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## ***Bombax ceiba* L. : An Overlooked Plant with Immense Medicinal Properties**

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### **Abstract**

This communication is an attempt to throw light on the medicinal properties of ‘Silk Cotton Tree’- *Bombax ceiba* L. (Angiosperms; Family: Bombacaceae), a common tropical tree growing in India. This plant has strong anti-inflammatory, hepatoprotective, anti-bacterial, anti-viral, analgesic and hypoglycaemic activity. In the Ayurvedic system of medicines, this plant is found to be beneficial as stimulant, astringent, demulcent, diuretic, cooling, tonic, anti-dysenteric, etc. The plant is also known for the production of various phytochemicals like saponin, terpenoids, flavanoids, phenolics and C-flavonol glycosides (Shamimin), a secondary metabolite which plays an important role in curing a wide variety of ailments of human being. However, till date this plant remains under-utilized because of slow propagation.

*Keywords:* *Bombax ceiba*, medicinal properties, secondary metabolites, shamimin.

## **Introduction**

*Bombax ceiba* L. belongs to family Bombacaceae is a tall deciduous tree with straight and rigid tree, commonly known as ‘Semal’ or ‘Cotton tree’. This tropical tree has a straight, tall trunk and its leaves are deciduous in winter. Pentamerous large red flowers come into sight during spring just before the emergence of new foliage are characteristics of this magnificent plant. Flowers produce a capsule which, when ripe, enclose white fibres resembling cotton. Its trunk bears spikes to deter attacks by animals. This large deciduous tree of tropical forests widely distributed throughout Australia and Asia including India. Due to its drought tolerance ability, it is one of the dominant plant species of Southern Rajasthan, India [1]. Ethnobotanical studies show that among various tribals of India, this plant was use for multiple daily requirement, for instance, as food, fodder, fuel, fibre, medicines etc., and also known to the tribes for its drought tolerance capacity [2, 3]. Hence, since time immortal it holds the ethno-medicinal and socio-economics values.

The plant has its spiritual importance too, and also known as ‘King of forest’ because of its giant appearance and big flowers [4]. It is one of the five sacred trees of ‘Panchvati’. Almost each and every part of the plant like leaves, flower, fruit, root, stem, bark, gum and heartwood have specific medicinal properties and hence primarily used by various tribal communities and forest dwellers for the healing of diseases.

On the basis of earlier reports regarding the healing touch of this particular plant. The reliability of *B. ceiba* for its crucial medicinal usage has been tested and validated through various experiments and now in health care sectors this plant emerges as a potent source of therapeutic molecules to heal various diseases especially in developing nations. This plant is now one of the impending probable for pharmacological industries as recreational drugs, medicines, nutraceuticals, and flavorings. Now a day’s *Bombax ceiba* gaining remarkable attention of researchers due to its phytoconstituents of medicinal use [5].

Besides having healing potential, the plant has also been used for several industrial and commercial purposes [6]. Recently, this plant has undergone extensive scientific research worldwide and it has been revealed that the leaves, stem and flowers of *B. ceiba* possesses antibacterial [7], strong anti-inflammatory [8], analgesic, oxytocic [9], antioxidant [10], hypotensive, hypoglycemic [11], anti-angiogenic [12], hepato-protective activities [13]. While the roots of the plant are useful in the treatment of acne [14], diarrhoea, dysentery [15], genito-urinary diseases [16], gastro-intestinal diseases [17], heart diseases [12], diabetes [18], leucorrhoea [19, 20], and impotence [21, 22]. As stated earlier that the different secondary metabolites are responsible for these pharmacological activities. Most of them have well characterized, although the C-Flavonol glycoside shamimin is somewhat less studied secondary metabolite which has advanced hypoglycemic with antimicrobial activity against some gram-negative and gram +ve bacteria. The reasons behind this fact are tedious isolation procedure and limited production because the undried newly grown leaves of *Bombax ceiba* is the only source of this metabolite [23].

Almost entire plant is important as far as medicinal importance is concerned. Chemical investigations that are performed worldwide have revealed that it is rich in sesquiterpenes, lupeol, naphthaquinones and calcium [24]. The properties of *B. ceiba* can be very well utilized to slow down the wasting and weight loss in AIDS patients [24]. *B. ceiba* is relatively safe, nutritive, cheaper, having reasonably good herbal anabolic effect with the additional advantages of fibrinolysis and antioxidant enhancing properties. Methanolic extract of roots showed high amounts of phenolic, tannins, and very good DDPH radical scavenging activity [25]. Leaf extracts also exhibit significant anti-fungal activities against ringworm infection and its bark contains the catechu tannic acid. Shamimin, obtained from leaves showed significant potency as a hypotensive agent at the dose of 15mg/kg, 3mg/kg, 1mg/kg, and significant hypoglycemic activity at 500mg/kg in Sprague- Dawley rats [26, 27]. Methanolic extract of leaves and pure compounds mangiferin and acetyl derivative of the mangiferin were evaluated with anti-HIV and anti-cancerous activities. The entire the samples were evaluated to be inactive cytotoxic and as anti- HIV agent.

Various workers from time to time have assessed the medical significance of this plant by taking specific criterion. Hypotensive activity and its toxicology were examined by the Saleem et al.<sup>11</sup> revealed that a novel constituent Shamimicin, along with label were present as one of the constituents in the stem bark of *B. ceiba* which possesses the most bio-active fractions.

Dabur et al. [28] checked the antimicrobial potential of extracts and screened them against selected pathogenic bacteria and fungi by using micro broth dilution assays and the observed excellent inhibitory activity against all the bacterial and fungal pathogens.

Later on, Verma et al. [24] discuss about the ethno-botanical, phytochemical and pharmacological reports on *B. ceiba*. They highlighted several hidden facts about this plant. Kumar [29] studied about the evolution of RBC membrane stabilization and antioxidant activity of *B. ceiba* by *in vitro* technique and study reports that the Human RBC and Sheep RBC has membrane stabilizing property and the antioxidizing property of ethyl acetate soluble fraction of the gynoecium part of *B. ceiba* and the results revealed that EtoAc, the soluble fraction of *B. ceiba* possesses remarkable anti-inflammatory property.

Gandhare et al. [30] assessed the antioxidant potential of bark. Ethanolic and aqueous extracts of the bark were subjected to *in vitro* antioxidant activity screening models such as ABTS, nitric oxide, DPPH, and superoxide radical scavenging activity, inhibition of lipid per oxidation reduction of ferric ions and total antioxidant capacity. Several concentrations of ethanolic and aqueous extracts were compared for their antioxidant activity in different *in vitro* models and it was observed that free radicals were scavenged by the extracts in a concentration dependent manner up to the given concentration in all the models.

Patil and Patil [31] evaluated the cardio protective potential of aqueous flower extract of *B.ceiba* on the basis of biochemical and histopathological parameters in Adriamcin (Adr) induced myocardial infarction in rats. Myocardial lipid per oxidation was significantly increased in Adr treated animals as compared to normal animals. Pretreatment with *B.ceiba* showed a

significant raise in GSH levels as compared to Adr treated group.

Hossain et al. [25] investigate the antipyretic activity of the methanol extract of *Bombax malbaricum* leaves in rats. Baker's yeast was used to induce fever in Wistar rats was measured rectally over a period of 8 h. MEBM significantly reduced yeast – induced pyrexia hence the MEBM leaves possess significant antipyretic activity.

Chetan et al. [32] have evaluated the potentiality of anti-diabetic activity of *B. ceiba* bark extract for its hypolipidemic and hypoglycemic impending through normal and streptozotocin-induced diabetic rats administered with a graded oral dose of 200,400,600mg/kg/day for 21 days and the result showed that a dose of 600mg/kg of *B. ceiba* extract is the most effective to cause significant ( $p \leq 0.001$ ) hypolipidemic and hypoglycemic effects on streptozotocin-induced diabetic rats.

Recently, Jain and Verma [33] have assessed the credibility of ethno-medicinal claims regarding this plant. They validated the various medicinal claims of this marvellous plant on the basis of a well planned compilation. This study again proves the immense potential of this plant for the cure of several diseases of human and other animals.

## **Discussion**

Almost each and every plant has certain medicinal importance. We cannot neglect the presence of even a miniature plant in our surroundings. Nature has invested a lot in all its creations and it is needed from the human 'the best creation of nature' to critically analyse the potential of all surrounding plants 'the precious gift of nature to them' for their possible eco-friendly use. Since the inception of civilization, we have used numerous plants ranging from grasses, shrubs and giant trees for our livelihood. Plants provided us each and everything, including medicines. Uncountable plants have been used for medicines since time immortal. Unlike food plants the medicinal plants store the basic active ingredients of medicinal use in their root, leaves, stem and bark etc. Therefore, they are not easily available like fruits and seeds

and it is required to develop a different method for extraction of medicinally important phyto-constituents. Actually, this is going on with rapid pace, however the many plants have left unexplored for their medicinal uses because of various reasons, *B. cieba* is also one such plant which remains unexplored for its medicinal potential. *B. cieba* has different constraints regarding this fact, the deciduous nature, huge size, rigid texture of the stem and long life span limit its use as a medicinal plant. Because for an ideal medicinal important plant its *in vitro* regeneration and subsequent scaling up is necessary for proliferation of superior genotypes. At present not much work has been done in this direction, hence the application micropropagation technique for this plant can offer a rapid means of producing clonal planting stock of superior genotypes. The resultant plants will produce a sufficient amount of biologically active substances including shamimicin and lupeol. Shamimin is especially important as it has many medicinal properties and can boost the Pharmaceutical industries, where novel medicines can be generated that play important role in curing the wide range of ailments of human being. So, enhancement in its production through micropropagation will make its availability bit easier to cure many diseases of human being, especially HIV and cancerous because shamimin is proven very efficient in controlling these two deadly diseases.

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