International Journal of Advanced Scientific Research
www.allscientificjournal.com
ISSN: 2456-0421
Received: 31-03-2025, Accepted: 30-04-2025, Published: 16-05-2025
Volume 10, Issue 2, 2025, Page No. 6-8

Medicinal plants of Uttar Pradesh, India

Dr. Rajeshwari Mishra, Saumya Rai
Department of Botany, Isabella Thoburn College, Lucknow, Uttar Pardesh, India

Abstract
Uttar Pradesh, one of India's most populous and ecologically diverse states, harbors a rich repository of medicinal plants that have been integral to traditional healing systems such as Ayurveda, Unani, and folk medicine. The state's varied geography—from the Gangetic plains to the Vindhya and Terai regions—supports a wide range of flora with therapeutic properties. Ethnobotanical surveys and scientific studies have documented over 500 species used by local and tribal communities to treat ailments including gastrointestinal disorders, skin diseases, respiratory infections, diabetes, and inflammation. Medicinal Plants have been used by our ancestors for centuries as they contain metabolites with medicinal properties and are capable of curing various ailments naturally. India is a storehouse of decades of ancestral knowledge about herbal literature and thus a big contributor to the medicinal plant industry. Ayurveda is now a popular form of traditional medicine that uses these plants and it's bioactive compounds to cure diseases. Uttar Pradesh is one of the largest and most populous states of India. The majority of rural population and now even the urban population is using and appreciating the science of plant-based therapy in their daily life and encouraging research, development and cultivation of medicinal plants.

Despite their cultural and pharmacological significance, these plant resources face threats from habitat degradation, overharvesting, and climate change. This abstract underscore the urgent need for systematic conservation, documentation, and integration of traditional knowledge with modern pharmacological research to ensure sustainable utilization of Uttar Pradesh's medicinal plant heritage.

Keywords: Medicinal plants, Plant Based therapy

Introduction

Non-formal education is a form of education that occurs outside the formal school system. It encompasses all organized educational activities that take place outside of the formally established system. Non-formal education according to Ihejirika (2000) [3], is any organized or systematic educational activities carried out outside the framework of the formal school system to provide a specific type of learning to a specific sub-group of the population, both adults and children. It includes different types of learning experiences; it is a lifelong process of learning that includes adult and continuing education, the apprenticeship system, in-service programme, on-the-job training programme, personnel and professional development, and workers' and students' industrial training. Short-term learning activities such as conferences, seminars, workshops, and evening classes, as well as specialized purpose programs such as functional and literacy programs, volunteer youth programs, skill acquisition, and liberal education classes, constitute non-formal education, which can be called "living room" or leisure education (Amirize in Ossai & Nwalado, 2014) [8]. The various skills acquisition and apprenticeship programs are examples of non-formal education. Medicinal plants have been a part of our folklore since time immemorial. There is ample evidence of medicinal botanical literature even in prehistoric times. Indian religious texts like the Charita Samhita and Rig Veda describe thousands of plant species and their medicinal properties. Chinese, Greeks, Europeans and Japanese are also known to extensively use plant-based pharmacopeia. Over 3500 years ago, Willow tree bark was used as a pain reliever by the Sumerian people, and later on by the Greeks to ease childbirth pain. Towards the late 19th century, A chemist from Bayer healthcare, Felix Hoffmann synthesized acetylsalicylic acid from salicylic acid found in Willow bark. Acetylsalicylic acid is the main ingredient in Aspirin, now a frequently used pain reliever. Other important plants like Madagascar Periwinkle, which contain bioactive compound predecessors of Vincristine and Vinblastine, have been used as anticancer drugs for a long time. Artemisinin, an antimalarial, was isolated from *Artemisia annua* by Chinese scientists in the 1970s. (Archana k. Verma *et.al*.,2007) [1]. Medicinal plants are reservoirs of bioactive compounds in their constitution which when isolated can be used to make plant-based drugs. These are alkaloids, saponins, tannins, glycosides, terpenes, flavonoids, phenols to name a few. Some compounds are specifically named after the scientific name of the plant, like Curcumin in *Curcuma longa* and Atropine in *Atropa belladonna*. Different parts of plants, like leaves, seeds, roots, stem, fruits, flowers contain specific chemical compounds and are thus used to cure different diseases. Sometimes all the parts of a plant are medicinally useful, sometimes only one part is used in medicine. (Kishan K. Prajapati et. Al. 2024; Shazia Bi,2020) [2, 3]

India is a country gifted with a large floral biodiversity. Harbouring over 45,000 plant species, the country accounts for 6-7% of the world's total plant species. Out of these, more than 8000 species of plants are medicinal in nature (Yogendra Singh, 2016) [4]. Practitioners of various health systems like Ayurveda, Siddha and Homeopathy use these plants for pharmacotherapy. In India, more than 80% of rural population uses herbal plants to treat various ailments as these have no side effects and are cheaper than allopathic drugs (Shyam Govind Singh, 2022). India is one of the most important exporters of medicinal plants and plant-based drugs, and the demand is increasing tenfold every year. (AK Singh, *et.al*, 2002; [6] Anurag Singh and P.K. Singh, 2008) [8]

Every plant is unique; thus, it requires a specific set of environmental conditions to grow. Some plants grow well in high altitudes and mountain ranges, some do well in plains, some require a moist tropical climate and some are suited for a sandy desert. The type of soil in which the plant is sown is also very important because the roots acquire water and nutrients for its development from the soil. Other important factors affecting the vegetation are temperature, rainfall, sunlight, natural fauna and human activity.

Geographical and Climatic Conditions of Uttar Pradesh

Uttar Pradesh is the fifth largest and most populous state of India. It covers an area of 2,40,928 sq km, which is 7.3% of the geographical area of the country. Situated in the north western part of the country, it is bordered by Uttarakhand in the north, Haryana, Delhi and Rajasthan in the west, Madhya Pradesh in the south and south west, Chhattisgarh in the south and Bihar in the east. The state is divided into three regions - The Shiwalik in the north, The Gangetic plains in the central region and The Vindhya range in the south. Climate of this state is humid subtropical and a dry winter. Annual rainfall is between 1000mm to 1200mm and temperatures are extreme ranging between 5°C to 47°C. Many rivers, namely Ganga, Yamuna, Gomti drain in the state. The seasons are Summer from March to June, Monsoon from July to September and Winter from October to February. The soil type in Uttar Pradesh is mostly alluvial soil, but saline, sandy loam, red soil and black soil are also found in different Agro climatic zones. This wide range of agro climatic factors is responsible for the cultivation of numerous plants in this state, and many of them contain compounds with potent medicinal properties. (NRI Department, Govt. of Uttar Pradesh)

The Central Institute for Medicinal and Aromatic Plants (CIMAP) is located in Lucknow, the capital city of Uttar Pradesh. It promotes cultivation and research related to medicinal plants. It comes under the government organisation The Council of Scientific and Industrial Research (CSIR) to promote industrial and economic growth. Scientists at CIMAP are working towards research on medicinal plants and several plant based medicinal products, like BGR - 34 to manage type 2 diabetes have been manufactured. The making in India of *Artemisia annua*, the antimalarial drug has been ensured by developing high yielding varieties, derivatizing artemisinin and promoting the cultivation of improved varieties in the farmer's field.

With the collaborative efforts of research institutions, AYUSH Ministry and its National Medicinal Plants Board (NMPB), Uttar Pradesh can meet the rising demand of medicinal drugs and also provide financial aid to cultivators.

Table 1: Medicinal Plants of Uttar Pradesh

S. No.	Scientific name	Common name	Family	Parts used	Bioactive compounds	Medicinal uses
1.	*Azadirachta indica*	Neem	Meliaceae	Leaves, flowers, seeds, fruits, roots and bark	Azadirachtin, Nimbolide, Gedunin, Nimbidin	Malaria, Skin conditions, Oral health.
2.	*Curcuma longa*	Turmeric, Haldi	Zingiberacea	Rhizome	Curcumin, Demethoxycurcumin	Inflammation, Cardiovascular health and throat infections.
3.	*Rauwolfia serpentina*	Indian snakeroot, Sarpgandha	Apocynaceae	Root and rhizome	Serpentine, Reserpine	Hypertension and Brain function.
4.	*Withania somnifera*	Indian Ginseng, Ashwagandha	Solanaceae	Root and Berry	Withanolides	Stress, Blood sugar
5.	*Aegle marmelos*	Bel	Rutaceae	Leaves, bark, roots, fruits and seeds	Marmelosin, Luvangetin, Marmelide	Diarrhea, Dysentery, Ulcers, Fever,
6.	*Catharanthus roseus*	Madagascar periwinkle, Sadabahar	Apocynaceae	Leaves, stem and root	Vincristine, Vinblastine, Catharanthine, Vindoline	Cancer, Diabetes and Asthma
7.	*Embica officinalis*	Gooseberry, Amla	Phyllanthaceae	Fruits, leaves, seed, root, bark and flowers	Gallic acid, Rutin, Emblicanins	Boosts immunity, Blood purifier, Hair growth
8.	*Moringa oleifera*	Drumstick, Moringa	Moringaceae	Leaves, bark, seeds, root, sap and flowers	Moringine, Quercetin, Glucomoringin	Heart disease, wounds, Inflammation
9.	*Ocimum sanctum*	Holy Basil, Tulsi	Lamiaceae	Leaves, flowers, seeds, root and stem	Eugenol, Linalol, Methylchavicol, Thymol	Respiratory issues, Stress reliever, Blood purifier, Insect bites
10.	*Tinospora cordifolia*	Giloy	Menispermaceae	Stem, root and leaves	Cordifolioside A, Berberin	Fever, Blood sugar, Immunity, wounds
11.	*Aloe barbadensis*	Aloe vera	Liliaceae	Leaves	Aloein, Aloesin, Emodin	Oral health, Acne, Digestive problems
12.	*Solanum nigrum*	Nightshade, Makoy	Solanaceae	Leaves, fruit and root	Solasonine, Solasodine, saponins	Pain, Ear pressure, Skin conditions
13.	*Eclipta prostrata*	Bhringraj	Asteraceae	Leaves, flowers, root, stem	Wedelolactone, Coumestan, Luteolin	Hair growth, Skin conditions, Liver disorders, Respiratory problems
14.	*Bacopa monnieri*	Water hyssop, Brahmi	Scrophulariacea e	Leaves and stem	Bacoside A and B, Betulinic acid	Anxiety, Brain function, Memory, Epilepsy
15.	*Ficus religiosa*	Peepal	Moraceae	Root, bark, stem, leaves, fruits	Beta sitosteryl D-glucoside, Kaempeferol, Myricetin	Asthma, Cough, Eczema, Diarrhea
16.	*Butea monosperma*	Palash	Fabaceae	Flowers, leaves, bark, seed gum	Butrin, Isobutrin, Isocoreopsin	Stomach problems, Fever, Urinary tract health
17.	*Asparagus officinalis*	Asparagus, Satawar	Asparagaceae	Roots and seeds	Asparagusic acid	Diuretic, Fever
18.	*Datura stramonium*	Datura	Solanaceae	Flowers and seeds	Atropine, Scopolamine, Hyoscyamine	Anesthesia, Asthma, Joint pain
19.	*Convolvulus prostratus*	Morning glory, Shankhpushpi	Convolvulaceae	Roots, stem, flowers, fruits, stem	Convolamine, Convolvuline, Convozine, Confoline	Nervous system ailments, Insomnia, Cardiac functioning
20.	*Boerhaavia diffusa*	Punarnava	Nyctaginaceae	Herb, root, seeds	Boerhaavic acid, Punarnavoside, Boerhaavone, Boeravinones A-J, Boerhaavisterol	Kidney disorders, Arthritis, Obesity, Eye problems

Fig 1: Images of Medicinal Plants

Conclusion

Uttar Pradesh is home to a rich heritage of medicinal herbs used in folklore medicine for centuries. These plants not only heal the ailment from its root cause, they also have slim to none side effects and are cheap and readily available. Knowledge about plant-based pharmacopeia has been passed on through generations. These plants contain compounds that have medicinal potential and a part of the plant or sometimes the whole plant is used in pharmacotherapy.

Uttar Pradesh is one of the most geographically and climatically variable states of India, therefore several medicinal plants are grown here.

However, the state still has to face challenges like overexploitation, human activities like deforestation, lack of knowledge of cultivation of medicinal plants. If the government, research institutions and plant hobbyists come together to foster learning, promote research and cultivation and ensure proper commerce of medicinal plants and herbal drugs, it can become an important source of income for the farmers and a progressive economic industry.

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