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PHARMACOLOGICAL REVIEW ON BAMBUSA TULDA ROXB

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ABSTRACT

Bambusa tulda is one of the remedial plants of regional patrimony but it's having universal significance. Our World was contributed with a rich wealth of restorative plants. Those plants have always been the prime source of medicine in India and contemporarily they are becoming red throughout the Globe. *Bambusa tulda* belongs to the family *Poaceae*, the fifth-largest flowering plant, also known as Spineless Indian bamboo, Indian Timber bamboo, and Bengal Bamboo.

Bamboos are one of the earth's aged and the most beneficial plant materials. Its distributed widely in varied habitats. The very popular uses of bamboo are for architecture and construction works, medicine, agro-forestry, food, biofuel. A secretion of bamboo is a fine, siliceous matter called 'tabasheer', which is used as a cooling tonic to treat bronchial asthma and even as a stimulant. In India and China, almost the entire plant parts are used for therapeutic purposes. It is reported that raw bamboo consists of cellulose, hemicellulose, pectin, protein, vitamins, pigments, minerals fats, acetylcholine, ash constituents, lignin, tannins.

The bamboo plant is possessing curative actions which can be used as anti-bacterial, to treat Hansen's disease, anti-inflammatory, diuretic, anti-oxidant, stimulate menstruation, neurotransmitter, cardioprotective, anti-allergic, bronchial asthma, anti-diabetic, anti-cancer activities and also used for vomiting and nose bleeding and all these activities are reported. The current analysis aims to compile the remedial values of *Bambusa tulda* which are proven through the research using current scientific approaches and inventive scientific tools.

Keywords*: B. tulda, bamboo day, bamboo terminology, cultivation, identification features, phytochemical constituents, medicinal uses*.

1. INTRODUCTION

Bambusa tulda is a giant, fastly growing grasses, which is widely distributed all over the world and native to the Indian subcontinent, China, Bhutan, Bangladesh, Nepal, Vietnam, Myanmar, Thailand and neutralized in Iraq, Puerto, Rico, and parts of South America, Colombia, Ecuador, Australia[1].

All the bamboo plants are popular as ornamental flowers and are grass in nature because the larger ligneous stem bamboo resembles a bush in appearance and are frequently called" Bamboo trees". Including indigenous and non-indigenous almost 165 bamboo species throughout India. They are perennial flowering plants, evergreen in nature. In this genus, out of the 22 genera occurring in India,19 is native and then 3 are exotic. Bamboo assumes symbolic meaning in East Asian culture, embarking such values as endurance and friendship, as considering the four seasons or a sacred barrier against evil[2].

The bamboo plant is considered a symbol of eternity, tradition, and lineage, for example, "When the bamboo is old, the bamboo sprouts appear" is a very famous Vietnamese proverb. It is also called "Green Gold". In India, it remains a symbol of Friendship[2].

BAMBOO DAY

All year on September 18, this day is celebrated as World Bamboo Day to lift the global awareness of the bamboo plant. On Sept-18,2009, the World Bamboo Congress was organized in Bangkok and at that time only the World Bamboo Organization was conventionally recognized.

On this memorable day of September 2009, the Deputy Governor of Bangkok who is also recognized as a representative of the Royal Thai Government, Ms. Susanne Lucus who is an Administrative Director of WBO along with Mr. Kamesh Salam who is the President of WBO, including other members coordinatively titled September 18 of every year as World Bamboo Day. The day is all about bamboo; sustainability, ecology, habitat, food, medicine, housing, construction, aesthetics, music, art, science, architecture, and environment.

Bamboo is associated with traditional agricultural societies and the holistic Universe, from breath to demise. The day is celebrated with the aim to awareness to promote and conserve the bamboo industry, it promotes the cultivation of bamboo.

Origin of the Word "Bamboo"

The 'Bamboo' word is derived from "MAMBU" which is a Malay word. Then Malay is a Malaysian standardized language that is spoken by the native peoples of Malaysia and Indonesia.

The Dutch name is "Bamboes"

Neo-Latin name is "Bambusa"

Synonyms:

Bambusa teres,

Bambusa macala,

Dendrocalamus tulda (Roxb.),

Bambusa trigyna,

Plant information:

Figure no.1

Figure no.2

TAXONOMIC CLASSIFICATION

Kingdom: Plantae

Division: Tracheophyte

Class : Magnoliopsida

Order : poles

Family : *Poaceae*

Subfamily: Bambusoideae

Genus : *Bambusa*

Species : *tulda* Roxb.

REGIONAL NAMES

Sanskrit: Vanshah lochana, venulavanam

Tamil : munkil maram, munga-luppa,mullumangila, mulmunkil.

Assam: Jati Bahn, bhaluki-makel

Tripura: mritinga, paora

Telugu: veduruppu,mulkas veduru,mullu veduru.

Kannada: bidiru

Hindi : baanz, bans-lochana,banskapur,

Myanmar: thaik-wa,

India : tulda bans,

Thailand: phai-bong dam,

Bhutan : singhane bans

2. DESCRIPTION

Bamboo's growth rate is 910mm (36 inches) in 24 hours. So, it is described as the rapidly growing plant on the Earth. Though bamboos grownup in a tiny at the beginning, strong growth spout in the summer season and then remains dormant during winter[3].

The best growth will occur in moist region with yearly rainfall around 1200-2500mm. Throughout, the apex growth of bamboo branches can rise at least a meter every day. But the local soil and climatic conditions, based on species the growth of Bamboo species will differ[3].

Anji Country is very famous as the "Town of Bamboo, it furnishes the suitable climate and soil conditions to cultivate, harvest in China. So, this plant usually rises in subtropical zones and humid sectors of India[3].

Bambusa tulda is well-known species in the bamboo family because of its everlasting and delicious, cluster-forming bamboo with stems of 6-20m height. Then it is having narrow walled canes of 50-100 mm in diameter along with internodes 36-60 cm in length. It belongs to the *Poaceae* family, also called *Gramineae* which is usually a big and almost omnipresent family of liliopsids flowering plants commonly named grasses[4].

3. BAMBOO TERMINOLOGY

Sympodial (clumping): bamboos are the ones that usually do NOT broaden and form strong bunches which only gradually expand in diameter all the year.

Monopodial (Running): bamboos are the demised bamboos that won't only gain control of your garden but also a bit possibly your neighbors. They can be glorious but when their growth is under control.

Rhizome: they are subterranean stems of bamboo from culm, roots and other radicles can rise. They are used to store starches and nutrients.

Culm: this name given to the stems of bamboo

Shoot: this name is given to juvenile culm as it arises from the radicle.

Nodes: these are the midsection that disparate the hollow bamboo culms into the cavity and are the noticeable 'rings' on the bamboo culms.

Internodes: the hollow sections between the nodes. These vary in length from species to species.

Culms Sheath: this name was given to the protective leaves which enclose new shoots / juvenile culms as they rise. In the beginning, they are the strength of the plant, once aged it starts falling off. Differentiation of Bamboo species identified with help of this sheath too.

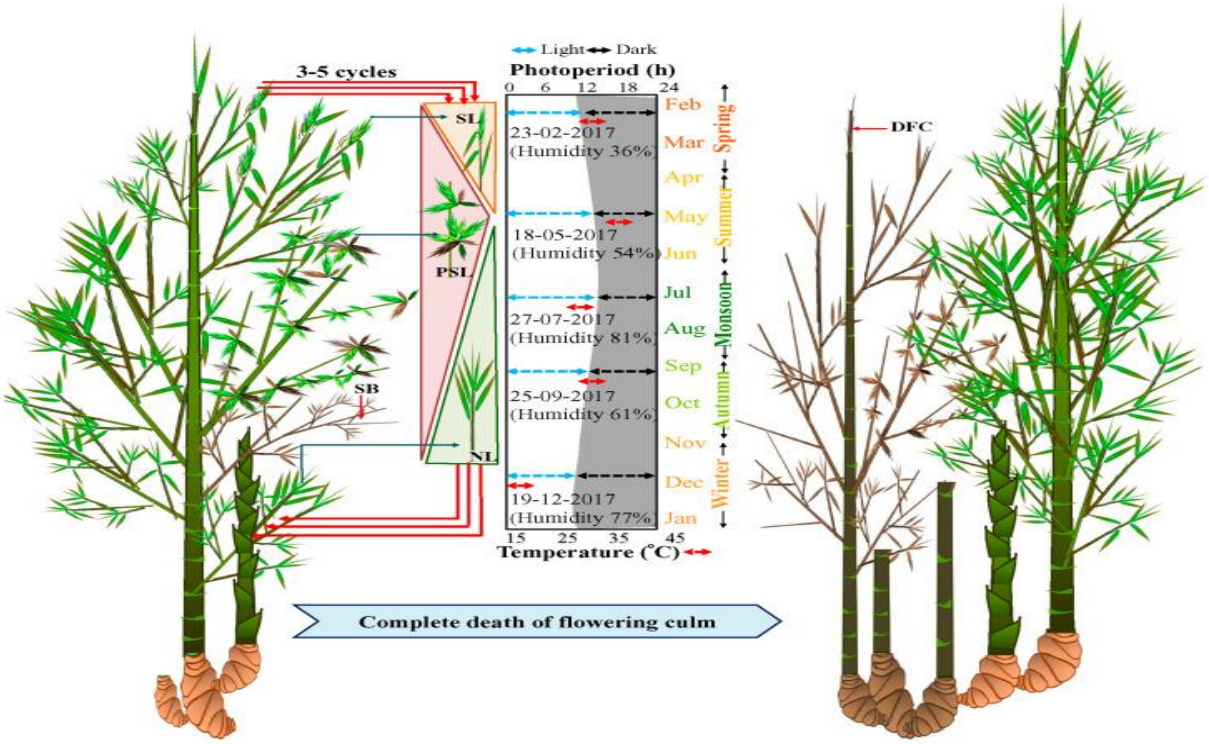

Figure no.3

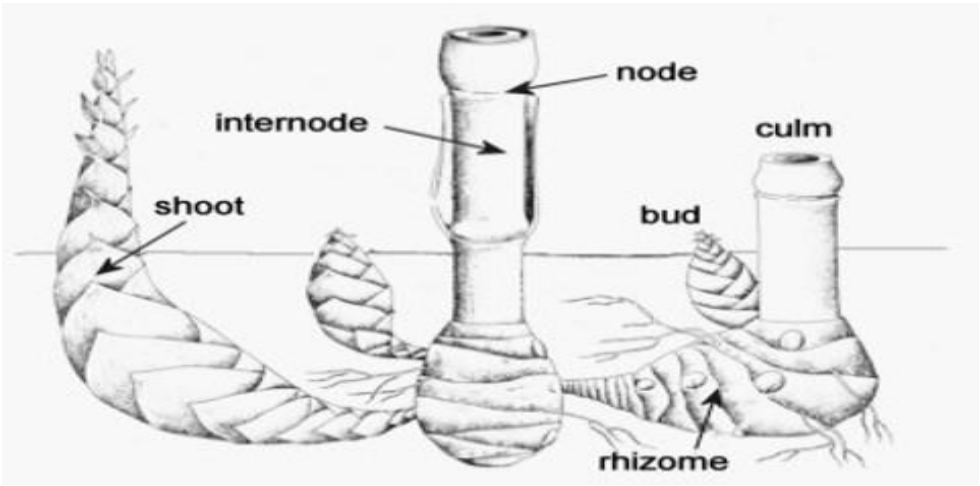

Figure no.4

4. CULTIVATION AND HARVESTING DETAILS

India is the second bulk bamboo producer of the globe and always the first place for China. The yearly production rate is approximately around 3.23 MT (Million Tonnes). This plantation is particularly cultivated for commercial uses in India. The major producers of Bengal bamboo are Assam, Mizoram, Tripura, Nagaland, Arunachal Pradesh in India[4].

B. tulda normally grow up in humid, tropical rainforest area with the altitude of up to 1,500 m and also grow up in hot conditions. The suitable growing moist areas with yearly daylight temperature range between 22 - 28º C and the tolerable temp between 9- 32º C. Then the median annual rainfall range between 1200 – 2500 mm rainfall and tolerable range between 700 - 4,500mm rainfall[5].

The growth rate is better in productive, well-drained, deep loamy soils along with appropriate organic matters and generally neutral to acidic pH range soil is preferable, tolerable pH is 4.5 - 6.0. Usually, bamboo is implanted during the monsoon. The dimension of pits is 60*60 cm size in heavy rainfall

areas should be plowed and seedbed-raised seedlings must be implanted and a small pressure is needed to apply around seedlings in at space of 5*4 meters distance so that 1 acre of land can appropriately accommodate nearly 200 plants[5].

Figure no.5

5. PROPAGATION

The bamboo seedlings are propagated by seed, rhizome cutting, culm cutting, by tissue culture. They are grown on seedbeds after that seedling is transplanted into field. In the rhizome cultivation technique, a little extra care is required. Because the culms of a year with roots must be plowed and incised into one-meter size and deep-seated in monsoon[6].

Within a month seed will start to germinate and then the young plant gives out its new stem. During this period the rhizome begins to grow and the new bud culms will develop at the end of 9 th month. They will finish up their growth in less than 2-3 months. Once became as shoots and got mature, then their breath and length won't increase[6].

The Shoots start to grow at the early monsoon season and within a month, they will emerge out of the ground. The growing speed of young shoots is almost 70 cm every day. Budding shoots are consumed as a vegetable[7].

To get the best yield, manures and fertilizers are added to the main field because the bamboo plant needs excess nutrients. Nitrogen and Potassium are the major components of fertilizer because of that the bamboo plant grows well. The topsoil mixed with 2 kg of phosphoric fertilizer is filled in each pits up to 10 cm before propagation Irrigation of the bamboo field must be done regularly to get proper growth especially when grown-up on seedbed. Once the plants get rooted firmly, then the interval of water supply can be increased[8].

Figure no.6

Figure no.7

HARVESTING:

After 5-7 years of planting, the culm starts to get mature. Usually, 3– 4-year older culms are collected and at the end of 4 th year, the plants start the chopping cycle. The matured culms are normally found in the middle of the clump and are collected during the initial year[9].

Culms are incised at length as low as possible by leaving only one internode above the ground. Harvesting methods and skills are generally varied based on different locations. Harvesting of bamboo is ended with choosing the matured culms than chopping the trees. The culms should be treated with solutions of calcium hydroxide or copper sulfate, sodium carbonate to improve their longevity[10].

ANNUAL YIELD:

The matured bamboos yearly yield in India is approximately around 4.6 MT. The annual yield of dried culms of bamboo varies within the range of 2 to 4 tonnes per hectare and on average,250 air-dried culms weigh nearly 1 ton. The price amount of one ton (sun-dried 15 % moisture) bamboo in Indian rupees is Rs 4000. The net earnings from this plantation will be about Rs 70 lakh over a decade and also this plantation is more commercial and money-making than sugarcane and rice[11&12].

FLOWERING:

Bamboos are usually semelparous which are the plants that will flower set seeds and then die. *B. tulda* will flower occasionally at the time interval of 2 years in a sequence of 15- 60 years. The seeds are feasible and edible[13-15].

Figure no.8

6. IDENTIFICATION FEATURES OF *BAMBUSA TULDA*

Bambusa tulda's usual growth is 5-20m long and means breadth is 4 -10cm.

Features	Specialties present
1. Sympodial/Monopodial	*B. tulda* is sympodial
2. Habitat	Tropical lowland bamboo Natural range; transitory forest, humid alluvial flat land, valleys, lakeshore at the altitude of 1500m.Common species in plains and hilly regions of Assam and also cultivated.
3. Culms	green → greyish green → brown colour (young) (mature) (drying) Culm-internodes are usually at the length of 36-60cm and have a very strong thick barrier, covered with white blooms. It's woody without nodal roots and is erect.
4. Shoots	Yellowish green along the dusty top(young), slightly sour fitted to be pickled before being able to eat.

5.Internodes	Length=30-60cm, Diameter=0.8-1.2cm Nodes are protuberant and over them a band of white hairs is present. They are hollow, green to grey internodes
6. Culm's sheath	Cream-colored pointed blade of breadth 5-10cm which are triangular. Asymmetrical sheath proper of 15-32 in length and 25-34cm broad is present. Blade breadth is 5-10cm.The sheath 's upper part is protected with blackish-brown hairs and the lower surface is not hairy.
7. Branches	It develops many clumped branches per node.it usually with 3 larger dominant branches. The lateral branches are dendroid.
8. Leaves	*B. tulda* leaves are lance-like shaped (its narrow end is sharp and pointed like the head of a spear),15-25cm in length,2-4cm broad. The leaves are containing 12-20 secondary veins and even midrib is also visible. Apex is acuminate and scabrous margins present.
9. Flowers	They are occasional and convivial for a period of 24 years in the cycle of 15-60 years. The seed production is viable and edible.
10. Habit	Perennial and caespitose.
11. Rhizomes	Clumped loosely and short.

Table no.1PHYTOCHEMICAL CONSTITUENTS

Bioactive constituents of bamboo leaves: tannins, polyphenols, saponin glycosides, steroids, flavonoids, coumarins, triterpenoids, amino acids like choline, glutelin, methionine, betaine, lysine, proteolytic enzymes like urease and nuclease. Sigma-5-en-*3 β*-ol-*β*-D glucose pyranoside are introverted in the best quantities and contained nutrition in which protein, carbohydrate, vitamins, fibers, and essential minerals have been observed [16-22].

Shoots: oxalic acid, reducing sugars, resins, di feruloyl arabinoxylan Hexa saccharides, waxes, HCN, benzoic acid is present and have considerable amount of potassium carbohydrates, phenolic acids, vitamin-c, vit-12, vit-B1, Vit-B3, and fibers [16-23].

Seed; proteins such as l-arginine, cysteine, methionine, lysine, leucine, histidine, phenylamine, isoleucine, **vitamins of** B1, B3, B12 are present[23].

ETHNOMEDICINAL USE:

In folk medicine, the leaves of *B. tulda* are used for controlling fever, cold, bronchial asthma and wheezing, leprosy. The leaves of bamboo had been utilized to treat various diseases in *Chinese* medicine especially for cleansing the blood along with the body detox process almost a millennium[24].

COMMERCIAL USES:

1. Used for construction and architectural work, furniture, boxes, mats, basketry, household utensils, boxes, scaffolding, and handicrafts.

2. Used as starting goods for aroma stick (agarbatti) industry and in paper pulp production[25].

EDIBLE USES:

The juvenile shoots of *B. tulda* are edible but slightly bitter. A survey had reported more than 50 bamboos used for the sublime purpose in huge and small scale in North East Himalayas region. varieties of preparations like bamboo candy, bamboo shoot bhaji, chutney, pickle, fried shoots, kadi, pulav, keema, soup, bamboo juice, and bamboo beer are made from bamboo shoots.

The young shoots of bamboo are called '*Karil'* and the shoot is crushed, a fermented wet form called '*Sadhana'* and fermented dry form is called '*haua'* [25].

MEDICINAL USES:

The siliceous ooze out of the culm is used as a stimulant and tonic. The fresh and fermented shoots of *Bambusa tulda are* utilized as starting material for steroid drug production because *B. tulda* contains more amount of Phyto steroids present in succulent shoots[26].

AGROFORESTRY USES :

Bambusa tulda is grown in acreage and grassland as wide breaker. The bamboo sounded agro-forestry are increasing in the forest areas in recent days. The bamboo is a unique, productive, versatile, extraordinary plant of Earth. Agroforestry is an ecological-based natural resource management system[27].

Bamboo plant-based agroforestry plays a vital and emerging role in the conservation of resources. It is nourishing the atmospheric oxygen and CO2 ratio level and enhances the biodiversity, and renewable energy of forests because bamboo is a good soil binder and has energy for effective carbon sequestration which will counteract the emission of greenhouse gases, climatic changes and global warming, ice melting[28].

7. VARIOUS IDENTIFIED THERAPEUTIC USES OF *BAMBUSA TULDA*

Anti-inflammatory effect:

Jason K Higa *et al*., (2011) had been deliberated the extracts of *Phyllostachys edulis* also a kind of bamboo species having anti-inflammatory action on excessively produced of IL-6 in metabolic cell lines by Lipotoxicity effect. He correlated the standard drug sample with the ethanolic bamboo leaves extract revealed a vital anti-provocation (inflammation) effect. The *Bambusa arundinaceous* leaves methanolic extract had anti-inflammatory effects in contrast the cancer-induced along with also immunologically induced paws edema and he had got remarkable result in contrast with standard drugs[29].

Anti-diabetic activity:

Arvind Kumar Goyal *et al* (2018), was deliberated the methyl hydroalcoholic leaves extract of *Bambusa tulda* had proven anti-diabetic activity. These results revealed that the *B. tulda* can be used to treat hyperglycemic(diabetic) patients and confirm this plant as a potential candidate for anti-hyperglycemic activity[30&31].

Anti-Cancer activity:

Vivek Sharma *et al* had deliberated that the bamboo shoots have several bioactive chemicals that had proven potent anti-cancerous properties. Then results revealed that high quantities of phenolic compounds possess potent radical scavenging activity and exerted anti-carcinogenic effects by regulating ROS levels, signal transduction cascades, angiogenesis, cell proliferation[32].

Proliferative activity:

Hyunjin Lee *et al*., (2017) reported the proliferative effect on human stem cells and demonstrated that at starting time points, the ability of *B. tulda* extracts to increase multiplication of mesenchymal stromal cells as well as improved cartilage I expression. They revealed the proliferative action of the *B. tulda* plant[32].

Antioxidant activity:

Aravind Kumar Goyal *et al*., (2015) had found the antioxidant action using the DPPH method. This might be the first report to provide evidence that crude aqueous methanolic extract of B. tulda leaf is a potential source of natural antioxidants. This study had proven that 70% aqueous methanolic leaf extract was found to be a better antioxidant and radical scavenger as compared to the standard Ascorbic acid sample[33,34&35].

Antibacterial activity:

Vijay Kumar Singh *et al*., (2010) evaluated the antibacterial activity of leaves extract of *Bambusa tulda* against both G +ve and G-ve bacterial strains by disc diffusion method. He had got a wonderful result that all extracts are effective inhibitors against S. aureus. When compared with standard antibiotic Penicillin, both extracts such as aqueous and ethanolic were shown the productive inhibitory action on both kinds of bacterial strains[36].

8. CONCLUSION

For long and long years, Phytotherapy plays a vital synergistic role in the development of present human civilization. This review article is shortly sharing and concluding the therapeutic uses, bioactive chemical, and pharmacological effects of *Bambusa tulda*, a very famous species of bamboo family. These plants are God-gifted to our globe because it's having many therapeutic actions like antioxidant, ant- bacterial, anti-inflammatory, anti-diabetic activity, and anti-cancerous activity. This bamboo plant is having more edible uses and has sweet taste. Its possessing a remarkable task in soil and water management, also useful for carbon segregation process. Then the further more studies also required with the *Bambusa tulda* to reveal the various mechanism of actions with other remedial activities.

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