

## Exotic arboreal plants of Bhopal, their therapeutic potential and Conservation

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### Abstract

A survey of Bhopal was carried out to record the exotic plant species growing in various localities. It was found that several species are growing luxuriantly away from their native places or centres of origin. These include a number of weeds such as *Acanthospermum hispidum* DC., *Argemone mexicana* L., *Gomphrena celosioides* Mart., *Oxalis latifolia* H.B. & K. and *Parthenium hysterophorus* L. etc. The arboreal species include *Cananga odorata*, *Crescentia cujete*, *Melaleuca leucadendron*, *Grevillea robusta*, *Couroupita guianensis*, *Adansonia digitata* and scores of others. The present paper deals with the medicinal utility of certain exotic arboreal species, which have enriched the flora of Bhopal from aesthetic point of view also, because many of them are elegant and produce flush of beautiful blossoms. Almost all the species dealt with in the paper have been found to have various therapeutic utilities and therefore can be exploited after conserving the existing specimens *in situ* and systematic propagation by vegetative means, seed germination and plant tissue culture technique using various explants.

**Key words :** Exotic, Flora, Medicinal, Weeds, conservation, antimicrobial, antioxidant.

**B**hopal, the capital city of Madhya Pradesh is strategically located in the heart of the country, being situated on 23°-16' North latitude and 77°-25' East longitude. Moreover, it is situated on a sand-stone ridge 503m above M.S. level and has an eye-catching view as it stands on the edge of two main lakes, Upper lake or 'Bara talab' having an area of

4.82 sq.km and the Lower lake or 'Chhota talab' occupying an area of 3.218sq.km.<sup>19</sup>. Beside these lakes, there are several smaller water bodies which add to the aesthetic beauty to the area.

The flora of Bhopal is very rich in angiosperms which is reported to comprise of

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836 species, 544 genera and 148 families<sup>19</sup>. The family Leguminosae is dominant with 90 species followed by Asteraceae with 59 species. The family Poaceae is placed at 3rd position with 53 species. Since the publication of the flora of Bhopal, the city has undergone various developmental processes such as urbanization, industrialization and agricultural pursuits. All these activities have resulted in large scale deforestation and elimination of several plant species on one hand and plantation of new species, mostly comprising of arboreal plants belonging to indigenous as well as exotic ones. Hence, the statistics of floristic composition has drastically changed, and the present worker shall try to present the recent vegetation scenario in the forthcoming papers. The present paper concerns with few exotic species which have been planted by various agencies and individuals for the sake of greenery & beauty of their blossoms. A perusal of literature reveals that these exotic species are of immense therapeutic potential owing to the presence of effective secondary metabolites contained. It has been observed that after plantation of these exotic species no efforts were made to further propagate them.

In the lines to follow, there is mention of 7 exotic arboreal species, which are arranged alphabetically and encompass such information as botanical name, family, vernacular names, nativity, location at Bhopal and medicinal utility.

***Adansonia digitata* Linn.**

*Family:* Bombacaceae

*Vernacular names:* Gorakh-amli,

Gorakshi, Khurasani Imli,

Baobab tree

*Nativity:* Tropical Africa

*Location at Bhopal:* 45-Bungalows.

Tulsi Nagar & E-1, Area Colony.

It is a massive deciduous fruit tree upto 30 m high with a life span of several hundred years. It bears short, stout & tortuous branches, digitately compound leaves & beautiful white large pendulous flowers & voluminous fruits.

*Medicinal utility:*

In Africa the leaves are used as a diaphoretic and as a prophylactic against fevers<sup>3</sup>. The fruit pulp has been tested on rats for its antidiarrhoeal activity and found to be effective<sup>1</sup>. According to Carlsen *et al.*,<sup>2</sup> the antioxidant activity of the baobab varies with the plant part used. The antioxidant content of the dried leaves was 48.1 mmol./100 g which was almost 5 times higher than that of fruit pulp. The value is much higher the antioxidant contents of orange (0.9m mol/100 g); mango (1.7m mol/100 g; apple (3.8m mol/100g); and papaya (0.6 m mol/100 g). Masola *et al.*,<sup>18</sup> have reported the antimicrobial activity of stem & root bark of *A. digitata* against Gram+ve, Gram-ve bacteria and yeasts. The extracts (aqueous & ethanolic) were effective and the MIC values ranged from 1.5 to 6 mg/ml. The antimicrobial activity can be attributed to the presence of tannins, phlobatannins, terpenoids and saponins in the stem bark. The fruit pulp is also reported to have analgesic and antipyretic activities<sup>20</sup>.

***Anacardium occidentale* Linn.**

*Family:* Anacardiaceae

*Vernacular names:* Cashew nut, Kaju

*Nativity:* Eastern Brazil

*Location at Bhopal:* Jawahar chowk, Census office, Civil lines

It is an evergreen medium sized tree with spirally arranged leaves. It produces cashew nut and cashew apple, which develops from the pedicel or hypocarpium.

*Medicinal utility:* Many parts of the plant are used in the traditional medicine of Patamona of Guyana. They grind the seeds into a poultice for treating snakebites, apply nut oil to cracked heels or as an antifungal agent, and use the fruits, bark and leaves for many other purposes including antifungal activity for sores and rashes or as an antipyretic and for anti-diarrheal applications<sup>5</sup>.

Dahake *et al.*,<sup>5</sup> have reported antibacterial and antifungal activity of ethanolic and petroleum ether extracts of leaves of *A. occidentale*. According to their findings, both the extracts exercised antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa* and *Escherichia coli*. However, the highest antibacterial activity of ethanolic extract was against *S. aureus* followed by *B. subtilis*, whereas petroleum ether extract was more effective against *E. coli* followed by *P. aeruginosa*. Both the extracts were effective against *Candida albicans* and *Aspergillus niger*. Here also ethanolic extract was found to be more effective compared to Petroleum ether extract in both the cases.

Masaki and Kubo<sup>17</sup> have reported the cashew shell oil chemicals to be effective in controlling *Streptococcus mutans*, a bacterium responsible for many dental cavities and *in vitro* antibacterial activity against this and other

Gram positive bacteria.

Kubo *et al.*,<sup>14</sup> report that the anacardiac acids isolated from *A. occidentale* apple juice have been found to have cytotoxic activity against B.T.20 breast carcinoma cells.

***Cananga odorata* Hook. f. & Thom.**

*Family:* Annonaceae

*Vernacular names:* Ilang ilang, Fragrant Cananga, Macassar oil plant. Perfume tree, Ylang ylang.

*Nativity:* Philippines.

*Location at Bhopal:* Only a single tree has been sighted at Govt. Hamidia Arts & Commerce College, Hathikhana, Bhopal

It is reported to be a fast growing tree (5 m/year), contrary to a single tree at Bhopal, which has not attained 4 m height in almost 25 years. Leaves are smooth and glossy with undulate margins. Flowers are fragrant, long stalked, drooping with 6 narrow perianth leaves.

*Medicinal utility :* The essential oil from flowers is said to be used in aromatherapy. It is believed to relieve high blood pressure & normalize sebum secretions. Oil is also used as an application in cephalalgia, ophthalmia and gout<sup>3</sup>.

In traditional medicines the decoction of bark is used in the treatment of rheumatism, ulcers and fevers and also as antifungal<sup>11</sup> and amoebicidal agent<sup>4</sup>. It is also used to treat gastrointestinal disorders and as a laxative<sup>9</sup>. The dried flowers are used against *Tinea* infections<sup>15</sup> and malaria<sup>13</sup>. The oil from the flowers is said to be useful in the treatment of

depression, anxiety, distressed breathing and as an aphrodisiac<sup>9</sup>. It gives relief from frigidity, palpitations & stress. Also used as antiviral, antifungal, amoebicidal, antiseborrhagic, and antiseptic<sup>11</sup>. It has antioxidant properties also<sup>23,25</sup>, which may be considered as potential lead compounds for the development of new drugs.

***Conocarpus lancifolius* Engl. & Diels**

*Family:* Combretaceae

*Vernacular names:* Qalab (Somali).

Damas (Arabic), Common tug tree

English

*Nativity:* Somalia, Yemen

*Location at Bhopal:* Near Bungalow of Dr. S. M. Laiq, B.D.A. Colony, Koh-e-Fiza.

A quick growing tree with systematic growth habit which can easily be shaped into a variety of different forms. It produces very small flowers in cone like structures. It is hardy, salt and drought tolerant with very extensiven root system.

*Medicinal utility:* Methanolic extracts of aerial parts of the plant were tested for their antibacterial and antifungal activities against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus cereus*, *Proteus mirabilis* and *Klebsiella pneumoniae*, *Aspergillus flavus*, *A. niger*, *Candida albicans* and *Saccharo-mycetes cerevisiae* by Saad *et al.*,<sup>21</sup>. They reported extract's antibacterial activity against *K. pneumoniae*, *B. cereus*, *E. coli* and *P. aeruginosa*. The highest inhibition was found in case of *K. pneumoniae* followed by *B. cereus*.

Among the fungi tested, only *S. cerevisiae* was found to be susceptible. But in all the cases the antimicrobial activity was lower than the standard drugs.

Saadullah *et al.*,<sup>22</sup> studied antidiabetic activity of whole plant methanolic extract of *C. lancifolius* *in vitro* as alpha glucosidase inhibition and *in vivo* as alloxan induced diabetic rabbits with other biochemical parameters (LDL, HDL, SGPT, SGOT, creatinine, urea and triglyceride). They report the inhibition of alpha glucosidase activity. According to them a dose of 200mg/kg body weight significantly ( $p < 0.05$ ) decreased the blood glucose level, plasma total cholesterol, triglycerides and LDL in treated rabbits compared to diabetic rabbits. This dose significantly increased the level of HDL in treated rabbits. The SGOT and SGPT also significantly ( $P < 0.05$ ) decreased in diabetic rabbits. The antidiabetic potential of *C. lancifolius* may be attributed to the presence of saponins.

***Couroupita guianensis* Aubl.**

*Family:* Lecythidaceae

*Vernacular names :* Cannon ball tree, Topgola, Bala de canon, Lingum, Nagamalli.

*Nativity:* Central South America

*Location at Bhopal:* Govt. Hamidia Arts & Commerce College and Kilol Park.

A tall deciduous tree, which produces profusion of flowers and cannon ball like fruits on the trunk and main branches (cauliflory). The flowers are incredible, with bicolored petals, red on the dorsal side and yellow on the ventral. The stamens form a hood in the centre.

It was named by French botanist, J.F. Aublet in 1775.

*Medicinal utility:* Native Amazonians use extracts of several parts of the tree to treat hypertension, tumours, pain and inflammation. It has also been used to treat the common cold, stomachache, skin disorders, wounds, malaria and toothache. The aqueous and methanolic extracts of *C. guianensis* leaves have been reported to have antibacterial and antifungal activities. According to Kavitha *et al.*,<sup>12</sup> the methanolic extract is effective against *Salmonella typhi*, *Escherichia coli* and *Streptococcus aureus*. They report the maximum antifungal activity against *Aspergillus niger* and minimum against *Rhizopus indicus*.

Elumalai *et al.*,<sup>7</sup> report the antiulcer activity of ethanolic extract of leaves. According to them a dose of 150-300 mg/kg produced significant inhibition of the gastric lesions induced by pylorus ligation induced ulcer and ethanol induced gastric ulcer. The antioxidant activity of alcoholic extract of *C. guianensis* has been reported by Umachigi *et al.*,<sup>24</sup>. According to them, the *C. guianensis* accelerates the wound healing process by decreasing the surface area of the wound and increasing the tensile strength. The activity is due to the presence of stigmasterol and flavonoids in the extract.

The flowers of *C. guianensis* contain a compound called 'isatin'. The derivatives of this compound are known to have cytotoxicity against human carcinoma cell lines. Mariappan *et al.*,<sup>16</sup> report that isatin starts the apoptosis process with DNA fragmentation. Cleavage of DNA at the inter nucleosomal linker sites yielding DNA fragments is regarded as a

biochemical hallmark of apoptosis. The reported the antioxidant and cytotoxic activity of isatin isolated from the flowers of *C. guianensis* against HL60 cells.

***Crescentia cujete* Linn.**

*Family:* Bignoniaceae

*Vernacular names:* Calabash Ayale, Calabacero Miracle fruit, Vilayati Bel, Beggars bowl.

*Nativity:* Central & South America

*Location at Bopal:* Old R.T.O. campus. Pataudi's bungalow and VIP road, near Karbala rotary.

A large deciduous tree, called Calabash. It is often grown as an ornamental. It also exhibits cauliflory with flowers all over the trunk and main branches. The fruits are more or less spherical and not as many as flowers, because many flowers fall off before fertilization.

*Medicinal utility:* Fruit is considered aperient, laxative and expectorant. It is also said to be anthelmintic, analgesic, antiinflammatory and febrifuge., In India, it is used as pectoral, the poultice of the pulp is applied to the chest. In Costa Rica it is used as purgative, whereas in Columbia it is used for respiratory afflictions.

According to Chopra *et al.*,<sup>3</sup> the decoction of bark is used for cleaning of wounds and leaves pounded to a poultice applied on forehead in case of headache. The fruit pulp is reported to be poisonous to birds and small mammals. Das *et al.*,<sup>6</sup> carried out phytochemical screening of crude ethanolic extracts of *C. cujete*. Stem bark and leaves revealed the presence of steroids, flavonoids, saponins, tannins, glycosides and terpenoids.

They report that all the fractions and the crude ethanol extract of both bark and leaves exhibited antioxidant activities, however, Ethylacetate fraction of leaves showed highest antioxidant activity based on the results of DPPH, FRP and TAC assay tests. The wood is reported to be used in the treatment of fever and earache and the drug made from leaves is used in the treatment of blood pressure.

***Melaleuca leucadendron* Linn.**

*Family:* Myrtaceae

*Vernacular names:* Cajeput tree, Kayapati, Cajuputte

*Nativity:* East Indies, Tropical Australia

*Location at Bhopal:* Govt. Hgmidia Arts & commerce College. Only one tree is left.

It is also a quick growing tree with white wood, lanceolate leaves and bark which peels off in thin papery pieces. It produces flowers with long filamentous white stamens in spikes resembling *Callistemon lanceolatus*.

*Medicinal utility:* The oil from the leaves is said to be used as antispasmodic, diaphoretic stimulant, antiseptic and anthelmintic. It is highly stimulant, producing a sensation of warmth when taken internally increasing the fullness and rapidity of the pulse and sometimes producing profuse perspiration. Used as a stimulating expectorant in chronic laryngitis and bronchitis, as an antiseptic in cystitis and as an anthelmintic for round worms, also used in chronic rheumatism. Applied externally, it is stimulant and mildly counter-irritant and is usually applied diluted with 2 parts of olive oil or turpentine ointment. Also used externally for psoriasis and other skin affections<sup>8</sup>.

Oil distilled from fresh leaves and twigs is used internally and externally, applied in rheumatism; as stimulant and antispasmodic, in choleraic diarrhoea, as rubefacient, acne and eczema. Also used as mosquito repellent. The bark from the stem is said to be stimulant and has tonic properties<sup>3</sup>.

The exotic species of plants owe their origin to remote geographical areas and have adapted well to the ecological conditions of this city. Their number is stationary, and it is likely that after completion of their life span, they will make their exit from Bhopal's floral scenario. It is therefore, there is an earnest need to conserve the existing plant specimens and efforts should be made to raise new plants through stem cuttings, root suckers (as in *Couroupita guianensis*) seeds and tissue culture through various explants. Botanical survey and expeditions all over the world record new species, but several of them are lost before they are known to science. Aimless and indiscriminate exploitation of plants by traders and smugglers has resulted in the extermination and extinction of several species of flowering plants. An example of plant conservation is worth citing. St. Helena ebony, *Trochoetopsis melanoxylon* was thought to be extinct until a solitary tree was sighted in 1980. Now, over 3000 cuttings have been planted on the island.

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