

Research Article

Innovative Oral Breath Strips with *Piper betle* L. Extract for Refreshing Mouth Feel

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Abstract: Halitosis also known as bad breath is a common problem suffered from the people around a world and it appears mainly often resulting from poor oral hygiene, dietary habits, and underlying health conditions. This research explores the creation of innovative oral breath strips with contain *Piper betle* L. extract that have antimicrobial and oral health benefits. The goal is to have oral breath strips that are not only pleasant but will also help do good for oral hygiene. The *Piper betle* L. extract was extracted by the solvent extraction with undenatured ethanol so that its bioactive compounds could be preserved and concentrated. Oral breath strips with *Piper betle* L. extract was prepared by using solvent casting method to ensure the extract is well distributed throughout polymer matrix. Screening for phytochemical involves looking for alkaloids, saponins, flavonoids, steroid and terpenoid to verify the presence of important bioactive components. This invention aims to solve the need for an easy to use , natural remedy for bad breath that also promotes dental health. Breath strips that function as a dual-action product, giving off a sudden freshness boost and perhaps reducing bad breath by using *Piper betle*'s antibacterial qualities. In response to the need for a convenient, effective, and natural solution to bad breath, these oral breath strips provide an immediate refreshing effect. The antimicrobial properties of *Piper betle* L. is to reduce oral bacteria and improve dental hygiene. Moreover, the use *Piper betle* L. is also growing faster according to trend grow plant-based culture. Commercially, these oral breath strips hold significant potential due to their ease of use, portability, and the request of natural ingredients. Oral breath strips represent an attractive addition to the oral care market, which is increasingly driven by consumer demand for innovative and health conscious products.

Keywords: oral breath strips; *Piper betle* L.; mouth refreshing; oral malodour.



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1. INTRODUCTION

Oral breath strips became popular formulation for on the go fresh breath. The various synonym used for FDF's (Fast dissolving films) include mouth dissolving film (MDF's), Oral disintegrating Film (ODF's), melt in mouth Films, Oro dispersible, Oral strips (OS), quick dissolving and disintegration films (Patil & Shrivastava, 2014). Breath odour is public as it occurs within a social and cultural context and personal as it affects one's body image and self-confidence. The sense of smell is personal, deeply

felt, and establishes a connection between a person and the outside world. Oral health is an important aspect of overall well-being, yet it is not getting enough attention. As cases of oral and dental issues like gingivitis, and halitosis, there has been higher demand for innovations in dental hygiene. Traditional methods like toothbrushing, mouthwash, and breath mints have been the support for managing oral hygiene, but consumers are increasingly seeking new and effective alternatives. The research seeks to fill a gap in the current literature and explores the development of paper breath strips as innovative, convenient, and portable options for oral care. In this research, herbal oral breath strips containing an ethanolic extract of *Piper betle* L. (betel leaf) was prepared to improve oral hygiene and combat bad breath caused by sulfur-producing bacteria in the mouth. According to Nalina and Z.H.A Rahim (2007), in south asia region, *Piper betle* L. is among of the plants traditionally used for controlling carries, periodontal disease and bad breath. That studies also reported that extract of *Piper betle* L. (betel leaf) exhibit antibacterial activity towards some types of bacterial gram positive (Nalina & Z.H.A Rahim, 2007).

Piper betle L. commonly known as betel leaf, is a medicinal plant found in tropical countries, revered for its therapeutic properties. A study by Kumar et al. (2020) found that a sample of betel leaves collected in Tamil Nadu, India is known to contain steroids, tannins, proteins, amino acids, flavonoids, terpenoids, mucilage, essential oil, saponin, carbohydrates, and vegetable oil, but no alkaloids. One of the studies in the International Journal of Pharma Sciences and Research showed developed antimicrobial properties using ethanol extract of *Piper betle* L. for various pathogenic bacterial strain. The main active principle allyl pyrocatechol (APC) from *Piper betle* L. leaves which are used traditionally in the prevention of oral malodor by Indian and Chinese communities, exhibited significant activity against obligate oral anaerobes responsible for halitosis was detected during bioassay-guided fractionation (Ramji et al., 2002).

Recently, fast dissolving films are gaining interest as an alternative of fast dissolving tablets. Although betel leaf has long been used in dental care, there hasn't been much innovation in the field, and customers are always looking for new ways to freshen their breath. Breath strips were an exciting innovation since they provided a stylish and useful alternative for conventional techniques. Paper breath strips are small, thin, and dissolvable strips that are used to freshen breath. When placed on the tongue, they dissolve quickly, releasing the formula and providing an instant burst of freshness. However integrating natural extracts, like those that exist in *Piper betle* L. to these forms of products might be a creative way to freshen the mouthfeel while also improving oral health.

2. METHOD & MATERIAL

2.1 Preparation of Herbal Extract

Fresh *Piper betle* L. leaves were collected from Ipoh, Perak for research purposes. The leaves were then identified and authenticated at University Putra Malaysia (UPM). The leaves were rinsed with clean water to remove impurities and dried under sunlight.

2.2 Extraction Process

Ethanol extract was prepared by macerating 500 mg of powdered *Piper betle* L. with 1000 ml of undenatured ethanol in a Schott's bottle. The samples in ethanol were soaked for a week at room temperature. The extract was filtered using Whatman No. 1 filtered paper, and was evaporate using a

rotary evaporator at a temperature of 38 °C at 85 rpm. The obtained crude ethanol extract was stored in a sterilized container and kept in the refrigerator for future use.

2.3 Phytochemical Screening of *Piper betle* L. crude extract

Quantitative determination of phytoconstituents were done:

2.3.1 Test for Alkaloids:

A few drops of concentrated hydrochloric acid were added to 1 ml of the extract, followed by Dragendroff's reagent. The appearance of a reddish-brown color indicates the presence of alkaloids.

2.3.2 Test for Flavonoids:

A few drops of concentrated sulphuric acid were added to 1 ml of the extract. The occurrence of a stable yellowish orange indicates the presence of flavonoids.

2.3.3 Test for Steroids:

Equal volume of Chloroform was added to 1 ml of the extract followed by 2 ml of concentrated sulphuric acid and acetic anhydride. The formation of a green precipitate indicated the presence of steroids.

2.3.4 Test for Saponins:

1 ml of the extract and 5 ml of distilled water were shaken vigorously in a test tube. Lather formation indicates the presence of saponins.

2.3.5 Test for Terpenoids:

To 5 ml of the extract, 2 ml of chloroform were added followed by 3 ml of concentrated sulphuric acid to form a layer. The Formation of a reddish brown precipitate at the interface indicated the presence of terpenoids.

2.3.6 Test for Phenols:

To 1 ml of the extract, 2 ml of 10% Lead Acetate were added. The formation of a white precipitate indicates the presence of phenols.

2.4 Formulation of Paper Breath Strips

This method was carried out for active extracts as per the standard procedure (Dinge & Nagarsenker, 2008).

2.4.1 Solvent Casting technique:

In the preparation of paper breath strips, the solvent casting technique is use.

2.4.2 Formulation:

Ingredient	Quantity
Undenatured Ethanolic <i>Piper betle</i> L. Extract	0.4%
Polymer matrix (HPMC)	3%w/v
Plasticizer	1%w/v
Flavouring agent	1-2 drops
Sweetener	1-2 drops
Solvent (Ethanol or water)	To 100 mls

2.4.3 Methodology:

1. Cold maceration was done with ethanol for the extraction of *Piper betle L.* extract and then concentrated using a rotary evaporator.
2. The polymer matrix material was then dissolved in a denatured ethanol to form a viscous solution.
3. The *Piper betle L.* extract was added to the polymer solution and mixed thoroughly until uniform.
4. This was followed, if desired by dissolving the flavouring agent and sweetener in the mixture while stirring.
5. Plasticizer was incorporated into the compound to increase flexibility and processing properties.
6. The mixture was poured onto a flat surface or mould, spreading it evenly to the desired thickness using a spatula or roller.
7. The solvent will then be left to dry at room temp or gradually until the mixture solidifies as a film
8. This film was then solidified and the cut into thin strips of desired length with help of a hacking tool.
9. These paper breath strips were stored in airtight packaging to protect their freshness and efficacy.

This formulation, based on specific requirements and preferences, ensures the safety, efficacy, and consistency of the paper breath strips.

3. FINDINGS, RESULTS AND DISCUSSION

3.1 Phytochemical Screening of *Piper betleL.* Crude Extract

The initial screenings of phytochemicals maybe helpful in identifying the bioactive principles and may lead to development of new drug. From Table 1 analysis, ethanol Piper betle extract contain phenol, flavonoids, saponin and steroids. Phenols and flavonoids were found in this extract might be responsible for antimicrobial activities in *Piper betle L.* According to Witkowska et al. (2013), Phenolic compounds were the most common secondary metabolites implicated with microbial growth inhibitory action in herbs. Previously studies also had showed the effectiveness of antibacterial activities of phenolics compound against gram-positive and gram-negative bacteria (Cetin-Karaca, 2011).

Table 1. Qualitative analysis of phytoconstituents in ethanolic extract of *Piper betle L.*

CHEMICAL CONSTITUENTS	ETHANOL EXTRACT	OBSERVATION
Alkaloids	-	-
Phenols	+	Blue green to black coloration
Flavonoids	+	Yellow coloration
Saponins	+	Stable persistent froth
Terpenoids	-	-
Steroid	+	Blackish-green coloration

3.2 Formulation

The process for formulating *Piper betle* L. extract as oral breath strips involves several steps, including the preparation of the extract and the formulation of the oral strips. Undenatured ethanol was used in this preparation of oral breath strips, where it safely to use internally as oral breath strips. Solvent casting approach, was working in the preparation of oral breath strips. Subsequently, the extract would be incorporated into a suitable polymer matrix along with other ingredients to form the oral breath strips. Hydroxypropylmethyl cellulose (HPMC) is used in this research. HPMC is a polymer with excellent film forming ability, was used as a primary film former in films (Dinge & Nagarsenker, 2008).



Figure 1. This is a figure final product of oral breath strips before cut into desired size and shape of strips.

3.3 Future Improvements

Comprehensive clinical trials need to conduct to further validate the efficacy and safety of breath strips. These trials should involve diverse demographic groups and longer use periods to assess long-term benefits and potential side effects.

4. INNOVATION HIGHLIGHT/ NOVELTY

Even though betel leaf is a traditional ingredient for oral care, the category has seen limited innovation and consumers are looking for new ways to alleviate unsavoury breath. Oral breath strips were a major improvement, providing another fashionable and more practical option to the traditional methods. However, the potential for incorporating natural extracts like those from *Piper betle* L. into such products could represent a novel approach to refreshing mouth feel and improving oral health. As betel leaves has numerous antibacterial and anti-inflammatory properties, products that have been derived from its extract can be used as an additional adjunct in order to protect the teeth effectively even among children.

Oral breath strips with ethanol *Piper betle* L. extract also are a novel and unique product for several reason:

i. Convenience and Portability:

Oral breath strips are thin, easy to use and carry. Its provide a quick and convenient way to freshen breath without the need of water.

ii. Fast acting and Efficient:

Fast dissolving - The strips dissolve quickly in the mouth, delivering the active compounds directly to oral cavity. This ensures fast action against bad breath and instant freshness.

iii. Cultural relevance

Traditional medicine – *Piper betle* L. has a long history of use in traditional medicine. Incorporating this into modern products respect cultural heritage and introduces traditional medicinal plants to a wider public.

iv. Eco-consciousness

The biodegradable properties of the strips are in line with the eco- consciousness trend. Customer seeking for eco-friendly and sustainable items will find this appealing.

5. COMMERCIAL VALUES

The unique combination of breath freshening properties and potential health benefit of the oral breath strips made from *Piper betle* L. extract present a significant marketing opportunity.

i. Partnership and collaborations

Collaboration with dental care brands, it can boost credibility and market penetration. Gaining endorsement from dentist and healthcare professionals can significantly enhance product trust and acceptance.

ii. Multiple Sales Channel

The product can be sold through various channel, including pharmacies, health stores, and online platforms, enhancing accessibility and reach.

iii. Growing consumer demand for Natural products.

Increasing awareness and preference for natural and organic products can drive demand for these breath strips, appealing to consumers looking for safe and chemical- free alternative.

6. CONCLUSION

The growing preference from consumers for simple and efficient oral care products may be achieved by the creation of novel oral breath strips containing *Piper betle* L. extract. Such products could provide a refreshing mouthfeel and improve oral health by utilizing the therapeutic characteristics of betel leaf. The addition of traditional herbal extracts with modern alternatives could indicate a new development in oral hygiene as the oral care profession grows. In conclusion, research on the extract of *Piper betle* leaf reveal that its use in breath strips as well as other oral hygiene products has a bright future. The potential to develop a product exist when the ease of use of breath strips is combined with the proven benefits of betel leaf extract.

Acknowledgments: The authors would like to thank KPJ University (KPJU), Nilai Negeri Sembilan for the financial support under research project grant.

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