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FORMULATION AND EVALUATION OF LICORICE – POTATO BASED HERBAL EYE PATCH

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ABSTRACT

Infraorbital dark circles are a common cosmetic concern caused by various factors, including facial structure, soft tissue changes, and skin-related issues. To effectively address these concerns, personalized treatment plans are necessary. Prolonged exposure to blue light from digital screens such as phones, laptops, and televisions can damage the retina and optic nerve, leading to eye fatigue, dryness, early macular degeneration, and vision problems like nearsightedness. Eye strain is not only linked to screen use but also to activities requiring high concentration, such as scientific research, fine arts, and detailed craftsmanship, as well as exposure to pollutants, fumes, cooking, and driving in polluted environments. Herbal eye patches have gained popularity as soothing skincare products that rejuvenate the delicate skin around the eyes. These patches often contain natural ingredients like licorice and potato (Solanum tuberosum), which have anti-inflammatory and cooling effects to reduce puffiness, dark circles, and signs of fatigue. This project focuses on developing an eco-friendly, biodegradable herbal eye patch made from sustainable materials such as potato peel . Infused with organic herbs known for their calming and medicinal properties in Ayurvedic medicine, the mask provides a natural, gentle, and effective solution for eye care. Emphasizing environmental sustainability, the product aims to minimize waste throughout its lifecycle while promoting healthy and refreshed skin.

KEYWORDS : *Sensitive Cells- Eye Fatigue- Dryness - Retinal Damage- Flexibility- Soothing - Revitalizing Properties- Reduce Puffiness- Anti-Inflammatory -Sustainable-Biodegradable.*

2. INTRODUCTION

Patches for under eyes are becoming a regular “must have” product among regular skin care products. There are so many patches out there and they all claim to do magic to the skin around your eyes. Eye patches can re hydrate dry under eye skin, reduce wrinkles, dark circles and puffiness. They are designed to regenerate and tone tired, stressed skin. A breakthrough in skincare, herbal eye patches enriched with the powerful combination of licorice and solanum tuberosum offer a targeted solution for effectively addressing dark circles. Harnessing the natural properties of licorice, known for its skin-brightening and anti-inflammatory qualities, these patches aim to visibly reduce discoloration around the eyes.

The inclusion of solanum tuberosum, or potato extract, further enhances the formula by potentially aiding in skin tone balancing. Under eye patches are nothing but masks that are specifically designed for the delicate skin under the eyes. These patches are generally made out of hydrogel, however, there are patches that are also made from cloth, and bio-cellulose, amongst other skin-friendly materials. Together, these herbal ingredients work synergistically to provide a gentle yet potent remedy for the stubborn concern of dark circles, promising a revitalized and brighter under-eye area. Embrace the rejuvenating power of nature with these herbal eye patches, tailored to unveil a refreshed and more radiant look. With constant hustle, getting an eight-hour sleep at night is hardly possible. So it’s likely to wake up having swollen, baggy eyes the next morning. But under-eye patches can effortlessly work their magic when you want to refresh your skin. It can address many concerns like dark circles, puffy eyes, fine lines and wrinkles around the eyes. Also called eye patches, they are specifically crafted to soothe sensitive areas under or around the eyes.

Since their primary role is to relax the nerves beneath the eyes, they are carefully made of hydrogel, a skin-soothing ingredient. They are available in effective combinations, with each ingredient having its relevance in benefiting your skin. The present study aimed to development of eco-friendly herbal patches product. This research work is about eye mask which helps to reduce the dark circles and gives a cooling effect for the users.

3. STATEMENT OF THE PROBLEM

In today’s digital era, excessive screen time and environmental exposure have led to an increased prevalence of dark circles, puffiness, and eye strain, particularly among young adults and working professionals. Conventional cosmetic solutions often rely

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on synthetic ingredients that may cause adverse reactions or fail to address the root causes effectively. Despite the growing demand for natural and sustainable skincare alternatives, there remains a lack of effective, eco-friendly products specifically formulated to target under-eye issues using herbal ingredients. This study aims to address this gap by developing and evaluating herbal eye patches utilizing licorice (Glycyrrhiza glabra) and potato peel (Solanum tuberosum) for their cooling, anti-inflammatory, and skin-brightening properties.

4. HYPOTHESIS

It is hypothesized that herbal eye patches formulated using natural ingredients such as licorice (Glycyrrhiza glabra) and potato peel (Solanum tuberosum) will be effective in significantly reducing the appearance of dark circles, puffiness, and eye fatigue when applied regularly. The anti-inflammatory, antioxidant, and skin-brightening properties of licorice, combined with the phenolic compounds and nutrients in potato peel, are expected to nourish the delicate under-eye skin, promote circulation, and provide a cooling and soothing effect. Furthermore, due to the natural and biodegradable nature of the ingredients used, these herbal patches are presumed to be safer, more skin-friendly, and environmentally sustainable than commercially available synthetic products. Therefore, the study anticipates that the developed eye patches will show noticeable improvements in the under-eye area without causing irritation or side effects.

5. AIM : "Formulation And Evaluatin Of Licorice – Potato Based Herbal Eye Patch"

6. OBJECTIVES

1.To develop the eco-friendly eye patches using potato peel and licorice.
2.To apply the potato peel extract and licorice extract on cotton pad for its medical and cooling properties for eye
3.To develop the eye patches for reducing the dark circle.
4.To reduce the redness, increase the moisturizer and give cooling effect.
5.To evaluate effectiveness and cooling property of the developed in herbal eye patches.
6.To develop the chemical free organic eye patches.
7.To harness the anti-inflammatory and antioxidant benefits of licorice.
8.To provide a natural remedy for eye puffiness and fatigue.
9.To ensure the eye patches are gentle for sensitive skin.
10.To incorporate rose water for added antibacterial and soothing effects.
11.To create a user-friendly, ready-to-use herbal eye care product.
12.To test market acceptance through user feedback.
13.To support Ayurvedic practices with modern application.
14.To encourage sustainable skincare product development.
15.To demonstrate the role of herbal textiles in health and beauty.

7. EYE PATCH OVERVIEW

An eye patch is a piece of fabric or other material that you wear over your eye. It blocks vision in one eye and treats some vision problems with what is called occlusion therapy. Patches are also common to wear after eye procedures.

7.1. Types Of Eye Patch

1. Hydra Gel Eye Patch :

Hydra gel Eye Patches are hydration sealing, under eye plumping patches. These patches are infused with peptides and plant extracts, that helps in reducing dark circles & under eye hollowness. You may feel a tingling sensation when you wear them on, that's the patch working on under-eye puffiness reduction.

2. Cosmetic/Fashion Eye Patches :

1. Decorative Patches: Worn for aesthetic purposes, these can be stylish and may have various designs.

2. Specialty Patches*:* Some are designed for specific occasions or themes. When using an eye patch, it's essential to follow proper hygiene practices to prevent any complications. If you have specific concerns, consulting with an eye care professional is advisable.

3. Cooling or Soothing Eye Patches

Often infused with ingredients like aloe vera or cucumber extract to provide a cooling sensation and reduce puffiness.

4. Gold or Hydrogel Eye Patches

Some patches contain gold particles or have a hydrogel base, which can have a luxurious feel and may contribute to improved skin elasticity.

5. Detoxifying Eye Patches

Formulated with ingredients like charcoal or green tea extract to detoxify and refresh the eye area.Always read and follow the instructions provided with the cosmetic eye patches, and consider your skin type and specific concerns when choosing a product. It's recommended to do a patch test before regular use, especially if you have sensitive skin.

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7.2 Potato Peel (Solanum tuberosum)

The potato is a starchy, tuberous crop from the perennial nightshade *Solanum tuberosum*. The peels contain an array of nutritionally beneficial compounds, which can be utilized in many ways, e.g., the peel extract, can be used as a natural antioxidant in foods. Moreover, the phenolic compounds are particularly beneficial in the treatment of certain chronic diseases, and also in the prevention of cancer. The potato's fiber, potassium, vitamin C and vitamin B-6 content, coupled with its lack of cholesterol, all support heart health. Varying amounts of potassium, iron, riboflavin, folate, and vitamins are found primarily in the thick periderm of the potato skin. The concentrations of some minerals were found to be greater in the skin than in the flesh of the tuber .Peels are the major by-product of potato processing industries, which represent a major waste disposal problem for the industry concerned. Up-grading of this by-product to value added products is therefore of interest to the potato industry. The peeling is accomplished by abrasive peeling, steam peeling or lye peeling, depending on the types of products to be processed. Abrasive peeling is used for chips, whereas steam peeling is used for frozen and dehydrated products. The use of lye peeling requires a neutralization step, after peeling. Potato skin is composed of suberized phellem cells, the outer component of the tuber periderm. The periderm tissue consists of two additional cell types: a single-cell meristematic layer, the phellogen (cork cambium) that produces the phellem cells and is localized underneath them; and a parenchyma-like phelloderm that is derived from inward cell divisions of the phellogen. The periderm is a tissue of secondary origin that replaces the epidermis when the latter is damaged.

7.2.1 Phenolic Compounds

Phenolic compounds are heterogenous class of secondary metabolites which are classified as phenolic acids and flavonoids. The latter components represent a very large subclass, with approximately 9000 compounds. The major phenolic acids present were: gallic acid, caffeic acid, chlorogenic acid and protocatechuic acid. An experimental pro-oxidant system was used to induce lipid peroxidation in rat red blood cells (RBCs) and human RBC membranes. Potato peel was found to inhibit lipid peroxidation with similar effectiveness in both the systems (about 80–85% inhibition by PP at2.5 mg/ml). The following are the phenolic compounds present in the skin of potato. Phenolic compounds are the main class of natural antioxidants. Extracts of peels from several variety of potatoes were highly efficient in reducing lipid peroxidation both in fish oil and in oil-in water emulsions.

Chlorogenic acid is by far the most abundant phenolic component and constitutes up to 90% of the total phenolics. It has a Protective effect in neuroinflammatory conditions.

Caffeic acid is an antioxidant in vitro. Caffeic acid also shows immunomodulatory and antiinflammatory activity. Caffeic acid outperformed the other antioxidants, reducing aflatoxin production by more than 95% percent.

- Antibacterial activities of these compounds were found in high doses against Escherichia coli, Salmonella typhimurium and Bacillus cereus.
- Antioxidant activity was found in multiple systems such as superoxide scavenging ability.
- Quercetin, a flavonoid found in potato skin, possesses powerful anti-inflammatory properties and antioxidant capabilities that protect the body's cells from free radical damage.
- The hydroxycinnamic acids of potato peel also caused in vitro peroxidation of human low-density lipoprotein (LDL).
- Choline is a very important and versatile nutrient in potatoes that helps with sleep, muscle movement, learning and memory. Choline also helps to maintain the structure of cellular membranes, aids in the transmission of nerve impulses, assists in the absorption of fat and reduces chronic inflammation.
- The protein contained in potato skins which is known as patatin, can help in reducing blood pressure and shield the heart against possible disease.

7.3.2 Miscellaneous Uses Of Potato Peels

Potato peel used as a low-cost agro-industrial medium in production of both alpha-amylase and alkaline protease enzymes and several extracellular hydrolytic enzymes which produced high yield and high activity of the produced enzymes. Also, an industrially important polysaccharide ‘pullulan’, can be produced by enzymatic hydrolysis of potato processing wastes.

It was extensively used in different food industries, under solid-state controlled growth conditions and was successfully used in some applications.

Potato peel is used in livestock and cattle feed, since the fibres are suitable for ruminants, and it also contains certain nutrients beneficial for the animal.

-The potato peels may be used as a replacer of wood fibre in paper making. This is a very cheap and efficient method of utilization.

7.4 Properties of Athimadhuram

- It has sweet flavor
- Anti-inflammatory
- Antispasmodic
- Acts as a laxative
- Contains a chemical called Glycyrrhizin
- Rejuvenator
- antioxidant
- Carries phytoestrogenic quality and

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- Immune booster

8. MATERIAL

A. Formulation Table for Herbal Eye Patch :

Sr. No.	Ingredients	Quantity	Purpose
1	Potato Peel Extract	20 grams	Anti-inflammatory, antioxidant, soothi
2	Licorice (Glycyrrhiza glabra)	10 grams	Skin brightening, anti-inflammatory
3	Rose Water (Rosa damascena)	10 milliliters	Cooling effect, antibacterial, fragrance
4	Cotton Pads	As required (1 pair per use) Patch base	Patch base, absorbent, skin-friendly

8.1 Selection Of Fabric

Cotton pads, made from compressed raw cotton, are used in medical and cosmetic applications. Medically, they help stop minor bleeding and are often secured with tape. In cosmetics, they're used for applying or removing makeup and cleaning babies due to their softness. Unlike loose cotton, compressed pads are stronger, more absorbent, and less likely to leave threads behind. The demand for natural, hypoallergenic, and high-performance cotton pads has increased, especially for skincare routines.

Fig: No. 1. Cotton Pads

8.2 Selection Of Herb

8.2.1 Herbs:1 Potato peel- Solanum tuberosum
8.2.2 Herbs:2 Athimathuram -Glycyrrhiza glabra L. (Licorice)
8.2.3 Rosa damascene-Rose water

8.2.1 Potato peel- Solanum tuberosum :

Potato peel, a byproduct of potato processing, is rich in dietary fiber (40–50%), phenolic compounds, and vitamins like B6, riboflavin, and vitamin C. It offers various health benefits such as antioxidant, anti-carcinogenic, anti-diabetic, and cholesterol-lowering effects. It is also being explored as a functional food ingredient, especially in bread making. However, safety aspects like glycoalkaloid content must be considered.

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Fig :.2. Potato Peel Extract

8.2.2 Athimathuram -*Glycyrrhiza glabra L. (Licorice) :*

Athimathuram or scientifically termed as Glyceria glabra Glycyrrhiza glabra or Liquorice plant is a cultivated acclaimed for its medicinal properties. It is commonly called as sweet wood. Athimathuram comprises active compound namely, glycyrrhizic acid, in abundance.

Fig :3. Athimathuram -*Glycyrrhiza glabra* L. (Licorice)

8.2.3 Rosa damascene-Rose water

water is created by distilling rose petals with steam. Rose water is fragrant, and it's sometimes used as a mild natural fragrance as an alternative to chemical-filled perfumes. Rose water has been used for thousands of years, including in the Middle Ages. It's thought to have originated in what is now Iran. It's been used traditionally in both beauty products and food and drink products. It also comes with plenty of potential health benefits, including the following.

Fig : 4. Rosa Damascene

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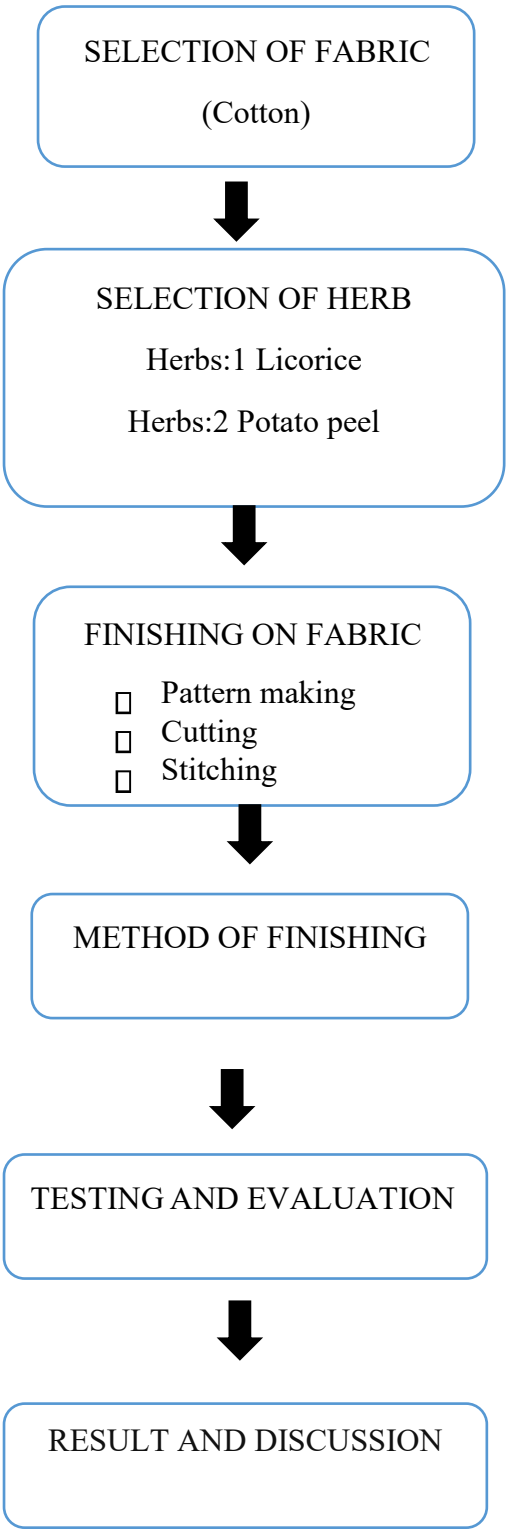
9. METHODOLOGY



10. METHOD OF FINISHING

- Solanum tuberosum (potato peel) skin were collect 20g and extract were taken from potato peel
- Athimathuram (Licorice) were (10g) were mixed in solanum tuberosum extract Rose water 10m were mixed with extract
- Rose water (Rose Damascene) extract is used for the purpose of having antibacterial and antioxidants properties
- Cotton pads were used for eye patches and extract was directly apply through eye patches.

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11. PLAN OF WORK

A. Sequential Workflow

1. Literature Survey
Collection and review of published data on the medicinal properties of Solanum tuberosum (potato peel) and Glycyrrhiza glabra (licorice) in skincare, especially for under-eye treatment.

2. Collection and Authentication of Plant Materials
Procurement of potato peels and licorice root from verified sources.
Authentication of raw plant materials through botanical references.

3. Preparation and Extraction of Herbal Ingredients
Extraction of potato peel and licorice using aqueous or ethanol-based methods.
Filtration and concentration of extracts for application use.

4. Formulation of Eye Patches
Infusion of cotton pads with herbal extract mixture (potato peel extract, licorice extract, and rose water).
Fabrication steps: pattern making, cutting, stitching (if required), and preparation of patches.

5. Evaluation of the Herbal Eye Patches
Assessment of pH, texture, cooling effect, and user comfort.
Organoleptic properties and user acceptability testing.

6. User Testing and Feedback Collection
Distribution of eye patches to a group of 20 users.
Collection of user feedback via structured questionnaire.

7. Cost Analysis
Estimation of raw material and production costs.
Determination of total product cost and potential for scalability.

8. Stability Testing (optional)
Observation of patch integrity and properties over a 30-day period under ambient conditions.

9. Data Analysis and Interpretation
Compilation and interpretation of user feedback and lab evaluations.

10. Documentation and Report Writing
Preparation of the final report with all results, discussions, and future scope.

B. Timeline

Week	Activity
Week 1	Literature review and project planning
Week 2	Collection and authentication of plant materials
Week 3	Extraction of potato peel and licorice
Week 4	Preparation of extract blend and initial formulation
Week 5	Fabrication of herbal eye patches
Week 6	Evaluation: pH, cooling effect, physical properties
Week 7	User testing and feedback collection
Week 8	Costing and optional stability observation
Week 9	Data analysis and interpretation
Week 10	Documentation and report writing

12. TESTING AND EVALUATION

12.1 Quantitative Analysis : The developed product was physically evaluated using a people. A questionnaire was prepared based on the usage of the reusable diaper and eco- friendly product. People's review about the product is taken as the major aspects and other details like positive and negative feel of the product was also questioned below.

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12.2 Determination of Solubility
Purpose: Assess how well the extract dissolves in aqueous medium.
Method: Add extract to distilled water, check for dissolution and clarity.
12.3 Determination of Absorption (Patch Test)
Purpose: Evaluate how well the formulation is absorbed into the skin.
Method: Apply patch under eye for 15–30 min, assess moisture absorption and skin condition.
12.4 Determination of Physical Appearance
Purpose: Visual evaluation of the eye patch.
Parameters: Size, shape, cleanliness, cotton integrity, overall neatness.
12.5 Irritancy Test
Purpose: Detect any skin reaction.
Method: Apply patch on inner arm or under-eye. Monitor for 24 hours for redness, itching, swelling.
12.6 pH Evaluation
Purpose: Determine skin compatibility.
Method: Extract patch liquid, use pH paper or meter. Acceptable Range: 5.5–6.5 (safe for eye area)
12.7 Stability Test
Purpose: Check how stable the product is over time.
Conditions: Store patches at: Room temperature Refrigerator (4°C)
Accelerated (40°C, 75% RH) Duration: 1–3 months
Parameters to Observe: Color, odor, texture, and microbial growth.

13. RESULTS AND DISCUSSION

In this study, herbal eye patches were developed using natural ingredients —potato peel extract (Solanum tuberosum), licorice root (Glycyrrhiza glabra), and rose water (Rosa damascena) — with the objective of reducing dark circles, eye puffiness, and skin irritation around the eyes. The results observed from the application and evaluation of these patches are as follows:

A. Effect on Skin

The patches effectively reduced dark circles under the eyes, which is attributed to the skin-brightening and anti-inflammatory properties of licorice. Glycyrrhizin, flavonoids, and other natural compounds present in licorice helped in reducing pigmentation.
Potato peel contains chlorogenic acid, caffeic acid, and quercetin, which are powerful antioxidants. These compounds helped reduce inflammation, puffiness, and redness while improving overall skin texture.
Rose water provided a cooling and soothing sensation, helped in hydrating the skin, and contributed antibacterial benefits that further enhanced the product's effectiveness.

B. User Experience and Comfort

The patches were made using cotton pads, which are soft, hypoallergenic, and comfortable on the skin. Users found them non-irritating, and easy to apply and remove.
The natural ingredients produced a mild fragrance and a relaxing effect, making the product pleasant to use, especially after screen exposure or during tiredness.
The formulation avoided any synthetic chemicals, making the product suitable for sensitive skin and ideal for regular use.

C. Cost and Sustainability

The total cost of producing one pair of eye patches was approximately ₹150, including:
Cotton pads: ₹50
Herbal ingredients (licorice and potato peel): ₹50
Production and processing: ₹50
The product was designed to be biodegradable, eco-friendly, and chemical-free, aligning with current trends in sustainable skincare.

D. Overall Observations

The patches showed promising results in improving the appearance of the under-eye area.
They effectively addressed dark circles, puffiness, dryness, and irritation without any reported side effects.
Consistent use of the patches is expected to yield long-term improvements in skin tone and texture around the eyes.
The use of waste materials like potato peel highlights the product's innovative and sustainable aspect.

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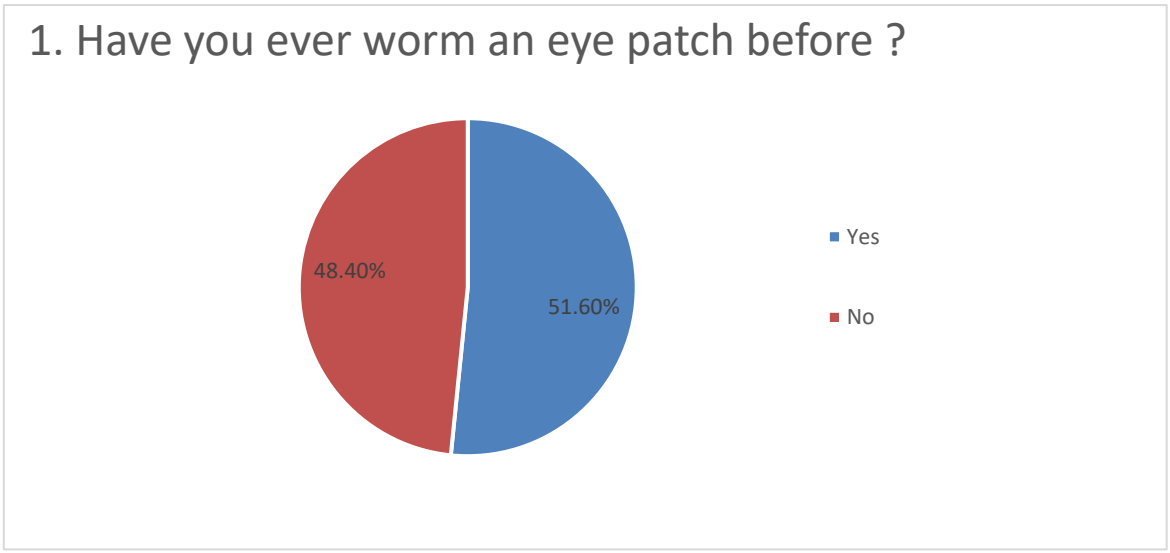
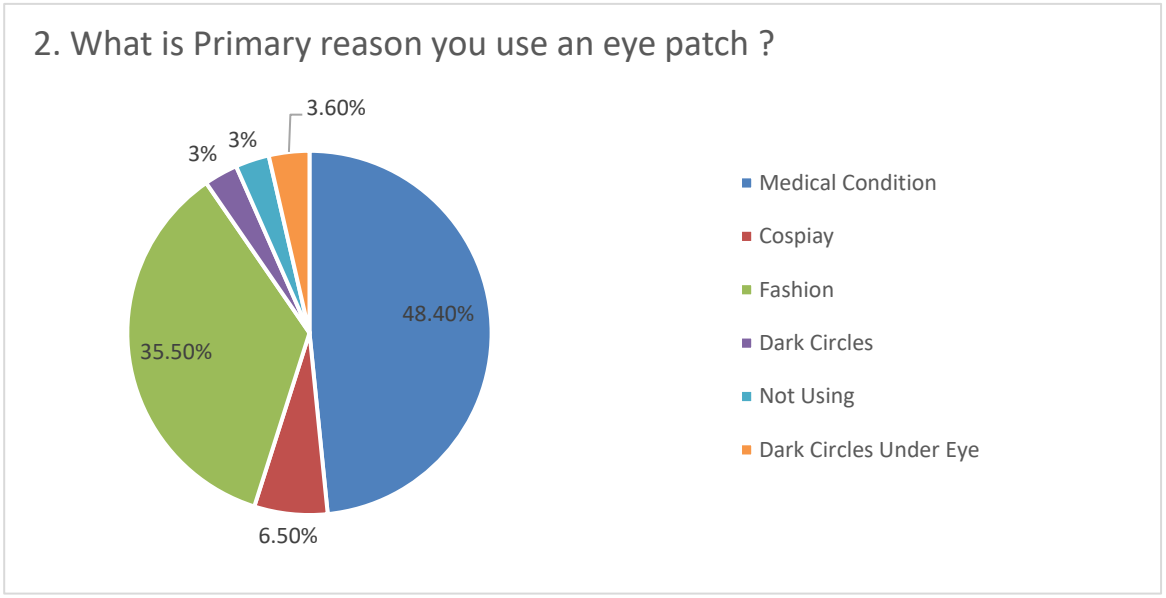
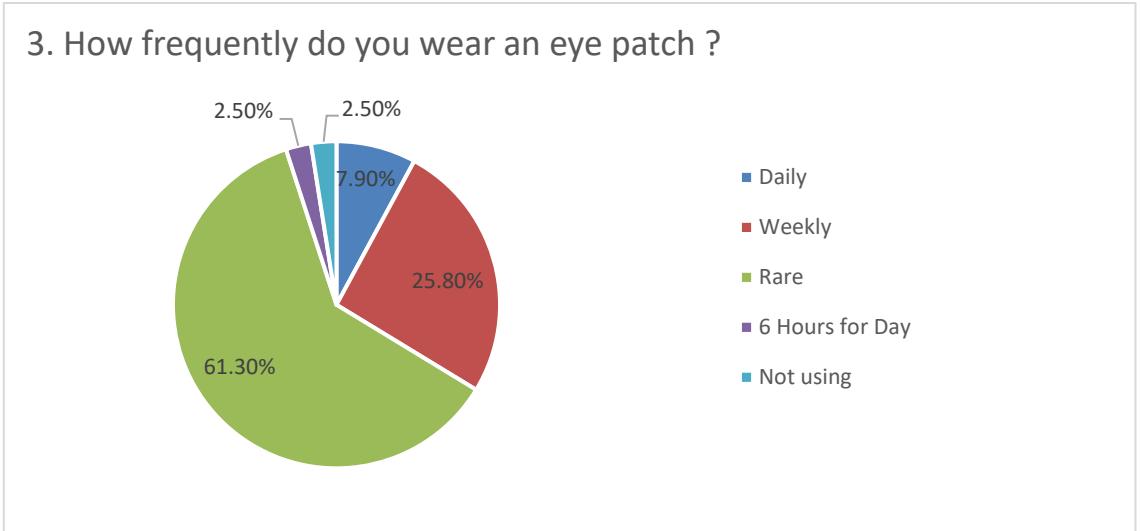
13.1 QUANTITATIVE ANALYSIS







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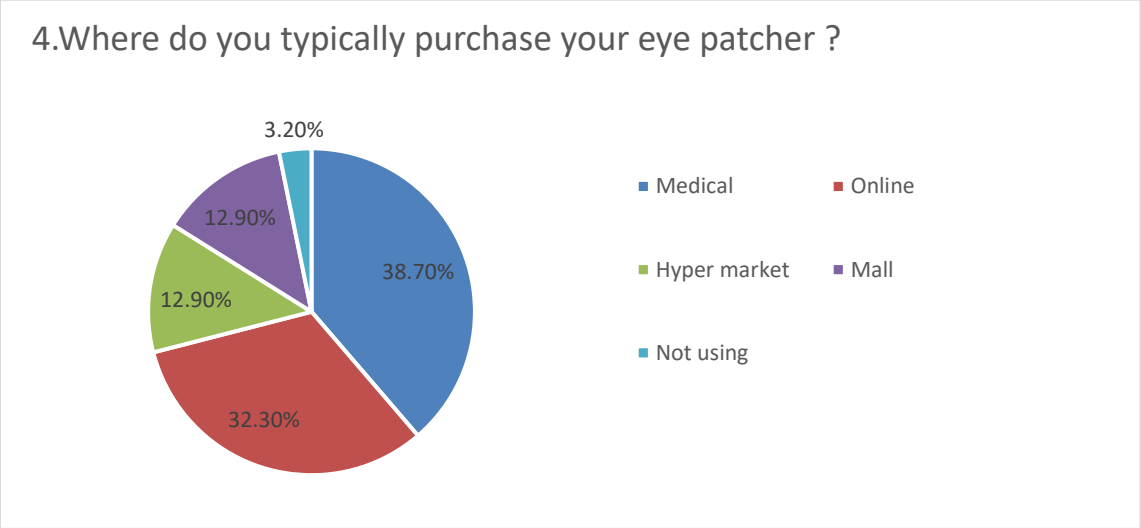

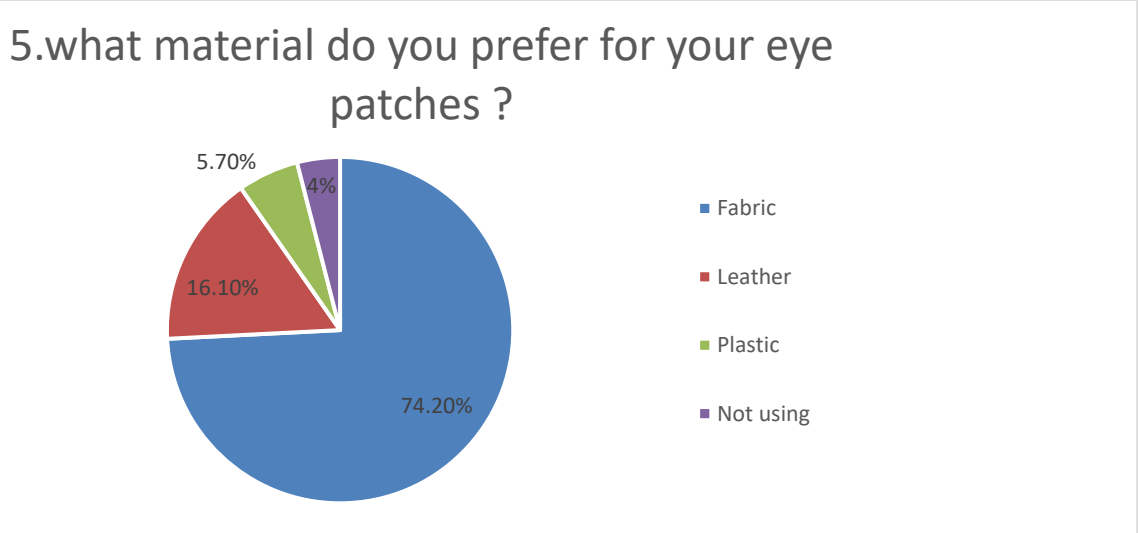

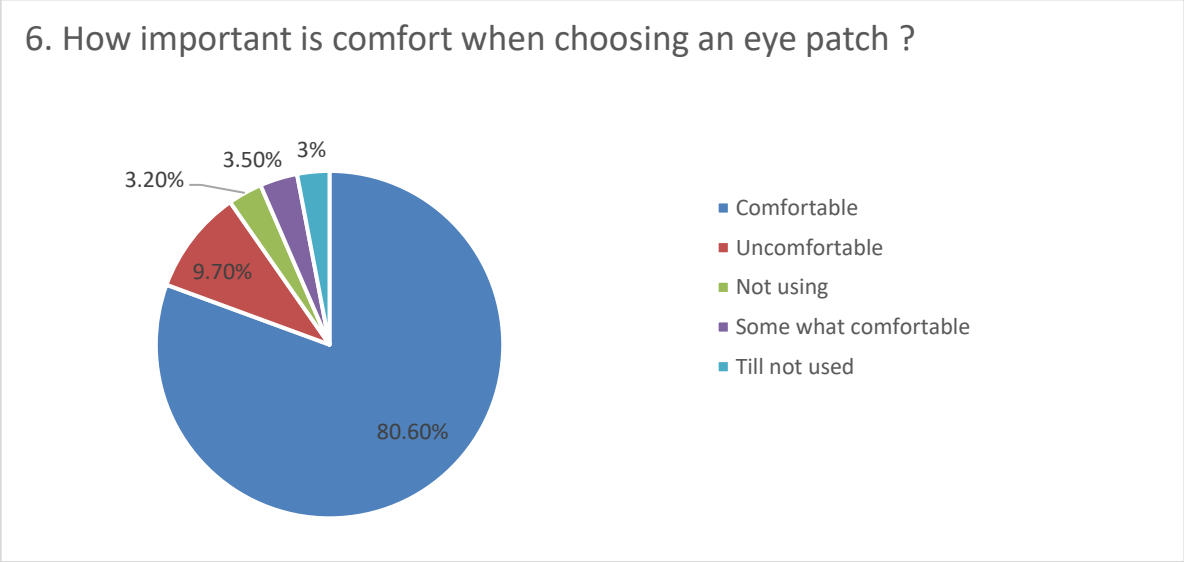

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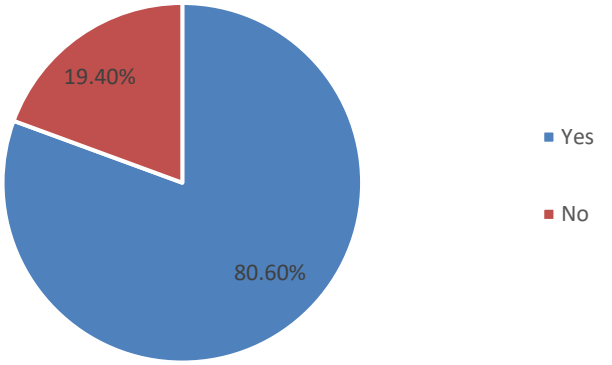
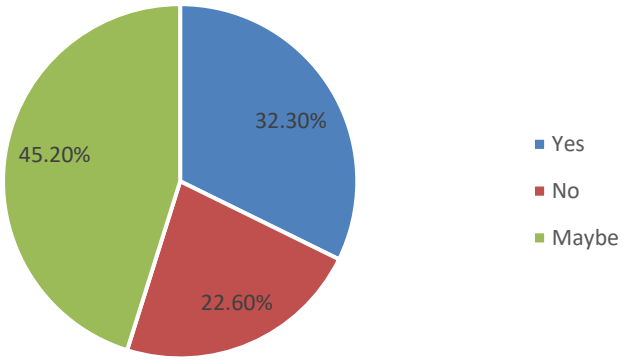
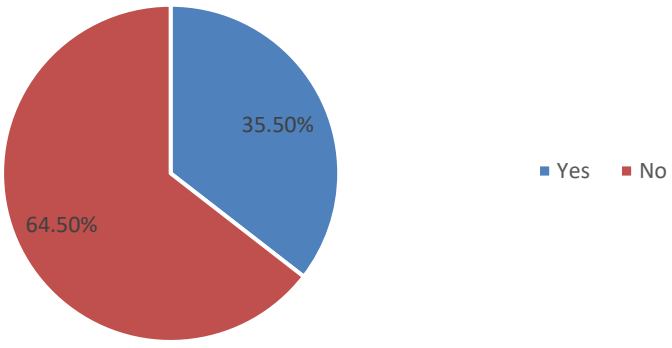
7. Do you prefer reusable or disposable eye patches ?



8. Are you more inclined towards function eye patches or those with asethetic designs ?



9. Have you experienced any challenges or discomfort while wearing an eye patche ?



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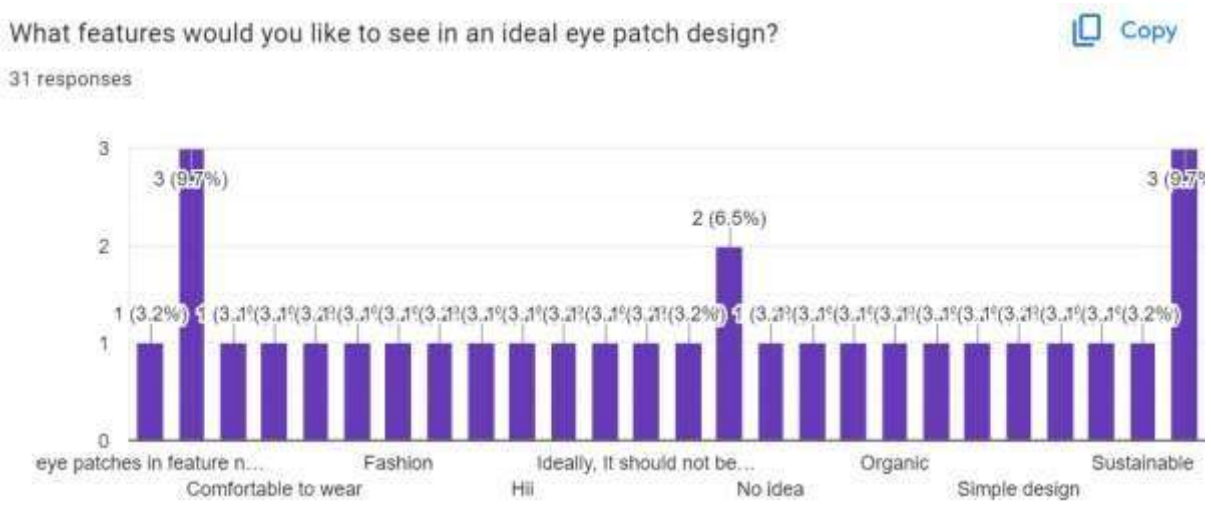

13.2 Future Scope

This product is a very good source for dark circles, puff-eyes, eye irritation and also gives cooling effect. If this gives good result of course it will have high sales rate because of these benefits also it is budget friendly because the ingredients used in this sleeping eye patches like potato peel extract, licorice, rose water and cotton pads is also budget friendly . Also, it is very essential in today's life style.

To sell this product it is good to make a tie-up with famous cosmetic or beauty companies. It is not that easy to have a tie-up with famous beauty or cosmetic company. Step by step process will give successful output.

14. SUMMARY

The project focuses on the formulation and evaluation of an herbal eye patch made from licorice (Glycyrrhiza glabra) and potato peel (Solanum tuberosum), aimed at reducing dark circles, puffiness, eye irritation, and fatigue. The patches are infused with natural extracts and rose water, applied to cotton pads to create a biodegradable, eco-friendly, and chemical-free skincare product. Testing included pH evaluation, skin compatibility, and user feedback from 20 individuals. The results demonstrated good user acceptance, comfort, and effectiveness, supporting the use of natural materials in skincare.

14.1 CONCLUSION

The herbal eye patch developed in this study proved to be effective, affordable, and safe for reducing dark circles and soothing eye strain. The combination of licorice, potato peel, and rose water offered anti-inflammatory, antioxidant, and cooling effects, with no reported side effects. Its eco-friendly formulation and positive user feedback indicate strong potential for commercialization and adoption as a natural alternative to synthetic under-eye treatments. Regular use is expected to improve skin tone and texture around the eyes.

15. EXPECTED OUTCOME

15.1 Reduction of Dark Circles

The herbal eye patches, incorporating potato peel extract (Solanum tuberosum) and licorice (Glycyrrhiza glabra), are designed to reduce the appearance of dark circles under the eyes through their anti-inflammatory and skin-brightening properties.

15.2 Soothing and Cooling Effect

The inclusion of rose water and the natural properties of the herbs are expected to provide a cooling, soothing sensation, reducing eye irritation, puffiness, and redness.

15.3 Eco-Friendly and Biodegradable

The patches are made using cotton pads and natural ingredients, making them biodegradable, chemical-free, and environmentally friendly.

15.4 Affordable Product

The prototype product costs Rs.150 per pair. It is anticipated that with mass production, the cost could be lowered, enhancing affordability and accessibility.

15.5 Consumer Acceptance

Based on a survey of 20 users, the product was well-received, indicating good potential for market viability.

15.6 Potential Commercialization

The report notes the possibility of collaborating with cosmetic companies for broader distribution, leveraging the product's natural, budget-friendly, and functional benefits.

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15.7 Health and Cosmetic Benefits :

Improves skin hydration and moisturization Supports skin tone balance Helps relieve eye fatigue Acts as an antioxidant and antimicrobial agent.

16. ANNEXURE

Eye Patch

17. REFERENCE

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