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BOMBAX CEIBA: A PLANT OF THERAPEUTIC POTENTIAL

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ABSTRACT: Medicinal plants have been utilized to treat a wide range of illnesses throughout human history. Plants are able to produce a wide variety of secondary metabolites, which are chemical substances that assist them defend against predators. The plants are significant for their therapeutic significance because of these organic ingredients, which also have various biological actions. Red silk cotton tree, or *Bombax ceiba* L., is a member of the Bombacaceae family of plants. *B. ceiba* is a tall tree whose components are used to treat a variety of ailments. These parts include the flower, leaf, gum, fruits, seed, stem bark, roots, heartwood and thorns. Essential phytoconstituents including lupeol, vanillin, anthocyanins, shamimin and mangiferin are found in *B. ceiba*. The herb has been used therapeutically in Ayurvedic, Siddha and Unani medicine, among other ancient medical systems. This page provides a thorough analysis of *B. ceiba's* pharmacological, phytochemical and therapeutic qualities.

INTRODUCTION: Plants are the source of many medicinal compounds that are utilized today to cure ailments like cancer, hormone imbalance, jaundice, diabetes, inflammation etc. [1]. Herbal medicine continues to be considered one of the most potent traditional natural medicines, even with the advancements in modern medical science [2]. The family Bombacaceae includes the medicinal herb *Bombax ceiba* (also known as *Bombax malabarica*), which is widely grown in China, India, Pakistan and Vietnam [3]. Plant appears in **Fig. 1, 2.** There are several names for it depending on the language, including the Indian kapok tree (English), the silk cotton tree, Shalmali (Sanskrit), semal (Hindi), shimul (Bengali), mullilavu (Malayalam) and kondabruga (Telugu) [4]. There are several applications for *B. ceiba* and its beneficial use has been documented in traditional Indian medical systems such as Ayurveda, Siddha and Unani [1].

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The wood of *B. ceiba* is light-coloured, delicate and soft. It works well for light plywood and is in high demand as matchwood. Due to the cotton-covered seeds being carried a vast distance by the wind, it has spread widely [5].

Plant *B. ceiba* is used to treat wounds, leprosy, boils, asthma, diarrhoea and many other skin conditions. Its various parts are also used for their pharmacological activities, which include antiviral, antihypertensive, anti-inflammatory, antidiabetic, antioxidant and antibacterial properties.

FIG. 1: A TREE OF *BOMBAX CEIBA*

FIG. 2: A TREE OF *B. CEIBA* IN FLOWERINGSEASON

There have been reports of several chemical components found in *B. ceiba*. The main chemical compounds found in plant parts (namely the flower, roots, bark and leaves) are Vicenin, quercetin-3-O-β-D-glucuronopyranoside, isohemigossylic acid, lactone-2-methyl ether, quercetin-3-O-β-D-glucuronopyranoside anthocyanin, shamimicin, 7-hydroxycadalene, quercetin, rutin, lupeol, quercetin-3-O-β-D-glucopyranoside, fraxetin, sexangularetin-3-O-sophoroside, vitexin, quercetin-3-O-β-D-glucuronopyranoside, isovitexin, kaempferol 3-O-β-D-glucuronopyranoside, benzyl-βD-glucopyranoside, kaempferol-3-O-rutinoside, scopolin, iso-mangiferin, hentriacontane, 7-O-methyl mangiferin, esculetin, phenylethyl rutinoside, protocatechuic acid, chlorogenic acid, scopoletin, methyl chlorogenate, blumenol C-glucopyranoside, vanillic acid and mangiferin. The structures of these compounds are shown in **Fig. 3** [6-11].

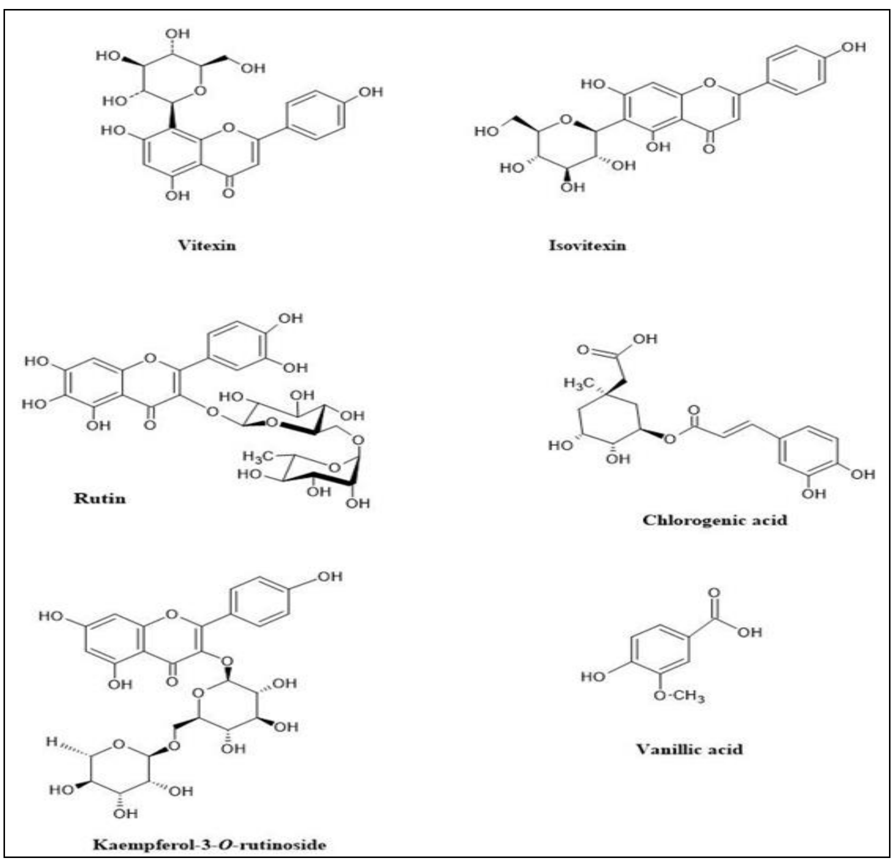

FIG. 3: PHYTO CONSTITUENTS OF *BOMBAX CEIBA*

Morphology: Plant *B. ceiba* grows from sea level to 1500 meters in height in India. Red silk cotton grows to a maximum height of 100 feet at a medium rate. Conical thorns are typically seen on the bark and branches of young trees [2].

Flowers-Many long, dense, silky-haired seeds are embedded in the massive, meaty, bright scarlet, yellow, or orange flowers [4]. As the leaves on the tree fall, the flowers bloom [12]. **Fig. 4** shows the plant's flower.

Leaves: The leaves are glabrous, big and spread apart. *B. ceiba* leaf is depicted in **Fig. 5** leaflets are lanceolate, 5-7, and 10–20 cm long [4, 13].

Bark: The tree's grey-brown or silver-grey bark is adorned with sharp, pointed thorns that resemble cones [12]. **Fig. 6** depicts the bark of *B. ceiba*.

Fruits: The tree produces brown, up to 55 mm-long fruits that contain many black seeds [12].

Seeds: Long, white wool with an irregular, oval shape encases smooth, black or grey seeds with dense, silky hair [12].

Gum: Semul-gum is a translucent, opaque and dark brown in color [12].

The tree grows along riversides and in deciduous forests, both wet and dry, all-over peninsular India. Deep sandy loamy soil or other well-drained soils are ideal for the tree's growth, especially in valley regions where the 50 to 460 cm of annual rainfall are uniformly distributed throughout the year. The tree grows swiftly and is a strong light-demander [14].

FIG. 4: *B. CEIBA* FLOWER

FIG. 5: *B. CEIBA* LEAVES

FIG. 6: *B. CEIBA*BARK

TABLE 1: TAXONOMICAL CLASSIFICATION OF *B. CEIBA* [11-13]

Rank	Scientific Name and common Names
Kingdom	Plantae – Plants
Subkingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Malvales
Family	Bombacaccac
Genus	*Bombax* L.
Species	*Bombax ceiba* L.
Binomial name	*Bombax ceiba* L.; *Bombax malabaricum* D.C.; Salmaliamalabarica (D.C.) Schott and Endl.

Phytochemical Analysis of Extracts of Various parts of *B. ceiba*:

Flowers: The flowers only contain fixed oils and fats, according to the petroleum extract; alkaloids, fixed oils, fats, phenolic compounds and flavonoids are contained in the acetone extract, while proteins, amino acids, glycosides, methanol and water extracts contain alkaloids, coumarins and flavonoids [15]. The blooms have been found to contain traces of essential oils, free β-sitosterol, quercetin, hentriacontanol, β-Dglucoside of β-sitosterol kaempferol and hentriacontane [11].

Leaves, Stem and Roots: The ethanol extract of fresh, undried *B. ceiba* leaves yielded a pale-yellow powder that was identified as shamimin, a flavonoid C-glycoside that was recently discovered. Its 2-(2,4,5-trihydroxyphenyl)-3,5.7-trihydroxy-6-C structure was determined. One 12-glucopyranosyloxy-4H-1-benzopyran-4-one [12]. The leaves tannins, flavonoids, reducing sugars, steroids, saponins and anthraquinones were all found in the aqueous extract. Three bioactive compounds phlobatannin, alkaloids and saponins are present in the stem as opposed to two phlobatannin and alkaloids in the root [2, 16]. The presence of less bioactive compounds was demonstrated by the ethanolic extracts in comparison to an aqueous solvent. While the stem contained only flavonoids, the leaves also included alkaloids, saponins, and tannins. The root also contains just lowering sugars. Quantitative investigation shows that the leaves have high quantities of flavonoids (3.1%) and saponins (5.04%), but low levels of steroids (0.18%). The number of alkaloids (1.04%) and saponins (1.37%) in the roots was moderate. Merely 1.52 percent of the significant quantity of alkaloids discovered in the stem bark [2, 17].

Pharmacological Profile of *B. ceiba*:

Antiinflammatory Activity:

Bark: The human red blood cell (HRBC) membrane stabilization method was slightly adjusted in order to assess the bark extract's *in-vitro* antiinflammatory activity. Bark from *B. ceiba* shown a significant reaction and can reduce inflammation when extracted ethanolically. The findings indicated that, when compared to the standard, diclofenac potassium (50 mcg/ml) (74.07% inhibition rate), the ethanol extract at a concentration of 1000 mcg/ml demonstrated highly significant antiinflammatory activity ($p<0.001$) (62.96% inhibition rate) compared to the aqueous extract ($p<0.01$) (46.30% inhibition rate) and petroleum ether extract ($p<0.05$) (22.22% inhibition rate) [1, 18-19].

Flowers: Rats with paw edema caused by carrageenan were used to test the floral extract's anti-inflammatory properties. When compared to normal 2 mg/100 g.b.wt indomethacin (34.1%, 44.6%, 38.1%, 49.1%), the acute paw edema was reduced at 1, 2, 3, and 4 hours by 25 mg/100 g.b.wt (28.0%, 23.8%, 24.9%, 22.9%) and by 50 mg/100 g.b.wt (30.1%, 28.3%, 32.5%, 37.0%) of 70% methanolic extract [20].

Roots, Stems & Xylem: An aqueous extract (10 mg/kg body weight) of the plant's roots, stem and xylem significantly ($p<0.01$) decreased inflammation in carrageenan-induced paw oedema in Wistar rats by 79%, 74%, and 46%, respectively, compared to standard indomethacin [21].

Thorns: When compared to the industry standard diclofenac sodium, the hydroalcoholic thorn extract of *B. ceiba* demonstrated significant in-vitro antiinflammatory efficacy. At 500 µg/mL and 1000 µg/mL of extract concentration, the percentage of hypotonicity-induced stabilization/protection of human red blood cells (HRBC) membrane was determined to be 44.7% and 46.9%, respectively [22].

Antioxidant Activity:

Bark: The animals treated with *B. ceiba* methanol extract showed an increase in antibody titer values of 11.2 ±0.30 and 13.1 ± 0.27 and the delayed type of hypersensitivity (DTH) reaction induced by SRBC was also demonstrated to be substantial ($P<0.001$). The antioxidant activity was assessed at 150 mg/kg and 300 mg/kg (p.o.) doses. It also resulted in a significant decrease in lipid per oxidation (LPO) levels and improvements in the catalase (CAT), reduced glutathione (GSH), superoxide dismutase (SOD) activity and haematological profile [23].

The ethanolic and aqueous extracts antioxidant activity was assessed in a number of in-vitro models, including 1,1 di phenyl 2 picryl hydrazyl (DPPH) activity, 2,2 azino bis (3 ethyl benzo thiazoline 6 sulphonic acid (ABTS) activity, dimethyl sulfoxide (DMSO) activity, nitric oxide scavenging, superoxide dismutase activity, ferric ion reduction, total antioxidant activity, and lipid peroxidation activity at concentrations ranging from 50 µg/ml to 150 µg/ml. It was discovered that, up to the designated concentration, the extracts scavenged free radicals in a concentration-dependent manner in all of the models. When both extracts were compared to the standard (ascorbic acid), the results were almost the same [24].

The ethanolic bark extract shown good reducing power ability and outstanding in-vitro antioxidant activity against Nitric oxide and DPPH radicals; these results were statistically significant ($p<0.05$), suggesting that the extract is a useful source of antioxidants. The ethanolic extract demonstrated 90% DPPH radical scavenging at a dose of 100 µg/ml, whereas the standard showed 92% DPPH radical inhibition. The extract's EC50 value was found to be 23.62± 1.99 µg/ml. The concentration at which the inhibition rate is 50% or the absorbance is 0.5 is known as the EC50 value [25].

Thorns: The capacity of the hydroalcoholic thorns extract to scavenge 1,1-diphenyl-2-picrylhydrazyl radical [DPPH] radical (41.62%) demonstrated its in-vitro antioxidant activity. Less than the absorbance of ascorbic acid (100µg/mL) ($p<0.001$), the absorbance of the thorn extract (100µg/mL) was 0.493 with 41.62% inhibition [22].

Flowers: Using methanolic flower extract, the antioxidant activity was examined. The EC_{50} for DPPH was 87 µg/ml, and the lipid peroxidation of soy bean liposomes and microsomes caused by peroxynitrite and ascorbyl radicals was 15 µg/ml and 105 µg/ml, respectively. The extract's K 0.5 value for inhibiting myeloperoxidase activity was 264 µg/ml. The ethanolic floral extract has little toxic effect on Vero cells [26].

Leaves: Crude extracts of *B. ceiba* leaves were reported to have in-vitro antioxidant activity (DPPH and ABTS + assay) in 95% ethanol leaf extract (0.012 ± 0.0003 mg/mL and 0.009 ± 0.0005 mg/mL, respectively) [27].

The chemical mangaferin, 2-β-D-glucopyranosyl-1,3,6,7-tetrahydroxy-9H-xanthen-9-one, had strong antioxidant activity in the DPPH assay. It was synthesized directly from methanolic extracts of *B. ceiba* leaves (EC50 = 5.8 (+/-) 0.96 µg/ml) [12].

Antibacterial and Antimicrobial Activity:

Stem Bark: Using the agar well diffusion method, the in-vitro antibacterial activity of a methanolic extract of *B. ceiba* stem bark was evaluated against three pathogenic bacterial strains: *Escherichia coli*, *Bacillus subtilis*, and *Klebsiella pneumonia*. The concentrations of the extract were 15 mg/ml, 30 mg/ml, 60 mg/ml, and 120 mg/ml. The extract was found to be effective against both Gram positive and Gram-negative bacteria even at lower doses ($p > 0.05$) [25].

Thorns: Under controlled conditions, the disc diffusion method was used to test the *B. ceiba* ethanolic plant extract's in-vitro antibacterial activity using the Muller Hinton Agar medium. The results showed that the ethanolic thorn extract had the largest zone of inhibition (ZOI) against *B. subtilis* (16.6 mm); nevertheless, at both 50 g/mL and 100 g/mL, the thorn extract showed moderate ZOIs against E. coli (13.6 mm) and *K. pneumonia* (11.3 mm) [22]. After assessing the thorn extract's antibacterial activity *in-vitro* against *Staphylococcus aureus*, it was determined that the silver nanoparticles exhibited noteworthy efficacy, exhibiting a 27.2 mm zone of inhibition at a minimum inhibitory concentration of 25 µg/Ml [28].

Antiangiogenic Activity:

Stem Bark: Methanol extract of *B. ceiba* stem bark has a strong antiangiogenic effect on human umbilical venous endothelial cells (HUVEC) in vitro tube formation. At dosages of 50 µg/ml and 30 µg/ml, luteol (found in the extract) strongly inhibits the formation of HUVEC tubes, with an inhibition rate of more than 80% at 50 µg/Ml [3. 18].

Antidiarrhoeal Activity:

Roots: The antidiarrheal properties of root methanol extract were assessed in Swiss-Albino mice at doses of 200 mg/kg and 400 mg/kg b. wt. throughout the first, second, third, and fourth hours of the test procedure [29].

Analgesic Activity:

Flowers: Using an electronically controlled hot plate, the analgesic activity was assessed on mice, the test subject. The test drug or 70% methanolic flower extract (50 mg and 25 mg of extract/100 g.b.wt.) administration caused the hind paw tendency to jump or lick before and after 1-2 hours of treatment. The mean reaction time was delayed, with percentage changes of 56.5% and 66.2% after 1 hour and 72.6% and 83.1% after 2 hours, respectively. The remaining group, on the other hand, showed a considerable delay with percentage changes of 48% and 68% after 1 and 2 hours, respectively, after receiving the medication tramadol (2 mg/100 g.b.wt.) 60 minutes before to testing [20].

Roots: The analgesic effect of treating Swiss-Albino mice with 200 mg/kg and 400 mg/kg b.wt. of the methanol extract of *B. ceiba* roots was assessed using the tail immersion method after 30, 60, and 90 minutes of treatment. The *B. ceiba* methanol extract showed significant peripheral analgesic activity, with percent inhibition values of 45.12% and 62.76% at 200 mg/kg and 400 mg/kg b.wt, respectively [29].

Hepatoprotective Activity:

Leaves: The extract from *B. ceiba* leaves exhibits liver-protective or hepatoprotective qualities. The phytosomes were made via the solvent evaporation technique. The ratios of 1:0.5, 1:1.0, 1:1.5, 2:0.5, 2:1.0 and 2:1.5 are provided by several formulations. With a maximum yield of 89.5%, particle size of 217.90±2.45, and entrapment efficiency of 71.25%, formulation F3 suggests that a 1:1.5 drug: lipid ratio is appropriate for complicated formulation. The absorption maxima of *B. ceiba* were determined to be 420 nm.

A typical graph showed linearity in the range of 10 µg/ml–60 µg/ml (R^2 = 0.9948). The compatibility of the *B. ceiba* methanolic leaves extract and excipients was evaluated using the FTIR peak matching method [18].

Roots: When an ethanolic extract of young B. ceiba (Et-BCYR) roots and metformin reduced serum levels of SGOT (Serum Glutamic Oxalate Transaminase) and SGPT (Serum Glutamic Pyruvate Transaminase) in Alloxan-Induced Diabetic Mice to 58% and 81.11%, respectively, the hepatoprotective activity was assessed. The values are the mean± standard error of three independent experiments. Et-BCYR's ability to lower SGOT and SGPT levels to 58% and 76.53%, respectively, indicates that liver damage may be treated with it [30].

Bark: The study assessed the hepatoprotective effect on diffused sinusoid enlargement, cell necrosis, and liver fatty degeneration. Specifically, the intravenous administration of an aqueous bark extract (1 gm/kg of body weight) significantly ($p<0.0001$) decreased aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels in rodents (rats) induced hepatotoxicity [31].

Flowers: The hepatoprotective effect was studied in rats administered isoniazid and rifampicin to cause liver damage. The rats also received a methanolic flower extract at 150 mg/kg, 300 mg/kg, and 450 mg/kg i. p. which significantly decreased their levels of AST (aspartate aminotransferase), ALT (alanine aminotransferase), alkaline phosphatase (ALP), and total bilirubin. Additionally, there was a noticeable decrease in thiobarbituric acid reactive substances (TBARS) levels and an increase in glutathione (GSH) and total protein levels [32].

Hypoglycaemic Activity

Stem Bark: 50% ethanolic stem bark extract was shown to be hypoglycaemic at maximum tolerated doses of 50 mg/kg and 250 mg/kg in albino rats. This plant's ethanolic stem bark extract has hypoglycaemia properties [32].

Leaves and Flowers: Sprague-Dawley rats were used to test the ethanolic extract's hypoglycaemic potential. After six hours, a 500 mg/kg dose of the plant's leaves and flower extract significantly reduced the subject's fasting blood sugar level (26.6%) [33].

Roots: The ethanolic extract of *B. ceiba's* young roots was tested for hypoglycemia activity at 400 mg/kg. The extract may also have hepatoprotective, hypolipidemic, and hypoglycemic effects. At different times (0-24 hours), the blood glucose level was significantly ($p>0.05$) lower in (AIDM) Alloxan-Induced Diabetic Mice when an ethanolic extract of *B. ceiba* young roots (400 mg/kg bw) was given intraperitoneally. In 16 hours, there was 78.36% more activity than the average (72.36%) [19, 29, 30].

Bark: Using streptozotocin-induced diabetic rats, the ethanolic bark extract's hypoglycemic effectiveness was evaluated. The most effective dose for causing substantial ($p<0.001$) hypoglycemia and/or hypolipidemia effects is 600 mg/kg of *B. ceiba* ethanolic bark extract. Furthermore, as compared to rats with untreated AIDM at different time points (0-24 hours), this dose significantly ($p<0.001$) decreased the levels of total cholesterol and triglycerides in rats with severe diabetes ($p>0.05$). In 16 hours, there was 78.36% more activity than the average (72.36%) [34].

Cytotoxicity:

Flowers: The methanolic extract of *B. ceiba* flowers was used to study the cytotoxicity activities. contains four butyrolactones and two derivatives of ascorbic acid; it has been shown to have protective effects against the cytotoxicity of benzo[a]pyrene (BaP) in HT1080 cells. Groups exposed to 50 µM benzo[a]pyrene showed cytotoxicity viabilities of 40% to 60% as compared to the groups treated with methanolic extract. Quercetin, Kaempferol, Butyrolactone derivative, and (-) Loliolide were among the identified compounds that lessened the cytotoxicity brought on by Mangiferin and 16 extract components [35].

Anti-obesity:
Stem Bark: The strong anti-obesity potential of the ethanolic extract at 200 mg/kg and 400 mg/kg against high fat diet-induced experimental obesity was evaluated due to the active flavonoids and lupeols present in the stem bark ethanolic extract of *Bombax ceiba* Linn. These compounds have the ability to modulate the Fatty Acid Synthase (FAS) and Protein Tyrosine Phosphatase-1B(PTP-1B) signalling in Wistar rats [36].

Anticancer Activity:
Leaves: Using the human leukemia cell line (HL-60), the 3-(4, 5-Dimethylthiazol – 2 - yl) - 2, 5-diphenyltetrazolium bromide (MTT) assay, caspase-3 activity, and cell cycle analysis were used to evaluate the extract's *in-vitro* anticancer efficacy. The antitumor efficacy of *B. ceiba* methanolic (BCM) leaf extract was assessed *in-vitro* using the HL-60 cell line.

After adjusting cell density to 1.5×106 cells/mL, cells were treated with BCM at concentrations of 1 µg/mL, 10 µg/mL, 25 µg/mL, 50 µg/mL, and 100 µg/mL for variable amounts of time. BCM at all concentrations decreased the viability of HL60 cells in a concentration-dependent manner. Between 1 µg/mL [(98.90± 0.43)%] and 10 µg/mL [(96.02± 1.08)%], While BCM caused significant cell death at 25 µg/mL [(75.14± 0.44%)] (P>0.05). 50 µg/mL [(68.91±0.21)%] and (P<0.01) (69.89 ± 0.09)%], 100 µg/mL (P<0.001) (P<0.001) [37].

Antipyretic Activity:
Leaves: The methanol extract of *Bombax ceiba* leaves (MEBC) was used to study the antipyretic efficacy in Wistar rats. When it comes to pyrexia caused by Baker's yeast, MEBC have strong antipyretic effects. The pyrexia caused by yeast is greatly reduced by MEBC (200 mg/kg and 400 mg/kg) ($p < 0.05$ and $p < 0.01$), respectively [19, 38].

Cardioprotective Activity:
Flowers: The heart's lactate dehydrogenase (LDL) was found to increase ($p<0.001$) in the aqueous flower extract of B. ceiba, while serum glutamic oxaloacetic transaminase (SGOT) and LDH were found to decrease at 150 mg/kg, 300 mg/kg, and 450 mg/kg b.wt. Additionally, the extract was found to have a protective effect against Adriamycin-induced myocardial infarction in rats [39].

Aphrodisiac Activity:
Roots: When the ethanolic roots extract (400 mg/kg body weight/day) was administered orally by gavage, the aphrodisiac effect was measured 12. Mount latency (ML), intromission latency (IL), ejaculation latency (EL), mounting frequency (MF), intromission frequency (IF), ejaculation frequency (EF) and postejaculatory interval (PEI) at 0, 7, 14, 21 and 28 days were the parameters that were observed prior to and during the sexual behaviour study. The ML, IL, EL, and PEI are all considerably reduced by the extract ($p<0.05$). The MF, IF, and EF were all considerably increased by the extract ($p<0.05$). These effects were seen in both sexually active and passive male mice [11, 18].

Hypotensive Activity:
Stem Bark: Evaluation of hypotensive activity was done at a dosage of 10 mg/kg. Rats with mean arterial blood pressure decreased by 58% after being exposed to a petroleum ether extract of *B. ceiba* stem bark (BCBP) [40].

Woods: The isolated chemical stigmast-4-en-3-one (1) of the petroleum ether extract of *B. ceiba* woods was used to evaluate the hypotensive action. It was found to be the active constituent, exhibiting a 55% reduction in blood pressure at a dose of 10 mg/kg [41].

Leaves: Shalimin, a C-flavonol glucoside included in the methanolic leaf extract of *B. ceiba*, was used to assess hypotensive activity. In Sprague Dawley rats, this dramatically lowered blood pressure at doses of 15 mg/kg, 3 mg/kg and 1 mg/kg [42].

Antianxiety Activity:
Leaves: Using the elevated plus maze method, the antianxiety effects of ethanolic extracts of *B. ceiba* leaves on rats were ascertained. The extract at 400 mg/kg significantly increased the amount of time

and entries into the open arm when compared to the control group (ethanol) and this difference was statistically significant (p value< 0.05). The most significant results were obtained with diazepam in comparison to the other groups (p<0.0005) [43].

Flowers: The hydroalcohalic extract of *B. ceiba* flowers (200 mg/kg and 400 mg/kg p.o.) was used to assess the antianxiety impact because it increases the number of mice that enter the open arm and their duration there in the elevated plus-maze paradigm [44].

Inhibitory Effects on Fatty Acid Syntheses:

Flowers: The minimal inhibitory concentration of *B. ceiba* ethanolic floral extract on fatty acid syntheses (FAS) is 247.98 µg/ml. Fatty acid syntheses (FAS) have been found to be hyperactive and overexpressed in the majority of malignancies [45, 46].

Stem Bark: When compared to the usual medication Gemfibrozil 50 mg/kg, the *B. ceiba* methanolic extract significantly (p < 0.05) reduced the increase in the levels of the serum indicators at 200 mg/kg and 400 mg/kg [36].

Diuretic Activity:

Fruits: Examining the diuretic effects of the aqueous and ethanol extracts from *B. ceiba* L. fruits, it was shown that at higher doses (200 mg/kg and 400 mg/kg, p.o., respectively), both extracts significantly increased urine production. Aqueous extract led to a considerable increase in urinary Na+ and K+ levels [47].

Antiosteoporotic Activity:

Stem Bark: The antiosteoporotic action of *B. ceiba* was investigated using its petroleum extract and methanol. At 100 mg/kg and 200 mg/kg, the two extracts considerably enhanced the osteoblast cell proliferation and alkaline phosphatase activity in UMR-106 cell lines. Additionally, it was found that administering petroleum ether and methanolic extract for 28 days significantly reduced the effects of ovariectomy-induced bone porosity and restored the bone's natural structure [48].

Nephrotoxicity Activity:

Leaves: Rats were exposed to gentamicin-induced renal damage, and the nephrotoxicity was assessed using *B. ceiba* ethyl acetate, n-butanol and aqueous leaf extracts. When co-administered with gentamicin (80 mg/kg) for 8 days, it was discovered that n-butanol and aqueous leaf extracts (200 mg/kg) protected the rats from changes in serum levels of urea, creatinine, and MDA (malondialdehyde) by reversing mild tubular necrosis rather than severe tubular necrosis [49].

CONCLUSION: The plant family Bombacaceae includes *B. ceiba* L. The tall tree *B. ceiba* is used to treat a wide range of illnesses. According to this review of the literature, traditional medicine has long employed a variety of *B. ceiba* Linn parts, including the flower, leaf, gum, fruits, seed, stem bark, roots, heartwood, and thorns, as a means of treatment. The chemical components that these plants create are diverse, as evidenced by the Bombacaceae family. The most significant isolated substances found in *Bombax ceiba* L. include phenols, anthocyanins, oxidized naphthalenes, sesquiterpenes, sesquiterpene lactones, triterpenes, steroids, lignans, alkaloids, amino acids, coumarins, long chain fatty acids and their esters, cyclopropenoid fatty acids, and carbohydrates. This review concludes that this herb has hepatoprotective, anticancer, cytotoxic, and abortifacient properties, among other uses. To make better use of this plant, however, more work needs to be done in terms of identifying and isolating the pharmacologically active compounds from various plant sections.

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