

A REVIEW ON TAMBULA (PIPER BETEL LINN.) FROM AYURVEDIC AND MODERN PERSPECTIVE

Bibha Rani Ratna^{1*} and Rajneesh Kasaudhan²

¹Assistant Professor Department of Dravyaguna.

²Assistant Professor Department of Rasa shashtra and Bhaishajya kalpana.

Ankerite Ayurvedic Medical College and Hospital, Mohanlalgang, Lucknow, 226301.

Article Received on
18 March 2021,

Revised on 08 April 2021,
Accepted on 28 April 2021

DOI: 10.20959/wjpr20215-20379

*Corresponding Author

Dr. Bibha Rani Ratna

Assistant Professor

Department of Dravyaguna.

Ankerite Ayurvedic Medical

College and Hospital,

Mohanlalgang, Lucknow,

226301.

ABSTRACT

Tambula a herbal drug which was described by ancient acharayas as mukhasodhan, ruchikarak, and sugandh dravya. In nighantus it is described as krimihara and jantujit by Priya nighantu and Bhavprakash nighantu described it as sleshma, daurgandhya, mala, vata and shrama hara. Rajnighantu described it as kaphakasa hara, ruchya, and deepaniya. This review recollects the information related to tambula from three Samhita (1500BC -600 AD) and 6 nighantus Of sangraha kala (10 TO 17 AD). It is observed that the drug is used in more than 10 formulations. indicated more than in 20 diseases condition including krimirog, aruchi, gulma, vrana Useful part of the plant is patra swaras. It is used in various doses forms. Contraindication: Raktapitta, Kshata, Shotha, Madaty.

KEYWORDS: Mukhasodhana, Ruchikarak, Krimihara, Deepaniya.

INTRODUCTION^[1,2,3,11]

Ayurveda deals with drugs of plants, animals, metal and mineral origin. Among these maximum drug are of plant origin. (1) Tambul is well described by bhavprakash nighantu mentioned in guduchyadi varga. (2) Tambul is botanically identified as piper betel belonging to Piperaceae family.

In vedic kala tambul was just used for daurgandhya nasana, ruchikaran, and mukhasodhana. Specific uses and its varieties are explained in various nighantus.

Rajnighantu described about 7 varieties of tambul.

Shrivati, Amlavati, Satasa, Guhagare, Amlasara, Patulika, Hrisaraniya.

Plants may contain constituents that can be used to treat diseases such as infections, inflammatory conditions and cardiovascular diseases, but the scientific information on most of these medicinal plants in use are lacking.

AIM AND OBJECTIVE

Therefore as part of the efforts to promote the use of medicinal plants either as an alternative or an adjunct to conventional medicine, it is necessary for scientists to carry out investigations into herbal medicines. This will help bridge the gap between conventional and herbal medicines.

Table no. 01: Synonyms acc. to differet acharya.^[4,5,6,7,8,9]

Sl. no.	Paryaya	Ra. Ni	Pri. Ni	Bh. Ni	Sho. Ni	Dha. Ni	Mad. Ni	Kai. Ni
1	Nagavalli	+	+	-	+	-	+	+
2	Nagini	-	-	+	-	-	+	+
3	Nagavallari	-	-	+	-	-	-	-
4	Phanilata	+	-	-	-	-	-	-
5	Bujanglata	+	-	-	-	-	-	-
6	Nagavallika	-	-	-	+	-	-	-
7	Tambooli	+	+	+	-	-	+	+
8	Tambool	-	-	+	-	-	-	-
9	Saptashira	+	-	-	-	-	-	-
10	Phanivalli	+	-	-	-	-	-	-
11	Mukhabushan	+	-	-	-	-	-	-
12	Parnalata	+	-	-	-	-	-	-
13	Tamboolvali	-	+	+	-	-	+	+
14	Madhaypatri	+	-	-	-	-	-	-

Tambul: Leaves dry up in lack of water

Nagvalli: Climber spreads like a snake.

Saptashira: Leaf having seven venations.

Table no. 02: Vernacular name.^[26]

Sanskrit	Tambool, Nagavalli, Nagini, Nagavallari
Hindi	Paan
Gujrati	Nagarbael
Marathi	Videch paan
Kannada	Elli
Arabic	Tambool
Semang	Serasa, cabe
Telugu	Tamalapaku, Nagavalli
sakai	jerak

japanese	suruh,bodeh
Tamil	Vettilai
Malyalum	Vettilakotti
Bengali	pan
Malaysia	Sirih, Sirih melayu, Sirih cina, Sirih hudang, Sirih carang, Sirih kerakap
Marati	Nagbael
Latin Name	Piper Betel
English Name	Betel Leaf

Table no. 03: Classification.

01	Raj nighantu	Amradivarga
02	Madanpala nighantu	Phaladivarga
03	Shodhala nighantu	Chandanadivarga
04	Kaidev nighantu	Oushadivarga
05	Priya nighantu	Pippalyadivarga
06	Bhavprakash nighantu	Guduchyadivarga
07	Nighantu Aadarsh	Pippalyadivarga

Taxonomical position^[26]

For the purpose of uniformity and universality in the knowledge of plants, a system of classification and designation of plants has been evolved in the science of botany called Taxonomy. **Naagavalli** can be designated under the following Taxonomic position:

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Magnoliopsida
Order	: Piperales
Family	: Piperaceae
Genus	: Piper
Species	: Betel

Habitat

- **Global:** It is nature to central and eastern Malaysia betel thrives under humid tropical forest condition with high relative humidity condition. It is also cultivated in India.
- **India:** The plant grows from sea level to 1000 mts. rainfall more than 179cm is necessary cultivated mostly in bengal, bihar, orrisa, up, rajasthan and southern india

Pharmacognocny of nagavalli (Piper betel Linn)^[11,12]➤ **Macroscopic characters**

- **Colour:** Yellowish green to dark green in colour with glossy upper surface. □ Odour: Characteristic and Pleasant.
- **Taste:** The betel leaves are aromatic with varied taste, ranging from sweet to pungent due to the presence of essential oils. .
- **Shape and Size:** The betel leaf is a heart shaped with different size. The size of the leaf varies with different cultivar from 7-15cm in length and 5-14cm in width. Betel leaves are simple alternate stipulate petiolate with 0.75 to 3.8cm, ovate oblong broadly ovate cordate or obliquely elliptic entire glabrous coriaceous 10 to 18 cm long and 5 to 10 cm broad acuminate oblique and rounded base.

➤ **Microscopic characters**

- Transverse section of leaf through midrib shows four layered upper and two layered lower epidermis.
- The cuticle is thick on the upper epidermis and thin on the lower epidermis. The cells of the outer epidermal layers on both sides of the leaf are small, that possess tannins and oils. The sub epidermal cells on the abaxial side are enlarged and they store water. Crystal and oil reserves are found in the sub epidermal cells on both sides.
- The palisade layer are well distinguished they are double layered short wide compact cells and mesophyll cells are 3-4 layered and small lobed. Thick walled irregular secretory cells are seen with dense contents of probable an essential oil.
- The leaves are hypostomatic, tetra-cytic stomatal complexes are common which is the characteristic feature of the Piperaceae.
- The trichomes are glandular which have unicellular apical cell and a short pedicel. The pedicel has thicker wall, surrounded by 5 or 6 epidermal cell arranged in a rosette disc like manner. The apical cell of trichome is slightly pointed or clavate shaped. The vascular bundles located at the centre of midrib portion single ovate collateral cells with destea of xylem elements and a thick phloem was observed.
- The stems are dichotomous, articulate, swollen and rooted at nodes 3mm in diameter, woody and with 2.5 to 4cm long internodes. Stem stout with pinkish-stripe along node dilated and rooting. The inflorescence is an axillaries spike which is 5.5 cm long. The fruits are drupaceous, orange, and 3mm in diameter.

➤ **Cultivation and propagation**

- **Climatic conditions:** It grows in tropical climate with high rainfall. Shady places are best for vigorous growth.
- **Soil:** Excellent growth is mentioned on silt clay loam of high water holding capacity recommended soils are sand, clay and sandy clay deep, with high permeability and good drainage. Stem cutting having 3 to 5 nodes are used and these are planted in such a way that 2 to 3 nodes are buried in the soil. A single node cutting with a mother betel leaf is also planted. Apical and middle portion cutting of the betel vine are used for planting.

Two types of betel cultivation is practiced in India

1. Open system cultivation using support plants
2. Closed system cultivation using rectangular structures called “barejas”.

Harvesting

It is done during march to april in U.P., M.P., and BIHAR

During may to june in A.P, Telangana.

During january to feb, april to may in Tamil nadu.

Mature betel leaves are plucked by hand along with a portion of petiole.

Harvested betel leaves are washed, cleaned, and graded according to their quality and size of marketing.

Phytochemistry

Phytochemicals are naturally present in plants and shows biological significance by playing an essential role in the plants to defend themselves against various pathogenic microbes by showing the antimicrobial activity by inhibition or killing mechanisms. the presence of these compounds varies from plant to plant and without these it cant be considered to have any effect.

Table no. 04.

Sl. No.	Chemical constituents
1	Chavibetol
2	Allypyrocatechol
3	Eugenol
4	Piperitol
5	Quercetin
6	Luteolin
7	β- sitosterol

8	Hydroxychavicol
9	Eugenol methyl ether
10	D- limonene
11	Myrcene
12	Stearic acid
13	2- Mono palmitin
14	Allo ocimene
15	Cavacrol
16	Cymene
17	Terpinolene
18	α -Myrcene

Rasa panchaka: The science of Ayurveda explains Pharmacodynamics of a drug in unique way i.e, in terms of Rasapanchaka i.e, Rasa, Guna, Veerya, Vipaka, Doshakarma. This description is not found in earlier literature, but we find in later lexicon

Table no. 05^[4,5,6,7,8,9]

Pharmacological properties attributed to *Tambula* in different *nighantus*.

Rasa	Guna	Veerya	Vipaka	Karma
Katu, tikta, Kashaya	Tikshna, ushna, khsara, vishad, laghu, sara	Ushna	Katu	Vata-kapha shamak

Therapeutic use^[13,14,15,16,17,18,19,20,21,22,23,24,25]

- Betel leaf has been described from ancient times as an aromatic, stimulo-carminative (katu), astringent and aphrodisiac (Kamagnisandipanam).
- The leaves are credited with wound healing property. The Indian traditional system of medicine has identified the leaves with digestive and pancreatic lipase stimulant activities.
- Betel leaf is traditionally known to be useful for the treatment of various diseases like bad breath, boils and abscesses, conjunctivitis, constipation, headache, itches, mastitis, mastoiditis, leucorrhoea, otorrhoea, swelling of gum, rheumatism, cuts and injuries.
- Fresh juice of betel leaves is used in many ayurvedic preparations.
- Leaves considered being useful in treating bronchitis and dyspnea.
- The leaves were chewed by singers to improve their voice. The fruit of Piper betel employed with honey as a remedy for cough.
- The fresh betel leaves possess antimicrobial, ringworm, antifungal, antiseptic and antihelminthic effects.
- Leaves are used in eye drops for eye injury/infection as a baby lotion for the new born, for coughs, asthma, constipation and to arrest milk secretion.

- Essential oil from leaves of this plant has been used for the treatment of respiratory catarrhs and antiseptic.
- Leaf extract is reported to inhibit male reproductive competence.
- The leaves possess antifertility on male rats 51 and antimotility effects on washed human spermatozoa.
- In folk medicine root is used as long lasting female oral contraceptive. The users believe that chewing the 'paan' improves their efficiency and stamina.
- Piper betel showed hypotensive, cardio tonic, smooth and skeletal muscles relaxant actions.
- **Pharmacology**
 - **Antimicrobial activity:** The leaf has a significant antimicrobial activity against broad spectrum of micro-organisms. The bioactive molecule thought to be responsible for antibacterial activity is sterol, which has been obtained in large quantities in betel leaf extracts. The mode of action may be due to surface interaction of sterol molecule present in the extracts with the bacterial cell wall and membrane leading to alteration in the primary structure of cell wall, ultimately lead to pore formation and degradation of the bacterial components. It is reported that sterol act through the disruption of the permeability barrier of microbial membrane structures. The leaf has also poses the antifungal activity against many fungal infections. One of them is dermatophytosis.
 - **Gastroprotective activity:** Mucus layer is considered to be important in mucosal defences against endogenous aggressors, e.g., acids, and also as an agent in facilitate the repair process. It is generally believed that enhanced acid secretion is the most important factor for the induction of gastric lesions. The higher dose of hot water extract does not cause significant inhibition in acidity or pH of gastric fluid. Therefore, gastroprotective effect of piper betel was not mediated via inhibition of acid secretion in the gastric mucosa but by increasing its mucus content.
 - **Antioxidant activity:** Oxidative damage is an important effect of ionizing radiation on biological membranes. It is a chain reaction. Here the presence polyphenols compounds like chatecol, allylpyrocatecol etc. in betel leaf extract inhibited the radiation induced lipid peroxidation process effectively. This could be attributed to its ability to scavenge

free radicals involved in initiation and propagation steps. The extracts reduced most of the Fe³⁺ ions and possess strong reductive ability.

- **Antidiabetic activity:** The aqueous extract of betel leaves possess marked hypoglycaemic activity when tested in fasted normoglycaemic rat. The ability of lowering blood glucose level of Streptozocin (STZ) induced diabetic rat gives a suggestion that the extract have the insulinomimetic activity.
- **Effect on the cardiovascular system:** Leaf is considered to provide strength to the heart (cardio tonic) and regulates irregular heart beat and blood pressure. Platelet hyperactivity is important in the pathogenesis of cardiovascular diseases due to intravascular thrombosis. Piperbetol, ethylpiperbetol, piperol A and piperol B isolated from leaves, selectively inhibited platelet aggregation induced by platelet activating factor (PAF) in a concentrationdependent manner.
- **Antifertility activity:** The plant extract may brought about its effect through pituitary-gonadal axis, which resulted in diminished gonadolrophine release, in turn reduced reproductive organ weights and estrogen level affecting ovarian cyst. Serum biochemistry revealed that glucose level was declined but cholesterol and Vitamin C concentrations were elevated beyond control value; indicate nonutilization of cholesterol by the system, hence decrease in estrogen level. The data suggests that betel extract brought about antifertility and antiestrogenic effects in female rats and these effects were reversible on cessation of treatment.
- **Immunomodulatory activity:** Many of the disorders today are based on the imbalances of immunological processes. This necessitates the search for newer and safer immunomodulators. From literature it conclude that betel leaf a novel candidate for immunosuppressive activity. The same could be further evaluated for its anticancer activity or as a potential candidate in the treatment of autoimmune disorders such as rheumatoid arthritis, systemic lupus erythomatous or emphysema.
- **Cholinomimetic effect:** Betel leaf rise in body temperature due to cholinergic responses. Thus, leaves contain cholinomimetic and possible calcium channel antagonist constituents which may provide the basis for several activities shown by this plant.

- **Hepato-protective activity:** The antihepatotoxic effect of betel leaf extract was evaluated on ethanol and carbon tetrachloride (CCl₄) induced liver injury in a rat model. The histological examination showed that the betel leaf extract protected liver from the damage induced by CCl₄ by decreasing alpha-smooth muscle actin (alpha-sma) expression. These findings support a chemo preventive potential of betel leaf against liver fibrosis.
- **Neuropharmacological profile:** Hydroalcoholic extract of betel leaves exhibited improvement in the discrimination index, potentiating the haloperidol induced catalepsy, reduction in basal as well as amphetamine induced increased locomotor activity and delay in sodium nitrite induced respiratory arrest. These results from review suggest possible facilitation of cholinergic transmission and inhibition of dopaminergic as well as noradrenergic transmission by the extract.

Parts used^[26]

Prayojyanga of tambool: Patra

Posology^[26]

Dosage of tambool: *Swarasa:* 10 to 20ml.

Table no. 06: Classical formulations.^[26]

Sl. No.	Yogas	Indications	Reference
1	Lokanath Rasa	Atisara & Sangrahani	Rasendra Sara Sangraha
2	Pushpadhanwa Rasa	Vajikarana	Yogaratnakara
3	Bruhat Sarwajwarahar Lauha	Jwara	Bhaishajyaratnavali
4	Laghusutshekara Rasa	Pittajanita Roga	Sidhayoga Sangraha
5	Brihat Visamajwarantaka Rasa	Visham jwar	

• CONCLUSION^[9,28]

Tambul is found throughout India and its description can be traced since Samhita period. Tambul is attributed with pharmacological properties i.e. katu tikta rasa, katu vipaka, & ushna veerya and useful to combat various diseased conditions such as krimirog, aruchi, gulma, vrana, kasa, swasa, mukhasodhana and many more.

According to Bhav Prakash Nighantu, persons who are addicted to eating betel leaves (paan) feel very relaxed, mind becomes calm. Feels less fatigue, hunger or thirst. There is an increased sense of sexual excitement in them.

Betel leaf is not a strong intoxicant and person do not suffer from its toxicity on addiction. Betel leaf should always be consumed after waking up, after bathing, after meals and after emesis and purgation.

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