

## Extraction Of Essential Oil From Betel Leaves

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**Abstract** - Betel leaf (*Piper betel* L.) Is a plant with a lot of essential oil (EO) that belong to the Piperaceae family and is utilised in traditional herbal treatment. Essential oil extraction from fresh and cured betel is of great interest to both industrial users and researchers. As a result, the goal of this study was to maximise The EO extraction and yield of various extraction techniques. The extraction of dried Piper betel leaves was prepared using Soxhlet apparatus and the solvent used for extraction was de-ionized water and ethanol (70%). Gas chromatography mass spectrometry (GC/MS) was used to identify the bioactive components in the leaves extract. The extract included alkaloids, phenolic compounds, alcoholic compounds, organic acids as well as other solvent soluble components, according to Phytochemical analysis. Water extraction yielded 1.57g, which was somewhat higher rather than ethanol extraction yield (70%)(1.23g). Let's we can discuss more about the extraction of oils furthermore in our discussion.

**Key Words:** 1) Betel Leaves 2) Biochemical 3) Cultivation 4) Propagation 5) Extraction 6) Distillation

### 1. INTRODUCTION

Betel leaves which are famously known as "paan" in India has many properties like anti-inflammatory, antimicrobial, ...etc. They also contain essential oils which leads to different researchers to be focused on this topic. The betel vine (*Piper betel* L.) is a dioecious, evergreen creeper in the Piperaceae family that is an indigenous medicine plant with glabrous, deep green, heart-shaped leaves that are commercially valuable. The leaves are nutritious and contain anticarcinogens, indicating that anticancer medications may be developed in the future. The main biochemical component of betel leaves is the essential oil, the taste of the leaves is enhanced by this. Essential oil was said to contribute to the therapeutic properties of betel vine. Betel vine was also said to have immunosuppressive and antibacterial properties. The important ingredient in betel pepper volatile oil is phenols (Chavicol, Chavibetol, Eugenol,...) at the side of another phenoplast compound as well as betaCaryophyllin, beta-Cadinen, 4-allyl-1,2diacetoxibenzen (27.51%). "These phenol derivatives presented in betel leaf essential oil have multi biological effects such as antibacterial, antifungal, and antioxidant effects, etc." [1]. With value of 100, 200 and 200 µg/mL, betel leaf essential oil inhibits three microorganisms: Gram(+) *Bacillus subtilis*, *Aspergillus niger*, and *Fusarium oxysporum* moulds. Volatile oil contain compounds such as eugenol, limonene, terpinolene, citronellal, and camphor, which show rejection action in mosquitoes and other biting insects and can be used as a mosquito repellent alternative to manufactured insecticides. This observe additionally seems on the antibacterial and antioxidant houses of piper betel Leaves crucial oil.

#### 1.1 PHYTO - CONSTITUENTS OF BETEL LEAF

"The leaves are full of vitamins like vitamin C, thiamine, niacin, riboflavin and carotene and are a great source of calcium. Since betel is an aromatic creeper, you can easily grow it as an ornamental plant in your homes and derive the maximum health benefits from the same" [2]. The leaf contains Water (85-90%), Proteins (3- 3.5%), Carbohydrates (0.5-6.1%), Minerals (2.3- 3.3%), Fat (0.41%), Fibre (2.3%), Essential oil (0.08-0.2%), Tannin (0.1-1.3%), Alkaloid (arakene). It also contains different vitamins like VitaminC (0.005-0.01%), Nicotinic acid (0.63- 0.89mg/100gms), Vitamin-A (1.9-2.9mg/100gms), Thiamine (10-70µg/100gms), Riboflavin

(1.9-30µg/100gms) beside this it contains minerals such as Calcium (0.2-0.5%), Iron (0.005-0.007), Iodine (3.4µg/100gms), Phosphorus (0.05-0.6%), Potassium (1.1- 4.6%). "Leaves contain bitter compounds that are about (0.7-2.6%). The specific strong pungent aromatic flavour in leaves is due to phenol and terpene like bodies" [4]. "The total phenol contain is vary on the gender. The male plant contains three fold higher total phenols content and twofold higher thiocyanate content as compare to female plant. The quality of the leaf depends upon the phenolic content, i.e., more the phenolic content betters the leaf quality. Recently many researches works shows the betel leaves contains starch, diastases, sugars and an essential oil composing of safrole, allyl pyrocatechol monoacetate, eugenol, terpinen-4-ol, eugenyl acetate, etc." [9] "as the major components Phytochemical investigation on leaves revealed the presence of Alkaloids, Carbohydrate, Amino acids, Tannins and Steroidal components. The middle part of the main vine contains largest quantity

of Tannin” [3]. “The terpenoids include 1, 8- cineole, cadinene, camphene, caryophyllene, limonene, pinene, Chavicol, ally pyrocatechol, carvacrol, safrole, eugenol and chavibetol are the major phenols found in betel leaf” [4].

## 1.2 INFORMATION ABOUT ESSENTIAL OIL

Essential oils are compounds extracted from plants. As they are extracted from plants, so their extraction from betel leaves makes a good interest for researchers to find the optimum way of extraction and yield. The oils capture the aroma and flavor of the plant, or it's “essence”. Each essential oil has it's own distinct scent due to it's unique aromatic components. Therapeutic salves are procured through refining (through steam as well as water ) or mechanical techniques, similar to infection pressing. At the point when the fragrant engineered material have been removed, they are gotten together with a carrier oil to make a thing that is ready for use. The way the oils are made is important, as the quality of essential oils depends on the particular process by which it is gets extracted.

## 2. Material used for preparation of Essential Oil

Raw Materials used for project	Equipment's used for project
Fresh betel Leaves	Fume hood
Distilled Water	Blender
Deionized Water	Refrigerator
Ethanol (70%)	Soxhlet Extractor

## 3. Procedure for experiment

### Soxhlet Extraction Process / Soxhlation / Continuous hot percolation process:-

Basically soxhlet is the apparatus used for extraction of components which not be Displaced from the cells of the feed (i.e. betel leaf in our case). Soxhlet extractor apparatus consists of different parts like round bottom flask, soxhlet Extractor, syphon tube, condenser, ..etc., every component has its own task. Basically, Round bottom flask contains solvent which is nothing but distilled water in aqueous Extraction technique. In soxhlet extractor, we put the material from which we are going to Extract the product i.e. oil. It has a side tube for flow of vapours of solvent to the condenser. A syphon tube which syphons over the Extract from soxhlet extractor to the Flask. This is what every part of the soxhlet extractor contraption does.

### 3.1 Aqueous extraction

Using Soxhlet apparatus as well as 150 ml Deionized water, ten grams of dry powder were extracted. For this Soxhlet Extraction method, a ratio of 1:15 of dry powder and solvents was chosen. The extraction strategy was completed for 24 hours at a temp. of 150°C. The extract was dried in an oven at 40°C for three days until the solvent had evaporated, leaving just the dry extract . Weighting and recording the dry extract.



Fig. 1: soxhlet extraction assembly

### 3.2 Ethanol (70%) Extraction

Ethanol extraction is also very similar to aqueous extraction, only the solvent is changes in both the processes. There is refined water there, while here is 70 % by weight ethanol. 10 grams of dry powder was extracted with the aid of using the use of Soxhlet system with a hundred and fifty ml of Ethanol (70%). The solvents used were of analytical grade. Proportion 1:15 of the dried powder as well as solvents were select for this Soxhlet extraction process. The extraction process was run For 24 hour and set at 80°C for ethanol extraction. Extricate were dried in stove for three days in 40°C until the dissolvable is vanished and just left dried separate. The dried extract was Weighed and recorded.

### 4. Calculation of Yield of Essential oil (EO)

$$\text{EO Yield} = \frac{\text{Volume of extracted Essential Oil(ml)}}{\text{Amount of betel leaves originally used (gm)}}$$

#### 4.1 Gas Chromatography (GC-MS) analysis of Essential oils:

The chemical composition of essential oil extracted from both fresh and cured leaves At different operating conditions was analysed by GC-MS that used to separate the Compounds “from volatile oil by gas chromatograph component and then identifies those Compounds at a molecular level by the mass spectrometer (MS) component” [5]. For the Characterization of volatile compounds, both FLEO and CLEO were subjected to GC-MS (Thermal Scientific GC (TRACE™ 1300) and MS (DSQ II) that equipped with a flame Ionization detector. Twenty micro liters of FLEO and CLEO were dissolved in 480 µL of Methanol and 1 µL of this solution was injected into GC-MS system to identify the Chemical compounds presented in Eos. “The injection temperature and ion source Temperature of GC are set at 250 °C” [6]. “The column temperature is held isothermal at 70 °C For 2 min, and then programmed to 250 °C for 10 minutes” [7]. Helium was taken as carrier gas. An electron ionization mode with 70 eV ionization vitality was utilized for The GC-MS recognizable proof.

The sector mass analyser was set to scan from 40 to 500 amu for 2 s (Basak And Guha, 2015). Each individual quantified component of both EO was identified by Relative peak percent area, retention time and mass fragmentation pattern using NIST mass Spectral library.

## 5. RESULT AND DISCUSSION:

### Soxhlet Method Extraction

Method of extraction	Yield
Aqueous	1.57
Ethanol (70%)	1.23

Above table and Figure 8 (below figure) show the yield of aqueous extract and Ethanol (70%) extract. 10 grams of dried piper betel leaves can produce of 1.57 grams of extract in aqueous extraction and 1.23 grams of extract in ethanol(70%) extraction [8] . The yield of aqueous extraction better than ethanol (70%) extraction because of polarity water is more noteworthy than ethanol and the polar substances are simpler to be extract than nonpolar compounds. The hydroxyl group in water and ethanol can establish hydrogen bonds with bioactive substances. "Aqueous extraction is more effective than ethanol extraction in antimicrobial compound because water has higher polarity and shorter chain than ethanol (Pin et al., 2010)"[8]. This may be determined by the capacity of water to remove polar compounds such as aromatic carboxylic acids. The Carboxylic Acids are a kind of organic function group that is very Polar.

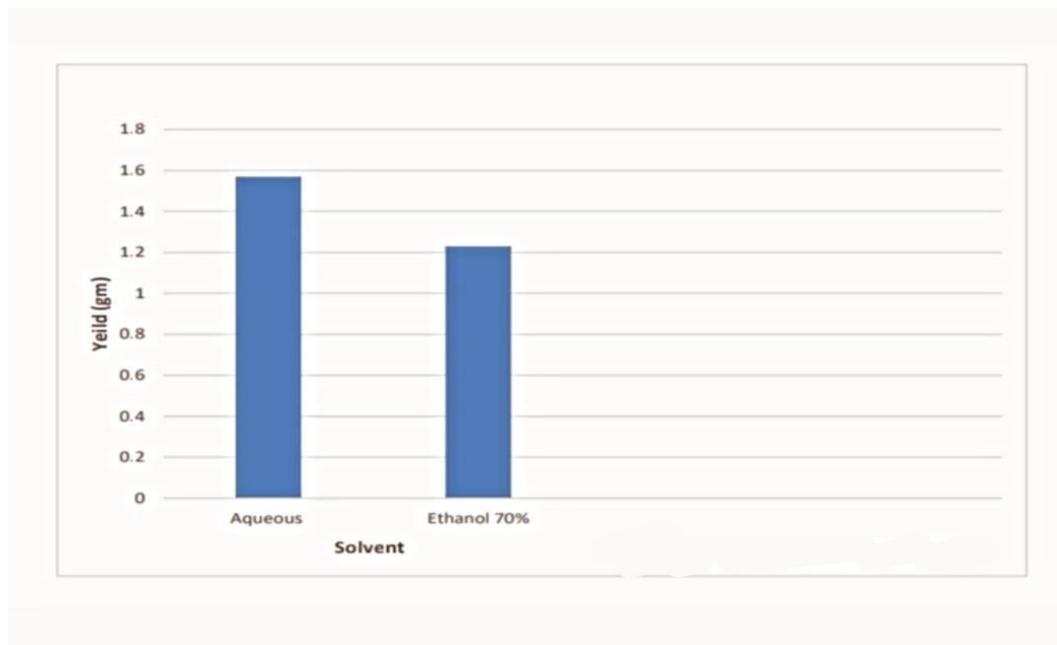


Chart 1: Yield Of Extraction

From the above graph, it is clear that, the yield of extraction is better in aqueous solvent extraction than the 70% ethanol solvent extraction. This is because of polarity difference between water and ethanol as mentioned in above page too. This extracted essential oil has many uses both in the side of biological prospective as well as much advantages in health prospective too. Let's discuss the uses of essential oils so that we will continuously seeking for new technological opportunities in this field.

## 6. CONCLUSIONS

In conclusion, dried Piper betel leaves contain various bioactive compound as well as the essential oils. "Based on this preliminary study, the aqueous extraction and ethanol (70%) extraction of dried Piper betel leaves can consider as a promising tool for antibacterial" [8], antioxidant etc. properties of essential oils. Aqueous extraction is less cost and green process if compare to using ethanol as solvent because water is non-toxic and eco-friendly than the ethanol extraction. Further investigations in detail are needed on this topic to optimize the antimicrobial efficiency and toxicology of extract to formulate the new commercial product in market.

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