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Physicochemical and phytochemical status on flower of *Bombax ceiba*

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Abstract

Bombax ceiba flower extracts and its solvent fractionates were subjected to physicochemical and preliminary phytochemical screening using standard tests. The present study deals with phytochemical investigations of *Bombax ceiba* flower including determination of loss on drying, ash values and extractive values. The qualitative chemical examinations revealed the presence of various phytoconstituents like flavanoid, terpenoid saponins, phenolic compounds, carbohydrates, tannins and glycosides in the flower of the plant extracts. The presence of various bioactive components confirms the application of *B. ceiba* for various ailments by traditional practitioners. The study revealed specific identities for the particular crude drug which will be useful in identification and control to adulterations of the raw drug.

Keywords: *Bombax ceiba*, physicochemical analysis, extraction techniques, phytochemical screening.

Introduction

Since the ancient times, nature has been a huge source of medicinal agents. All over the world, plants have served as the richest source of raw materials for traditional as well as modern medicine [1-2]. The medicinal value of plants is mainly due to the presence of some chemical substances known as phytochemicals. They are basically plant metabolites, are synthesized in all part of plant body by itself and have some definite physiological action on animals [3-6].

Bombax ceiba Linn. (Silk cotton tree, Syn. *Bombax malabaricum* DC. *Salamalia malabarica* DC. Schott & Endl.) belongs to the family Bombacaceae. It is a large deciduous tree which is found throughout India and other parts of tropical and subtropical Asia. Indian kapok tree (English), Shalmali (Sanskrit), Semal (Hindi), Shimul (Bengali), mullilavu (Malyalam). Bark of Semal looks pale ashy to silver grey, 1.8 - 2.5 cm thick. Semal tree has the compound leaves which are palmate, digitate, large, spreading, glabrous which has common petiole, and the size of leaf is 15-30 cm long. Five leaflets are common in one leaf but sometimes up to the seven leaflets could be found. The size of leaflets varies from 10 to 20 cm. The leaflets are lanceolate, acuminate, more or less coriaceous and entirely glabrous. The bright red flowers, which appear in January to March, are large. Flowers are numerous, large, 10-12.5 cm across. It has the thick, fleshy and cup shaped Sepals. It bears generally 5 petals in one flower which are 7.5-15 cm long oblong, recurved above, and fleshy, of bright crimson (rarely yellow or orange) colour. The pods are about 10- 18 cm in length, oblong-oval in shape. It has many pharmacological activities like in-vitro Anti-inflammatory, Anti-diabetic, Anti-obesity, Hypotensive, Antioxidant, Antiangiogenic, Antimicrobial, Cytotoxicity, Aphrodisiac, Haemostatic, Astringent Diuretic, Cardiotonic, Demulcent, Anti-dysentric, anti-diahorreal, and Antipyretic effects [7-11]. In the present paper, the physicochemical parameters and preliminary phytochemical screening different solvent extracts of flower of *Bombax ceiba* were done for identification of the drug in dry form and control the adulterants.

Materials and Methods

Collection of plant materials

The flower of *Bombax ceiba* was collected from Bilaspur area, C.G. in the month of March' 2017. The plant materials were taxonomically identified and authenticated by Botanical Survey of India (BSI), Central Regional centre, Allahabad (U.P.). A voucher specimen was deposited having the specimen Ref. No. 99568.

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Processing of Plant Materials

The plant Materials was cleaned and shade dried until all the water molecules evaporated and the dried plant materials (petals of flower) was taken and grinded into coarse powder powdered. The powdered samples were stored in a clean glassware container until needed for analysis with proper labeling.

Preliminary physicochemical characteristics:

Air dried flowers were used for quantitative determination of proximate analysis e.g., loss on drying, total ash, acid insoluble ash, alcohol soluble extractive values. These physicochemical studies were done according to standard procedure of Indian Pharmacopoeia and WHO guidelines^[12-15].

Preparation of plant extracts**Solvent extraction**

Crude plant extract was prepared by Soxhlet extraction method. About 20 gm of powdered plant material was uniformly packed into a thimble and extracted with 250 ml of different solvents separately. Solvents used were petroleum ether, chloroform, ethyl acetate, acetone methanol, ethanol and water as per polarity. The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor become colorless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40 °C till all the solvent got evaporated. Dried extract was kept in refrigerator at 4 °C for their future use in phytochemical analysis.

Qualitative phytochemical analysis

The extracts were tested for the presence of bioactive components by using following standard methods^[16-20].

Phytochemical Screening:**Test for Alkaloids (Wagner's test)**

A fraction of extract was treated with 3-5 drops of Wagner's reagent (1.27 g of iodine and 2 g of potassium iodide in 100 ml of water) and observed for the formation of reddish brown precipitate (or colouration).

Test for Carbohydrates (Molisch's test)

Few drops of Molisch's reagent were added to 2 ml portion of the various extracts. This was followed by addition of 2 ml of conc. H₂SO₄ down the side of the test tube. The mixture was then allowed to stand for two-three minutes. Formation of a red or dull violet colour at the interphase of the two layers was a positive test.

Test for Cardiac glycosides (Keller Kelliani's test)

5 ml of each extract was treated with 2 ml of glacial acetic acid in a test tube and a drop of ferric chloride solution was added to it. This was carefully underlayered with 1 ml concentrated sulphuric acid. A brown ring at the interface indicated the presence of deoxysugar characteristic of cardenolides. A violet ring may appear below the ring while in the acetic acid layer, a greenish ring may form.

Test for Flavonoids (Shinoda test)

To the extract, a few magnesium turnings and a few drops of concentrated hydrochloric acid were added and boiled for five minutes. Red coloration identifies the presence of flavonoids.

Test for Phenols (Ferric chloride test)

A fraction of the extracts was treated with aqueous 5% ferric chloride and observed for formation of deep blue or black colour.

Test for Phlobatannins (Precipitate test)

Deposition of a red precipitate when 2 ml of extract was boiled with 1 ml of 1% aqueous hydrochloric acid was taken as evidence for the presence of phlobatannins.

Test for Amino acids and Proteins (1% ninhydrin solution in acetone).

2 ml of filtrate was treated with 2-5 drops of ninhydrin solution placed in a boiling water bath for 1-2 minutes and observed for the formation of purple colour.

Test for Saponins (Foam test)

To 2 ml of extract was added 6ml of water in a test tube. The mixture was shaken vigorously and observed for the formation of persistent foam that confirms the presence of saponins.

Test for Sterols (Liebermann-Burchard test)

1 ml of extract was treated with drops of chloroform, acetic anhydride and conc. H₂SO₄ and observed for the formation of dark pink or red colour.

Test for Tannins (Braymer's test)

2 ml of extract was treated with 10% alcoholic ferric chloride solution and observed for formation of blue or greenish colour solution.

Test for Terpenoids (Salkowki's test)

1 ml of chloroform was added to 2 ml of each extract followed by a few drops of concentrated sulphuric acid. A reddish brown precipitate produced immediately indicated the presence of terpenoids.

Test for Quinones

A small amount of extract was treated with concentrated HCl and observed for the formation of yellow precipitate (or colouration).

Test for Oxalate

To 3 ml portion of extracts were added a few drops of ethanoic acid glacial. A greenish black colouration indicates presence of oxalates.

Results and Discussion

Results obtained for quantitative determination of proximate analysis and qualitative screening of phytochemicals in flower of *B. ceiba* are presented in Table 1 & 2. Total thirteen phytochemicals were screened in which eleven were found present in different solvent extracts. They are cardiac glycosides, flavonoids, phenols, carbohydrates, saponins, tannins, alkaloids, proteins, phlobatannins and terpenoids. Remarkably, carbohydrate flavonoids, phenols, saponins, tannin, quinones, alkaloids and terpenoids were present in the flower of these plants. This suggests that the flowers have extensive potentials of phytochemicals.

Physicochemical parameters of the flower of *Bombax ceiba* Linn. are tabulated in Table 1. Different extracts of the powdered flower were prepared for the study of extractive values. Percentage of extractive values was calculated with reference to the air dried drug. The results are shown in Table 1. Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant material can be easily deteriorated due to fungus. The loss on drying at 105°C in flower was found to be 10.1 %. Total ash value of plant material indicated the amount

of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 6.55 %. The negligible amount of acid insoluble siliceous matter present in the plant was 4.54 %. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids.

In these screening process alkaloids, tannins, saponins, flavonoids and terpenoids, glycosides, phenols shows different types of results in different solvents. From the flower, water extract showed the presence of carbohydrate, alkaloids, saponins and tannins. However, 70% ethanol and acetone had the presence cardiac glycosides, carbohydrates, flavonoids, phenols, saponins, proteins, alkaloids and terpenoids. The methanol extract had the presence of cardiac glycosides, carbohydrate, alkaloids, flavonoids, phenol, tannins, saponins and terpenoids.

The medicinal value of plants means definite physiological

action on the human body due to presence chemical substances. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against diseases. Alkaloids protect against chronic diseases. Saponins protect against hypercholesterolemia and antibiotic properties. Steroids and triterpenoids show the analgesic for central nervous system activities [21].

Table 1: Physicochemical analysis of flower of *Bombax ceiba*

S.N.	Parameters	Results (% w/w)
1	Total Ash	6.55
2	Acid insoluble Ash	4.54
3	Water insoluble Ash	1.58
4	Water soluble extractive value	12.15
5	Alcohol soluble extractive value	4.26
6	Loss on Drying	10.1

Table 2: Result of phytochemical evaluation of flower of *Bombax ceiba*.

S. N.	Phytochemicals/ Solvent Extracts	Pet. Ether	Chloroform	Ethyl acetate	Acetone	Ethanol	Methanol	Water
1	Alkaloids	+	+	+	+	+	+	+
2	Cardiac Glycosides	-	-	-	-	+	+	-
3	Carbohydrates	+	+	+	+	+	+	+
4	Flavonoids	-	-	+	+	+	+	-
5	Phenols	-	-	+	+	+	+	-
6	Phlobatannins	-	-	-	+	-	+	-
7	Proteins	-	-	-	-	+	+	+
8	Saponins	+	+	+	+	+	+	+
9	Sterols	-	-	-	-	-	-	-
10	Tannins	+	+	+	+	+	+	+
11	Terpenoids	+	-	-	+	+	+	-
12	Quinones	-	-	-	+	+	+	+
13	Oxalates	-	-	-	-	-	-	-

+ = present; - = absent.

The result indicates that *Bombax ceiba* flower hold promises as source of pharmaceutically important phytochemicals. Flavonoids generally present in areal parts like flowers play some metabolic role and control development in living system. Tannins are known to inhibit pathogenic fungi. The flavonoids and phenolic compounds in plant have been reported to exert multiple biological effects including antioxidant, free radical scavenging abilities, anti-inflammatory, anti-carcinogenic, astringent, cytotoxicity, anti-diabetic, cardiogenic, antipyretic effects etc. [22].

Conclusion

Evaluation of drug means confirmation of its identity and determination of its quality, purity and detection of the nature of adulteration. Proximate analysis is useful in determining authenticity and purity of sample and also these values are important qualitative standards. The screening of a crude drug is necessary for biochemical variation in the drug, deterioration due to treatment and storage and substitution and adulteration. Preliminary Phytochemical screening is a part of chemical evaluation. The qualitative chemical test is useful in detection of adulteration. Phytochemicals found in flower extracts of *Bombax ceiba* indicates their potentiality as a supply herbal medicine. The results from the ash value, acid insoluble ash and water soluble ash values suggested that the flower contains demonstrable quantity of inorganic salts. The phytochemical characterization of the extracts, the isolation of responsible bioactive compounds and their biological activity are necessary for future studies.

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