigate the antihypertensive effect after oral supplementation of dried radish leaves powder (DRLP). Angiotensin-converting enzyme (ACE) activity was measured by spectrophotometric assay. The systolic blood pressure (SBP) was measured in spontaneously hypertensive (SHR) and normotensive rats (Wistar) by the tail cuff method after a 4-week diet with DRLP at the level of 2.5% or 5%. The supplementation of DRLP decreased SBP of SHR although the 5% supplementation level did not show any more pronounced effect than the 2.5% level did. The decrease in the SBP observed for both 2.5% and 5% DRLP was accompanied by significant increases of the urinary Na and K excretion. The DRLP supplementation showed a potent ACE-inhibitory activity in pulmonary tissue from both hypertensive and normotensive rats. However, the DRLP supplementation did not affect the SBP in normotensive rats. These results indicated that DRLP exerted an antihypertensive effect in SHR due to the decreased ACE activity and increased urinary Na excretion(Bo Ram Kim, 2010).

2.6. Carom copticum

1. Botanical name **:** *Carom copticum*

2. Part used **:** Fruits, seeds

3. Habitat **:** Mediterranean region

4. Chemical Composition : Thymol, dipentene,t-terpenene,glycosides

Botany : A minutely pubescent herb with a fusiform root.

Stem : 30-90cm tall, erect, branched.

Leaves : pinnate, ultimate, segments, all leaves linear.

Flowers : white, polygamous, umbels, enlarged or irregular petals.

Fruit : ovoid, -2mmcompressed, solitary.

The crude extract of C. copticum (1-30 mg/kg) produces a fall in BP and heart rate (HR) of anesthetized normotensive (NMT) rats. Hypotension produced is very brief and returns to normal within a minute. At the low dose (up to 1 mg/kg), the crude extract produces negligible change in the HR. However, bradycardia has been reported at the higher doses (10-30 mg/kg)(A.H.Gilania, 2005).

2.7. *Allium Sativum*

1. Botanical name **:***Allium sativum*

2. Part used : Bulb

3. Habitat **:** Tropical areas

4. Chemical Compositions **:** Phenol, flavonoid, alliin, gallic acid

Botany : Biennial, perennial herb with aromatic fleshy ground bulb.

The leaves : Long, narrow and flat like grass.

The bulb :The only part eaten is of a compound nature, consisting of numerous bulb lets, known technically as 'cloves,' grouped together between the membranous scales and enclosed within a whitish skin, which holds them as in a sac.

The flowers : Placed at the end of a stalk rising direct from the bulb and are whitish, grouped together in a globular head, or umbel, with an enclosing kind of leaf, and among them are small bulb.

Garlic has long been used for a variety of cardiovascular conditions, especially hyperlipidemia. It has also been reported to have hypotensive action. It is thought to increase

nitric oxide production, resulting in smooth muscle relaxation and vasodilatation. One of the primary active compounds that gives garlic its characteristic odor and many of its healing benefits is called allicin. Meta-analysis of randomly chosen literary data has demonstrated that garlic is related to decrease of BP in patients with increased systolic pressure, but not in patients without increased systolic pressure.Garlic preparations have been found to be superior to placebo in reducing BP in individuals with HTN. The antioxidative and antihypertensive effect of garlic has been observed in 20 patients with HTN compared to 20 patients with normal pressure, who have been receiving garlic pearls preparation for a period of two months. The results have revealed decreased BP, significant reduction of 8-hydroxy-2-deoxyguanosin, level of nitric oxide, and lipid peroxidation, and an increased level of antioxidative vitamins (C and E). This study points to the beneficial cardioprotective action of garlic in essential HTN(Ahmad, 2011).

2.8.Allium cepa

1. Botanical name **:** *Allium cepa*

2. Part used **:** Bulbs

3. Habitat **:**Tropical and subtropical regions

4. Chemical Compositions **:** beta-sitosterol-3 beta-glucopyranoside-6'-palmitate, sitosterol, tryptophane, adenine riboside

Botany **:** Biennial, perennial herb with aromatic fleshy underground bulb

Leaves **:** Linear hollow, cylindric and fleshy

Flowers **:** White in globular umbels, spathe composed of 2-3 reflexed walls

The bulb **:** Several layers,Ovaloccur in clusters of 3–18, plant protected by a membrane which turns to a papery coat.

This study was designed to show the effects of onion on blood pressure in N G-nitro-L-arginine methyl ester (L-NAME) induced-hypertensive rats and stroke prone spontaneously hypertensive rats (SHRSP) using dried onion at 5% in their diets. For the experiment with L-NAME induced-hypertensive rats, male 6-weeks-old Sprague-Dawley rats were given tap water containing L-NAME to deliver 50 mg/kg BW/day. In this experiment,

we found distinct antihypertensive effects of onion on the L-NAME induced-hypertensive rats and the SHRSP. Dietary onion decreased the thiobarbituric acid reactive substances (TBARS) in plasma in these hypertensive rats. Also, onion increased the nitrate/nitrite (products of nitric oxide (NO)) excreted in urine and the NO synthase (NOS) activity in the kidneys in SHRSP. These results suggested that the increased NO caused by the greater NOS activity, and additionally by the increased saving of NO by the antioxidative activity of onion, was one of the cause of the antihypertensive effect of onion in SHRSP. In the L-NAME induced hypertensive rats, onion did not significantly block the inhibition of NOS activity by L-NAME, and decreased nitrate/nitrite excretion in urine was not restored. The mechanism of the antihypertensive effect of onion probably involves increased saving of NO by antioxidative activity of onion in L-NAME induced-hypertensive rats(Yoko Sakaia, 2003).

2.9.*Elletaria cardamom*

1. Botanical name	**:**Elettaria cardamomum
2. Part used	**:**Seeds
3. Habitat	**:** Tropical region
4. Chemical Compositions	**:** Linalool, terpenolene, sabinene, linalool, endbornyl acetate

Botany	**:** Perennialherb with fleshyrhizomes gives rise to erect shoots that bear two rows of linear-lance-shaped leaves
Leaves	**:**Smooth and dark green above, silky and paler beneath. They taper to an acute point
The inflorescences	**:**Separate, horizontal stems that spread along the ground. loose panicles about 2 ft. (0.6 m) long, white or yellowish petals with lilac veins and pink or yellow margins
The fruits	: Thin-walled, smooth-skinned, oblong, greenish capsules about 3/4 in (1.9 cm) long. Contains 15-20 aromatic reddish brown seeds.

Fruit powder was evaluated for its antihypertensive potential and its effect on some of the cardiovascular risk factors in individuals with stage 1 hypertension. Twenty, newly diagnosed individuals with primary hypertension of stage 1 were administered 3 g of

cardamom powder in two divided doses for 12 weeks. Blood pressure was recorded initially and at 4 weeks interval for 3 months. Blood samples were also collected initially and at 4 weeks interval for estimation of lipid profile, fibrinogen and fibrinolysis. Total antioxidant status, however, was assessed initially and at the end of the study. Administration of 3 g cardamom powder significantly ($p<0.001$) decreased systolic, diastolic and mean blood pressure and significantly ($p<0.05$) increased fibrinolytic activity at the end of 12th week. Total antioxidant status was also significantly ($p<0.05$) increased by 90% at the end of 3 months. However, fibrinogen and lipid levels were not significantly altered. All study subjects experienced a feeling of well-being without any side-effects. Thus, the present study demonstrates that small cardamom effectively reduces blood pressure, enhances fibrinolysis and improves antioxidant status, without significantly altering blood lipids and fibrinogen levels in stage 1 hypertensive individuals(Verma S.K, 2009).

2.10.*Cinnamom zeylanicum*

1. Botanical name : *Cinnamon zeylanicum*

2. Part used : Bark

3. Habitat : Asia

4. Chemical Compositions : Volatile oil, Caryophyllin, Eugenin, Tannic acid, Salicylic acid

Botany **:** A small tree 10-13
branches with pale yellowish grey, smooth and glabrous buds

Leaves **:** Opposite, numerous, long oval.

Flowers **:** Regular, Bisexual, Jointed to short stalks,

Calyx **:** 1.2cm long, glabrous, Colour change from white green to crimson

Fruit **:** Fleshy, obovoid-oblong, Crowned by persistant inflexes calyx.

In a series of three experiments, treated SHR eating sucrose and non-sucrose containing diets were given various amounts of cinnamon, cinnamon extracts, or chromium. Then various parameters such as: body weight, systolic blood pressure, hematology and blood chemistries were followed for three to four weeks.

Diets high in sucrose content are associated with insulin resistance and the elevation of SBP. Addition to diets of cinnamon (8% w/w) reduced the SBP of rats eating sucrose containing diets to virtually the same levels as SHR consuming non sucrose containing (only starch) diets. The presence of cinnamon in the diet also decreased the SBP of SHR consuming a non-sucrose-containing diet, suggesting that cinnamon reduces more than just sucrose-induced SBP elevations—perhaps a genetic component of the elevated BP as well. The effects of cinnamon on SBP tended to be dose-dependent. Cinnamon did not decrease the levels of blood glucose, but did lower circulating insulin concentrations. Aqueous extracts of cinnamon also decreased SBP and lowered the circulating levels of fructosamine. Though cinnamon possess antihypertensive action(Harry G.P, 2006).

2.11. *Hibiscus rosasinensis*

1. Botanical name : Hibiscus rosasinensis

2. Part used : Leaves, flowers

3. Habitat : Tropical and subtropical region

4. Chemical Compositions : Hibisin

Botany **:** Large spreading shrub with brownish bark, long stem with reddish brown

Leaves **:** Simple, Alternate, Ovate, or lanceolate,the leaves are arranged alternately on branches and are ovate in shape, 5 to 15 cm long. Dark green or variegated with lighter patches and the margins of the leaves are toothed.

Flowers **:** regular, Bisexual, Solitary, Axillary, Bright red,the red flowers are very large and can be up to 15 cm long. Stalks of the stamens and the style are fused into a long column that is exerted from the center of the widely spreading petals.

Calyx **:** Fused, segments almost divided to the middle

Fruits **:** Capsuled, of Red hibiscus is a dry, five parted capsule that contains up to three seeds, each of which is kidney-shaped and 2.5 cm long. (Staples 2005).

The antihypertensive effect of this plant extract has been variously studied. An intravenous administration of 20 mg/kg of a water extract of dry HS calyx produced a fall in the BP of experimentally induced hypertensive rats. The antihypertensive effects of the crude extract of the HS have been attributed to mediation through acetylcholine and histamine like dependent mechanism through direct vasorelaxant effects(Adegunloye BJ, 1996).Earlier

report showed that the petal crude extract of same plant had a direct relaxant effect on the aortic smooth muscle of rats(Ngom S, 2009)

2.12.Daucus carota

1. Botanical name **:** *Daucas carota*

2. Part used **:** Leaves, root

3. Habitat **:** Western Asia and Europe

4. Chemical Compositions **:**Phytic acid phosphorus. Choline, Carotol Daucene, Germacrene ,Copaenol

Botany **:** A biennial, up to 150 cm tall with a grooved, hairless or bristly stem.

Leaves **:** Finely divided, giving a feathery appearance. Upper leaves are reduced and have a sheathing petiole (leaf stalk). Leaves have a characteristic carrot odour.

Root **:** Small (in comparison to commercial carrots), tough, pale-fleshed taproot.

Flowers **:** White to purple-tinged, borne in late summer in umbrella-like clusters (umbels) up to 7 cm in diameter. The umbels can be concave, flat or convex. Central flowers of the umbel are sometimes dark purple. Flowering heads become concave (and are considered to resemble birds' nests) when they turn to seed.

Fruits **:** Dry schizocarp (splitting into two single-seeded portions), 2–4 mm in diameter, with spiny ridges. The spiny fruits attach to the fur of passing animals, aiding seed dispersal.

It has been used in traditional medicine to treat HTN. Activity-directed fractionation of aerial parts of *D. carota* resulted in the isolation of two coumarin glycosides coded as DC-2 and DC-3. Intravenous administration of these compounds caused a dose-dependent (1–10 mg/kg) fall in arterial BP in NMT anesthetized rats. In the in vitro studies, both compounds caused a dose-dependent (10–200 μg/ml) inhibitory effect on spontaneously beating guinea pig atria as well as on the K+ -induced contractions of rabbit aorta at similar concentrations. These results indicate that DC-2 and DC-3 may be acting through blockade of calcium channels, and this effect may be responsible for the BP-lowering effect of the compounds observed in the in vivo studies.(Gilani AH, 2000).

Conclusion

It's essential to evaluate the studies on individual siddha plants as well as siddha formulations supporting antihypertensive activity in order to establish its clinical usage globally. This study concludes the new active principles obtained from plant sources results various therapeutic effects in hypertensive disorder. Thus the active principles possess antihypertensive activity in different animal models and Clinical trials .Hence the review study is concluded that many of the herbal preparations possess antihypertensive activities which give many links to develop the future trials.

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