Bauhinia variegata Linn: All Purpose Utility and Medicinal Tree

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Introduction

Bauhinia variegata (variegated orchid tree) a member of family Fabaceae and subfamily Caesalpinioideae is commonly known as mountain ebony (English) or kachnar (Hindi). It is a well known ornamental tree of tropical and sub-tropical climate with hot and dry summers and mild winters. It is native of Asia and is widely found in the Indian subcontinent and in regions of China. Tree grows well in areas with full sun or partial shade and is fairly resistant to drought but susceptible to fire. Though frost kills leaves of seedlings and saplings, they recover during summers. It is a small to medium size tree growing 10-12 m in height and 50 cm in diameter. It can be found up to an altitude of 1,800 m, mean annual temperature ranges from 0°-47° C with mean annual rainfall of 500-2,500 mm. The tree grows in all types of soil, preferring a fertile, moisture-retentive but well-drained soil. It is a deciduous tree, leaf fall starts in November-December and tree remains leafless from January-April. Leaves are long, broad, rounded and bilobed at the base and apex. Flowers are very showy which bloom when the leaves start falling. The fruit is a pod 15-30 cm long, containing 10-15 seeds. The species reproduces naturally through seeds.

On the basis of study for seed and growth characteristics, B. variegata along with Grewia optiva and Albizia lebbeck has been found to be the most suitable tree species for plantations in Garhwal Himalayas (Mishra et al., 2009). It is a well known fodder species of mid hill region. It also finds role in paper and cellulose, round log and sawn wood, wood wool board, gum and fiber production and recovering degraded areas (Martinelli-Seneme et al. 2006; Mali et al., 2007). Various plant parts of the species like stem, stem bark, leaves, seeds, roots, flower buds and flowers are used in various indigenous systems of medicine and popular among various groups in India for cure of variety of ailments (Pandey et al., 2011). Various compounds, such as cyanidin glucoside, malvidin glucoside, peonidin glucoside and kaempferol galactoside, isolated from B. variegata are believed to inhibit growth and spread of various cancers of lung, liver, oral cavity, larynx and malignant ascites.
Utility: Products and Services

Many products and associated services can be obtained from B. variegata which are categorized as:

1) Ornamental: The showy fragrant, pink, purple or white flowers make the tree attractive for ornamental and avenue plantings.
2) Fodder: Leaves make good fodder and are greedily eaten by sheep, goats and cattle. The average annual fodder yield per tree is 15-20 kg of dry matter.
3) Food: Leaves and flower buds are eaten as vegetables.
4) Fuel: One of the main uses of B. variegata is as fuel; calorific value is 4,800 kcal/kg.
5) Fiber: Fiber is extracted from weak stems and is used for making ropes.
6) Timber: The wood is brown; moderately hard and used for agricultural implements.
7) Gum or resin: The tree yields a gum, which is used as adhesive and industrial product.
8) Tannin or dyestuff: The bark produces tannins, used in various shades of brown.
9) Lipids: The seeds are made up of 20 per cent endocarp and 80 per cent kernel. They yield 16.5 per cent of pale yellow, fatty oil on extraction with petroleum ether but only 6.1 per cent in a hydraulic press.
10) Medicine: It is used for the treatment of bleeding hemorrhoids, cough, diarrhea, dysentery, heartburn, hematuria, indigestion, malaria, menorrhagia, skin diseases, sore throat, TB, dyspepsia, bronchitis, leprosy, ulcer, obesity and worms. It is also used as an astringent, tonic and anthelmintic.

Medicinal Uses

In India, B. variegata has been widely used as a medicinal plant in the tribal, Ayurveda, Unani and Homeopathy systems of medicines. It is believed to possess anti-tumour, anti-microbial, anti-inflammatory, anti-goitrogenic, hepatoprotective and haemagglutination properties (Mali et al., 2007).

Bark

The bark is alterative, astringent and tonic and is useful in the treatment of skin diseases, scrofula and ulcers. The bark decoction is used for diarrhea control, as an astringent alternative and for treating scrofula, skin diseases and ulcers. The extracts of Glycosmis pentaphylla and B. variegata show a free radical scavenging activity comparable to that of ascorbic acid. The overall antioxidant activity can be attributed to flavonoids, phenolic and other phytochemical constituents which can be a source of natural antioxidant that may have greater importance as therapeutic agent in preventing or showing oxidative stress related degenerative diseases (Bhatia et al., 2011). Study conducted by Balamurugan and Muralidharan (2010) reported that the body weight and feed intake of hypercaloric diet fed female rats was reduced significantly when treated with methanolic extract of stem and root barks of B. variegata, which could be due to the presence of â-sitosterol in the stems and the tendency of the extract to reduce lipid profile and elicit the brain serotonin level. The stem bark extract of B. variegata exhibit significant hepatoprotective activity (Bodakhe and Ram, 2007). Balasubramanian et al. (2009) isolated flavanone from the stem of B. variegata and tested for cytotoxic activity against 57 human tumour lines. Their results showed that the flavanone has cytotoxic activity against human tumour cell lines. The ethanolic extract of the stem bark of B. variegata is an immunomodulatory agent and most likely acts by stimulating both the specific and non specific arms of immunity (Ghaisas et al., 2009). The study conducted by Koti et al. (2009) shows that the ethanol extract from the bark of B. variegata exhibits significant anti diabetic activities. The aqueous extracts from the root of B. variegata Linn produces significant dose dependent analgesic activity (Rajani et al., 2009). Patil et al. (2010) reported that the acetone: water extract and isolated compound of B. variegata stem bark showed primarily significant activity on in vitro human neutrophils in all parameters, which are comparable to standard and control at different concentration signifying the potential immuno-stimulating effect. According to the observations listed by Roth et al. (2011) while studying the significance of ornamental plants in human welfare, bark of B. variegata, Wrightia, Swertia, Azadirachta, Commiphora and Rubina are taken in equal quantity and decoction is prepared. One cup of this decoction is taken thrice a day against cancer.

Leaves

The juice extracted from the leaves and roots of B. variegata is used by people of Gond tribe of Madhya Pradesh to cure chest pain. The study conducted by Prashar et al. (2010). On high fat fed rats showed that the orally administered ethanolic extract of B. variegata was found to be effective in suppressing high fat diet induced hyperlipidemia and suggests its beneficial use as an anti-atherogenic drug. Another study conducted by Thiruvenkatasubramanian and
Jayakar (2010) on streptozotocin induced diabetic rats indicated that ethanolic and aqueous extracts exhibited a potent blood glucose lowering properties. The ethanol and aqueous extracts of roots of *B. variegata* possess analgesic effects which may be due to the presence of flavanoids. Whereas, the anti-ulcer activity may be due to possible involvement of prostaglandin and mucus in anti-ulcer effect of extract or it can be by free radical scavenging effect or due to its anti-secretory activity. (Kumar and Rajani, 2011). The ash of dried leaves is taken against cough (Pant and Sharma, 2010).

**Roots**
The root is used as an antidote to snake poison. A decoction of the root is used to treat dyspepsia. To verify its medicinal potential a lot of study and scientific research has been carried out.

**Buds**
The dried buds are used in the treatment of piles, dysentery, diarrhea and worms.

**Flowers**
The study conducted by Pandey and Agrawal (2010) on the chemopreventive action of *B. variegata* flower extract on two-stage skin carcinogenesis, induced by a single topical application of 7,12-dimethylbenz (a) anthracene (DMBA) revealed the chemopreventive role of *B. variegata* flower extracts against DMBA-induced skin carcinogenesis in mice. Both ethanol and aqueous root extracts produced significant free radical scavenging activity. Both the extracts produced significant nephroprotective activity in gentamicin induced nephrotoxicity model as evident by decrease in elevated serum creatinine, serum urea, urine creatinine and BUN levels, which was further confirmed by histopathological study. Gentamicin induced glomerular congestion, blood vessel congestion, and epithelial desquamation, accumulation of inflammatory cells and necrosis of the kidney cells were found to be reduced in the groups receiving the root extract of *B. variegata* along with gentamicin.

**Conclusion**

*B. variegata* is considered as an ornamental and fodder tree; has started gaining popularity and increase in demand because of the medicinal properties it possesses. Its uses in traditional systems of medicine has been known since long, but in last few years many experiments have been conducted to prove its utility, effectiveness, and usefulness. It has been observed that this species is not in abundance in the wild and is mostly seen around farmers’ fields. There is a possibility of reduction in its genetic variability due to less number of individuals present in the wild. Implementation of suitable projects/ programs, articulating the medicinal and economic value, with participation from the private sector needs to be organized for conserving the existing genetic variations. Moreover, promising individuals may be selected, propagules may be collected and multiplied for producing quality planting material of the species. Various scientific and research institutes should be roped in for creating scientific studies aimed at developing improved planting stock with proper and easy establishment of seedlings. Awareness creation, quality planting stock, proper water harvesting techniques along with adequate return for investment might help the farming community in looking at this tree as a major source of livelihood. The medicinal and varied multipurpose uses, that *B. variegata* tree possesses, may be a source of income generation and economic benefit especially for villagers of hilly areas.

**References**


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