International Journal of Research in Pharmacy and Allied Science (IJRPAS)
Published by Ideal Publication
Available at https://idealpublication.in/ijrpas/

OVERVIEW ON BETELE VINE PLANT (*Piper betel*) HEART OF SOUTH EAST ASIAN (GOLD GREEN)

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Article History
Received: 24/12/2022
Accepted: 27/12/2022
Published: 01/01/2023

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Abstract: Piper betle or betel vine, an economically and medicinally important cash crop, belongs to the family Piperaceae, often known as the gold green. The plant can be found all over the world and is cultivated primarily in South East country beautiful glossy heart-shaped leaves, which are chewed or consumed as betel quid and widely used in chinese and indian folk medicine, as carminative, stimulant, astringent, against parasitic worms, conjunctivitis, rheumatism, wound, etc., The pharmacological attributes of P. betle areanti-larvicidal activity, antiproliferation, anticancer, anti-malaria activity, neuropharmacological, analgesic, antioxidant, antiulcerogenic, hepatoprotective, antifertility, antibacterial, antifungal and many more. The application serves as a promising therapeutic candidate for different diseases. The present review comprehensively summarizes ……. Method of preparation, plant extract, essential oil which contains most important bioactive compound among the wide range of chemical constituents & phytoconstituents found in different plant part like leaf, steam, root with there excellent core therapeutic as well as medicinal value..

Keywords: betle vine, gold green, anti-ulcerative, hepato-protective, plant extract, heart shape.

INTRODUCTION

Piper betle or betel vine, an economically and medicinally important cash crop, belongs to the family Piperaceae, often known as the gold green. Naturally occurring herbs are being used for a long time in food and for medicinal purposes throughout the world. Although,modern approach towards lifestyle has isolated us from the nature.

The plant can be found all over the world and is cultivated primarily in South East country beautiful glossy heart-shaped leaves, which are chewed or consumed as betel quid and widely used in Chinese and Indian folk medicineIt has more than 100 varieties, all over the world of which about 40 of them are found in India. It grows in dry, loam and clay soils that contain high amount of detritus, maintaining a pH of 7-7.5. It having especial type of aroma is just because of the presence of essential oils and its taste ranges from sweet to pungent.

It is locally known s '*paan*' in Hindi (India) and is mostly consumedin the form of mouth freshener or appetizer in India.the betel leaves are nutritive and possess aninsecticidal and antitumor activity antioxidant activity, neuroprotective activity antidiabetic and antihelmintic activity, antimicrobial activity and many more. The leaves also contain avariety of biologically active components likehydroxychavicol, chavicol, piperbetol, chavibetol,piperol A, methylpiperbetol, and piperol. The key component of the leaf is a volatile oil known asbetle oil

Plant Extract

Procedure for leaf extraction: on extraction will get extract and essential oil

Preparation of betel leaf powder (BLP)

Approximately 3 to 5 years old and only mature and healthy leaves were used. Leaves were washed thoroughly using the running tap water. Subsequently, leaves were dried using a hot air oven overnight at 50 °C until the moisture content of the leaves was less than 10%. Dried leaves were collected, blended using a high-speed blender (Panasonic, Model MX-898N, Berkshire, UK), and sieved using 80 mesh stainless-steel sieve to obtain the fine powder. The betel leaf powder (BLP) was kept in zip-lock bags and placed in a desiccator at room temperature until further processing.

Preparation of betel leaf ethanolic extract (BLEE)

The extraction process was performed by using leaf powder &70% ethanol having ratio 1:15(w/v). Ethanol was removed by a rotary evaporator before being lyophilized. Dried extract without removing the chlorophyll was used as the control termed 'BLEE-CON' and stored at −20 °C until use.

Preparation of BLEE with dechlorophyllization using different methods

Dechlorophyllization using different organic solvents

The procedure of Dechlorophyllization was done by using Acetone, chloroform, and petroleum ether were selected as dechlorophyllizing solvents. Each solvent was mixed with BLP separately at a 1 : 10 powder/solvent ratio (w/v) and stirred for 30 min, followed by filtering using Whatman filter paper no. 1.

The filtrate was discarded, and the retentate was subjected to dechlorophyllization in the same manner for another two times. The retentates were subsequently dried for 1 h at 105 °C in a hot air oven. Thereafter, the dried powders were subjected to ethanolic (70%) extraction and filtered. The obtained extracts after lyophilization were termed BLEE-ACT, BLEE-CF, and BLEE-PET for BLP dechlorophyllized using acetone, chloroform, and petroleum ether, respectively. The resulting lyophilized powders were placed in vials, capped, and kept at −20 °C until use.

Dechlorophyllization using sedimentation

Sedimentation technique was used for the dechlorophyllization. Firstly, ethanolic extract was prepared from BLP as described by After removing the ethanol by a rotary evaporator at 40 °C, the distilled water was added to the concentrated extract at 1 : 1 ratio (v/v). Sedimentation was then allowed to occur at 4 °C for 24 h. After sedimentation and being centrifuged at 10 000×*g* and 4 °C for 30 min, the supernatant was collected and lyophilized. The dried extract termed "BLEE-SED" was placed in vial, capped, and kept at −20 °C before analysis.

Essential Oil

[2] **[3]**To extract this EO from plant materials, several methods of extraction techniques such as hydro-distillation in which Two hundred grams of cleaned fresh and cured betel leaves was hydro-distilled separately in triplicate with a Clevenger apparatus. Leaves were placed into a 5 L size of round-bottom distillation flask. The round bottom flask was heated by heating mantle at a temperature of 100°C. During the extraction process, the steam and vaporized oil were condensed into liquid form by a vertical condenser and collected in the receiver tube. The volatile EO was then separated from water by a separating funnel and collected in a measuring tube. The collected EO was dried over anhydrous sodium Sulphated until the last traces of water had been removed, labeled in vials and stored in refrigerator at 4°C for further use. The EO yield of both leaves was expressed as mean values on dry weight basis.

The EO yield was determined by the following Eq. (1):

$$EO\ Yield = \frac{Volume\ of\ extracted\ EO\ ml}{Dry\ weight\ of\ leaves\ g} \times 100$$

steam distillation, steam and water distillation, solvent extraction, super critical extraction etc. were adopted (Dai et al., 2010; Mason et al., 2011; Chemat et al., 2012). These techniques are widely used to enhance the extraction efficiency and to identify the chemical constitutes because of its simple and fast repeatability. However, HD method was widely used to extract EOs from most of the plant matrix that has gained much popularity in the present time with low cost and environmental friendliness (Memarzadeh et al., 2015; Umar et al., 2018). Up to now, there are several methods which have been widely used for the identification of all phyto-chemical compounds present in extracted EOs and these include gas chromatography- mass spectrometry (GC–MS), high-performance liquid chromatography (HPLC), high-performance liquid chromatography with mass spectrometry (LC–MS), nuclear magnetic resonance spectrometry (NMR), Fourier transform infrared (FT-IR) spectroscopy etc.

Gas chromatography- mass spectrometry is a central useful analytical tool in the research field of herbal medicines, especially for identification of various mixtures of organic compounds present in isolated EOs (Matasyoh et al., 2007; Gu et al., 2014). Now-a-days, more sophisticated vibration spectrometric methods are followed such as FT-IR and FT-Raman etc. to find out the chemo types because of time and sample treatment (Daferera et al., 2000). Fourier transform infrared spectrometry is a simple, rapid and non-destructive method used for the determination of main components and also identifies the function

Chemical Constituents:

[4]Fresh leaves of betel leaf contains verious constituent like moisture ,protein ,fat, carbohydrate, fiber, minerals chlorophyll ,Nicotinic acid, calcium, phosphorus ,iron ,iodine, vitamin B , Vitamin A Thiamine , Riboflavin, Tannin ,Nitrogen ,Potassium ,energy. The leaves contain enzymes like diastase and catalase. The leaves also contain significant amount of all amino acids except lysine, histidine, arginine which occur in traces[5] **[6]**(Guha, 2006). Besides that, the leaves also contain potassium nitrate The indentified sugars in betel leaves are include glucose, fructose (reducing sugar),maltose, sucrose & essential oil from 0.7% to 2.6% (Periyanayagam et al., 2012).

Chemical Constituents	% Conc.	Chemical Constituents	% Conc.
moisture	85-90%,	iron	0.005-0.007%,
protein	3-3.5%	iodine	3.4µg/100mg
fat	0.4-1.0%,	Vitamin A	1.9-2.9 mg/100g
carbohydrate	0.5-6.10%,	Vitamin C	0.005-0.01%,
fiber	2.3%,	Thiamine	10-70 µg/100g,
minerals	2.3-3.3%,	Riboflavin	1.9-30 µg/100g
chlorophyll	0.01-0.25%,	Tannin	0.1-1.3%,
Nicotinic acid	0.63-0.89 mg/10g	reducing sugar	0.38-1.46%.
calcium	0.2-0.5%	Potassium	1.1-4.6%,
phosphorus	0.05-0.6%	energy	44 kcal/100gm
Potassium nitrate	0.26-0.42%	Nitrogen	2.0-7.0%,

Phyto-chemicals found in betel leaf

Betel Leaves Extract (BLE)

[7] [8]Betel vine extract found verious phytochemical constituents on its botanical origin and the solvent used for extraction. A primary phytochemical found as alkaloids, tannins, glycosides, reducing sugars, and saponins were found in the water extract of betel leaves [9]. Moreover, a study determined the total content of phenol, flavonoid, and tannin in water, ethanol, ethyl acetate, acetone, and dichloromethane extracts of betel leaves from Mauritius [10]. The highest total phenol, flavonoid (i.eQuercetin) , and tannin were found in the acetone, dichloromethane, and ethanol extracts, respectively. someveriety of betel leaves contain steroids, tannins, proteins, amino acids, flavonoids, terpenoids, mucilage, volatile oil, saponin, carbohydrates, and fixed oil, but an absence of alkaloids [11]. Furthermore,some plant containes bioactive

compounds such asphytol, acyclic diterpene alcohol, 4-chromanol, hydroxychavicol or 4-allylpyrocatechol,&allylpyrocatechols 1

Betel Leaves Essential Oil (BLEO)

[9][10][11] [12] Betel leaves contain 0.15% to 0.2% essential oil which are classified as monoterpenes, sesquiterpenes, aldehydes & phenyl propanoid groups such as acetyl eugenol, eugenol, chavicol, and safrole were the major components [13] The study also revealed that BLEO contained eugenol (40%)and a combination of carvacrol and chavicol (up to 40%) with chavibetol as a marker compound. Meanwhile, another study found additional main compounds including estragole, linalool, _-copaene, anethole, and caryophyllene _-terpinene, p-cymene, 1,8-cineole, _-caryophyllene, _-humulene, allylpyrocatechol, allylcatechol, methyl eugenol, estragol (methyl chavicol), chavibetol, chavibetol acetate, safrol, 4-allyl-2-methoxy-phenolacetate, and 3-allyl-6-methoxyphenol [14,15,16]The leaves also contain significant amount flavonoid and polyphenol content (Chakraborty and Shah, 2011; Durgaprasad et al., 2011). The terpenoids include 1, 8- cineole, cadinene, camphene, caryophyllene, limonene, pinene, Chavicol, ally pyrocatechol, carvacrol, safrole(48.7%), eugenol and are the major phenols found in betel leaf Chavibetol, Allypyrocatechol, Chavibetol acetate (15.5%)., Eugenol, Piperitol, Quercetin, Luteolin, β- sitosterol, Hydroxychavicol, α- terpineol, Allylcatecol, Eugenol methyl ether, D- limonene, 2-noanone, 4-allyl phenyl acetate, Piperlonguminine, α- cadinol, Ocimene, N-decanal, Cavacrol, 2-undecanone, Myrcene, Stearic acid, 2- Mono palmitin, Alloocimene, Cymene, Terpinolene, α-Myrcene, Limonene, Vanillin, Thymol, Cis-piperitol, Tarpinolene, Propcatechuic acid, Gallic acid, β- pinene, Camphene, Linalool, Allyldiacetoxy benzene, Eucalyptol, Sabinene, 3-allyl-6-methoxyphenol, m-Cymen-8-ol, 4 cineole, α-pinene, Anethole, Estragol, Arecoline, Benzene acetic acid, Isoeugenyl acetate, Isoeugenol, Chavicol, Eugenyl acetate, 4-allyl phenol, α-bergamotene, Isoeugenyl acetate, Caffeic acid, (E)-ß-ocimene, Ferulic acid, stearic acid, Carryophyllene, Humlene, α- farnesene, Germacrene-A, Germacrene-D, (E)-ß-Damascenone, 4E-decadienamide, Isoascaridole, 4-Allyl anisole, Safrole, 5-Indanol, 4-allyl resorcinol, ß-isosafrole, α-muurolene, Cadinene, α- copaene, α-cubebene, α- selinene, Cuparene, Piperine, Piperbetol, Methylpiperbetol, Piperol-B, Piperol-A, Ellagic acid, Cepharadione-A, α- Bisabolene and many more (Pradhan et al., 2013). polyphenol, alkaloids, saponin (skb) 9.

Phytochemical constituents	% of chemical constituents
Chavibetol	53.1
Chavibetol acetate	15.5
Caryophyllene	3.71
Allylpyrocatecholdiacetate	0.71
Eugene	0.32
a-Pinene	0.21
f-Pinene	0.21
Safrole	48.7
1, 8-Cineol	0.04
AllylpyrocatecholMonoacet	0.23

Tannins	0.1-1.3%

Phyto-chemicals found in Root

[17] alcoholic extract of *Piper betle* roots furnished aristololactam A-II and a new phenyl propene, characterized as 4-allyl resorcinol, while the petroleum-ether extract yielded a diketosteroid, *viz.* stigmast-4-en-3,6-dione. (Chemical Constituents of *Piper betle* Linn.(Piperaceae) roots.

Phyto-chemicals found in Stem

[18]Nine compounds were isolated from the petroleum ester and ethyl acetate soluble fractions of the 70% acetone extract and their structures were identified as 6beta-hydroxystigmast-4-en-3-one (1), beta-sitosterol (2), stigmasterol (3), oleanolic acid (4), 23-hydroxyursan-12-en-28-oic acid (5), beta-sitosterol-3-O-beta-D-glucoside-6'-O-palmitate (6), beta-daucosterol (7), (2*S*) -4'-hydroxy- 2,3-dihydroflavonone-7-O-beta-D-glucoside (8) and alpha-ethyl glucoside (9

Phyto-chemicals found infruits

[19]Thirteen compounds were isolated from the 95% ethanol extract of the fruits of Areca catechu. Their structures were identified as isorhamnetin (1), quercetin (2), liquiritigenin (3), 5,7,4'-trihydroxy-3',5'-dimethoxyflavanone (4), (+)-catechin (5), resveratrol (6), ferulic acid (7), vanillic acid (8), 5,8-epidioxiergosta-6,22-dien-3beta-ol (9), stigmasta-4-en-3-one (10), beta-sitosterol (11), cycloartenol (12), and de-O-methyllasiodiplodin(13), respectively.

Medicinal values :

Medicinal value of Leaf oil and extract

❖ **Essential oil of Leaf**

- **Anti-larvicidal activity[21]***Piper betel* was observed by L.S. RArambewela*et al.*, in the year 2011. The *piper betel* essential oil at different concentrations, *i.e.* 500, 100, 50, 25, 12.5 and 6.25 ppm concentrations were used, and motility was recorded between 1 to 24 h. Mortalities of 43% and 100% were observed for 100 and 500 ppm concentrations, respectively, within 1 h.
- **Anti-malaria activity: [22]**Essential oil of *Piper betle*provided better protection from biting of mosquitoes *Anopheles stephensi*and *Culexfatigans* compared to known mosquito repellent citronella oil. *Piperbetle*oil provided more than 4 hrs protection against*Anophelesstephensi*and *Culexfatigans*when applied at the rate of 20 µl /cm2 where as citronella oil provided only 2.2 and 2.6hrs protection respectively. Thus, mosquito repellent activity of pan were proved
- **As an antiseptic:**[29] The Piper betel essential oil is a powerful antiseptic.
- **Astringent:** [29] The essential oil of Piper betel is used as a strong astringent.
- **Nervous system:**[29] Piper betel essential oil has been used as a primary stimulant for the central nervous system followed by a kind of inebriety in large doses.

❖ **Betel leaf extract**

1. **Antihistaminicactivity:[23]**properties are also observed with ethanol extracts of Piper betle (Hajare et al, 2011)
2. **Antimicrobial activity**: **[24]**betel leaves ethanol extract showed an excellent potential to inhibit the growth of foodborne pathogens such as *Escherichia coli* ATCC 25922, *Vibrio cholera* ATCC 6395 and *Staphylococcus aureus*ATCC 25923
3. **Antifungal activity:[25]**Ali I *et al.*, 2007 studied the *in-vitro* antifungal activity of hyroxychavicol isolated from *piper betel* leaf. The minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) were determined using broth microdilution method. Hydroxychavicol exhibited inhibitory effect on fungal species of clinical significance
4. **Antioxidant activity:[27]**methanolic extracts of the betel leaves possess reducing power, DPPH radical, superoxide anion scavenging and deoxyribose degradation activities. :ref Manigauha, A., Ali, H., Maheshwari, M.U., Antioxidant activity of ethanolic extract of Piper betel leaves, Journal of Pharmaceutical Research, **2**, 3, 2009, 491-494.
5. **Anti-fertility Activity: [26]**Sharma JD *et al.*, (2007) studied the anti-fertility efficacy of *Piper betel* Linn. (Petiole) in female Albino rats. Normal cyclic female Albino rats (Rattusnorvegicus) of Wister strain weighing between 150-200 gm were treated with *Piper betel* (Petiole) ethanolic (50%) extract (100 mg/day/rat) for 30 days.
6. **Anti-dermatophytic Activity: [27]** Anti-dermatophytic Activity of *Piper betel* cream was studied by NopamartChatchawanchonteera*et al.,* in 2006. Crude ethanolic extracts of *Piper betel* leaves

Medicinal value of Stem: [31]use as anticarcinogenic agent

Medicinal value of Root :[30]use as an antidibetic agent

Medicinal value of Fruit:[28]use for schizophrenia, and glaucoma a group of eye disorder, it also help to improve digestion

CONCLUSION: From this review it is seems that, we extracted the chief constituent from the plant or its individual parts (leaf, stem ,root ,fruit) by using the technique that's helps to identify particular constituents which contains a number of chemical constituent &phytoconstituents which having particular therapeutic valueit helps to reveals its uses for various therapeutic purposes. It can also use for the treatment of various disorders in human being such as, , fungal infection, microbial infection, inflammation, antihistaminic, antidermatophyticschizophreniaetc.

The betel plant really as a cheap, natural and easily available, digestive, mild stimulant, aphrodisiac and refreshing mastication .Still, so much work is required with the betel leaf to investigate the mechanism of actions with other therapeutic activities. This adequately justifies its nomenclature as the "Green Gold of India".

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