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Development and Evaluation of Grape Seed Oil Body Butter: Skin Nourishment and Moisture Retention

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ABSTRACT
This study delves into the development and analysis of body butter enriched with grape seed oil, celebrated for its rich linoleic acid content and powerful antioxidants. The primary goal is to create a skincare product that enhances hydration, supports skin repair, and exhibits anti-inflammatory properties. By incorporating grape seed oil alongside other natural components, the formulation emphasizes improved functionality and sensory qualities, such as texture and spreadability. The research further involves comprehensive assessments of its physical and chemical properties, stability over time, and compatibility with the skin, showcasing its potential as an effective and versatile option for everyday skincare.

Keywords: *Grape Seed Oil, Antioxidants, Body Butter, Cocoa butter.*

1. INTRODUCTION

Body butter is a rich, ultra-nourishing skincare product that provides exceptional hydration, particularly for dry skin. It often includes natural ingredients such as shea butter, cocoa butter, and various plant-based oils. Due to its thick and decadent consistency, body butter creates a luxurious moisturizing experience, acting as a protective barrier on the skin. [1]

Compared to other moisturizers like lotions, body butter is significantly thicker and contains a higher concentration of oils and butters. This allows it to deeply hydrate and replenish the skin's natural moisture, delivering long-lasting nourishment. Unlike lotions, which are water-based emulsions, many body butters are waterless formulations. This means they don't require preservatives and are especially effective in restoring the skin's natural oils, though they don't address dehydration as effectively as water-containing creams.

Body butter is a versatile product that not only softens and smoothens the skin but may also protect it from environmental stressors like pollution and UV rays. Whether homemade or from natural brands, it is crafted using a blend of solid butters and liquid oils, often whipped into a creamy texture. This thick, luxurious moisturizer is ideal for those who seek intensive care for their skin. [2]

Common Ingredients

Butters: These are fats extracted from nuts, fruits, and plants. Popular examples include shea butter, cocoa butter, mango seed butter, and kokum butter. Each type of butter offers unique benefits, such as antibacterial properties or being rich in vitamins and minerals. Due to their thick and dense consistency, butters are often combined with oils in body care formulations to make them easier to apply and use [3]

Oils: Plant-derived oils are widely used in skincare and body care products. Common ones include argan oil, sunflower seed oil, jojoba oil, olive oil, coconut oil, almond oil, grapeseed oil, and rosehip oil. Each oil provides distinct advantages for the skin, ranging from soothing and hydrating to brightening and nourishing. [4]

Humectants: Ingredients like glycerin and hyaluronic acid are often added for enhanced hydration. Humectants draw moisture into the skin and help retain it, leaving the skin plump and well-moisturized. [5]

Fragrances: Most body care products include some type of fragrance, which can be natural, such as essential oils, or synthetic. While facial skincare products with fragrance may not be suitable for everyone, it's generally acceptable in body care since the skin on the body is less sensitive. Fragrance-free options are also available for those who prefer them. [6]

2. MATERIAL AND METHODOLOGY

1) **Selection of active**
2) **Collection and Authentication**
3) **Extraction Method**

Grape Seed Oil Rich in Antioxidants: Packed with vitamin E and proanthocyanidins, grape seed oil protects the skin from oxidative damage and helps diminish visible signs of aging. [7]

Lightweight and Non-Greasy: This oil is quickly absorbed, making it a great choice for moisturizing without leaving a greasy feel. [8]

Anti-Inflammatory Properties: The presence of linoleic acid helps calm inflammation and soothe irritated skin, promoting a healthy complexion [9]

Methods:-

1) Selection of active

Grape seed oil contains several active ingredients that contribute to its beneficial properties for skincare: **Linoleic Acid:** An omega-6 fatty acid that supports the skin's barrier function and helps reduce inflammation [10] **Oleic Acid:** An omega-9 fatty acid known for its moisturizing properties and its ability to enhance skin elasticity. **Vitamin E:** A potent antioxidant that safeguards the skin from oxidative stress and promotes overall skin health. [11,12]

2) Collection and Authentication

Collecting and authenticating grape seed oil involves several steps to ensure its quality and purity. Here's an overview of the process: [13]

- **Grape Harvesting:** Grapes are collected at their peak ripeness to ensure quality.
- **Seed Separation:** Mechanical pressing or similar methods are used to extract seeds from the grape pulp. [14]
- **Drying Process:** The extracted seeds are dried thoroughly to minimize moisture, facilitating the extraction process. [15]
- **Authentication of Herbal Materials:** Ensuring the authenticity of herbal raw materials is essential for their safety and efficacy. Grape seeds are authenticated by a botanist in the botanical department. [16]

3) Extraction Method

a) Fractional Distillation

Fractional distillation is a technique employed to separate mixtures of liquids with boiling points that are close, typically less than 70°C apart.[17] In this process, the liquid mixture is heated until it boils, producing vapors that ascend through a glass device known as a fractionating column. [18,19]

3. EXPERIMENTAL WORK

Formulation with water and Oil Phase

Table No. 1: Formulation table of water and oil Phase Ingredients

Ingredient	**Water Phase**							
	L1	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**
Water	100	100	100	100	100	100	100	100
Di Sodium EDTA	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Glycerin	5	5	5	5	5	5	5	5
Carbapol-940	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Propylene Glycol	3	3	3	3	3	3	3	3
Kathon CG	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

TEA	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Hydroxyethyl Cellulose	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Citric Acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Xanthan Gum	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Oil Phase								
Grape Seed Oil	3	3.2	3.4	3.6	3.8	4	4.2	4.4
Isopropyl Myristate	7	7	7	7	7	7	7	7
Grape Seed Oil	3	3	3	3	3	3	3	3
Cetyl Alcohol	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Arlacel 165	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Brij 721	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
GMS	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Bees Wax	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Almond oil	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Formulation Development of Body Butter

Procedure:

- Take Water and Heat Upto 75OC
- Add DI sodium EDTA and stir well
- Then add Carbopol 940 Slowly Avoid Lumps Formation
- Take Glycerine and Propylene Glycol mix them with xanthan gum and Add
- Add HEU and stir well
- Take oil Phase ingredients(Grape Seed Oil, Isopropyl Myristate, Grape Seed Oil,Cetyl Alcohol, Arlacel 165, Brij 721, GMS, Bees Wax, Almond oil) and heat upto $75^{O}C$
- Then oil phase transfers into the water phase and starts homogenization.
- Then temp. below 45OC Add Kathin CG, TEA

Extraction of Grape Seed Oil-Based Body Butter Useing Fractional Distillation:

Fractional Distillation

Fractional distillation is a process utilized to separate liquid mixtures with boiling points that differ by less than 70°C. During this method, the liquid mixture is heated to produce vapors, which rise through a glass device known as a fractionating column. This column, situated between the flask containing the mixture and the "Y" adaptor, enhances the efficiency of separation between the liquid components. [20,21,22]

The fractionating column significantly improves separation compared to simple distillation due to the presence of materials like glass beads. These beads serve as "theoretical plates," enabling vapors to condense, re-evaporate, and condense repeatedly, effectively performing multiple distillations within the column. Each theoretical plate corresponds to one vaporization-condensation cycle, akin to one simple distillation. [23,24] In this process, the more volatile components tend to migrate upwards within the column, while the higher boiling-point liquids remain lower. Ultimately, the purified vapor

reaches the condenser, where it cools down and transitions into liquid form, collecting in the designated vessel. Typically, Vigreux columns (such as the Chemglass CG-1231 series) are employed, with their optimal length depending on how closely the boiling points of the desired compound and impurities align. However, it is important to note that longer Vigreux columns may result in lower recovery rates. [25,26,27]

Fig.No.1: Fractional distillation Apparatus

Fig.No.2: Extraction of Grape Seed oil in Fractional distillation

Preliminary phytochemical screening:

a) Flavonoids: To test for flavonoids, add a few drops of NaOH solution to the sample. The formation of a dilute acid indicates their presence. [28]

b) Glycosides: Dissolve a small quantity of the alcoholic extract in 1 mL of water, then add aqueous sodium hydroxide. A yellow color formation confirms the presence of glycosides. [29]

c) Alkaloids (Mayer's Test): Dissolve 1.36 g of mercuric chloride in 60 mL of water, and separately dissolve 5 g of potassium iodide in 10 mL of distilled water. Mix these solutions and dilute them to 100 mL using distilled water. Add a few drops of this reagent to 1 mL of acidic aqueous solution of the sample. Blue or green coloration indicates alkaloids. [30]

d) Phenols (Ferric Chloride Test): Mix 1 mL of the alcoholic sample solution with 2 mL of distilled water, then add a few drops of 10% aqueous ferric chloride solution. A blue or green color confirms the presence of phenols. [31]

e) Tannins (Lead Acetate Test): Add a few drops of a 1% lead acetate solution to approximately 5 mL of aqueous extract in a test tube. The appearance of yellow or red precipitate confirms tannins. [32]

f) Lipids: Place 5 drops of the sample in a test tube, then add a pinch of sodium hydrogen sulfate. The presence of glycerin, indicated by a pungent odor (produced during hydrolysis in fixed oils), confirms lipids. [33]

Fourier Transform Infrared spectroscopy (FT- IR):

The FT-IR spectra showed no significant differences between the polymer (Carbopol-940) and formulations containing pure essential oils. Peaks observed in the range of 3000–3500 cm^{-1} were attributed to the alkane group ($-CH_3$). These peaks were sharper in all spectra except for the polymer, likely due to the coordination of linkages.

Additionally, peaks in the range of 1600–2395 cm^{-1} corresponded to the alkene group (C=C). These were more pronounced in the polymer spectra compared to others, indicating strong bond interactions among the polymer's alkene groups. Peaks within the range of 1020–1160 cm^{-1} were linked to the presence of phenyl groups. [34]

The FT-IR results for formulations containing essential oils aligned well with expectations, suggesting stability in these formulations with respect to Carbopol-940 and the use of penetration enhancers. [35]

4. RESULT AND DISCUSSION

Evaluation of Extract

Preliminary Phytochemical Screening:

Table No.2: Preliminary Phytochemical Screening

Sr. no.	Alkaloids	Flavonoids	Phenols	glycosides	Tannins	Lipids
1	Essential Oils	+	+	+	+	+

Here, + = Present, - = Absent

Fractional Distillation:

Result obtained by is shown in Table below:

Table No.3: weight of oil with respect to time

Weight (g)	Time (mins)
0.80	250
0.90	500
1	750

1.05	100
1.10	1200

The oil produced by Fractional Distillation Method is 4.85g weight of oil per 100g of dry leaves Manjistha thereby producing 4.85% oil yield at 78^0C

Table No.4: Result of Essential Oils Extraction

Method of extraction	**% yield**
Fractional Distillation	4.85

Calculation of Percentage Yield of Volatile Oil:

Material Balance for Fractional Distillation Method

- Weight of Grape Seed = 100g
- Quantity of hexane used= 600ml, Quantity of Ethanol used= 200ml
- Weight of beaker= 105.26g
- Weight ethanol and essential oil= 202.7g
- The weight of oil obtained= 4.85g
- %yield = ME/MG x 100
- Where, ME = Mass of essential oil MG = Mass of Grape Seed sample
- ME = 2.45g MG = 100g
- By substituting values
- %yield = 4.85/100 x 100 =4.85%
- Therefore % yield= 4.85%

The graph below shows the plot of the weight of essential oil with respect to time for solvent extraction method

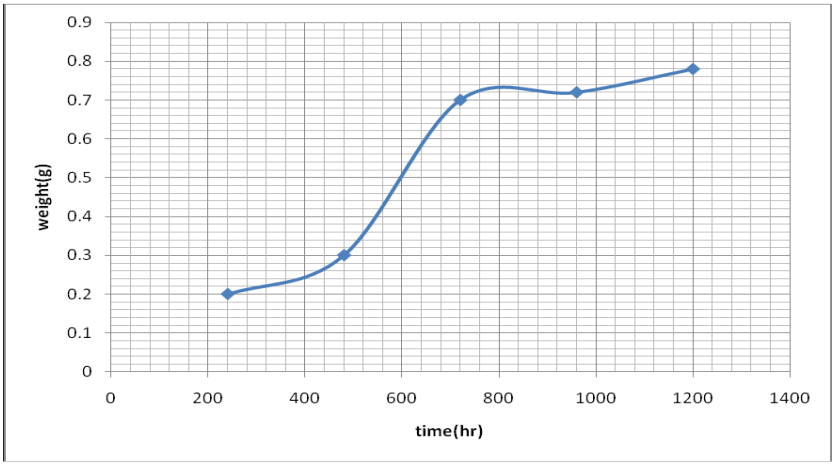

Fig.No.13: Graph below shows the plot of the weight of essential oil with respect to time for Fractional Distillation Method

Fourier Transform Infrared spectroscopy (FT- IR):

The FT-IR spectra in no significant difference in polymer (carbopol-940), pure Essential oils formulations.

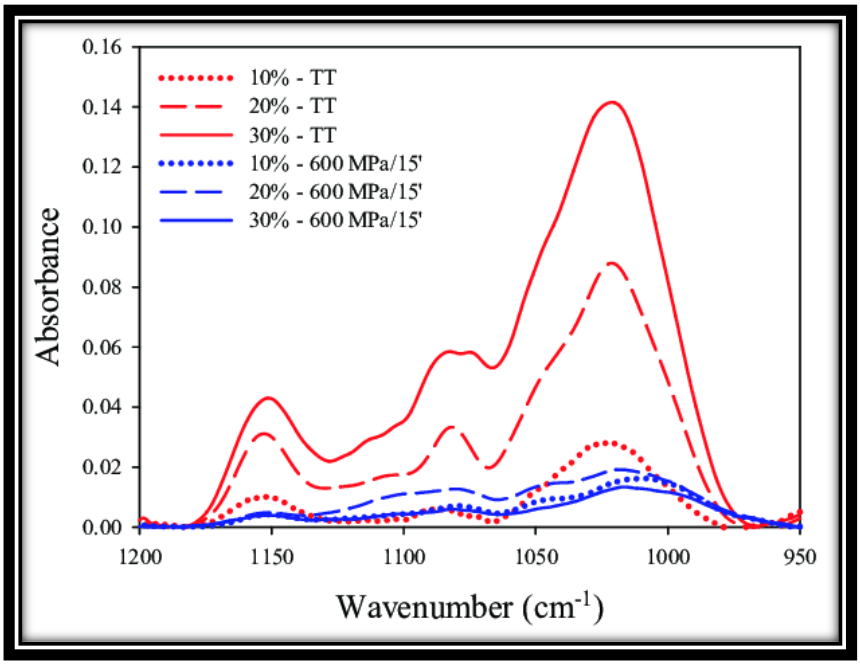

Fig.No. 3: Fourier Transform Infrared Spectroscopy (FT- IR)

5. CONCLUSION

The grape seed oil-based body butter exhibited outstanding moisturizing effects, enhanced skin elasticity, and provided robust antioxidant protection. Sensory evaluations highlighted its smooth texture and non-greasy consistency, making it a well-received formulation. Overall, the body butter shows great potential for promoting skin health and addressing a variety of skin concerns.

Fractional distillation plays an integral role in the extraction and refinement of grape seed oil. This technique facilitates the efficient separation of the oil from other components by leveraging differences in their boiling points. Utilizing a fractionating column ensures the oil is purified to a high standard, effectively eliminating impurities and undesirable compounds.

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