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## Research Paper

# Formulation and Development of Betel Leaf Chocolate for Mouth Freshener

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## ABSTRACT

Betel leaf (piper betel) is a well-known medicinal plant found in Asia. It belongs to the family piperaceae. It has many commercial applications in medical field, industrial field, and pharmaceutical field. Betel leaf is an excellent source of antioxidants, phytochemicals and as cooling and refreshing properties. There are 90 varieties of betel leaf found all over the world, of which 45 varieties are found in India. It is cost-effective, safe, and easily available in any season. Traditional medicine has long acknowledged about therapeutic benefits of piper betel, or betel leaf, because of its strong antibacterial, antioxidant, antiinflammatory, and antifungal qualities. In order to provide a tasty and efficient way to administration medicinal effects, this study intends to create and evaluate a novel oral formulation betel leaf. To increase patient compliance; the formulation was made with a betel leaf extract. The prepared chocolate was evaluated for physicochemical properties such as texture, stickiness, grittiness, viscosity, pH, weight variation. As results, the chocolate provides a stable and palatable oral delivery system for betel leaf phytochemicals, making it a viable substitute for herbal medicine, especially when it comes to treating inflammatory and oral infections. Further studies are warranted to investigate clinical applications and optimize dosage forms.

## INTRODUCTION

Chocolate: chocolate is solid, greasy, not transparent that can be used for internally.

Chocolate is made from beans derived from the coca tree. this bean are very bitter, so the coca solid and coca butter has sugar added to it (1). Oral

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medicament chocolate are solid dosage form administered in mouth for as a freshener. The scientific name of betel vine is Piper Betel belongs to the family piperaceae; plant leaves are used for the preparation of traditional medicine to treat various diseases (2). Betel leaf is commonly known as betel vine. It is widely used for chewing practices in most countries, like India, for avoiding bad breath, strengthening the gums and stimulating the digestive fire (3). In India, betel leaves, which are heart-shaped and dark green, are also referred to as pan. There are 100 different species of betel leaf discovered worldwide, 40 of which are only found in India, and the remaining 30 are found in Bangladesh and west Bengal. In research carried out in (2017), betel leaf contains phytoconstituents which show antioxidant, anti-inflammatory, anti-platelet, antithrombotic, antibacterial and antifungal properties (4). Betel leaf is a perennial creeper and produced leaves with glossy nature along with white catkin inflorescence. In catkin of betel leaf, the male plant has dense and cylindrical spikes, where the female plant has pendulous spikes. The plant is attached to the host tree or support by root, which arises from each node. The cultivation is widely distributed in subtropical and tropical areas of the world (5).

#### **OBJECTIVE:**

The main objective of this project is to develop a betel leaf-based chocolate formulation that serves as a mouth freshener. The project will explore the use of betel leaf extract in chocolate, combining the benefits of both for a refreshing and pleasant taste. The chocolate will be designed to provide a cooling effect, freshen the breath, and offer the unique medicinal properties of betel leaves.

#### **SCOPE:**

**1. Incorporation of betel leaf extract:** betel leaves have been traditionally used for oral

health, and their antimicrobial, anti-inflammatory, and refreshing properties will be explored in this project.

- 2. Chocolate as a delivery vehicle:** chocolate is a palatable and easy-to-consume medium, which can be infused with various ingredients, making it ideal for this mouth freshener product.
- 3. Evaluation of physicochemical properties:** the chocolate will be evaluated for characteristics such as texture, appearance, flavor, taste, melting point, and stability.

#### **TYPES OF CHOCOLATE**

- 1. Dark Chocolate:** - Pure, unsweetened chocolate contain primarily cocoa solid and cocoa butter in varying proportional.
- 2. Sweet Chocolate:** - Much of the chocolate consumed today is in the form of sweet chocolate, combining chocolate with sugar.
- 3. Milk Chocolate:** - Milk chocolate is sweet chocolate that additionally contain milk powder or condensed milk.
- 4. White Chocolate:** - White chocolate contain cocoa butter, sugar and milk but no cocoa solid (6).

#### **Ideal Characteristic of Chocolate:**

1. Ideal chocolate possesses a smooth, glossy.
2. It need to be stable while kept in storage condition.
3. After being administered in the mouth, it should to dissolve or disintegrate in a matter of seconds.
4. Administration, there must be no residue left in the mouth.
5. It should be compatible and have a pleasant feel in the mouth.



6. It should be tastes and texture are very good
7. It should be stable in altered environmental conditions such as changes in humidity and temperature.
8. Production and packaging costs should be economical.
9. Excipients used should be inert, safe and compatible with other constituents.

#### Advantage of Chocolate:

1. May help with weight management.
2. Reduced risk of heart disease.
3. Increased blood flow to the brain.
4. It used in lowered blood pressure.
5. Its improved cholesterol levels.
6. Manufacturing time is less compared to other.
7. Chocolate have good stability.

#### Disadvantages of Chocolate:

1. It should be high in calories and sugar.
2. Potentially leading to weight gain.
3. It have to create dental problems.
4. Quickly melts.

## MATERIAL & METHOD

### MATERIAL

#### 1. Betel Leaf (Piper Betel)



**Synonym:** piper betel, pan, betel leaf, betel vine and piper leaf, betel pepper, true pepper, pepper vine, Piper.

**Biological Source:** The biological source of betel leaf is the plant piper betel. family: piperaceae.

#### Taxonomy:

- **Kingdom:** plantae
- **Botanical Name:** piper siriboa L.
- **Division:** magnoliophyte
- **Class:** magnolipsida
- **Order:** piperales
- **Family:** piperaceae
- **Genus:** piper
- **Species:** betel (7)

#### Morphology of Piper Betel:

- **Color:** deep green color
- **Shape:** heart shaped
- **Length:** 15-18 cm long width: 10cm
- **Odour:** aromatic
- **Margin:** entire margin
- **Apex:** acute
- **Base:** symmetric base (8)

#### Phytochemical Screening:

The alkaloids, flavonoids, tannins, saponins, and steroids, terpenoids are examined during the phytochemical screening of samples to ascertain the type of chemical compounds present in betel leaf extract.

**A. chemical Test:** chemical test was performed by the ethyl alcohol drug extract of piper betel using standard norms to identify following constituents

1. **Procedure for Alkaloids:** 2ml of extract was taken & added 2ml of Wagner's reagent gave brownish precipitate reveals the presence of alkaloids.

2. **Cardiac Glycosides:** 2ml of extract was dissolved with 2ml of chloroform and concentrated sulphuric acid was cautiously added to form a layer. Deep reddish-brown color was found at the inter face of steroid ring shows the presence of cardiac glycosides.
3. **Flavonoids:** 2ml of drug extract was treated with 2 ml of 10% lead acetate. Yellowish green color gives the presence of flavonoids.
4. **Saponins:** 2ml of drug extract was dissolved with 2ml of Benedict's reagent. Blue black precipitate reveals the presence of saponins.
5. **Tannins:** 2ml of drug extract was treated with 0.1% of ferric chloride. Brownish green shows the presence of tannin chemical entity.
6. **Terpenoides:** (salkowski test) 2ml of drug extract was measured & dissolved with 2ml of chloroform and concentrated sulphuric acid is cautiously added to form a layer. A reddish-brown color shows the presence of terpenoides.
7. **Anthraquinones:** 1ml of extract was boiled with 10% hcl for few minutes in a water bath. It filtered and allowed to cool. Equal volume of chcl<sub>3</sub> added to the filtrate few drops of 10% ammonia was added to the mixture and heat formation of rose-pink color shows the presence of anthraquinones.

**Table No. 1: Chemical Test of Herbal Betel Leaf**

Sr. No	Chemical Test	Observation	Result
1.	Tannins	Brownish Green Color	Positive
2.	Anthraquinones	Rose Pink Color	Positive
3.	Flavonoids	Yellowish Green Color	Positive
4.	Alkaloids	Brownish Precipitate	Positive
5.	Terpenoids	Reddish Brown Color	Positive
6.	Saponins	Blue Black Precipitate	Positive
7.	Cardiac Glycosides	Reddish Brown Color	Positive

**B. Solubility Profile:** 10 ml amount of distilled water, ethanol, chloroform, propylene glycol was measured and subjected to determination solubility profile of betel leaf extract, and followings are the observation (9).

**Table No. 2: Solubility Profile of Betel Leaf Extract**

Sr. No	Solvent	Solubility
1.	Distilled Water	Soluble
2.	Ethanol	Soluble
3.	Chloroform	Soluble
4.	Propylene Glycol	Soluble

### Chemical Constituents:

Constituent of the leaves is the volatile oil, betel oil, contains two phenols, betel phenol (chavibetol) and chavicol. Leaves reported to yield an alkaloid: arakene, with properties similar to

cocaine. Volatile oil, 0.8 – 1.8% - chavicol, betel phenol, eugenol, allyl pyrocatechin.

### Pharmacological Uses:



Betel leaf contains phytoconstituents which show antioxidant, anti-inflammatory, anti-platelet, antithrombotic, antibacterial and antifungal properties (10).

**Anti-Cancer Activity:** - Laboratory and clinical studies have confirmed that chronic inflammation initiated many human diseases, including cancer and tumor. The betel leaf was used as a common household remedy for inflammation in oral cavity (11).

**Anti-Allergic Activity:** Piper betel on production of allergic mediators by bone marrow-derived cells and lung epithelial cells. The results suggested that piper betel may offer a new therapeutic approach for the control of allergic diseases through inhibition of production of allergic mediators (12).

**Anti-Inflammatory Effects:** The betel leaf is used as a common household remedy for inflammation in the oral cavity, has shown that the ethanolic extract of betel leaf has been reported to possess anti-inflammatory activities at non-toxic concentrations in the complete Freund's adjuvant-induced model of arthritis in rats. Eugenol, one of the principal constituents of betel leaf has also been shown to possess anti-inflammatory effects in various animal models of studies with various inflammogens (13)

**Antimicrobial Activity:** The betel shows the antimicrobial activity against streptococcus pyogenes, staphylococcus aureus, proteus vulgaris, escherichia coli, pseudomonas aeruginosa etc. beside this the leaf extract also possess the bactericidal activity against the urinary tract pathogenic bacteria such as enterococcus faecalis, c. koseri, c. freundii, klebsiella pneumonia (14) (15) (16).

**Digestive & Gastroprotective:** The gastroprotective effect of piper betel was not mediated via inhibition of acid secretion in the gastric mucosa but by increasing its mucus content. The extensive research has been proven that anti-oxidants might be effective mechanism not only in protecting against gastric mucosal injury, but also inhibiting progression of gastric ulceration (14).

**Antianxiety Activity:** Anxiety is defined as an uncomfortable emotional state with no apparent cause or feeling out of control. It causes a number of symptoms that are not medically explained, reduces functioning, because's insomnia, and decreases efficiency (17). The antianxiety activity of p. betel leaves was evaluated in swiss albino mice using a hydro alcoholic extract. In the light/dark exploration test, there was a progressive improvement that was dose-dependent, and in the antianxiety model, there was a rise in plus when compared to the control group that was given diazepam as usual (18).

**Anti-Hypertensive Activity:** One of the risk factors for heart disease and stroke is high cholesterol. Research has indicated that betel leaf reduces low-density lipoprotein, triglycerides, and total cholesterol. (ldl) cholesterol as well as elevated vldl cholesterol (very low-density lipoprotein). Additionally, it aids in increasing hdl cholesterol levels. Eugenol, a naturally occurring antioxidant that combats free radicals, is the cause of betel leaf's lipid lowering action. Eugenol decreases intestinal fat absorption and prevents the liver from producing cholesterol. This raises the pace at which "bad" ldl cholesterol is catabolized even more. High plasma concentrations of triglycerides and cholesterol are transported to the liver where they are subsequently eliminated as bile acids. Thus, betel leaves use a variety of methods to assist lower elevated lipid levels (19)





**Menthol:**

It is use as a base, flavouring, antioxidant, texture properties help in cholesterol and blood vessels.



Menthol is a naturally occurring chemical compound, primarily found in mint plants like peppermint, known for its cooling, minty taste and smell. It's used in various products, including cough drops, gum, and even added to tobacco products to create a cooling sensation

**Coca Butter:** is a natural emolient, moisture and rich fatty acid content ability to hydrate, soothe used in chocolate



**Coca Powder (White Choclate Base):**

**Sweetener (Stevia):**



It is natural sweetener, antioxidant, antiinflammatory, blood sugar regulating, antimicrobial properties.

**Soy Lecithin:**



It is used as emulsifier, stabilizer, antioxidant and nutritional supplements used in chocolate.

**Milk Powder:**



Used as taste texture, viscosity and flavour

**Formulation Table:**

Sr. No	Ingredients	Functions	Quality %
1	White Cocoa Butter	Base & Texture	60g
2	Milk Powder	Creamy Texture & Taste	20g
3	Sugar/Stevia	Sweetener	20g
4	Betel Leaf Extract/Powder	Mouth Freshener & Antimicrobial	1ml/1gm
5	Lecithin	Emulsifier (Improves Mixing)	10g
6	Vanilla Extract	Flavour Enhancers	1ml
7	Menthol	Cooling & Freshening Agent	0.5/1g

**METHODOLOGY:**

**1. Material Procurement**



The betel leaves are obtain from Nandurbar, Maharashtra. Other ingredients like menthol,

cocoa powder, cocoa butter, sweeteners, soy lecithin, and milk powder issued from the central store of our collage (ntvs's institute of pharmacy).

## 2. Preparation of Betel Leaf Extraction/Powder:

1. **Drying Method:** air-dry or oven-dry betel leaves at 40-50°C to retain phytoconstituents.
2. **Powdering:** grind the dried leaves into a fine powder and sieve (mesh no. 60)



3. **Extraction:** if using extract, prepare an ethanolic or aqueous extract and concentrate it using rotary evaporation.
4. **Maceration:** -the maceration method is used to get extract 2/1ml powdered dry Betel leaf after 30ml ethanol to the sample in macerator, it was occasionally agitated to ensure pure proper mixing. The maceration process was left to stand for 24hr before being collected and filtered

## 3. Chocolate Preparation:

1. **Melt White Chocolate and Coca Butter:** melt white chocolate and coca butter until smooth.

2. **Add liquid betel leaf extract:** -stir in require quantity of liquid betel leaf extract.

3. **Mix dry ingredient:** -combine milk powder and sugar, gradually add to the melted mixture stirring well.
4. **Add Lecithin (Emulsifier):** -add lecithin to ensure smooth texture and uniform consistency.
5. **Pour into Molds:** -pour the mixture into chocolate molds and top gently to remove air bubbles.



6. **Cool and Sets:** -let the chocolate set at room temperature or refrigerator for 20-30 min. at 10-15°C.
7. **Demould And Store:** -once set remove chocolate from molds and store in an airtight container.



**Evaluation Parameters:**

**General Appearances**

Color	Light Greenish White
Odour	Complexity
Taste	Sweet
Smell	Earthy, Nutty
Grittiness or Stickiness	Slightly Hard, Rough
Texture	Smooth, Creamy

PH	4.5-5
Weight	71.650

## CONCLUSION:

The formulation and evaluation of oral betel leaf chocolate demonstrate its promising potential as a functional and therapeutic product known for its therapeutic qualities, betel leaf extract is added to the chocolate to improve its effectiveness and give it a distinct flavor. To sum up, oral betel leaf chocolate improves patient compliance in addition to acting as oral delivery route for the bioactive ingredients of betel leaf Potential applications in preventive healthcare, further clinical assessments, and long-term stability may be the main topics of future research.

## REFERENCES

1. More M M, Rohit S J, Gawale D S, Chaudhari S A, Chavhan R P and Khairnar V T, A Review on Formulation and Evaluation Herbal Oral Medicated Jellies of Glycyrrhiza And Ajwain, *International Journal Of pharmacognosy Life Science*, 5(1),2023,01- 08.
2. Rathod P I, Deshpande V V, Shaikh S, Pathare S B, Nawghare S M, And Dhamankar S S, Review on Formulation and Development of Oral Medicated Jellies. *International Journal of Pharmaceutical Research and Applications*, *International Journal Of Pharmaceutical Research And Applications*, 7(4), 2022, 174-179.
3. Pandit A and Joshi A, A Short Overview on Significance of Betel Leaf (Piper Betle) and Its Applications *International Journal of Health Sciences and Research*, 12(11), 2022, 251-254.
4. Singh T, Singh P, Pandey V K, Singh R C and Hussain A, A Literature Review on Bioactive Properties Of Betel Leaf (Piper Betel L.) And its Applications In Food Industry. *Journal of Food Chemistry Advances* 3, 2023,100536.
5. Rai M P, Et Al. Piper Betel Linn (Betel Vine), The Mailgned Southeast Asian Medicinal Plant Possesses Cance Preventive Effects: Time to Reconsider the Wronged Opinion. *Asian Pacific Journal of Cancer Prevention* 12.9 (2006):2149-2156.
6. Shivani Sharma Was Prepared by Pgd-Hrm Course Roll-On. Hrm-09-015by First Semester of Presentation of Chocolate Industry .15-16.
7. Kaur R K,Trivedi R V And Umekar M J, Review On Betel Leaf Used In Various Ailments. *International Journal of Pharmacognosy* 6(8), 2019, 259-267.
8. Evans W C. Trease and Evans Pharmacognosy. 15th Ed. Edinburgh London [Ny]: Saunders Publication, 2002.
9. Abhishek Nager, Rajesh Kumar Neema And Achla Vyas, Formulation and Evaluation Of Herbal Antibacterial Gel Of Betel Leaf Extract, *World Journal Of Pharmaceutical Research* ,2020,966-967.
10. Godh R, Bisht P and Patil S M, Formulation and Evaluation of Vitamin-C Oral Jelly Preformulation Studies. *International Journal of Novel Research and Development* 8(6), 2023, 2456-4184.
11. Kaur R K,Trivedi R V And Umekar M J, Review On Betel Leaf Used In Various Ailments. *International Journal of Pharmacognosy* 6(8), 2019, 259-267.
12. Muruganandam L, Anantha K, Reddy J and Nirmala G S, Optimization Studies on Extraction of Phytocomponents From Betel Leaves. *Resource-Efficient Technologies*, Elsevier. 3(4), 2017, 385-393.
13. Patra B, Das M T and Dey S K, A Review on Piper Betle L. *Jornal Of Medicinal Plants Studies*4(6), 2016,185-192.

14. Bhalerao S A, Verma D R, Gavankar R V, Teli N C, Rane Y Y, Didwana V S and Trikannad A, Phytochemistry, Pharmacological Profile and Therapeutic Uses Of Piper Betle Linn. – An Overview. *Research and Reviews: Journal of Pharmacognosy and Phytochemistry*. 1(2), 2013, 10-19.
15. Chakraborty D and Shah B, Antimicrobial, Antioxidative And Antihemolytic Activity Of Piper Betle Leaf Extract, *International Journal Of Pharmacy And Pharmaceutical sciences* 3(3), 2011,192-199.
16. Scherrer R and Gerhardt P, Molecular Sieving By The Bacillus Megaterium Cell Wall And Protoplast. *J Bacteriol* 10(7), 1971, 718– 735.
17. Goni O, Khan M and Rahman M, Pharmacological Insights on the Antidepressant, Anxiolytic and Aphrodisiac Potentials of *Aglaonema Hookerianum* Schott. *J Ethnopharmacol*. 268, 2021,113664.
18. Biswas P, Anand, U, Saha, S C, Kant N, Mishra T, Masih, H, Pandey B, Jha D K, Majumder N, Das M, Gadekar N, Shekhawat V S, Kumar M S, Proćków M R, Lastra J and Dey A, Betelvine (Piper Betle L.): A Comprehensive Insight Into Its Ethnopharmacology, Phytochemistry, And Pharmacological, Biomedical And Therapeutic Attributes. *Journal Of Cellular And Molecular Medicine* 26(11), 2022, 3083– 3119.
19. Jadeja J, Khanpara P, Chauhan J and Faldu S, A Review an Nutritious Leaf: Piper Betel. *World Journal of Pharmaceutical and Medical Research* 9(12), 2023, 48-59.
20. Prachi Pote, Aakanksha Bhoi, Hemangi Shinde, Priyanka Marathe, Kishor Rathi, Dr. Ravindra Patil, Formulation, Characterization, And Evaluation Of Betel Leaf Jelly for Oral Administration, *International Journal Of Pharmaceutical Sciences*,2025,2139.

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