International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar – Apr 2025, pp: 857-870 www.ijprajournal.com ISSN: 2456-4494

A Novel Approach To Skincare: Formulation And Evaluation Of A Rosehip Oil Basedvitamin 'C' Cream

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Date of Submission: 20-03-2025 Date of Acceptance: 30-03-2025

ABSTRACT
The skin is approximately 22 square feet, and is the largest organ of the human body, covering approximately 15% of the total body weight. It acts as a protective barrier for external factors, regulates body temperature and promotes emotions such as touch, pressure, and pain. The skin is made up of several layers, including the epidermis, dermis and the smallest. The outer layer, the epidermis, are flat cells that provide a physical barrier to losing water and external pathogenic microorganisms. The dermis beneath the epidermis is a tightly connected fabric that supports the epidermis and contains blood vessels, nerve terminals, and hair follicles. The inner layer of subcutaneous intelligence is a glass fabric that attaches the skin to muscles and bones. To assess function and diagnose various skin disorders, an understanding of the anatomy of the skin is necessary. This rich and luxurious cream combines the powerful antioxidant properties of rosehip oil with the clear and protective effect of vitamin C. Rosehip oil, extracted from the seeds of rose bushes, is prized for its rich composition of essential fatty acids like linolenic acid. This lightweight oil absorbs easily, providing deep hydration without a greasy residue. Rich in vitamin C and antioxidants, it promotes collagen production and protects the skin from environmental damage. Orange peel extract, derived from the outer rind of oranges, is rich in antioxidants like vitamin C and limonene. The cream was formulated incorporating rosehip seed oil and orange peel extract along with other excipients such as emulsifiers, preservatives, viscosity enhancers, essential oil for improving organoleptic properties. Total of 5 formulations were prepared, and these formulations were evaluated for viscosity, pH, stability, spread ability, skin irritancy, and determination of vitamin c concentration. The results have shown that the cream exhibited quantifiable physical and chemical properties. F3, F4, F5 formulations have shown potential results. These formulations were stable and passed all the evaluation tests. These findings demonstrate that the topical cream formulation containing orange peel extract, rosehip oil, and vitamin C have the potential to be an effective skincare solution for improving skin health, reducing hyperpigmentation, and enhancing skin hydration and elasticity while undertaking further in vivo and in vitro studies in the future.

KEYWORDS: Skin anatomy, Rosehip oil, Vitamin C, Antioxidant, Moisturizing, Skin health, Hyperpigmentation, Epidermis, Dermis.

I. INTRODUCTION

The human skin serves as the body's first line of defines against external chemical and microbiological dangers and is the organ most exposed to the environment. It supports a microbiological environment that is unique to each individual and differs significantly throughout the surface of the body (1-4). According to recent research, the composition of the skin microbiota may be related to the use of makeup or antiperspirants." These investigations, however, were conducted for a little time (7–10 days) and/or without cleaning the volunteers' initial personal hygiene products, which resulted in an inadequate assessment of microbial changes because the Skin turnover takes 21–28 days (5-9). Most adult human micro biomes, skin, or other micro biomes are known to degrade without intervention. Stay constant in relation to individual variances. The chemicals that live on the skin's surface and how skin care products affect this chemistry are little understood, even though the skin micro biome remains stable for years (10-18).

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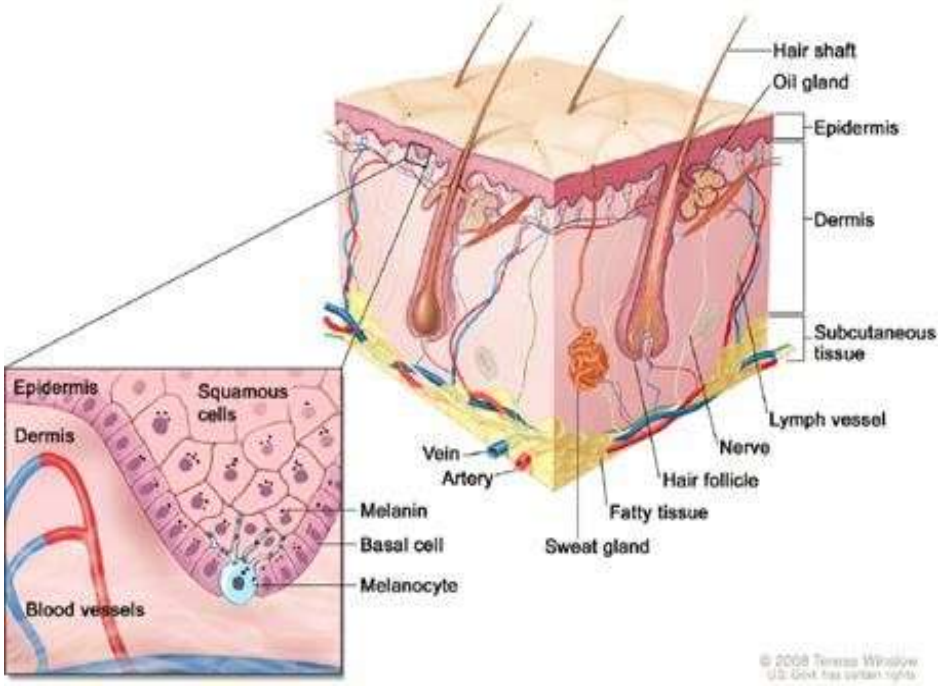

Researchers and food industry professionals are currently paying more attention to unconventional fruit seed oils because of their special nutritional and functional qualities (Raihana, Marikkar, Amin, & Shuhaimi, 2015). Among these, the food and non-food industries have used rosehip seed oil (RSO). According to Nadpal et al. (2018), rosehips are pseudo carps or fake fruits of Rosa species that are members of the Rosaceae family. They contain a fleshy outer covering that envelops a single achenes-covered seed. Roses are among the almost 200 species of the rosaceous family, which are distributed throughout the Middle East, Asia, North America, Africa, and Europe (Jimenez et al., 2017). Out of all the Rosa species, R. canina and R. rugosa are grown for their commercial purposes and are referred to as field rose and wild rose, respectively (Kayahan et al., 2023, Patel, 2013). While R. rugosa is indigenous to Korea and Japan, R. canina grows as a shrub in Western Asia, North America, and Europe (Ilyasoglu, 2014, Kayahan et al., 2023, Milic et al., 2020) (19).

The lipids, fatty acids, sterols, and bioactive substances included in rosehip seeds are vital for the body's healthy operation and should be included in every diet. According to Simopoulos et al. (2016), rosehip seeds have the highest concentration of polyunsaturated fatty acids (PUFA), particularly linoleic and α-linolenic acids. According to reports, rosehip seeds are also a good source of polyphenols (Demir and Acaralı, 2023, Koca et al., 2018; Ahmad and Anwar, 2016). Rosehip seed's galactolipids can prevent the synthesis of prostaglandin and nitric oxide, which prevents primary chondrocytes, SW1353 cells, and the release of different cytokines (such as interleukin (IL)-1β, IL-6, IL-12, interferon-γ, and TNF-α) from proliferating (ChrubasikHausmann, Chrubasik, Neumann, & Muller-Ladner, 2014) (20).

In a variety of forms, cosmetics are used very widely and frequently to improve appearance. Cosmetics are designed to decrease oil production, combat acne, and lessen wrinkles. Regarding. Skin protection, sunscreen, anti-acne, anti-wrinkle, and antiaging formulations are made with a variety of natural and synthetic components to address different sorts of skin conditions. Quality standards must be upheld during the cosmetic formulation development process. In terms of performance, a formulation's quality should meet the needs of the customer. The properties of the herbs used to make cosmetics include antibacterial, antiseptic, antiinflammatory, and antioxidant qualities. These herbal items assert that they don't have any negative effects, which are typical of goods that contain artificial ingredients. Such herbal remedies are appealing. Have flooded the Indian economy, both socially and technologically. There are many therapeutic plants in Varnya Kashaya, according to Ayurvedic literature, particularly Charak Sahita.

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For a radiant complexion, employ herbs like Chandan, Haldi, Khas, Nagkheshara, Manjistha, and Yastimadhu; kustaharan is also listed for Arusa, Amala Bavchi, Guduchi, and Chakmard (21-22).

COMPONENTS USED

Formulation components used for the following are:

ROSEHIP SEED OIL:

- **Biological Name:** Rosa canina (Common species, but also Rosa rubiginous, Rosa moschata)
- **Synonyms:** Dog Rose, Wild Rose, Hip berry, Rose Haw
- **Biological Source:** Dried seeds of the fruit (hip) of the Rosa species **Chemical Constituents:**
  - Essential fatty acids (linoleic acid, linolenic acid)
  - Vitamins (Vitamin C, A, E)
  - Flavonoids
  - Tannins
  - Carotenoids (β-carotene, lycopene)
- **Geographical Source:** Native to Europe, Asia, and South America.

ORANGE PEEL EXTRACT:

- **Biological Name:** Citrus sinensis (Sweet Orange), Citrus aurantium (Bitter Orange)
- **Synonyms:** Sweet Orange, Navel Orange, Valencia Orange
- **Biological Source:** The fruit and peel of Citrus sinensis from the Rutaceous family **Chemical Constituents:**
  - Vitamin C (Ascorbic acid)
  - Flavonoids (Hesperidin, Naringin)
  - Essential oils (Limonene, Citral)
  - Carotenoids (β-carotene, Lutein)
  - Sugars (Glucose, Fructose)
- **Geographical Source:** Grown in tropical and subtropical regions, including Brazil, Spain, India, and China.

BEESWAX:

- **Biological Name:** Cera alba
- **Synonyms:** White Wax, Yellow Wax, Apis Wax

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- **Source:** Beeswax is a natural secretion of the honeybee (Apis mellifera and other Apis species).

ALOE VERA GEL:

- **Biological Name:** Aloe barbadensis miller
- **Synonyms:** True Aloe, Burn Plant, Lily of the Desert
- **Biological Source:** Gel and latex obtained from the leaves of Aloe barbadensis
- **Chemical Constituents:**

- Polysaccharides (Acemannan, Glucomannan)
- Enzymes (Aminopeptidases, Cellulases)
- Vitamins (Vitamin C, E, B-complex)
- Minerals (Calcium, Magnesium, Zinc)
- Anthraquinones (Aloin, Emodin)

- **Geographical Source:** Native to North Africa, Arabian and cultivated worldwide in tropical and arid regions like India.

ROSEWATER:

- **Biological Name:** Rosa damascena (Damask Rose) or Rosa centifolia (Cabbage Rose)
- **Synonyms:** Gulab Jal, Rose Hydrosol, Aqua Rosae
- **Biological Source:** Rose water is obtained by steam distillation of fresh rose petals, primarily from Rosa damascena and Rosa centifolia.
- **Chemical Constituents:**

- Flavonoids (Quercetin, Kaempferol)
- Phenolic compounds (Gallic acid, Tannins)
- Essential oils (Citronellol, Geraniol, Nerol)
- Terpenes (Linalool)
- Vitamin C

- **Geographical Source:** Mainly produced in Bulgaria, Turkey, India, Iran, Morocco, and France

COCONUT OIL:

- **Biological Name:** Cocos nucifera
- **Synonyms:** Copra Oil, Coconut Butter
- **Biological Source:** Extracted from the dried kernel (copra) or fresh meat of the coconut fruit from the Coconut Palm (Cocos nucifera).
- **Chemical Constituents:**

- Fatty Acids: Lauric acid, Myristic acid, Caprylic acid, Capric acid, Palmitic acid
- Vitamins: Vitamin E, Vitamin K
- Antioxidants: Polyphenols
- Sterols: Phytosterols

- **Geographical Source:** Widely grown in tropical and coastal regions, including India, the Philippines, Indonesia, Sri Lanka.

SHEA BUTTER:

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- **Description:** A natural fat extracted from the nuts of the Vitellaria paradoxa (Shea tree).
- **Uses:** Deeply moisturizes skin, soothes irritation, and provides anti-aging benefits in skincare and haircare products.

LIQUID PARAFFIN:

- **Description:** A highly refined, colorless, and odorless mineral oil derived from petroleum**.**
- **Uses:** Acts as a moisturizer in skincare, a laxative in medicine, and a lubricant in industrial applications.

STEARIC ACID:

- **Description:** A saturated fatty acid derived from animal or plant fats, often in waxy solid form.
- **Uses:** Used as an emulsifier in cosmetics, a thickening agent in creams, and a lubricant in soaps and candles.

LANOLIN:

- **Description:**A natural wax derived from sheep's wool, known for its thick, greasy texture.
- **Uses**: Acts as an intense moisturizer in skincare, protects dry and cracked skin, and is used in baby creams, lip balms, and medical ointments.

XANTHAN GUM:

- **Description:** A polysaccharide produced by fermentation of Xanthomonas campestris bacteria, appearing as a fine white powder.
- **Uses:** Works as a thickening and stabilizing agent in cosmetics, food, and Pharmaceuticals, preventing ingredient separation in lotions, creams, and gels

BORAX (Sodium Borate):

- **Description:** A naturally occurring mineral composed of sodium, boron, oxygen, and water

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- **Uses:** Acts as an emulsifier in creams, a cleansing agent in detergents, and a preservative in pharmaceuticals.

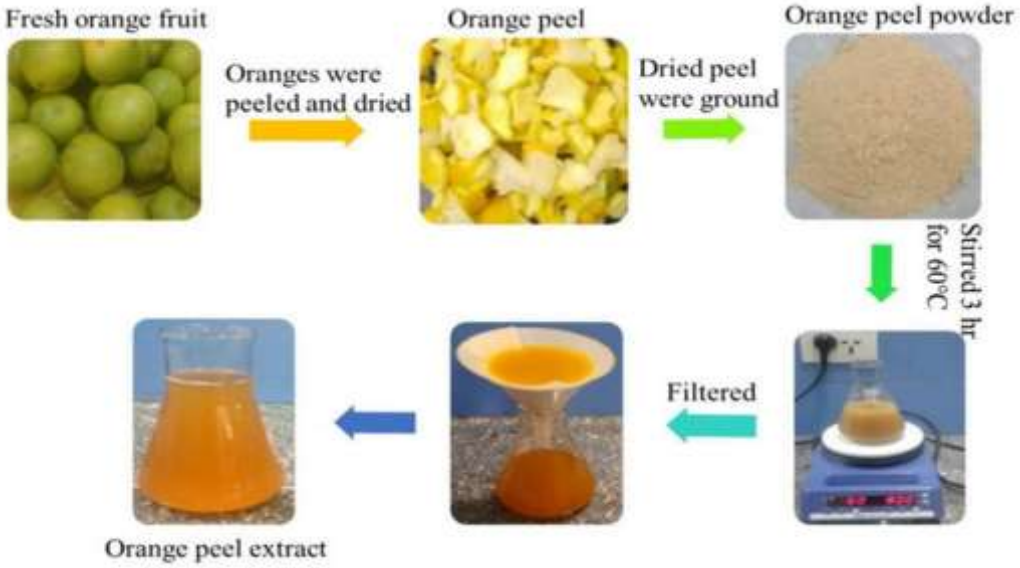
GLYCERIN:

- **Description:** A colorless, odorless humectant derived from plant oils or animal fats.
- **Uses:** Retains moisture in skincare, enhances hydration in hair products, and is used in pharmaceutical formulations.

METHYL PARABEN:

- **Description:** A synthetic preservative derived from p-hydroxybenzoic acid, commonly used in personal care products.
- **Uses:** Prevents microbial growth in cosmetics, pharmaceuticals, and food Products.

EXPERIMENTAL PROCEDURE:
PREPARATION OF ORANGE PEEL EXTRACT:



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- The infusion method is a gentle way to extract bioactive compounds from orange peels using hot water. This process is commonly used to obtain antioxidants, flavonoids, and essential oils from citrus peels.
- Wash fresh orange peels thoroughly to remove dirt and pesticides.
- Dry the orange peels either by sun drying or dehydrator. Powder the dried peels ✓Heat distilled water to about 80–90°C (not boiling) to preserve active compounds.
- A ratio of 1:10 (1g peel to 10mL water) for better extraction.
- Add the dried orange peel powder to the hot water. Cover the container and let it steep for 15–30 minutes.
- Stir occasionally to ensure even extraction. Filter the extract using a strainer or cheesecloth to remove solid residues.
- Allow the liquid to cool to room temperature. The cooled extract is used in the formulation.

ROSEHIP OIL EXTRACTION:

- In this study, cold-pressed rosehip oil was used for the formulation of a Vitamin C cream.
- The oil was commercially sourced from [INFIMITY], ensuring purity and retention of bioactive compounds.
- No in-house extraction of rosehip oil was performed.
- Cold-pressed rosehip oil was selected for this study due to its superior retention of essential fatty acids, antioxidants, and vitamins.
- Using a commercially available source ensured consistency in composition, eliminating variations that could arise from in-house extraction methods.

FORMULATION OF CREAM:

PREPARATION OF OIL PHASE: In a China dish, beeswax, liquid paraffin, soft paraffin, stearic acid was melted over a water bath. After melting, coconut oil and rosehip oil were added, maintaining the heating temperature to 75°C.

PREPARATION OF WATER PHASE: In another China dish, xanthan gum, methyl paraben, borax, aloe Vera gel and glycerine were melted over a water bath. After melting, orange peel extract was added, maintaining the heating temperature to 75°C.

PREPARATION OF CREAM: Maintaining the temperature, slowly water phase was added to the oil phase by stirring slowly till a smooth cream is formed. After cooling down, a capsule of vitamin E was added. A drop of rose oil was added for fragrance.

FORMULATION TABLE:

S.no	Ingredients	F1	F2	F3	F4	F5
1	Orange peel extract (ml)	2	2	2	2	2
2	Rosehip oil (ml)	4	2	2	2	8
3	Beeswax (g)	5	0.5	0.5	0.3	3.5
4	Coconut oil (ml)	1	1	1	1	1
5	Liquid paraffin (ml)	-	1	1	1	10
6	Soft paraffin (g)	-	0.3	0.3	0.2	0.5
7	Xanthan gum (g)	0.5	0.5	0.5	0.5	1
8	Glycerine (ml)	-	0.5	0.5	0.5	0.5
9	Borax (g)	-	-	-	0.3	0.4

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10	Stearic acid (g)	-	-	-	0.02	0.02
11	Methyl paraben (g)	0.5	-	0.2	0.03	0.04
12	Aloe Vera gel (ml)	-	1	1	1	1
13	Vitamin- E capsule (ml)	1	1	1	1	1

PHYSICAL APPERANCE OF CREAM:
The herbal cream was evaluated based on physical parameters, including colour, Odour, consistency, and the state of the formulation.
Colour: The colour of the cream was examined visually, and the results are shown in the table.
Odour: The odour of the cream was found to be characteristic.
State: The appearance of the cream was evaluated through visual inspection.
Consistency: The consistency of the formulation was assessed by manually rubbing the cream on the hand. It exhibited a smooth consistency.

Iodometric titration for determination of vitamin C concentration:

In a 50 ml burette, 0.01M sodium thiosulphate was filled. In a 250ml conical flask, 1 g of cream was added and dispersed in distilled water, gently heated to get even dispersion. 10 ml of this cream solution was taken to this 0.015M of 10 ml excess KI solution was added, 10 ml of dilute sulphuric acid (h2so4) and a few drops (2-3 drops) of starch indicator were added.

The contents of conical flask were titrated against sodium thiosulphate, observed for the disappearance of blue colour. Disappearance of the blue colour determines the end point of titration. The volume consumed by the burette after colour change was noted. The amount of volume consumed by the cream solution determines the concentration of vitamin c.

Iodometric titration of cream for determination of vitamin c concentration

pH Determination: A 0.5 g sample of the cream was dispersed in 50 ml of distilled water, and its pH was measured using a digital pH meter.

Phase Separation: The cream was stored in a tightly sealed container at room temperature, away from sunlight and observed for 24 hours for any phase separation.
Stability test: The stability of all creams was checked by observing for phase separation, creaming, colour change, coalescence, changes in viscosity and sweating at three different temperatures; 40 degrees, room temperature (25 degrees), 10 degrees. These changes were observed for 3 days to show any signs of instability parameters.
Spread ability test: Spread ability was tested by placing cream between two slides arranged in a slant position, where the lower slide is fixed, the upper slide is allowed to drop with weight attached (20g). The time required for the slide to drop was noted and spread ability was calculated using the following equation.$S=W\times\frac{l}{t}$

Where,
S: spread ability, W: weight tied to upper slide, L: length of upper slide, T: time taken for upper slide to slip.
Skin irritancy: This test assesses the quality of materials or chemicals to determine if they are harmful to the skin or mucous membranes. A specific area on the dorsal surface of the left hand is marked, and the cream formulation is applied.

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The time of application is recorded, and the formulation is left for a few minutes to observe any signs of irritation.

Wash ability: The wash ability test involved applying a small amount of cream to the hand and washing it with tap water. The wash ability was determined based on how easily the cream was washed away.

Viscosity: The viscosity of the formulation was measured using a Brookfield viscometer at 15 rpm with spindle No 62.

Brookfield viscometer

II. RESULTS AND DISCUSSION

The following results were shown by the cream, they are formulated in the tables as given below.

PHYSICAL PARAMETERS:

S.no	Ingredients	F1	F2	F3	F4	F5
1	Colour	Pale yellow	Light yellow	Creamy corn	Creamy corn	Creamy corn
2	Odour	Unpleasant	pleasant	pleasant	pleasant	pleasant
3	Consistency	Tough	Silky with little fluid consistency	Creamy	Creamy	Creamy
4	State	Rigid	Semi Solid	Semi Solid	Semi Solid	Semi Solid

VISCOSITY TEST:

S.no	Formulation	Viscosity (cp)
1	F1	2200
2	F2	1000
3	F3	1100
4	F4	1010
5	F5	1500

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pH TEST:

S.no	Formulation	pH
1	F1	6.5
2	F2	6.0
3	F3	6.3
4	F4	6.4
5	F5	6.21

VITAMIN C CONCENTRATION :(F5)
Burette reading for formulation
F5 = 9ml Calculation:

10 mL of 0.015 M iodine solution was used
Moles of iodine = (Volume in Liters) ×((Molarity) = (10 mL / 1000 mL/L) ×0.015 mol/L = 0.00015 moles.

9 mL of 0.01 M sodium thiosulfate was used:
Moles of sodium thiosulphate consumed= (9 mL / 1000 mL/L) × 0.01 mol/L = 0.00009 moles

Moles of Iodine that Reacted with Sodium Thiosulfate:
Because of the chemistry of the reaction, the moles of iodine that react with sodium thiosulfate are equal to the moles of sodium thiosulfate used.
So, 0.0009 moles of iodine reacted with the sodium thiosulfate

Moles of Iodine that Reacted with Vitamin C:
We started with 0.00015 moles of iodine. 0.0009 moles of that reacted with sodium thiosulfate. The rest reacted with Vitamin C.

Moles of iodine reacted with Vitamin C = 0.00015 moles - 0.00009 moles = 0.00006 moles **Moles of Vitamin C:**
The reaction between Vitamin C and iodine is 1:1. This means 1 mole of Vitamin C reacts with 1 mole of iodine.
So, we have 0.00006 moles of Vitamin C.

Grams of vitamin c:
Grams of Vitamin C = (Moles of Vitamin C) × (Molecular Weight) = 0.00006 moles ×176.12 g/mol = 0.0105672 grams
Molecular weight of ascorbic acid: 176.12g

Concentration of Vitamin C in the Cream:
We had 1 gram of cream.
Concentration = (Grams of Vitamin C) / (Grams of Cream) = 0.0105672 g / 1 g = 0.0105672 g/g
To get in mg/g, multiply by 1000: 0.0105672 g/g ×1000 mg/g = 10.57 mg/g (approximately)
Concentration in percentage : 10.57mg/g / 100= 0.10%

Therefore, concentration of vitamin c in cream is found to be 0.1%
IRRITANCY TEST:

S.no	Formulation	Irritancy test
1	F1	None
2	F2	None
3	F3	None
4	F4	None
5	F5	None

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PHASE SEPARATION:

Phase Separation

S.no	Formulation	Phase separation
1	F1	None
2	F2	None
3	F3	None
4	F4	None
5	F5	None

WASHABILITY:

S.no	Formulation	Wash ability
1	F1	Easily washable with little greasiness
2	F2	Easily washable with little greasiness
3	F3	Easily washable with little greasiness
4	F4	Easily washable with little greasiness
5	F5	Easily washable with little greasiness

SPREADABILITY:

S.no	Formulation	Time (sec)	Spread ability
1	F1	15	10.1
2	F2	4	38
3	F3	6	25.3
4	F4	5	30.4
5	F5	5	30.4

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MICROBIAL GROWTH:

Microbial growth shown in F2 formulation

S.no	Formulation	Microbial growth	
		Positive	Negative
1	F1	-ve	
2	F2	+ve	
3	F3	-ve	
4	F4	-ve	
5	F5	-ve	

EXPLANATION OF MICROBIAL GROWTH

Why did you include a preservative in the first test but not the second?

The primary objective of this experiment was to evaluate the effectiveness of the preservative. The first test established the expected growth profile when the preservative is present. The second test, without the preservative, allowed us to observe how microbial growth would proceed in its absence, thus directly measuring the preservative's impact on controlling microbial proliferation.

What information did you gain from the test without the preservative regarding the preservative's efficacy?

The purpose of comparing a test with a preservative to one without was to directly evaluate the effectiveness of the preservative. The test containing the preservative established a baseline, showing the expected microbial growth pattern under controlled conditions. The test without the preservative allowed us to observe the natural, uninhibited microbial growth, revealing the impact of the preservative's absence. By comparing the two, we could clearlydetermine the preservative's ability to control microbial proliferation and assess its overall efficacy.

DISCUSSION:

In this research, natural ingredients such as rosehip seed oil and orange peel along with coconut oil, aloe vera gel are used for skin care. Rosehip oil, well known for wounding healing properties, boosting collagen, anti-inflammatory properties. Oranges are used commonly in our daily life, the orange peels, in which the glycosides hesperidin and naringin, which is an important

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antioxidant. Aloe Vera gel and coconut oil are beneficial for human health, due to their nutritional values. At present, there is no commercial cream available that was based on both rosehip oil and orange peel extract for skin remedies. Hence, in this research work, various cream formulations containing rosehip and orange peel extract were prepared and characterized using standard methods.

Based on the above tests we can say that F1 cream was solid and not easily spreadable indicating high viscosity but has passed other evaluation tests and showed no signs of phase separation, no irritation. While F2 formulation has shown microbial growth. It also had a little extra smooth consistency with extra greasiness when compared to other formulations. F3, F4, F5 were showing values at the standard rang. They have smooth application, do not cause irritation, do not show phase separation, have easy wash ability but have left little greasiness as they are w/o emulsion. These formulations do not show any signs of separation at various temperatures i.e. at 10, 40, 25°C.

III. CONCLUSION

The present work has concluded that cream was prepared using rosehip seed oil and orange peel extract as key ingredients using simple methods and ingredients. Five formulations were prepared with varying amounts of excipients and types of excipients that are compatible with key ingredients.

The first formulation was hard and not easily spreadable. The second formulation has developed microbial growth, produced more greasiness. Formulations F3, F4, F5 were stable, not showing any signs of phase separation, no change in colour and maintained viscosity at all temperatures.

Formulations, F3, F4, and F5 have shown desired results and are stable formulations. They have passed all the evaluation tests performed.

From the above observations, we can conclude that the formulation of the above cream is safe to use, providing potential benefits from rosehip oil and orange peel extract. This study successfully formulated a cream incorporating Vitamin C from orange peel extract and rosehip seed oil, using their combined antioxidant and skin-beneficial properties. Iodometric titration revealed a Vitamin C concentration of approximately 10.57 mg per gram of cream. While this formulation demonstrates the potential of incorporating natural Vitamin C sources into a topical cream, further research is recommended to optimize the extraction process, enhance stability, and evaluate the cream's efficacy through in-vitro and in-vivo studies. This preliminary investigation provides a foundation for developing a natural and effective Vitamin C skincare product.

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