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Research Article

**FORMULATION AND EVALUATION OF A HERBAL LIP-  
LIGHTENING SCRUB****Ms.K.Manga<sup>1</sup>, Panjala Nithish<sup>2</sup>, Patlolla Bhavana<sup>3\*</sup>, Patnala Shivani<sup>4</sup>, Peraka Pavan Sai Balaji<sup>5</sup>, Pillalamarri Dharmateja<sup>6</sup>**<sup>1</sup> Assistant Professor, Department of Pharmaceutics, Malla Reddy College of Pharmacy, Dhulapally, Secunderabad-500100<sup>23456</sup> Department of Pharmaceutics, Malla Reddy College of Pharmacy, Dhulapally, Secunderabad-500100**Running Title:** Herbal Lip-Lightening Scrub Formulation**Conflict of Interest:** The authors declare that there is no conflict of interest.**Funding:** The authors received no specific funding for this research work.**Abstract:**

Lip hyperpigmentation is a common cosmetic concern associated with ultraviolet exposure, dehydration, smoking, and prolonged use of synthetic cosmetic products. Synthetic lip-lightening formulations may cause irritation and long-term adverse effects, necessitating safer herbal alternatives.

The present study aimed to formulate and evaluate a herbal lip-lightening scrub containing liquorice extract for the management of lip hyperpigmentation. Three formulations (F1, F2, and F3) were prepared using liquorice powder, beetroot powder, strawberry powder, beeswax, petroleum jelly, sesame oil, coconut oil, honey, vitamin E, and strawberry essence. The prepared formulations were evaluated for organoleptic properties, homogeneity, pH, spreadability, abrasiveness, washability, solubility, irritation test, moisturizing effect, microbial limit test, and stability for one month at room temperature.

All formulations showed uniform appearance, pleasant odor, and good homogeneity without phase separation. The pH values were found to be  $6.7 \pm 0.2$  (F1),  $6.4 \pm 0.1$  (F2), and  $6.1 \pm 0.1$  (F3), indicating compatibility with lip skin. Spreadability diameter was recorded as 5.8 cm (F1), 6.5 cm (F2), and 5.2 cm (F3), demonstrating satisfactory ease of application. Abrasiveness testing revealed gentle and non-irritant exfoliation in F1 and F3, while F2 showed mild exfoliation. All formulations were easily washable, with F2 and F3 leaving no residue. The irritation test showed no redness, itching, or discomfort in any formulation. Stability studies conducted for one month demonstrated no change in color, odor, or phase separation. Microbial limit testing showed absence of visible microbial growth in all formulations. Among the formulations, F3 exhibited better moisturizing effect with soft and hydrated lips after application.

The developed herbal lip-lightening scrub demonstrated satisfactory physicochemical properties, stability, safety, and effective moisturizing performance. The formulation, particularly F3, may serve as a safe and natural alternative to synthetic lip-lightening products for improving lip texture and pigmentation.

**Keywords:** Lip hyperpigmentation, Herbal lip scrub, Liquorice extract, Natural exfoliation, Cosmetic formulation.

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## INTRODUCTION:

This research article highlights the significance of organic ingredients in cosmetics, particularly in lip care products, emphasizing their safety over artificial alternatives. It outlines various lip problems such as chapping and discoloration, linking them to specific lip balm types including tinted, medicated, and organic options [1]. The global lip care market is projected to surpass \$2 billion, driven by consumer safety concerns and rising disposable incomes. The anatomical complexity of lips necessitates specialized cosmetic considerations, given their unique features. Additionally, the article discusses harmful ingredients found in some products and underscores the importance of moisturizing components like beeswax and natural oils [2]. It concludes with the need for cosmetic formulations that prioritize both aesthetic appeal and therapeutic effectiveness in maintaining healthy lips.

## MATERIALS AND METHODS:

### Materials

**Petroleum jelly:** Petroleum jelly is an emollient and occlusive agent derived from petroleum refining, commonly used in cosmetic and dermatological products. It prevents trans epidermal water loss, keeping skin and lips moist, while also aiding in healing dry or cracked lips by enhancing the skin's barrier function [3]. Non-irritant and non-comedogenic, it is safe for topical use and acts as an effective moisture-retaining hydrophobic barrier, making it essential in lip care formulations.

**Beet root powder:** Beet root powder (*Beta vulgaris*) is a natural ingredient known for its rich content of betalains, antioxidants, vitamins A and C, and minerals. It is commonly utilized in herbal cosmeceuticals for its coloring properties, improving blood circulation to the lips, enhancing their appearance by reducing pigmentation, and offering antioxidant protection [4]. In lip scrubs, it provides mild exfoliation, a pink/red tint, and serves as a natural cosmetic stain while neutralizing free radicals to prevent premature aging and darkening of the lips.

**Strawberry powder:** Various active compounds, such as ellagic acid, alpha hydroxy acids (AHAs), and vitamin C, play an important part in formulating products for the skin. AHAs help gently exfoliate the dead skin cells on the lips by dissolving their connections to one another. Ellagic acid acts as an antioxidant that protects collagen from degradation, and vitamin C brightens the skin [5]. In addition to these, strawberry powder contains AHAs, vitamin C, and antioxidants to help with exfoliation while promoting new cell growth; thus, increasing the smoothness, softness, and brightness of the lip area and providing them with a pleasant scent.

**Liquorice powder:** The powder derived from licorice root (*Glycyrrhiza glabra*) contains active ingredients, including glabridin and liquiritin, that can help lighten and depigment the skin. These compounds inhibit the activity of the enzyme tyrosinase, which is responsible for producing melanin. In addition to its skin-lightening abilities, licorice provides anti-inflammatory and antioxidant properties, making it safe to use on the sensitive skin of the lips [6]. When used in herbal lip scrubs, licorice can help to reduce hyperpigmentation on the lips by inhibiting melanin production and assisting with the elimination of already present discoloration caused by smoking, sun exposure, or genetics.

**Sesame oil:** Active ingredients in sesame oil (which is derived from the seeds of a plant called *Sesamum indicum*) like vitamin E and lignans (the two types of lignans in sesame oil are sesamin and sesamol) promote healthy skin by assisting in repairing the skin's barrier and providing protection against UV radiation. The deep absorption of antioxidants (the primary antioxidant in sesame oil is sesamol) provides nourishment to the skin and makes the skin feel soft, while also helping the absorption of other active ingredients [7]. As a natural UV filter, sesame oil can help prevent sun-induced darkening of lip skin (hyperpigmentation), and can also help improve both the spread ability of a product and moisturize skin when used in cosmetic products.

**Castor oil:** Castor oil (from the *Ricinus communis* plant) is mainly made up of 90 percent ricinolein acid and is used in cosmetics (lip products) because of its emollient properties and ability to enhance the penetration of other ingredients into the skin. Due to the viscosity of Castor Oil, it produces a glossy effect for an extended period of time while providing hydration and moisture retention [8]. Castor Oil also helps to heal dry, chapped lips and improves the texture and gloss in lip scrubs.

**Bees wax:** The honeybee produces beeswax, a natural wax that is used in cosmetics such as lip scrubs for its stiffening and binding properties. Beeswax contributes to a solid product form, consistent texture, moisture retention, and a protective barrier against dryness. It also enhances stability and sensory feel, resulting in a creamy texture. Its active components, including esters and long-chain fatty acids, allow it to function as a rheology modifier and protective barrier [9], creating a breathable film that prevents fat transfer and chapping while safeguarding the formulation from environmental damage.

**Honey:** Honey can be considered to be an active compound in lip scrubs. It is a humectant (draws moisture) and mild enzyme-based exfoliant (removes dead cells). By attracting moisture to the

lips, honey will help to keep your lips moist and prevent them from getting dry. In addition, honey contains enzymes, which will provide a gentle way to exfoliate your lips; furthermore, honey contains antibacterial properties which can help to soothe and heal cracked lips [10]. In other words, honey has three components that enhance moisturizing qualities, improve lip texture, and increase the overall acceptability of herbal formulations.

**Rose oil:** Active ingredients such as Citronellol, Geraniol and Nerol are present in combination with Rose Oil, which acts as an essential oil for adding fragrance, along with providing anti-inflammatory properties [11]. Rose Oil helps to calm irritated lips from the mild amount of micro-trauma caused by scrubbing and replaces the “raw”/natural scents of the other ingredients with a floral fragrance, thereby increasing consumer acceptance of the lip scrub.

Liquorice powder (*Glycyrrhiza glabra*), beetroot powder (*Beta vulgaris*), and strawberry powder (*Fragaria × ananassa*) were procured from a local herbal supplier, Secunderabad, Telangana, India. Beeswax and petroleum jelly (pharmaceutical grade) were obtained from a certified pharmaceutical raw material supplier, Hyderabad, India. Coconut oil and sesame oil (cold-pressed grade) were purchased from an authorized organic vendor. Honey and vitamin E capsules were obtained from a local pharmacy. Strawberry essence was procured from a cosmetic raw material supplier. Ethanol (70%) used for extraction was of analytical grade.

All reagents and chemicals used in the study were of analytical grade and used without further purification. The apparatus employed included borosilicate beakers, measuring cylinders, thermometer, water bath, glass rod, electronic weighing balance, sieve (#60), and airtight lip scrub containers.

#### Method Of Preparation:

##### Extraction Of Liquorice Powder

Dried liquorice roots were thoroughly washed to remove dirt and impurities, then allowed to dry in

shade. The roots were coarsely powdered using a mortar and pestle, and 10 g of the powdered root was transferred into a clean conical flask. To this, 100 mL of 70% ethanol was added, maintaining a 1:10 ratio of root powder to solvent. The flask was sealed and allowed to stand at room temperature for 48 hours, with gentle shaking 2–3 times daily to enhance extraction. After maceration, the mixture was filtered through Whatman filter paper to remove insoluble matter. The filtrate was then concentrated on a water bath at temperatures not exceeding 40 °C to obtain a semi-solid extract. The concentrated extract was subsequently dried in a hot air oven or freeze-dryer to yield liquorice powder, which was transferred to an airtight container and stored, until it is used in the lip balm formulation.

##### Extraction Of Beetroot Powder

Fresh beetroot was thoroughly washed, peeled, and chopped into small pieces. The pieces were crushed into a coarse pulp using a blender or mortar and pestle. 10 grams of the pulp were transferred into a conical flask and macerated with 100ml of 70% ethanol at room temperature for 24–48 hours with occasional shaking to facilitate extraction. The mixture was then filtered through Whatman filter paper to remove insoluble matter, and the filtrate was concentrated on a water bath at temperatures not exceeding 40 °C to obtain a thick liquid extract. The concentrated extract was subsequently dried in a hot air oven or freeze-dryer to yield beetroot powder, which was stored in an airtight container for further use in cosmetic formulations such as lip balm.

##### Extraction Of Strawberry Powder

Fresh strawberries were washed, de-stemmed, and crushed into a coarse pulp. The pulp (100 g) was macerated with 1 L of 70% ethanol for 24–48 hours at room temperature with occasional shaking. The mixture was filtered, and the filtrate was concentrated on a water bath at temperatures not exceeding 40 °C to obtain a thick liquid extract. The concentrated extract was then dried in a hot air oven or freeze-dryer to yield strawberry powder, which was stored in an airtight container for use in cosmetic formulations.

Table 1: Ingredients and Uses of lip lightening scrub

Ingredients	F1	F2	F3	Uses
Petroleum jelly	7.5	7.0	6.0	Occlusive
Beeswax	3.0	3.0	3.0	Binder
Sesame oil	2.5	1.5	2.0	Emollient
Coconut oil	2.5	1.5	2.0	Moisturizer
Vitamin E	0.2	0.2	0.2	Antioxidant
Liquorice extract	0.2	2.5	3.0	Depigmenting
Beetroot extract	0.8	1.3	1.3	Colorant
Strawberry extract	0.8	1.3	1.3	Exfoliant

Honey	0.5	0.5	0.5	Humectant
Strawberry essence	q.s	q.s	q.s	Flavouring agent

## PROCEDURE

All glassware and containers were washed, dried, and sanitized using 70% ethanol before use. Beeswax, petroleum jelly, coconut oil, and sesame oil were accurately weighed using a digital balance and transferred into a clean, dry borosilicate beaker. The beaker was placed on a water bath (double boiler) and heated gradually to 65–70 °C with continuous stirring using a glass rod until all ingredients melted completely and a clear uniform base was obtained. The molten base was removed from the water bath and allowed to cool to 40–45 °C. At this temperature, vitamin E was added and mixed thoroughly for 2 minutes, followed by the addition of honey with continuous stirring until a smooth mixture was formed. Licorice powder, beetroot powder, and strawberry powder were passed through a #60 sieve and mixed uniformly in a separate mortar. The herbal powder mixture was slowly added to the base at 35–40 °C with continuous stirring to ensure uniform dispersion and to avoid lump formation. Strawberry essence was added dropwise at a temperature below 35 °C and mixed gently for 1–2 minutes. The prepared lip scrub was poured into clean, sterilized containers while still in a semi-fluid state (30–35 °C). The containers were allowed to cool and solidify at room temperature (25 ± 2 °C), sealed, and labeled.

### Evaluations For Herbal Lip-Lightening Scrub

**Organoleptic evaluation:** The formulations were examined visually and by manual perception for color, odor, texture and general appearance; observations were recorded as part of the primary quality check for consumer acceptability. [12]

**Homogeneity:** A small quantity of each formulation was inspected and rubbed between the fingers and observed under normal light to detect any grittiness, lumps, or phase separation, ensuring uniform distribution of ingredients. [13]

**pH determination:** The pH of each formulation was measured using a calibrated digital pH meter after dispersing a fixed amount in distilled water; values were recorded to ensure compatibility with the natural pH range of lip/perioral skin. [14]

**Spreadability (wettability/ease of application):** Spreadability was measured by placing a specified amount of formulation between two glass slides, applying a standard weight for a fixed time, and measuring the diameter (or using a parallel-

plate/slip-and-drag method); spread diameter (or spreadability index) was recorded. [15]

**Abrasiveness:** The exfoliating/abrasive action of the scrub particles was assessed by gently rubbing a small quantity on the forearm skin and observing the intensity of exfoliation (subjective scoring for mild/moderate/heavy abrasion) to confirm effective but non-traumatic exfoliation. [16]

**Washability:** Washability was evaluated by applying the formulation to skin, rinsing with tap water (and mild soap for an exaggerated wash test where applicable), and scoring the ease of removal and presence/absence of residual greasy stickiness. [17]

**Solubility test:** Small amounts of the formulation were placed in separate test tubes with distilled water and with methanol (or other relevant solvents), shaken, allowed to stand, and observed for dispersion/solubility behavior and phase separation. [18]

**Irritation test:** A patch/skin-application test was carried out by applying a small quantity of formulation to a limited area of skin (inner forearm) and observing at defined intervals (e.g., 1, 24, 48 h) for any signs of erythema, edema, itching or other adverse reactions; absence of reaction indicated good topical tolerance. [19]

**Stability study:** Samples were stored at ambient room temperature and examined periodically (e.g., day 0, 7, 14, 30) for any physical changes such as color, odor, texture, and phase separation; data were recorded to assess short-term physical stability. [20]

**Moisturizing effect:** After application, the test area was visually and manually assessed for immediate and short-term changes in softness, smoothness and perceived hydration; subjective improvement in lip hydration/softness was recorded. [21]

**Microbial limit test:** The formulations were tested for microbial contamination using standard pharmacopeial methods (total aerobic microbial count, yeast and mold count and absence of specified pathogens) and compared with accepted microbial limits for topical/cosmetic products. [22]

## RESULTS AND DISCUSSIONS:

### 1. Organoleptic properties :

Organoleptic evaluation was carried out to assess the physical characteristics of the formulations such

as color, odor, appearance, and texture, which influence patient acceptability.

Table 3: Homogeneity

Table 2: Organoleptic evaluation

Formulation	Observation		
F1	Homogeneous, slight graininess		
F2	Homogeneous, no lumps		
F3	Homogeneous, uniform particles		
EVALUATION PARAMETERS	F1	F2	F3
COLOUR	Light brown	Dark brown	Light pink
ODOUR	Pleasant	Pleasant	Pleasant
TEXTURE	Slightly coarse	Moderate coarse	smooth
APPEARANCE	Uniform	Uniform	Uniform

## 2. Homogeneity :

All formulations (F1, F2, and F3) were found to be **homogeneous**, with uniform distribution of herbal ingredients and no visible lumps or phase separation.



Figure 1: Homogeneity

## 3. pH Determination:

The pH of the formulations was determined to ensure compatibility with the lip skin and to avoid irritation upon application.

Table 4: pH Determination

Formulation	pH(Mean $\pm$ SD)
F1	6.7 $\pm$ 0.2
F2	6.4 $\pm$ 0.1
F3	6.1 $\pm$ 0.1



Figure 2: pH Determination

## 4. Spreadability:

Spreadability was evaluated to determine the ease with which the lip scrub spreads on the lip surface with minimal effort.

Table 5: Spreadability

Formulation	Spread diameter (cm)	Inference
F1	5.8	Good
F2	6.5	Moderate
F3	5.2	Very good

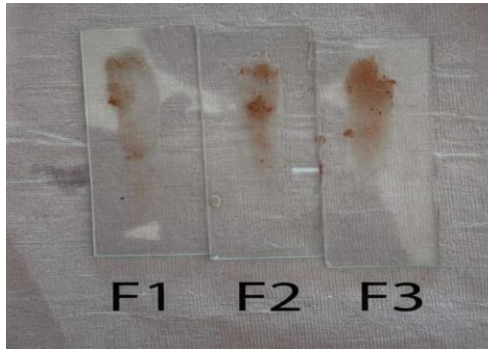


Figure 3: Spreadability

### 5. Abrasiveness:

Abrasiveness was assessed to evaluate the exfoliating strength of the scrub and to ensure gentle removal of dead skin without causing damage.

Table 6: Abrasiveness

Formulation	Observation
F1	Gentle, non-irritant
F2	Mild exfoliation
F3	Gentle, non-irritant



Figure 4 :Abrasiveness

### 6. Washability:

All formulations were **easily washable with normal water** without leaving greasy residue.

Table 7: Washability

Formulation	Observation
F1	Washable with slight residue
F2	Easily washable
F3	Easily washable

### 7. Solubility test

Table 8: Solubility test

Solvent	Observation
Distilled Water	Insoluble; formulation remained undissolved
Methanol	Partially soluble; slight dispersion observed



Figure 5: Solubility in water

Figure 6: Solubility in methanol

**8. Irritation Test:**

The irritation test was performed to evaluate the safety of the formulations on the lip skin. No redness, itching, or discomfort was observed after application

Table 9: Irritation Test

Formulation	Skin reaction
F1	No irritation
F2	No irritation
F3	No irritation

**9. Stability Study (1 month):**

All formulations were stored at room temperature and observed over the study period.

Table 10: Stability Study

Parameter	F1	F2	F3
Color change	No	No	No
Odor change	No	No	No
Phase separation	No	No	No

**10. Moisturizing Effect:**

The moisturizing effect was evaluated to assess the ability of the lip scrub to hydrate and soften the lips after use.

Table 11: Moisturizing Effect

Formulation	Observation
F1	Lips soft
F2	Moderate moisturization
F3	Lips soft and hydrated

**11. Microbial test :**

The microbial limit test was performed on lip scrub formulations F1, F2, and F3 using standard microbiological procedures. After incubation for the specified period, all test samples were observed for microbial growth.

No visible microbial colonies were detected in any of the tested formulations. The total viable count for bacteria and fungi was found to be within permissible limits.

Table 12: Microbial test

Formulation	Bacterial Growth	Fungal Growth	Observation
F1	Absent	Absent	No microbial contamination
F2	Absent	Absent	No microbial contamination
F3	Absent	Absent	No microbial contamination

**CONCLUSION:**

The present research work was aimed at the formulation and evaluation of a herbal lip lightening lip scrub using natural and safe ingredients such as liquorice, beetroot powder, strawberry powder, sesame oil, coconut oil, honey, and vitamin E. Three different formulations (F1, F2, and F3) were developed by varying the concentration of the base and active components to obtain an effective and cosmetically acceptable product.

Based on its balanced consistency, good spreadability, pleasant sensory qualities, and uniform dispersion of herbal powders, Formulation F3 was determined to be the most appropriate and optimum formulation out of the three. While liquorice effectively lightened the lips, the higher concentration of beetroot and strawberry powders in F3 contributed to improved antioxidant activity, gentle exfoliation, and natural pigmentation. Sesame oil, coconut oil, honey, and vitamin E provided the lips with nourishment and protection, while beeswax and petroleum jelly guaranteed proper occlusiveness and moisture retention.

Formulation F2 showed excessive greasiness due to a higher concentration of petroleum jelly, which adversely affected spreadability and user acceptability. Formulation F1, although stable, contained lower concentrations of herbal actives compared to F3, resulting in comparatively reduced efficacy.

Therefore, based on overall evaluation parameters, Formulation F3 was selected as the best formulation. The study concludes that the developed herbal lip lightening scrub is safe, effective, economical, and suitable for cosmetic application, offering a natural alternative to synthetic lip care products.

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**REFERENCES:**

1. Visht S. Formulation and evaluation of lip balm using different herbal pigments. *Pharmacogn Res.* 2024 Apr 20.
2. Yadav A, Karmokar K, Gop R, Mudartha D, Maheshwari V. Formulation and evaluation of herbal lip balm from amaranth leaf colour pigment. *Int J Res Appl Sci Eng Technol.* 2020 Jun;8(6):653-2.
3. Mishra I, Jyoti S, Singh RK, Tanniru R, Rao CM. Formulation and evaluation of a

polyherbal lip balm. *Int J Pharmacogn.* 2025;12(8):668-86.

4. Patil A, Gadge S, Yeskar M, Maggidwar S, Indurwade N. Formulation and evaluation of herbal lip scrub by using beetroot. *Int J Sci Res Technol.* 2025 Mar 5.
5. Gyawali R, Paudel PN. Herbal remedies in cosmeceuticals formulation: A review on Nepalese perspectives. *Annapurna J Health Sci.* 2022 Mar 6;2(1):59-65.
6. Stiani SN, Yusransyah Y, Septiana D, Sumantri IB. Effectivity and evaluation of licorice root (*Glycyrrhiza glabra*) extract serum formula as a facial brightening. *Res J Pharm Technol.* 2024 Sep 1;17(9):4142-8.
7. Waykule N, Bagewadikar P, Kale S. Formulation and evaluation of lip balm by using honey and sesame oil to lighten the dark lips. *World J Pharm Res.* 2022 Mar 24;11(6):710-22.
8. Veludurthi PA, Vadaga AK. A comprehensive review of formulations, ingredients, advances, and future perspectives in lipcare cosmetics. *J Pharma Insights Res.* 2024 Jun 8;2(3):123-8.
9. Talreja S. The development and evaluation of a herbal lipstick formula utilizing various extracts. Zenodo (CERN European Organization for Nuclear Research); 2023 Jul 19.
10. Ramadianti S, Supardi S, Teheni MT. Making lipscrub with honey moisturizing active ingredients and natural exfoliating coffee grounds for dry lip treatment. *Int J Multidiscip Learn.* 2025 Apr 30;1(4):27-33.
11. Qureshi MN, Patel SM, Shaikh SA. Formulation and development of herbal rose lip balm. *J Adv Future Res.* 2025 Nov;3(11):570-9.
12. Ilieva GIT, et al. Stability of organoleptic agents in pharmaceuticals and cosmetics. 2016. Available from: [https://www.researchgate.net/publication/319659075\\_Stability\\_of\\_Organoleptic\\_Agents\\_in\\_Pharmaceuticals\\_and\\_Cosmetics](https://www.researchgate.net/publication/319659075_Stability_of_Organoleptic_Agents_in_Pharmaceuticals_and_Cosmetics)
13. Marianni B, et al. Ensuring homogeneity in powder mixtures for pharmaceutical applications. *Pharmaceutics.* 2021;13(4):563. Available from: <https://www.mdpi.com/1999-4923/13/4/563>
14. Lukić M, Čabrijan M, Gruić A. Towards optimal pH of the skin and topical formulations. *Cosmetics.* 2021;8(3):69. Available from: <https://www.mdpi.com/2079-9284/8/3/69>
15. Al-Barghouthy EY, et al. Comparative evaluation of spreadability measurement techniques for topical formulations. *Polymers.* 2025;11(12):1006. Available from: <https://www.mdpi.com/2310-2861/11/12/1006>
16. Herdianty J, Wijayanto A. Variations in the type of abrasive material used in body scrub preparations on the evaluation of the preparation. *Strada J Pharm.* 2021;3(2):58-61.

- Available from: <https://thesjp.org/index.php/SJP/article/view/141>
17. Igielska-Kalwat J, et al. In vivo studies of substances used in the cosmetic industry: methods and recommendations. *Int J Cosmet Sci.* 2016. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4969411/>
  18. Dow Development Labs. What is the purpose and approach to solubility studies? 2019. Available from: <https://www.dowdevelopmentlabs.com/ask-a-formulator-what-is-the-purpose-and-approach-to-solubility-studies/>
  19. Organisation for Economic Co-operation and Development (OECD). Test No. 404: Acute dermal irritation/corrosion. OECD Guidelines for the Testing of Chemicals, Section 4: Health Effects. 2015. Available from: <https://www.oecd.org/environment/test-no-404-acute-dermal-irritation-corrosion-9789264242678-en.htm>
  20. Ilieva GIT. Stability of organoleptic agents in pharmaceuticals and cosmetics. 2017. Available from: [https://www.researchgate.net/publication/319659075\\_Stability\\_of\\_Organoleptic\\_Agents\\_in\\_Pharmaceuticals\\_and\\_Cosmetics](https://www.researchgate.net/publication/319659075_Stability_of_Organoleptic_Agents_in_Pharmaceuticals_and_Cosmetics)
  21. Lin TK, Zhong L, Santiago JL. Anti-inflammatory and skin barrier repair effects of topical application of some plant oils. *Int J Mol Sci.* 2018;19(1):70. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5796020/>
  22. Halla N, et al. Cosmetics preservation: a review on present strategies. *Cosmetics.* 2018. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6099538/>