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Formulation and Evaluation of Topical cream containing Kewda Extract for Antifungal Potential

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ABSTRACT:

Topical antifungal creams are widely used to treat fungal infections that affect the skin, nails, and scalp. These creams have evolved from early remedies, which laid the groundwork for modern antifungal treatments. Among the natural ingredients explored for their medicinal properties, *Pandanus odorifer*, commonly known as Kewda, has gained significant attention. This aromatic plant, belonging to the *Pandanaceae* family, is not only valued for its industrial and aromatic uses but also for its therapeutic potential. The therapeutic benefits of Kewda flowers are attributed to their rich phytochemical content, which includes bioactive compounds such as terpenes and phenolic substances, known for their medicinal properties. In addition to its therapeutic uses, the essential oil derived from Kewda flowers has long been utilized in perfumery and culinary applications. Recent scientific studies have further validated the traditional claims of Kewda's antifungal properties. Research indicates that Kewda extracts, particularly its essential oils, are effective in combating dermatophytes—fungal pathogens that cause infections. Beyond its antifungal activity, Kewda flowers also exhibit anti-inflammatory, antioxidant, and antimicrobial properties, highlighting their broad medicinal potential. To harness these properties, the Kewda flower was subjected to a maceration extraction process to obtain its bioactive extract. This extract underwent various tests, including microbial and phytochemical analyses, to confirm its efficacy and composition. Using this extract, antifungal creams were formulated with ingredients such as mineral oil, stearic acid, methylparaben, xanthan gum, sorbitol, and flavouring agents. The Kewda flower extract was incorporated into these formulations in varying concentrations to develop three distinct prototypes. Each formulation was carefully evaluated to identify the most optimized version. Key parameters such as content uniformity, spreadability, viscosity, pH, and homogeneity were assessed to ensure the cream's quality and stability. Additionally, microbial evaluation tests were conducted on the Kewda extract to determine its antifungal effectiveness, indicated by the zone of inhibition against fungal pathogens. Through this process, one optimized formulation was selected, demonstrating the potential of Kewda flower extract as a key ingredient in effective topical antifungal treatments. This approach bridges traditional knowledge with modern pharmaceutical practices, offering a natural alternative for managing fungal infections.

Key words: Topical antifungal cream, *Pandanus odorifer*,

Introduction:

Fungal infections (also called mycoses) represent the invasion of tissues by one or more species of fungi which may cause superficial, localized, deeper tissue infections to serious lung, blood (septicaemia) or systemic diseases. Some fungi are pathogenic, causing disease whether the immune system is healthy or not.[1]

Several antifungal agents are available on the market in different topical preparations (e. g., creams, ointments, and powders for the purpose of local dermatological therapy). One of these antifungal agents is chlorphenesin (CHL), which has both anti-fungal and antibacterial properties. It is applied locally in mild uncomplicated dermatophyte and other cutaneous infections.[2, 3]

Pandanus odoriferous (Forssk.) Kuntze, (Screwpine), an industrially important aromatic plant commonly known as kewda, belongs to the family Pandanaceae. In India, the plant is distributed in two biogeographic zones: the Western Ghats zone and the coastal zone. The coastal areas of the Ganjam district of the Orissa state are the luxuriant growth centres of the plant.[4] Andhra Pradesh, Tamil Nadu, and to some extent in parts of Uttar Pradesh.[5]

The major active components of the hydro distilled kewda oil were 2-phenyl ethyl methyl ether, terpinen-4-ol, α-terpineol and 2-phenyl ethyl alcohol, benzyl benzoate, viridine and germacrene B (8.3%).[6]

And also, it contains phytochemicals such as lignans and isoflavones, as well as coumestrol, alkaloids, steroids, carbohydrates, phenolic compounds, glycosides, proteins, amino acids, vitamins, and minerals.[7]

A cream is a thick, smooth substance made up of a mixture of two phases: one phase is spread out in the other. It contains one or more active ingredients, either dissolved or mixed in the cream. Depending on how the ingredients are mixed, a cream can be either an oil-in-water cream (where oil is spread in water) or a water-in-oil cream (where water is spread in oil). [8 -9]

A typical topical cream formulation contains an active pharmaceutical ingredient (API) mixed in a base, usually an emulsion of either oil-in-water or water-in-oil. The base is made up of various ingredients like emulsifiers, stabilizers, preservatives, and humectants that help

improve the cream's ability to penetrate the skin and maintain stability. Common excipients used include water, oils, emulsifiers, and thickening agents. This combination ensures the cream delivers the API effectively while preserving its texture, ease of application, and shelf- life. [10]

Topical treatments for skin fungal infections are typically made in the form of creams, lotions, or gels.[11] These treatments can either kill the fungi (fungicidal) or prevent their growth (fungistatic), depending on the specific medication used. Topical antifungal agents are often preferred because they generally have fewer side effects compared to oral medications. [12 ,13]

Materials and methodology:

Ingredients	Uses
Kewda flower extract	Antifungal agent
Mineral oil	Emollient
Stearic acid	emulsifier
Sorbitol	Humectant
Xanthan gum	Thickener
Alcohol	Diluent
Methyl paraben	Preservative
Lavender oil	Flavoring agent

Methods :

Maceration is a process in which a substance, typically plant material, is soaked in a liquid solvent to soften it and extract its soluble components. The technique allows the solvent to penetrate the material, dissolving and extracting desired compounds such as Flavors, colours, or active ingredients, commonly used in pharmaceuticals, cosmetics, and food industries. [14]

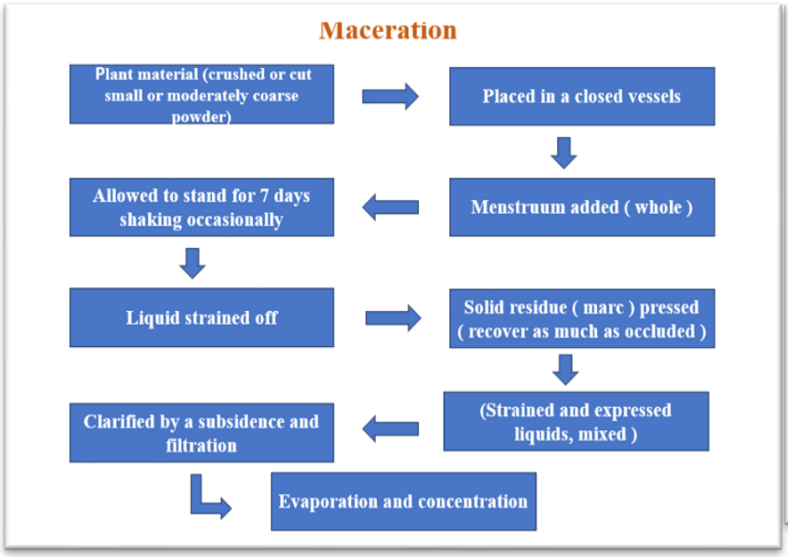


Fig. no. 01: Maceration process

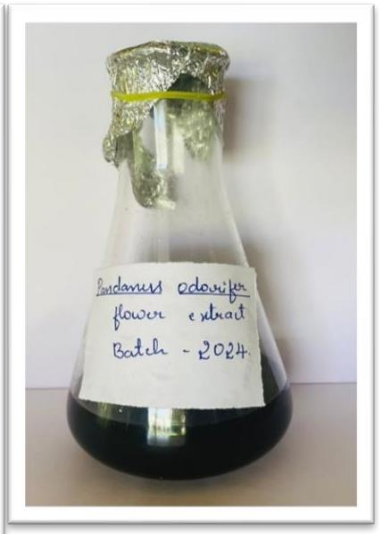


Fig. no. 02: kewda flower extract

Phytochemical screening Test for benzyl benzoate :

1. NaOH Test: Add a small amount of benzyl benzoate to a test tube and Add a few drops of sodium hydroxide (NaOH) solution. A white precipitate indicates the presence of benzyl benzoate.
2. FeCl3 Test: Dissolve a small amount of benzyl benzoate in a test tube with a suitable solvent like ethanol and Add a few drops of iron (III) chloride (FeCl3) solution. A colour change, usually to a violet or purple colour, indicates the presence of benzyl benzoate.

Tests for terpenoids

1. **Chloroform Test**

Take a small quantity of the plant extract in a test tube, add a few drops of chloroform to the extract, Shake the mixture well and allow it to settle and observe the appearance of a greenish colour at the interface, indicating the presence of terpenoids.

2. Sulfuric Acid Test

Take a small quantity of the plant extract in a test tube and Add a few drops of concentrated sulfuric acid carefully along the side of the test tube. Observe the formation of a reddish-brown colour at the interface, indicating the presence of terpenoids.

3. Fehling's Solution Test

Take a small quantity of the plant extract in a test tube, add an equal volume of Fehling's solution A and B. Heat the mixture in a water bath for a few minutes, Observe the formation of a brick-red precipitate, indicating the presence of terpenoids.

Method of formulation

The preparation process involves cleaning and sterilizing all equipment and containers, heating the oil phase ingredients, and the water phase ingredients separately. The water phase is then gradually combined with the oil phase while stirring continuously. After cooling the mixture to 40°C, preservatives and flavoring agents are added, followed by measuring the pH of the cream conducting evaluation tests**.**

Pictorial representation of formulating the cream

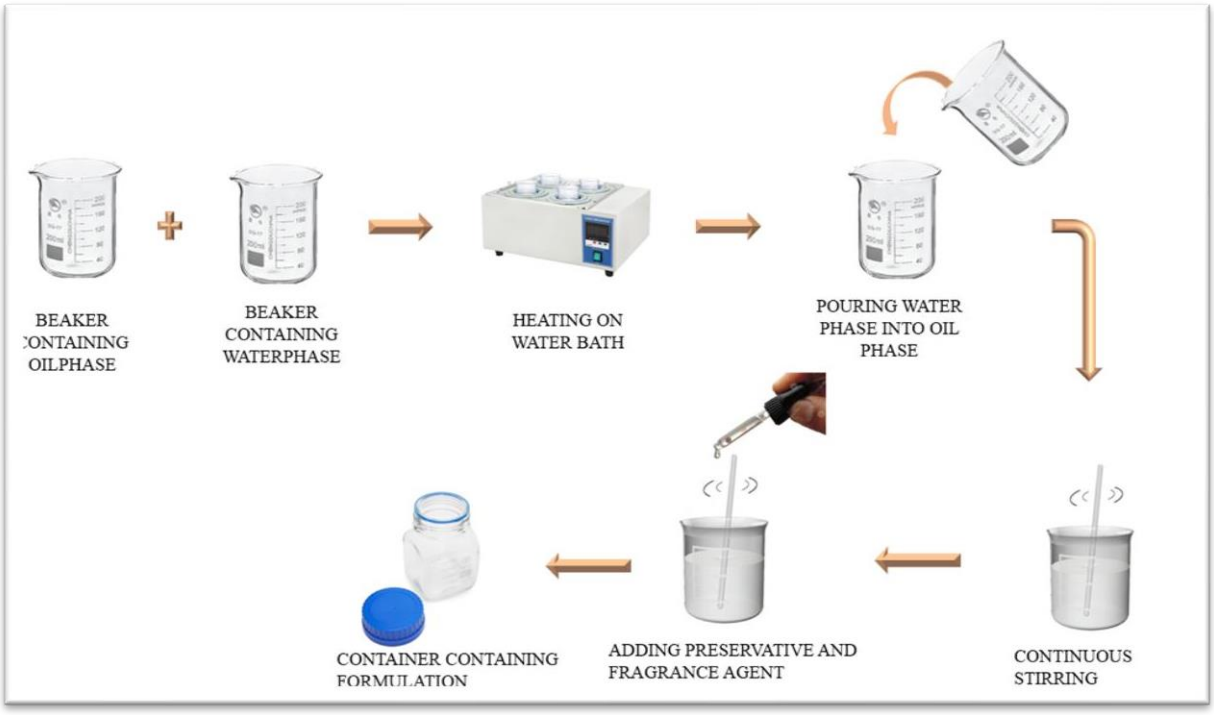


Table II: Different Formulations of antifungal cream.

Ingredients	Quantity taken(gm)		
	F-1	F-2	F-3
Kewda	0.4	0.4	0.4
Xanthan gum	0.1	0.3	0.1
Sorbitol	0.6	0.5	0.6
Alcohol	1	1	1
Water	Qs	Qs	Qs
Mineral oil	2	1	2
Steric acid	1	1	1
BHA	0.2	0.25	0.3
Lavender oil	0.2	0.3	0.4
Methyl paraben	0.04	0.04	0.04

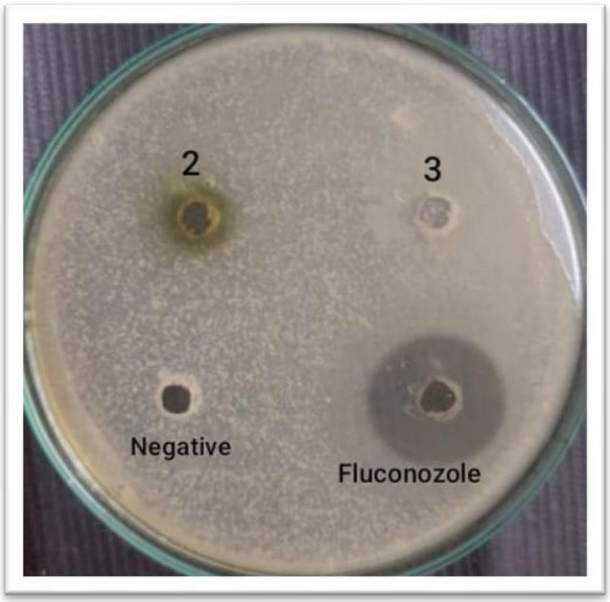
Determination of fungal growth:

Preparation of Saburou dextrose Agar Plates: Suspend 65.0 grams in 1000 ml distilled water. Heat to boiling to dissolve the medium completely. Autoclave at 15 lbs. pressure (121°C) for 15 minutes. Cool to 45-50°C.Mix well and pour into sterile Petri plates or test tubes. Store prepared SDA plates or tubes at 2-8°C until any defects appear on them.

Determination of zone of inhibition: For the Prepared Sabouraud dextrose Agar Plates, place 1gm of Formulated Creams. For the same plate inoculate *Candida albicans* and allow it to grow for 6 days and measure its zone of inhibition with Zone reader and note the values. [15,16]

S-2 showed 10 mm zone of inhibition, whereas no zone of inhibition was seen for S-3 at the tested concentration. Antibiotic showed 22 mm zone of inhibition.

Fig no. 03: Anticandida activity of sample 2 &3.



S-1 showed 1mm zone of inhibition , S-4 and S-5 showed no zone of inhibition.

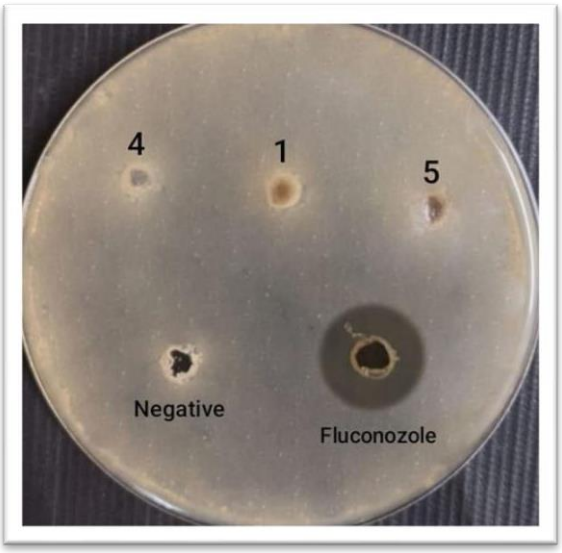
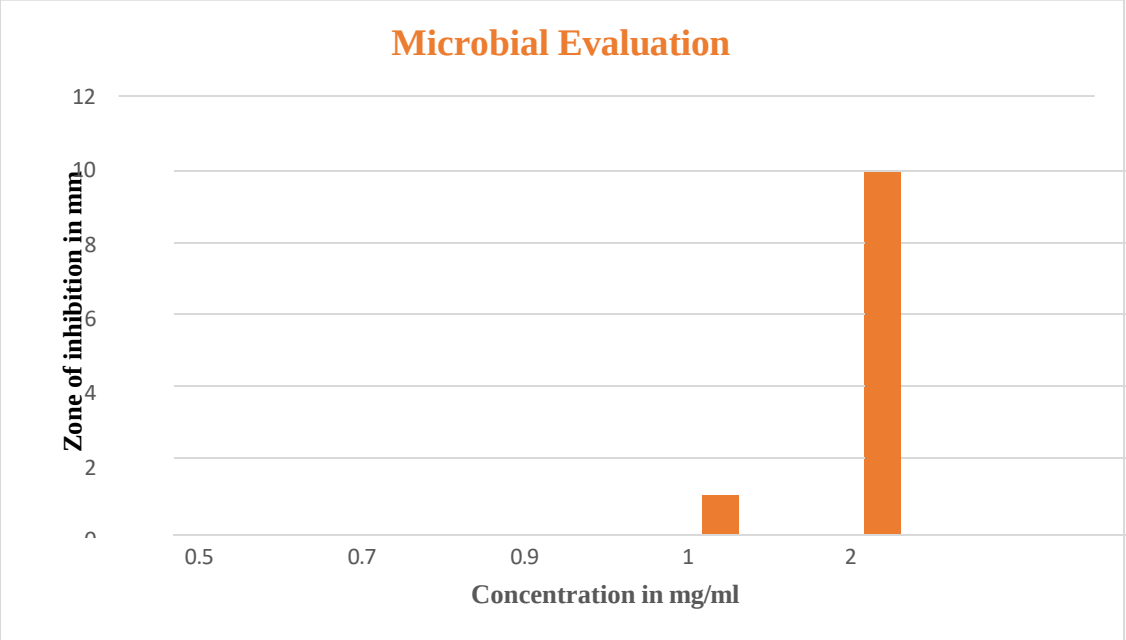


Fig. no. 04: Anticandida activity of sample 1, 4 & 5.

Table II: table showing the zone of inhibition for the different concentration of extract.

Sample number	Concentration in mg/ml	Zone of inhibition in mm
1	1	1
2	2	10

3	**0.5**	**0**
4	**0.7**	**0**
5	**0.9**	**0**



Graphical representation showing microbial ecvaluation.

pH: 5gm of the formulated cream was mixed in 50 ml distilled water and measured by using pH meter at 27°C.[17]

Procedure for pH measurement: The calibration of a pH meter is done using buffer solutions with pH values of 7.00, 4.00, and 9.20. This ensures the proper performance of the pH electrode. Before use, both the electrode and the temperature probe are cleaned with deionized water and gently wiped with soft tissue paper. The electrode is then immersed in the solution containing the sample, and the pH mode key on the instrument is pressed. The pH reading will be displayed on the instrument's screen. If necessary, the reading is saved, and it can be printed using a connected printer. After the measurement, the electrode and temperature probe are cleaned again with distilled water, wiped gently with tissue paper, and the instrument is reset for the next use.

Table III: pH test results

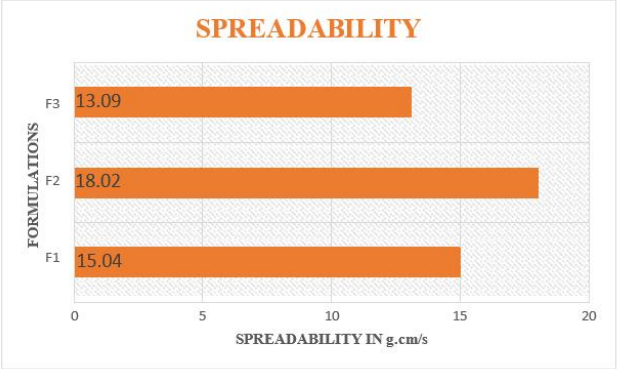
Sl. No	Formulation	pH
01	I	6.10
02	II	6.31
03	III	6.24

Viscosity: The viscosity of the herbal cream was determined by Brookfield viscometer using RV spindle no 96 at 20 rpm at temperature 25^{0}C. About 15ml of the was taken in beaker and spindle was immersed in the formulation. The reading was recorded at initial and after rotation at different temperature. The reading was recorded thrice.[18]

Spread ability: The cream is spread on hand by cotton and checked whether it easily spread. Then Prepare the clean glass slides and add measured amount of skin toner (1ml), and place it between the slides, spread the toner evenly using gentle pressure, separate the slides and measure the spread diameter.

Table IV: Spread ability test results.

Sl no.	Formulations	Spredeability in g.cm/s
1	F1	15.04
2	F2	18.02
3	F3	13.09



Graphical representation showing spreadability of different formulations

TEST FOR CONTENT UNIFORMITY

a) Sample Preparation: Accurately weigh a specific amount of the cream (e.g., 1 g) from different portions of the batch. Dissolve the weighed sample in a suitable solvent, such as methanol or another extraction solvent, to extract the active ingredient.
b) Filtration: Filter the solution to remove any undissolved particles or excipients
c) Dilution: Dilute the filtered solution to a known volume using the solvent, ensuring that the concentration of the active ingredient falls within the detection range of the assay method (e.g., UV spectrophotometry, HPLC).
d) Analysis: Analyse the samples using an appropriate analytical technique, such as high- performance liquid chromatography (HPLC) or UV-visible spectrophotometry, to quantify the amount of the active drug.
e) Calculation: Calculate the drug content for each sample and compare it with the labeled claim. The content uniformity typically must fall within 85% to 115% of the labeled amount for each sample.

Formula for calculating content uniformity

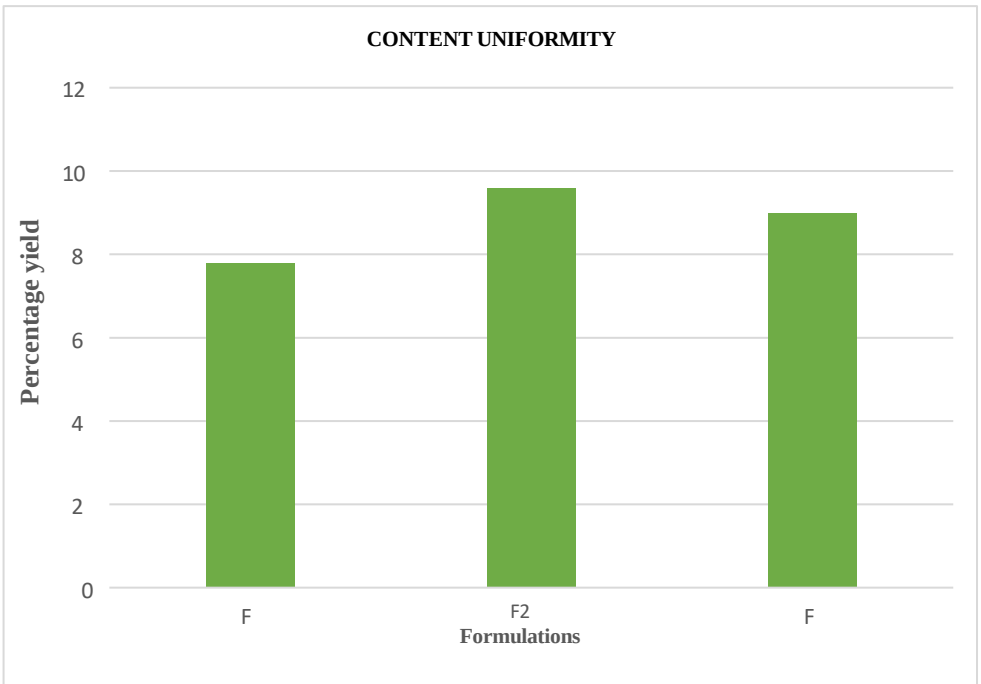
- Practical yield = $\frac{concentration \times Dilutiuon\ factor}{weight\ of\ c\ ream\ in\ grams}$
- Percentage yield = $\frac{practical\ yield}{theoretical\ yield}$ x 100

Content uniformity results :

- Theoretical yield: 0.05 mg/ml.
- Table no.9: Content uniformity test results.

Formulations	Practical yield in mg/ml	Percentage yield
I	0.039	78
II	0.049	96
III	0.045	90

Graphical representation showing content uniformity.



Conclusion:

The antifungal cream was successfully developed using Kewda extract as the active ingredient, along with various formulation components. The Kewda flowers underwent maceration extraction to obtain the extract, which was subjected to microbial and phytochemical tests. Among three formulations, one was selected and evaluated for parameters such as content uniformity, spreadability, viscosity, pH, and homogeneity. The cream demonstrated desirable qualities, including good consistency, spreadability, and no phase separation over the study period.

The stability tests indicated that the cream maintained its visual appearance, viscosity, nature, and pH, with no significant changes. Its pH value of 6.42 confirms compatibility with the skin. The herbal cream is safe, non-toxic, and meets the growing demand for natural cosmetics with fewer side effects. Additionally, Kewda extract showed antifungal, anti-inflammatory, antioxidant, and antimicrobial properties. Microbial tests revealed zones of inhibition in certain samples, confirming its antifungal activity. Thus, the formulated cream is safe and effective for use.

Summary: This study focused on creating an antifungal cream using Kewda flower extract to promote human health. The Kewda flower, known for its characteristic odor, was processed using the maceration extraction method to obtain the extract. This extract underwent microbial evaluation and phytochemical screening to confirm its therapeutic potential. The cream was formulated using ingredients like mineral oil, stearic acid, methyl paraben, xanthan gum, sorbitol, and flavoring agents, combined with the Kewda extract. Three formulations (F1, F2,
and F3) were prepared, and an optimized version was identified based on the concentration of the ingredients.

The cream was tested for properties such as spreadability, homogeneity, content uniformity, pH, and viscosity, ensuring compatibility with the skin. Kewda extract demonstrated antifungal, anti-inflammatory, antioxidant, and antimicrobial activities, with microbial evaluation showing zones of inhibition in specific tests. Overall, the cream was found effective and safe for use, combining therapeutic benefits with a pleasant sensory experience.

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