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FORMULATION AND EVALUATION OF HERBAL SHAMPOO FROM PIPER BETEL LEAVES.

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ABSTRACT

Shampoo is a hair care product used for the removal of dirt, oil, dandruff and other air pollutant. It is cosmetic preparation. It is antioxidant and antidandruff shampoo is helpful in increasing the blood circulation and treating dandruff problems thus help hair growth as well as in the other treatment of hair diseases. The antioxidant property of plant and different herbs can be utilized in hair fall conditions. The main objective of this study was to eliminate harmful synthetic ingredient and stop the hair fall from shampoo formulation and substitute them with safe natural ingredients. All the ingredients used to formulate shampoo are safe and physiochemical evaluation showed ideal result. The aim of this study is to develop an herbal hair growth promoting shampoo using Piper Betel and Psidium Guajava leaves extract.

The aim of the present study was to formulate and evaluate herbal shampoo containing natural ingredients with an emphasis on safety and efficacy. The results of this study suggested that herbal shampoo formulation of leaves extract is good for the hair growth. The shampoo was prepared by taking extracts of betel leaves, guava leaves, reetha and Curry leaves. The formulation at laboratory scale was done and evaluated for number of parameters to ensure its safety and efficacy.

KEYWORDS : Dandruff, Antioxidants , Synthetic ingredient, Cosmetic preparation.

CHAPTER 1: INTRODUCTION

Hair

Hair is a protein filament that grows from follicles found in the dermis. Hair is one of the defining characteristics of mammals.

Structure of Hair

A hair is composed of columns of dead, keratinized cells welded together. The shaft is a superficial portion of the hair, which projects from the surface of the skin. The shaft of straight hair is rounded in cross section. The root is the portion of the hair deep into the surface that penetrates into the dermis and sometimes into the subcutaneous layer. Each Strand of hair is composed of medulla, cortex and cuticle.

. **Medulla**

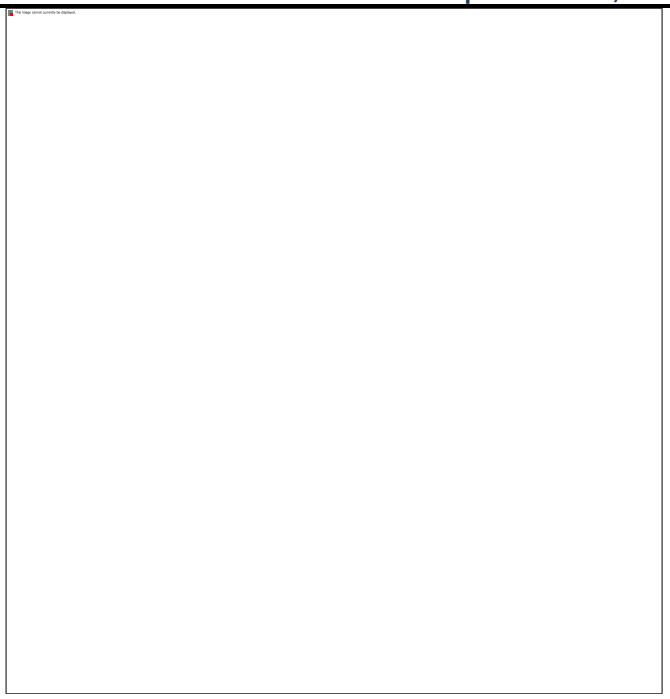
It is central part of shaft. It is composed of two or three layers of polyhedral cells containing pigment granules.

. **Cortex**

It is highly organized located peripheral to the medulla and forms major part of the shaft. It consists of elongated keratinized cells, containing pigment granules.

. **Cuticle**

It is outermost layer of hair and consists of single layer of thin flat cells, which are heavily keratinized.



Hair Problems

. **Dandruff**

Dandruff is a skin condition that mainly affects the scalp. Dandruff is a common condition that causes the skin on the scalp to flake

. **Hair Fall**

Hair fall is the thinning of hair on the scalp. The medical term for hair fall is alopecia. Hair fall is one of the most common complaints among all patients. Hair fall occurs due to physical stress, poor diet, lack of proteins and vitamins

Shampoo

Shampoo is a hair care product, typically in the form of a viscous liquid that is used for cleansing hair. A shampoo is a preparation of a surfactantin a suitable form - liquid, solid or powder - which when used under the specified conditions will remove dirt, and skin debris from the hair shaft. A liquid preparation of soap or detergent to wash the hair is called shampoo. The goal of using shampoo is to remove dirt that is build up on the hair, provide nourishment and give healthy look to the hair. The shampoo sector is probably the largest market for sale amongst the hair care products since shampoos are one of the cosmetic products used in daily life. Various

synthetic compounds, chemicals, dye and their derivative has been proved to cause various skin diseases having numerous side effects. Many synthetic shampoos are present in the current market both medicated and non-medicated; however, herbal shampoo are nowadays mostly popularized due to their natural origin, safety, increasing consumer demand, low cost and negligible side effects.

Herbal Shampoo

Herbal shampoos are shampoos infused with extracts of natural ingredients. Herbal shampoo is a cosmetic preparation which uses herbs from plants and it is meant for washing of hair and scalp just like a regular shampoo. These shampoos are free of harsh chemicals. Herbal formulations are considered as alternative to synthetic shampoo but formulating shampoos using completely natural raw material is challenging task. The selection of active ingredients for hair care is based on the ability of the ingredient to prevent skin damage as well as to improve the quality of skin by cleansing, nourishing and protecting the skin.

Ideal Characteristics of Herbal Shampoo

. Should effectively wash hair.

. Produce good amount of foam.

. Should completely remove the dust, excessive sebum.

. Should be removed by rinsing with water.

. Should leave the hair non dry, soft, lustrous with good manageability.

. Should impart a pleasant fragrance to the hair.

. Should not feel hand rough and chapped.

. Should not cause irritation to the scalp, skin and eye.

Composition of Herbal Shampoo

. Active Agents

. Conditioning Agents

. Anti-Dandruff Agents

. Thickening Agents

. Antioxidants

Advantages of Herbal Shampoo

. Easy to manufacture and cheap in cost.

. Easily available and found in large variety and quantity.

. They did not provoke allergic reactions and do not have negative side effects.

. Easily incorporate on skin and hair.

Disadvantages of Herbal Shampoo

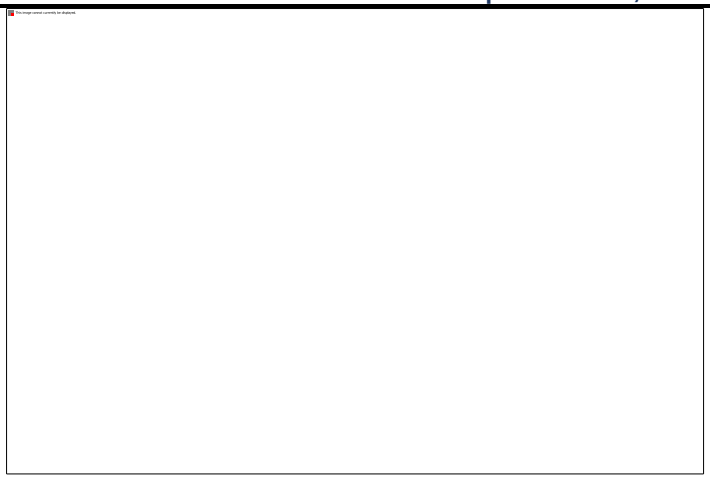
. Difficult to hide odor and taste sometimes.

. Herbal drugs having slower effect than allopathic drug hence require long term therapy.

. Manufacturing process is time consuming and complicated.

Introduction to Herbal Ingredients

Piper Betel Leaves



Scientific Classification

Kingdom - Plantae

Phylum - Tracheophyta

Class - Magnoliopsida

Order - Piperales

Family - Piperaceae

Genus - Piper L

Species - Piper betel L

Biological name - *Piper betel* L

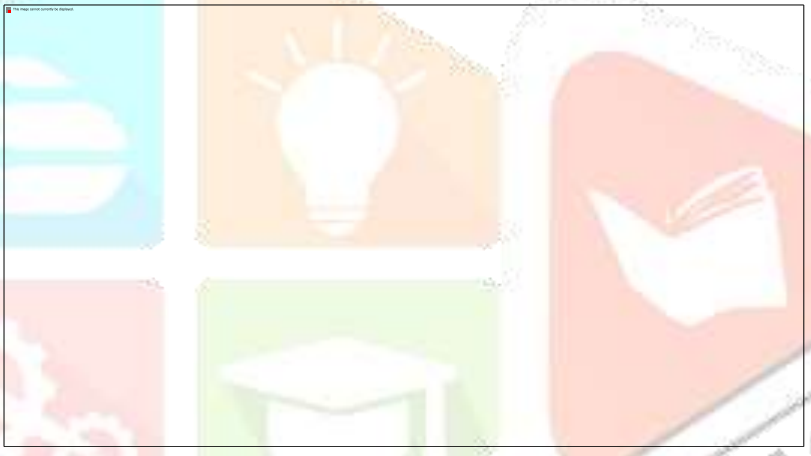
The betel plant is native to Southeast Asia. It is an evergreen, dioecious, perennial, with glossy heart-shaped leaves. Betel plants are cultivated for their leaves which are most commonly used as flavoring in chewing arecanut. The primary use of betel leaf is as a wrapper for the chewing of areca nut (tobacco), it is mainly used to add flavor. It may also be used in cooking, usually raw, for its peppery taste. Heart- shaped Piper betel leaves are magnificent reservoirs of phenolic compounds with
antiproliferative, antimutagenic, antibacterial, and antioxidant properties.

Native to South-east Asia. Widely consumed in South Asian countries, In India betel leaves are commonly known as “paan leaves”. The glossy leaf contains biophenolics such as hydroxychavicol, eugenol, chavibetol, and piperols. Leaves also
contain eugenol, chavicol, hydroxychavicol and caryophyllene.

Medicinal Uses

- Betel leaves are used as a stimulant, an antiseptic, and a breath-freshener,
- Betel leaves are known to treat issues like hair fall. Betel leaves regularly helps in quick hair growth.
- They condition the hair and make your hair thick and long.
- Betel leaves are known to prevent hair loss and promote hair growth.
- betel leaf serves as an antioxidant and anti-inflammatory

Psidium Guajava Leaves



Scientific Classification

Kingdom - Plantae

Phylum - Magnoliophyta

Class - Magnoliopsida

Order - Myrtales

Family - Myrtaceae

Genus - Psidium

Species - Psidium guajava L.

Biological name - *Psidium guajava* L

Psidium guajava, the commonly known as guava, is an evergreen shrub native to tropical and subtropical areas, thus allowing production around the world. The plant is used in many

different shampoo products. The leaves of *P. guajava* contains flavonolmorin, morin-3-O-lyxoside, morin-3-arabinoside, quercetin and quercetin-3-O-arabinoside.

Guava leaves strengthen the hair follicles, which promote thicker, stronger, shinier, and healthier hair growth. Guava leaves contain Vitamin C, which helps boost collagen activity. This helps hair grow out faster and healthier.

Medicinal Uses

- Guava plant used *for the treatment of diarrhoea, diabetes, hypertension, gastroenteritis, dysentery and pain relief.*
- Guava leaves have the ability to stop hair loss.
- *Remedies for dysentery, diarrhea.*
- Guava leaves are used to treat certain respiratory and gastrointestinal disorders.
- It increases platelets inpatients suffering from dengue fever.

Curry Leaves

Scientific Classification

Kingdom - Plantae

Division - Magnoliophyta

Class - Magnoliophyta

Order - Sapindales

Family - Rutaceae

Genus - Murraya

Species - M. koenigii

Biological name - *Murraya koenigii L*

It is a tropical and sub-tropical tree. Its leaves, known as *curry leaves*, are used in many dishes in the Indian subcontinent. The leaves of *Murraya koenigii* are also used as an herb in Ayurvedic and Siddha medicine in which they are believed to possess anti-disease properties.

Curry leaves are rich source of beta-carotene and proteins, which reduce hair loss and increase hair growth. They also contain amino acids and antioxidants which strengthen the hair follicles and moisturize the scalp. It also helps to remove dead hair follicles, having anti-dandruff property. Curry leaves are rich source of Vitamin B, which help to restore hair color by nourishing and strengthening the roots. The leaves are a rich source of carotenoids, beta-carotene, calcium and iron.

Medicinal uses

- Powerful antioxidant.
- Reduce risk of cancer.
- Reduce risk of heart diseases and diabetes.
- Antibacterial, neuroprotective, hepatoprotective
- Effective in diarrhoea and morning sickness

Reetha

Scientific Classification

Kingdom - Plantae

Division - Tracheophytes

Order - Sapindales

Family - Sapindaceae

Genus - Sapindus

Species - S. mukorossi

Biological name- *Sapindus mukorossi*

Sapindus mukorossi, commonly known as Indian soapberry, washnut, or ritha. The soapnut contains the compound of saponin, which has natural cleansing properties, and therefore the soapnut can be used as a cleanser for hair, skin. It is used as foaming agent has been used for hair cleansing property due to high saponin content. It keeps scalp gentle & removes any microorganisms responsible for infection. It is also
helpful for removal of dandruff.

Medicinal uses

- Reetha is widely used in preparations like shampoo. The dried fruit powder is used as a foaming agent in shampoos. It is also used to remove oil from the scalp
and as a hair cleanser.
- Reetha have antifungal activity, antibacterial activity, anti-protozoal activity, anti-inflammatory effect and wound healing action.

CHAPTER 2: LITERATURE SURVEY

Khaloud Al Badi, Shah A. Khan.et.al 2014

The study aimed to formulate a pure herbal shampoo and to evaluate and compare its physicochemical properties with the marketed synthetic and herbal shampoos.

Sachin Dubey ET al.2004

Formulated two preparations of herbal shampoo using some common traditional drugs such as bahera, amla, neem, tulasi, shikakai, henna and brahmi and evaluated for organoleptic powder characteristics, foam test and physical evaluation and considered as safe.

Sutar Manisha et al. 2013

Formulated a polyherbal shampoo using amla fruit, hibiscus leaf, neem leaf, shikakai fruit, aloe leaf, henna leaf, and ritha fruit and evaluated for organoleptic, powder characteristics, dirt dispersion, wetting time, foam test and physical evaluation and considered as safe.

Gholamreza Dehghan et al. 2011

Formulated a herbal conditioner shampoo using fenugreek seeds methanol extract and evaluated for physicochemical properties.

Mohamed Halith ET al.2009

Formulated herbal shampoo using natural ingredients with tulasi and neem. Both are having anti-bacterial action. The study revealed that the anti-bacterial activity of Ocimum sanctum and Azadiracta indica against strains of G+ and G- organisms and fungal organisms.

Swati Deshmukh et al. 2012

Formulated herbal shampoo using aloe Vera, shikakai, ritha, Amla, brahmi and

evaluated and concluded as safe.

Naresh et al. 2013

Formulated aherbal shampoo containing chamomile, rose and orange peel and sodium lauryl sulphate. The shampoo is evaluated for physical parameters and considered as safe.

Palwe Vimal devidas, Dr. L. D. Hingne 2022

Formulated and evaluated herbal anti-hair fall and hair growth promoting shampoo containing betel leaves and guajava leaves extract. Formulation was evaluated for general parameters such as pH, dirt dispersions, and appearance.

Sachin Gholve, Omprakash Bhusnure et al 2015

Formulated a polyherbal Shampoo which is effective in reducing dandruff without irritation, less adverse effect and better conditioning effect. It includes methi, henna, reetha, tulsi, neem, amla, shikakai, ashwagandha, aloe, brahmi had been reported for hair growth and conditioning. It involves evaluation parameters like Organoleptic evaluation, General powder Characters, Physicochemical Evaluation, Cleaning action, foaming, Dirt dispersion.

Tanya Malpani, Manali Jeithliya, Nanadini Pal and Payal Puri 2020

Developed a stable and functionally effective herbal shampoo by excluding synthetic chemicals. Herbal shampoo formulated contains pomegranate, ginger, curry leaves, reetha, and aloevera. Evaluation study on shampoo showed good cleaning action, better foaming capacity, and quick wetting time.

Neelam Joshi, Kalpana Patidar, Rakesh Solanki, Vandana Mahawar 2018

Formulated a herbal anti-hair fall and hair growth promoting shampoo containing betel leaves and guava leaves extract. Formulation was evaluated for general parameters such as pH, dirt dispersions, and appearance.

Vijayalakshmi A, Sangeetha S, Ranjith N 2018

Formulation of shampoo using the extracts of amla, hibiscus, acacia, soapnut, bhringraj, aloe, and shikakai. Evaluated for organoleptic, physicochemical, and performance tests in terms of visual assessment, wetting time test, pH, assurance of solid contents, surface tension, detergency, dirt dispersion, conditioning performance, foam volume, stability

and considered as safe.

Pawan Maurya, Shashikant Maury, Piyush Yadav, Manoj Kumar Yadav, Suraj Maurya, Satyam Jaysawal 2021

Prepared and evaluated an herbal shampoo and determined physiochemical function that emphasizes on safety, efficacy and quality of the product. Herbal shampoo reduces hair loss; promote growth and strength of hair. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair

traditionally.

Waghmode Monika Vasant, Dr. Hingane L. D 2022

The herbal shampoo was formulated using natural ingredient like fenugreek seeds, shikakai, reetha, tulsi, aloe vera, hibiscus, amla, henna, lemon with proven efficacy of hair care preparation is prepared. The formulation at laboratory scale was done and

evaluated for number of parameters to ensure its safety and efficacy.

CHAPTER 3: OBJECTIVES

CHAPTER 3 : OBJECTIVES

- To formulate shampoo containing natural ingredients.
- To formulate herbal shampoo for hair growth that strengthen the hair follicles.
- To stimulate and promote healthy hair growth.
- To formulate shampoo free from harmful chemicals.
- To formulate herbal shampoo for prevention of dandruff.
- To protect scalp and prevent hair fall.
- To develop a stable and functionally effective herbal shampoo by excluding Synthetic chemicals.
- To study various extraction methods.

- To study evaluation parameters for shampoo.
- Herbal shampoos for hair growth are formulated to strengthen the hair follicles by delivering essential oils and nourishment all through the roots and follicles. Stimulates the formation of new and healthy hair roots and promotes healthy hair growth.
- Herbal shampoo will not only give hair protection but also conditioning effect, shine and manageability.
- These shampoo are free from side effects since no surfactants are involved, has good stability .
- Betel leaves condition the hair and prevent from itchiness, drandruff and split ends.
- The vitamin C in guava leaves helps to nourish scalp and make the roots stronger and less prone to breakage and thus hair loss.

CHAPTER 4: METHODOLOGY

EXTRACTION

Extraction is defined as the process of isolation of soluble material from an insoluble residue, which maybe liquid or solid, by treatment with a solvent on the basis of physical nature of the crude drug to be extracted.

Methods used in the extraction of medicinal plants

- **Maceration :** This is an extraction procedure in which coarsely powdered drug material, either leaves or stembark or root bark, is placed inside a container; the menstrum is poured on top until completely covered the drug material. The container is then closed and kept for at least three days. The content is stirred periodically, and if placed inside bottle it should be shaken time to time to ensure complete extraction. At the end of extraction, the micelle is separated from marc by filtration or decantation. Subsequently, the micelle is then separated from the menstrum by evaporation in an oven or on top of water bath.
  This method is convenient and very suitable for thermolabile plant material.
- **Infusion** : The drug material is grinded into fine powder, and then placed inside a clean container. The extraction solvent hot or cold is then poured on top of the drug material, soaked, and kept for a short period of time. This method is suitable for extraction of bioactive

constituents that are readily soluble. In addition, it is an appropriate method for preparation of fresh extract before use.

The solvent to sample ratio is usually 4:1 or 16:1.

- **Digestion** : This is an extraction method that involves the use of moderate heat during extraction process. The solvent of extraction is poured into a clean container followed by powdered drug material. The mixture is placed over water bath or in an oven at a temperature about 50^{o}C. This method is suitable for plant materials that are readily soluble.

- **Decoction** : This is a process that involves continuous hot extraction using specified volume of water as a solvent. A dried, grinded, and powdered plant material is placed into a clean container. Water is then poured and stirred. Heat is then applied throughout the process to hasten the extraction. The process is lasted for a short duration usually about 15 min. The ratio of solvent to crude drug is usually 4:1 or 16:1. It is used for extraction of water soluble and heat stable plant material.

- **Percolation** : The apparatus used in this process is called percolator. It is a narrow-cone-shaped glass vessel with opening at both ends. A dried, grinded, and finely powdered plant material is moistened with the solvent of extraction in a clean container. More quantity of solvent is added, and the mixture is kept for a period of 4h. Subsequently, the content is then transferred into percolator with the lower end closed and allow to stand for a period of 24h. The extract is separated by filtration followed by decantation. The marc is then expressed and final amount of solvent added to get required volume.

- **Soxhlet extraction :** This process is known as continuous hot extraction. The apparatus is called Soxhlet extractor made up of glass. It consists of a round bottom flask, extraction chamber and condenser at the top. A dried, grinded, and finely powdered plant material is placed inside porous bag (thimble) made up of a clean cloth or strong filter paper and tightly

closed. The extraction solvent is poured into the bottom flask, followed by the thimble into the extraction chamber. The solvent is then heated from the bottom flask, evaporates, and passes through the condenser where it condenses and flow down to the extraction chamber. The solvent and the extracted plant material flow back to the flask. The entire process continues repeatedly until the drug is completely extracted. This method is suitable for plant material that is partially soluble in the chosen solvent and for plant materials with insoluble impurities. However, it is not a suitable method for thermolabile plant materials.

- **Microwave-assisted extraction** : This is one of the advanced extraction procedures in preparation of medicinal plants. The technique uses mechanism of dipole rotation and ionic transfer by displacement of charged ions present in the solvent and drug material. This method is suitable for extraction of flavonoids. It involves the application of electromagnetic radiation in frequencies between 300 MHz and 300 GHz. The technique uses microwave radiation to bombard on object, which can absorb electromagnetic energy and convert it into heat. Subsequently, the heat produced facilitates movement of solvent into the drug matrix.
- **Ultrasound-assisted extraction** : This process involves application of sound energy at a very high frequency greater than 20 KHz to disrupt plant cell and increase the drug surface area for solvent penetration. Consequently, secondary metabolites will be released. In this method, plant material should dry first, grinded into fine power, and sieved properly. The prepared sample is then mixed with appropriate solvent of extraction and packed into the ultrasonic extractor. The high sound energy applies hasten the extraction process by reducing the heat requirements.

Method used in extraction of herbal extract : Decoction

Extract Preparation

. **Extraction of Piper betel leaves using distilled water as a solvent -** Betel leaves were extracted using water as a solvent .The extraction was carried out using heating mantle and beaker of 1000 ml. Leaves were dried under shade and dried powder leaves was used for extraction . About 3 gm of powdered leaves were boiled with 100 ml of water at 50oCto avoid degradation of phytochemical

for 4 hour, extract was filtered.

. **Extraction of Psidium guajava leaves using distilled water as a solvent-** Guava leaves were extracted using water as a solvent. The extraction was carried out using heating mantle and beaker of 100 ml. Leaves were dried under shade and dried powder of leaves was used for extraction sample of 5 gm guava leaves in 100 ml distilled water was boiled for 4 hour at 100 Celsius the sample

was then filtered.

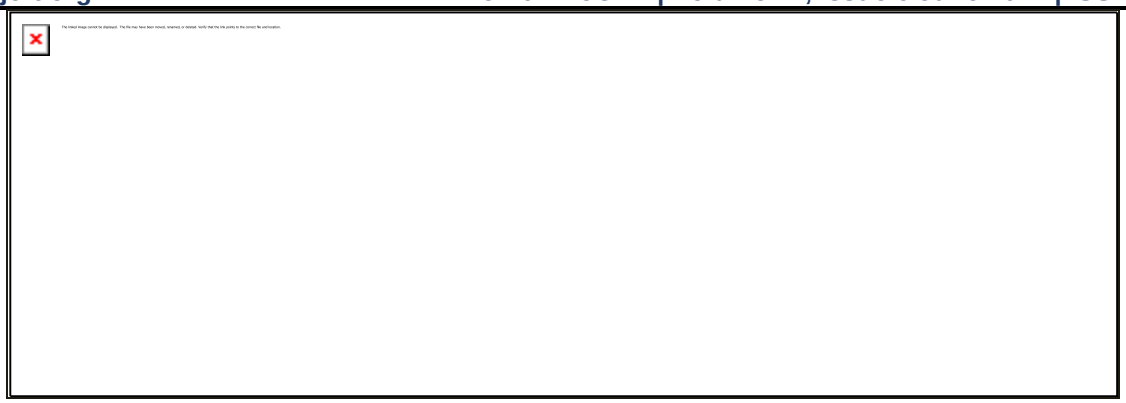
. **Extract of Curry patta and Reetha-** 5 gm curry patta powder and 20 gmreetha powder mixed with 100 ml water. Mixture kept on heating until water is reduced

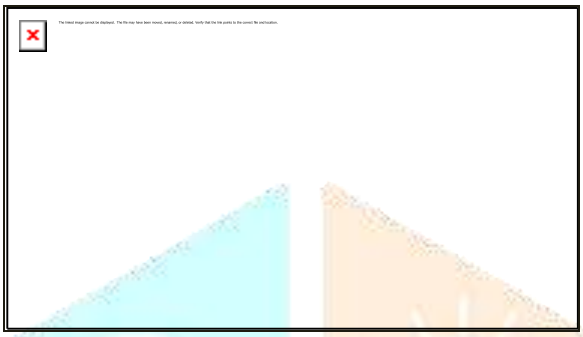
to one quarter. It was then filtered.

. Prepare xanthum gum solution and mix with herbal extract. Add 2 drops of perfume.

Formula of Herbal Shampoo

Ingredients	**Quantity**	**Uses**
Piper betel leaves extract	5 ml	Antioxidant
Psidum guajava leaves extract	5 ml	Antidandruff & anti hair fall
Curry patta extract	3 ml	Hair growth promoter
Reetha	5 gm	Foaming Agent
Xanthum gum	2 gm	Thickening agent
Rose Oil	0.2 ml	Perfume
Water	Q.S	Solvent





Evaluation parameters of herbal shampoo

Physical appearance

Formulation prepared was evaluated for the clarity, color, odor, and foam producing ability.

Determination of pH

A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter.

Dirt dispersion

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. One drop of India ink was added; the test tube was stoppered and shakes it 10 times.

The amount of ink in the foam was estimated as none, light, moderate, or heavy.

Foaming ability & foam stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder & the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1 minute shaking was recorded. Immediately after shaking the volume of foam at 1 minute intervals for 10 minutes were

recorded. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo

has good stability and the prepared shampoo exhibits higher foam property.

Determination of solid content percentage

The percentage of solid substance was determined by weighing about 4 g of shampoo in a dry, clean, and evaporating dish. The liquid portion of the shampoo was evaporated in a dish by placing on hot plate. The percentage and the weight of the solid contents

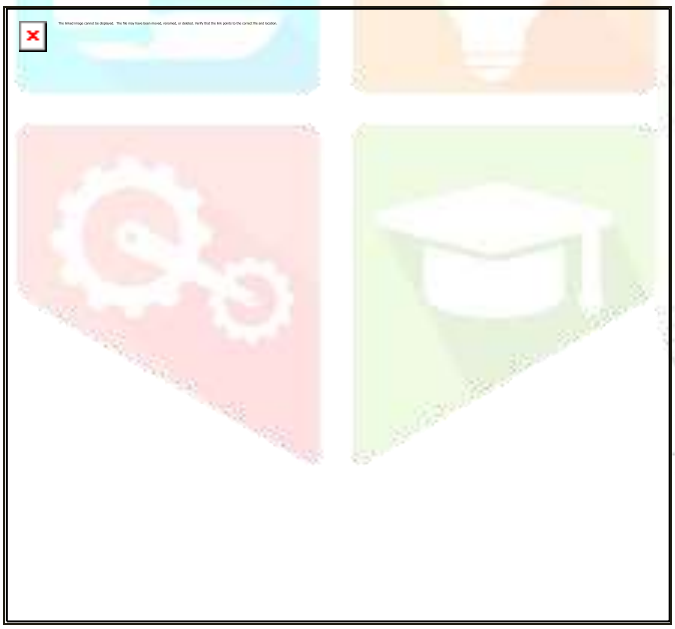
present in the shampoo were calculated after drying completely.

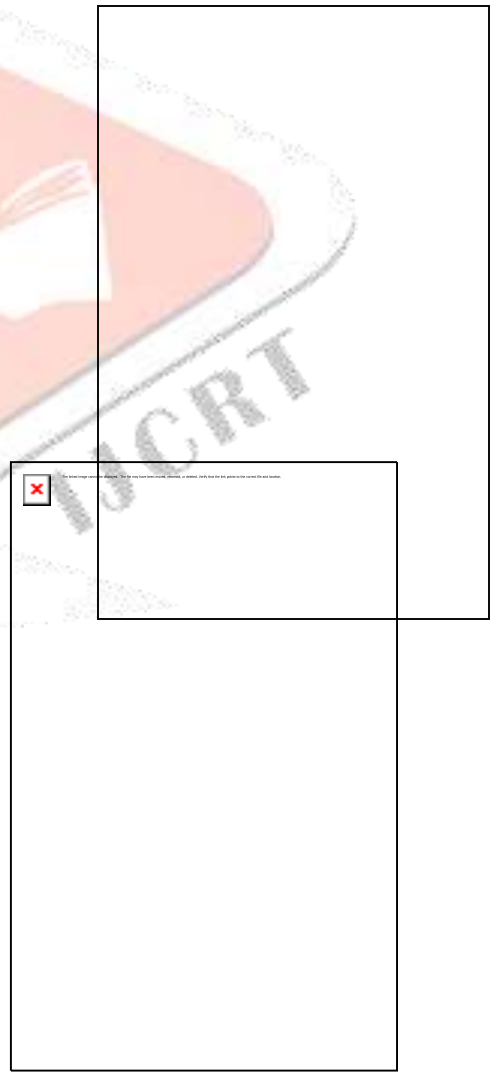
Skin Irritation Test

Prepared herbal shampoo was applied on skin for 5 minutes after that was washed and

tested for irritation or inflammation to the skin.

Foaming Ability





Viscometer

CHAPTER 5 : RESULT

Parameter	Formulation		
	F1	F2	F3
Color	Dark brown	Dark brown	Dark Brown
Odor	Rose like	Rose like	Rose like
Clarity	Clear	Clear	Clear
pH	5	6	6
Viscosity	1.15	1.25	1.40
Foaming Ability	25 ml	20 ml	20 ml

Dirt Dispersion Test - Slightly color change

Skin irritation test - No irritation / harmful effect

Dirt Dispersion Test - Slightly color change

Use - Remove oil and dandruff

Category - Anti dandruff and hair growth promoter

Direction - External use only

Storage - Store in well closed container

All parameter gives favorable result. It has a good odor given by the fragrance in the ingredients and also a good foam producing ability. The result obtained on present study shows that the active ingredients of these drugs when incorporated in shampoo gives more stable product. The pH of the shampoo has been shown to be important for improving and enhancing the qualities of hair, minimizing the irritation to the eyes and stabilizing the ecological balance of the scalp.

Xanthum gum is added in the preparation as a thickening agent and make the preparation thick. As conce. of

thickening agent increases, foaming ability decreases.

CHAPTER 6 : CONCLUSION

A survey of global hair care market trends indicates that consumer use of herbal hair products has significantly increased over the past years. The objective of the study was to develop a stable and

functionally effective herbal shampoo by excluding synthetic chemicals, which are normally incorporated in such formulations to larger extent. Synthetic hair shampoo is known to damage the hair cuticle leaving it brittle, dull and dry. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally. Formulated an herbal anti-hair fall and hair growth promoting shampoo containing betel leaves and guava leaves extract. Shampoo is effective in reducing dandruff without irritation, less adverse effect and better conditioning effect. Formulators must play an active role in educating the customers about the cleaning action of the shampoo respective of their factors. The

present work focuses on the potential of herbal extracts from cosmetic purposes.

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Formulation and Evaluation Of Herbal Shampoo

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