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Studies on various plant species threatened and Endangered in flora of India

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Abstract
India's diverse plant flora, crucial for traditional medicine and the Ayurvedic system, is facing threats from deforestation, habitat destruction, and climate change. The study highlights the importance of studying threatened and endangered plant species, highlighting their ecological, environmental, and socio-economic importance. Examples include Red Sanders, Kokum, Pitcher Plant, Lion's Foot, Andaman Redwood, Wild Banana, Bamboo Orchid, Nagaland Bamboo, Indian Sandalwood, and others. Conservation efforts, including habitat restoration and community involvement, are crucial for mitigating threats and preserving India's plant biodiversity for future generations.

Keywords: Various plant, traditional medicine, medicinal plants

Introduction

India is home to a diverse range of flora due to its varied climate, topography, and ecosystems. The country's rich biodiversity can be attributed to its tropical and subtropical climate, diverse soil types, and varying altitudes. India is one of the world's 17 mega-biodiverse countries, hosting a significant portion of the Earth's biodiversity. The country is divided into various bio-geographic zones, each characterized by distinct flora. These zones include the Himalayas, Western Ghats, Indo-Gangetic Plains, Deccan Plateau, and the Northeastern states. India has several types of forests, including tropical rainforests, deciduous forests, coniferous forests, and mangrove forests. The Western Ghats and the Eastern Himalayas are known for their rich evergreen and semi-evergreen rainforests. India boasts a variety of tree species, including teak, sal, sandalwood, deodar, neem, banyan, peepal, and many others. The country is also home to various species of coniferous trees like pine and fir, found in the northern regions. India has a long tradition of using plants for medicinal purposes. The Ayurvedic system of medicine relies heavily on the use of medicinal plants. Medicinal plants like neem, tulsi (holy basil), aloe vera, and turmeric are widely used for their therapeutic properties. Several plant species are endemic to specific regions of India, meaning they are found nowhere else in the world. For example, the Nilgiri tahr is a unique plant species found in the Nilgiri Hills. India has a significant coastline with diverse mangrove ecosystems. Sundarbans, the largest mangrove forest in the world, is located in the delta region of the Ganges, Brahmaputra, and Meghna rivers.

Due to factors like deforestation, habitat destruction, and climate change, many plant species in India are facing the threat of extinction. Conservation efforts, including the establishment of national parks and wildlife sanctuaries, are in place to protect and preserve the country's diverse flora. India has a tradition of preserving certain patches of forests known as sacred groves. These areas are protected due to cultural and religious beliefs and play a vital role in biodiversity conservation. The Himalayan region in northern India is known for its unique alpine and subalpine flora. It includes a variety of rhododendrons, junipers, and medicinal herbs.

India faces a significant threat to its medicinal plants, with over 90% of them endangered due to various factors like excessive collection and overexploitation. The IUCN Red List lists 457 out of 2,143 medicinal plant species as threatened. Efforts have been made to assess and conserve these plants, but there is a need for a more unified approach to conservation to ensure the long-term survival of these valuable resources [1]." (Neelam *et al*., 2021) (Arumugam, 2016) "The Western Ghats and the Eastern Himalayas are two major hotspots in India with a rich diversity of plant species, including endangered plants. A total of 560 plant species in India are listed in the IUCN Red List of Threatened Species, with 247 of them classified as threatened. The IUCN recognizes categories such as critically endangered, endangered, and vulnerable for threatened species. India has a rich biodiversity and ranks first in the percentage of flora containing active medicinal ingredients [2]." (R., 2014)

Studying threatened and endangered plant species is critical for maintaining biodiversity, ecosystem stability, and the overall health of the planet. The insights gained from such studies contribute to conservation efforts, sustainable resource management, and the well-being of both natural ecosystems and human societies. Studying threatened and endangered plant species is of paramount importance due to several ecological, environmental, and socio-economic reasons. Threatened and endangered plant species are often indicators of environmental health. The decline in their populations can signify broader issues within ecosystems. Conservation efforts aimed at these species contribute to the overall preservation of biodiversity, maintaining a balance in ecosystems and ensuring the survival of various interconnected species. Each plant species plays a unique role in its ecosystem, contributing to nutrient cycling, water purification, and habitat provision for other organisms.

The loss of a particular plant species can disrupt these ecological functions, potentially leading to imbalances in the entire ecosystem. Many threatened and endangered plant species have medicinal properties and are valuable sources

of pharmaceutical compounds. Indigenous communities often rely on these plants for traditional medicine, and their extinction could result in the loss of valuable resources for medical research and healthcare. Endangered plants often have cultural and ethnobotanical importance, especially for indigenous communities. These species may be deeply woven into local traditions, rituals, and practices, contributing to the cultural identity of communities.

Threatened and endangered plant species may possess unique genetic traits that are crucial for breeding programs aimed at developing more resilient and adaptable crops. Studying these species helps maintain genetic diversity, providing resources for agriculture and enhancing the resilience of plant populations to changing environmental conditions. Changes in the distribution and abundance of plant species can serve as indicators of climate change impacts.

Studying threatened and endangered species helps researchers understand the effects of climate change on plant populations, guiding conservation strategies and adaptation efforts. Research on endangered plant species contributes to our understanding of plant biology, ecology, and conservation science. The knowledge gained can be used to develop effective conservation strategies and management plans for both endangered and non-endangered species. The presence of threatened and endangered plant species often leads to the establishment of protected areas and conservation policies. Studying these species provides a scientific basis for developing and implementing conservation laws and regulations.

India is home to a significant number of threatened and endangered plant species due to various factors such as habitat loss, deforestation, climate change, and anthropogenic activities. The assessment of threatened plant species is often done by organizations like the Botanical Survey of India (BSI) and the International Union for Conservation of Nature (IUCN). Conservation efforts, including the establishment of protected areas, habitat restoration, and community involvement, play a crucial role in mitigating the threats faced by the endangered plant species in India.

Red Sanders (Pterocarpus santalinus): This tree species is native to the southern parts of India, particularly in the Eastern Ghats. Red Sanders is valued for its rich red wood and has faced threats due to illegal logging. Kokum (Garcinia indica): Kokum is a fruit-bearing tree found in the Western Ghats. It is used for culinary and medicinal purposes. Deforestation and over-exploitation have led to its classification as near-threatened. Pitcher Plant (Nepenthes khasiana): Endemic to the Khasi Hills in Meghalaya, this carnivorous plant is facing threats due to habitat loss and over-collection. It is listed as endangered. Lion's Foot (Parnassia nubicola): Found in alpine meadows of the Himalayas, Lion's Foot is an endangered plant species. It is threatened by habitat destruction and climate change impacts on its high-altitude habitat. Himalayan Yew (Taxus wallichiana): This coniferous tree species, native to the Himalayan region, is known for its taxol-containing bark used in cancer treatment. Over-harvesting for medicinal purposes has led to its endangered status. Andaman Redwood (Pterocarpus dalbergioides): Endemic to the Andaman Islands, this tree species is critically endangered due to habitat loss caused by logging and conversion of land for agriculture. Wild Banana (Musa balbisiana): Found in the Western Ghats, this wild banana species is facing threats from habitat destruction and is categorized as vulnerable. Bamboo Orchid (Arundina graminifolia): Widely distributed across India, this terrestrial orchid species is threatened by habitat loss, particularly due to deforestation. It is listed as near-threatened. Nagaland Bamboo (Bambusa tulda): Endemic to the Northeastern state of Nagaland, this bamboo species is endangered due to habitat loss and over-exploitation for construction purposes. Indian Sandalwood (Santalum album): Known for its aromatic heartwood, sandalwood faces threats from illegal logging and habitat loss. It is categorized as vulnerable.

Methodology

The authors conducted a thorough survey, both online and offline, to evaluate the risk profile of medicinal herbs utilised by vaidhya and traditional practitioners. 12 species were chosen for further exploration throughout this approach. Statistical analysis techniques used to analyze the data.

Threatened and Endangered Plant Species in India

1. *Aucklandia costus*

Image from Google Aucklandia costus

Aucklandia costus, commonly known as Costus or Kuth, is a perennial herb belonging to the Asteraceae family. It is native to the Himalayan region, including parts of India, Nepal, and China. The plant is valued for its medicinal properties, and various parts of the plant, particularly the root, are used in traditional medicine systems.

Description: *Aucklandia costus* is a herbaceous plant that typically grows to a height of about 1 to 1.5 meters. The leaves are large, alternate, and have a serrated margin. Plant produces small, tubular, yellow flowers that are arranged in dense, terminal heads. The root of *Aucklandia costus* is the most valued part of the plant for medicinal purposes. It is aromatic and has a strong, pleasant fragrance.

Medicinal Uses: In traditional medicine, particularly in Ayurveda, the root of *Aucklandia costus* is highly regarded for its medicinal properties. It is used in the treatment of various ailments, including digestive disorders, respiratory

conditions, and as an immune system booster. The root is also known for its anti-inflammatory and anti-spasmodic properties.
Aucklandia costus has cultural and traditional significance in the regions where it is native. It is often incorporated into local healing practices. The plant has a history of use in traditional Tibetan medicine.

Conservation: Due to overharvesting for its medicinal root and habitat loss, *Aucklandia costus* is considered vulnerable in certain regions. Sustainable harvesting practices and conservation efforts are necessary to ensure the long-term survival of the species. Efforts are being made to cultivate *Aucklandia costus* to meet the demand for its medicinal properties and reduce pressure on wild populations.
It's important to note that while *Aucklandia costus* has been used traditionally for medicinal purposes, the use of any medicinal plant should be approached with caution. Consulting with healthcare professionals or practitioners of traditional medicine is advisable before using such herbs for therapeutic purposes. Additionally, conservation efforts are crucial to protect the species and ensure its sustainable use.

2. Gentiana kurroo

Image from Google Gentiana kurroo
Gentiana kurroo, commonly known as Indidan Gentian, Kutki or Kuru, is a perennial herb belonging to the Gentianaceae family. This plant is native to the Himalayan region, particularly found in the alpine and subalpine regions of India, Nepal, and Bhutan. Gentiana kurroo is known for its bitter-tasting roots, which have significant medicinal value in traditional systems of medicine, including Ayurveda.

Description: *Gentiana kurroo* is a low-growing herb with lance-shaped leaves arranged in whorls along the stem. The plant typically reaches a height of about 20-50 cm. The flowers are tubular, trumpet-shaped, and usually blue or violet in color. They are arranged in terminal clusters. The primary medicinal part of the plant is its roots. The roots are long, slender, and known for their intensely bitter taste.

Medicinal Uses: In traditional medicine, especially in Ayurveda, the roots of *Gentiana kurroo* are highly valued for their medicinal properties. Kutki is known for its bitter tonic properties and is used to stimulate appetite and aid digestion. It is traditionally employed in the treatment of liver disorders, fever, jaundice, and respiratory issues. The bitter compounds in the roots are believed to have hepatoprotective (liver-protecting) effects.

Cultural and Traditional Significance: *Gentiana kurroo* has cultural and traditional significance in the regions where it is native. It has been used for centuries in traditional healing practices. The bitter taste is often associated with its therapeutic effects in traditional medicine systems.

Conservation: Due to its medicinal value, there has been increasing demand for *Gentiana kurroo* roots, leading to concerns about overharvesting and unsustainable collection. Conservation efforts, including cultivation and sustainable harvesting practices, are being promoted to ensure the species' survival. Efforts are being made to cultivate *Gentiana kurroo* to meet the demand for its medicinal properties and reduce pressure on wild populations. Cultivation can also help in preserving the genetic diversity of the species. As with any medicinal plant, it's essential to use *Gentiana kurroo* under the guidance of qualified healthcare professionals or practitioners of traditional medicine. Sustainable harvesting practices and conservation measures are crucial to protect the species and its natural habitats.

3. *Aconitum heterophllum*

Image from Google *Aconitum heterophyllum*
Common name – Atis
Family- Ranunculaceae
Aconitum heterophyllum, commonly known as "Ativisha" or "Atees," is an endangered medicinal plant found in the Himalayan region. It holds significant ethnomedical value due to its traditional use in various forms of medicine. Here are some important points:

Traditional Uses: Aconitum heterophyllum has been used in Ayurvedic, Tibetan, and other traditional medicine systems for centuries. It is commonly used to treat fever, digestive disorders, respiratory issues, and as an anti-inflammatory agent.

Active Compounds: The plant contains alkaloids such as atisin, which are believed to contribute to its medicinal properties. These compounds have shown potential analgesic, anti-inflammatory, and antipyretic effects.

Ethnobotanical Importance: Indigenous communities often use Aconitum heterophyllum as part of their traditional healing practices. It is considered a valuable resource for treating a variety of ailments, highlighting its cultural and medicinal significance.

Conservation Concerns: Due to overharvesting and habitat loss, Aconitum heterophyllum is now endangered. Conservation efforts are essential to preserve this plant and its ethnomedical heritage.

Pharmacological Potential: Ongoing research is exploring the pharmacological potential of Aconitum heterophyllum, aiming to validate its traditional uses and discover new therapeutic applications.

4. Rauwolfia serpentine

Image from Google Rauwolfia serpentina
Common name – Sarpgandha
Family – Apocynaceae
Rauwolfia serpentina, commonly known as "Indian snakeroot" or "Sarpagandha," is a significant plant in ethnomedicine and modern pharmacology. Here are the key medicinal uses and conservation aspects of this plant:

Conservation and Ethnomedicinal Importance
Hypertension: *Rauwolfia serpentina* is widely known for its use in treating high blood pressure. The plant's roots contain alkaloids, such as reserpine, which have been historically used to manage hypertension.

Mental Health: The plant has been used in traditional medicine to treat mental health conditions, including anxiety and schizophrenia. Reserpine, one of its primary compounds, has sedative properties and was one of the first drugs used to treat psychotic disorders.

Snake Bites and Insect Stings: Traditionally, the plant has been used as an antidote for snake bites and insect stings, which is reflected in its common name "snakeroot."

Other Uses: It is also used to treat gastrointestinal disorders, insomnia, and as a general tranquilizer. Its roots have been utilized in various formulations in Ayurvedic and other traditional medicine systems.
Overharvesting and Habitat Loss: Due to its extensive use in traditional medicine and pharmaceutical industries, *Rauwolfia serpentina* has been overharvested, leading to a decline in wild populations. Habitat loss due to agricultural expansion and deforestation further threatens its existence.

Ethnomedicinal Significance: The plant has been an integral part of traditional medicine in South Asia for centuries. Its medicinal properties have been well-documented in ancient texts and are still widely recognized today.

Conservation Efforts: Efforts to conserve *Rauwolfia serpentina* include promoting sustainable harvesting practices, cultivation in botanical gardens and farms, and legal protection in some regions to prevent illegal collection. Conservationists also emphasize the importance of preserving traditional knowledge associated with the plant's uses.

Pharmacological Research: Ongoing research continues to explore the full range of therapeutic potential of *Rauwolfia serpentina*, including its efficacy and safety for modern medicinal applications.

5. *Angetica glauca*

Image from google Angetica glauca
Common name – Choraka
Family – Apiaceae
Angelica glauca, commonly known as "Chora" or "Himalayan Angelica," is a medicinal plant native to the Himalayan region. It has significant ethnomedicinal uses and is valued in traditional practices. Here are some key points regarding its medicinal uses and conservation:

Conservation and Ethnomedicinal Importance
Digestive Health: Angelica glauca is traditionally used to treat digestive disorders, including indigestion, flatulence, and stomach cramps. The plant's rhizomes and roots are

commonly used to prepare remedies that stimulate appetite and aid digestion.

Respiratory Issues: The plant is also used to treat respiratory conditions such as asthma, bronchitis, and coughs. It is believed to have expectorant properties that help clear mucus from the respiratory tract.

Anti-inflammatory and Analgesic: *Angelica glauca* has been used as an anti-inflammatory agent to relieve pain and inflammation. This makes it valuable in treating conditions like arthritis and other inflammatory disorders.

Aromatic and Carminative: The essential oils extracted from the plant have aromatic and carminative properties. These oils are sometimes used in aromatherapy and traditional remedies to alleviate stress and anxiety.

Overharvesting: Due to its medicinal value, *Angelica glauca* has been subject to overharvesting in the wild. This practice threatens its natural populations, as the plant is often harvested unsustainably.

Habitat Loss: Habitat destruction due to agricultural expansion, infrastructure development, and climate change poses a significant threat to *Angelica glauca*. The plant's natural habitats in the Himalayan region are increasingly under pressure.

Ethnomedicinal Significance: *Angelica glauca* holds cultural and medicinal importance among indigenous and local communities in the Himalayas. It is a part of traditional healing practices, and its knowledge has been passed down through generations.

Conservation Efforts: Efforts to conserve Angelica glauca include promoting sustainable harvesting techniques, cultivating the plant in botanical gardens and farms, and protecting its natural habitats. Conservationists also emphasize the importance of documenting and preserving traditional knowledge associated with the plant's uses.

Pharmacological Research: Research is ongoing to explore the pharmacological properties of Angelica glauca, including its active compounds and potential therapeutic applications. This research aims to validate traditional uses and discover new medicinal benefits.

6. ***Pittosorum eriocarpum***

Image from google *Pittosporum eriocarpum*
Common name – Doon cheese wood
Family – Pittioraceae
Pittosporum eriocarpum, commonly known as "Pittosporum" or "Cheerful Plant," is a plant species with notable medicinal and ethnomedicinal uses. Although less widely known than some other medicinal plants, it has been used in traditional practices and faces conservation challenges. Here are the key points regarding its medicinal uses and conservation:

Conservation and Ethnomedicinal Importance
Traditional Medicine: *Pittosporum eriocarpum* has been used in traditional medicine for various ailments. The plant's leaves, bark, and other parts have been utilized in herbal remedies.

Antibacterial and Antifungal Properties: The plant is known for its antibacterial and antifungal properties, making it useful in treating infections and skin diseases. It has been used traditionally to prepare topical applications for wounds and skin conditions.

Anti-inflammatory Uses: The plant has been employed to reduce inflammation and pain. It is sometimes used in the treatment of rheumatism and other inflammatory conditions.

Respiratory Ailments: In some traditional practices, *Pittosporum eriocarpum* is used to alleviate respiratory issues such as coughs and colds, likely due to its soothing and expectorant properties.

Conservation Status: Like many medicinal plants, *Pittosporum eriocarpum* faces threats from overharvesting and habitat loss. The growing demand for medicinal plants can lead to unsustainable harvesting practices, which can endanger wild populations.

Habitat Destruction: Deforestation, agricultural expansion, and urbanization contribute to the loss of natural habitats for Pittosporum eriocarpum, further putting its survival at risk.

Ethnomedicinal Significance: The plant holds cultural importance among communities that use it for medicinal purposes. It is part of the ethnomedicinal knowledge passed down through generations, reflecting its role in traditional healing systems.

Conservation Efforts: Efforts to conserve Pittosporum eriocarpum include sustainable harvesting practices, cultivation initiatives, and habitat protection. There is also a focus on documenting traditional knowledge and integrating it with modern conservation strategies.

Research and Documentation: Continued research is needed to better understand the plant's pharmacological properties and potential medicinal applications. Documenting its traditional uses and the knowledge associated with them is crucial for preserving cultural heritage and promoting sustainable use.

7. *Cypripedium cordigerum*

Image from google Cypripedium cordigerum
Common name – Lady's sleeper
Family – orchidaceae
Cypripedium cordigerum, commonly known as "Heart-Leaf Lady's Slipper," is a species of orchid that has been traditionally used in various medicinal practices. Here are key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance
Traditional Medicine: *Cypripedium cordigerum* has been utilized in traditional medicine systems, particularly in Tibetan and Himalayan practices. It has been used for its purported calming and sedative effects, often as a treatment for anxiety, insomnia, and nervous disorders.

Menstrual Disorders: The plant has been used traditionally to address menstrual irregularities and discomfort, due to its potential effects on the hormonal system.

Aphrodisiac Properties: In some traditional contexts, *Cypripedium cordigerum* has been considered to have aphrodisiac properties and has been used to enhance libido and treat sexual dysfunction.
Pain Relief: The plant has been employed to relieve pain, including headaches and general body aches, leveraging its purported analgesic properties.

Endangered Status: *Cypripedium cordigerum* is considered endangered due to overharvesting, primarily driven by its medicinal value, and habitat destruction. The delicate nature of orchid habitats, often in specific and fragile ecosystems, makes them particularly vulnerable.

Habitat Loss: The natural habitats of *Cypripedium cordigerum*, which include alpine and subalpine regions, are threatened by human activities such as agriculture, deforestation, and climate change.

Ethnomedicinal Significance: The plant holds significant ethnomedicinal value among indigenous and local communities in its native range. It is part of the cultural heritage and traditional healing practices of these regions.

Conservation Efforts: Conservation strategies for *Cypripedium cordigerum* include habitat protection, regulation of harvesting practices, and propagation initiatives, such as cultivating the plant in botanical gardens and nurseries to reduce pressure on wild populations.

Legal Protection: In some areas, *Cypripedium cordigerum* is protected under national and international laws, which regulate its collection and trade to prevent overexploitation and ensure the species' survival.

Research and Documentation: Continued research into the pharmacological properties of *Cypripedium cordigerum* is important for validating its traditional uses and discovering potential new applications. Documenting traditional knowledge associated with the plant can also support conservation efforts by highlighting its cultural and medicinal importance.

8. *Dalbergia latifolia*

Image from google ***Dalbergia latifolia***
Common name – Indian Rose wood
Family – Fabaceae
Dalbergia latifolia, commonly known as "Indian Rosewood" or "East Indian Rosewood," is a hardwood tree species native to India and Southeast Asia. While it is primarily known for its high-quality timber, it also has some traditional medicinal uses. Here are the key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance
Traditional Medicine: *Dalbergia latifolia* has been used in traditional medicine, particularly in Ayurveda, for various purposes. The bark, leaves, and wood of the tree have been utilized for their purported medicinal properties.

Antibacterial and Antifungal Properties: Extracts from the bark and leaves of *Dalbergia latifolia* have been traditionally used to treat infections, owing to their antibacterial and antifungal properties. These extracts are sometimes applied to wounds to prevent infection.

Anti-inflammatory and Analgesic: The plant is believed to possess anti-inflammatory and analgesic properties, which makes it useful in treating conditions like arthritis, joint pain, and muscle aches.

Gastrointestinal Issues: In some traditional practices, the bark of *Dalbergia latifolia* is used to address digestive issues, including stomach aches and dysentery.

High-Value Timber: *Dalbergia latifolia* is highly valued for its dense, durable, and beautifully grained wood, which is used in high-quality furniture, musical instruments, and luxury items. This has led to extensive logging and exploitation, contributing to its decline in the wild.

Overharvesting and Illegal Trade: The demand for Indian Rosewood has led to overharvesting and illegal logging, exacerbating the decline of natural populations. The species is listed under CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), restricting international trade to prevent further exploitation.

Habitat Loss: In addition to overharvesting, habitat loss due to agriculture, urbanization, and deforestation poses a significant threat to *Dalbergia latifolia*. Its natural habitats are being increasingly fragmented and degraded.

Ethnomedicinal Significance: The traditional medicinal uses of *Dalbergia latifolia* are an important aspect of its cultural heritage. Indigenous and local communities have long used the plant in their traditional healing practices.

Conservation Efforts: Conservation strategies include sustainable management and harvesting practices, reforestation, and plantation programs to reduce pressure on wild populations. There is also a focus on enforcing legal protections and preventing illegal trade.

Research and Sustainable Use: Continued research into the medicinal properties of *Dalbergia latifolia* can help validate its traditional uses and potentially discover new applications. Sustainable use practices are essential to balance the demand for its timber and medicinal properties with the need for conservation.

9. ***Ulmus wallichiana***

Image from google ***Ulmus wallichiana***

Common name – Kashmir Elm

Family – Ulmaceae

Ulmus wallichiana, commonly known as "Himalayan Elm" or "Indian Elm," is a tree species native to the Himalayan region. It is recognized for its traditional medicinal uses and faces conservation challenges. Here are the key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance

Traditional Medicine: *Ulmus wallichiana* has been used in various traditional medicine systems, including Ayurvedic and Tibetan medicine. The bark, leaves, and other parts of the tree are utilized for their medicinal properties.

Anti-inflammatory and Analgesic: The bark of *Ulmus wallichiana* is known for its anti-inflammatory and analgesic properties. It is traditionally used to treat conditions like arthritis, joint pain, and muscle aches.

Respiratory Ailments: The tree's bark is used in traditional medicine to treat respiratory conditions, such as coughs, bronchitis, and asthma. It is believed to have expectorant properties that help clear the respiratory tract.

Digestive Health: *Ulmus wallichiana* has been used to treat digestive disorders, including diarrhea, dysentery, and indigestion. The mucilaginous extracts from the bark are soothing and can help alleviate gastrointestinal discomfort.

Skin Conditions: The bark and leaves are sometimes used in traditional remedies for skin conditions, such as wounds, burns, and ulcers, due to their purported healing and protective properties.

Overharvesting: The medicinal value of *Ulmus wallichiana* has led to overharvesting, which poses a threat to its wild populations. The bark is particularly targeted, often leading to the death of the tree if harvested unsustainably.

Habitat Loss: Habitat destruction due to deforestation, agricultural expansion, and urban development also threatens *Ulmus wallichiana*. The tree's natural habitat in the Himalayan region is being increasingly fragmented.

Ethnomedicinal Significance: The tree holds significant cultural and medicinal value among indigenous and local communities in the Himalayas. Its use in traditional healing practices is an important part of the ethnomedicinal heritage of these regions.

Conservation Efforts: Conservation efforts for *Ulmus wallichiana* include promoting sustainable harvesting practices, establishing protected areas, and conducting reforestation programs. These measures aim to preserve the species and its habitat.

Research and Documentation: Continued research into the pharmacological properties of *Ulmus wallichiana* is important to validate its traditional uses and explore new medicinal applications. Documenting traditional knowledge associated with the plant can support conservation efforts and promote sustainable use.

Climate Change Impact: Climate change poses additional threats to *Ulmus wallichiana*, potentially altering its habitat range and affecting its growth patterns. Conservation strategies must consider the impacts of climate change to ensure the long-term survival of the species.

10. *Cinnamomum zeylanicum*

Image from google Cinnamomum zeylanicum
Common name- Dalchini
Family- Lauraceae
Cinnamomum zeylanicum, commonly known as "Ceylon Cinnamon" or "True Cinnamon," is a spice tree native to Sri Lanka and southern India. It is well-known for its aromatic bark, which is used as a spice and in traditional medicine. Here are key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance
Antioxidant Properties: *Cinnamomum zeylanicum* is rich in antioxidants, which help protect the body from oxidative stress and free radical damage. These properties contribute to its potential health benefits.

Anti-inflammatory and Antimicrobial: The essential oils and compounds in cinnamon, such as cinnamaldehyde, have anti-inflammatory and antimicrobial effects. This makes it useful in treating infections and inflammatory conditions.

Blood Sugar Regulation: Cinnamon is traditionally used to help regulate blood sugar levels. Some studies suggest that it may improve insulin sensitivity and lower blood glucose levels, making it beneficial for people with diabetes or insulin resistance.

Digestive Health: Cinnamon has carminative properties, which help relieve gas and bloating. It is also used to treat digestive disorders such as indigestion, nausea, and diarrhea.

Heart Health: The consumption of cinnamon has been associated with cardiovascular benefits, such as lowering blood pressure and cholesterol levels. This contributes to its use in promoting heart health.

Respiratory Ailments: Cinnamon is used in traditional remedies for respiratory conditions like coughs, colds, and bronchitis, often in the form of teas or inhalations.

Overharvesting and Sustainability: The high demand for Ceylon cinnamon, both as a spice and for its medicinal properties, has led to concerns about overharvesting and sustainability. Ensuring sustainable cultivation practices is crucial for preserving the species.

Habitat Conservation: *Cinnamomum zeylanicum* is native to Sri Lanka's tropical forests, which are under threat from deforestation and land conversion for agriculture. Protecting these habitats is vital for the conservation of the species.

Cultural and Economic Significance: Cinnamon has significant cultural and economic importance in Sri Lanka and surrounding regions. It has been used for centuries in traditional medicine, cuisine, and rituals, and is a major export product.

Biodiversity Conservation: Preserving *Cinnamomum zeylanicum* contributes to broader biodiversity conservation efforts, as it is part of the unique ecosystem of the Sri Lankan rainforests.

Research and Documentation: Continued research into the medicinal properties of *Cinnamomum zeylanicum* can help validate traditional uses and explore new health benefits. Documenting traditional knowledge and practices related to cinnamon can support sustainable use and conservation efforts.

Climate Change Impact: Climate change poses potential risks to the cultivation and growth of *Cinnamomum zeylanicum*, as changes in temperature and rainfall patterns can affect its habitat and productivity. Conservation strategies must account for these factors to ensure the long-term sustainability of the species.

11. *Dioscoria belophylla*

Image collected from google Dioscoria belophylla
Common name – Turar
Family- Dioscoreaceae
Dioscoria belophylla, commonly known as "Wild Yam," is a species of yam found in the Indian subcontinent. It is known for its medicinal properties and traditional uses. Here are the key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance
Anti-inflammatory and Analgesic: *Dioscoria belophylla* is traditionally used to treat inflammatory conditions and pain. Its tubers are believed to possess anti-inflammatory and analgesic properties, making them useful for conditions like arthritis and rheumatism.

Digestive Health: The tubers of *Dioscoria belophylla* are used to aid digestion and treat gastrointestinal issues such as dysentery, diarrhea, and stomach cramps. They are considered to have soothing effects on the digestive tract.

Hormonal Balance: Like other species in the Dioscorea genus, *Dioscoria belophylla* contains compounds that can influence hormonal balance. It has been used traditionally to address menstrual disorders, including irregular menstruation and menopausal symptoms.

Nutritional Value: The tubers are also a source of nutrition, providing carbohydrates and some vitamins and minerals. In some regions, they are consumed as a food source during periods of scarcity.

Overharvesting: Due to its medicinal and nutritional value, *Dioscoria belophylla* faces the threat of overharvesting. Unsustainable collection practices, particularly for its tubers, can deplete natural populations and threaten the species' survival.

Habitat Loss: Habitat destruction, including deforestation and agricultural expansion, poses a significant threat to *Dioscoria belophylla*. Its natural habitats are often disrupted or destroyed, leading to a decline in its populations.

Ethnomedicinal Significance: *Dioscoria belophylla* holds cultural and medicinal importance in many indigenous and local communities. It is part of traditional knowledge systems and is used in various healing practices.

Conservation Efforts: Conservation efforts for *Dioscoria belophylla* include promoting sustainable harvesting techniques, cultivating the plant in controlled environments, and protecting its natural habitats. There is also a need to raise awareness about the importance of the species and the risks associated with overexploitation.

Research and Documentation: Continued research into the pharmacological properties of *Dioscoria belophylla* is important to validate its traditional uses and explore potential new applications. Documenting traditional knowledge related to the plant can support conservation and sustainable use initiatives.

Legal and Policy Measures: Implementing legal protections and policy measures to regulate the collection and trade of *Dioscoria belophylla* can help prevent overharvesting and ensure its conservation.

12. *Gloriosa superba*

Gloriosa superba
Common name – Glory lily
Family – Colchicaceae
Gloriosa superba, commonly known as "Glory Lily" or "Flame Lily," is a climbing plant native to tropical regions of Africa and Asia. It is known for its striking flowers and medicinal properties, but also poses significant conservation concerns due to overharvesting and habitat loss. Here are the key points regarding its medicinal uses and conservation status:

Conservation and Ethnomedicinal Importance
Anticancer Properties: *Gloriosa superba* contains colchicine and related alkaloids, which have been used in the treatment of gout and as a component in chemotherapy drugs for certain types of cancer. These compounds interfere with cell division, making them useful in controlling the proliferation of cancer cells.

Anti-inflammatory and Pain Relief: The plant is used in traditional medicine for its anti-inflammatory and analgesic properties. It is applied topically to relieve pain and reduce inflammation in conditions such as arthritis and other inflammatory disorders.

Antifungal and Antibacterial: Extracts from *Gloriosa superba* have shown antifungal and antibacterial properties, making it useful in treating various infections and skin diseases.

Treatment of Gout: The colchicine in *Gloriosa superba* is a well-known treatment for gout, helping to alleviate the symptoms by reducing inflammation and pain associated with uric acid crystal accumulation in the joints.

Use in Traditional Medicine: In various traditional medicine systems, the plant is used to treat a range of conditions including digestive disorders, respiratory issues, and skin diseases. It is also sometimes used as a purgative and anthelmintic (to expel parasitic worms).

Toxicity and Precaution: While *Gloriosa superba* has medicinal uses, it is also highly toxic. Ingestion of even small amounts can be fatal, causing symptoms such as nausea, vomiting, diarrhea, and multi-organ failure. Proper identification and careful handling are crucial.

Overharvesting: The plant is threatened by overharvesting due to its medicinal value, particularly for its tubers which contain the active alkaloid colchicine. Unsustainable harvesting practices can lead to the depletion of wild populations.

Habitat Loss: Habitat destruction, including deforestation, agricultural expansion, and urbanization, poses a significant threat to the natural populations of *Gloriosa superba*. This is especially concerning in its native habitats in Africa and Asia.

Ethnomedicinal Significance: *Gloriosa superba* holds significant cultural and medicinal importance in many regions where it is found. It has been used in traditional healing practices for centuries, and this traditional knowledge is an important aspect of its conservation.

Conservation Efforts: Conservation strategies for *Gloriosa superba* include promoting sustainable harvesting methods, cultivating the plant in botanical gardens and farms, and protecting its natural habitats. Some regions have implemented legal protections to regulate its collection and trade.

Research and Sustainable Use: Ongoing research into the pharmacological properties of *Gloriosa superba* aims to better understand its medicinal potential and ensure safe and effective use. Sustainable use practices and public education are essential to prevent accidental poisoning and ensure the plant's conservation.

Conservation Efforts

India possesses several laws and policies designed to safeguard plant biodiversity, including; The Biological Diversity Act of 2002 creates a three-tiered institutional framework for the management of biodiversity protection initiatives. The framework comprises the National Biodiversity Authority (NBA), State Biodiversity Authorities (SBAs), and Biodiversity Management Committees (BMCs). The legislation also fosters just and equitable benefit-sharing for local communities, indigenous populations, and custodians of traditional knowledge.

The Wild Life (Protection) Act, 1972 defines protected zones for wildlife and imposes penalties for the killing of specific species. Wetland Conservation and Management Regulations, 2010, safeguard the wetlands in India. The Centrally Sponsored Scheme of the National Plan for Conservation of Aquatic Ecosystems assists states in the management of wetlands, including Ramsar sites. The Wildlife Crime Control Bureau addresses illicit wildlife trafficking, encompassing endangered species.

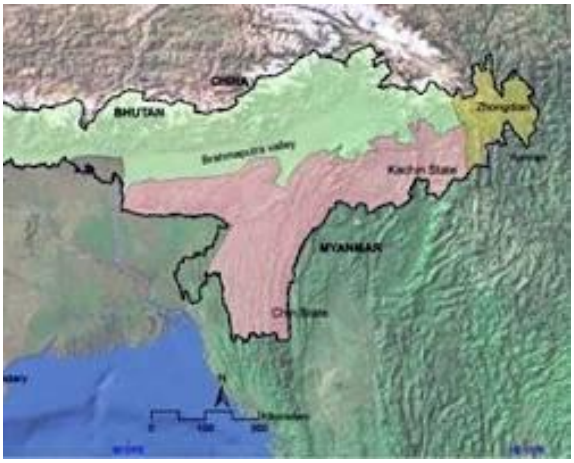
Establishment of protected areas and botanical gardens

Plant Protected Areas

Western Ghats: This UNESCO World Heritage Site is home to a wide range of endemic plant species, including orchids, ferns, and bamboo.

Western Ghats, India

Eastern Himalayas: Another UNESCO World Heritage Site, this region is known for its diverse alpine and subalpine flora, including rhododendrons, junipers, and medicinal herbs.



Eastern Himalayas, India

Sundarbans: The world's largest mangrove forest, located in the delta region of the Ganges, Brahmaputra, and Meghna rivers. It is home to a variety of mangrove species and is a UNESCO World Heritage Site.

Sundarbans, India

Nilgiri Hills: This mountain range in South India is home to a unique plant species, the Nilgiri tahr, and is a UNESCO World Heritage Site.

Nilgiri Hills, India

Pilikula Nisargadhama: This nature park in Karnataka is home to a variety of plant species, including medicinal plants, and is a popular tourist destination.

Pilikula Nisargadhama, India
Botanical Gardens:
Acharya Jagadish Chandra Bose Indian Botanic Garden: Located in Kolkata, this is one of the oldest botanical gardens in India, established in 1787. It is home to a diverse collection of plants, including the Great Banyan Tree, the largest banyan tree in the world.

Acharya Jagadish Chandra Bose Indian Botanic Garden, Kolkata
Lalbagh Botanical Garden: Located in Bangalore, this botanical garden is famous for its glasshouse, which houses a collection of tropical plants.

Lalbagh Botanical Garden, Bangalore
National Botanical Research Institute: Located in Lucknow, this institute is involved in research on plant taxonomy, ecology, and conservation.

National Botanical Research Institute, Lucknow
Government Botanical Garden: Located in Ooty, this botanical garden is known for its collection of orchids and other alpine plants.

Government Botanical Garden, Ooty
Jawaharlal Nehru Tropical Botanic Garden and Research Institute: Located in Thiruvananthapuram, this institute is involved in research on tropical plants and their conservation.

Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Thiruvananthapuram
These are just a few examples of the many important plant protected areas and botanical gardens in India. These places play a vital role in conserving India's rich plant biodiversity and promoting awareness about the importance of plants.

Efforts to promote ex situ conservation (e.g., seed banks, tissue culture)

Ex situ conservation, which involves preserving plant species outside their natural habitats, plays a crucial role in India's efforts to safeguard its rich plant biodiversity. Here are some prominent examples of ex situ conservation methods employed in India:

Seed Banks

National Bureau of Plant Genetic Resources (NBPGR): Located in New Delhi, NBPGR is India's premier institution for germplasm conservation. It maintains a vast collection of seeds from various plant species, including crops, wild relatives, and endangered species.

Regional Plant Genetic Resources Centers (RPGRCs): These centers are established across different regions of India to collect, conserve, and distribute germplasm specific to their localities.

International Rice Research Institute (IRRI): Based in the Philippines, IRRI maintains a global rice germplasm bank, including a significant collection of Indian rice varieties.

Tissue Culture

National Institute of Plant Genome Research (NIPGR): Located in Delhi, NIPGR conducts research on plant genomics and employs tissue culture techniques for the propagation and conservation of endangered plant species.

Botanical Survey of India (BSI): The BSI maintains herbaria and botanical gardens across India and uses tissue culture for the propagation of rare and endangered plants.

Various Universities and Research Institutions: Many universities and research institutions in India have tissue culture laboratories that work on the conservation of specific plant species.

Botanical Gardens and Arboreta

National Botanical Research Institute (NBRI): Located in Lucknow, NBRI maintains a vast collection of plants and uses ex situ conservation techniques, including seed storage and tissue culture.

Botanical Garden, Ooty: This garden is known for its collection of alpine plants and uses ex situ conservation methods to preserve rare species.

Indian Botanical Garden, Kolkata: This historic garden houses a diverse collection of plants and has played a significant role in plant conservation efforts.

Challenges and Future Directions

Despite these efforts, ex situ conservation in India faces several challenges, including limited resources, lack of awareness, and the difficulty of maintaining genetic diversity. Future directions include: Strengthening existing seed banks and tissue culture facilities: Investing in infrastructure and technology to ensure long-term viability of germplasm.

Promoting public awareness: Raising awareness about the importance of plant biodiversity and ex situ conservation.

Developing new technologies: Exploring innovative techniques like cryopreservation and DNA banking for more efficient and effective conservation.

Collaborating with international organizations: Partnering with institutions like the Millennium Seed Bank Project to share knowledge and resources.

By addressing these challenges and implementing effective ex situ conservation strategies, India can safeguard its rich plant biodiversity for future generations.

Discussion and Conclusions

This endangered species survey of specific plants provides a comprehensive overview of diverse flora, its significance in traditional medicine, and the threats it faces. India is a mega-biodiverse country with various biogeographic zones, each characterized by distinct flora. The country has a long tradition of using plants for medicinal purposes, and the Ayurvedic system of medicine relies heavily on these plants. However, many plant species in India are facing the threat of extinction due to deforestation, habitat destruction, and climate change. Conservation efforts are in place to protect and preserve the country's diverse flora.

The present review paper also discusses the importance of studying threatened and endangered plant species. It highlights the ecological, environmental, and socio-economic reasons for preserving these species. These species play crucial roles in ecosystems, provide medicinal resources, and have cultural significance. The paper also discusses the threats faced by these species, such as habitat loss, deforestation, and climate change. Conservation efforts, including habitat restoration, community involvement, and protected areas, are crucial for mitigating these threats.

Further it was concluded by providing examples of threatened and endangered plant species in India, including Red Sanders, Kokum, Pitcher Plant, Lion's Foot, Himalayan Yew, Andaman Redwood, Wild Banana, Bamboo Orchid, Nagaland Bamboo, Indian Sandalwood, *Aucklandia costus*, *Gentiana kurroo*, *Aconitum heterophyllum*, *Rauwolfia serpentina*, *Angelica glauca*, *Pittosporum eriocarpum*, *Cypripedium cordigerum*, *Dalbergia latifolia*, *Ulmus wallichiana*, and *Cinnamomum zeylanicum*.

By this review research work we provided a valuable overview of India's plant biodiversity, its significance, and the challenges it faces. It emphasizes the importance of conservation efforts to protect these valuable resources for future generations. The paper evoked a potential implications for policy-making and management strategies.

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