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# Physicochemical and preliminary phytochemical studies on Kachnar bark (Bauhinia variegate)

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## ABSTRACT

Present communication attempts to evaluate the physicochemical and preliminary phytochemical studies on the bark of Bauhinia variegate of the family Leguminosae. It is a medium sized tree occurring in sub-Himalayan tract extending eastwards to Assam, Eastern, Central and South India. It is commonly called as Mountain Ebony. The reported biological activities are anti-diabetic, anti-inflammatory, immunomodulatory, anti-tumour, hepatoprotective, anti-bacterical activities, etc. Several Tests were performed using n-hexane, chloroform, ethyl acetate, alcoholic and water extracts. Thin layer chromatography technique was used to separate the chemical compounds and observed under UV and iodine vapour. Preliminary phytochemical tests performed were dragendoff's test, alkaline test, shinoda test, molisch's test, noller's test, Liebermann-Burchard reagent and NaOH solution. Physico-chemical parameters performed were loss of drying, total ash value, acid-insoluble ash, watersoluble extractive, alcohol-soluble extractive, pH, particle size, bulk density, tapped density, heavy metals, microbial contamination studies. The physicochemical parameters, preliminary phytochemical constants, toxic heavy metal, and microbial contamination analysis were performed as there is no detailed standardisation work reported on bark. The result represents the specific identities for the particular crude drug which will be useful in identification and control to adultrations of the crude drug.

Keywords: Bauhinia variegate, physicochemical, phytochemical

## INTRODUCTION

Kachnar is commonly called as Orchid Tree, Varigated Bauhinia<sup>1</sup>. In different languages it is called as: Kancanaraka(Sanskrit), Mountain Ebony(English), Kachanar, Kanchanar, Kachnar(Hindi), Champakati, Kanchanar, Kachnar(Gujarati).<sup>2</sup>

Kachnar consists of the dried, stem bark of *Bauhinia variegata* belonging to family Leguminosae; a medium sized tree occurring in sub-Himalayan tract extending eastwards to assam, Eastern, Central and South India.<sup>2</sup>

There are two varieties, red and white. The bark of both is alternative, tonic, astringent. Red flowered variety: The bark is acrid, cooling, laxative, appetising, astringent, to bowels in some doses; cures bililousness, "kapha" and "vata", ulcers, tuberculous glands, leprosy.<sup>3</sup>

White flowered variety: The bark is acrid, sweet; appetising, cooling, astringent to bowels; cures biliousness, "kapha", leucoderma, anal troubles, tuberculous glands, cough, asthma, diseases of the blood, ulcers, vaginal discharges; antihelmintic; used in strangury, thirst, burning sensation.<sup>3</sup>

Kachnar is closely related to peacock flower and to the tree may cinsider the world's most beautiful, the royal Poinciana. Orchid tree is grows 20-40ft tall and 10-20ft wide with a spreading crown of briefly deciduous leaves which are 4-6 in across and rounded with lobed ends and heart shaped base. The leaves are shaped in a little like a

cow's hoof. The flowers are reminiscent of showy orchids, with 5 irregular, usually slightly overlapping petals in shades of magenta, lavender, purplish blue or even white. The flowers often make their 1<sup>st</sup> appearance in late winter while the tree is bare of leaves. The blooming period then lasts until early early summer. The flowers are 3-5 in across and carried in cluster at the branch tips.<sup>1</sup>

## **Biology**<sup>4</sup>:

It is a natural habitat in India, the tree is deciduous, remaining leafless from Jan-Feb to April with the leaf fall in Nov-Dec. flowering occurs when the plant is leafless. Tree starts flowering at a very early age of 2-3 years. The seeds disperse from the pods and germinate on sites with favourable light and moisture conditions, while in unfavourable niches the radical dries up or is destroyed by birds.

## Ecology<sup>4</sup>:

*B. variegata* is a plant of tropical and sub-tropical climates with hot, dry summers and mild winters. It demands plenty of light and requires good drainage. Severe frosts kill the leaves of seedlings and saplings, but they recover during summer. The tree is fairly resistant to drought but susceptible to fires.

#### **Biophysical limits**<sup>4</sup>:

Altitude- upto 1800m, mean annual temperature: 0-47°C, mean annual rainfall: 500-2500 mm

Soil type- Capable of growing on a wide range of soils from gravelly, shallow, rocky soil on hill slopes to sandy loam and loamy soil in the valley.

#### **Description:**

#### Macroscopic Study:

Bark, dark brown, sometimes with silvery patches, rough, compact, exfoliating in woody strips and scales, outer surface with small transverse and longitudinal cracks, internal surface white, taste, astringent.



figure:1

#### **Microscopic Study:**

Transverse section of mature stem bark shows a wide stratified cork, outer cork composed of thin-wailed, slightly compressed, yellow brown cells followed by a number of layers of brown coloured cells, inner cork composed of transversely elongated orange brown cells, cork interrupted at certain places due to formation of rhytidoma, some secondary cortex composed or 15 or more rows or transversely elongated to circular, thin-walled, parenchymatous cells, some secondary cortex cells contain orange brown contents: groups of stone cells found scattered in this region occasionally arranged in 1-7 or more tangential rows, pericyclic fibres, thick-walled with narrow lumen, scattered in secondary cortex in singles or in groups, secondary phloem consists of sieve tubes, companion cells, phloem parenchyma and fibres traversed by funnel shaped medullary rays , phloem fibres arranged in radial rows throughout phloem region, prismatic and rhomboidal crystals or calcium, oxalate abundantly found in phloem and secondary cortex regions, very rarely found in cork cells, cluster crystals also present in secondary cortex and secondary phloem, crystal fibres also found in secondary phloem.

## **Powder Characteristics:**

pinkish, under microscope showing abundant crystals of calcium oxalate, sclercids in singles or in groups with wide lumen, bits of fibres, cork and secondary cortex cells, containing coloured content, and numerous crystal fibres.

### Chemical Constituents<sup>5</sup>:

5,7- Dihydroxy and 5,7- dimethoxy- flavones- 4-0- alpha-L- rhamnopyranosyle- beta- D- glucopyranosides, kaempferol-3- glucoside lupeol and  $\beta$ -sitosterol have been isolated from the stem. Quercitroside, isoquercitroside, rutoside, taxifoline, rhamnoside, myricetol glycoside, apigenin-7-0- glucoside quercetin, rutin, apigenin; ascorbic acid, aspartic, glutamic, octadeconoic acids, keto and amino acids and tannins have also been reported. 3-glucosides of peonidin and cyaniding, malvidin and peonidin, 3-diglucosides malvidin obtained from the pale violet flowers while the white flowers contain 3-galactoside and 3-rhamnoglucoside of kaempferol.

### Traditional Uses<sup>6</sup>:

In medicines, the leaves are rich in reducing sugar and have good nutritive value for the healthy development of tasar silk worms. The leaves are used for the preparation of biddies. The root is carminative and used in dyspepsia and flatulence and as an antidote to snake poison. The bark is astringent, tonic, antihelmintic, scrofula and skin diseases. The flowers and flower buds are used as a vegetables and laxative. The juice of flower is used to treat diarrhoea, dysentery and other stomachic disorders. The dried buds are useful for the treatment of diarrhoea and dysentery, worms, piles and tumours.

In Ayurveda, Ayurvedic literature claim the plant is reported to have Kasaya rasa, Ruksha guna, Shita virya and Katu vipaka. The stem bark of *B. variegata* is used in the treatment of krinnroga (worm infection), gandamala (scrofula), apaci (cervical lymphadenitis) and vrna (wounds).

### Pharmacological Studies<sup>6</sup>:

Antidiabetic activity, anti-inflammatory activity, immune-modulatory activity, anti-tumour activity, hepatoprotective activity, antibacterial activity, haemagglutinating activity, haematinic activity, antimicrobial activity, antibacterial activity.

## **RESULTS AND DISCUSSIONS**

The stem bark of *B. variegata* was collected and analysed the various standardisation parameters. Preliminary phytochemical results showed the presence or absence of certain phytochemicals in the drug. The tests performed using n-Hexane, Chloroform, Ethyl acetate, alcoholic and water extracts. Phytochemical test revealed the presence, Alkaloid, triterpene, saponins, flavonoids, polysaccharides, Steroid, Tannin and results are given in Table1.

SR NO.	NATURAL PRODUCT	TEST	PETROLEUM ETHER	METHANOL	ETHYL ALCOHOL	CHLOROFORM
1	Carbohydrates	Molish Test (general)	+ve	-ve	-ve	-ve
		Fehling's test (Reducing sugar)	-ve	+ve	+ve	-ve
		Benedict's test (reducing sugar)	-ve	+ve	+ve	-ve
		Barfoed's test (monosaccharides)	-ve	-ve	+ve	+ve
2	Gums	Soln + HCl+ fehling's test	+ve	+ve	+ve	+ve
3	Proteins	Biuret test (general)	+ve	-ve	-ve	+ve
		Millon's test	-ve	+ve	-ve	+ve
		Xanthoprotein test (tyrosine or tryptophan)	+ve	-ve	-ve	-ve
4	Amino acids	Ninhydrin test (general)	-ve	-ve	-ve	-ve
		Tyrosin test	-ve	-ve	-ve	-ve
		Cystein test	-ve	-ve	+ve	-ve
5	Fats and oil	$CuSO_4 + NaOH$	+ve	-ve	-ve	+ve
6	Triterpenoid	Noller's test $(tin + SO_2Cl)$	-ve	-ve	-ve	-ve
7	Steroid	Salkowski reaction	-ve	-ve	+ve	-ve
		Liebermann - Burchard reaction	-ve	+ve	-ve	-ve
8	Cardiac Glycosides	Baljet's test	+ve	+ve	+ve	+ve

## Table 1: <sup>7</sup>Preliminary phytochemical tests for different solvent extract of bark for *Bauhinia variegate*

		Legal's test	-ve	+ve	-ve	-ve
		Keller-Killiani test	-ve	-ve	-ve	-ve
9	Anthraquinone glycosides	Borntrager's test	-ve	-ve	-ve	-ve
		Modified Borntrager's test	-ve	-ve	-ve	-ve
10	Saponin glycosides	Foam test	+ve	+ve	+ve	-ve
11	Cyanogenetic glycosides	Na picrate test	-ve	+ve	+ve	+ve
12	Coumarin glycosides	Alcoholic extract made alkaline	-ve	-ve	-ve	-ve
		NaOH, boil- UV (fluorescence)	-ve	+ve	-ve	-ve
13	Flavonoids	Shinoda test	-ve	+ve	-ve	-ve
		Lead acetate	-ve	+ve	+ve	-ve
		NaOH	+ve	+ve	+ve	+ve
14	Alkaloids	Dragendorff's test	+ve	+ve	+ve	+ve
		Mayer's test	-ve	-ve	-ve	-ve
		Wagner's test	+ve	+ve	+ve	+ve
		Hager's test	+ve	+ve	+ve	+ve
15	Tannins	5% FeCl <sub>3</sub>	-ve	+ve	-ve	-ve
		Lead acetate	-ve	+ve	+ve	+ve
		Dil. HNO <sub>3</sub>	-ve	+ve	+ve	-ve
		Acetic acid	-ve	+ve	+ve	-ve

The Physio-chemical parameters of stem bark of *B. variegata* Linn are tabulated in Table 2. The pH value of 10% w/v aqueous solution is acidic. Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant can be easily deteriorated due to fungus. The loss on drying at 105°C in root was found to be 8.43 %. 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 8.66 %. The negligible amount of acid insoluble siliceous matter present in the plant was 2%. The water-soluble extractive value was indicating the presence of sugar, acids and inorganic compounds. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids the results given in Table <sup>2</sup>. The presence of pesticide residue organochlorine pesticide, organophosphorous pesticides and Pyrethroids were not detected in the plant samples.

Table 2: <sup>8,9</sup> Physico-chemica	l parameters of bark of	Bauhinia variegate
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Parameters	Results
Description	Reddish- brown
Loss on drying	8.43% w/w
Total ash	8.66 % w/w
Acid – insoluble ash	2% w/w
Water – soluble extractive	14.62% w/w
Alcohol – soluble extractive	21.08% w/w
pH	5.3
Particle size	
Passing through 200 mesh size sieve	78.18 % w/w
Passing through 40 mesh size sieve	98.1 % w/w
Bulk density	0.309 gm/ml
Tap density	0.408 gm/ml
Heavy metals	C C
Lead	Absent
Cadbium	Absent
Arsenic	Absent
Microbial contamination	
Test for E.coli	Absent
Fluorescence intensity	
At 254nm (short)	Brown green
At 366nm (long)	Black



Fig.2: TLC profile of the bark of Bauhinia variegate

• R<sub>f</sub> value= distance travelled by solute/ distance travelled by solvent

TLC of the ethanol extract developed in the mobile phase of Toluene: Ethyl acetate: Acetic Acid :: 5.0 : 4.2 : 0.8 and observed under UV 254 nm and under UV 366 nm.

 $\begin{array}{l} R_{f} value_{METHANOL} = 4.2/4.7 = \textbf{0.893} \\ R_{f} value_{CHLOROFORM} = 4.1/4.7 = \textbf{0.872} \\ R_{f} value_{ETHYL \ ACETATE} = 4/4.4 = \textbf{0.909} \\ No \ spot \ was \ detected \ for \ petroleum \ ether \ extract. \end{array}$ 

- Heavy metal tests for lead, cadbium and arsenic was performed as per the procedure given in the text book.<sup>10</sup>
- Antibacterical study was performed by pour plate method using organism E.coli.

## CONCLUSION

Preliminary phytochemical and physico-chemical, toxic heavy metal, microbial contamination and TLC studies in autentification adultration for quality control of crude drug were described and studied. This study may help the researchers for further studies on different models to evaluate and isolate the chemical constituent responsible for the antibacterial activity. The periodic assessment of the drug is essential for quality assurance and safer use of herbal drugs.

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