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A review on bauhinia vahlii wright & ARN

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Abstract

Bauhinia vahlii Wright & Arn is a huge climber native mainly to India and has been cultivated as an ornamental plant in different regions including Egypt. It belongs to family Fabaceae (Caesalpinaceae), which grows in Sub-Himalayan region at an altitude of 3000m above sea level and mainly in Assam, Central India, Eastern and Western Ghats. The herb is extensively utilised in numerous traditional medical practises, including Ayurveda, Unani, and homoeopathy due to the presence of various important phytoconstituents. This review primarily outlines its historical aspects, phytoconstituents and pharmacological action and folklore uses.

Keywords: *Bauhinia vahlii*, phytoconstituents, pharmacological actions, traditional uses

1. Introduction

Although they mentioned "*Bauhinia racemosa* Vahl," the name *Bauhinia vahlii* Wright & Arn was first legitimately published in the Isle of Wight without any description or diagnosis which made a passing reference to the effectively published description by Vahl that came before. Therefore, contrary to what is usually believed in the majority of published literature, *Bauhinia* was not truly published in Wright & Arn. for the first time. The fact that Wright & Arnott discovered Vahl had incorrectly applied the binominal *Bauhinia racemosa* Lam. to a specimen that needed to be classified as a new species is the cause. So they gave Vahl a new name to honour him. Only the Schumacher specimen from "India Orientali" and the plate provided in Vahl (1794) qualified as original materials because Wight only cited the n^o 628, i.e., Wight's herbarium specimens to whom the n^o 628 is associated, in the protologue of *Bauhinia vahlii*. *Bauhinia sericea*, *Phanera vahlii* (Wight & Arn) Benth, and *Bauhinia vahlii* Wright & Arn, Wight and Arn. Are the three names on the herbarium sheet? The locale had been listed as India Orient, however a note by A. Fox Maule (AFM) from 1984 explains that the epithet sericea was changed to racemosa in Vahl's manuscript. Because the calyx was 5 lobed rather than 2 & 3 lobed, the Vahl specimen could not be perfectly matched with the Indian sample. Instead of being narrowly elliptic, the ovary was widely elliptic. While Rexburg's description of the nature of the splitting of the calyx and the shape of the ovary of this species was totally in agreement with Banyopadhyay, Wight & Arnott only note the calyx shape, which is elliptical splitting to the base ^[1].

2. Classification

The following describes *Bauhinia vahlii*'s taxonomic position:

Kingdom: Plants

Sub kingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Sub class: Rosidae

Order: Fabales

Family: Fabaceae, Caesalpinaceae

Genus: *Bauhinia*

Species: *Vahlii*, *Variegata* L

2.1 Synonyms

Bauhinia racemosa Vahl

Phanera vahlii

Bauhinia variegata

Bauhinia purpurea Linn

Bauhinia tomentosa Linn

Bauhinia chinensis (DC.) Vogel

Bauhinia decora Uribe

Phanera variegata (L.) Benth

2.2 Vernacular names

B. vahlii is a giant climber. It goes by a number of names in many languages^[2-3].

Language	Name
Sanskrit	Asmantaka, Malanjhana, Phalgu.
Assamese	Nak kati lewa, Shonapushpaka
Bengali	Chehur lata Shimool, Kanchana
Hindi	Malu, Jallaur, Jallur, Mahul
Kannada	Chambolli, Kanchavala, Bilimandar
Marathi	Chambuli, Raktakancana
Nepali	Bhorla
Malayalam	Mottanvalli, Chuvannamandaram, Mandaramu
Tamil	Mandarai, Adda, Kattumandarai, Kattaki, Kanjani
Telugu	Madapu, Adattige, Adavimandaramu, Devakanchanamu
Oriya	Siyali, Kachan, Borada, Kosonara
English	Mountain ebony, Buddhist bauhinia, Poor man's orchid
Punjabi	Kanchanal, Kovidara, Kolar
Urdu	Kanchnal, Bwechin

3. Origin and geographical description

It is a little to medium-sized tree called *B. vahlii*. It is deciduous and grows to a height of around 10 to 12 metres. Most of it is grown in tropical areas. There are 600 species in the genus *Bauhinia*, which includes shrubs, trees, and vines. Typically, it is grown as an ornamental plant. It flourishes all over China and India. It is a dependable greenhouse species that thrives in the Himalayas at an elevation of 3000 metres⁴. The Fabaceae (Caesalpinaceae) family member *B. vahlii* is also known as Mountain Ebony (English), Rakta Kanchan (Marathi), and kachnar (Hindi).

One of the most prevalent types of Indian *Bauhinia* is the giant climber *Bauhinia Vahlii*. The species is found in Assam, Central India, Bihar, the Eastern and Western Ghats, and the Sub-Himalayan region up to 3000 metres above sea level. In Madhya Pradesh, Orissa, and Andhra Pradesh, leaves are collected^[2-6].

4. Historical aspects

4.1 Vedic period

- Kovidara was Kanchanara's original name during the Vedic and Samhita eras.
- In the Ayodhyakanda, Sundara Kanda, and Yuddakanda of the Valmiki Ramayana of the Rig Veda, kodivara flowers are mentioned in literature.
- Kodivara is described in Varivamsa as a *B. variegata* tree with lovely blossoms.
- Vedic literature views it as a stem that should not be used in ceremonies.

4.2 Charaka Samhita

- In sutrastana's vamanapoga desaimani, Kodivara is addressed.
- Kodivara is also mentioned in samhitas and chakrapani. According to a report, kodivara blossoming happens in sarat ritu.

4.3 Susrutha Samhita

- Both the Kashaya Varga and the Urdwa Bhagaharangana mention Kodivara.
- Rakapitta chikitsa uses kodivara leaves.
- Devakanchanara was mentioned in kalpastana for sarpa visha chikitsa. In addition, he recommended kodivara flowers for internal bleeding.
- Karbudhara was viewed by Dalhana as a specific type of kanchanara or slesmataka.

- Kanchanara and kodivara, two of the flowers and leaves found in Karbudhara, are used as vegetables.

4.4 Astanga Hrudaya

- For arsha chikitsa, kovidara root powder was utilised.
- Kovidara Picchabasti administered treatment for rectal prolapse. For the treatment of fever, anorexia, goitre, malignant tumours, and abdominal enlargement, kovidara flower decoction was used.

4.5 Sarangadara Samhita

- It was recommended that Kanchanara Guggulu be used to heal ailments including apachi, grandhi, gulma, and kushta.

4.6 Nigantu Period

- The guna karmas of Kanchanara are described in detail in the nigantu works of Dhanvantari, Raja, Bhavaprakasa, and Kaiyadeva.

4.7 Dhanvantari Nigantu

- Rakata pushpa was referred to as kovidara and Svetapushpa as Kanchanara.

4.8 Bhavaprakasa Nigantu

- This was discussed by Bhavamisra in the Guduchyadivarga, along with kanchanara and kovidara.

4.9 Modern period

- In several writings from this time period, Kanchanara is mentioned. Botanists investigated the chemical makeup of the various drug's constituents.
- This medicine has been covered in several works by 20th-century Ayurveda acharya like Yadavji, Trikramji, Viswanath Dwivedi, Priyavarat Sharma, etc.
- Kanchanara is utilised nowadays for a variety of home tasks in addition to being used as a medicine.
- Allopathic, unani, siddha, and ayurvedic medical systems use the drug's extracts or raw form for a variety of therapeutic applications.

History attests to kanchanara's efficacy as a medicine^[7].

B. variegata is also known as Kanchnar, Gandari, Yugmapatra, and Karbudara in ayurvedic literature. *B. variegata* possesses Kasaya rasa, Ruksha guna, Shita virya, and Katu vipaka, according to reports. Apaci (cervical lymphadenitis), gandamala (scrofula), krimiroga (worm infestation), and vrana (wounds) can all be treated with stem bark of *B. variegata*^[8]. Ayurvedic doctors have employed *B. variegata* bark powder in conjunction with other medications to treat a variety of ailments. In conjunction with myrrh (*Commiphora molmol* Engler), turmeric (*Curcuma domestica* Linn.), and ashoka (*Saraca indica* Linn.) are used to treat gynaecological disorders. When combined with guggulu (*Commiphora weightii* Linn.), punarnava (*Boerhaavia diffusa* Linn.) and triphala, (equal parts of *Terminalia bellerica* Linn., *Terminalia chebula* Retz. and *Emblica officinalis* Gaerth) is used to relieve lymphatic edoema. It is combined with ashwagandha (*Withania somnifera* Linn.) Dunal), bakuchi (*Mimusops elengi* Linn.), ginger (*Zingiber officinale* Roscoe.), and guggulu to cure osteoporosis. Kutki (*Picrorrhiza kurroa* Linn.) and bibhitaki (*Terminalia bellerica* Linn.) are used together to treat diarrhoea.

5. Botanical description

5.1 Leaves

This enormous climber has thickly hairy branches and circinate tendrils that are typically opposite the foliage. Leaves are petiolate and alternating, orbicular in shape, 7.5 to 9 cm long, cordate at the base, lobed at the apex, 10 to 46 cm long and nearly as wide, sparsely and densely hairy on the top and below surfaces. A terminal inflorescence, subcorymbose, thickly hairy raceme with persisting bracteoles. The leaves vary in size, typically up to 18 inches in diameter, as broad as long profoundly cordate, 11 to 15 nerved, cleft through approximately 1/3 of the length, sub-coriaceous, dark green and glabrescent above more or less downy beneath, lobes obtuse, rounded petiole 3 to 6 inches long, strong [3,6].

5.2 Flowers

The plant produces several axillary raceme inflorescences, each of which has 20–35 blooms, the majority of which are in the bud state and have three or more fully grown flowers. The flowers are huge, zygomorphic, white when young, turning buff as they age, and on long cylindrical pedicles. When fully blown, they measure 10–12 cm long and 4–5 cm wide. The calyx has thick hairs and is made up of two lobes that are created by the remaining three green sepals and two combined green sepals that comprise the calyx. A standard petal is encased within the lateral ones (wings) of the corolla's five white, densely hairy petals, which is a frequent morphological feature for the Caesalpinaceae subfamily [9, 10]. Two little infertile staminodes and three free, lengthy, fertile stamens make up the androecium. Recently, several taxonomists separated the genus *Phanera* from *B. vahlii* based on the number of fertile and sterile stamens as well as other

morphological differences [11]. One pistil and a monocarpellary ovary with abundant yellowish hair make up the gynoecium. It has a long, reddish-colored, densely haired style that is finished with a green stigma.

5.3 Stem

The main stem (trunk) is robust, solid and cylindrical with thick brown cork showing longitudinal fissures and transverse cracks. It grows obliquely or vertically for around 50–70 cm before continuing primarily horizontally, reaching lengths of up to 1.5–3 m with bases that are between 22–28 cm in diameter. The stem subsequently splits into smaller branches that are between 17 and 20 metres long and 10 to 15 centimetres wide, which continue to develop horizontally and/or climb vertically on adjacent supports. The monopodial branching has pairs of revolute tendrils, petioles, leaves, and/or inflorescences on each branch. The surfaces of old branches are rough, fissured, and cracked, and they are cylindrical and greyish brown in colour. Younger branches climb using many pairs of tendrils, are flexible, green, densely hairy, 0.5–1 cm in diameter, cylindrical (deeply grooved when very young), and fracture with fibrous tissue. The morphological segregation of *B. vahlii* to the genus *Phanera* was targeted by the presence of tendrils in addition to the quantity and fertility of stamens [11].

5.4 Fruit

Fruit is a 20–30 cm long, flat, woody pod with fine rusty hairs. Pod woody, dehiscent, reddish velvety, and 6–12 seeded, measuring 22.5–30 cm in length, 5–7.5 cm in width. Seeds are flat, dark brown, polished and 2.5 cm in diameter [6].

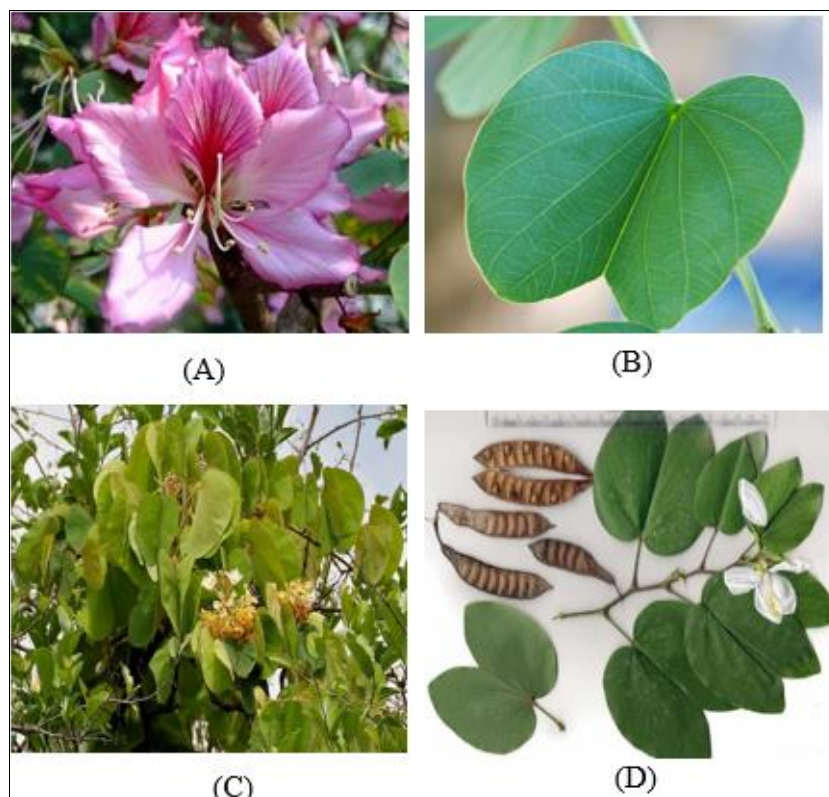


Fig 1: (A) *B. vahlii* flower, (B) *B. vahlii* leaf, (C) *B. vahlii* plant, (D) *B. vahlii* twig with fruit and flower

6. Ecological impact on *bauhinia vahlii*

6.1 Climate

B. vahlii, which can ascend to an altitude of 1500 metres in the Himalayas from Kashmir, India, is thought to be a serious

adversary of trees.

6.2 Soil

Both alkaline rocky soil and acid sand are suitable for

growing *B. vahlii*, however it is crucial that the soil be well-drained.

7. Cultivation and Collection

When given the right conditions, *B. variegata* can be naturally propagated through its seeds, however artificial multiplication is accomplished by stump planting, or the direct sowing of seeds. Branch cuttings typically have trouble establishing roots, but when auxins are applied in August, November, and February, these cuttings thrive. Direct sowing can be carried out in lines with a 3 m separation. Within a week of the beginning of the monsoon rains, germination begins, guaranteeing enough soil saturation. The soil ball and the plants as a whole must be transplanted. Seeds from the previous year are sown in March or April in preparation for planting out in July or August [12]. Seeds, stem planting, and branch cutting are all used to propagate the ornamental plant. In March and April, seeds are sowed. In July and August, the seedlings are then replanted. When the monsoon season begins, they begin to sprout. *In vitro* regeneration was seen in explants of mature *B. variegata* nodal trees. On media enhanced with 13.3 micrometre IBA, optimal shooting was accomplished in 15-20 days. When transplanted to MS media with 4.9 micrometre IBA within 45 days, single shoots with 3-4 nodes begin to root [13].

Flowers: Vasantha rutu.

Flowering: February-April.

Fruiting: May-June [13].

8. Chemical constituents [14]

The roots of *B. variegata* were found to contain flavonoids such as flavanone, 5, 7-dimethoxy-3, 4-methylenedioxyflavanone, and a novel dihydrodibenzoxepin, 5, 6-dihydro-1, 7-dihydroxy- 3, 4- dimethoxy-methylidibenzoxepin [32]. The roots of *B. variegata* was utilized to produce the new flavonol glycoside 5, 7, 3', 4'-tetrahydroxy-3-methoxy-7-O-alpha-rhamnopyranosyl (1->3)-O-beta-galactopyranoside. A triterpene saponin that was isolated from the leaves of *B. variegata* Linn. Was credited with the plant's anti-inflammatory and antinociceptive qualities. From *B. variegata*, a phenanthraquinone called bauhinione has been discovered [15].

8.1 Roots

The root bark constitutes (2S)-5, 7-dimethoxy-3', 4'-methylenedioxy flavonone and 5,6-dihydro-1,7-dihydroxy-3,4-dimethoxy-2-methylidibenzoxepin;5,7,3',4'-tetrahydroxy-3-methoxy-7-O-L-rhamnopyranosyl (1 3)- O -D-glucopyranoside. Hentriacontane, 5,7,3',4'- tetrahydroxy-3-methoxy-7-O-L-rhamno pyranosyl (13)- O-galactopyranoside, 5,6-dihydro-1,7-dihydroxy-3,4-dimethoxy-2-Methylidibenzoxepins(2S)-5,7-dimethoxy-3',4'methylenedioxyflavanone, flavanone (2S)-5,7-

dimethoxy- 3',4'-methylenedioxyflavanone and a new dihydrodibenzoxepin,5-hydroxy7,3',4',5'-tetra-methoxyflavone5-O-beta-Dxylopyranosyl-(1-2)-alpha-L-rhamnopyranoside. Bauhinione, a new phenanthraquinone was isolated from *B. variegata* and its structure was 2, 7-dimethoxy-3-methyl-9, 10- dihydrophenanthrene-1, 4- dione analyzed by the spectroscopic analysis¹⁶. *B. variegata* root powder passed a qualitative chemical analysis that revealed it included proteins, flavonoids, carbohydrates, tannins, glycosides, phenolic compounds, gums, and mucilages^[4, 16].

8.2 Stems

The stem bark constitutes hentriacontane, octacosanol and stigmaterol; 5, 7-dihydroxyflavonone-4'- O--L-rhamnopyranosyl--D-glucopyranoside; sitosterol, lupeol and kaempferol-3-glucoside; 2, 7-dimethoxy-3- methyl-9, 10-dihydro phenanthrene-1, 4-dione on the basis of spectroscopic analysis. Additionally, it demonstrates the existence of nitrogenous compounds, reducing sugars, and glycosides. According to reports, the stem bark of *B. variegata* contains tannins that have immunomodulatory properties^[16].

8.3 Leaves

Leaves consisted of heptatriacontan-12,13-diol and dotetracont-15-en-9-ol. The phytoconstituents of leaves of *B. variegata* leaves are alkaloids, tannins, cardiac glycosides, flavonoids i.e quercetin, rutin, apigenin and apigenin 7-O-glucoside has similar *B. variegata* composition with spathulenol, germacrene D, δ -cadinine^[4].

8.4 Buds

Buds consist of alanine, glycine, aspartic acid, phosphoenolpyruvic acid, serine, glutamic acid, and ketoglutaric acid oxaloacetic acid^[14].

8.5 Flowers

Quercitroside, taxifoline rhamnoside, rutin, Isoquercitroside, tannins, apigenin-7-O-glucoside, rutoside, malvidin-3-glucoside, kaempferol-3-glucoside, peonidin-3-glucoside, myricitol glycoside, quercetin, quercetrin, apigenin, ascorbic, aspartic, glutamic, octadecanoic acid, keto acids, amino acid, cyaniding-3-glucoside, malvidin-3-diglucoside, peonidin-3-diglucoside, 3-galactoside and 3-rhamnoglucoside of kaempferol.

8.6 Seed

Amino acids, Carbohydrates, flavonoids, glutamic acid, proteins, ascorbic acid, alkaloids, leucoanthocyanines, arginine, alanine, aspartic acid, isoleucine, glycine, methionine, histidine, serine, lysine, phenylalanine, proline, threonine, tyrosine, valine, 5-hydroxy7,3',4',5'-tetra-methoxyflavone-5-Obeta-D-xylopyranosyl-(1->2)-alpha-L-rhamnopyranoside. The seeds yield fatty oil containing steric, linolinic acid, palmitic, oleic, and myristic acid^[4].

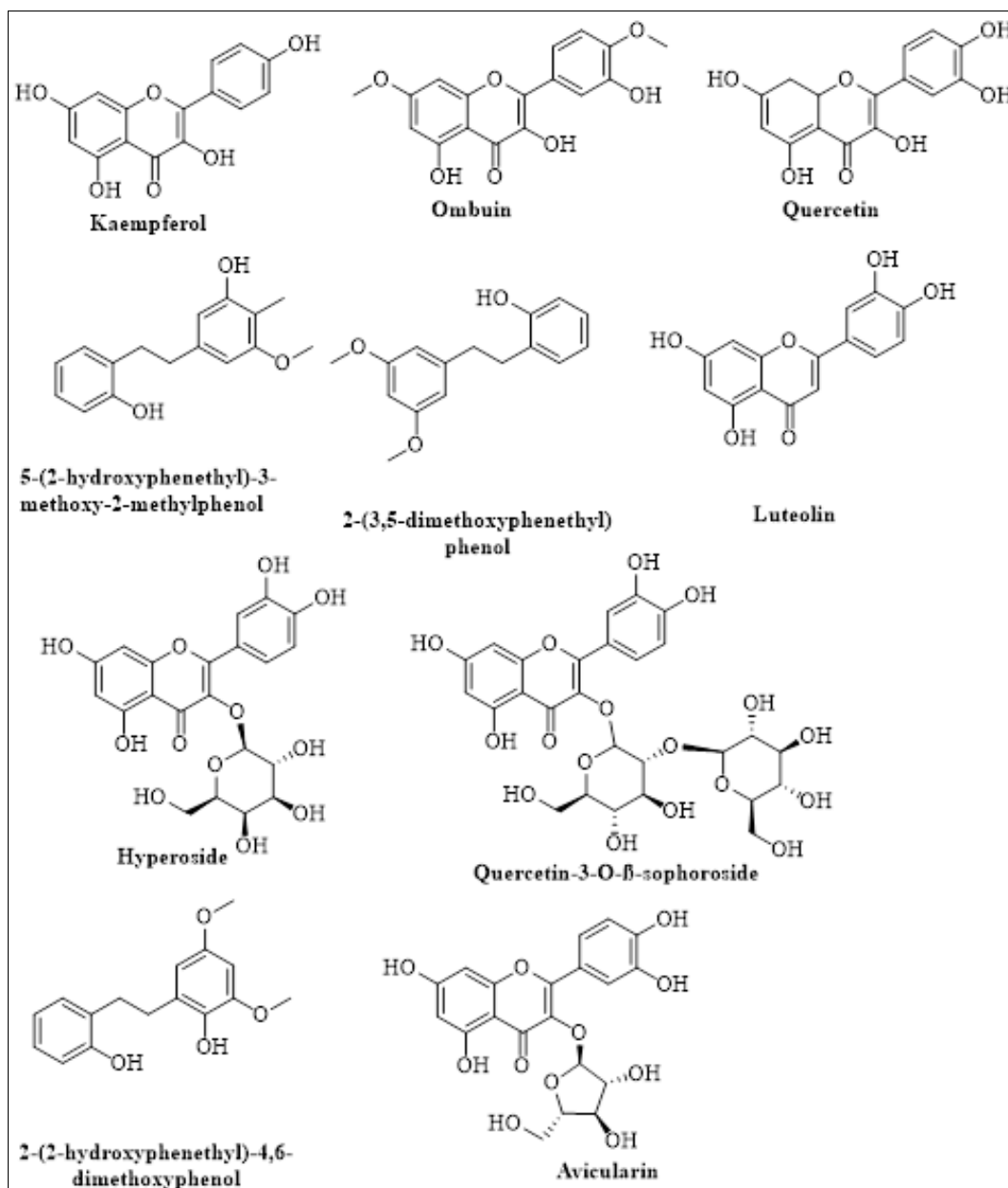


Fig 2: Structures of some flavonoids from *B. vahlii*.

8.7 Bark

The bark yields fibre and tannins. Seven flavonoids, namely kaempferol, ombuin, kaempferol-7,4'-dimethyl-ether-3-O-β-D-glucopyranoside, kaempferol-3-O-β-D-glucopyranoside, isorhamnetin-3-O-β-D-glucopyranoside and hesperidin, together with one triterpene caffeate, 3β-trans-(3,4-dihydro xycinnamoyloxy) olean-12-en-28-oic acid were isolated from the non-woody aerial parts of *B. variegata*

Phytochemical analysis of the root bark of *B. variegata* Linn. yielded a new flavanone, (2S)-5,7-dimethoxy-30,40-methylenedioxyflavanone and a new dihydrodibenzoxepin, 5,6-dihydro-1,7-dihydroxy-3,4-dimethoxy-2-methyl-dibenz[b,f]oxepin together with three known flavonoids. The structures of the new compounds were determined on the basis of spectral studies^[4].

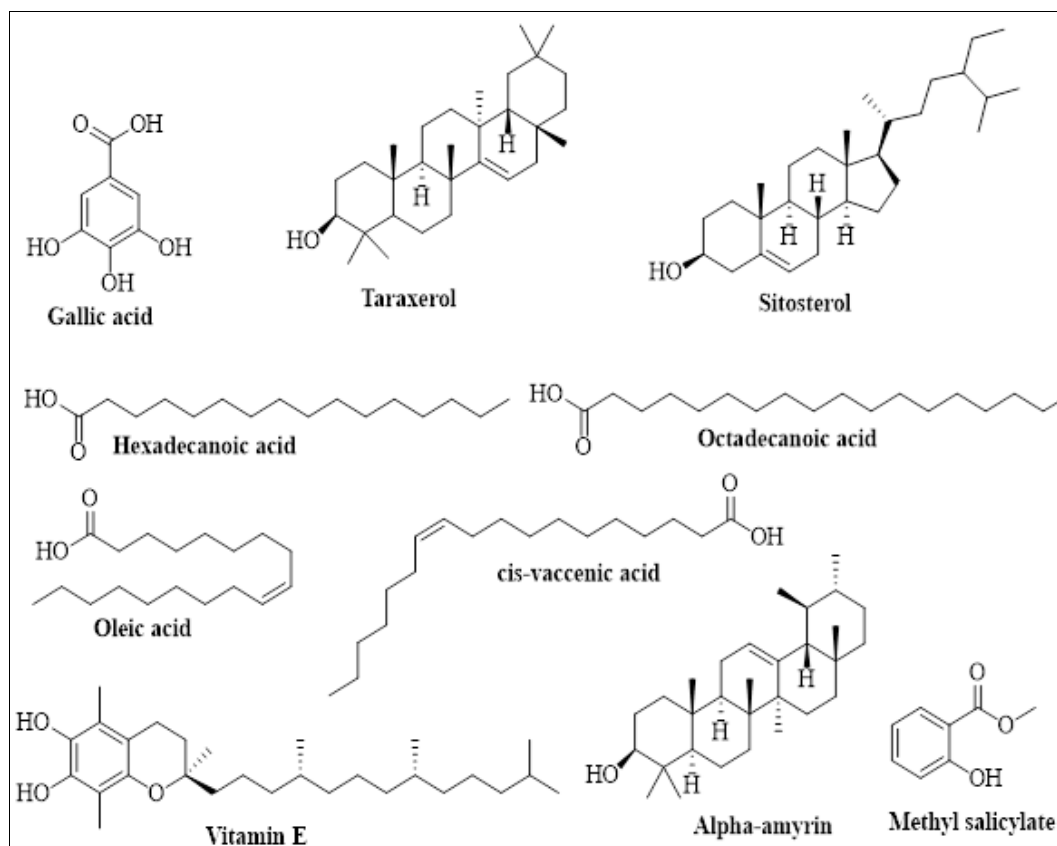


Fig 3: Structures of some steroids and fatty acids from *B. vahli*

9. Pharmacological studies

9.1 Anti-inflammatory

The *B. variegata* flower buds are used as a styptic in hemorrhagia and menorrhagia, as well as the treatment of piles, cough, eye conditions, and liver ailments [12]. A study was conducted to investigate the anti-inflammatory efficacy of an ethanolic extract of *B. variegata* roots in albino rats using a carrageenan-induced technique to cause hind paw edoema. The plant extract has a mild anti-inflammatory effect [14]. The anti-inflammatory properties of *B. variegata* Linn. leaf were reported by Gayathri G. *et al.* The research involved investigating for COX-2 and iNOS inhibitors from *B. variegata* Linn. Compound 3D structures that were discovered by GCMS analysis. It was discovered that the leaf's phytochemicals have *B. variegata* noticeably anti-inflammatory activity [17].

9.2 Antidiabetic activity

Gynecological disorders are treated with *B. variegata* [12]. In a study, the anti-diabetic effects of *B. purpurea* extract were examined against alloxan-induced diabetes in mice using the glucometer method at doses of 50 mg/kg, 100 mg/kg, and 200 mg/kg [18].

9.3 Anti-tumour activity

Due to the presence of an insulin-like protein in its leaves, *B. variegata* is frequently used as an anti-diabetic medication [19]. In Swiss albino mice, the ethanolic extract of *B. variegata* exhibited strong cytotoxic action against Ehrlich ascites cancer. *B. variegata* ethanolic extract proved effective at reducing the growth of solid tumour masses brought on by EAC cells when given orally [20-21].

The *B. variegata* ethanol extract was found to have chemopreventive and cytotoxic effects, according to Raj Kapoor B. *et al.* Human cancer lines and generated DEN

liver tumour were both susceptible to the chemopreventive and cytotoxic effects [21].

9.4 Antidepressant effect

Using the Tail Suspension Test (TST) and the Forced Swim Test, Khare P. *et al.* demonstrated that *B. variegata* had antidepressant properties (FST). The study found that *B. variegata* methanolic extract showed a substantial antidepressant like effect at doses of 100 & 200 mg/kg delivered for 7 & 14 consecutive days (0.05). Compared to imipramine, methanolic extract demonstrated considerable antidepressant effect in *P. B. variegata* [22].

9.5 Antianxiety activity

In Dalton's ascitic lymphoma N-nitrosodiethylamine-induced liver tumours and human cancer cell lines, kachnar was shown to have antitumor activity. Due to the flavonol glycoside 5,7,3',4'-tetrahydroxy-3-methoxy-7-O-alpha-l-rhamnopyranosyl(1-->3)-O-beta-galactopyranoside, it also has anti-inflammatory properties (Patil *et al.*, 2015). Researchers looked at the seeds and leaves of *B. variegata* for their potential anti-anxiety properties. Swiss albino mice were utilised in the elevated plus maze (EPM) equipment to examine the antianxiety activity. It was found that the methanolic extract of *B. variegata* seeds (200 mg/kg) and leaves (100 mg/kg, p.o.) greatly increased the amount of time the EPM spent in open arms. The anti-anxiety properties of *B. variegata* were comparable to those of buspirone [23].

9.6 Antimalarial activity

In tropical areas, *B. variegata* is widely dispersed and may be found all over India, but it is most common in Punjab, central, and southern India. It is widely distributed in the sub-Himalayan region and the outer Himalayas up to an elevation of 1300 metres. Additionally, China has it [24]. The

antimalarial activity of *Ocimum sanctum* Linn. and *B. variegata* Linn. Leaves and roots were tested against *Plasmodium berghei*. The mice were given oral administration of ether and water-soluble extracts, along with placebo controls. According to the study, mice treated with water soluble extracts of *Ocimum sanctum*'s leaves and roots displayed 2.80% 2.17% and 7.60% 5.32% infection, respectively, while mice treated with water soluble extracts of the plant's leaves displayed *B.variegata* infection at a rate of 23.60% 13.35% on day 4^[25].

9.7 Anti-ulcer activity

Additionally, the stems, roots, and leaves are beneficial for treating ulcers, diabetes, infections, jaundice, and leprosy^[26]. The plant *B. variegata* has anti-ulcer properties. Rats with pylorus ligation- induced and aspirin-induced stomach ulcers were treated with an alcoholic extract of the stem of *B. variegata* (250 mg/kg). The ulcer index was shown to be greatly reduced by *B. variegata* stem extract, which also decreased stomach secretions^[27].

9.8 Antioxidant and DNA protective activity

The leaves infusion is used as a laxative and to cure piles. To treat worms, tumours, diarrhoea, dysentery, and piles, dried buds are utilised^[28]. The *B. variegata* bark methanolic extract (MEB) has *in vitro* antioxidant and DNA protective action against oxidative damage caused by H₂O₂ to the pBR322 DNA. The study's findings support the idea that MEB and its polar sub-fractions (EAB, NBB, and REB) have strong antioxidant activity and the capacity to shield pBR322 DNA from H₂O₂ Immunomodulatory activity -induced oxidative damage. The abundance of phenolic/flavonoid chemicals in *B. variegata* bark extract and fractions may be the cause of their powerful antioxidant activity and capacity to protect DNA^[29].

9.9 Immunomodulatory activity

Obesity, hyperphagia, hyperglycemia, and hyperlipidaemia are all treated with kachnar^[29]. *In vitro* immunomodulatory action of *B. variegata* Linn stem bark extracts on human neutrophils was reported^[16]. *B. variegata* Human neutrophils' phagocytic function was dramatically boosted by Linn. stem bark when compared to controls, indicating a potential immunostimulating impact. As evidenced by the increase in cells that reached the lower surface of the filter, the *B. variegata* Linn stem bark extracts considerably boosted neutrophil chemotactic migration, acting as a chemoattractant^[16].

9.10 Antimicrobial activity

In a study, gram positive *B. subtilis*, *S. aureus*, and *S. epidermis* and gram negative *E. coli*, *S. flexinaria*, and *P. auriginosa* were used to determine the antimicrobial effect of a methanolic extract of the flower of the *B. variegata* Linn. According to a study, the methanolic extract of *B. variegata* Linn's flower suppressed the growth of microorganisms in a dose-dependent manner^[31].

10. Uses

- The traditional uses of *B. variegata* Linn. include the treatment of bronchitis, leprosy, inflammation, bacterial infection, liver disorders, diarrhoea, dysentery, skin disease, leprosy, intestinal worms, wounds, ulcer, fungal infection, ulcers, and tumours^[31, 32, 33].
- The stem bark is used as an astringent, alliterative, anticancer, anti-obesity, tonic, and anthelmintic, as well

as to treat obesity and ulcers^[20, 21, 30, 33, 34, 35].

- The leaves' infusion is used as a laxative and to cure piles. Abrasions can also be treated using leaves.
- To treat worms, tumours, diarrhoea, dysentery, and piles, dried buds are used^[27].
- In addition, *B.variegata* Linn has antibacterial, antifungal, antiulcer, and hepatoprotective properties^[36].
- The flavanone glycoside in its root is what gives it its anti-inflammatory properties^[32]. It is used to treat hyperglycemia, hyperlipidemia, obesity, and hyperphagia^[30].
- Protein and fatty acids with the alkyl groups oleic, linoleic, palmitic, and stearic acid are found in seeds. Aphrodisiac and tonic properties are attributed to seeds. Children who have dyspepsia are given the seed's paste and used to treat boils.
- Fruits are used as aphrodisiacs and anti-fertility remedies for women
- Cyanidin, malvidin, peonidin, and kaempferol are all found in flowers.
- Flavanol glycosides are present in the root^[37]. Root juice is used for dysentery, root decoction is used for fever, and the roots are utilised for pulmonary tuberculosis. In some locations, *B. vahlii* root is used as a toothbrush to treat pyorrhea, and root extract is used to treat virus-induced illness with a focus on herpes simplex.

10.1 Marketed Products

1. **Kanchnar Guggul:** An Ayurvedic remedy for the treatment of TB tumours, ulcers, gonorrhoea, and to increase white blood cells. It contains kanchnar bark (10 parts), ginger, black pepper, long pepper, cardamom, cinnamon, tejpatra leaves (Cassia cinnamon), and triphala (1 part of each of the above herbs).
2. **Chandanasaava:** Used as cardiac and digestive tonic
3. **Mutra Sangrahaniya Kwatha:** Used in UTI.
4. **Chitrakadi Taila:** Herbal oil used to apply into fistula tract to bring quick healing.
5. **Ushirasava:** Used in the treatment of heavy menstrual bleeding, skin diseases Gandamala Kandana Rasa: Used in goiter, cervical lymphadenitis.
6. Kanchanara drava
7. Kanchan gutika
8. Gulkand Kanchanara
9. Kanchanaradi Kwatha

11. Conclusion

The medicinal plant known as kanchnara (*B. vahlii* Linn.) has the ability to treat a number of illnesses. The pharmacological processes, conventional medical applications, cultivation, collecting, chemical components, and history of *B. vahlii* have all been covered. Flavonoids, glycosides, alkaloids, tannins, and terpenoids are some of the significant chemical components that make up *B. vahlii* Linn. and are responsible for its many pharmacological effects. *B. variegata* Linn. serves as an anti-diabetic, antioxidant, ulcer-preventing, anti-microbial, anti-bacterial, anti-cancer, and hepatoprotective agent. In order to investigate the molecular mechanisms of action of the numerous phytoprinciples inherent in *B.variegata*, additional research on the plant is necessary. The scientific study of *B. variegata* has demonstrated a wide range of biological possibilities. Due to its pharmacological and phytochemical characteristics, this plant can be used to make a variety of medications. A significant fraction of the global population relies solely on plants as a supply of medications.

Therefore, it is exceedingly difficult to supply safe, affordable, and effective medications, particularly to the population who lives in remote areas. Based on clinical trials, more research should be done on the chemical components and pharmacological effects of *B. variegata*. Through this research, it has been revealed that this plant contains antimicrobial, anti-inflammatory, anthelmintic, antitumor, cytotoxic, antiulcer, haemagglutination, hepatoprotective, and insecticidal properties. By doing clinical and pharmacological testing at the molecular level, there is still much to learn about the advantages of this herbal medicinal plant. Therefore, research should be conducted to standardise the various *B. variegata* extracts used to create herbal formulations, while also examining the potential mechanisms of action of the extracted active ingredients.

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