Pharmacognostic Study on the Leaf of *Piper betle* L.
Swe Mar Tin

**Abstract**
Specimens were identified according to Hooker (1879), Kirtikar and Basu (1933), Backer (1963), Hutchinson (1967), Brandis (1971) and Dassanayake (1987). Fresh and powder leaves of *Piper betle* L. were studied with the methods of Wallis (1967), Trease and Evans (1978) and Evans (2002). Elemental analysis was conducted by using Energy Dispersive X-Ray Fluorescence (EDXRF) and Atomic Absorption Spectrophotometery (AAS) methods. *Piper betle* L. contained the highest Mg concentration having 8.412 ± 0.007 ppm. Various solvents extracts of leaves showed the antimicrobial activity against *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus pumalis*, *Candida albicans* and *Escherichia coli*. Water extract of *Piper betle* L. showed activity against *Bacillus subtilis* respectively.

**Key words:** *Piper betle*, morphology, anatomy, fresh and powdered leaves, EDXRF, AAS, antimicrobial activity

**Introduction**

The study of traditional medicinal plants and their therapeutic properties play a very important role in the health care system of the country. In Myanmar, most of the populations have been using traditional medicine for centuries. Myanmar traditional practitioners use a variety of effective medicines mostly based on plant materials available. Such medicines may consist of a single potent plant or in combination with others in divergent ratios by mass or by volume.

In this paper, not only the morphological characters of *Piper betle*, but also its histological characters of fresh and powdered leaves, antimicrobial activities on 6 pathogenic microorganisms and preliminary phytochemical, physicochemical tests with elemental analysis are presented.

Leaves of *Piper betle* L. are stimulant, antiseptic and sialogogue. The chief constituent of the leaves is volatile oil. The oil is an active local stimulant used in the treatment of respiratory catarrhs as a local application or gargle, also as an inhalant in diphtheria (Grieve 1975). The leaves are used as a counter-irritant to suppress the secretion of milk in mammary abscesses. The fresh leaves and the fresh juice and the oil of betel vine have

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aromatic, carminative and astringent properties. The warm leaves form a valuable application to the chest in cases of bronchial difficulty, and are applied to the mammae to check the secretion of milk (Dey 1978). By means of its properties, the plant *Piper betle* was undertaken and studied.

The aims of the study is to explore the potent and qualitative medicine to promote the health of people and to facilitate easy identification of the herbs before their use, where there is no easy contact to drugstores and hospitals. Furthermore, to use the outcome results in upgrading the future traditional medicine to level up with the modern medicines.

The objectives are to identify and standardize the characters of medicinal plants used in traditional medicine, to determine the leaves of *Piper betle* L., to determine the antimicrobial activities.

**Materials and Methods**

The specimens utilized in this research were collected from Lashio, growing as cultivated plants. The collected specimens were studied and identified in the Department of Botany, University of Lashio with the help of literatures (Hooker 1879, Kirtikar and Basu 1933, Backer 1963, Hutchinson 1967, Brandis 1971, and Dassanayake 1987). The morphology and taxonomical studies were made from the fresh specimens of both the vegetative and reproductive parts.

The histological studies of the leaves as lamina, midrib and petiole of *Piper betle* L. were undertaken on fresh specimens. Free hand sections were made by using razor blades for microscopic study and chloral hydrate solution was used as clearing agents. The sections were stained with standard saffranin and studied. The stained selected sections and component cells were mounted in glycerin, enclosed with a cover slip and studied under the microscope. The observation of the powdered leaves was made by using the powder of the dried leaves.

Phytochemical investigations were carried out to determine the presence or absence of chemical constituents such as alkaloids, glycosides, flavonoids, terpene, steroids, saponins, reducing sugar, tannin, polyphenol, lipohelic and phenolic compounds. The powdered leaf samples were tested qualitatively by the methods of Central council for Research in Unani Medicine, 1987; Trease and Evans 1980; Santra 1999.
For elemental analysis, the energy dispersive X-ray fluorescence spectrometer (EDX 700, Shimadzu) and atomic absorption spectrophotometer (AAS instrument in Perkin Elma Analyst 800 spectrophotometer) were used to analyze the sample.

For antimicrobial activities, the powdered leaves of *Piper betle* L. extracted by using n-hexane, benzene, acetone, ethyl acetate, ethanol and water. The solvent extracts were tested against 6 pathogenic microorganisms; *Bacillus subtilis* (Jap-0221215), *Staphylococcus aureus* (ATCC-12277), *Pseudomonas aeruginosa* (IFO-3080), *Bacillus pumalis* (IFO-12102), *Candida albicans* (IFO-1060) and *Escherichia coli* (ATCC-25922) by using agar-well diffusion method.

**Results**

Scientific name – *Piper betle* L.
Myanmar name – Kun
English name – Betel vine
Family – Piperaceae
Flowering period – November to January
Part Used – Leaves

This species is growing as cultivated plant.

**Outstanding Characters**

Evergreen, root climbing herb, node jointed and rooted. Leaves simple, alternate, petiolate, caudate at the base, entire along the margin, acuminate at the apex. Inflorescence spike. Flowers minute, hypogynous, perianth absent. Filaments distinct; anthers dithecous. Ovary superior, 1-loculed with a solitary ovule; style 1. Fruit a small drupe. Seeds small.

Folk uses – carminative, stimulant, tonic, antiseptic, appetizing, antispasmodic, laxative, sedative.

Specimen examined – Thein-ni Road, No. 12 quarter, Lashio (Fig. 1).
Macroscopical Characters

Leaves were dorsiventral, simple, evergreen, alternate and petiolate. Petioles were 2.5 – 4.0 cm long and glabrous. Leaf blades were cordate in shape, 8.0 – 18.0 cm long and 7.0 – 12.0 cm wide, caudate at the base, entire along the margin, acuminate at the apex, reticulated venation and green or light green in colour. Texture of the leaves was slightly coriaceous and glabrous.

Histological Characters

The Lamina

In surface view, the cuticle was smooth, epidermal cells of both surfaces were polygonal, anticlinal wall wavy and thin-walled. Adaxial epidermal cells were measured 12.50 – 37.50 μm in length, 25.00 – 87.50 μm in breadth, those of abaxial surface were measured 12.50 – 25.00 μm in length, 37.50 – 87.50 μm in breadth. The palisade ratios of laminas were 2.25 – 3.67; vein-islet numbers of the laminas were 7.50 – 24.00; anisocytic type stomata were found on the lower surface and oval-shaped with two reniform shaped guard cells. Chloroplasts were present in guard cells. Stomatal index for the adaxial surface was nil and for the abaxial surface was 7.50 – 12.24.

In transverse section, the cuticle was smooth and measured about 6.25 μm in thickness in both surfaces and the lamina was measured 87.50 – 150.00
μm in thickness. Adaxial epidermal cells consisted of 3 – 4 layers of subepidermal cells and measured 75.00 – 87.50 μm thick. Cells were mostly barrel-shaped or oval in shape and measured 12.50 – 37.50 μm in length, 12.50 – 31.25 μm in breadth. Those of abaxial surface composed of 2 – 3 layers of subepidermal cells and measured 63.50 – 75.00 μm thick. The cells were mostly similar to those of the adaxial epidermal cells.

The mesophyll is composed of palisade and spongy parenchyma tissue and containing granular crystals. Palisade parenchyma below the adaxial epidermis is 1 layer thick, compactly arranged and vertically erect with numerous chloroplasts. The palisade layer is measured 25.00 – 37.50 μm thick. 3 – 4 layers of spongy parenchyma cells occurred in abaxial side, irregular in shape and connected each others by lateral extensions of various lengths enclosing the air cavities. The spongy layer was about 25.00 – 37.50 μm thick.

Vascular bundles of lateral veins were embedded in the mesophyll tissues. They were collateral type and different in size according to their position. Each bundle was surrounded by a parenchymatous bundle sheath. They were thin-walled and distinct from the neighbouring cells, rounded or oval in shape. Phloem composed of sieve tubes, companion cells and phloem parenchyma. Xylem composed of scalariform and spirally thickened vessels, tracheids, fibers and phloem parenchyma. Vessels were measured 225.00 – 412.50 μm in length and 12.50 – 25.00 μm in breadth. Tracheids were 62.50 – 125.00 μm in length, 6.25 – 25.00 μm in breadth. Fibers were measured 125.00 – 1125.00 μm in length, 6.25 – 25.00 μm in breadth (Fig. 2).

The Midrib

In surface view, the epidermis is composed of thin-walled and slightly rectangular-shaped parenchymatous cells. Cells were measured 25.00 – 87.50 μm in length and 12.50 – 31.25 μm in breadth. Oil drops were present at both surfaces.

In transverse section, midrib was subcircular or oval shape in outline, measured 1 – 3 mm in width, about 2 mm thick and covered with smooth cuticle. Both adaxial and abaxial surfaces of cuticle layers were measured about 6.25 μm in thickness. Both epidermal cells were 1-layered, oval to
barrel in shape, compactly arranged and measured 6.25 – 12.50 \( \mu m \) in length, 12.50 – 25.00 \( \mu m \) in breadth. The cortex was made up of collenchyma and thin–walled parenchyma. The outer collenchyma cells were 3 – 4 layered and measured 25.00 – 87.50 \( \mu m \) thick. Cells were measured 6.50 – 25.00 \( \mu m \) in diameter. Parenchyma cells above the vascular bundle was 4 – 10 layered and measured 212.50 – 337.50 \( \mu m \) thick, cells were measured 6.25 – 75.00 \( \mu m \) in diameter. Parenchyma cells below the vascular bundle was 5 – 10 layered and measured 375.00 – 450.00 \( \mu m \) thick, cells were measured 18.75 – 75.00 \( \mu m \) in diameter.

Three vascular bundles were present with accessory bundles and oval in shape. They were measured about 150.00 – 162.50 \( \mu m \) in width, 137.50 – 150.00 \( \mu m \) in thickness. Phloem tissues were 62.50 – 150.00 \( \mu m \) thick and composed of sieve tube elements and companion cells. Xylem layer was 150.00 – 287.50 \( \mu m \) thick and consists of scalariform and spirally thickened vessels, tracheids, fiber–tracheids and xylem parenchyma cells. Vessels were measured 137.50 – 450.00 \( \mu m \) in length and 25.00 – 62.50 \( \mu m \) in breadth. Tracheids were measured 50.00 – 112.50 \( \mu m \) in length and 12.50 – 25.00 \( \mu m \) in breadth. Fibers were measured 312.5 – 750.00 \( \mu m \) in length and 6.25 – 25.00 \( \mu m \) in breadth.

The Petiole

In surface view, the cuticle was smooth and the epidermis is composed of thin-walled and slightly rectangular-shaped parenchymatous cells. Cells were measured 12.50 – 25.00 \( \mu m \) in length and 12.50 – 50.00 \( \mu m \) in breadth. Oil drops were present at both surfaces.

In transverse section, petioles were semicircular in outline, forming a concave at the middle region of the adaxial side and measured 2.0 mm – 3.5 mm in width, 1 mm – 2.5 mm in thickness. The cuticle was smooth and 6.25 – 12.50 \( \mu m \) in thickness. Epidermal cells were 1-layered and barrel or rectangular in shaped. Cells were measured 25.00 – 50.00 \( \mu m \) in breadth, 12.50 – 25.00 \( \mu m \) in thickness. Cortex was made up of two types of tissues, collenchymatous tissues towards the peripheral region and thin–walled parenchymatous tissues the vascular bundles. Collenchymatous tissues were consisting of 5 – 7 layers and measured 37.50 – 75.00 \( \mu m \) thick. Cells were measured 6.25 – 37.50 \( \mu m \) in diameter. Parenchymatous tissues consisted of
4 – 7 layers and measured 162.50 – 312.50 μm thick. Cells were rounded or oval in shape and measured 25.00 – 87.50 μm in diameter. Pith consisted of parenchymatous cells and measured 437.50 – 1000.00 μm thick. Cells were rounded and measured 12.50 – 100.00 μm in diameter.

Vascular bundles were arranged in a ring of two rows. Each bundle was oval-shaped in outline. The inner large bundles, measured 187.50 – 275.00 μm in width and 187.50 – 375.00 μm in thickness were alternating with the outer small bundles, measured 75.00 – 200.00 μm in width and 87.50 – 112.50 μm in thickness. Phloem tissues were measured 31.25 – 75.00 μm thick and composed of sieve tube elements and companion cells. Xylem tissues were measured 37.50 – 137.50 μm thick and consisted of scalariform and spirally thickened vessels, tracheids, fibers and xylem parenchyma cells. Vessels were measured 125.0 – 412.5 μm in length and 12.5 – 25.0 μm in breadth. Tracheids were 125.0 – 250.0 μm in length, 6.25 – 12.5 μm in breadth. Fibers were measured 250.00 – 300.00 μm in length and 12.5 – 25.00 μm in breadth.

Sensory Characters of Powdered Leaf

The leaf was light green in colour and aromatic. The taste was slightly bitter and pungent.

Diagnostic Characters of the Powdered Leaf

The fragments of epidermal cells were measured 62.50 – 350.00 μm in length and 12.50 – 237.50 μm in breadth with anisocytic type of stomata. The fragments of palisade cells were measured 75.00 – 187.50 μm in length and 125.00 – 287.50 μm in breadth. The fragments of vessels were found not very abundant and associated with the mesophyll cells. They were measured 87.50 – 187.50 μm in length and 12.50 – 25.00 μm in breadth. Crystals were present as sandy like and measured 12.50 – 25.00 μm in the powdered leaves (Fig. 3).
Traditional medicinal uses of preparation methods

The liquid of boiling betel leaf and decoction of ginger with a little amount of rock salt are given for remedial using in hacking cough, whooping cough and asthma. *1,2,3,4,5,6,7,8,9,10

Salt packed with betel leaf is baked and made into powder. It is taken for coughing. *1,2,3,4,5,6,7,8,9,10

Slightly heated betel leaf smeared with coconut oil is applied on the fontanelle in an infant for coryza and also applied in layers over chest, especially of a child for the treatment of cough, pulmonary affections and bronchitis. *1,2,3,4,5,6,7,8.

The decoction of the betel leaves is used as eye drops in ophthalmic and other painful eye diseases and night blindness. *1,2,3,4,5,6,7

The fresh leaves applied externally around the eyes are also useful in eye diseases. *1,2,3,4,5,6,7,8,9,10

Betel petiole dipped in castor oil is used as a suppository for constipating infants. *1,2,3,4,5,6,7,8,9,10

In fusion of betel leaf juice and honey are given to children for therapeutic uses in fever, flatulence and digestive disorders. *1,5,6

The leaves are chewed to reduce bad breath, to remove foul odour from mouth and to improve the voice. *1,2,3,4,5,6,8,10

Preliminary Phytochemical Investigations

The preliminary investigations were analysed for the determination of chemical constituents from the leaves of *Piper betle* L. Alkaloid, glycoside, flavonoid, reducing sugar, phenolic compound, polyphenol, lipophelic, steroid, saponin, terpene and tannin were present. The results are shown in Table 1.

Physicochemical Characterization

In physicochemical investigation, the percentage of moisture content, total ash, acid insoluble ash, water soluble ash, water soluble matter, ethanol soluble matter, ethyl-acetate soluble matter and methanol soluble matter were analysed. It was found that *Piper betle* L. possesses the
highest percentage in total ash 20.87, water soluble ash 77.00, methanol soluble matter 28.00, ethyl-acetate soluble matter 56.00 and ethanol soluble matter 80.00. The results are shown in Table 2.

Elemental Analysis by Using EDXRF and AAS for Powdered Leaves

Elemental Analysis of Powdered Drugs by Using EDXRF

The experimental work for the analysis of elemental concentrations was carried out at University Research Centre, Yangon. Potassium (K) was found as principle elements and Copper (Cu) and Zinc (Zn) were found as trace elements. Cl, Br and P were non detectable in *Piper betle* L. The experimental data was shown in Table 3 and Fig.4.

Table 1. Preliminary Phytochemical Investigation of the Leaves of *Piper betle* L.

<table>
<thead>
<tr>
<th>No.</th>
<th>Constitution</th>
<th>Extract</th>
<th>Reagents</th>
<th>Observation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloid</td>
<td>D/W</td>
<td>Dragendorff’s reagent</td>
<td>Orange-red</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Glycoside</td>
<td>D/W</td>
<td>10% lead acetate</td>
<td>yellow</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Flavonoid</td>
<td>Ethanol</td>
<td>Dil.HCl + Mg</td>
<td>Pink</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Terpene</td>
<td>Ethanol</td>
<td>Acetic anhydride</td>
<td>Reddish brown</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Steroid</td>
<td>Ethanol / Petroleum ether</td>
<td>Acetic anhydride + H₂SO₄</td>
<td>green</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Saponin</td>
<td>D/W</td>
<td>Distilled water</td>
<td>frothing</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Reducing sugar</td>
<td>D/W</td>
<td>Benedict solution</td>
<td>Brick red ppt</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Phenolic compound</td>
<td>D/W</td>
<td>1%Potassium ferocyanide</td>
<td>Deep blue ppt</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Polyphenol</td>
<td>Ethanol</td>
<td>1% Ferric chloride solution</td>
<td>Blue</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>Lipophelic</td>
<td>D/W</td>
<td>0.5 M KOH</td>
<td>Rott deep colour</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
<td>Tannin</td>
<td>D/W</td>
<td>Ferric chloride</td>
<td>Blue black ppt</td>
<td>+</td>
</tr>
</tbody>
</table>
Table 2. Physicochemical Characterization of the Leaves of *Piper betle* L.

<table>
<thead>
<tr>
<th>No.</th>
<th>Physicochemical character</th>
<th>Quantity determined percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moisture content</td>
<td>17.06</td>
</tr>
<tr>
<td>2</td>
<td>Total ash</td>
<td>20.87</td>
</tr>
<tr>
<td>3</td>
<td>Acid insoluble ash</td>
<td>27.00</td>
</tr>
<tr>
<td>4</td>
<td>Water soluble ash</td>
<td>77.00</td>
</tr>
<tr>
<td>5</td>
<td>Water soluble matter</td>
<td>24.00</td>
</tr>
<tr>
<td>6</td>
<td>Methanol soluble matter</td>
<td>28.00</td>
</tr>
<tr>
<td>7</td>
<td>Ethyl-acetate soluble matter</td>
<td>56.00</td>
</tr>
<tr>
<td>8</td>
<td>Ethanol soluble matter</td>
<td>80.00</td>
</tr>
</tbody>
</table>

Table 3. The Relative Concentration of Elements in the Leaves of *Piper betle* by Using EDXRF

<table>
<thead>
<tr>
<th>Elements</th>
<th>Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>1.715</td>
</tr>
<tr>
<td>Ca</td>
<td>0.249</td>
</tr>
<tr>
<td>S</td>
<td>0.171</td>
</tr>
<tr>
<td>Fe</td>
<td>0.023</td>
</tr>
<tr>
<td>Mn</td>
<td>0.008</td>
</tr>
<tr>
<td>Cu</td>
<td>0.003</td>
</tr>
<tr>
<td>Zn</td>
<td>0.003</td>
</tr>
<tr>
<td>Ni</td>
<td>0.003</td>
</tr>
<tr>
<td>Sr</td>
<td>0.002</td>
</tr>
<tr>
<td>Rb</td>
<td>0.002</td>
</tr>
<tr>
<td>Cl</td>
<td>ND</td>
</tr>
<tr>
<td>Br</td>
<td>ND</td>
</tr>
<tr>
<td>P</td>
<td>ND</td>
</tr>
</tbody>
</table>

ND = Non detectable
Elemental Analysis of Powered Drugs by Using AAS

The elements contained in the leaves of *Piper betle* L. were measured in the unit of mg/l (ppm) in Atomic Absorption Spectrophotometer (AAS). It showed Ca concentration which contained $5.360 \pm 0.010$ ppm, Mg contained $8.412 \pm 0.007$ ppm. The elemental analysis of the samples was shown in Table 4.

**Determination of Antimicrobial Activities by Using Different Solvent Extracts**

In this experiment, different solvent extracts except from water the leaves of *Piper betle* L. showed the effective activity against all microbes. The water extract from the leaves of *Piper betle* L. only showed on *Bacillus subtilis*. These results were mentioned in Table 5 and Fig. 5.

Table 4. Elemental Analysis of by Using AAS

<table>
<thead>
<tr>
<th>Samples</th>
<th>Elemental conc: (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ca</td>
</tr>
<tr>
<td><em>Piper betle</em></td>
<td>$5.360 \pm 0.010$</td>
</tr>
</tbody>
</table>

Table 5. Antimicrobial Activities of Different Solvent Extracts from the Leaves

<table>
<thead>
<tr>
<th>Samples</th>
<th>Solvents</th>
<th>Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solvents</td>
<td><em>B.subtilis</em> &amp; <em>S. aureus</em></td>
</tr>
<tr>
<td><em>Piper betle</em></td>
<td>14mm</td>
<td>13mm</td>
</tr>
<tr>
<td></td>
<td>15mm</td>
<td>15mm</td>
</tr>
<tr>
<td></td>
<td>15mm</td>
<td>17mm</td>
</tr>
<tr>
<td>Ethylacetate</td>
<td>18mm</td>
<td>16mm</td>
</tr>
<tr>
<td>Ethanol</td>
<td>15mm</td>
<td>15mm</td>
</tr>
<tr>
<td>Water</td>
<td>12mm</td>
<td>–</td>
</tr>
</tbody>
</table>
Discussion and Conclusion

*Piper betle* L. (Kun) is an aromatic, climbing herb, belonging to family Piperaceae. Myanmar traditional practitioners described that betel leaves are not only used as expectorant, but also taken the boiled betel leaves with tumeric and a little amount of salt for fever. The juice of fresh leaf is used as eye drops for ophthalmic and fever in Myanmar folk medicine. Practitioners of Asian medicine have used *P. betle* L. for asthma and rheumatic arthritis for a long time.

In histological studies, the leaves of *Piper betle* L. presented in this study are dorsiventral type and reticulate venations. The studies of the epidermal cells of leaves are wavy in surface view and multi-layered sub epidermal cells are found. The mucilage cannal was observed in the petiole and midrib. Stomata nearly always confined to the lower surface of leaves. The vascular bundles are found in the petiole as closed circle of separate bundles and scattered like those of the monocotyledons. These characters are in agreement with those mentioned by Metcalfe and Chalk (1972).

The results of phytochemical investigations showed that the leaves of *Piper betle* L. contain phenolic compound. Phenol is no longer used as an antiseptic and seldom as disinfectant because it irritates the skin and has disagreeable odour. It is used as a standard for measuring the effectiveness of other disinfectants. Phenolic is derivatives of phenol. They altered to reduce its irritating qualities or increase its antibacterial activity. As a group, phenolics exert anti-microbial activity by injuring plasma membranes, inactivating enzymes and denaturing proteins. They are frequently used as disinfectants because they remain active in the presence of organic compounds. They are stable and they persist for long periods of time after application. For these reasons phenolics are suitable agents for disinfecting pus, saliva and feces.

According to elemental analysis of powdered drugs by using EDXRF method, K and Ca are found as principle elements in the powdered leaves. They also contain S, Fe, Mn, Cu, Zn, Rb, Ni and Sr. By the results of AAS, they showed no toxic metal Pb, Hg, Cd and As. Devaraj (2001) mentioned that the leaves of *Piper betle* L. contain betel-phenol, chavibetol and chavicol and cadinene. 100g of betel leaves consist of vitamin A 9339 I.U., vitamin B₁ 68 mcg, vitamin B₂ 31 mcg, vitamin C 3.5 mg, carbohydrate 4.8 g, fat 0.7 mg, protein 3.8 g and phosphorus 10 g. These may be believed useful for medicinal function.
The antimicrobial activity of various solvent extracts of the leaves of *Piper betle* L. showed the activity against the organisms, *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus pumalis*, *Candida albicans* and *Escherichia coli*.

*Bacillus* species are cylindrical or rod-like bacteria normally live in isolation. They show either pairs or short chains. They can cause soft tissue infection and skin disease. *Staphylococcus aureus* and *Pseudomonas aeruginosa* can cause inflammation burns and wounds infections. *Escherichia coli* can cause urinary tract infection, diarrhea and dysentery.

*Piper betle* L. maintained a broad spectrum antibacterial activity against all the test pathogens, such as *Ralstonia*, *Xanthomonas*, and *Erwinia*. It was also revealed that solvent extract of *Piper betle* L. had more superior action than streptomycin. The study also revealed that the active compound in *Piper betle* L. is hydroxychavicol. Its mode of action is similar to phenols, which are also anti-microbial agents (http://www. Antibacterial property of *Piper betel* L.). Because of these properties and their less expensiveness, *Piper betle* L. is one of the valuable herbs used as effected traditional medicine.

The Government of the Union of Myanmar has raised the standard of Myanmar Traditional Medicine. As a rule, the aim of the government strategy is to upgrade the benefit of research to be useful and applicable purposes. On this attitude various medicinal research programs were carried out to improve and to standardize the preparations as well as to fulfill the country’s needs and local needs.

This presentation will hopefully play a partially important role in improving the primary health care for the people, where there is no easy access to drugstores and hospitals. The plant which mentioned in this research is not only useful for common people but also for the researchers and the traditional practitioners.
Adaxial surface of lamina

Abaxial surface of lamina

Transverse section of lamina

Surface view of midrib

Transverse section of midrib

Surface view of petiole

Transverse section of petiole

pl = palisade parenchyma cell  
sp = spongy parenchyma cell  
ad epi = adaxial epidermal cell  
ab epi = abaxial epidermal cell  

epi = epidermal cell  
cr = cortex  
bv = vascular bundle  
tri = trichome  
mc = mucilagenous canal  
sub epi = subepidermal cell  

st = stomata

Fig. 2  Histological Characters of Leaf
Fig. 3  Powdered Leaf of *Piper betle* L.
Fig. 4  Elemental Analysis of the Leaf of *Piper betle* L.
Fig. 5  Antimicrobial Treatment of Different Solvent Extracts of 

Piper betle L.

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List of the Traditional Medicinal Practitioners for Information

U Nay Thu Yaine Kyaw, Traditional Medicine Practitioner Thein-ni Road, No. 12 Quarter, Lashio.

U Sai Aung Kyi (Ta sa 02891), Traditional Medicine Practitioner 2/534, Sao San Htun Road, Nam Ton Quarter, Kyaukme.

U Sai Nyunt Maung (Ta sa 02890), Traditional Medicine Practitioner Shwe-Myin-Pyan Clinic, Haw Kone Quarter, Kyaukme.

U Sein Win (Ta sa 00465), Traditional Medicine Practitioner Traditional Medicinal Clinic, No. 1 Quarter, Namtu.

U Saw Htwe Moe Aung (Ta sa 2986), Traditional Medicine Practitioner Yaung-Chi Traditional Medicinal Clinic, Yan-kin Road, No. 7 Quarter, Lashio.

U Thein Hlaing (Ta sa 03054), Traditional Medicine Practitioner Aye-yeik-chan-thar Traditional Medicinal Clinic Bu-tar Road, No. 9 Quarter, Lashio.

Daw Tin Tin Ywe (Ta sa 05194), Traditional Medicine Practitioner Aye-yeik-chan-thar Traditional Medicinal Clinic Bu-tar Road, No. 9 Quarter, Lashio.

U Saw Dar Le Oo, Traditional Medicine Practitioner Tain-phyu-thit-sar Traditional Medicinal Clinic, No. 8 Quarter, Lashio.

U Myo Nyunt Oo (Ta sa 02490), Traditional Medicine Practitioner Pan-Haike No. 1 Quarter, Namtu.

U Sai Pon Khum, Traditional Medicine Producer Sin-lin-aung Traditional Medicine Pharmacy No. 5 Quarter, Tangyan.

References


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