IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

BETEL LEAF USED IN COUGH SYRUP

Tanajee Sunil More.

Dr. Prachi Udapurkar.

(phD, Principle kishori college of pharmacy)

Madane N.N.

(M.Pharm)

Kishori College Of Pharmacy, Beed, Maharastra, 431122.

Abstract:

Piper betel Linn. an important species of the Piperaceae family is an evergreen and perennial creeper, with glossy heart-shaped leaves that are magnificent reservoirs of phenolic compoundswith antiproliferative, anti-mutagenic, antibacterial and antioxidant properties. Phytochemical studies show that Piper betel contains a wide variety of biologically active compounds whose concentration depends on the variety of the plant species. Many research studies on Piper betel has reported that it contains important chemical constituents such as chavibetol, chavibetol ace-tate, caryophyllene, allylpyrocatechol diacetate, campene, chavibetol methyl ether, eugenol, a- Pinene, f-Pinene, uLimonene, safrole, 1-8-cineol, and allylpyrocatechol monoacetate. These components are valued as a stimulant for its medicinal properties like anti-fungal, anti-nocicep-tive, anti-cancer, immunomodulatory, antihalitosis, anti-diabetic, gastroprotective, anti-allergic, anti-fertility, antifilarial, anti-larvicidal, wound healing and anti-dermatophytic. The present re-view is an attempt to highlight various traditional uses as well as pharmacological reports on Piper betel L.

Index Terms - (Tulsi, Vasa, Trikatu, Zingiber officinale, Piper nigrum, Piper longum, Shunthi)

INTRODUCTION:

Cough is a protective reflex that helps to expel irritant matter and is necessary for preventingmechanical obstruction to breathing. It is the most common symptom affecting a large popula-tion and presenting to general practitioners. It can also be associated with the pulmonary dis-eases like common cold, pneumonia and chronic bronchitis. Up to 40% of patients with chroniccough remain unexplained in specialist clinics and are observed creating serious health prob-lems. Both acute and chronic cough have significant impacts on health-related quality of life. Drugs that suppress cough are designated as anti-tussives. Some of them act on the centralnervous system to inhibit cough while others produce their effects locally. Centrally (codeine and ephedrine) and peripherally (bromhexine and guaefenesin) acting anti-tussives produceknown side effects such as sedation, constipation, drowsiness and addiction. Therefore, a needis felt to develop an effective anti-tussive and expectorant drug without any side effects.

In present study, selected Ayurvedic cough syrup consists extracts of Ocimum sanctum (Tulsi)Aerial, Adhatoda vasica (Vasa) Leaves, Trikatu [Compound of Shunthi (Zingiber officinale) Rhizome, Marich (Piper nigrum) fruit and Pippali (Piper longum) fruit], Zingiber officinale (Shunthi) Rhizome, Glycyrrhiza glabra (Yashtimadhu) Root, Solanum

xanthocarpum (Kan- takari) Whole plant along with powder of Navasar and Menthol. Each of these ingredients is reported to have direct or indirect anti-tussive effect.

Expectorant: A type of cough medicine use to clear mucous from your air way. You make taken expectorant to help relieve congestion if you have cold or the flu.

TYPES OF COUGH

Mainly there are two types of cough, which are classifies as follows .

- Wet cough
- Dry cough

Wet cough	Dry cough
• Productive and effective cough. • It expels secretion mucous or foreign Ma- terial from respiratory tract. • The main purpose of wet cough is to Re- move the foreign matter or mucous From res-piratory tract by which inspection is caused.	• Non effective and infective cough. • It expels secretion or mucous from lungs. • Dry cough is chronic in nature and It iscaused by dry irritation, smoke Or dust.

Table.1 Types of Cough

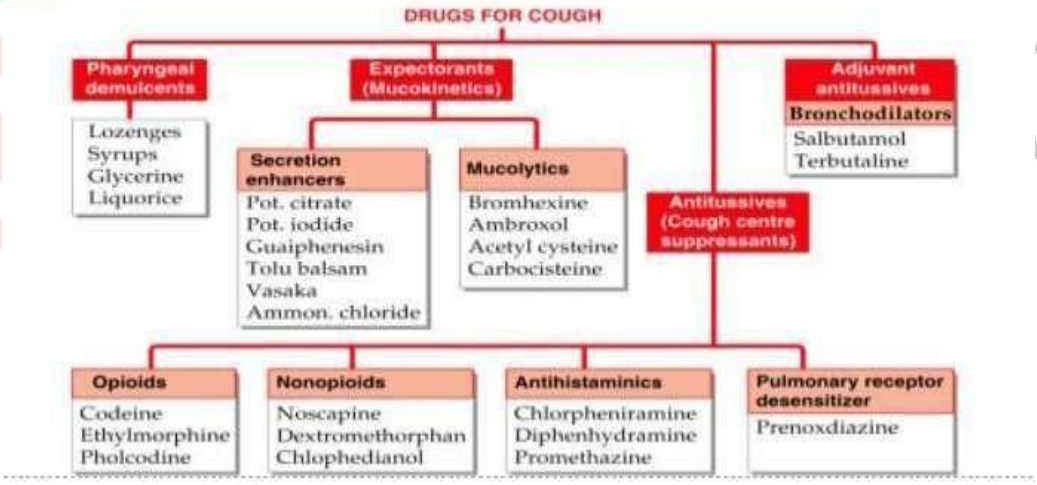


Fig 1. Classification of drugs for cough

REVIEW OF BETEL LEAF:

The betel leaf is an evergreen and perennial, creeper, with glossy heart-shaped and white catkin.The genus Piper (Piperaceae) is largely distributed in tropical and subtropical regions of the world. Piper betel is cultivated in India, Sri Lanka, Malaysia, Indonesia, Philippines, Island, and East Africa.

Fig 2. Betel Leaf.

TAXONOMICAL CLASSIFICATION:

Kingdom : Plantae

Division : Magnoliophyta

Class : Magnoliplasida

Order : Piperales

Family : Piperaceae

Genus : Piper

Species : Betel

COMMON NAME:

Sanskrit : Tambool, Mukbhushan.

Hindi : Paan.

Marathi : Khauch Paan.

SIGNIFICANCE OF BETEL LEAVES:

Guna (Quality)	Laghu, Ruksha,
Rasa (Taste)	Tikt
Vipak (Metabolism)	Katu
Virya (Potency)	Ushan
Prabhav (Impact)	Hridya

Table 2. Significance of Betel Leaves

VERITIES OF BETEL LEAF:

Based on the morphological characters and essential oil content, betel vine varieties are dividedinto five main groups viz, Bangla, Desawari, Kapoori, Sanchi, and Meetha.

1. **Bangla** is large thin leaves with nine main nerves and ovate lamina with cordate base.

Leaf apex is pointed and short, not curved. Petiolar sinus it is more prominent than othervarieties.

Fig 3. Bangla.

1. **Desawari** is large thin leaves and cordate lamina with seven to nine nerves. Leaf of Desawariis pinkish, and leaf apex is short, acuminate, and curved.

Fig 4. Desawari.

2. **Kapoori** leaves are more elliptical, and lamina is thin with undulated margin. Leaf apex ofKapoori is acuminate, and petiolar sinus is inconspicuous.

Fig 5. Kapoori.

1. **Sanchi** consists of a cordate leaf base with more elliptical lamina and long tapering apex.Normally seven nerves are seen in Sanchi.

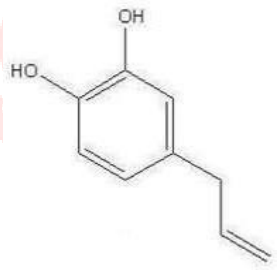
Fig 6. Sanchi.

CHEMICAL CONSTITUENT OF BETEL LEAF:

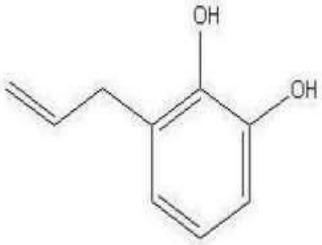
Leaves contain protein 3-3.5%, carbohydrate 0.5 - 6.10%, minerals 2.3-3.3%, and tannins 0.1 - 1.3%. It contains calcium, phosphorus, iron, iodine, potassium, vitamin B, vitamin C and vitamin A. It also contains some aromatic compounds and stable oils like phenol and terpene. Besides, it contains eugenol, chavibetol a-pinene, f pinene, 1, 8 cineole and hydroxychavicol. Major constituents of common betel were found to be safrole (48.7%) and chavibetol acetate (15.5%). The presence of allylpyrocatechol, caryophyllene, anethole, stearic acid, carvacrol, polyphenol, alkaloids, saponin, are also found in betel Leaf.

Chemical constituents	**% of chemical constituents**
Chavibetol	53.1
Chavibetol acetate	15.5
Caryophyllene	3.71
Allylpyrocatechol diacetate	0.71
Chavibetol methyl ether	0.48
Eugene	0.32
a-Pinene	0.21
f-Pinene	0.21
Safrole	48.7
1, 8-Cineol	0.04

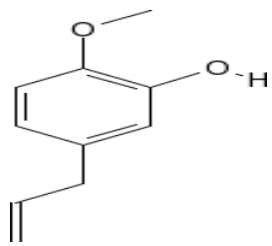
Table 3. Chemical constituents of Betel Leaf



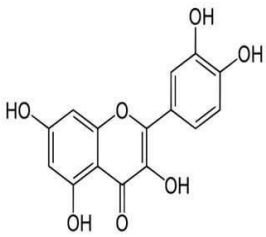
HYDROXYCHAVICOL ACETATE



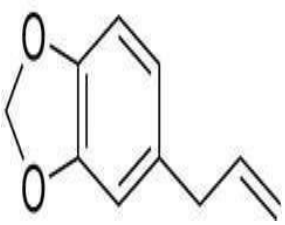
ALLYLPYROCATECHOL



CHAVIBETOL



QUERCETIN



SAFROLE

Fig 7. Structure of chemical constituents.

AYURVEDIC USES:

Scanty or Obstructed Urination:

Betel leaf juice is credited with diuretic properties. Its juice, mixed with dilute milk and sweet-ened slightly, helps in easing the passage of urine.

WEAKNESS OF NERVES:

Betel leaves are beneficial in the treatment of nervous disorders. The juice of a few betel leaves,with a teaspoon of honey, serves as a good tonic. A teaspoon of this mixture can be taken twicea day.

HEADACHES:

The betel leaf has analgesic and cooling properties. It can be applied to relieve intense head-aches.

RESPIRATORY DISORDERS:

Betel leaves are useful in pulmonary afflictions suffered in childhood and old age. The leaves,soaked in mustard oil and warmed, may be applied to the chest to relieve a cough or difficultyin breathing.

CONSTIPATION:

In the case of constipation in children, a suppository made of the stalk of betel leaf dipped incastor oil can be introduced in the rectum. This instantly relieves constipation.

SORE THROATS:

Local application of the leaves is effective in treating sore throat. The crushed fruit or berryshould be mixed with honey and taken to relieve an irritating cough.

WOUNDS:

Betel leaves can be used to heal wounds. The juice of a few leaves should be extracted and applied to the wound. Then a betel leaf should be wrapped over it and bandaged. The wound will heal with just a single application within two days.

BOILS:

The herb is also an effective remedy for boils. A leaf is gently warmed till it gets softened andthen coated with a layer of castor oil. The oiled leaf is spread over the inflamed part. This leafhas to be replaced, every few hours. After a few applications, the boil will rupture draining outall the purulent matter. The application can be made at night and removed in the morning.

DRYING OF BETEL LEAF :

Drying is also known as dehydration, which removes the moisture from the product and thusavoids spoilage. Drying is a well-known preserving technique to enhance the shelf life of leaves and to prevent post- harvest losses. Drying implies many advantages, like longer shelf life, being easy to handle, and requiring a minimum space to store. To preserve the phyto- chemical compound, the rapid drying method is used. Drying alters both physical and chemi- cal properties of a product, thus the selection of a drying technique is an essential factor. Gen-erally, drying methods like sun drying, shadow drying, vaccum drying, cabinat tray drying and oven drying were used for drying. Researchers concluded that 50°C was found to be the optimum temperature for drying betel leaves in cabinet drying. This study focuses on the dry-ing of betel leaf in solar tunnel drying and cabinet tray. In the drying process, betel leaf varie-ties of Pachaikodi and Vellaikodi were used. Visually, Pachaikodi betel leaf variety is dark green in colour while the Vellaikodi betel leaf variety is light green in colour. The drying characteristics, proximity and colour of dried betel leaf were also investigated.

RAW MATERIAL :

Pachaikodi and vellaikodi varieties of betel leaf were collected from the local farmers of Sriperambuthur. The freshly collected betel leaves were sorted, de-petiolized and washed be-fore drying.

PREPARATION OF BETEL LEAVES FOR DRYING :

The fresh betel leaves were sorted by removing pest damaged leaves, and petioles were re- moved from the leaves. The petiole-removed leaves are washed to remove dirt particles. Thewater drained from the leaves. After removal of excess water, drying was carried out with two different techniques, such as solar tunnel drying and tray drying.

DRYING OF BETEL LEAVES :

150g of betel leaves were weighed accurately and the drying process was carried out in a suntunnel dryer and a cabinet tray dryer.

(i) **Tray drying**. Betel leaves are sorted, washed, strained from excess water, weighed and placed in a tray for drying. The betel leaves were dried at 50°C in a cabinet tray dryer. Drying continues until a constant weight is reached. After com-plete drying, the dried leaves were grinded and sieved in a sieve. The sieved pow-der was packed in airtight LDPE pouches and stored at 4ºC for further usage.

(ii) **Solar tunnel drying.** Betel leaves are sorted, washed, strained from excess water,and weighed. The weighed betel leaves are uniformly distributed on the filter pa- pers and placed in the solar tunnel dryer for drying. The temperature of the solar tunnel dryer varies from 28°C to 38°C. Drying was carried out until it reached a constant weight.

(iii) **Vaccum Drying.** 10 grams of betel leaf was distributed uniformly as a thin layeron a tray and dried in vaccum oven on temperature 30, 50, 7o and pressure 1, 0.5 and o.o atm for each temperature respectively. The weight of sample measured inevery 15 minutes for 3 hours.

Fig 8. Dried leaves of betel plant

EXTRACTION OF BETEL LEAF :

Extraction methods comprises the separation of medicinally active portions of plant tissues from the inactive/inert components by using selective solvents. During extraction, solvents dif-fuse into the solid plant material and solubilize compounds with anologous polarity. Now day'spharmaceutical agencies begin processing of medicinal and aromatic flora in their system by means of the usage of extraction of energetic components. There are numerous approaches like distillation, effleurage, maceration, expression, solvent extraction and fluid extraction are to behad for extraction of plant element. The goal of systematized extraction approaches for crude drugs (medicinal plant parts) is to obtain the pharmaceutically energetic elements and to ex- clude undesired material by remedy with a selective solvent known as menstruum. The extractthus received, after standardization, may be used as a medicinal agent as such inside the shape of tinctures or fluid extracts or in addition processed to be incorporated in any dosage form including drugs and tablets. These products contain a complicated combination of many me- dicinal plant metabolites, together with alkaloids, glycosides, terpenoids, Flavonoids and lignans and many others. The standard strategies of medicinal plant extraction encompass mac-eration, infusion, percolation, digestion, decoction, hot continuous extraction (Soxhlet), aqueous-alcoholic extraction through fermentation, counter-current extraction, microwave-as- sisted extraction, ultrasound extraction (sonication), supercritical fluid extraction and phytonicextraction (using hydrofluorocarbon solvents). For aromatic plants, hydrodistillation tech- niques (water distillation, steam distillation, water and steam distillation),

hydrolytic macera- tion followed by way of distillation, expression and enfleurage (cold fat extraction) may be taken into account. Some of the modern extraction methods for aromatic plant life consist of headspace trapping, strong section micro extraction, protoplast extraction, microdistillation, thermomicrodistillation and molecular distillation. Extraction of the bioactive plant elements has usually been a tough project for the researchers. In this chapter, an attempt has been madeto offer an outline of sure extractants and extraction approaches with their advantages and drawbacks.

Choice of solvents:

Successful evaluation of biologically active compounds from plant parts are largely dependenton the sort of solvent used within the extraction system. Properties of a ideal solvent in plant extractions consists of, low toxicity, ease of evaporation at low temperature, fast physiologic absorption of the extract, preservative action, incapability to cause the extract to form complexor dissociate. The circumstances affecting the choice of solvent are amount of phytochemicals to be extracted, rate of extraction, variety of various compounds extracted, variety of inhibitorycompounds extracted, ease of subsequent handling of the extracts, toxicity of the solvent in thebioassay method, ability health hazard of the extractants. The preference of solvent is baised by using what is supposed with the extract. Since the end product will include traces of residualsolvent, the solvent must be nonpoisonous and need not intervene with the bioassay. The desire will even depend on the targeted compounds to be extracted.

Alcohol : The better activity of the Ethanolic extracts compared to the aqueous extract can be attributed to the presence of higher amounts of polyphenols in comparison to aqueous ex- tracts. It manner that they're greater efficient in cell walls and seeds degradation which have nonpolar character and cause polyphenols to be released from cells. More beneficial reason behind the decrease in activity of aqueous extract may be ascribed to the enzyme polyphenol oxidase, which degrade polyphenols in water extracts, while in methanol and ethanol they maybe inactive. Moreover, water is a better medium for the occurrence of the micro-organisms compared to ethanol. The higher concentrations of greater bioactive flavonoid compounds havebeen detected with methanol 70% due to its higher polarity than pure ethanol. By including water to the pure methanol up to 30% for making ethanol 70% the polarity of solvent was elevated. Additionally, methanol was found easier to penetrate the cell membrane to extract theintracellular ingredients from the plant material.

- **Water :** Water is prevalent solvent, used to extract plant products with antimicrobial prop- erty. Though traditional healers use generally water but plant extracts from organic solvents have been found to offer more consistent antimicrobial property as compared to water extract.Also water soluble flavonoids (in general anthocyanins) haven't any antimicrobial importanceand water soluble phenolics only important as antioxidant compound.

LERATURE REVIEW

Maran et al., 2013; Muruganandam et al., (2017):

Several extraction variables such as extraction temperature, extraction time, and mate-rial to solvent quantity were optimized to get maximum extraction yield by using Box-Behnken design (BBD) coupled with response surface methodology (RSM). Responsesurface methodology, a valuable tool helps to determine the optimum values of exper-imental parameters and builds a mathematical model to evaluate the interaction effect between variables with a reduced number of experiments (Maran et al., 2013; Muruga-nandam et al., 2017)

ECCLES, ET AL.,(2013):

Globally, breast cancer is the most common disease in women with new cases incidenceof 1.38 million per year

Zulharini M et al., (2018):

used methanolic extract of red betel leaf to evaluate the cytotoxic and anti-migration activity towards metastatic breast cancer. Red betel leaves (Piper crocatum Ruiz dan Pav) has been known as herbal medicine containing biphenolic, such as apigenin and luteolin de- rivatives which have cytotoxic activity toward cancer cells.

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 exhibitedinhibitory effect on fungal species of clinical significance with MICs ranging from

15.62 to 500 ug/ml for yeasts, 125 to 500 ug/ml for Aspergillus species and 7.81 to 62.5ug/ml for dermatophytes. The antifungal activity exhibited by this compound warrantsits use as an anti-fungal agent particularly for treating topical infections as well as gar-gle mouthwash against oral Candida infections .

MAJUMDAR B ET AL., (2003):

studied the healing effect on treatment with ethanol extract of P. betel at a dose of 150mg/kg body weight daily for 10 days, after induction of peptic ulcer by NSAID in albinorats. During the healing process, on treatment with extract of piper betel, antioxidant factor, e.g., superoxide dismutase and catalase activity, mucus and total gastric tissue sulphahydryl group were increased. Overall it can be suggested that the antioxidant or free radical scavenging activity of the plant extract may be responsible for its healing property 13 .

LD ET AL., (2014);

evaluated the gastroprotective activity of hot aqueous extract (HAE) and cold ethanolicextract (CEE) of P. betel against ethanolinduced gastric ulcers in rats. The parameters evaluated were (a) effects of HAE on mucus content adhering to the wall of the gastricmucosa, (b) acidity (total and free) (c) volume and (d) pH of the gastric juice. Oral administration of HAE and CEE provided marked dependent (HAE r2 = 0.97; CEE r 2 = 0.96) and significant ($P \leq 0.05$) than that of misoprostol, the reference drug.

KANJWANI DG ET AL., (2008):

evaluated immmunomodulatory activity of methanolic extract of Piper betel. The MPbconsisted of a mixture of phenols, flavonoids, tannins, and polysaccharides. Both in- vitro as well as in- vivo evaluation were carried out. The effects of MPB on lymphocyteproliferation, interferon-γ receptors and the production of nitric oxide were measured in-vitro.

ARAMBEWELA LS ET AL., (2005):

investigated the anti-diabetic activities of aqueous and ethanolic extracts of Piper betelleaves in rats. This was tested in normoglycaemic and streptozotocin (STZ)-induced diabetic rats using oral administration of hot water extract (HWE) and cold ethanolic extract (CEE). In normoglycaemic rats, both HWE and CEE significantly lowered the blood glucose level in a dose-dependent manner. In glucose tolerance test, both extractsmarkedly reduced the external glucose load.

ARAMBEWELA LS ET AL., (2011)

reported that Piper betel has antinociceptive activity. About 200 and 300 mg/kg doses of Piper betel extract markedly reduced the licking time in early and late phases of theformalin test in a bell-shaped dose-response curve. In the formalin test, the pain in the early phase is caused due to the direct stimulation of the sensory nerve fibers by forma-lin, while the pain in the late phase is due to the inflammatory mediators, like histamine, prostaglandin, serotonin, and bradykinin.

NILUGAL ET AL., (2014);

investigated the wound healing capability of Piper betel leaves and stem extract. The enhanced rate of wound contraction and the drastic reduction in healing time in male albino rats, which might be due to enhanced epithelialization was observed. The results showed wound healing and repair, accelerated by applying ointment formulation con- taining Piper betel leaves and stem extract, which was highlighted by the full thicknesscoverage of the wound area by an organized epidermis.

L.S. RARAMBEWELA ET AL., (2011):

Anti-larvicidal activity of Piper betel was observed The piper betel essential oil at dif- ferent 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. The concentra-tion of oil used was 1%, 0.8%, and 0.5% respectively and the mortality rate of 100% was observed in 1% betel oil solution within 1 h.

NOPAMART CHATCHAWANCHONTEERA ET AL., (2006):

Anti-dermatophytic Activity of Piper betel cream was studied by Nopamart Chatcha- wanchonteera et al., in 2006. Crude ethanolic extracts of Piper betel leaves (Pipe- raceae), Alpinia galangal rhizomes (Zingiberaceae) and Alliums ascalonicum bulbs (Liliaceae) were previously tested against selected dermatophytes (Microspore canis, Microsporum gypseum, and Trichophyton mentagrophyte). The results suggested a promising anti-fungal property of Piper betel extracts than its counterparts. In a study conducted by for anti-dermatophytic activity 10% Piper betel cream was formulated, subjected to physical and microbial limit tests, and evaluated for its effect against der-matophytes in-vitro.

PHARMACOLOGICAL ACTIVITY

A large number of natural products are being used in the treatment of many diseases as tradi- tional medicine in several countries. Piper betel belongs to the family Piperaceae and has over2000 species. The plant is indigenous to India. Piper betel leaves are shown to be effective against several human pathogens, although the mechanisms involved have not been elucidated.Extracts of Piper betel are used for the treatment of various ailments since ages due to its es- sential properties like anti-oxidant, anti-cancer, anti-allergic, etc.

GASTROPROTECTIVE :

Study evaluated the gastroprotective activity of allylpyrocatechol (APC), the major antioxidantconstituent of Piper betle, against indomethacin-induced stomach ulceration in a rat model. Results showed both APC and misoprostol effectively healed stomach ulceration. The protec- tive activity was attributed to antioxidant activity and the enhancement of mucin content of gastric tissues.

GASTROPROTECTIVE ACTIVITY:

The healing effect on treatment with ethanol extract of P. betel at a dose of 150 mg/kg body weight daily for 10 days, after induction of peptic ulcer by NSAID in albino rats. During the healing process, on treatment with extract of piper betel, antioxidant factor, e.g., superoxide dismutase and catalase activity, mucus and total gastric tissue sulphahydryl group were in- creased. Overall it can be suggested that the antioxidant or free radical scavenging activity of the plant extract may be responsible for its healing property. LD evaluated the gastroprotectiveactivity of hot aqueous extract (HAE) and cold ethanolic extract (CEE) of P. betel against eth-anol-induced gastric ulcers in rats. The parameters evaluated were (a) effects of HAE on mucuscontent adhering to the wall of the gastric mucosa, (b) acidity (total and free) (c) volume and (d) pH of the gastric juice. Oral administration of HAE and CEE provided marked dependent (HAE r2 = 0.97; CEE r2 = 0.96) and significant ($P \leq 0.05$) than that of misoprostol, the referencedrug. The HAE significantly increased the mucus content adhering to the wall of gastric mu- cosa and inhibited the volume of gastric acid, and hence concluded that both HAE and CEE of P. betel leaves have a strong gastroprotective activity.

WOUND HEALING ACTIVITY:

The enhanced rate of wound contraction and the drastic reduction in healing time in male albino rats, which might be due to enhanced epithelialization was observed. The results showed wound healing and repair, accelerated by applying ointment formulation containing Piper betelleaves and stem extract, which was highlighted by the full thickness coverage of the wound area by an organized epidermis. The animals treated with ointment formulation containing 10% Piper betel leaves and stem showed significant results when compared with providone iodine and control group. From this investigation, it can be concluded that Piper betel has the potentialability in wound healing.

ANTI-ALLERGIC ACTIVITY:

The effects of Piper betel ethanolic extract on the production of histamine and granulocyte macrophage colony-stimulating factor (GMCSF) by murine bone marrow mast cells (BMMCs)and on the secretion of exotoxin and IL-8 by the human lung epithelial cell line, BEAS-2B, were investigated in-vitro. The extracts significantly decreased histamine and GM-CSF pro- duced by an IgE mediated hypersensitivity reaction and inhibited exotoxin and IL-8 secretion in a TNF-α and IL-4-induced allergic reaction. The results suggested that Piper betel may offera new therapeutic approach for the control of allergic diseases through inhibition of productionof allergic mediators.

ANTI-LARVICIDAL ACTIVITY:

Anti-larvicidal activity of Piper betel 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 concen-trations, respectively, within 1 h. The concentration of oil used was 1%, 0.8%, and 0.5% re- spectively and the mortality rate of 100% was observed in 1% betel oil solution within 1 h. Betel solutions ranging in concentration from 1% to 4% were prepared using 1% Tween 80, sodium lauryl sulfate (0.05 gm/100 ml, as a stabilizer) and methylparaben (0.01 g/100 ml, as apreservative). The 4% and 3% preparations of the oil of betel were effective in killing 100% ofthe larvae of C. megacephala within 3 h, while betel oil at 2% concentration killed 97% of C. megacephala larvae within 4 h. This shows that betel oil is effective in the treatment of woundmyiasis.

ANALGESIC:

Study evaluated the analgesic activity of piper betel leaf using eddy's hot plate and heat con- duction method. Results showed a dose-dependent response. The aqueous extract of leaf was safe up to 1000 mg/kbw p.o. dose.

ANTIDEPRESSANT:

Study evaluated the antidepressant activity of ethanolic extract of P. betle leaves in Swiss al- bino mice. Results showed significant antidepressant effect as indicated by reduction in dura- tion of immobility. The 100 mg extract dose effect was greater than that of imipramine.

ANTIBACTERIAL:

According to the study, PB was effective against all pathogens tested, including Rastonia, Xan-thomonas, and Erwinia. Additionally, tests revealed that PB solvent extract had a more power-ful effect than streptomycin. The ethanol extract of P. betel showed the greatest zone of inhi- bition against Gram negative and Gram positive bacteria, with the greatest bactericidal activityagainst E. coli, P. aeruginosa, and S. aureus. The study of crude aqueous extract of P. betel demonstrated activity against most of the test bacteria.

ANTIOXIDANT:

Study showed a leaf extract to inhibit the radiationinduced lipid peroxidation process effec- tively, attributed to its ability to scavenge free radicals involved in initiation and propagation steps with elevation of the antioxidant status in the study animals.

ANTIMICROBIAL:

Study evaluated an aqueous extract of fresh leaves for antimicrobial activity. Results showed effective inhibitory action against the tested organisms (E. coli,Vibrio cholera,S. typhi, and S.parathyphi A and B).

ANTITUMOR:

Study evaluated a methanolic extract of Piper betel leaves and fractions for antitumor activityagainst Ehrlich ascites carcinoma in Swiss albino mice. Results showed significant antitumor activity, which may be attributed to augmentation of endogenousantioxidant potential.

ANTI-CHOLINESTERASE INHIBITORY ACTIVITY:

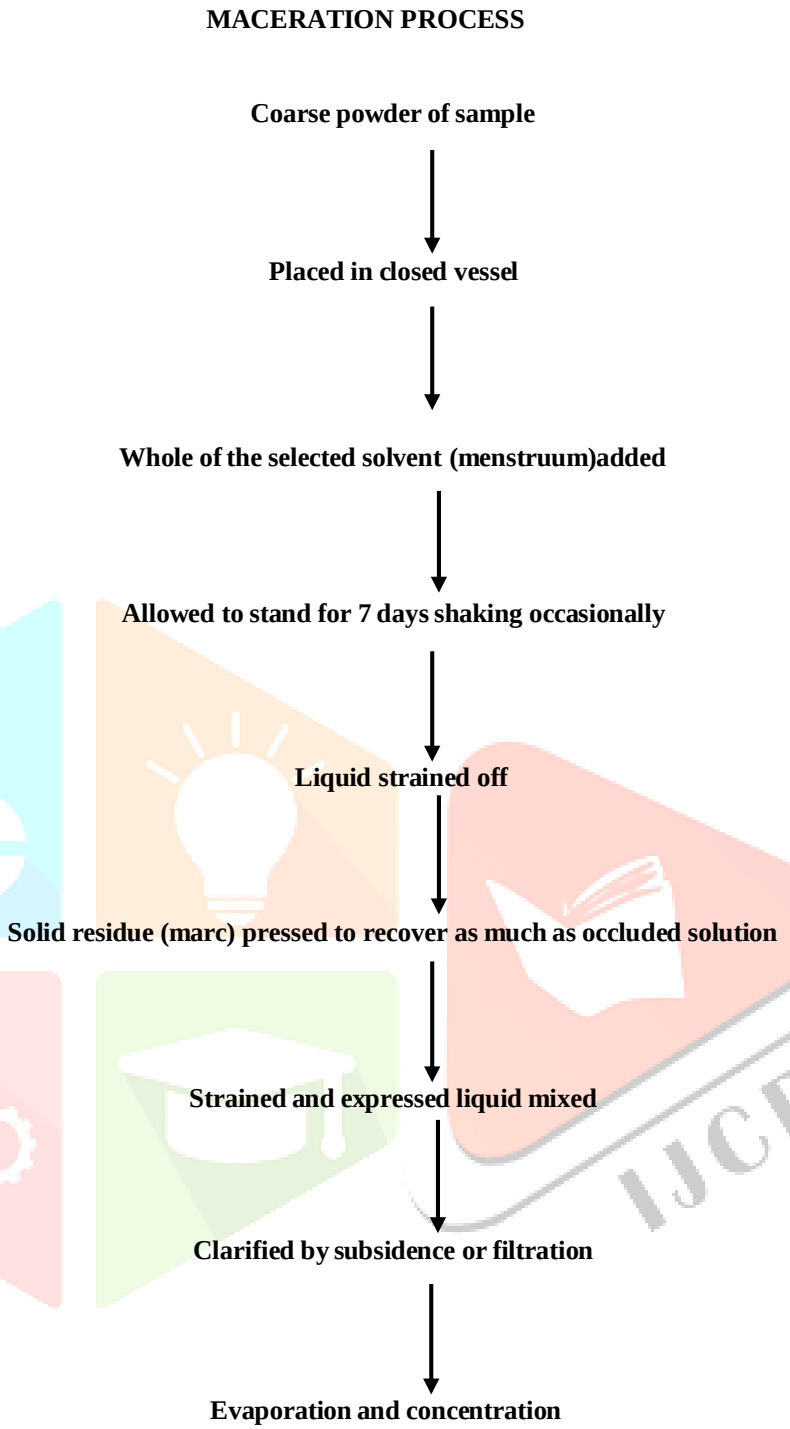
Study evaluated three leaf varieties Kaliganga, Meetha, and Haldi—for acetylcholinesterase inhibitory properties. Aqueous extracts of both fresh and dry leaves of all varieties inhibited acetylcholinesterase activity in a dose dependent manner. The AChE inhibitory property of P.betle may have a beneficial effect on memory function

ANTIDERMATOPHYTIC:

An ethnoveterinary study evaluated crude ethanolic extracts of P.betel leaves A.galanga rhi- zomes, and A. escalonicum bulbs against selected zoonotic dermatophytes (M. canis, M. gypseum, and T. mentagrophytes) and yeast-like Candida albicans. All the extracts caused concentration de- pendent suppression of fungi growth. Testing showed Pb cream formulation with potential therapeutic values for treatment of dermatophytosis.

S.no.	Plant part/ Extract	Activity/Animal/ Model	Result	Reference
1.	Aqueous extract of the fresh *Piper betle* leaves.	Antimicrobial activity/Various microorganisms /disc diffusion method.	Aqueous extracts showed effective inhibitory action against the microorganisms	Shameem Pasha MD; *et al*, (2013)
2.	*Piper betle* leaves/hot water extract/cold ethanolic extract.	Antioxidant activity/Initial antioxidant activity, Antioxidant activity with time & at elevated temperature (200 °C).	The extracts obtained from the leaves of *Piper betle* had profound antioxidant activity.	Arambewela Lakshmi; *et al*, (2006)
3.	*Piper betle* spray dried powder.	Antidiabetic activity/diabetes mellitus patients.	*Piper betle* as a nutraceutical resulted as a potential treatment for type 2 diabetes patients.	HewageeganaSujatha; *et al*, (2011)
4.	Aqueous extract of the fresh *Piper betle* leaves.	Antioxidative & antihemolytic activity/Microorganisms (*Streptococcus pyogenes, Staphylococcus aureus, Pseudomonas aeruginosa* & *Escherichia coli*).	The antioxidative & antihemolytic activities were attributed to the high concentration & combined activity of flavonoids & polyphenols.	Chakraborty Devjani; *et al*, (2011)
5.	Crude ethanolic extracts of *Piper betle* leaves.	Antidermatophytic activity/ zoonotic dermatophytes (*M. canis, M. gypseum*, and *T. mentagrophytes*) and yeast-like *Candida albicans*.	Testing showed *Piper betle* cream formulation with potential therapeutic values for treatment of dermatophytosis.	Trakranrungsiea N.; *et al*, (2008)
6.	Aqueous and ethanol extract of the *Piper betle* leaves.	Antibacterial Activity/ Gram positive (*Bacillus subtilis, Staphylococcus aureus* & *Micrococcus luteus*) & Gram negative (*Escherichia coli* & *Pseudomonas aeruginosa*) 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.	Kaveti Balaji; *et al*, (2011).
7.	The hot water *Piper betle* leaves extract.	Gastroprotective activity.	The study showed that it can protect against indomethacin-induced gastric ulceration due to its antioxidant and mucin protecting properties.	Pradhan D.; *et al*, (2013).
8.	The petroleum ether extract &methanol extract of the *Piper betle* leaves.	Insect Attractant Property /Field tests in a cornfield.	Field tests in a cornfield using trap contain the extracts, which does not detect adult moths of *Ostrinia salentialis*.	Yusoff Z.; *et al*, (2005)
9.	The methanolic extract of the *Piper betle* 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 hot plate method whereas significantly reduced the writhing caused by acetic acid & caused significant inhibition of carrageenan induced paw edema.	Akter Fahima; *et al*, (2012)
10.	The *Piper betle* plant extract.	Antifertility activity/ female rats.	The data suggests that betle extract brought about antifertility and antiestrogonic effects in female rats.	Pradhan Manas Ranjan.;*et al*, (2013)
11.	The *Piper betle* leaf extract.	Antihepatotoxic effect/ ethanol & carbon tetrachloride (CCl4) induced liver injury in a rat model.	The histological examination shows that *Piper betle* leaf extract secluded liver from the damage induce by CCl4 by declining alpha smooth muscle actin (alpha-sma) expression.	Young S.C.; *et al*,(2007)
12.	The *Piper betle* leaf infusion.	Skin Antiseptic/ pre-surgery cataract patients.	Results showed that 20% *Piper betle* leaf infusion to have an antiseptic	Husnun Amallia.; *et al*, (2009)

PROPOSED METHODOLOGY:



CONCLUSION:

Since the traditional times, piper betel is consumed frequently as cough syrup. According to numerous research studies, the medicinal importance of the herb as discussed above evidentlyprove that betel leaf is one of the most promising commercial botanical. It has shown to possessa lot of therapeutic activities such as anticancer activity, anti-fungal activity, antinociceptive activity, immunomodulatory activity, anti-halitosis activity, anti-diabetic activity, gastropro- tective activity, anti-allergic activity, antifertility activity, anti-filarial activity, anti-larvicidal activity, wound healing activity and antidermatophytic activity. In consideration of the proventherapeutic values of P. betel proper characterization could be useful for long term research fordrug development.

REFERENCES:

1. Arambewela LS, Arawwawala LD and Ratnasooriya WD: Anti-diabetic activities of aqueous and ethanolic extracts of P. betle leaves in rats. J of Ethno 2005; 102(2): 239-45.
2. Bajpai V., Sharma D., Kumar B. and Madhusudanan K.P. Profiling of Piper betel Linn.cultivars by direct analysis in real time mass spectrometric technique. Biomed. Chro- matogr. 24(12), 2010, 1283-1286.
3. Betel leaf farming, planting, care, harvesting guide by Jagdish 2015 http://www.agrifarming.in/betel-leaffarming-information
4. Bhattacharya S., Subramanian M., Bauri A. and Kamat J.P. Radioprotecting property of the ethonolic extract of the Piper betel leaf. Journal of Radiation Research. 46, 2005,165-171.
5. Bissa S, Songara D and Bohra A: Traditions in oral hygiene: chewing of betel (PipebetleL.) leaves. Current Science 2007; 92(1): 26-8.
6. Chahal J., Ohlyan R., Kandale A., Walia A. and Puri S. Introduction, phytochemistry, traditional uses and biological activity of genus piper: a review. IJCPR. 2(2), 2011, 130-144.
7. Datta Arani, International Journal of Pharma Sciences and Research "Antimicrobial Property of Piper betel Leaf against Clinical Isolates of Bacteria" Vol.2(3), 2011, 104-109.
8. Encyclopedia of life hosted by National museum of natural history (internet) Betel- piper betle- encyclopedia of lifehttp://eol.org/pages/491360/details
9. Kanjwani DG, Marathe TP, Chiplunkar SV and Sathaye SS: Evaluation of the immuno-modulatory activity of methanolic extract of Piper betel. Scandinavian Journal of Im- munology 2008; 67(6): 589-93.
10. Kumar N, Misra P, Dube A, Bhattacharya S, Dikshit M, Ranade S. Piper betle Linn. amaligned Pan-Asiatic plant with an array of pharmacological activities and prospects for drug discovery. Curr Sci. 99, 2010, 922–
11. Kumarasinghe SP, Karunaweera ND, Ihalamulla RL, Arambewela LS and DissanayakeRD: Larvicidal effects of mineral turpentine, low aromatic white spirits, aqueous ex- tracts of Cassia alata, and aqueous extracts, ethanolic extracts and essential oil of betelleaf (Piper betle) on Chrysomya megacephala. Int J of Derma 2002; 41(12): 877-80.
12. Nair R, Arawwawala LD, Kumaratunga KG, Dissanayake DS, Ratnasooriya WD and Kumarasingha SP: Investigations on Piper betle grown in Sri Lanka. Pharmacognosy Rreviews 2011; 5(10): 159.
13. Nilugal KC, Perumal K, Ugander RE and Chittor AI: Evaluation of wound healing ac-tivity of Piper betle leaves and stem extract in experimental Wistar Rats. Am J Pharm Tech Res 2014; 4(3): 443-52.
14. Ramji N, Yates R, Iyer R and Chandrasekaran S: Phenolic anti-bacterials from Piper betle in the prevention of halitosis. J of ethnopharmacology 2002; 83(1-2): 149-52.
15. Rao AR, Sinha A, Selvan RS. Inhibitory action of Piper betle on the initiation of 7.12-dimethylbenz[a] anthraceneinduced mammary carcinogenesis in rats. Cancer Lett. 26, 1985, 207–14.
16. Sharma R.K, Goyal A.K and Bhat R.A; Antifertility Activity of Plants Extracts On Female Reproduction: A