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A COMPREHENSIVE REVIEW OF SELECTED MEDICINAL PLANTS FROM UTTARAKHAND USED IN THE TREATMENT OF HYPERTENSION

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ABSTRACT

The Indian Himalayan region presents 18440 species of plants, containing about 45% medicinal properties. Uttarakhand is known as the "herbal state of India." The Indian second-highest peak of Nanda Devi (7817 m), is located in Uttarakhand. Uttarakhand is a storehouse of various herbs, medicinal and aromatic plants. Almost 5000 various plant species are present in Uttarakhand, and almost 700 species are for medicinal purposes. These herbs have long been utilised in the traditional Indian system and by locals to treat a variety of ailments. Hypertension is one of the most significant health disorders, and herbal drugs are the most effective treatment for it. Hypertension is a medical term used to describe high blood pressure. There are two types of Hypertension: Primary (idiopathic) and Secondary. The remaining 5-10% of instances are secondary hypertension, while 90- 95% of cases are primary hypertension. Herbal remedies for hypertension are used to treat and control it with minimal adverse effects. In the Uttarakhand region are many plants that are used in hypertension. There are some plants: ***Berberis aristata, Ajuga brocteosa, Prunus domestica, Zanthoxylum bungeanum, Rhododendron arboreum, Pyracantha crenulata, Bauhinia verigata, Cleome viscosa, Nardostachys jatamansi, Tinospora cordifolia, Ficus auriculata, Plantago ovata, Cedrus deodara, Hibiscus rosa-Sinensis, Plectranthus forskohlii, Acorus calamus, Valeriana wallichii, Evolvulus alsinoides, Allium sativum, Fritillaria roylei, etc.***

KEYWORDS: Hypertension disease, Uttarakhand region, Rhododendron arboreum, Berberis aristata, Rubus ellipticus, Myrica esclenta.

1. INTRODUCTION

For many years, medicinal plants have been utilised to treat diseases in humans. Recently, one-fourth of the population of the world has depended on medicinal plants with the less side effects. In the Indian Himalayan region, there are about 18440 plant species with 45% medicinal properties.[1] Presently, the Indian Himalayan region has 05 biosphere-protected areas, 28 wildlife sanctuaries, and 99 wildlife refuges. They are distributed over the 70,075.54 km2 tropical, sub-tropical, temperate, sub-alpine, and alpine ecosystems of the Indian Himalayan region. The Indian Himalayan region has about 18440 plant species: 675 foraged food plants, 118 aromatic oil-producing plants, and 155 “Religious” plants.

Uttarakhand is known as the ‘herbal state of India.’ In the state of Uttarakhand, more than 5000 plant species are present, and 500-700 species have medicinal uses.[2] With a surface size of 53,483 km^2, Uttarakhand makes up 17.3% of all of India. In Uttarakhand, about 92.57% of the hill area and 7.43% of the area is plains. Uttarakhand shares our international boundary with two countries: east with Nepal and north with China (Tibet), and the Uttarakhand national boundary is shared by two states: the northwest site is Himachal Pradesh, and the south site is Uttar Pradesh. The Indian second-highest peak of Nanda Devi (7817 m) is located in Uttarakhand.[3]

Hypertension is a highly widespread medical problem globally. Worldwide, hypertension is the third leading cause of death. Around the world, billions of people (about 1.39 billion) are affected by hypertension.[4] Hypertension is classified into two parts: primary (idiopathic) and secondary hypertension. Primary hypertension, or high blood pressure, is present in 90-95% of cases; the underlying medical reason is not known. Another ailment affecting the heart and arteries accounts for the remaining 5-10% of secondary hypertension.[5] As of 2021, hypertension and cardiovascular disease are the two progressive disorders that begin in childhood and mostly affect adults.[6]

2. Medicinal Plants Used in Hypertension

2.1. Indian Barberry

Common name: Daruharidra, Chutor.

Biological source: The botanical name of Indian barberry is *Berberis aristata,* and it belongs to the family of Berberidaceae.

Habitat: The altitude range of this plant in Uttarakhand is 2200-3200 m.

Chemical constituents: The chemical constituents present in Indian barberry is berberine, oxyberberin, aroma lines, karachine, palmatine, oxyacantine, taxilamine, epiberberine, deyhydrocaroline, jatrorhizine, and columbamine.[7]

Uses: The Indian barberry fruit extract is used as a cardiotonic, and this plant extract is used for other diseases like antioxidant, anticancer, anti-diabetic, anti-inflammatory, antimicrobial, etc.[8]

2.2. Timur

Common names: Tejphal, Darmar, Timroo, Tumbru, Nepali Dhaniya

Biological source: It consists of the fruit, bark, and seed of *Zanthoxylum bungeanum*, which belongs to the family Rutaceae.

Habitual: This plant will grow in the Himalayan valleys from Jammu to Bhutan. In Uttarakhand, their growing altitude range is 1000–2500 m.

Chemical constituents: The plant of Timur contains the alkaloids g-fagarine, b-fagarine, magnoflorine, nitidine, and chelerythrine. The bark is a canary-yellow crystalline compound, which is berberine, and this plant also contains linalool, beta-sitosterol, tamblin, aramatamide, acarine, etc. [9]

Uses: Timur plant leaves show a vasorelaxation effect, and another species of Timur (Zanthoxylum gulletii) stem and bark show an antihypertensive effect. Timur fruit extract is used as a cardioprotective, and the other use of this plant is the lipid-lowering effect, used in diabetes, antioxidants, and cardiac inflammation.[10]

2.3. Burans

Common names: Gurans, Lal Buransh

Biological source: It is obtained from the plant *Rhododendron arboreum*, which is a member of the Ericaceae family.

Habitual: Burans is The state tree of Uttarakhand. It grows at an altitude of 2500-3400 in the Himalayan range.

Chemical constituents: The burns plant can contain various types of chemicals in its bark, leaves, and flowers, like xanthoprotein, phenols, saponins, protein, steroids, tannin, coumarins, ascorbic acid, anthocyanins, carbohydrates, reducing sugars, glycosides, alkaloids, phlabatanins, terpenoids, and flavonoids.

Uses: The burans flower juice is used as an antihypertensive, and the flowers show antidiarrheal, cardioprotective, and hypolipidemic effects. The leaf excreted from the plant is used as an immunomodulator and has anticancer activity. Other uses of the plant excreted are anti-inflammatory, antibacterial, etc. [11]

2.4. Ratapatha

Common names: Neelknthi, Ratpatiya

Biological source: It is obtained from the plant *Ajuga brocteosa*, which belongs to the family Lamiaceae.

Habitual: This plant reaches 1500 m above sea level.

Chemical constituents: This herb can contain various types of chemical constituents, like polyphenols: gallic acid, vanillic acid, resorcinol, ferulic acid, and coumarin. Glycosides: 6-deoxyharpafide, raptoside. Flavonoids: concentration, chloroform-methanol, and the other constituents are saponins, tannins, and xanthipriteins.

Uses: Many disorders are treated with the entire plant, like cardioprotective activity. We use this plant to treat hypertension, stroke, arrhythmia, and other heart conditions. Other uses of this plant are anticancer, antimalarial, analgesic, antioxidant, and antiarthritic.[12]

2.5. Ghingaru

Common names: Indian hawthorn, Chota shaeb, Himalayan firethorn.

Biological source: It is obtained from the plant *Pyracantha crenulata*, which is a member of the Rosaceae family.

Habitual: This herb may reach a height of 2800 m above the sea.

Chemical constituents: This plant offers a great concentration of vitamins A, B, B2, B12, C, and E. Leaves contain polyphenols, phenolics, and tannins. The fruit contains proteins, vitamins, sugar, oligomeric proanthocyanidins, polyphenols, beta-sitosterol, and esculatin. The flowers contain phenylethylamine, omethoxphenyl methylamine, and thiamine. The bark contains peracetic acid, and additionally, linoleic, oleic, and palmitic acids are present in the seeds.

Uses: The herbal formulation of the plant is used as an antihypertensive. The flowers show anti-urolithogenic and antibacterial activity; the leaves show antioxidant properties, and the other use of the plant is a nootropic property or preparation of a heart tonic.[13]

2.6. Allo Bukhara

Common name: Plum

Biological source: It is obtained from the plant *Prunus domestica*, which belongs to the family Rosaceae.

Habitual: In Uttarakhand, this tree grows at an altitude between 1500-2500 m.

Chemical constituents: This plant fruit contains various chemical constituents like benzaldehyde, linalool, ethyl nonanoat, methyl cinnamate, and gama-decatactone. Nutrients: carbohydrates, several amino acids, vitamin A, potassium, zinc, calcium, and vitamin B complex. Fibres: pectin, hemicellulose, cellulose, glucose, fructose, lignins, and other chemical compounds are boric acid, benzoic acid, and predominant acid.

Uses: This plant is mostly used for its fruit. The fruit is used as an antihypertensive, anticancer, liver disorder, anxiolytic, and good for the bones.[14]

2.7. *Bauhinia verigata:*

Family: Fabaceae

Common name: Kachnar

Biological Source: One of the most interesting botanicals is the *Bauhinia variegata* or the orchid tree. More importantly, the leaves, flowers, and roots of the plant are components used for different applications.

Habitat: The species is cultivated in the Himalayan region at an elevation of 1900 m. It is also found in the Indian states of Uttarakhand, Assam and in Myanmar.

Chemical Constituent: Flavonoids Kaempferol-3-rhamnoglucoside and Kaempferol-3-galactoside are present in flower. The stems produce flavone glycoside, lupiol, and B-sitosterol, and the bark also contains Octacosanol, stigmasterol, and hentriacontane.

Uses: The medicinal application of B. variegata flower buds is for the treatment of haemorrhoids, dysentery, and diarrhoea. The blossoms are used as piles, oedema, and dysentery as well as anthelmintic and laxative. More pharmaceutical importance is attached to the bark of the plant. The local inhabitants use the plant's bark to treat various diseases. The bark possesses antileprotic qualities in addition to being used as a tonic and is stringent in case of fever. It's effective in treating skin conditions and promoting wound healing, has anti-goitrogenic effects, and has anticancer properties. Stomatitis and other skin conditions are treated using the leaves. The roots are traditionally used for carminative, dyspepsia, and flatulence, they are said to be an antidote to snake envenomation. They are helpful in anti-tumour activity and obesity.[15]

2.8. *Cleome viscosa:*

Family: Cleomaceae

Common name: Jakhiya

Biological Source: This is referred to as wild mustard or dog mustard, *Cleome viscosa*. The annual herbaceous plant has sticky surfaces and is a prevalent weed in the plains of India and many other tropical regions. All parts- leaves, seeds, or roots- are used for a wide range of applications.

Habitat: This is classified as an invasive species and exhibits a broad distribution in warm and humid ecosystems throughout the Americas, Africa, Asia, and Australia.

Chemical Constituent: The seeds have been said to contain an oil content of 18.3%, which contains sucrose as a carbohydrate, seven amino acids, and a combination of five distinct fatty acids. The oil present in the seeds contained a high amount of linoleic acid, together with other fatty acids like palmitic, linolenic acids, oleic, and stearic. Gupta and Dutt (1938) isolated two of the seed's chemical components, viscose and viscosin, a monomethoxy trihydroxyflavone. The seeds also contain cleomiscosin A, a coumarin-ignored; cleomiscosin B; cleomiscosin C with its regioisomer, cleomiscosin D.

Uses: The leaves are applied topically to alleviate earaches, boils, headaches, ulcers, or wounds. Seeds are documented to be beneficial in helminthic infections, convulsions, fever, Diarrhea, and skin diseases.[16]

2.9. *Nardostachy jatamansi:*

Family: Valerianaceae

Common Name: Jatamansi

Biological Source: This perennial grows in heights of 3,000–5,000 m (9,800–16,400 ft) in the Himalayas, mainly in a strip passing through Kumaon, Nepal, Sikkim, and Bhutan. It also occurs in northern Myanmar and western and central China.

Habitat: It is spread between 3,000 and 5,000 m, in altitude of the high Himalayan ranges of Bhutan, China, India, Myanmar, and Nepal.

Chemical Constituent: Sesquiterpenoids, flavonoids, diterpenoids, steroids, phenylpropanoids, monoterpenoids, trace elements, carbohydrates, triterpenoids, fatty acids, and so on are some of the compounds found in nardostachys plants.[17]

Uses: Nausea and stomach ache, poison countermeasures, scorpion sting, auricular flutter, headache, jaundice, sleeplessness, kidney symptoms, liver issues, flatulence, Menopausal symptoms, intestinal colic, syncope, hysteria, fever, stress, anxiety, epilepsy, hair loss, eye compounds, and uterine inflammation.[18]

2.10. *Tinospora cordifolia*

Family: Menispermaceae

Common Name: Giloya

Biological Source: *Tinospora cordifolia* is a large climbing shrub of the family Menispermaceae. It grows up to 300 m in altitude and occurs all over tropical China and India.

Habitat: It is distributed throughout all the parts of India that lie within its tropical range of elevation from Kumaon to Assam, 1200 meters above sea level. It is indigenous to Sri Lanka, Myanmar, and India.

Chemical Constituent: Terpenoids include ecdysterone makisterone, Furanolactone diterpene, Tinosporide, Furanolactone clerodane diterpene, Tinosporaside, furanoid diterpene, and several glucosides that were isolated as Tinocordioside, Sesquiterpene glucoside tinocordifolioside, phenylpropene disaccharides cordifolioside A, B and C, cordifoliside D and E, cardioid, palmatosides C and F, poly acetate, Sesquiterpene tinocordifolin. The alkaloids that include Jatrorrhizine, Palmatine, Tinosporine, Magnoflorine, Berberine, Tembeterine, Choline, Jatrorrhizine, 1,2-substituted pyrrolidine, Alkaloids, viz., Beberine are known as alkaloids.

Lignans: 3 (a, 4-dihydroxy-3-methoxybenzyl)-4-(4- hydroxy-3-methoxybenzyl),
Steroids: ß-Sitosterol, 20aHydroxy ecdysone, Giloinsterol.

Others - Heptacosanol, Tinosporal acetate, Tinosporidine, Octacosanol, Tinosporan acetate, sinapic acid, Giloin, Tinosponone, two phytoecdysones, an immunologically active arabinogalactan.[19]

Uses: It has anti-inflammatory, anti-toxic, anti-cancer, immune-modulatory, anti-microbial, and anti-oxidant properties.[20]

2.11. *Ficus auriculata*

Family: Moraceae

Common Name: Timla

Biological Source: The fig trees of the *Ficus auriculata.* They are typically found in continental Asia's tropical and subtropical zones. It is mostly known for having large, rounded leaves as well as sweet fruits.

Habitat: The plants are principally grown at an altitude of 1800 to 2600 meters under temperate, tropical, and subtropical climate conditions. Asia, particularly India, Bhutan, Malaysia, Pakistan, Nepal, Burma, China, Thailand, Vietnam, and other places are its native habitats.

Chemical Constituent: Phytochemical screening and assessment of *F. auriculata* fruit and leaf extract the presence of tannins, glycosides, phenols, and flavonoids were indicated. Both saponins were absent, while there were glycosides in the methanol extract and absent in the chloroform extract. Stem bark phytochemical investigation *Ficus auriculata* extracts contained carbohydrates, fatty oils, alkaloids, glycosides, amino acids, phytosterols, saponins, resins, tannins, diterpenes, flavonoids, proteins, and phenols in general.

Uses: *Ficus Auriculata* leaves are applied as a paste to help heal wounds. Besides, they are applied for treating dysentery and diarrhoea. Juice from the stem bark is effective in treating diarrheal conditions and cuts. Root latex is applied to vomiting, cholera, and mumps. A mixture of Oroxylum indicum bark and F. Auriculata root powder is taken if someone suffers from jaundice. Ficus species have flavonoids, which are polyphenolic power-holding chemicals. Such compounds help prevent and treat a range of conditions associated with oxidative stress, among them neurodegenerative and hepatic disorders. They have been traditionally used as a hypotensive, antidysentery, carminative, vermicide, stomachic, and as an astringent remedy.[21]

2.12. *Plantago ovata*

Family: Plantaginaceae

Common Name: Psyllium

Biological Source: The crushed seeds of the herb, *Plantago ovata*, which is native to Asia's regions, the Mediterranean, and North Africa, give psyllium husk.

Habitat: Such psyllium plants can grow expansively in a variety of natural habitats. It may occur in marshy tracts, roadsides, alpine and semi-alpine regions, and coastal areas.

Chemical constituents: The plant contains alkaloids, phenolic derivatives, phenols, flavonoids, and terpenoids in Plantago, which are of major therapeutic importance. It contains 6.5% tannin, emulsions, and the glycoside aucubin. It has anvrtyn, fatty acids, polysaccharides, and iridoid glycosides. There is a view that vitamin C is the main constituent of Plantago with medicinal value. Mucilage, which consists of four polysaccharides, constitutes 26.5%. Pectins, colouring agents, heterosis, and diseases are all present. They contain more than 1% of carboxylic and salicylic acids. Minerals contain potassium and zinc. They also include silicic acid and saponin.

Uses: It helps in losing weight, blood sugar regulation, reduction of cholesterol, stool softening, anti-inflammatory, and wound healing. Prebiotic, antioxidant, immunosuppressive, antiviral, anticancer, and antiproliferative.[22]

2.13. *Cedrus deodara:*

Family: Pinaceae

Common Name: Deodar or Himalayan Cedar

Biological Source: *Cedrus deodara*, commonly known as deodar, is a species of cedar in the family Pinaceae. It is native to the Western Himalayas, North Pakistan, North-Central India, Southwestern Tibet and West Nepal.

Habitat: This species primarily grows in Southwestern Tibet, West Nepal, East Afghanistan, North Pakistan and North-Central India. The ideal growing range for it is 1,500 to 3,200 meters (5,000 to 10,000 feet) above sea level.

Chemical Constituents: The principal elements of the essential oil are sesquiterpenes, β-himachalene (43%), particularly α-himachalene (12.5%), besides various sesquiterpene alcohols, himachalol, isocentdarol, allohimachalol, himadarol, and 3-beta-hydroxy-oleanolic acid methyl ester. Some chemicals isolated from the needles of Cedrus deodara pine have been reported as 9-hydroxy-dodecanoic acid, ethyl laurate, ethyl stearate, centdarol, ferulic acid, beta-sitosterol, shikimic acid, methyl coniferin, beta-sitosterol, and beta-glucoside.

Uses: Many parts of this species of plant are applied in conventional medicine to treat a range of diseases or conditions, including fever, inflammation, pains, ulcers, apoptosis, spasmodic conditions, hyperglycemia, infection, sleeplessness, psychiatric disorders, dermatological and haematological diseases.[23]

2.14. Hibiscus

Common Name: Jasud, China rose

Biological Source: It is derived from the *Hibiscus rosa-sinensis* flower *and* belongs to the family of the Malvaceae.

Habitat: It grows in human-altered environments.

Chemical Constituents: Perminary-tannins, anthraquinones, quinines, phenols, flavonoids, alkaloids, terpenoids, saponins, glycoside, protein, carbohydrate, and it also cantante cyclopropanoids, methyle sterculate, methyle 2-hydroxy sterculate, 2- hydroxy sterculate. Cyanidin 3- saphoroside is the primary anthocyanin found in the flower.

Uses: Using leaves and roots can increase blood flow and menstruation. Lives also use abortifacients, diarrhoea and flowers excreted are used in liver disorders, hypertension, regulate the menstrual cycle, stomach pain, and eye problems.[24]

2.15. Pashanbedi

Common Name: Patharchur

Biological Source: It is derived from the root of the plant *Plectranthus forskohlii, which* belongs to the family of Lamiaceae.

Habitat: It has a growing altitude of about 2400m, with a temperature of 18-27℃.

Chemical Constituents: The plant root extract is alpha-amyrin, betulic acid, 6-(3-dimethylaminp propionyl) forskolin hydrochloride, deactylforskolin, 9-deoxyforskolin, glycoside, 1,9-deoxyforskolin, beta sitosterol, 1,9-dideoxy-7-deoxyforskolin, dimethyl crypto japonol, alpha-cedrol, forskoditerpenoside.

Uses: Plant roots are utilised as an anti-obesity, heart disorders, hypertension, glaucoma, cancer metastases, antithrombotic effects, psoriasis, and asthma.[25]

2.16. Bach

Common Name: Gorbach, Vacha, sweet flag

Biological Source: It consists of the plant *Acorus calamus, which* belongs to the family of Araceae.

Habitat: The Bach plant grows in the Himalayan region in the altitudes of 1000-2300m.

Chemical Constituents: The plant of buch is cantoned the various chemicals; Phenyl propanol, alpha-asarone, beta-asarone, eugenol, isoeugenol, calomel, azulene, diketene, etc. Sesquiterpenoid- Calamene, calamenenol, alpha and beta gurjunene, valencene, viridiflorene, elemol, cedroi, spathulenol, etc.

Monoterpenes- Alpha pinene, beta-pinene, camphene, anethole, thymol, camphor, sabinene, etc.

Alkaloids- Trimethoxyamphetamine,2,3,4.

Amino acid- Arginine, lysine, phenylalanine, threonine, alpha-alanine, proline, glutamic acid, palmitic acid, myristic acid, etc.

Uses: The plant rhizomes are used as an antihypertension, antidiabetic, anti-obesity, etc. The lives are employed as an antidepressant, neuroprotective, antioxidant, anti-arthritic, etc. The whole plant of Bach shows a cardioprotective effect.[26]

2.17. Tager

Common Name: Indian valerian, Musklala

Biological Source: It is derived from the dried rhizome, stolon, and root of the *Valeriana wallichii*, which belongs to the family of the Valerianaceae.

Habitat: The tager grows to altitudes 1800-3000m on the Himalayan side.

Chemical Constituents: 6-methyl apigenin, hesperidin, dihydrovaltrate, valepotriates, valerianic acid, and valerosidatum glycoside are all present in the plant. Alkaloids, 1-camphene, chatinine, isovalerenic acid, formate, 1-pinene, glucoside, bornylisova-lerianate, maliol, terpineol, malic acid, valerianine citric acid, tartaric acid, and succinic acid are also present. In addition to alkaloids, the plant also includes flavonoids, resins, and volatile essential oils.

Uses: The plant's rhizome extracts are anti-inflammatory and antimicrobial. Other uses of the plants are as an antiarrhythmic, blood pressure lowering effect(antihypertensive), antispasmodic, antilesishmanial, antidepressant, anxiolytic, anti-cancer, and hepatoprotective activity.[27]

2.18. Sankha Holi

Common Name: Sankhapuspi, Vishmikranti

Biological Source: It is derived from the plant of the *Evolvulus alsinoides and* belongs to the family of the Convolvulaceae.

Habitat: It is a tiny, hairy, perennial herb that thrives in grassy, open areas.

Chemical Constituents: The plant of Sankha Holi contains- pentatriacontane, triacontane, beta-sitosterol, natural fat, 2-methyl-1,2,3,4-butanetetrol, scopolin, umbelliferone, Scopoletin, ferulic acid esters, stearic, oleic, 8-methyldecanoic,2,3,4-trihydroxy3methylbutyl 3-2-propenoate, 2-C-methyl erythritol and, 6-methoxy-7-O-glucopyranoside coumarin, caffeic acid, kaempferol-7-O-glucopyranoside, 1,3-di-O-caffeoylquinic acid methyl ester, kaempferol glucopyranoside, and the fresh plant of Sankha Holi is contain volatile oil.

Uses: Antihypertensive, antioxidant, anti-stress, hypolipidaemic effect.[28]

2.19. Garlic

Common Name: Lehsun

Biological Source: It is obtained from the bulbous plant *Allium sativum*, which belongs to the family of Lillaceae.

Habitat: The garlic is found in the Himalayan region at an altitude of 2500-3625m.

Chemical Constituents: The Gaelic contains lysine, aspartic acid, histidine, glycine, proline, valine, glutamine, leucine, methionine, threonine, phenylalanine, and isoleucine. [29]

They also contain ajoenes (E- E-ajoenes, Z-ajoenes), thiosulfinates, S-propyl-cysteine-sulfoxide, S-methyl cysteine-sulfoxide, N-acetylcysteine, and S-allyl-cysteine.

Uses: The garlic shows many pharmacological activities: antibacterial, antifungal, anti-protozoal, antiviral, antioxidant, anticancer, dyslipidemia, diabetes mellitus, effect of obesity, and antihypertensive.[30]

2.20. Kakoli

Common Name: Himalayan fritillary

Biological Source: It is obtained from the plant *Fritillaria roylei*, which belongs to the family of the Lillaceae.

Habitat: In Uttarakhand, it also grows at an altitude between 2800-4000.

Chemical Constituents: Bulbs contain alkaloids, peimine, peiminine, peimisine, propeimin, and sterol.

Uses: It functions as an antihypertensive, anti-rheumatic, galactagogue, anti-asthmatic, haemostatic, anti-ulcer, anti-microbial, and anti-viral. The roots are used for healing wounds. In traditional systems, they are also used to treat asthma, burns, stimulants, bronchitis, etc. [31]

Plant Species	Family	Common Name	Part Uses	Active Component	Pharmacological Activity
Berberis aristata	Berberidaceae	Daruharidra	Whole plant	Berberine, oxyberberine, aromoline, oxucanthine, etc.	Cardiotonic, anti- platelet, etc.
Zanthoxylum bungeanum	Rutaceae	Timur	Leaves	n- hexane, ethyl acetate, n-butanol, etc.	Antihypertensive, vasorelaxation, etc.
Rhododendron arboreum	Ericaceae	Burans	Flower, Leaves	1-hexadecene, docosanoic acid, rutin, coumaric acid, etc.	Cardioprotective, antibacterial, hepatoprotective, etc.
Ajuga	Lamiaceae	Neelknthi	Whole plant	Gallic acid, vanillic acid,6-	Hypertension, stroke,

brocteosa				deoxyharpafide, xanthipriteins, etc.	arrhythmia, etc.
Pyracantha crenulata	Rosaceae	Ghingaru	Leaves, fruit, flowers and bark	Flavonoids, phenolics, vitamins, sugar, oligomeric proanthocyanidins, etc.	Antihypertensive, antibacterial, antioxidant, etc.
Prunus domestica	Rosaceae	Plum	Fruit	Benzaldehyde, linalool, ethyl nonanoat, methyl cinnamate, etc.	Antihypertensive, anticancer, liver disorder, etc.
Bauhinia verigata	Fabaceae	Kachnar	Leaves and Bark	Kaempferol-3-gagalactoside, Stigmasterol, Lupiol, etc	Anti-inflammatory, anti-diabetic, anti-cancer, antihypertensive, antimicrobial, etc.
Cleome viscosa	Cleomaceae	Jakhiya	Leaves and Roots	Cleomiscosins (A, B & C), viscocic, viscosin	Antimicrobial, analgesic, anti-inflammatory, antihypertensive, etc.
Nardostachys jatamansi	Valerianaceae	Jatamansi	Rhizome	Sesquiterpenoids, monoterpenoids, Coumarins, etc	Antifungal, anticonvulsant, antihypertensive, antidiabetic, etc.
Tinospora cordifolia	Menispermaceae	Giloya	Stems and Leaves	Tinosporide, Berberine, Choline, etc	Anti-diabetic, anti-viral, anti-inflammatory, antihypertensive, anti-leprotic, etc
Ficus auriculata	Moraceae	Timla	Leaves and Bark	tannins, glycosides, phenols, flavonoids, etc	Antidiabetic, antihypertensive, antibacterial, anti-inflammatory, etc.
Plantago ovata	Plantaginaceae	Psyllium	Seeds	Psyllium polysaccharide, fatty acid, amino acids, etc	Anticancer, antiviral, antihypertensive, anti-constipating, anti-inflammatory, etc.
Cedrus deodara	Pinaceae	Deodar or Himalayan Cedar	Bark and Wood	Sesquiterpenes, Terpenoids, Phenols, etc	Anti-inflammatory, antihypertensive anti-cancer, anti-spasmodic, antifungal, antimicrobial, etc
Hibiscus rosa-Sinensis	Malvaceae	Hibiscus	Flowers	Tannins, anthraquinones, quinines, phenols, flavonoids, alkaloids, etc.	Liver disorders, hypertension, regulating the menstrual cycle, etc.
Plectranthus forskohlii	Lamiaceae	Patharchur	Root	1,9-deoxyforskolin, 1,9-dideoxy-7-deoxyforskolin, glycoside, forskoditerpenoside, etc.	Heart disorders, hypertension, glaucoma, cancer metastases, etc.
Acorus calamus	Araceae	Bach	Rhizomes	Phenyl propanol, eugenol, isoeugenol, anethole, thymol, etc.	Antihypertension, antidiabetic, anti-obesity, etc.
Valeriana wallichii	Valerianaceae	Tager	Roots and Rhizomes	Valepotriates, dihydrovaltrate, 6-methyl apigenin, resins, maliol, terpineol, malic acid, etc.	Blood pressure lowering effect(antihypertensive), antispasmodic, antilesishmanial, etc
Evolvulus alsinoides	Convolvulaceae	Sankhapuspi	Whole plant	Pentatriacontane, triacontane, beta-sitosterol, natural fat, Scopoletin, scopolin, etc.	Antihypertensive, antioxidant, anti-stress, etc.
Allium sativum	Lillaceae	Gaelic	Whole plant	Valine, glutamine, leucine, methionine, threonine, phenylalanine, etc.	Anticancer, dyslipidemia, diabetes mellitus, effect of obesity, antihypertensive
Fritillaria roylei	Lillaceae	Kakoli	Plant bulbs and root	Alkaloids, peimine, peiminine, peimisine, propeimin, etc.	Antihypertensive, anti-rheumatic, galactagogue, anti-asthmatic, etc.

3. DISCUSSION AND CONCLUSION

The Uttarakhand is a storehouse of various herbs, medicinal, and aromatic plants. The phrase "herbal state of India" Refers to Uttarakhand. For a very long time, people have utilized medicinal herbs to alleviate illness. Recently, one-fourth of the population of the world has

depended on medicinal plants with the less side effects. Throughout human history, herbal medicine has been utilised to promote health and treat illnesses. In the Uttarakhand region are many plants that are used in hypertension disease. There are some plants: ***Berberis aristata, Ajuga brocteosa, Prunus domestica, Zanthoxylum bungeanum, Rhododendron arboreum, Pyracantha crenulata, Bauhinia verigata, Cleome viscosa, Nardostachys jatamansi, Tinospora cordifolia, Ficus auriculata, Plantago ovata, Cedrus deodara, Hibiscus rosa-Sinensis, Plectranthus forskohlii, Acorus calamus, Valeriana wallichii, Evolvulus alsinoides, Allium sativum, Fritillaria roylei,*** **etc.** Numerous studies on this and other plants have shown that they are strong hepatoprotective agents that are used to treat hypertension.

It can be concluded that the Uttarakhand region has inherited extensive traditional knowledge and documentation. This understanding has yielded new information from the area. They continue to rely on plants for therapeutic purposes and are concerned about their depletion in the forest, forcing them to go even further to obtain them.

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