

Betel (*Piper betle*) as a basis of oral and digestive health security - A case study of Mithila region in North Bihar, India

Sushil Kumar and *Vidyanath Jha¹

Department of Botany,
L.N.Mithila University,
DARBHANGA-846004 (BIHAR), INDIA
*MLSM College,
DARBHANGA- 846004 (BIHAR), INDIA¹
Email: vidyanathjha@gmail.com

Received : 20.03.2024; **Accepted** : 18.04.2024

ABSTRACT

Traditional practice of betel consumption has been a major factor in maintenance of oral hygiene and digestive health. A number of secondary metabolites like alkaloids, terpenoids, steroids, flavonoids, polyphenols, tannins and saponins are present in betel leaf that are responsible for its therapeutic action against several human ailments. As such, betel has been a major factor in health security in India over millenia. Ayurved further refers to its role in delivery of drugs at appropriate places in human body. Other systems of traditional medicine under the umbrella of AYUSH also refer to the drug potentials of betel.

The paper takes into account the practices related with betel cultivation and its diverse use in relation to health security practices as prevalent in Mithila area of north Bihar.

Figures : 06

References : 38

Tables : 03

KEY WORDS : Betel, Bihar, Drug Delivery, Health Security, Mithila, Oral Hygiene

Introduction

Piper betle (betel/tambul/paan) is a major component of cultural life in India. It has strong religious nuance and is deeply associated with the dietary practices in the country. It is widely consumed for facilitating comfortable digestion.

Betel (*Piper betle*) is one of the potential cash crops grown extensively alongside the water bodies in rural areas of north Bihar. It is one of the major components of Mithila culture. Thousands of rural populace, belonging to the traditional 'paan' growers, derive their livelihood through betel cultivation. They raise their betel groves to maintain the shady habitat for this sciophyte and manage its unhindered irrigation throughout the year. They have developed their indigenous methods of betel cultivation over generations. The local varieties are widely known for their taste and efficacy and are in high demand from the neighbouring areas. Betel has more diverse ways of its usage in this region. A practice of adding tobacco products as supplementary masticatory items makes compromises with the original medicinal properties of betel. This turns

detrimental to the health of betel chewers.

Betel is generally used in the form of betel quid *i.e.*, betel leaf, areca nut, slaked lime and catechu. The traditional form of its use did have a positive medicinal effect on the overall health of those who consumed it.

Materials and Methods

Scientific literature on positive and negative aspects of the use of *Piper betle*, mostly as betel quid, were consulted. The review takes into account the traditional practice of betel consumption as well as recent practices related with its use. It elaborates the details of the recent status of betel consumption with reference to oral and digestive health in the country with special reference to north Bihar situation. Findings have been presented in the form of three tables and six figures.

Results and Discussion

Tambula of *Piper betle* Linn. belongs to the family Piperaceae. The plant has a significant role in the social, religious as well as medicinal life of India in the yore. It is held as a significant masticatory in the Indian folk life

ACKNOWLEDGEMENTS : Authors express their gratitude towards Sri Bhola Chaurasia, a betel trader of Darbhanga (Naka 5) for sharing information regarding its traditional uses.

TABLE- 1 : Various ingredients used in rolled betel (Khilli)

Meetha Patta (Fig-5A)	Sada Patta
1. It is imported from Kolkata.	1. It is locally available.
2. It has sweet taste.	2. It has stiff taste.
3. Costlier in price (costs Rs. 15/- per Khilli)	3. Cheaper in price (costs Rs. 8/- per Khilli)
	4. Local varieties used include Desi Patta, Chhoti Girah and Bari Girah

since ancient times^{3,5,10}. *Piper betle* Linn. (Piperaceae), a slender creeping plant, is widely distributed in India, Sri Lanka, Thailand and other tropical countries. This plant has deep green, heart shaped, smooth, shining and long stalked leaves, with pointed apex. Betel leaf possesses strong aromatic flavor and has been long in use for the preparation of traditional Indian ayurvedic herbal remedies (Fig-1). It has been reported for the treatment of various diseases such as conjunctivitis, boils and abscesses, cuts and injuries etc.^{12,27,28}. In addition, it also acts as a breath freshener, a digestive and pancreatic lipase stimulant and a pain killer in joint pain^{23,27,30}. The leaf extract possesses antifungal activity against various plant pathogens^{9,22,27}. Consumption of betel as quid has been the traditional practice in this area since ancient times. It helps the maintenance of oral hygiene and also helps in the process of digestion. Betel chewers earlier were in the practice of engulfing the liquid mixture of the quid juice mixed with saliva. On

the one hand it was helpful in removing the foul smell created by the oral microbiota and on the other hand this mixed juice helped in the process of digestion. Distribution of the betel quid after community feasts is still practiced. However, recent few decades have witnessed the induction of synthetic tobacco products available under the brand names of **Zarda, Tulsi, Chauri Patti, 500 Patti, 300 Patti, Ravi, Baba Patti, 64 Kimam** etc.

Piper betle is known for having antioxidant, antiproliferative, antibacterial, antifungal and anti-inflammatory properties^{20,32,33}. The leaves are also supposed to harden the gum, conserve the teeth and to prevent indigestion, bronchitis, constipation, congestion, cough and asthma. Innumerable scientific studies have validated the ethnomedicinal claims^{11,13}. Betel leaves are an integral component of the betel quid that consists of areca nut (*Areca catechu*), tobacco (*Nicotiana tabacum*) and slaked lime, a highly abused agent with

TABLE- 2 : Tobacco products used by Paan chewers as additional ingredients along with betel quid

Non-synthetic (Natural) product	Synthetic products (Fig-5B)
Hari patti (small leaflets of <i>Abrus precatorius</i>)	<ol style="list-style-type: none"> 1. Tulsi – a branded tobacco product. 2. Zarda - a branded tobacco product. 3. Chauri patti (Mahakal) - a branded tobacco product. 4. 500 patti - a branded tobacco product. 5. 300 patti - a branded tobacco product. 6. Ravi - a branded tobacco product. 7. Baba patti - a branded tobacco product. 8. 64 patti - a branded tobacco product. 9. Kimam - a branded tobacco product.



Fig.1 : District centre of sale of betel leaves (Kadirabad, Darbhanga)



Fig.3 : Different forms of betel nut as:Nirmali, Chhaliya, Fried and Chitti supari

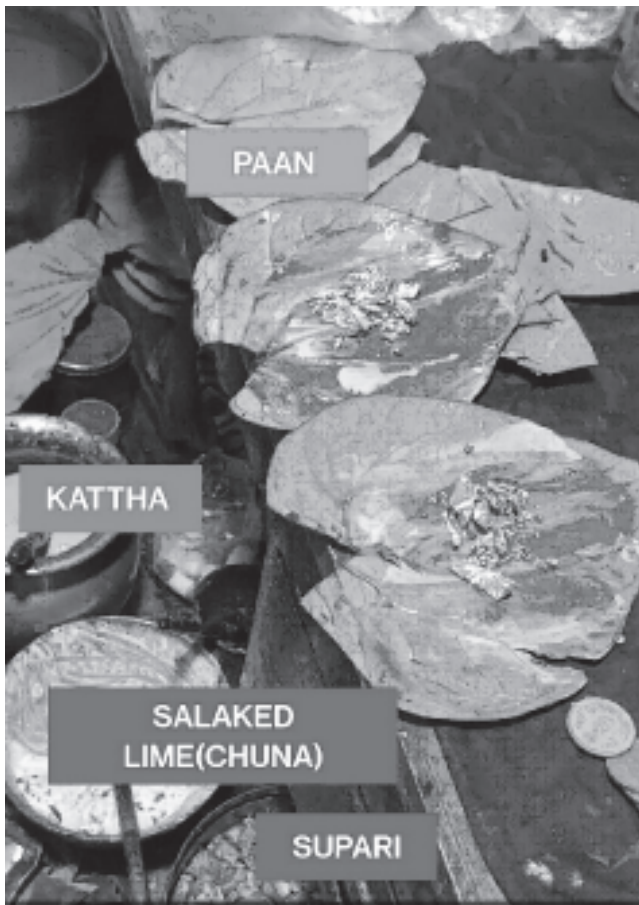


Fig. 2 : Betel quid, as practiced in this area

carcinogenic properties (Figs. 2,3 & 6). Regular chewing of betel quid is associated mainly with oral cancer and detailed studies with individual constituents of the quid have shown that both tobacco and areca nut are carcinogenic while slaked lime is shown to promote the



Fig-4 Ingredients of Mitha patta paan as observed in Darbhanga town area

process of carcinogenesis. However, unlike other constituents of the betel quid, the leaves are devoid of carcinogenic effects and on the contrary possess cancer preventive properties including those that are against the carcinogens present in tobacco^{24,25,26,33}. They are also considered as helpful treatments for various ailments, including boils and abscesses, conjunctivitis, constipation, headache, itches, gum swelling and rheumatism^{1,20}. Betel leaves have been shown to have proliferative, antitumour, anti-inflammatory and antimutagenic activities^{4,6,15,20,31,34}. Due to the potential of *Piper betle*, research is proceeding on its bioactive

TABLE- 3 : Non-tobacco products used by Paan chewers as additional ingredients along with betel quid

Non-syntheti products (Fig. 4)	Synthetic products
1. Hari patti (small leaf lets of Abrus precatorius)	1. Gulkand (Chutney)
2. Coconut powder	2. Hira-moti
3. Chhoti Ealichi (small cardamon)	3. Cherry
4. Laong (pepper)	
5. Sonf (fennel)	
6. Peppermint	

components, including hydroxychavicol, eugenol, chavibetol and chavivol, which may be important for halting cancer growth or killing cancer cells via their chemotherapeutic or chemopreventive properties^{14,18,20,37}. Among these, hydroxychavicol (HC) also known as 4-allyl-catechol is a major catecholic component of betel leaves that has been shown to have strong antimutagenic properties when compared with eugenol^{14,7,20}. HC has been reported to possess inhibitory properties against prostate, colon, glioma and leukemic

cancer cells while leaving healthy cells unharmed^{8,20}. Ethnobotanical aspects of betel cultivation in north Bihar have been elaborated^{16,17}. Modern experimental evidences of betel leaf being effective against anaemia antiulcerogenic, antifungal-activity, anti-inflammatory and diabetes also have been found^{2,36}. Role of betel leaf against cancer is well elaborated^{19,21,27}. The traditional Indian ayurvedic document describes several medicinal properties in *Piper betle* including it has an effective antifungal agent²⁷. Catechu has germicidal action and helps remove the foul smell of the mouth and adds red colour to the juice.

Eating betel quid without any additional ingredients does have a number of positive benefits. The betel juice helps the process of easy digestion as well^{29,35,38}. There are also some people who avoid using lime in the betel quid.

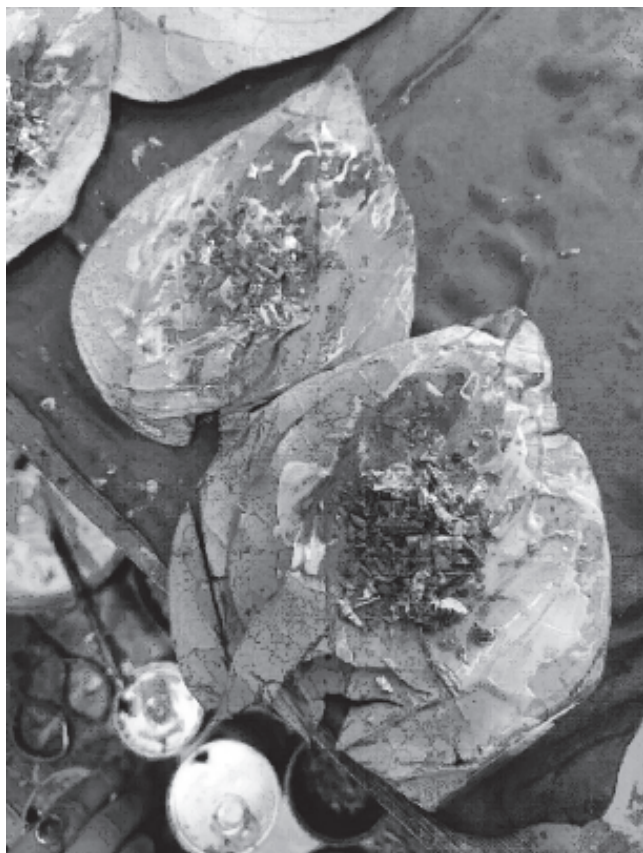


Fig. 5 : Ingredients of paan item before rolling: (A) Mitha Patta (B) Zarda Patta.



Fig. 6 : Oral view of a habitual Zarda paan chewer. (A) Abnormal swelling

Conclusion

There is a need to make people aware with the dangers associated with traditional betel quid while betel in itself could be considered as a health tonic, use

of tobacco ingredients makes it toxic. Recent decades have witnessed a spur in the cases of mouth cancer that is a result of rampant use of tobacco products.

References

1. Agarwal T, Singh R, Shukla AD, Waris I, Gujrati A. Comparative analysis of antibacterial activity of four *Piper betel* varieties. *Adv Appl Sci Res.* 2012; **3**: 698-705.
2. Ahmed S, Ali MC, Ruma RA, Mahmud S, Paul GK, Saleh MA, Alshahrani MM, Obaidullah AJ, Biswas SK, Rahman MM, Rahman MM, Islam MR. Molecular docking and dynamics simulation of natural compounds from betel leaves (*Piper betel* L.) for investigating the potential inhibition of alpha-amylase and alpha-glucosidase of type 2 diabetes. *Moleculers.* 2022; **27**, 4526-4544.
3. Ahuja SC, Ahuja U. Betel leaf and betel nut in India : history and uses. *Asian Agri-History.* 2011; **15**(1) : 13-35.
4. Amonkar AJ, Nagabhushan M, D'Souza AV and Bhide SV. Hydroxychavicol: A new phenolic antimutagen from betel leaf. *Food Chem Toxicol.* 1986; **24**: 1321-1324.
5. Borborah K, Baruah S, Borthakur SK. Plant masticatories and their medicinal importance from Assam and Meghalaya. *International Journal of Herbal Medicine.* 2014; **2**(3) : 21-25.
6. Chakraborty D, Shah B. Antimicrobial, anti-oxidative and anti-hemolytic activity of *Piper betel* leaf extracts. *Int J Pharm Pharm Sci.* 2011; **3**: 192-199.
7. Chang MC, Unag BJ, Tsai CY, Wu HL, Lin BR, Lee CS, Chen YJ, Chang CH, Tsai YL, Kao CJ, Jeng JH. Hydroxychavicol, a novel betel leaf component, inhibits platelet aggregation by suppression of cyclooxygenase, thromboxane production and calcium mobilization. *British Journal of Pharmacology.* 2007; **152** : 73-82.
8. Das S, Parida R, Sandeep IS, Nayak S, Mohanty S: Biotechnological intervention in betelvine (*Piper betle* L.). A review on recent advances and future prospects. *Asian Pac J Trop Med.* 2016; **9** : 938-946.
9. Dwivedi DV. Medico-cultural importance of Khadira (*Acacia catechu*) as depicted in Indian tradition. *Grips-The Standard Research.* 2013; **8** : 1-29.
10. Dwivedi DV, Lochan K. Tambula in Indian tradition. *South and Southeast Asia Culture and Religion.* 2011; **5** : 57-76.
11. Garaniya N, Atul B. Ethnobotanical and phytopharmacological potential of *Abrus precatorius* L.: a review *Asian Pacific Journal of Tropical Biomedicine.* 2014; **4** (1) : 27-34.
12. Guha P. Betel leaf. The Neglected Green Gold of India. *J Hum Ecol.* 2006; **19**(2):87-93.
13. Junairiah Matuzahroh N, Zuraidassanaaz IN, Sulistyorini L. Isolation and identification of secondary metabolites of black betel (*Piper betle* L. var *Nigra*). *Journal Kimia Riset.* 2018; **3**(2) : 131-138.
14. Kudva AK, Rao S, Rao P, Periera R, Bhandari G, Mathew JM, Ashwini K, Pais M, Swamy MK, Baliga M. *Piper betle* Linn, in cancer: Past, present, and future. In : Anticancer plants: Properties and Application. *Springer Singapore.* 2018; **1** : pp327-347.
15. Kumar N, Misra P, Dube A. Bhattacharya S, Dikshit M, Ranade S. *Piper betle* Linn. A maligned pan-asiatic plant with an array of pharmacological activities and prospects for drug discovery. *Curr Sci.* 2010; **99**: 922-932.
16. Kumar S, Jha V. Ethnobotany of betel cultivation and betel groves providing space for integrated horticulture : a case study of Mithla region in north Bihar, India. In : D. Das and P. Ghosh (eds.) *Ethnobotany and Ethnozoology.* Bharti Publications, New Delhi. 2022. pp 1-16.
17. Kumar S, Jha V, Kumar A. *Lannea coromandelica* (Hott) Merr. as supporting pole in the betel groves: a case study of north Bihar. *eJournal of Applied Forest Ecology (eJAFE).* 2021; **9**(2) : 1-4.
18. Madhumita M, Guha P, Nag A. Bio-actives of betel leaf (*Piper betle* L.). A comprehensive review on extraction, isolation, characterization, and biological activity. *Phytother Res.* 2020; **34**: 2609-2627.
19. Majumdar B, Chaudhuri SR, Ray A, Bandyopadhyay SK. Potent antiulcerogenic activity of ethanol extract of leaf of *Piper betle* Linn. by antioxidative mechanism. *Indian Journal of Clinical Biochemistry.* 2002; **17** : (1) 49-57.
20. Mohammad NA, Rahman AA, Kadir SSA. Hydroxychavicol as a potential anticancer agent (review). *Oncology*

- Letters*. 2023; **25** : 34-45.
21. Monte SM, de la, Moriel N, Lin A, Tanoukhy NA, Homans C, Gallucci G, Tong M, Satio A. Betel quid health risks of insulin resistance diseases in poor young south Asian native and immigrant populations. *International Journal of Environmental Research and Public Health*. 2020;**17**: 6690-6710.
 22. Nagargoje S, Patole V, Awari D. Cassava starch film loaded with extract of *Piper betle* leaf for anti-inflammatory activity. *Indian Journal of Natural Products and Resources*. 2022; **13**(1) : 36-44.
 23. Norton SA. Betel consumption and consequences. *J Am Acad Dermatol*. 1998; **38**(1):81-88.
 24. Paranjpe R, Gundala SR, Lakshminarayana N, Sagwal A, Asif G, Pandey A, Aneja R. *Piper betle* leaf extract: anticancer benefits and bio-guided fractionation to identify active principles for prostrate cancer management. *Advance Access Publication*. 2013; **34** (7) : 1558-1566.
 25. Patel A, Patel M, Tshering P, Koyyala VPB, Ghadyalpatil N. Chewing doma (fermented betel nut) : culture versus cancer ? *South Asian Journal of Cancer*. 2023; DOI : 10.1055/S-0043-1764216.
 26. Patidar KA, Parwani R, Wanjari SP, Patidar AP. Various terminologies associated with areca nut and tobacco chewing : a review. *Journal of Oral and Maxillofacial Pathology*. 2015; **19** (1) 69-76.
 27. Pawar S, Kalyankar V, Dhamangaonkar B, Dagade S, Waghmode S, Cukkemane A. Biochemical profiling of antifungal activity of betel leaf (*Piper betle* L.) extract and its significance in traditional medicine. *Journal of Advanced Research in Biotechnology*. 2017; **2**(1) : 4.
 28. Peter KV. Handbook of herbs and spices. 1" Edition Vol 1 and Vol 2. Sawston, Cambridge .2004; Woodhead Publishing Limited.
 29. Prabhu MS, Patel K, Saraawathi G, Srinivasan K. Effect of orally administered betel leaf (*Piper betel* Linn.) on digestive enzymes of pancreas and intestinal mucosa and on bile production in rats. *Indian J Exp Biol*. 1995; **33**(10):752-756.
 30. Pradhan D, Suri KA, Pradhan DK, Biswasroy P. Golden Heart of the Nature. *Piper betle* L. *Journal of Pharmacognosy and Phytochemistry*. 2013; **1**(6).
 31. Punuri JB, Sharma P, Sibyala S, Tamuli R, Bora U. *Piper betle*-mediated green synthesis of biocompatible gold nanoparticles. *Int Nano Lett*. 2012; **2**: 18.
 32. Rai KKR, Trivedi VR, Umekar MJ. Review on betel leaf used in various ailments. *International Journal of Pharmacognosy*. 2019; **6** (8) : 259 -267.
 33. Rai MP, Thilakchand KR, Palatty PL, Rao P, Rao S, Bhat HP, Baliga MS. *Piper betle* Linn (betel vine), the maligned Southeast Asian medicinal plant possesses cancer preventive effects: time to reconsider the wronged opinion. *Asian Pacific J Cancer Prev*. 2011; **12**(9) : 2149-2156.
 34. Sharma S, Khan IA, Ali I, Ali F, Kumar M, Kumar A, Johri RK, Abdullah ST, Bani S, Pandey A, *et al*. Evaluation of the anti- microbial, antioxidant, and anti-inflammatory activities of hydroxychavicol for its potential use as an oral care agent. *Antimicrob Agents Chemother*. 2009; **53**: 216-222.
 35. Sripradha S. Betel Leaf-The Green Gold. *Journal of Pharmaceutical Sciences and Research*. 2014; **6** (1): 36-37.
 36. Sznajder KK, Shenk MK, Alam N, Raqib R, Kumar A, Haque F, Blumenfield T, Mattison SM, Wander K. Betel quid use is associated with anemia among both men and women in Matlab, Bangladesh. *PLOS Global Public Health*. 2023; **3** (6): e0001677.
 37. Toprani R, Patel D. Betel leaf : Revisiting the benefits of an ancient Indian herb. *South Asian Journal of Cancer*. 2013; **2** (3) : 140 -141.
 38. Ying Li, Yang Y, Zhou J, Huang H, Du G. Effect of Chewing betel nut on the gut microbiota of Hainanese. *PLOS ONE*. 2021; **16** (10) : e0258489.