

FORMULATION AND EVALUATION OF HERBAL FACE WASH OF PIPER BETEL

Mr. Prashant More^{1*}, Dr. Abhijeet Kulkurni², Ms. Rutuja Pawar³, Ms. Rajashri Kamble⁴, Mr. Abhijeet Apshingekar⁵, Mr. Namdev Jaybhaye⁶

¹*Assistant professor, HOD Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

²Principal, Department of Pharmacology, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

³Student, Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

⁴Student, Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

⁵Student, Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

⁶Student, Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra.

***Corresponding author:** - Mr. Prashant More

*Assistant professor, Department of Pharmacognosy, Ashokrao Mane Institute of Pharmaceutical Sciences & Research, Save, Kolhapur, Maharashtra, E-mail: Prashantmore.tkcp@gmail.com Tel: +91 8390913127

Abstract:

Facial Skin is elegant and the ordinary soaps make it to lose texture and make it dry. Face wash is a mild cleanser acts without producing any harshness to skin. The purpose of face wash is to proclaim the cleansing, antiwrinkle, anti- acne, moisturizing and enhance the fairness of skin and thus skin look young and energetic. Acne is a chronic inflammatory disorder of pilocebaceous unit, which involves increased sebum production by sebaceous glands and abnormal desquamation of hair follicle occur in response to increasing androgen level with the onset of puberty. Acne is found as a most common skin problem. In this study, numerous natural ingredients such as betel, turmeric, walnut, citric juice, and aloe Vera were used to manufacture herbal anti acne face wash, and the formulations were evaluated for the intended criteria. Physical properties of the polymers used in the formulations were assessed, including colour, odour, Formulations that have beenprepared Physical properties such as colour, odour, pH, Spreadability, skin irritation testing, and stability studies were assessed.

Keywords: Anti-acne activity, Anti-microbial, Anti-Inflammatory, Traditional herbs.

INTRODUCTION

Herbal remedies are primarily used to treat chronic, rather than life-threatening, illnesses and to promote health. They can reduce the effectiveness of the other medication or bring on unanticipated adverse effects. After using a herbal medication, you can have a negative reaction or encounter side effects. Herbal face washes eliminate excess oil without eliminating nutrients from the skin. It need to look attractive and be stable. Face washes are designed to remove impurities, germs, dirt and makeup that can irritate the skin. Here's the tough part: when skin is cleansed too frequently, in contact with water or subject to harsh soaps, your skin's natural moisture is stripped sleaving it vulnerable to dryness and irritation.

Leaf (*Piper betel L.*) is a heart-shaped deep green leaf that grows on a root climbing vine. Traditional medicine has employed plant leaves to treat a variety of illness. It is a medicinal, recreational, and horticultural cash crop. It is used as a traditional herbal medicine in Asian countries. A hundred varieties of betel leaf (local name paan in India) are found across the world of which 40 found in India along with 30 found in West Bengal and Bangladesh (Guha & Jain, 1997). It is widely cultivated in different states (Orissa, Maharashtra, Uttar Pradesh, Tamil Nadu, and Madhya Pradesh) in India along with other countries like Bangladesh, Philippine Islands, Burma, Malay Peninsula, Malaysia, and Sri Lanka Based on its colour, size, taste, and aroma.^[1] This betel leaf is also called with different names according to their mother tongue, such as Saptaseera, Nagurvel, Nagaballi, Sompatra, Tambuli, Tamala-paku, Tambul, Vaksha Patra, Voojungalata, Vettilai.^[13] Antibacterial resistance has become a serious global health issue over the past few decades, endangering humanity.^[2] Hydroxychavicol (HC), an important component of Piper betel extract is an allylbenzene class of natural product that has the characteristic odour of P. betel leaves. HC has been reported to possess anti-mutagenic, anti-carcinogenic activity and several other biological

activities like antimicrobial, antioxidant, anti-inflammatory. [3]

Anti-acne: tending to prevent acne or to alleviate the symptoms of acne.



Fig. 1: Betel leaf (*Piper betel*)

ADVANTAGES:

1. They have no adverse effects and do not cause allergic reactions.
2. They can easily be used for skin.
3. These relatively show maximum activity with a lesser dose and fewer side effects.
4. They have more stability, purity, and efficacy, with their herbal constituents
5. Convenient to produce.

LITERATURE REVIEW:

1. Dr. varsha patil et al, have performed various physicochemical parameters of herbal drugs like pH, colour, odour as well as stability studies. They prepared the herbal face wash by using many herbs.
2. Dhanashree Koli et al, have done the development of formulation by using various herbal drugs. (xanthan gum, walnut, honey, lemon juice).
3. Rutuja Dalvi et al, have performed the various pre-formulation study of herbal extract by using various test. (carbohydrates, tannis, protein, alkaloids, phenolic compound).
4. Avinash Maske et al, have described herbal face wash in briefly. Also they have explained how to perform test of herbal face wash. They perform the stability testing of herbal face wash.
5. Jadhav. S.J et al, have explained about the herbal drugs evaluation techniques. Isolated and standardized the herbal drugs by using TLC and most test of identification. They explain procedure of UV spectroscopy method in very briefly. Also they describes the how to check solubility of herbal drugs by using water, acetone, ethanol, chloroform etc.
6. David Keith Hayes et al, Explain walnut composition and research in human health
7. M Mahfuzul Hoque et al, explains the antibacterial activity of ethanol extract of betel leaf (*Piper betel*) against some food borne pathogens.
8. Ni Made Dwi MaraWidyani Nayaka et al performs and explains antibacterial and antifungal properties, safety profiles, and commercial applications of betel leaf.

OBJECTIVE OF THE STUDY:

- The object of this study is to develop a herbal face wash and evaluate and it's parameter like colour, odour were compared with the changes in accelerated stability testing.
- Understand quality, safety and efficacy of using herbal medicine for treatment.
- To prepare herbal face wash that is helpful to cure acne.

Need of work:

Face washes are intended to remove dirt, bacteria, pollutants, and cosmetics that could irritate the face. The challenging issue is that excessive skin cleansing, exposure to water, or use of harsh soaps depletes skin's natural hydration, leaving it susceptible to dryness and inflammation. Ayurveda widely recommends eating betel leaves for relief from constipation but it's also useful for skin and also it's used for post meal digestive stimulant, natural antiseptic, oral deodorant and nerve tonic.

5. Plan of work:

- 5.1 Literature review
- 5.2 Need of work
- 5.3 Selection of drug's excipients
 - Authentication of drug
- 5.4 Pre-formulation study
 - 5.4.1 Characterization of drug-
 - Colour
 - Odour
 - Solubility study
 - 5.4.2 Identification of drug-
 - UV-Spectral analysis
 - Thin Layer Chromatography (TLC)
 - Water soluble ash value
 - Acid insoluble ash value
 - Total Ash value
- 5.5 Method and materials-
 - Formulation of herbal face wash
- 5.6 Evaluation Study -
 - Colour
 - Odour
 - pH
 - Spreadability
 - washability
 - Irritancy test
 - Antibacterial test
 - Foamability test
 - Stability testing
- 5.7 Result data & discussion
- 5.8 Conclusion

6. Drug Profile:

6.1 Betel leaf:

Synonyms: - Piper betel, Tamboolavalli, Pan.

Family: - Piperaceae.

Morphology: - It is an evergreen, perennial creeper to 90 cm. It has shiny heart-shaped leaves with small white flower spikes. It prefers a rich, well-drained soil with partial shade.

Physical and chemical properties:- Chemistry of betel leaf varies geographically and is mostly chavibetol dominant.^[4]

Chemical constituents:- carophyllene, cadinene, allyl catechol, eugenol methyl ether.

Uses: - The use of betel leaf can be traced as far back as two thousand years. Betel leaves help to heal the following illnesses. Such as

Headache: Betel leaf is a popular home remedy for headache. The betel leaf has analgesic and cooling properties.

Weakness of Nerves: Betel leaves play a vital role in the treatment of nervous pains, nervous exhaustion and debility.

Respiratory Disorders: Betel leaves are useful in pulmonary affection in childhood and old age. **Wounds:** Betel leaves can be used to heal wounds. The juice of a few leaves should be extracted and applied on the wound.

6.2 Aloe Vera:-

Synonym: - *Chinese aloe, Cape aloe*

Family: - Asphodelaceae

Morphology: - An evergreen perennial, it originates from the Arabian Peninsula, but grows wild in tropical, semi-tropical, and arid climates around the world.

Physical and Chemical properties: - The aloe plant, being a cactus plant, is between 99 and 99.5 per cent water, with an average pH of 4.5. The remaining solid material contains over 75 different ingredients including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid.

Uses: - *Aloe Vera* may be prepared as a lotion, gel, soap or cosmetics product for use on skin as a topical medication.

6.3 Turmeric: -

Synonym: - *Curcuma longa*.

Family: - Zingiberaceae.

Morphology: - The term *longa* come from the elongated shape of its rhizome. The rhizome with a characteristic deep orange-yellow colour known as turmeric. [5, 6]

Physical and Chemical properties: - Curcumin exists as a yellow-orange solid, with a molecular weight of 368 g/mol and a melting point of 183 °C. Chemically, it is a polyphenolic compound with two aromatic rings, each with one hydroxy and one methoxy substituent

Uses: - Turmeric was also a very important herb in traditional Chinese and Indian medicinal systems for the treatment of various diseases including cough, skin diseases, diabetic wounds, hepatic disorders, and cardiovascular disease.

6.4 Walnut: - **Synonym:** - *Juglans* **Family:** - Juglandaceae

Morphology: - Walnut trees are large and deciduous growing up to 15-40 m having a thick stem and large canopy (18 m wide) and can be as wide as 2-4 feet. The leaves are pinnate with 4-9 leaflets which are arranged alternatively and 2-inch in length and are yellow in colour. [7]

Physical and Chemical properties: - Total oil content ranged from 60.9 to 73.1%, while the crude protein ranged from 13.5 to 20.2%. Dietary fiber ranged from 1.0 to 4.3% and starch content made up no more than 2.6% of the remaining portion of the kernel. The main fatty acids of walnut kernel oils were oleic, linoleic, linolenic and palmitic acids.

Uses: - Walnuts have the highest percentage of antioxidant properties than other types of nuts Walnuts can combat the risks of cancer. They are rich in Omega-3 fatty acids and other antioxidants which have been proven to fight cancer.

6.5 Honey: -

Source: - Honey is a sugar like secretion deposited in honey comb by the bees *Apis mellifera*, *Apis dorsata* and other species of *Apis*.

Family: - Apidae

Chemical constituents: - Honey is an aqueous solution containing 35% glucose, 45% fructose and 2% sucrose.

Uses: - It is used as sweetening agent, nutrient, antiseptic and expectorant. [8]

6.5 Nutmeg seed: -

Synonyms: - *Myristica fragrans*

Family: - Myristicaceae

Morphology: - Nutmeg are ovular in shape with a length of 2-3 cm and around 2 cm broad. It is brown-

greyish brown in color with a strong aromatic odor and a bitter pungent taste. Prismatic or disc-shaped crystals of potassium tartarate may be observed

Physical and Chemical properties:- Chemical analysis confirmed the seeds' high contents of protein (28.48 ± 0.25%) and fat (51 ± 0.31%).

Uses:- Potential uses of Nutmeg for the Brain: Nutmeg might acts as a stimulant for the brain and helps in reducing stress.

Potential Uses of Nutmeg for the Heart: Nutmeg may be a great tonic for the cardiovascular system.^[9]

7. Excipients profile: -

7.1 Rose water: -

Uses:- One of the greatest benefits of rose water is its strong anti-inflammatory properties, strengthening the heart, cure of menstrual bleeding and digestive disorders and decrease inflammation particularly of the neck. ^[10]

7.2 Xanthan Gum: -

Uses:- The major applications of xanthan gum are in food industry as a suspending and thickening agent for fruit pulp and chocolates. It acts as a thickener therefore, it is widely used in face washes and body washes products. It works to efficiently thicken the foam without jeopardizing it. Xanthan gum is able to provide a foamy texture to the face washes and is responsible for its thick texture. ^[11]

7.3 Lemon juice: -

Uses: - As a rich source of vitamin C and citric acid, lemons are known for their detoxifying effects, especially when you add a few freshly cut wedges to your drinking water. Because of the health benefits of eating lemons, there's a growing popularity for using lemons as a natural treatment for skin conditions, like age spots and acne. However, using lemons on your face can do more harm than good. Here, we weigh the risks and benefits of lemon juice on the skin. ^[12]

8. MATERIAL AND METHODS: -

Following ingredients are used for the formulation of herbal face wash.

SR NO.	INGREDIENTS	USES
1	Betel leaf	Antibacterial
2	Turmeric	Antibacterial, Antioxidant
3	Nutmeg seed	Anti-inflammatory
4	Aloe vera	Soothing agent
5	Honey	Thickening agent
6	Xanthan gum	Gelling agent
7	walnut	Scrubbing agent
8	Rose water	Solvent, Perfume
9	Lemon juice	Anti-acne

Table No 8.1 List of ingredients

9. PREFORMULATION STUDY OF RAW MATERIAL

9.1 Phytochemical screening of constituents:

Test	Procedure	Observation
Carbohydrate	Benedict's test: Little amount of filtrate + Benedict's reagent (5 ml) heated on water bath for few minutes.	Appearance of red orange ppt. indicates presence of carbohydrates.
Proteins	Millons Test: To 2 ml of filtrate few drops of Millon's reagent are added. The result was observed.	A white precipitate indicates presence of protein.
Vitamins	Test for Vitamin C : To 2 ml of a 2% w/v solution add 2 ml of water 0.1 g of sodium bicarbonate and about 20mg of ferrous sulphate, shake and allow to stand a deep violate colour is produced. add 5 ml of 1 ml sulphuric acid,	The colour disappeared indicated test as positive

Alkaloids	Mayers Test: To 1 ml of filtrate, few drop of Mayer's reagent are added by side of the test tube.	The white or creamy precipitate indicated test as positive.
Phenolic compounds	Lead Acetate Solution: To 2-3 ml of aqueousextract add few drops of lead acetate solution.	A white precipitate indicate presence of phenolic compound ^[14]
Tannin	Ferric Chloride Test: Test solution + 5% ferric chloride solution (few drops)	Blue-black/green-black colour indicates presenceof tannins
Flavonoid	Alkaline reagent test: Test solution + NaOH (few drops)	Deep yellow colour indicates presence of flavonoid

Table No. 9.1 Phytochemical screening of constituents



Fig. 9.2 Chemical tests for Phytoconstituents

9.2 Determination of total ash: -

Useful for detecting low grade products Useful for detecting exhausted products, useful for detecting excess of sandy Useful for detecting earthy matter with drug.

Weigh accurately about 2-3 gm. of the powdered drug in a tared silica crucible. Incinerate the powdered drug by gradually increasing the temperature 550°C until free from carbon and cool. Keep it in desiccators. Weigh the ash and calculate the % of the total ash with reference to the air dried sample.

Formula:

$$\% \text{ total ash} = \frac{\text{Ash weight}}{\text{Weight of sample}} \times 100$$

9.3 Water-soluble ash value

To the crucible containing the total ash, add 25 ml of water and boil for 5 minutes. Collect the insoluble matter in a silica crucible or on an ashless filter-paper. Wash with hot water and ignite in a crucible for 15 minutes at a temperature not exceeding 450°C. Subtract the weight of this residue in mg from the weight of total ash. Calculate the content of water- soluble ash in mg per g of air-dried material.

Formula:

$$\% \text{ water soluble ash} = \frac{\text{Total ash weight} - \text{Water insoluble residue in total ash}}{\text{Weight of sample}} \times 100$$

9.4 Determination of acid insoluble ash value: -

Refer to the total ash procedure till ashing. Add 25 ml of dilute hydrochloric acid. Heat on a water bath for 10 minutes. Cool and filter the contents of the dish. Wash the filter paper with water until the washings are free from the acid. After the filter paper is free from the acid. Return the filter paper in a dish. Keep it in an oven at 100 ± 2°C for 25 to 30 minutes. Ignite in a muffle furnace at 550 ± 25°C for one hour. Cool the dish in desiccators and weigh. Repeat this process for two successive weighing. Record the

lowest mass. Calculate the result^[15]

Formula:

$$\% \text{ acid-insoluble ash} = \frac{\text{Acid insoluble ash weight}}{\text{Weight of sample}} \times 100$$

9.5 Solubility test:-

As adding solute for solubility analysis in small incremental amount to fixed the volume of solvents such as ethanol, acetone and chloroform. After undissolved particles will be examined.^[16]

9.6 Thin Layer Chromatography (TLC): -

Prepared the slurry (5gm of silica gel G in 12.5ml of water) then slurry spreaded in TLC plate. Then coated plate was placed at air for 30 min and then in hot air oven at 100°C for 30 min. Mobile phase (ethanol) suitable solvent poured in TLC chamber and closed the chamber and leaved for some time. Then placed TLC plate on the TLC chamber after solvent front gets to the top of plate then removed TLC plate and position of solvent was marked then plate placed in hot air oven at 100°C for 30 min. Then diluted sample solution should applied on TLC plate by using capillary tube and placed TLC plate. When sample spots was obtained then removed TLC plate. Then measured the distance travelled by solvent and the distance travelled by spots. Calculated the Rf value.

Formula: -

$$\text{Rf value: } = \frac{\text{Distance travelled by components}}{\text{Distance travelled by solvent}}$$

9.7 UV Spectroscopy method: -

Calibration curve of betel leaf extract was prepared in distilled water at maximum wavelength of 281 nm. Distilled water was used for the preparation of calibration curve. 1ml of crude extract was dissolved in 100 ml of distilled water that is treated as stock solution. This stock solution was diluted to get different concentrations. Final solution was scanned for λ max in the range of 200 to 400 nm using UV spectrophotometer.

10. FORMULATION OF HERBAL FACE WASH

10.1 Maceration: -

In maceration (for fluid extract), whole or coarsely powdered plant- drug is kept in contact with



Fig. 10.1 Maceration process

the solvent in a stoppered container for a defined period (at least 3 days) with frequent agitation until soluble matter is dissolved. The mixture then is strained; the Marc (the damp solid material) is pressed and the combined liquids are clarified by filtration or decantation after standing. This method is best suitable for use in case of the thermo labile drugs. ^[17]

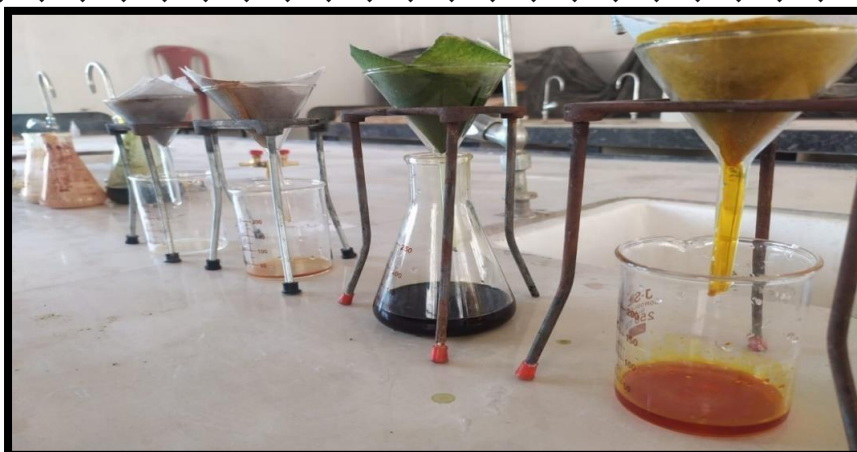


Fig. 10.2 Filtration process

10.2 Development of Formulation

Various formulation batches were prepared according to the Table 2. The desired concentration of gelling agent i.e. xanthium gum was weighed accurately and dispersed in hot rose water (not more than 60°C; 50 % weight of the batch size) with moderate stirring, avoiding air entrapment and allowed to soak overnight. Desired quantity of lemon juice was dissolved in desired amount of honey by gentle stirring. Desired quantity of concentrated herbal extracts were added to the remaining amount of rose water and mixed with above honey mixture by gentle stirring. This was finally mixed with previously soaked gel formulation. Prepared formulations were filled in a suitable container and labelled accordingly.^[18]

SR NO.	INGREDIENTS	Quantity taken for	
		F1	10g gel
1.	Betel leaf extract	1 ml	1 ml
2.	Turmeric extract	0.4 ml	0.25 ml
3.	Nutmeg extract	1 ml	0.25 ml
4.	Aloe Vera	0.5 ml	0.1 ml
5.	Honey	1 ml	0.25 ml
6.	Xanthan gum	0.05 g	0.1 gm.
7.	Walnut granules	q.s	q. s
8.	Rose water	q.s	q. s
9.	Lemon juice	0.2 ml	0.1 ml

11. EVALUATION PARAMETER OF FORMULATION

11.1 Colour examination

- 1) 5ml of prepared face wash was taken on a watch glass.
- 2) Colour was observed by naked eyes.

11.2 Odour examination:

- 1) 2ml of prepared face wash was taken and smelled.
- 2) Then Odour was observed.

11.3 pH examination:

- 1) Washed the glass electrode with distilled water and cleaned.
- 2) Placed the electrode in pH 7 buffer solution and set the value of 7 on the pH meter turning the calibrate knob on the meter.
- 3) Removed the electrode and washed with distilled water and cleaned.
- 4) Then placed electrode in the pH 4 buffer solution. Adjust the value.
- 5) Then electrode was placed in the final face wash and pH was observed.

11.4 Wash ability:

Formulations were applied on the skin & then ease & extent of washing with water were checked manually.

11.5 Spreadability:

Spreadability denotes the extent of area to which the gel readily spread on application to skin or the affected part. The bioavailability efficiency of a gel formulation also depends on its spreading value.

11.6Irritancy test:

Mark an area (1sq.cm) on the left-hand dorsal surface. Definite quantities of prepared face packs were applied to the specified area and time was noted. Irritancy, erythematic, edema, was checked if any for regular intervals of time.

11.7Stability studies:

Stability testing of prepared formulation was conducted by storing at different temperature conditions for the period of 72hrs. The packed glass vials of formulation stored at different temperature and were evaluated for physical parameters like colour, odour, pH, consistency and feel.^[19]

11.8Antibacterial test:

Procedure for nutrient agar 1 Weighed a few amount of nutrient agar medium & agar agar dissolved in 100 ml of distilled water. Allow it cool & 20 ml of agar medium was poured into each petriplates and allowed to solidify. Take a 0.1 ml of bacterial culture poured on the surface of the medium. The bacterial suspension was spread by L. rod. Then all plates were incubated at 37 °C for 24-48 hrs.

11.9 Foamability test:

Small amount of face wash will be taken in a beaker containing water. initial volume will be noted, beaker will be shaken for 10 minutes and the final volume will be noted, foam appears 1.5cm.

12. RESULT AND DISCUSSION

12.1Pre-formulation study: -

Phyto Chemical Screening of constituents -

SR. NO.	PARAMETERS	OBSERVED VALUE
1	Total ash value	7.5%
2	Water soluble ash value	0.47%
3	Acid insoluble ash value	3.5%



Fig 12.1 determination of ash value of betel leaf

12.2Determination of Rf value by Thin Layer Chromatography (TLC): -

Sample	Distance travelledby sample	Distance travelledby solvent	Rf value
Betel leaf extract	3.5	5	0.7

12.3Determination of solubility of betel leaf:

SR NO.	SOLVENTS	SOLUBILITY
1	Water	Slightly soluble
2	Ethanol	Soluble
3	Methanol	Soluble
4	Chloroform	Soluble

12.4UV - Spectroscopy: -

The λ max of betel leaf was found to be 281nm.

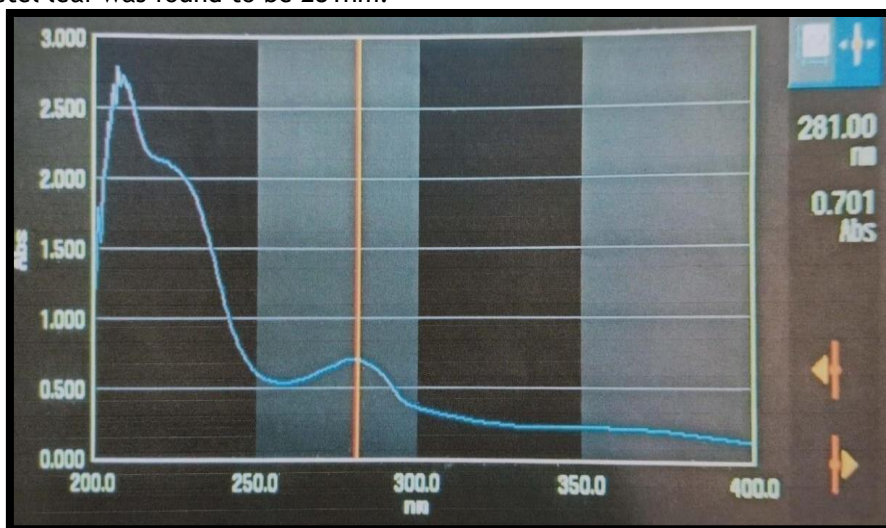


Fig. 12.4.1 λ max of betel leaf

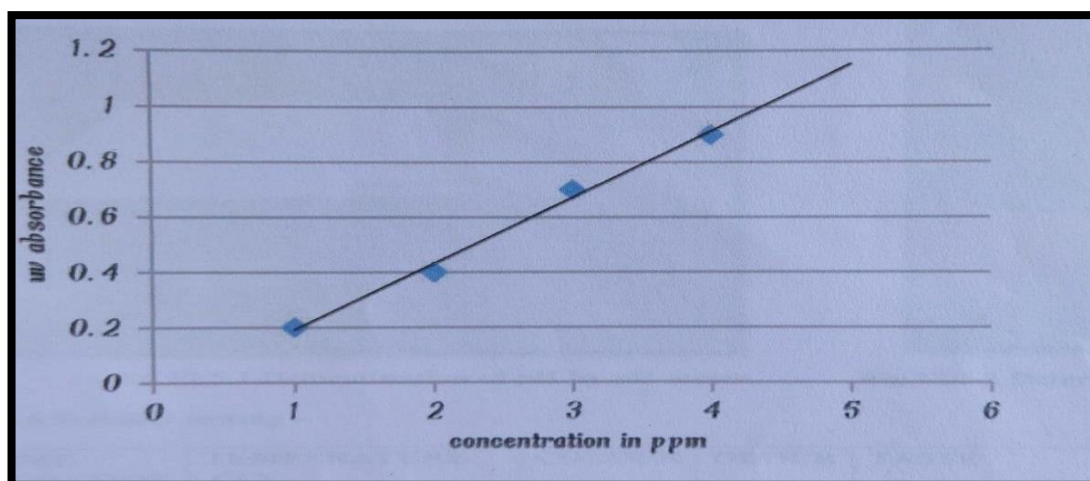


Fig. 12.4.2 Standard calibration curve of betel leaf in distilled water

12.5Physical parameter: -

SR. NO.	Parameter	Observation
1	Colour	Green
2	Odour	Aromatic
3	pH	7
4	Washability	Good
5	Spreadability	Good
6	Consistency	Semi-solid

Table 12.5.1: - physical parameters of formulation

12.6Antibacterial activity of betel leaf:-

Sr. No.	Parameter	Zone of Inhibition	Result
1	Anti-bacterial activity	Zone of inhibition observed diameter of zone 25mm.	Anti-bacterial activity present.

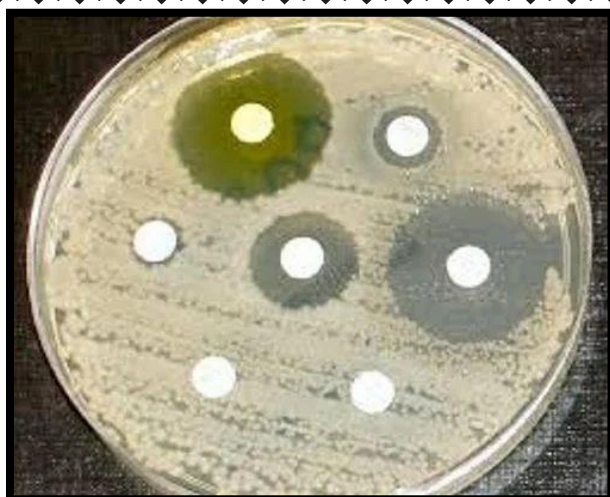


Fig. 12.6.1 Antibacterial activity of betel leaf

12.7 Washability:

The formulation was applied on skin and wash with running water. The good wash ability are observed.

12.8 Foam ability:

A few ml of formulation has been taken in beaker with water. Beaker was shaken a ten times. The good foam ability was observed.

12.9 Stability study of formulation:-

Stability tests A series of tests designed to obtain information on the stability of a pharmaceutical product in order to define its shelf-life and utilization period under specified packaging and storage conditions. After the formulation the stability study was conducted under different temperature (4°C, room temperature and 47°C respectively) at different time intervals (24 hours, 48 hours, 72 hours respectively).

TIME DURATION (HOURS)	TEMPERATURE (°C)	COLOUR	ODOUR
24	4 ⁰	No change	No change
	Room temp.	No change	No change
	47 ⁰	No change	No change
48	4 ⁰	No change	No change
	Room temp.	No change	No change
	47 ⁰	No change	No change
72	4 ⁰	No change	No change
	Room temp.	No change	No change
	47 ⁰	No change	No change

Table 12.7.1 Stability testing study



Fig. 12.7.2 Stability testing study the result was observed after 24 hrs, 48 hrs, 72 hrs respectively.

CONCLUSION:

Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic. Herbal formulations are in high demand on the global market. It's a fantastic endeavor to build

the herbal face cleanser with betel leaf extracts.

In this study, numerous natural ingredients such as betel, turmeric, walnut, citric juice, and aloe Vera were used to manufacture herbal anti acne face wash, and the formulations were evaluated for the intended criteria. Physical properties of the formulations were assessed, including colour, odour, Formulations that have been prepared Physical properties such as colour, odour, pH, Spreadability, skin irritation testing, and stability studies were assessed.

Reference:

- [1]. Madhumita M, Guha P, Nag A. Bio actives of betel leaf (Piper betle L.), A comprehensive review on extraction, isolation, characterization, and biological activity. *Phytotherapy Research*. 2020 Oct; 34(10):2609-27.
- [2]. Nayaka N M, Sasadara MM, Sanjaya DA, Yuda PE, Dewi NL, Cahyaningsih E, Hartati R. Piper betle (L): Recent review of antibacterial and antifungal properties, safety profiles, and commercial applications. *Molecules*. 2021 Apr 16; 26(8):2321.
- [3]. Singh D, Narayanamoorthy S, Gamre S, Majumdar AG, Goswami M, Gami U, Cherian S, Subramanian M. Hydroxychavicol, a key ingredient of Piper betle induces bacterial cell death by DNA damage and inhibition of cell division. *Free Radical Biology and Medicine*. 2018 May 20; 120:62-71.
- [4]. Jincy. v. varghese1, athira p, sandra t.s, sruthi k.b, stella jose, research on formulation and evaluation of polyherbal anti-acne facewash, volume 10, issue 4 april 2022 | issn: 2320- 2882.
- [5]. Khade Swati S, Uchale Tushar P, Gosavi Akshata A, Gunjal Abhishek, Avanti R. Thanage, Formulation and Evaluation for Herbal Face Wash, *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 2, Issue 5, June 2022*.
- [6]. Meng FC, Zhou YQ, Ren D, Wang R, Wang C, Lin LG, Zhang XQ, Ye WC, Zhang QW. Turmeric: A review of its chemical composition, quality control, bioactivity, and pharmaceutical application. *Natural and artificial flavoring agents and food dyes*. 2018 Jan 1:299-350.
- [7]. Hayes D, Angove MJ, Tucci J, Dennis C. Walnuts (*Juglans regia*) chemical composition and research in human health. *Critical reviews in food science and nutrition*. 2016 Jun 10;56(8):1231-41.
- [8]. Dr. Varsha Tiwari, A practical book of herbal drug technology, 2nd edition, Nirali prakashan, page no. 2-5.
- [9]. Ibrahim MA, Cantrell CL, Jeliaskova EA, Astatkie T, Zheljzakov VD. Utilization of nutmeg (*Myristica fragrans* Houtt.) seed hydrodistillation time to produce essential oil fractions with varied compositions and pharmacological effects. *Molecules*. 2020 Jan 28;25(3):565.
- [10]. Safia A, Aamir Z, Iqbal A, Rafi S, Zafar M. Assessment of rose water and evaluation of antioxidant and anti-inflammatory properties of a rose water based cream formulation. *Int. J. Pharm. Clin. Res*. 2019 Jan 25;11:43-8.
- [11]. Palaniraj A, Jayaraman V. Production, recovery and applications of xanthan gum by *Xanthomonas campestris*. *Journal of food engineering*. 2011 Sep 1;106(1):1-2.
- [12]. Klimek-Szczykutowicz M, Szopa A, Ekiert H. Citrus limon (Lemon) phenomenon—a review of the chemistry, pharmacological properties, applications in the modern pharmaceutical, food, and cosmetics industries, and biotechnological studies. *Plants*. 2020 Jan 17;9(1):119.
- [13]. Rutuja V. Dalavi1, Manali V. Gharat, Aniket R. Chikane, Amit A. Dound, Prof. Kajal A. Walunj, A Research Article on Formulation and Evaluation of Antiacne Herbal Face Wash, *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 2, Issue 5, June 2022, 2581-9429*.
- [14]. Jegatheesh U., Bhagwan R.K, Mohan Lal JS, Aravind G., A book of herbal drug technology, 1st edition, Page No. 43.
- [15]. Roy-Guide SP, Sarma S, Rai SP. Novel formulation and evaluation herbal based lotion for the antimicrobial and antifungal properties.
- [16]. Hait, Milan. (2019). *Extraction Techniques of Herbal Drugs*. 10.22271/ed.book.415.
- [17]. Koli DS, Mane AN, Kumbhar VB, Shaha KS. Formulation & evaluation of herbal anti-acne face wash. *World J. Pharm. Pharm. Sci*. 2016 Apr 15;5(6):2001-200.
- [18]. Maske AO, Pandhare M, Ashwin DW. Formulation and evaluation of herbal face pack for glowing skin. *International Journal of Advances in Pharmaceuticsm*. 2019;8(01):5184-9.