

Introduction about the Botanic Garden & Conservation of Medicinal Plants



Introduction about the Botanic Garden

A Botanic Garden is an open museum of living collection of myriad of plants, where trees, shrubs, herbs, climbers, lianas etc. are scientifically arranged, properly labelled based on an internationally accepted classification, and more closely allied groups/plants are specially grown together for better understanding of species. Unlike parks, in Botanic Gardens trees conserved in Arboretum, Gymnosperms and Pine trees are grown in Pinetum, Pandanus (screw pine) in Pandanetum, orchids in Orchidarium, bamboos in Bambusetum, palms in Palmetum, cactus in Cactarium etc.

Primarily, the earlier Botanic Gardens were set up with a role to introduce, grow and multiply important economic plants from around the globe and to carry out acclimatization study in different trial plots so as to release for cultivation in newer areas. Further emphasise was given to develop improved varieties of economically important plants of the region for commercial exploitation by conducting various horticultural researches such as hybridization, selection, cross pollination, trial etc. It also acts as a data base of plants and a living repository of native and exotic species. Comparative study of living and preserved herbarium specimen also being made through Botanic Garden for clear understanding of particular species and further taxonomic advancement.

At present there are about 2000 Botanic Gardens in the world and India having about 120 (including university, municipal and regional gardens) among that the Indian Botanic Garden (IBG), Howrah formerly known as 'Company Bagan', the Royal Botanic Garden, Kolkata, at present AJC Bose Indian Botanic Garden (AJCBIBG), Howrah, is one of the best landscaped gardens in the world. The original history of IBG is almost similar to the Kew Garden in England which is situated on the bank of the river Thames, a few miles away from London. The Kew garden is about 50 years younger to IBG, Howrah which owes its interests in the Botany of Royalty but the latter has been established with economic and scientific aims. The Kew garden started initially with a meagre area of 15 acres of land in 1841 and during the course of time it grew further under the hands of a well-known botanist Sir William Hooker, the first director of Royal Botanic Garden, Kew and now it possesses 288 acres. The Royal Botanic Garden, Kolkata, on the contrary, situated on the bank of river Hooghly a few kilometres away from Kolkata, established by Col. Robert Kyd in 1787, in a vast area of about 300 acres of land and it was regarded as the largest and one of the oldest botanic gardens in the world till the middle of 19th century and now occupies an area of 273 acres.



The Great Banyan Tree of AJCBIBG, Howrah



The Kyd's Monument at AJCBIBG, Howrah

Currently, the garden with an area of 273 acres and being a living repository of 1377 species of plants possesses 25 divisions and 24 interconnected lakes, and the lakes are connected to the Ganges through sluices for the regular inlet and outlet of water. The garden is a unique place of learning & rich array of curiosity and occupies matchless

attractions like the 'Great Banyan Tree', a living wonder in the plant kingdom; the Large Palm House containing rich collection of palms including *Lodoicea maldivica* (the Double Coconut palm); Branching palm (*Hyphane thebaica*) introduced from Egypt; The century Palm (*Corypha macropoda*) ; The Giant Water Lily (*Victoria amazonica*) brought from Amazon river; The queen of flowering trees (*Amherstia nobilis*) a native of Burma; The mountain rose or Venezuelan rose (*Brownea* sp.); The Baobab tree or Kalpavriksh (*Adansonia digitata*) native of Africa; The Rosogolla tree (*Chrysohyllum cainito*); The Cannon ball tree (*Couroupita guianensis*); The African Sausage tree (*Kigelia pinnata*) and the mad tree (*Pterigota alata* var. *irregularis*); The 'Candle Stick Tree' (*Permentiera cereifera*) etc., are a few to mention.

Right now, Acharya Jagadish Chandra Bose Indian Botanic Garden is taken as a centre of conservation of plant resources from their extinction. This garden serves as a living repository of plants of a country and also of selected exotic species, and a 'safe abode' for the rare and endemic plants. As a result, it houses the germ plasm collection of selected economic, ornamental and medicinal plants and their wild progenitors. The garden also acts to promote educational programmes in order to generate awareness about the value of trees and other curious, beautiful, interesting plants with delightful landscaping and display. This garden also organises flower, foliage and plant shows etc.; exchange of viable seeds, seedlings and other propagules as well. As a whole, this garden acts as a data bank of information and documentation on holdings in the botanic garden.

During the time of establishment of this Garden in 1787, Bengal was reeling through the aftermath of 'Great Bengal Famine' and subsequent failure of crops. So the garden played a greater role for introduction of many crops and economic plants like Tea, Coffee, Mahogany, Teak, Cardamom, Cinchona, Cinnamon, Cotton, Indigo, Nutmeg, Pepper, Clove, Sugarcane, Potato, Sago, Cocoa etc., and other species used as food, vegetable, fodder, oil, fruit, fibre, timber and ornamental plants were first introduced into this historic Garden. Multiplication of most of the introduced species carried out in the Garden itself and distributed to different parts of the country for commercial cultivation. Such a way this garden has helped for the economic development of the country.

Medicinal Plants : A Must to Conserve

According to Charaka, the great ancient Indian physician, "A medicine in the hands of incompetent physician becomes a poison whilst in the hands of a gifted physician becomes a powerful medicine". Further, Ashtanga Hridaya (ancient Indian ayurvedic text book) reads as "there is nothing in the universe which is non-medicinal". It is now very clear that no plants in the world are left out without any medicinal value. However some plants are more useful and effective in treating specific ailments than the others. Some plants are used as single remedies, while some are in combinations.

There are about 8000 (out of 17,564) spp of plants found in India. Out of which 4635 sps are being used by the Ethnic Communities, 2000 sps in Unani, Tibetan, Siddha etc., 1800 spp in Ayurvedic system, 500 in Homoeopathy, 4700 by the Folk.

West Bengal possesses more than 700 species covering aromatic plants, spices and herbal vegetables of which about 75 species are known to be commercially operated, either collected from Nature or cultivated.

Considering the importance of medicinal plants AJC Bose Indian Botanic Garden(AJCBIBG), Howrah established a medicinal garden named as 'Charaka Udyan' way

back in 1990. At present 140 medicinal plants are conserved in the 'Chraka Udyan' of AJCBIBG.

Let us examine some of the important medicinal plants we use for treating various ailments.

1. Vasaka, Bakas (Justicia adhatoda L) :

Nature: Dense evergreen erect shrub attaining a height of 1.2 to 2.5 m

Occurrence: Throughout Sub-Himalayan region and Western Ghats

Parts used: Leaves, roots and flowers.

Uses: The leaves (contain viscine) are antiseptic used in Cough, Bronchitis and Asthma. Also used in Rheumatism and as insecticidal. Crude extract of the leaf is more useful for respiratory ailments. Leaves are also used in Homeopathy for colds, coughs, pneumonia, spitting of blood, fever, jaundice etc. Roots are antiseptic and expectorant used in cough, asthma and intermittent fever. Flowers are used as antiseptic.



Justicia adhatoda L - Plant



Medicine from Vasaka

2. Tulsi – Sacred basil (Ocimum sanctum L) :

Nature: Erect much branched herb about 30-90 cm height. Stems and branches are covered with hairs.

Occurrence: Throughout India, wild and cultivated, native to the Indian subcontinent.

Parts used: Whole plant, roots, seeds, leaves and flowers.

Uses: Leaves and seeds contain lot of essential oils like Phenols and Aldehydes etc. Leaves also contain Ascorbic acid and Carotene. The plant is considered as expectorant, diuretic, anti-septic and cardiac stimulant also effective in Bronchitis. The root decoction is given in malarial fever. The juice of leaves is dropped into ears as a remedy in earache. The flowers with honey, ginger and onion juice are used in cough as expectorant.



Tulsi-Habit



Tulsi-leaves



Tulsi-drug

3. Ghrita Kumari – Indian Aloe (Alo barbedensis Mill. Syn. A.vera) :

Nature: A perennial and succulent herb about 30-60 cm high. Stem short, thick and somewhat divided

Occurrence: Found in a semi-wild state in all parts from dry westward valleys of Himalayas to Western Ghats. Also planted in Gardens.

Parts used: Pulp, expressed and dried juice of leaves, roots etc.

Uses: The pulp and leaf of aloe contains barbaloin aloe and many other useful

compounds. The plant is used in menstrual diseases and stomach pain, as a tonic after pregnancy, in fever and in uterine disorders. The mucilage is used in painful inflammation. The dried juice is given in constipation and fresh juice as cooling is given in fevers. Aloe meat is eaten to alleviate colds and with salt to keep blood in good condition and to relieve constipation. Aloe extract and vitamin therapeutically are used for glaucoma patients. The plant is also used as antiseptic, germicidal and blood purifier and in chronic ulcers to stimulate healing. The roots of aloe are used in colic pain.



Aloe barbedensis- Habit



Cut leaf portion



Flower

4. **Brahmi, Brihmi sak – Water hyssop [Bacopa monnieri (L.) Wettst.] :**

Nature: A perennial herb, creeping-ascending and glabrous about 60-90 cm high. The flowers are white or tinged with purple axillary or solitary.

Occurrence: Found in marshy, damp and wet areas throughout India.

Parts used: Whole plant, juice, stem and leaves.

Uses: Famous for memory power; the whole plant is nerve tonic, diuretic and aperients and is used in insanity, epilepsy, asthma and harshness. The juice of the plant is mixed with petroleum is applied in rheumatism. The leaves alone fried in butter are given to relieve hoarseness and their powder is said to be very effective in asthenia. The stem and leaves are useful in stopping excess urination. The plant is often confused with Centella asiatica (Dankuni patta).



Bacopa monnieri – Habit



Memory pills

5. **Bach, Vaca - Sweet flag plant (Acorus calamus L.) :**

Nature: It is an aromatic marsh herb, with creeping, branching, and rhizome. Leaves distichous, ensiform about 1 m high, flowers minute.

Occurrence: Probably a native of India grows in marshy areas and swamps throughout India.

Parts used: Rhizome (dried and fresh)



Acorus calamus - Habit



Inflorescence



Dried Rhizome

Uses: Rhizome contains an essential oil with β -asarone as major constituent. The rhizome is expectorant, laxative, diuretic, carminative and anthelmintic. It is used as a remedy for sore throat, asthma and bronchitis; good for diseases of the mouth; useful in general weakness, stomatitis, toothache, inflammations, pains in the liver and the chest, kidney troubles, leucoderma, remedy for flatulence, colic or dyspepsia. It is also used in remittent fevers; useful remedy for dysentery and diarrhoea of children. The Chinese believes the rhizome to be beneficial for cancer.

6. Nayantara, Nityakalyani, Sadabahar-Madagascar periwinkle [Catharanthus roseus (L.) G. Don] :

Nature: An erect handsome perennial herb, 50-70cm height. The flowers are white or deep-rose coloured and are borne in axillary clusters.

Occurrence: Native of Madagascar, now commonly grown in India.

Parts used: Roots, leaves and whole plant.



Catharanthus roseus- Rose Shade



Catharanthus roseus- White shade



Fruits & seeds

Uses: The roots are sedative and tranquiliser, bitter, acidic and stomachic and are used as tonic. The leaves in the form of an infusion are administered in menorrhagia and their juice good for wasp stings. The whole plant is hypotensive, sedative and tranquiliser and as used as safe remedy for diabetes. An extract from the plant has shown growth inhibitory effect in human tumours.

7. Kalmegh, Kiryat- King of bitter [Andrographis paniculata (Burm.f) Wall.ex Nees] :

Nature: An erect and branched annual herb with 4-angled branches and about 30-90 cm height. Flowers are small and solitary arranged in axillary and terminal racemes or panicles.

Occurrence: Found throughout the plains of India and sometimes cultivated.

Parts used: Leaves, Whole plant dried.



Andrographis paniculata- Habit



Drug from Andrographis paniculata

Uses: The plant is considered febrifuge, tonic, alterative and anthelmintic and is used in Debility, Dysentery and Dyspepsia. An infusion of the plant is given in fever. Besides, the plant is also used in Spleen complaints, Colic, Strangulation of intestine, Constipation, Diarrhea, Cholera etc. The plant is also used as blood purifier in Unani medicine.

8. Bhui amala, Bhumyamalaki - (Phyllanthus niruri L) :

Nature: An erect and glabrous annual herb about 10-30 cm high. The flowers are

axillary and yellowish or whitish.

Occurrence: Common throughout India up to 917 m.

Parts used: The whole plant leaves, shoot and root.



Phyllanthus niruri- Habit



Close view-Leaf



Drug from Phyllanthus niruri

Uses: The whole plant is antipyretic, antiseptic, astringent, cooling, diuretic and useful in treating gastro intestinal problems as colic, diarrhoea, dysentery, dyspepsia, gonorrhoea, menorrhagia and Jaundice. The decoction of the plant is given in Jaundice. The leaves crushed and mixed with salt applied locally to skin affections, swellings and ulcers in the form of a bandage.

9. Ashok- Ashoka tree [*Saraca asoka* (Roxb.) De Wilde] :

Nature: A small evergreen tree about 5-8 m height. The bark dark brown to grey and sometimes black. Flowers orange or light yellow very fragrant. Pods are flat, oblong, woody.

Occurrence: It grows wild along streams or in shady evergreen forest up to an altitude of 750m in Central and Eastern Himalayas as well as Western Ghats in India.

Parts used: Bark, flowers and seeds.



Asoka tree in flowering



Close view of flower



Young fruits

Uses: The stem bark is used to cure Colic, Dysentery, and Dyspepsia, Piles, Ulcers and uterine problems, particularly in menorrhagia due to uterine fibroids, leucorrhoea and menstrual pain. The flowers are crushed and used in blood dysentery, diabetes, as excellent uterine tonic. The seeds are considered diuretic and their powder is used in various medicines. Ashokarishtam is made out of the bark of Ashok.

10. Arjun, Arjuna- Arjun tree (*Terminalia arjuna* (Roxb.) W.& A. :

Nature: A large tree often with buttressed trunk, smooth grey bark and drooping branchlets about 20-25 m high. The flowers are yellowish white and are borne in short paniced spikes.



Terminalia arjuna-Habit



Fruits



Flowers

Occurrence: It is common on the banks of rivers, streams and dry water courses in Sub-Himalayan tract and Central and South India and in West Bengal.

Parts used: Fruits, leaves and bark.

Uses: The fruits are used as tonic and deostruent. Externally, leaves are used as a cover on sores and ulcers and their juice is used in earache. The bark is antidyseric, antipyretic, astringent, cardi tonic. The powder of the bark acts as a diuretic in cirrhosis of liver and gives relief in symptomatic hypertension. The extract of the bark is used for cleaning sores, ulcers and cancers etc. The ashes of the bark are prescribed in scorpion bites.

Some Threatened / Endangered Medicinal plants :

1. Sarpagandha, Chandra- Serpentina (*Rauvolfia serpentina* Benth.ex Kurz :

Nature: An erect, glabrous perennial herb or under shrub. Leaves are in whorls of 3 or 4. The flowers are white or pinkish. Fruits are ovoid and purple back when ripe.

Occurrence: Grows in waste places and in shady forests in different parts of Eastern India, Central India and Western Ghats- Categorized as Endangered.

Parts used: The leaves and roots.



Rauvolfia serpentina in fruiting



Flowering

Uses: The common use is to treat snake-bite (roots are used). The juice of the leaf is applied for removal of opacities of the cornea of the eyes. Root is anthelmintic, febrifuge and bitter tonic.

2. Papra, Bakrachimaka- Indian Podophyllum (*Podophyllum hexandrum* Royle) :

Nature: Herbaceous perennial growing up to 0.5 m high. Grows well as undergrowth in fir forests, rich in humus in shady localities in association with Rhododendron, Salix, Juniperus.

Occurrence: Himalayas - Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh etc., at altitudes of 2500 and 4200 m. Also found in open alpine meadows - Endangered.



Podophyllum – in flowering



Podophyllum-in fruiting

Parts Used: Rhizome and roots.

Uses: Freshly collected rhizomes are reported to contain more active principles which are lost on prolonged storing. The dried rhizome forms the source of medicinal resin. Podophyllin obtained from the plant is purgative, alterative, emetic and bitter tonic and is given in conjunction with Belladonna and Hyoscyamus. Podophyllin is toxic and strongly

irritant to skin and mucous membranes. Large doses cause severe vomiting and diarrhoea. It is used in veterinary medicine as a cathartic for dogs and cats, also used in removing warts in animals. Cardio-vascular effects of sublethal doses of podophyllin are reported to be wild and transitory.

3. **Katuki, Kutki – Picrorhiza (Picrorhiza kurroa Royle ex Benth) :**

Nature: It is a small perennial herb has a long, creeping rootstock. The leaves of the plant are flat, oval, and sharply serrated. The flowers are white or pale purple and borne on a tall spike.

Occurrence: Found in the Himalayan region growing at elevations of 3,000 - 5,000 meters grows in rocky crevices and moist, sandy soil. - Threatened

Parts Used: Rhizome and root

Uses: Picrorhiza kurroa is a well-known herb in the Ayurvedic system of medicine and has traditionally been used to treat disorders of the liver and upper respiratory tract, reduce fevers, and to treat dyspepsia, chronic diarrhea, and scorpion sting. The plant is self-regenerating but unregulated over-harvesting has caused it to be threatened to near extinction. Current research on Picrorhiza kurroa has focused on its hepatoprotective, anticholestatic, antioxidant, and immune-modulating activity.



Picrorhiza kurroa-Habit



Picrorhiza kurroa- Roots

4. **Jinseng - Himalayan Ginseng (Panax pseudoginseng Wall) :**

Nature: Perennial herbs with horizontal knotted rootstock. Stem erect, 40-80 cm high, terminating in a whorl of leaves. Leaves digitate, usually in whorls at apex of stem. Flowers in terminal, unequal, umbellate heads, pale green or orange-yellow. Fruits drupaceous, globose, 3–5 mm across, dull green to black.



Panax pseudoginseng-Habit



Panax pseudoginseng-Rhizome

Occurrence: It is found in soils which has deep humus in thick Conifer-Oak and Birch forests of temperate zone. It is also found along slopes of Tista Valley between Zema (3000 m) and Kalep (4000 m) in North Sikkim and in Lachung Valley under Himlock- Acer-Silver Oak community very close to river bed. At Chhangu in East Sikkim, it is sparse and found along the lake margin and the Rani Chhu River. (Himalayas and N.E. India, especially Sikkim, Arunachal Pradesh, Manipur and Meghalaya between altitudinal ranges of 2900 - 4000 m) - Endangered.

Parts Used: Rhizome.

Uses: The Ginseng (rhizome) is popularly known as the elixir of life and it is extremely popular rejuvenating and revitalizing tonic. Further, it is considered as a

panacea. It is used to increase longevity, mental agility and to check hypertension. It is also used locally for the treatment of cancer. Orally, it is used as a haemostatic for treating conditions such as vomiting and coughing up of blood, blood in the urine or stool, bleeding nose and hemorrhagic disease. It is used in cases of dyspepsia, palpitation and asthma. It is also used for controlling amnesia, headache and convulsions. It is a very good sex tonic.

5. **Jatamansi- Indian Nard (*Nardostachys grandiflora* DC.) :**

Nature: Perennials, erect rhizomatous herbs, 10-60 cm high. Rootstock stout, long, covered with fibres from the petioles of withered leaves. Stems pubescent upwards, glabrous below. Flowers rosy pale pink or blue. Fruits obovoid, ca 4 mm long, flattened.

Occurrence: Found clinging to steep rocky cliffs and grassy slopes at altitudes between 3000 and 4000 m. It also grows on moss-laden rocks and moist boulders. In Himalayas (Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh) and other adjoining countries. - Endangered.

Parts Used: Mostly Rhizome.



Nardostachys grandiflora-Habit



Roots



Aromatic oil

Uses: The rhizomes are used as a drug and in perfumery. Oil obtained from the roots is used as a hair tonic and also imparts black colour to the hair and in many medicinal preparations. The oil exerts a hypertensive effect and it has a distinct depressant action on central nervous system in moderate doses; lethal doses cause deep narcosis and ultimately death within a few hours. A tincture is given in colic and flatulence. The rhizome is antiseptic, antispasmodic, appetizer, aromatic, and carminative, emmenagogue, diuretic, stomachic, laxative, tonic, expectorant and vermifuge. It is used to treat high blood pressure, cold and cough, colic, diabetes, diarrhea, digestive and respiratory disorders, dysmenorrhoea, epilepsy, erysipelas, flatulence, headache, hysteria, convulsions, leprosy and palpitation of heart. Essential oil is also used in aromatherapy.

Conclusion :

Due to the large scale habitat destruction, over exploitation and uncontrolled clearing of forests many medicinal plants in the wild are fast disappearing. Every year hundreds of medicinal plants face extinction in the globe, mainly due to anthropogenic activities, prior to reveal its utility to mankind. Industrial pollution and global warming are the other factors causes large scale elimination of valuable plant species and their habitats. Plant based medicines are the safest one and highly reliable for any kind of treatments as it doesn't have any side effects. The plants we exploit today for medicine may not be available tomorrow if we are not taken proper care for their protection. Therefore, conservation of medicinal plants in the wild as well as in gardens and our premises is a must for the well being of humanity in the long run. Let us all join together in this preservation endeavor....!

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