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Formulation and Evaluation of Marigold Extract Based Liquid Foundation

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ABSTRACT

Design and assessment of a liquid foundation with improved cosmetic and medicinal properties based on marigold extract is the main objective of this study. The antioxidant, anti-inflammatory, antibacterial, and anti-aging qualities of marigold (Tagetes erecta), which has a lot of naturally active substances including flavonoids and lutein, led to its selection. Ethanolic Soxhlet extraction was used to obtain the extract, guaranteeing the best possible yield of active ingredients. Talc, kaolin, titanium dioxide, iron oxide, glycerine, almond oil, maize starch, zinc stearate, and lavender oil were combined with rose water to create the foundation. Organoleptic characteristics, pH, spreadability, viscosity, adhesion, washability, and irritation potential of the produced product were assessed. The formulation had a beige colour, a smooth texture, a pH of 5, and good spreadability (23.13gm.cm/sec) and viscosity (1131.16 cPs), according to the results. The product exhibited good adherence, was easily washing, and was non-irritating. By adding the marigold extracts to the formulation which provides dermatological benefits with sufficient coverage and uniformity of skin colour. The prepared formulation is a safe, stable, and all-purpose cosmetic product that combines therapeutic benefits with good appearance, making it versatile for contemporary cosmetic applications.

Keywords: *Marigold extract, Liquid foundation, Formulation, Evaluation.*

Introduction

Cosmetics are preparations applied to clean, beautify, and enhance attractiveness. Since cosmetics are now considered daily necessities in society, there is a huge consumer base with strong requirement demand. Cosmetics can be categorized as skin or body care. Applying and covering skin surface with decorative cosmetics improves appearance and has emotional, and psychological benefits, including boosting self-confidence. Foundation is type of attractive cosmetics that covers pores, scars, acne, and uneven facial skin surfaces. Each human being possess skin, which is a much-needed defensive organ. As lifestyles and pollution levels rise which affects skin health leading to aging, hyperpigmentation, swelling, acne, dark spots, and several other conditions. The tone of the skin ranges from I to VI. I for light pale white, II for white fair, III for medium white to olive, IV for olive, moderate brown, V for brown dark brown, and VI for black extremely dark. By choosing their skin colour, they can utilize the foundation [1].

Marigold belongs to tagetes genus which contains approximately fifty species of annual or permanent herbaceous plants. It belonging to the Asteraceae family. Marigold is being used as a flavouring and medicinal herb from the long ago throughout Indonesia, China, and India. The foundation of most Indian curries, marigold is a flavour that adds flavour to traditional Indian food. The usage of marigold in curries dates back over 5,000 years.

Native to Mexico and other warmer regions of America, this solid, branching herb has been seen in other tropical and subtropical regions, including as Bangladesh and India. These are fast-growing annual blooming plants that range in height from dwarfs of 6 to 8 inches to medium, larger, and erect-growing plants of 10 to 3 feet. They have a shorter flowering season from midsummer to frost and produce huge, pompon-like double flowers up to 5 inches across. It is a highly valued garden plant that produces Tagetes oil, an intensely fragrant essential oil that is mostly utilized in the creation of premium fragrances. It is a highly sought-after garden plant that produces Tagetes oil, an intensely fragrant essential oil that is mostly utilized in the creation of premium fragrances. Traditional medicine uses this plant's many parts, especially its flowers, to treat a variety of illnesses [2].

Materials and Methods

Materials:

Marigold extract was made in a lab; talcum powder, kaolin, iron oxide, methyl paraben, and maize starch were obtained from SD Fine Chemical Limited in Mumbai; almond oil was acquired from Patanjali Ayurveda Limited in Haridwar; glycerine and zinc stearate were acquired from Vasa Scientific Ballari; titanium dioxide was supplied from BRM Chemicals in Delhi; and rose water was obtained from Gou Ganga Bengaluru.

Method:

Extraction of lutein from marigold [3]

The marigold flower powder is put in a filter paper bag and put inside a Soxhlet device. Ethanol is the solvent employed in this extraction. The vapours were condensed when the extraction solvent in the flask was heated. The marigold powder-filled filter paper bag was packed with the condensed extract. The liquid contents of the chamber siphon were collected into a flask once the liquid level in the chamber reached the top of the siphon tube. The procedure was repeated until the solvent in the extractor's siphon tube turned colourless. The extracted material was placed in a Petri dish and cooked to between 30 and 40 degrees Celsius on a hot plate. until the solvent had completely evaporated.

Fig 1. Soxhlet Apparatus

Fig 2. Lutein Extraction

Formulation of foundation from the marigold extract [3]

Take a dried and cleaned mortar and pestle then add a measurable amount of talc, zinc stearate kaolin and maize starch as they mentioned in Table no 1 and stirred continuously to get a homogeneous mixture. Glycerol and water were added slowly followed by vigorous stirring to yield a smooth paste. The required amount of preservative was added and colouring agent was mixed properly to get the required colour. Almond oil was added dropwise with continuous stirring of the mixture. when the formulation gets the primary thickness, the stirring was stopped and the remaining amount of water was added slowly with proper stirring which yields a smooth homogeneous liquid foundation having marigold extract.

Table 1: Composition of Foundation

INGREDIENTS	F1	USES
Marigold extract	120 mg	Antibacterial
Talcum powder	2.4 gm	Adhesive agent
Kaolin	1.6 gm	Covering agent
Methyl paraben	250 mg	Preservative
Almond oil	4.6 ml	Hydrating agent
Iron oxide	160 mg	Pigment
Glycerine	2.8 ml	Binder
Maize starch	4.6 gm	Soothing agent
Titanium dioxide	1 gm	Pigment
Zinc stearate	1 gm	Lubricating agent
Lavender oil	1 ml	Fragrance
Rose water	QS	Vehicle

Evaluation parameters of Foundation

Organoleptic Evaluation [4]

The organoleptic properties of foundation cream, such as colour, fragrance, texture, and smoothness, were assessed.

Phytochemical Evaluation [5]

The identification test for alkaloids, glycosides, tannins, carbohydrates, volatile oils were done by employing suitable chemical reagents.

Determination of pH [1]

pH of the prepared formulation was determined by using a pH paper.

Spreadability [1]

Approximately 2 grams of foundation cream was applied to the surface of the slide. A 20-gram weight was then added to other side that had a slide attached to it. Spreadability was assessed by measuring time (in seconds) required to separate the upper slide from the surface.

$$\text{Spreadability} = \frac{M \times L}{T}$$

Where,

M=Standard weight, which is placed on the upper slide.

L=Length of glass slide.

T=Time in second.

Viscosity [6]

The viscosity of the prepared liquid foundation was determined by using spindle number 64 Brookfield viscometer at 100rpm. The final reading was then calculated by taking average of three values. Viscosity was usually expressed in cps.

Irritation test [7]

On the back side of the left hand, mark out 1 square centimetre area. On the specified marked area, required amounts of foundation cream was applied and the time was recorded. The applied area was monitored up to 24 hours to look for any signs of irritation, erythema, or edema, and the findings were recorded.

Adhesion test [7]

The capacity of a preparation to stick to skin when applied is called an adhesion test. Superior adhesion is a result of a valuable preparation. For the production of the liquid foundation, the higher the adhesion, is sign of better the liquid formulation.

Washability test [7]

A least amount of the foundation was applied to the hand, and it was cleaned with tap water to assess the washability efficiency of the prepared liquid foundation cream.

Results

Characterization of foundation

Organoleptic evaluation

The organoleptic evaluation of the foundation was assessed. The formulation colour was natural. The formulated product had a good and acceptable odour, which is acceptable for cosmetic compositions. According to the specifications of the cosmetic formulation, texture and smoothness were satisfactorily reported in Table no 2.

Table 2: Organoleptic Evaluation of Foundation

Parameters	Observations
Colour	Beige
Odour	Pleasant
Appearance	Smooth, Fine
Texture	Fine

Phytochemical tests for extract

The prepared foundation was assessed using the phytochemical characteristics listed in Table no 3. It was found to have phytoconstituents that are beneficial for skin glow, including carbohydrates, alkaloids, glycosides, tannins, and volatile oil.

Table 3: Phytochemical tests for extract

TESTS	OBSERVATION	INFERENCE
Test for carbohydrates: Solubility test:	Insoluble	Polysaccharides
Molish's Test:	Violet ring at the junction of two liquids	Present
Fehilings Test	Yellow or brick red ppt	Reducing sugars present
Benedict's Test	Green, Yellow Red ppt.	Reducing sugars present
Test for Alkaloids: Dragendroff's Test:	Orange Red Colour was obtained	Alkaloids present
Mayer's Test	No Creamy- white precipitate	Absent
Test For Glycosides: Borntrager's Test	No pink or red colour	Absent
Test For volatile oil: Salkowski reaction	Greenish Fluorescence	Present
Liebermann reaction	No Blue Colour	Absent
Test for Tannins Ferric Chloride Test	Brownish green colour	Present

pH of Foundation cream

pH paper was employed to measure the pH of the foundation. The pH of the foundation should be in the range of 4.5 and 6 because it resembles the skin pH. The pH of the formulation was found to be 5 as reported in Table no 4.

Spreadability

A test was conducted to evaluate the foundation spreading capacity. The foundation was believed to be easily spreadable when applied to the skin. The spreadability of the prepared formulation was 23.13 gm.cm/sec and reported in Table No 4.

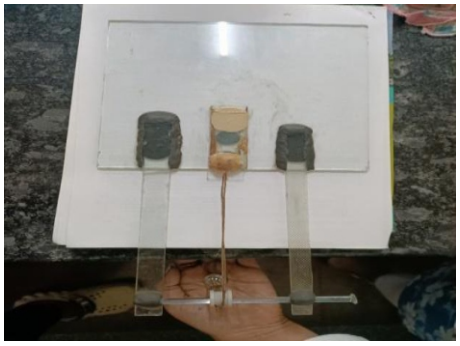

Fig 3. Spreadability

Viscosity

The Brookfield Viscometer with spindle number 64 at 100 rpm and 25°C was used to measure the viscosity of the prepared foundation lotion. For foundation viscosity was found to be 1131.61(cps) as the report mentioned in Table no 4.

Fig 4. Brookfield Viscometer

Table 4: Spreadability, Viscosity and pH

FORMULATION CODE	PARAMETERS			
	Spreadability in gm.cm/sec	Viscosity in cPs	pH	Adhesive property
F1	23.13	1131.16	5	Good

Irritation test

Table No. 5 reported the results of irritation. During irritancy tests, the formulation exhibited no signs of swelling, redness, or irritation. Applying this product to the skin is safe.

Table 5: Irritancy test

Parameter	F1
Irritation	Non-Irritant
Redness	No sign of redness
Swelling	No swelling

Adhesion test

The purpose of the adhesion test is to determine how well a formulation such as creams, lotions, foundation, or films sticks to the surface it is applied to, which is typically the skin. It aids in assessing the product's capacity for retention while in use. A product with good adhesion will not flake, peel, or come off easily and will remain in place for a longer period of time. The formulation shows good adhesion efficiency as reported in Table no 4.

Washability test

This is a popular technique for determining whether a formulation is washable after it has been applied to the skin. Water is then used to remove all of the formulation's contents from the hand's surface.

Discussion

The new semi-natural-based foundation lotion demonstrated acceptable physicochemical and cosmetic properties, suggesting that topical application is appropriate. The formulation had a beige colour, a pleasant smell, and a smooth texture, all of which are desirable qualities for increasing consumer acceptance and aesthetic appeal, according to organoleptic evaluation. These qualities also imply that the chosen ingredients worked well together to create a stable and palatable composition.

Carbohydrates, alkaloids, glycosides, tannins, and volatile oils were all found in the mixture, according to phytochemical screening. These phytoconstituents may contribute to the foundation's general skin-protective and nourishing effects because they are known to have antioxidant, antibacterial, calming, and skin-conditioning qualities. Therefore, in addition to offering coverage, the use of herbal elements improves the cosmetic formulation's functional value.

It was determined that the foundation's pH of 5.0 was within the typical physiological pH range of human skin, which is roughly 4.5–6.0. To protect the skin's acid layer, minimise irritation, and lower the chance of microbial growth, it's critical to maintain a pH that is friendly with the skin. Therefore, the formulation is suitable for regular topical application based on the observed pH.

Spreadability is an important factor that affects cosmetic products' uniform dispersion and convenient application. The spreadability score of 23.13 g.cm/s showed that the formulation distributes easily on the skin, making it easier to build a thin, even coating without using too much force.

After application, good spreadability contributes to a natural appearance and improves user ease.

A Brookfield viscometer was used to measure the foundation lotion's viscosity, and it was determined that it was appropriate for topical use. A suitable viscosity guarantees easy dispensing, stops leaks during storage, and permits the formulation to stay on the skin without unwanted flow. Additionally, it enhances the product's overall performance and physical stability.

The irritation testing showed that after topical application, the formulation did not cause any redness, swelling, or irritation. These results validate the formulation's safety for cosmetic usage and show that the substances are well tolerated by the skin.

Based on adhesion testing, the formulation adhered to the skin's surface satisfactorily, allowing for extended retention upon application. For cosmetic products to maintain consistent coverage, minimise the need for reapplication, and enhance product performance during regular daily activities, adequate adherence is essential.

The formulation was easily removed with water, demonstrating acceptable user convenience and cleanliness, according to the washability test. Easy washability lowers the risk of skin irritation associated with forceful scrubbing by ensuring that the product does not leave excessive residue on the skin and may be removed without the use of harsh cleansing agents.

Conclusion

The fabrication of a liquid foundation formulation is an example of how cosmetic science and skin care advantages can be successfully combined. The preparation of a liquid foundation that balances skin tone was the aim of the study. Marigold derived lutein-containing liquid foundation. The liquid foundation's pH was between 4.5 and 6, which is within the skin's typical pH range. The product offers desired qualities such a smooth texture, sufficient spreadability, good coverage, and stability by carefully choosing the right pigments, binders, and excipients. All things considered, liquid foundation is a multipurpose cosmetic product that strikes a balance between efficacy, safety, and satisfaction with users.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author Contribution

Associate Professor contributed to overall revision, guidance and approval of revised final manuscript. Assistant Professor promoted the study design, supervision during the experiment, data analysis, and manuscript revision. Students contributed to research work, data collection, formulation preparation, evaluation of results and preparation of the initial manuscript draft.

Data Availability statement

The data prepared and suitably analysed during this research study are available from the corresponding author upon request.

Ethics Approval

Since this research work was not include human volunteers to perform the any evaluation parameters, it is not applicable.

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