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Design And Characterization Of Grape Seed Oil-Based Body Butter

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This research centers on the creation and evaluation of a grape seed oil-based body butter, highlighting its promise as a natural, effective skincare product. Grape seed oil, valued for its rich concentration of antioxidants like vitamin E and proanthocyanidins, was selected for its ability to combat oxidative stress, enhance skin hydration, and strengthen the skin barrier. The formulation incorporates grape seed oil with natural ingredients such as shea butter, cocoa butter, and humectants, resulting in a nourishing product tailored for various skin types, particularly dry and sensitive skin.

Key properties including texture, spreadability, and stability were assessed, along with sensory characteristics such as absorption and non-greasiness. Additionally, the study evaluated the antioxidant activity and moisturizing capabilities of the product. Findings revealed that the grape seed oil-based body butter delivered effective hydration, boosted skin elasticity, and demonstrated strong antioxidant properties, establishing it as a promising candidate in the realm of natural skincare solutions.

Keywords: Kathon CG, Hydroxyethyl Cellulose, Anti-Oxidant, Hazelnut Butter.

INTRODUCTION: Body butters are exceptional skincare products, offering intense hydration and nourishment for the skin. [1] They are thicker than lotions, providing long-lasting moisture—particularly suited for dry areas such as elbows and knees. Additionally, body butters can enhance skin texture, promote cell regeneration, and help reduce the appearance of scars, stretch marks, and blemishes. Their natural ingredients also make them effective in soothing and calming itchy or irritated skin. [2]

Types and Uses of Body Butters: [3,4]

- **For Dry, Cracked Skin:** Opt for body butters like shea, cocoa, or mango butter. These are rich in fatty acids, providing deep nourishment and moisture.
- **For Aging Skin:** As skin loses elasticity with age, antioxidants in shea butter, argan oil, coconut oil, and avocado oil can help combat dryness and protect against aging.
- **For Sensitive Skin:** Gentle, fragrance-free options like hemp seed butter and calendula butter are ideal. Shea and cocoa butter may also be suitable after patch testing.

- **Grease-Free Options:** Lightweight and fast-absorbing body butters, such as jojoba butter, grapeseed butter, and aloe vera, deliver hydration without a greasy feel.
- **For Oily Skin:** Non-comedogenic butters like apricot kernel or sunflower seed butter can balance moisture while preventing pore clogging.
- **For Acne-Prone Skin:** Shea and cocoa butter are excellent for their gentle, non-comedogenic moisturizing properties.

Popular Body Butters:

1. **Almond Butter:** Packed with vitamin E, it softens skin, soothes irritation, and reduces wrinkles. Avoid if allergic to nuts. [5]
2. **Aloe Vera Butter:** A refreshing blend of aloe vera gel and coconut oil, ideal for soothing sunburn or mild cuts. [6]
3. **Apricot Kernel Butter:** Rich in essential fatty acids, it improves elasticity, soothes inflammation, and softens dry skin. [7]
4. **Argan Butter:** Luxurious and antioxidant-rich, it nourishes skin, reduces inflammation, and protects against environmental damage. [8]
5. **Avocado Butter:** Deeply moisturizing with vitamins A, D, and E, it soothes rough skin and boosts elasticity. [9]
6. **Babassu Butter:** Lightweight and non-greasy, perfect for calming itchy or irritated skin. [10]
7. **Baobab Butter:** Packed with omega fatty acids, it enhances skin elasticity and reduces scars, with quick absorption.
8. **Grape Seed Butter:** Extracted from cold-pressed grape seed oil, this butter features a light, nutty fragrance. Rich in essential fatty acids and antioxidants, it excels at hydrating and repairing damaged skin. It is also reputed for its ability to reduce dark circles and puffiness around the eyes, although some may find it slightly greasy. [11]
9. **Green Tea Butter:** Made from green tea leaves, this butter carries a fresh, clean aroma and is packed with antioxidants. It can help defend the skin against free radicals, reduce inflammation, and enhance skin tone, making it especially suitable for acne-prone skin. However, its cost can be a limiting factor.
10. **Hazelnut Butter:** Derived from roasted hazelnuts, this butter boasts a rich, nutty scent and is packed with vitamins and minerals. It deeply nourishes and hydrates dry skin, making it a great choice for sensitive skin. It may also assist in reducing scars and stretch marks, but individuals with nut allergies should exercise caution.
11. **Hemp Seed Butter:** Cold-pressed hemp seeds produce this butter, which has a light, earthy aroma. It is abundant in essential fatty acids, helping to improve skin elasticity and reduce inflammation. It's also effective at diminishing the appearance of fine lines and wrinkles. [12]

Benefits of Body Butter [13,14]

Body butter stands out among moisturizers due to its thick, rich consistency, which offers intensive hydration and nourishment. While all body moisturizers provide similar benefits, body butters go a step further with their unique properties:

- **Moisturizes Skin:** Delivers lasting hydration, keeping skin soft and supple.
- **Smooths Skin Texture:** Enhances smoothness for a polished look and feel.

- **Forms a Protective Barrier:** Shields skin from moisture loss and environmental irritants.
- **Provides Vitamins & Minerals:** Enriches the skin with essential nutrients.
- **Prevents Stretch Marks:** Promotes elasticity to help prevent stretch marks.
- **Soothes Irritation & Skin Conditions:** Eases discomfort caused by rashes, eczema, and psoriasis.
- **Strengthens Moisture Barrier:** Reinforces the skin's natural hydration defenses.

Unique Benefits of Body Butter [15,16,17]

Body butter's thicker formulation allows it to deliver exclusive advantages:

- **Locks in Moisture:** Rich oils create a durable protective barrier, especially effective post-shower. Shea and cocoa butter are particularly effective for this occlusive effect.
- **Soothes & Heals:** Fatty acids in botanical oils aid in calming and accelerating the healing of dry or chapped skin, even surface wounds.
- **Hydrating Properties:** Formulations with water and humectants offer direct hydration while sealing moisture into the skin in one step.
- **Intense Hydration:** Offers deep nourishment for extra-dry areas like elbows, knees, and feet.
- **Skin Repair:** Supports the healing of damaged skin, leaving it softer and healthier.
- **Nourishes Skin:** Packed with essential fatty acids and vitamins for optimal skin health.
- **Creates a Protective Shield:** Prevents water loss while safeguarding against irritants.

MATERIALS AND METHODS:

1) **Selection of base**
2) **Formulation**
3) **Preparation**
4) **Evaluation**

Selection of Base for Grape Seed Oil-Based Body Butter

The focus of this study was to develop a Grape Seed Oil-Based Body Butter using carefully chosen ingredients:

a) Arlacel 165 (Emulsifier): A versatile emulsifier used in creams, lotions, deodorants, antiperspirants, and shampoos. It effectively binds oil and water, creating a stable formulation. [18]

b) Propylene Glycol (Moisturizer): A clear liquid with humectant properties, recognized as one of the most effective moisturizers for skin hydration. [19]

c) Carbopol 940 (Film-Forming Agent): Known for providing stain protection and water resistance, this polymer is commonly used to thicken products such as lotions, conditioners, and gels. It also enables the creation of sparkling clear formulations for hand and body washes. [20]

d) Beeswax (Moisturizing Agent): A natural humectant that attracts and binds water, helping the skin retain moisture and stay hydrated. [21]

e) Cetyl Alcohol (Emulsifier): Prevents the separation of creams into oil and liquid components. It also contributes to thickness and enhances foam production in formulations. [22]

f) Brij S721 (Emulsifier): Derived from stearyl alcohol, this ingredient functions as a dispersing agent, emulsifier, and surfactant, ensuring stable dispersions in cosmetic products. [23]

Formulation of Grape Seed Oil-Based Body Butter

Table No.1: Formulation of Grape Seed Oil-Based Body Butter

Ingredients	Parts Used	Category	Qty%
Grape Seed Oil	Seed	Anti-Oxidant	3
Di Sodium EDTA	-	Chelating Agent	0.1
Hydroxyethyl Cellulose	-	Moisturizing agent	0.5
Carbapol-940	-	Film Forming Agent	0.3
Glycerin	-	Humectant	5
Propylene Glycol	-	Humectant	2
Isopropyl Myristate	-	Emollient	7
Cetyl Alcohol	-	Emulsifier	1.2
Arlacel 165	-	Emulsifier	1.2
Brij 721	-	Emulsifier	1.2
GMS	-	Emulsifier	1.8

Kathon CG	-	Preservative	0.5
Bees Wax	-	Moisturizing Agent	1.5
Almond oil	-	Emollient	0.5
Triethylamine	-	Neutralizer	0.1
Xanthan Gum	-	Thickening Agent	0.2
Citric Acid	-	pH Stabilizer	0.1
Water	-	Solvent	73.8

EXPERIMENTAL WORK:

Characterization of the Developed Formulation

The body butter underwent thorough evaluation based on its organoleptic characteristics, washability, spreadability, pH, viscosity, drug content, in vitro drug diffusion studies, stability study, in vitro skin irritation test, and antimicrobial efficacy. All tests were conducted in triplicate, and average values were reported. [24,25]

Organoleptic Characteristics: The psychorheological properties, such as color, odor, and texture, were analyzed to ensure sensory appeal**.** [26]

Washability: The body butter's ability to be removed after washing with water was observed following application on the skin. [27]

Spreadability: Spreadability, an essential criterion for body butter, determines the ease and extent to which the formulation spreads on the skin. This property is crucial for therapeutic efficacy. A specialized apparatus was utilized to measure spreadability by assessing the time required for a movable glass slide, with the formulation applied, to separate from a stationary slide under a fixed weight. [28,29]

$$Spreadability = \frac{m.l}{t}$$

Where, S=Spreadability (gcm/sec)

m = weight tied to the upper slide (200 grams)

l= length of glass slide (6cms).

t = time taken is seconds. [30]

pH Determination: The pH was measured using a digital pH meter, with readings taken until they stabilized. Each formulation was tested thrice for consistency. [31]

Viscosity: Using a Brookfield viscometer (RVT 230, USA), the viscosity of the body butter was assessed in triplicate. The formula used: Viscosity (cps) = Spindle reading X Factor for spindle at 100 rpm. [32]

Drug Content: A 0.1g sample was sonicated in phosphate buffer (pH 7.4), filtered, and further diluted before spectrophotometric analysis (Tazarotene: 351 nm; Hydroquinone: 288 nm). Tests were performed thrice, and averages were recorded. [33,34]

In-vitro Drug Release Studies: Cellophane membranes pre-soaked in phosphate buffer (pH 7.4) were mounted on diffusion cells. The formulations were placed inside, immersed in receptor media, and maintained at 37±0.5°C37\pm0.5°C for two hours. Periodic aliquots were withdrawn, diluted, and analyzed using UV-Vis spectrophotometry. [35]

Drug Release Kinetics: Drug release data were fitted to various models:

1. Zero-order: Cumulative drug release vs. time.
2. First-order: Log cumulative % drug remaining vs. time.
3. Higuchi model: Cumulative drug release vs. √time.
4. Korsmeyer-Peppas model: Log cumulative drug release vs. log time. [36]

Stability Study: The optimized formulation was stored at 25°C±2°C/6025°C±2°C/60%±5\% RH and 40°C±2°C/7540°C±2°C/75%±5\% RH for six months. Samples were analyzed for organoleptic properties, washability, spreadability, pH, viscosity, and drug content on the 1st, 30th, 90th, and 180th day. [37]

RESULT AND DISCUSSION

Evaluation Results of Developed Body Butter Formulation

Washability: All formulations demonstrated easy removability with water, confirming their suitability for skin application and effortless cleansing.

Spreadability: The spreadability of the body butter formulations ranged from 129.41 ± 5.71, with the optimized batch (L8) showing a spreadability of 62.59 ± 2.25. This value signifies its moderate spreading efficiency upon application to the skin.

pH Determination: The pH levels of the lotion formulations were measured using a calibrated digital pH meter. The average pH of the formulations was approximately 6, with the optimized lotion (batch L8) achieving a precise pH of 6.12 ± 0.07, indicating skin-friendly acidity.

Viscosity: Initial viscosity tests utilized spindle number 7 at 20 rpm, but readings below 10 prompted adjustments to spindle speed and type. Switching to spindle number 6 at 100 rpm yielded consistent results, with the optimized body butter (batch L8) exhibiting a viscosity of

3500 ± 100 cps. Spindle number 2 at the same speed was used for alternate evaluations, ensuring appropriate dial readings.

Drug Content: All lotion formulations maintained drug content at approximately 99%, indicating minimal drug loss during manufacturing processes, ensuring formulation efficiency.

In-Vitro Drug Release Studies: Drug release from cellophane membranes showed dependence on formulation composition. The presence of rice bran wax, varying from 10% to 20%, influenced drug permeation time—ranging between 8 to 16 hours for lotion and 8 to 14 hours for body butter. Release kinetics analysis applied Zero-order, First-order, Higuchi, and Korsmeyer-Peppas models to understand drug diffusion mechanisms. Correlation coefficients (r2r^2) were determined from plotted graphs for further data interpretation.

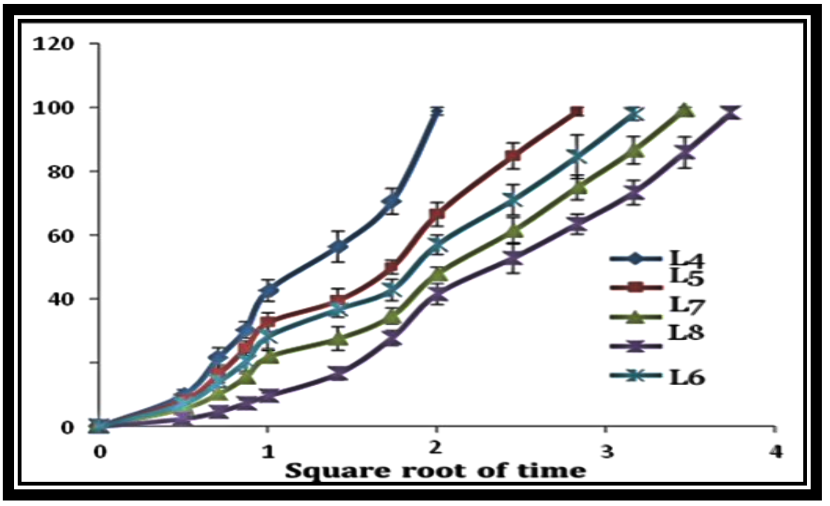

Fig.No.1: Higuchi release graph of Grape Seed oil

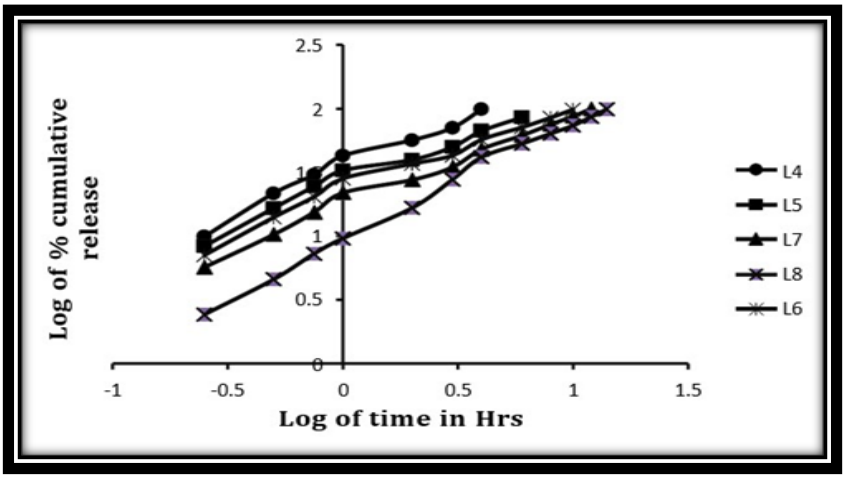

Fig.No.2: Korsmeyer-peppas release graph

Optimized lotion was found stable with no changes in physical characteristics, washability and pH at all the temperature and humidity conditions used. Viscosity of all formulations was decreased at elevated temperature condition (40°C ± 2°C/75% ± 5% RH) but effect was not drastic. There was a very slight variation in viscosity and spreadability of all the formulations at room temperature (25°C ± 2°C/60% ± 5% RH). After a period of 6 months, the amounts of drug remained in the optimized lotion was 97.58% and 95.31% when stored at 25°C ± 2°C/60% ± 5% RH and 40°C ± 2°C/75% ± 5% RH respectively thus loss of drug at elevated temperature was in acceptable rage of ±5% variation. Thus, both optimized Body Butter were found stable.

Table No.2: Stability study data of optimized Body Lotion (L8)

Test	**Physical Characterization**			**Washability**	**pH**	**Viscosity(cps)**	**Spreadability g.cm/sec**	**Drug content (%)**
	Color	Odor	Texture					
Initial	Pale yellow	Characteristic	Smooth	Washable	6.11± 0.04	3500± 100	61.80± 1.96	**99.74 ±0.18**
25°C ± 2°C/60% ± 5% RH								
1month	Pale yellow	Characteristic	Smooth	Washable	6.14± 0.03	3550±50	58.83±1.17	**98.13 ±0.14**
3months	Pale yellow	Characteristic	Smooth	Washable	6.10± 0.02	3500±50	59.98±1.31	**97.31 ±0.16**
6months	Pale yellow	Characteristic	Smooth	Washable	6.09± 0.03	3450±100	60.86±1.21	**97.23 ±0.13**

40°C ± 2°C/75% ± 5% RH								
1month	Pale yellow	Characteristic	Smooth	Washable	6.08± 0.03	3200±100	65.66±1.45	**95.47 ±0.15**
3months	Pale yellow	Characteristic	Smooth	Washable	6.07± 0.04	3150±50	66.15±1.23	**95.43 ±0.16**
6months	Pale yellow	Characteristic	Smooth	Washable	6.07± 0.04	3150±50	66.24±1.01	**95.34 ±0.15**

The optimized lotion demonstrated stability, maintaining its physical characteristics, washability, and pH across all tested temperature and humidity conditions. At elevated temperatures (40°C ± 2°C/75% ± 5% RH), a reduction in viscosity was observed; however, this change was not significant. Similarly, formulations stored at room temperature (25°C ± 2°C/60% ± 5% RH) exhibited only minimal variations in viscosity and spreadability over time.

After six months, the drug content of the optimized lotion retained 97.58% and 95.31% of its original amount under storage conditions of 25°C ± 2°C/60% ± 5% RH and 40°C ± 2°C/75% ± 5% RH, respectively. The drug loss at elevated temperatures remained within the acceptable range of ±5% variation, confirming that the formulations are stable under these conditions. Both optimized body butters were found to exhibit excellent stability.

CONCLUSION: The development and analysis of grape seed oil-based body butter underscore its effectiveness as a natural skincare product. Enriched with antioxidants like vitamin E and proanthocyanidins, grape seed oil plays a pivotal role in protecting the skin from oxidative stress and environmental harm. The formulation showcases remarkable hydration, reinforces the skin barrier, and delivers a luxurious, non-greasy application experience.

Comprehensive evaluations of its physical, chemical, and sensory attributes confirm its stability and adaptability for a variety of skin types, especially dry and sensitive skin. With its superior moisturizing capabilities and potent antioxidant benefits, this grape seed oil-based body butter stands out as a promising and eco-friendly addition to the expanding market of natural skincare solutions.

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