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FORMULATION AND EVALUATION OF LIQUORICE HERBAL KAJAL

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Abstract:

This thesis aims to develop and evaluate a medicated herbal kajal using liquorice extract, emphasizing its anti-inflammatory property for both cosmetic and therapeutic applications. The objectives include reviewing literature on liquorice extract's medicinal properties, formulating the kajal with beneficial herbal ingredients, and evaluating its physical parameters, anti-inflammatory potential, and stability. The methodology encompasses the extraction of glycyrrhizic acid from liquorice root, the formulation of kajal using various oils and additives, and multiple evaluation tests. Physical evaluation of the kajal includes assessments of color, odor, texture, and consistency, all of which met the desired criteria. The pH determination showed an average pH of 7.18, indicating suitability for skin application. Skin irritation tests confirmed the kajal's safety, with no irritation observed. Spreadability tests revealed optimal spreadability, ensuring smooth application. Stability studies showed no changes in the product's characteristics at room temperature and 40°C, indicating good shelf-life. The evaluation of the base, specifically cow ghee, included acid, saponification, and ester values, confirming its quality. This research supports the potential of herbal kajal with liquorice extract as a safe, effective, and stable cosmetic product with added therapeutic benefits.

Index Terms: herbal kajal, liquorice extract, anti-inflammatory, cosmetic formulation.

Introduction :

In addition to its cultural and aesthetic significance, kajal is worn to ward against "evil eyes." In children's eyes, kajal is used as a protective symbol to ward off evil. The term "kajal" refers to eye ointment, or Anjanum, in Ayurvedic terminology. Many different kinds of medicinal plants are utilize to treat eye conditions. The healthcare system continues to face challenges in the battle against eye disorders and side-effect-free substances. Nonetheless, the limits of conventional medications can be surmounted with the help of Ayurvedic herbs. This is why there has been a lot of work done to identify novel therapeutic herbs. This is due to its affordability, effectiveness, and lack of significant side effects. Kohl is a well-known eye solution that is used to treat and prevent eye problems. It is characterized as cool and clean for the eyes in practically all human cultures. Applying medicated kajal has the benefits like it soothes irritated, sore, and stressed eyes and has a cooling impact, the formulation is used as an anti-inflammatory agent and to treat itchy or red eyes. (1) For maintaining and enhancing eye beauty Numerous safe, secure, and natural methods are available through Vedic science. Many plants and herbs were employed to create Ayurvedic cosmetics with the aid of the science of Ayurveda, which protected the body from external influences while also improving the appearance of the skin. Plant compounds are also utilized in cosmetics for practical uses including moisturizing, whitening, coloring, sunscreen, antioxidant, immunostimulant, cleaning, preservers, thickeners, etc. The popular notion that kohl is good for the eyes from a medical standpoint and the fact that wearing kohl is prescribed by the sunna, the Islamic customs, are the final reasons. Many plants, either alone or in combination, are used to treat ophthalmic problems in the Ayurvedic medical system. These plants are referenced in classic Indian texts such as Charak Samhita, Sushrut Samhita, Bhav Prakasha, Ras Tarang, Nayan Drastam, and Astaghriday. In Ayurveda, an Indian medical system, numerous eye conditions and illnesses,

such as Abhishyand (conjunctivitis), Adhimanth (glaucoma), Timir (cataract), etc., have been extensively described1.There have also been descriptions of their causes and therapies. It has also been common practice to recommend the use of many herbal remedies in various dosage forms, such as extract, arkas (aqueous distillate), kajal (collerium), fermentation, and washing with different extracts.(2)This area of concern extends beyond the use of animals in scientific testing to include the use of materials and substances originating from animal sources. The Drugs and Cosmetics Act addresses the standards and caliber of medications and cosmetics produced and distributed in India.(3)

Aim and Objective :

Aim :

The aim of this thesis is to formulate and evaluate a medicated herbal kajal using liquorice extract as a key ingredient. The focus will be on developing a safe and effective herbal cosmetic product with potential antimicrobial and anti-inflammatory properties for cosmetic and therapeutic use.

Objective :

1. To review existing literature on the medicinal properties of liquorice extract, particularly its antimicrobial and anti-inflammatory effects.
2. To formulate a medicated herbal kajal incorporating liquorice extract and other herbal ingredients known for their beneficial properties.
3. To evaluate the physical parameters of the formulated kajal, including color, odor, texture, consistency and pH.
4. To assess the antimicrobial activity of the herbal kajal against specific pathogens, such as *Staphylococcus aureus.*
5. To conduct in vitro studies to determine the anti-inflammatory potential of the kajal, focusing on the effects of liquorice extract.

Methodology :

Extraction of glycyrrhizic acid from liquorice root:

Materials:

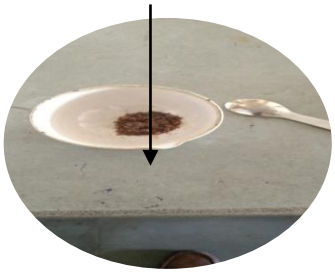
We bought the licorice from the neighborhood market, and the Pharmacopoeial Laboratory of Indian Medicine (PLIM) provided the authentication. Every solvent utilized was of the analytical variety.

Methodology:

Take liquorice root and convert it into powder .

Take 10gm of liquorice powder and add 30ml of ethanol + 70ml of water in a stoppered container and allow to soak for 60 minutes.

Then filter the solution and evaporate it completely.



Collect the concentrated extract of GA.(10)

Figure 1: Flow chart of methodology to extract glycyrrhizic acid from liquorice root.

Formulation of kajal :

Materials:

Sr no.	Name of ingredients	Quantity taken
1.	Liquorice extract(11)	2.5gm
2.	Coconut oil (12)	2.5ml
3.	Almond oil (13)	3ml
4.	Castor oil	3ml
5.	Vitamin E	3drops
6.	Glycerol	2drops
7.	BHA & BHT (14)	12gm
8.	Cow ghee (15)	q.s.

Table1. Composition of formulation of medicated kajal.

Method of preparation:

Make a wick of muslin cloth piece , put the wick into the mud lamp containing coconut oil and almond oil.

↓

Burn it and collect carbon black over the copper plate.

↓

Plant extract were incorporated along with additives.

↓

Ghee was added in desired proportions to make the formulation viscous.

Figure 2. Formulated liquorice kajal.

Evaluation test of herbal kajal :

1. Physical Evaluation:

The medicinal herbal kajal formulations underwent physical parameter evaluations, including color, texture, smell, and consistency.

Principle: Assessing the color, odor, taste, size, shape and texture of the kajal using the senses (sight, smell, touch). This provides a qualitative assessment of the drug.(16)
Procedure: Color: Observe the color of the kajal. It should be black in color.(4)
Odor: Smell the kajal to assess its odor. It should have a characteristic odor.(9)
Texture and Consistency: Feel the texture of the kajal between your fingers to evaluate its smoothness and consistency. Herbal kajal formulations are expected to have a smooth appearance and possess a semi-solid consistency.(9),(4)
Appearance: Visually inspect the kajal for any irregularities in appearance. It should have a smooth and uniform texture.(4)

Figure 3. Physical observation of liquorice kajal.

2. **pH determination:** A pH meter is used to determine the formulation's pH.
Principle of pH meter: It measures the voltage between the two electrode, one is a glass electrode, and the other is a reference electrode. Sometimes, if both electrons are present, it is called the combination electrode, and they are inserted into the solution in which pH is to be tested, after immersing these electrodes in a solution, the H+ ion in the test solution was exchanged for other positively charged hydrogen ions present on the glass ball. So there is an action between these H+ ions of the solution and the H+ ions or positively charged ions present in the glass bulb. The amplifier detects the difference in electric potential between the two electrodes. The contrast of these potentials is called the pH unit.(17)
Procedure: After being weighed out, 1 gram of kajal sample was mixed with 25 milliliters of DMSO (dimethyl sulfoxide) and kept for two hours. Three measurements of the kajal composition's pH value were made, with an average being obtained. (1)

Figure 4. Observation of pH of liquorice kajal

3. **Skin irritation test:** Principle: Skin irritation test involves assessing the potential of chemicals to cause reversible damage to the skin. These test aim to predict skin irritation without using animals and humans. Such tests are crucial for safety evaluations before product introduction, providing mechanistically-relevant measurements of cell damage and inflammatory responses in reconstructed human epidermis models.(18)
Procedure: Put the kajal on the hand of the volunteer in the form of a patch and then observe the sense of itching and redness or any other inflammation.

Figure 5. Observation of skin irritation test of liquorice kajal.

4. **Spreadability:** Principle: The spreadaibility testing of herbal kajal involves measuring the time it takes for a specific amount of kajal to spread to a certain thickness under a defined weight. This test assesses the ease with which the kajal can spread evenly. The spreadability test is crucial for evaluating the texture and consistency of the kajal, ensuring it can be applied smoothly and uniformly.(4)
   Procedure: A large amount of kajal sample was obtained on glass slides in order to measure the spreadability of kajal formulations. The samples were then pressed to the same thickness using weight for five minutes on the slides. On the pan, weight is placed. The spread was measured as the amount of time needed to separate a slide into two.
   Computed with the following formula: S = M. L / t
   Considering that M is the weight (g) fastened to the upper glass slide
   L is the length that was moved on the slide (in centimeters).
   T is the time to divide the slide.
5. **Stability Studies:** Principle: This study aim to ensure that the kajl maintains its quality and efficacy over time, providing insights into its shelf-life and storage conditions.(9)
   Procedure: At room temperature and 40°C, physical characteristics such color, smell, texture, and consistency were measured.
6. **Evaluation of Base:** The acid value and saponification value were used to evaluate the base, which is ghee.
   Acid value: Principle*:* If CMM samples contain high levels of fatty acids, they may develop rancidity when stored. Fats, aldehydes, carboxylic acids, ketones are released during decomposition. It would then impair the quality of CMM samples since they would smell distinct. The acid value is based on the quantity of potassium hydroxide required to neutralize one gram of free acids in one gram of fats, oils, or similar substances. Additionally, sodium hydroxide may be required.
   Procedure: The following procedure determines the acid value: Weigh precisely about 10 g of the substance in the 250 ml conical flask, add 50 ml of alcohol, and add 1 ml of phenolphthalein. Warm up on a water bath if necessary to dissolve the substance. Titrate with 0.1 N potassium hydroxide. Shake constantly until pink color is obtained. Note the number of ml required and calculate the acid value using the formula:
   Acid value = a x 0.00561 x 1000/W Where, a = number of ml of 0.1 potassium hydroxide required W = weight of g of substance taken.
   Saponification value: Principle*:* Saponification is the process of hydrolyzing fats or triglycerides by combining them with a strong alkali inorder to create glycerol and potassium salts of them. An excess of alcoholic KOH is refluxed with a known quantity of fat or oil. A titration against a standard acid determines the remaining KOH after saponification. Saponification number of fats or oils is determined by using the value obtained.
   Procedure: The amount of potassium hydroxide milligrams needed to neutralize fatty acid, as measured by the following procedure, is the saponification value. Include 40 grams of 20 m illiliters of potassium hydroxide should be combined with enough alcohol to generate 1000 milliliters. Let it sit for the entire night.
   Accumulate 4g of ghee into a 250 ml conical flask. Add the potassium hydroxide alcohol solution, connect it to the reflux condenser, and use another reflux condenser as a blank to add other reagents. on a water bath for one hour.
   Add 1 milliliter of phenolphthalein. Use o.5 N hydroxide acid to titrate. Make a note of the necessary milliliters and use the following formula to get the saponification value: Saponification value = (b-a) x28.05/W Where, W = weight in g of substance taken a = sample solution reading. b = blank solution reading.

   Ester value: Principle: Esters are saponified with potassium hydroxide when a substance has the esters of 1 gram of potassium hydroxide. Milligrams of potassium hydroxide must be added to one gram of oil sample in order to hydrolyze the esters. Separating the acid value from the saponification value is the ester value. Molecular weight is low in high ester values, while their ester content is high.

   Procedure: Calculate the ester value by subtracting the acid value from the saponification value: Ester value= Saponification value- Acid value

Figure 6. Observation of acid value determination of ghee

Result and discussion :

To guarantee that the created medicated kajal was superior, the assessment parameters listed below were carried out.

1. **Physical evaluation:** The final product has a distinctive smell and is shiny black.There was a silky texture.It has a semisolid consistency.

Sr. No.	Parameter	Observation
1.	Color	Black
2.	Odor	Characterstic odor
3.	Texture	Smooth
4.	Consistency	Semisolid

Table 2.Result of physical evaluation

2. **pH determination:** pH was measured by pH meter 3 times, the average pH assessed in below table:

Sr. No.	Measured pH
1.	7.18
2.	7.15
3.	7.20
Average	7+_10

Table 3. Result of pH determination

3. **Skin irritation test:** No irritation observed after application on the skin.
4. **Antimicrobial activity:** Antimicrobial activity was demonstrated by medicated kajal formulations that were prepared. Liquorice root extract and almond oil and coconut oil soot on copper plate was responsible for significant result of antimicrobial activity.
5. **Spreadability:** The prepared formulation has the best spreadability possible. Spreadability falls between 7.43+_0.233.The total obtained result shown in the table:

Sr.No.	Spreadability
1.	7.40+- 0.23
2.	7.59+-0.01
3.	8.0+-0.02
Average	7.66+-0.86

Table 4. Result of Spreadability measurement

6. **Stability studies:** No changes were observed in color, pH, odor, texture, or consistency during the 40°C and room temperature stability study.

Sr.No.	Parameter	At room temp.	At 40°C
1.	Color	No change	No change
2.	Odor	No change	No change
3.	Texture	No change	No change
4.	Consistency	No change	No change

Table 5. Result of Stability studies.

7. **Evaluation of base:**

Acid value: Acid value = a x 0.00561 x 1000/W

Where, a = number of ml of 0.1 potassium hydroxide required W = weight of g of substance taken.
Where, a is 3.5ml and W is 10
Acid value = 3.5 x 0.00561 x 1000/ 10
Acid value =1.96

Saponification value: Saponification value is calculated by using formula

Where, b is 57.8 and a is 24.1
Saponification value = (b-a) x28.05 /W
Saponification value = (57.8-24.1) x28.05 /4
Saponification value = 236.321

Ester value: Ester value= Saponification value- Acid value.

Saponification value: 236.321 and Acid value : 1.96
Ester value: 236.321-1.96=234.361

Herbal medicine kajal is made and assessed using many metrics. The results of the physical assessment test are displayed in Table No. 3 pH, Table No. 4 displays the spreadability result. The objective of this study was to develop a medicated herbal kajal using liquorice extract as a key ingredient, aiming to produce a safe and effective cosmetic product with potential antimicrobial and anti-inflammatory properties. The formulation process employed traditional and scientifically validated techniques to incorporate liquorice extract along with other beneficial herbal ingredients. Natural oils such as coconut oil, almond oil, and castor oil, combined with additives like vitamin E, glycerol, and ghee, were used to enhance the therapeutic properties and stability of the kajal. The method of collecting carbon black from burning oils and integrating the herbal extract reflects a blend of traditional practices and modern scientific understanding. Physical evaluation, including assessments of color, odor, texture, and consistency, confirmed that the formulated product met expected standards, exhibiting a shiny black color, characteristic odor, smooth texture, and semi-solid consistency. These attributes are crucial for user acceptance and satisfaction. Stability studies conducted at room temperature and 40°C indicated no significant changes in color, odor, texture, or consistency, suggesting a stable shelf life. Additionally, the skin irritation test showed no adverse reactions, affirming the product's safety for topical use. The spreadability test demonstrated that the kajal could be applied smoothly and evenly, essential for consumer satisfaction, with an average spreadability value of 7.66±0.86, ensuring uniform delivery of active ingredients. The acid value, saponification value, and ester value of the base (ghee) were within acceptable ranges, indicating good quality and stability of the fatty components used in the formulation. The development of a medicated herbal kajal using liquorice extract has shown promising results in terms of physical properties, antimicrobial activity, stability, and safety. These findings support the potential of this kajal as a cosmetic product with added therapeutic benefits. Future research should focus on in-depth studies of its anti-inflammatory properties and long-term stability to further validate its efficacy and safety for consumer use. This study contributes to the growing field of herbal cosmetics, highlighting the importance of integrating traditional knowledge with modern scientific approaches to create innovative and effective products.

Conclusion :

In conclusion, the successfully developed and evaluated a medicated herbal kajal incorporating liquorice extract, demonstrating its potential as a safe and effective cosmetic product with antimicrobial and anti-inflammatory properties. The formulation process, which combined traditional techniques and modern scientific methods, utilized beneficial herbal ingredients like coconut oil, almond oil, castor oil, vitamin E, glycerol, and ghee to enhance the kajal's therapeutic properties and stability. The physical evaluation of the kajal showed that it met the expected standards of color, odor, texture, and consistency, ensuring user acceptance and satisfaction. Stability studies indicated that the kajal maintained its quality at room temperature and 40°C, with no significant changes in its physical attributes, and the skin irritation test confirmed its safety for topical use.The spreadability test demonstrated that the kajal could be applied smoothly and evenly, an essential factor for both cosmetic appeal and therapeutic efficacy. The pH of the formulation was within the acceptable range, ensuring it is suitable for use around the eyes. Moreover, the base components, including the acid value, saponification value, and ester value, were found to be within acceptable ranges, indicating the stability and quality of the fatty components used in the formulation.Overall, the medicated herbal kajal with liquorice extract exhibited promising results in terms of physical properties, stability, safety and spreadability. These findings support its potential as a cosmetic product with added therapeutic benefits. Future research should focus on in-depth studies of its anti-

inflammatory properties and long-term stability to further validate its efficacy and safety for consumer use. This study contributes to the growing field of herbal cosmetics, emphasizing the importance of integrating traditional knowledge with modern scientific approaches to create innovative and effective products.

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