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Phytochemistry and therapeutic activities of *Piper betel* Linn. Leaves

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Abstract

The present paper deals with an extensive review on the phytochemical and therapeutic activities of *Piper betel* leaves. It is known as a rich source of alkaloids, tannins, saponins, flavanoids and polyphenols respectively. The innumerable medicinal properties and therapeutic uses of *Piper betel* as well as its phytochemical investigations prove its importance as a valuable medicinal plant.

Keywords: Phytochemistry, therapeutic activities and *Piper betel*

Introduction

Medicinal herbs are moving from fringe to mainstream use with a greater number of people seeking remedies and health approaches free from side effects caused by synthetic chemicals. India officially recognizes over 3000 plants for their medicinal value. It is generally estimated that over 6000 plants in India are in use in traditional, folk and herbal medicine, over the last few years, researchers have aimed at identifying and validating plant-derived substances for the treatment of various diseases. Interestingly it is estimated that more than 25% of the modern medicines are directly or indirectly derived from plants. It is worth mentioning that Indian medicinal plants are considered as a vast source of several pharmacologically principles and compounds that are commonly used as home remedies against multiple ailments^[1]. Since early 1990s, the use of forest products for medicine has been emerging as a vital income generating resource for the development of various social groups, hence, there is an increased attention for their long-term sustainability^[2]. Indian traditional medicine is based on various systems including Ayurveda, Siddha, Unani and Homoeopathy. The evaluation of these drugs is primarily based on phytochemical, pharmacological and allied approaches including various instrumental techniques such chromatography, microscopy and others. With the emerging worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, the evaluation of the rich heritage of traditional medicine is essential^[3]. In this regard, one such plant is *Piper betel*^[4].

There are about 100 varieties of betel vine in the world, of which about 40 are found in India. *Piper betel* Linn. (Local name 'Paan') Piperaceae, a dioecious, annual creeper, climbing by many small adventitious rootless, grows to a height of about one meter, generally grown in hotter and damper parts of the country^[5, 6]. It is extensively found in damp forests and is propagated in India and other countries in South-East Asia, such as Vietnam and China. In India it is found in Uttar Pradesh, Bihar, Bengal, Orissa, Tamilnadu, Andhra Pradesh and Karnataka. In Tamilnadu, three varieties of *Piper betel* leaves, Sirugamani, Karpoori and Vellaikodi are accessible mostly^[7]. It is used in variety of decoction, in curing wounds, burns, impetigo, furunculosis, eczema, lymphangitis and juice is beneficial stomatic. Kammaru (a variety of *Piper betel*) leaf has a good level of juice that heals pharyngitis, abdominal pain and swelling. Generally betel leaf cures urticaria and as per ayurvedic medicine, it recovers the loss of equilibrium between the three 'humours,' namely, Vatha, Pitha and Kapha. The roots and fruits are well-known for treatment of malaria, asthma^[8, 9]. The chief Ayurvedic preparations of *Piper betel* plant are Lokantha Rasa, Puspadhava Rasa, Brhat sarwajwarahara, lanha, laghu sutaseknara Rasa, Brhat visamaj warantaka Rasa. In Ayurveda, betel leaf juice is commonly utilized as an adjuvant & combined with different other medicines most likely for better effects beside its separate use as medicine. In Susrta-Samhita, tambool leaves have been described as aromatic, sharp, hot, acrid and valuable for voice, laxative, appetizer, beside this they soothe vata and aggravate pitta^[10].

According to folk medicine, betel leaf can help in the treatment of headache, itching, mastitis, cuts, abrasions, constipation, and injuries [11, 12].

Phytochemical review

Piper betle leaf extract contains phytosterols, alkaloids, carbohydrates, water, tannins, phenols, flavonoids, and essential oils. Oils from the leaves contain carvacrol, eugenol, chavicol, allylkatechol, cineol, estragol, caryophyllene, cardinene, p-cymenedaneugenolmethylether. The leaves used for chewing contain up to 2.6% of bright yellow aromatic oil which is steam distillation. Chavibetol forms the characteristic component of betel oil. But some of Indian samples contain eugenol in larger quantities 25-40%. Other constituents of oil are chavicol, eugenol methyl ether, cineole, caryophyllene and cadinene [13]. The *Piper betle* leaf has been described to have Piperol-A, Piperol-B, methyl piper betol and they also have been isolated [14]. The betle leaves have starch, sugars, diastases and an essential oil composing of terpinen-4-ol,

safrole, allylpyrocatechol monoacetate, eugenol, eugenyl acetate, hydroxylchavicol, eugenol, piper betol and the betle oil contains cadinene carvacrol, allyl catechol, chavicol, p-cymene, caryophyllene, chavibetol, cineole, estragol, etc. as the key components [15]. Phytochemical analysis on leaves revealed the presence of Alkaloids, Tannins, Carbohydrate, Amino acids and Steroidal components. The chief component of the leaves is a volatile oil in the leaves from different countries, called Betle oil and contains 2 phenols, betle phenol (Chavibetol and Chavicol). Codinene has also been found [16]. Chavibetol is a natural chemical compound of the phenylpropanoid class. It is the most important component of the essential oil from the leaves of the *Piper betle* plant. It is an aromatic compound with a spicy odor and is an isomer of eugenol [17, 18]. The therapeutic activities are reported with plant part extract, activity methods and results are depicted in Table No. 1.

Therapeutic activities

Table 1: Different therapeutic activities reported in *Piper betle* plant

S. No.	Plant part/Extract	Activity/Animal/ Model	Results
1	Aqueous extract of the fresh <i>Piper betle</i> leaves.	Anti-microbial activity/ Various microorganisms/disc diffusion method.	Aqueous extracts showed effective inhibitory action against the microorganisms [19]
2	<i>Piper betle</i> leaves/hot water extract/cold ethanolic extract.	Antioxidant activity/Initial anti-oxidant activity, Antioxidant activity with time & at elevated temperature (200 °C).	The extracts obtained from the leaves of <i>Piper betle</i> had profound antioxidant activity [20].
3	<i>Piper betle</i> spray dried powder.	Antidiabetic activity/diabetes mellitus patients.	<i>Piper betle</i> as an utraceutical resulted as a potential treatment for type 2 diabetes patients [21].
4	Aqueous extract of the fresh <i>Piper betle</i> leaves.	Anti-oxidative & anti-hemolytic activity/Microorganisms (<i>Streptococcus pyogenes</i> , <i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> & <i>Escherichia coli</i>).	The anti-oxidative & anti-hemolytic activities were attributed to the high concentration & combined activity of flavonoids & polyphenols [22].
5	Crude ethanolic extracts of <i>Piper betle</i> leaves.	Anti Dermato phytic activity/ zoonotic dermatophytes (<i>M. canis</i> , <i>M. gypseum</i> , and <i>T. mentagrophytes</i>) and yeast-like <i>Candida albicans</i> .	Testing showed <i>Piper betle</i> cream formulation with potential therapeutic values for treatment of Dermato phytases [23].
6	Testing showed <i>Piper betle</i> cream formulation with potential therapeutic values for treatment of Dermatophytosis.	Antibacterial Activity/ Gram positive (<i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i> & <i>Micrococcus luteus</i>) & Gram negative (<i>Escherichia coli</i> & <i>Pseudomonas aeruginosa</i>) bacteria/ Agar diffusion method.	The study reveals that both the aqueous and alcoholic extracts be active beside the strains of bacteria which are common cause of infections [24].
7	The hot water <i>Piper betle</i> leaves extract.	Gastro protective activity.	The study showed that it can protect against indomethacin-induced gastric ulceration due to its antioxidant and mucin protecting properties [25].
8	The petroleum ether extract & methanol extract of the <i>Piper betle</i> leaves.	Insect Attractant Property /Field tests in a corn field.	Field tests in a corn field using trap contain the extracts, which does not detect adult moths of <i>Ostrinia alentalis</i> [26].
9	The methanolic extract of the <i>Piper betle</i> leaves.	Analgesic and anti-inflammatory activity/Carrageenan induced hind paw edema model, hot plate, writhing and formalin tests/ Swiss albino mice and Wistar Rats.	The dose produced a significant increase in pain threshold in hotplate method whereas significantly reduced the writhing caused by acetic acid & caused significant inhibition of carrageenan induced paw edema [27].
10	The <i>Piper betle</i> plant extract.	Anti-fertility activity/ female rats.	The data suggests that betle extract brought about anti-fertility and antiestrogenic effects in female rats [28].
11	The <i>Piper betle</i> leaf extract.	Anti-hepatotoxic effect/ ethanol & carbon tetrachloride (CCl4) induced liver injury in a rat model.	The histological examination shows that <i>Piper betle</i> leaf extract secluded liver from the damage induced by CCl4 by declining alpha smooth muscle actin (alpha-sma) expression [29].
12	The <i>Piper betle</i> leaf infusion.	Skin Antiseptic/ pre-surgery cataract patients.	Results showed that 20% <i>Piper betle</i> leaf infusion to have an anti-septic [30].
13	The ethanolic extract of <i>Piper betle</i> leaf.	Radio protective activity/ Rat liver mitochondria and pBR 322 plasmid DNA.	The extract of <i>Piper betle</i> effectively prevented γ -ray induced lipid Peroxidation [31].
14	The methanolic extract of the <i>Piper betle</i> .	Immuno modulatory activity/ Mice.	The study reveals that it significantly suppressed hemagglutinin stimulated Peripheral blood lymphocyte proliferation in a dose-dependent manner [32].
15	The ethanolic Extract of <i>Piper betle</i> leaves.	Anti-depressant Activity/ Mice.	The study showed that it has significant anti-depressant activity greater than Imipramine and has the potential to be used as an anti-depressant [33].

Conclusion

The medicinal importance of the *betle leaf* as evidently prove that is one of the most promising commercial botanical with earlier reported to possess a lot of therapeutic values. The leaf has the great potency to act as natural antioxidant. The antioxidant property is correlated with different biological activities like Antibacterial, Hepatoprotective, Antidiabetic, Antifertility, Antiseptic, Antidepressant and Anticancer properties, since free radicals are involved in all these diseases. The leaf extract also shows the Gastro protective activity by enhancing the mucus rather than decrease the acid production. Considering the above properties, it comes to conclusion that *betle leaf* has a tremendous strength to come out as a future green medicine.

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References

- Pallab Maity, Dhananjay Hansda, Uday Bandyopadhyay, Dipak Kumar Mishra, Indian Journal of Experimental Biology. 2009;47:849-861.
- Chandra Prakash Kala, Indian Journal of Traditional Knowledge. 2006;5(4):537-540.
- Gupta RK. Medicinal & Aromatic plants, CBS publishers & distributors, 1st edition; c2010. p. 116-117.
- Eanguwar Srinivas Reddy, Shivraj Kasinath Bembrekar, Rameshwar Ramchandra Bichewar and Saiprabha Shirsat. Ethnobotanical Studies on *Piper betle* L. Among the folk peoples of Vidul, Taluka Umardhed, District Yavatmal, Maharashtra, India. International Journal of Research Culture Society. 2022;6(10):51-55.
- Nagori K, Singh MK, Alexander A, Kumar T, Dewangan D, Badwaik H. *et al.* A review on its ethnobotany, phytochemistry, pharmacological profile and profiling by new hyphenated technique DART-MS (Direct Analysis in Real Time Mass Spectrometry). Journal of Pharmacy Research. 2011;4(9):2991-2997.
- Pradhan D, Suri KA, Pradhan DK, Biswasroy P. Golden Heart of the Nature: *Piper betle* L. Journal of Pharmacognosy and Phytochemistry; c2013. p. 1-6.
- Bhattacharya S, Banerjee D, Bauri AK, Chattopadhyay S, Bandyopadhyay SK. Healing property of the Piper betel phenol, allylpyrocatechol against indo methac in-induced stomach ulceration and mechanism of action. World J Gastroenterol. 2007;13(27):3705-3713.
- Mandarin's KM. Indian Materia Medica Vol I, Edn 3, *Popular Prakasan* Pvt. Ltd. Mumbai; c2007.
- Deshpande SM, Upadhyay RR, Singh RP. Chemical study of Piper betel leaves. Current Sci. 1970;39:372.
- Kumar N. Betel Vine. (*Piper betle* L.) Cultivation: A unique case of plant establishment under anthropogenically regulated microclimatic conditions. Indian Journal of History of Science. 1999;34(1):19-32.
- Betel Leaf: The Neglected Green Gold of India, Journal of Human Ecology, Cite Seer X, the Pennsylvania State University.
- Betel leaf: Revisiting the benefits of an ancient Indian herb, South Asian Journal of Cancer, US National Library of Medicine, National Institutes of Health.
- Daniel M. Useful herbs of planet earth; Betel, Tambulah/Pan (*Piper betel* Linn.-Piperaceae, Scientific publishers (India), Jodhpur; c2013. p. 255.
- Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants CSIR, New Delhi; c956.
- Sugumaran M, Poornima M, Venkatraman S, Lakshmi M, Srinivasan Sethuvani. Chemical composition and antimicrobial activity of sirugamani variety of Piper betle Linn Leaf oil. Journal of Pharmacy Research. 2011;4(10):3424-3426.
- Prabodh S, William SN. Chemical Composition and Biological Activities of Nepalese *Piper betle* L. IJPHA. c2012. p. 1-2.
- Rawat AKS, Tripathi RD, Khan AJ, Balasubrahmanyam VR. Essential oil components as markers for identification of *Piper betle* L. Cultivars, Bio chem Syst Ecol. 1989;17:38-55.23.
- Bhalerao S, Verma D. Phytochemistry, Pharmacological Profile and Therapeutic Uses of *Piper betle* Linn, An Overview. RRJPP; c2013. p. 1-2.
- Shameem PMD, Thirumal Mb. A preliminary antimicrobial screening on leaves of *Piper betle* Linn. Contemporary Investigations and Observations in Pharmacy. 2013;2(1):22-26.
- Lakshmi A, Menuka A, Damisha R. *Piper betle*: apotential natural antioxidant. International Journal of FoodScience and Technology. 2006;41:10-14.
- Sujatha H, Menuka A, Rajapaksha ALS, Ariyawansa HS. *Piper betle* linn: As a Remedy for Diabetes mellitus. IJRAP. 2011;2(5):601-1603.
- Devjani C, Barkha S. Antimicrobial, Antioxidative and Antihemolytic activity of *Piper betle* Leaf Extracts. International Journal of Pharmacy & Pharmaceutical Sciences. 2011;3(3):192-199.
- Trakranungsiea N, Chatchawanchonteerab A, Khunkittic W. Ethno veterinary study for antidermatophytic activity f *Piper betle*, *Alpinia galanga* and *Allium ascalonicum* extracts *in vitro*. Research in Veterinary Science. 2008;84(1):80-84.
- Kaveti B, Tan L. Antibacterial Activity of *Piper betle* Leaves. International Journal of Pharmacy Teaching & Practices. 2011;2(3):129-132.
- Pradhan D, Suri KA, Pradhan DK, Biswasroy P. Golden Heart of the Nature: *Piper betle* L. Journal of Pharmacognosy and Phytochemistry; c2013. p. 1-6.
- Yusoff Z, Mahmud Z, Saleh SH, Mohd Esa Y. Study onthe Chemical Constituents of *Piper betle* L. in Relation to their Possible Insect Attractant Property; Malaysian Journal of Science. 2005;24(1):1-2.
- Badrul AM, Fahima A, Nahida P, Rashna SP, Akter S, Chowdhury J, *et al.* Antioxidant, analgesic and anti-inflammatory activities of the methanolic extract of *Piper betle* leaves. Avicenna Journal of Phytomedicine; c2012. p. 1-14.
- Pradhan MR, Mohanty M, Mohapatra S, Sahoo S. Antifertility Effect of Alcoholic Stalk Extract of *Piper betel* Linn. on Female Albino Rats. IRJP; c2013. p. 4-1.
- Young SC, Wang CJ, Lin JJ, Peng PL, Hsu JL, Chou FP. Protection effect of piper betel leaf extract against carbon tetrachloride-induced liver fibrosis in rats. Arch Toxicol. 2007;81(1):45-55.
- Amallia H, Sitompul R. Effectiveness of *Piper betle* leaf infusion as a palpebral skin antiseptic. Universa Medicina; c2009. p. 28-2.
- Bhattacharya S, Subramanian M, Bauri A, Kamat JP. Radio protecting property of the ethonolic extract of the piper betel leaf. Journal of Radiation Research. 2005;46:165-171.
- Kanjwani DG, Marathe TP, Chiplunkar SV, Sathaye SS. Evaluation of Immuno modulatory Activity of Methanolic Extract of Piper betel. Scandinavian Journal of Immunology. 2008;67:589-593.
- Vinayak M, Ruckmani A, Chandrashekar K, Gopala RKV, Madhavi E, Swati B, *et al.* Antidepressant Activity of Ethanolic Extract of *Piper betle* leaves in Mice. Current Research in Neuroscience. 2012;2:11-16.