WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

FORMULATION DEVELOPMENT & EVALUATION OF PAPAYA, BAEL FRUIT EXTRACT & FLAXSEED FACE SERUM

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ABSTRACT:

Now a days herbal face serum is gaining a great popularity in market of cosmetics. This abstract outline the key components and potential advantages of herbal face serums, focusing on their efficacy in improving skin health and appearance. It contains extract of herbal ingredients, essential oils, vitamin C, and antioxidants which are necessary for skin for nourishment, hydration, and to rejuvenate. The natural exfoliating properties of papaya extract can help to unclog pores, prevent acne breakouts, and even out skin tone, while bael fruit extract's antimicrobial properties may aid in combating acne-causing bacteria. These extracts are typically obtained through processes such as maceration. The addition of papaya and bael fruit extracts to serums enhances their efficacy in promoting healthier, more youthful-looking skin, making them popular ingredients in modern skincare formulations. As it contains papaya as API it can also be used in melasma treatment. The herbal serum formulated went under various evaluation test like pH, stability, irritancy, spread ability etc. and it is also being compared with marketed formulation.

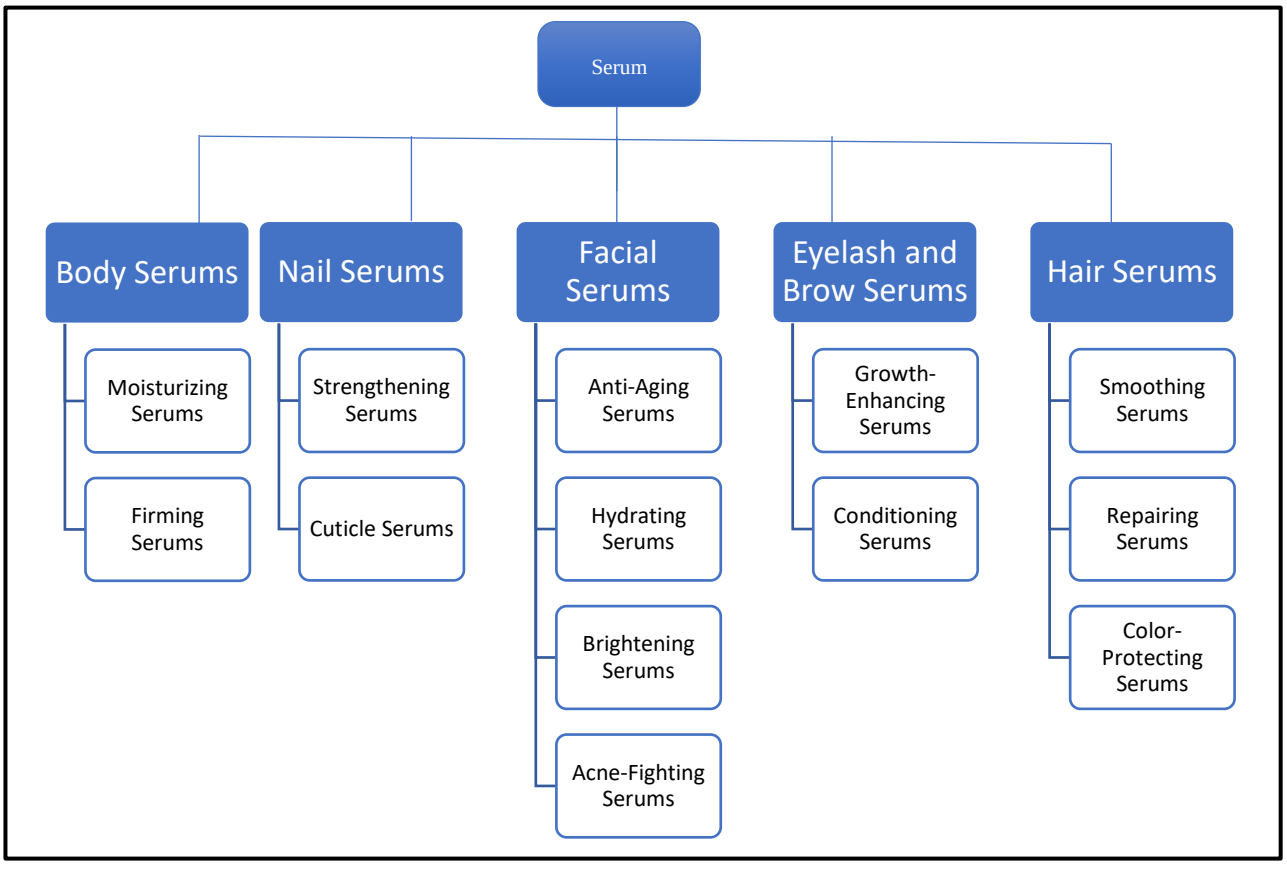
Keywords: herbal serum, bael and papaya serum, melasma skin disease.

INTRODUCTION:

Serum-

They are lightweighted cosmetic product used to enhance the beauty by delivering active ingredient to its target for better and effective action in concentrated form.

Figure 1. Types of serum.



Introduction of Face Serum:

Figure 2. Ordinary serum bottle.

- Face serum is a lightweight, concentrated skincare cosmetic product that delivers active ingredients to the skin to address various concerns. Serums can help with hydration, anti-aging, brightening, or acne. It should contain hyaluronic acid, glycolic acid, and vitamin C for better effect.
- In the realm of skincare, face serums have emerged as a cornerstone in modern beauty routines, promising targeted solutions for a myriad of skin concerns. From combating signs of aging to addressing hyperpigmentation and dehydration, face serums offer a potent blend of active ingredients designed to penetrate the skin's surface and deliver transformative results.
- Face serums are formulated with high concentrations of active ingredients, such as vitamins, antioxidants, and hydrating agents, meticulously selected to address specific skincare needs. This concentrated formulation allows for deeper penetration into the skin, targeting underlying issues at their source and yielding noticeable improvements in skin texture, tone, and overall appearance.
- The application of face serums is simple yet transformative. After cleansing and toning, a small amount of serum is gently massaged into the skin, focusing on areas of concern. The lightweight, fast-absorbing texture allows for seamless layering with other skincare products, making face serums a versatile addition to any skincare routine.
- In this comprehensive overview, we delve into the efficacy of face serums, exploring their formulation, key ingredients, application techniques, and transformative benefits. Through a nuanced understanding of the science behind face serums, we aim to empower individuals to make informed decisions in their skincare journey, unlocking the potential for healthier, more radiant skin.

Advantages of herbal face serum.

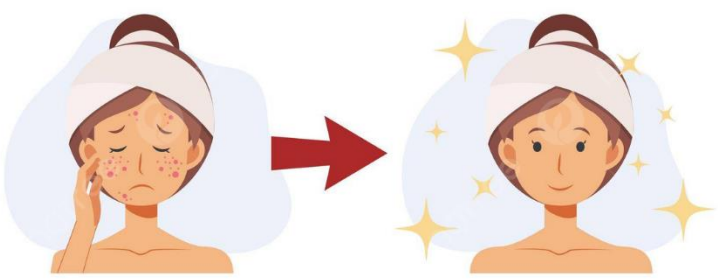
- Herbal face serums utilize natural botanical extracts, rich in vitamins and antioxidants, for potent skin nourishment.
- They offer gentle yet effective solutions for various skincare concerns, suitable for all skin types.
- With high concentrations of active herbal ingredients, serums provide targeted and visible results with minimal product usage.
- Herbal formulations promote skin health holistically, fostering long-term radiance and well-being.
- Environmentally sustainable practices in herbal serum production support eco-conscious skincare choices.

Disadvantages of synthetic face serum.

- Synthetic face serums may contain harsh chemicals that can irritate sensitive skin.
- Prolonged use of synthetic face serums may lead to skin dryness or dehydration.
- Some synthetic face serums contain preservatives or fragrances that can trigger allergic reactions.
- Synthetic face serums may not provide long-term benefits and could potentially exacerbate certain skin conditions over time.
- The production of synthetic face serums often involves the use of non-renewable resources and may contribute to environmental pollution.

Why there is need to use face serum?

Figure 3. Before and After face serum us



Face serums are highly concentrated formulations designed to deliver active ingredients directly into the skin. They are often lighter in consistency compared to moisturizers, allowing them to penetrate deeper into the skin. Here are some reasons why people use face serums:

1. **Targeted Treatment:** Serums are formulated to address specific skincare concerns such as hydration, brightening, anti-aging, or acne control. They typically contain higher concentrations of active ingredients like vitamins, antioxidants, and peptides, which can effectively target these concerns.

2. **Deep Hydration:** Some serums are designed to deeply hydrate the skin, providing a boost of moisture to improve skin texture and plumpness. Hyaluronic acid is a common ingredient in hydrating serums, known for its ability to hold moisture in the skin.

3. **Anti-Aging Benefits:** Many serums contain ingredients like retinol, vitamin C, and peptides, which are known for their anti-aging properties. These ingredients can help reduce the appearance of fine lines and wrinkles, improve skin firmness, and promote collagen production.

4. **Brightening and Even Skin Tone:** Serums containing ingredients like vitamin C, niacinamide, and liquorice extract can help brighten the skin, fade dark spots and hyperpigmentation, and even out skin tone.

5. **Lightweight Texture:** Serums have a lightweight texture that allows them to be easily absorbed into the skin without leaving a greasy or heavy feeling. This makes them suitable for all skin types, including oily and acne-prone skin.

6. **Enhanced Efficacy:** By delivering active ingredients directly into the skin, serums can enhance the efficacy of your skincare routine. They can be used alone or layered with other skincare products to address multiple concerns simultaneously.

Overall, face serums can be a valuable addition to your skincare routine, providing targeted treatment and delivering potent ingredients for healthier, more radiant skin.

Need and Rationale:

The need for herbal face serums stems from a growing demand for natural skincare solutions that are gentle yet effective.

- Firstly, herbal serums offer a gentle alternative to conventional products, catering to individuals with sensitive skin or those seeking to avoid harsh chemicals.
- Secondly, the rationale behind their use lies in the potent properties of herbal ingredients, such as antioxidants and anti-inflammatory compounds, which can protect the skin from environmental damage and soothe irritation.
- Additionally, herbal serums provide hydration and moisture retention through nourishing botanical oils, promoting a healthy complexion without clogging pores.
- Lastly, their sustainable and eco-friendly nature aligns with the values of consumers who prioritize ethical skincare practices and seek products that are both effective and environmentally responsible.
- Overall, herbal face serums offer a holistic approach to skincare, addressing various concerns while harnessing the power of nature's botanical treasures.

Aim and Objective:

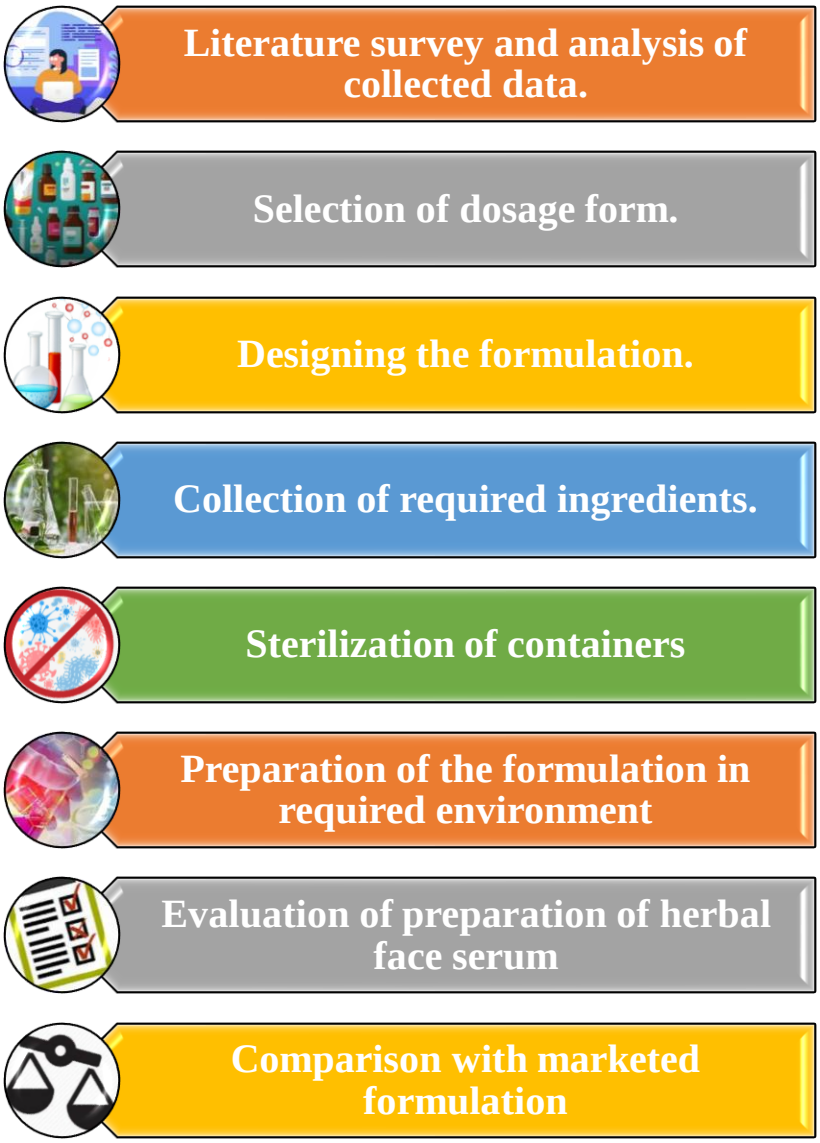
Aim-

Our aim is to formulate a herbal face serum that harnesses the power of natural botanical extracts to provide gentle yet effective skincare. By combining antioxidant-rich herbs with nourishing botanical oils, our serum aims to protect, soothe, and hydrate the skin, promoting a radiant and healthy complexion.

Objective-

- Develop a herbal face serum that utilizes a synergistic blend of botanical extracts and oils to address various skincare concerns, including hydration, anti-aging, and inflammation.
- Ensure the formulation is free from harsh chemicals and synthetic additives, catering to individuals with sensitive skin and those seeking natural skincare alternatives.
- Conduct rigorous testing to validate the efficacy and safety of the serum, ensuring it delivers noticeable results without causing adverse reactions.
- Incorporate sustainable and ethically sourced ingredients to align with environmentally conscious consumer preferences.
- Provide clear instructions for usage and dosage, empowering consumers to incorporate the serum into their daily skincare routines effectively.

Plan of work:-



LITERATURE REVIEW: -

- **Kokate C.K, Purohit A.P and Gokhale S.B. Pharmacognosy, Nirali publication, edition 50-**
  We studied and reviewed the taxonomical classification and pharmacognosy of bael plant, papaya plant, alovera gel etc. taxonomical classification, synonym, biological source, geographical source/habitat, chemical constituents and uses were studied from the book of Kokate C.K, Purohit A.P and Gokhale S.B. Pharmacognosy.
- **Miss. Ashwini. R. Patil, miss. Anjali. R. Patil, r. B. Lovhare, formulation and evaluation of herbal face serum containing aloe vera and Aegle marmelos, international research journal of modernization in engineering technology and science, e-ISSN: 2582-5208, volume:05/issue:04/april-2023. –**
  From this literature we reviewed that effect of serum on skin ageing and facial wrinkles, ability of ingredients to penetrate deep into skin for rapid absorption and non-oily finish . From this literature we studied face serum prepared from aloe vera, bael fruit extract, and olive oil is highly effective. Because aloe vera serum has the capacity to absorb swiftly and penetrate deeper, Aloe vera gel is frequently used to treat a variety of skin diseases, as well as sunburn, small wounds, insect bites, and wound healing. Additionally, it possesses anti-bacterial, anti-fungal, and anti- inflammatory effects . Anti-inflammatory and antioxidant effects
  of Bael fruit extract. This literature is also helpful for the comparative studies that we will do after the preparation of formulation.
- **Miss. Gauri Deshmukh, miss. Vaishnavi katkar, Mr. Sanjay garje, Mr. Gaffar Sayyad, a comprehensive review of herbal face serum, epra international journal of multidisciplinary research (ijmr), ISSB: (online): 2455-3662, volume: 10| issue: 3| march 2024| journal**

Doi: 10.36713.

From this literature we studied about face serum and history of facial serum and basics of face serum, functions of skin and advantages of face serum on skin. The herbal ingredients that can be used for herbal face serum and the needed additives for formation of serum were reviewed. Detailed discussion of various herbal ingredients commonly used in face serums such as aloe vera, turmeric, green tea, and rosehip oil. The properties of these ingredients, including their antioxidant, anti-inflammatory, and moisturizing benefits, are elaborated. The review outlines multiple benefits, including skin hydration, anti-aging effects, improvement in skin texture, and reduction of blemishes and pigmentation. It emphasizes the holistic and synergistic effects of combining multiple herbal ingredients.

- **Pinyada kerdpremwes1, ampa jimtaisong, carica papaya l. Leaf as a sustainable source of antioxidant in 2 cosmetic formulations: a study on facial serum, cosmetic and beauty innovations for sustainable development (CBIS) research group, 13 July 2023.**
  The study by Kerdpremwes and Jimtaisong presents a compelling case for the use of Carica papaya L. leaf extract as a sustainable and effective antioxidant in facial serums. It demonstrates the potential of this natural ingredient to enhance cosmetic formulations while promoting environmentally friendly practices. The research highlights the dual benefits of using papaya leaf extract: improving skin health and contributing to sustainable development in the cosmetic industry. This comprehensive review serves as a valuable resource for researchers and cosmetic formulators interested in innovative and sustainable skincare solutions.

MATERIAL AND METHOD: -

- Herbal formulation is widely used now-a-days and for skin care herbal formulations are mostly preferred. Even traditionally for dark skin or pimples or to hydrate skin herbal ingredients wear used for facial packs.
- The herbal ingredient used to treat skin problems are papaya, bael fruit, aloe Vera gel, essential oils vitamin C, etc. which are very helpful and contains antioxidant property which help to reduce the skin problem.
- Herbal serums are gaining popularity due to the natural and safety approach and also it is affordable then allopathic serums they act as alternative or complementary treatment for the skin problems like acne, Dehydration of skin or pores , dry skin , wrinkles etc.
- In our research we give information regarding the herbals face serum which will cure the skin problems by rehydrating and by reducing wrinkles acne or unclogging pores that is by improving skin immunity. Which will help to improve the appearance of the skin.

Selecting papaya pulp and flaxseed oil for face serum formulation offers several compelling benefits:

Papaya Pulp:

- Rich in vitamins A, C, and E, papaya pulp provides powerful antioxidant protection against free radicals, helping to prevent premature aging and skin damage.
- Enzymes like papain in papaya pulp gently exfoliate the skin, promoting cell turnover and revealing a brighter, more radiant complexion.
- Papaya contains natural enzymes that can help reduce inflammation and soothe irritated skin, making it beneficial for individuals with sensitive or acne-prone skin.

Flaxseed Oil:

- Flaxseed oil is a rich source of omega-3 fatty acids, which help to nourish and hydrate the skin, promoting a soft and supple complexion.
- The anti-inflammatory properties of flaxseed oil can help calm redness and irritation, making it suitable for sensitive or reactive skin types.
- Flaxseed oil contains lignans, which have been shown to have antioxidant properties that protect the skin from environmental stressors and promote overall skin health.

Combining papaya pulp and flaxseed oil in a face serum formulation creates a synergistic blend that addresses multiple skincare concerns. The antioxidant-rich papaya pulp helps to protect the skin from damage and promote a youthful glow, while the hydrating and soothing properties of flaxseed oil nourish and calm the skin. Overall, this formulation provides a natural and effective solution for achieving healthy, radiant skin.

- In this research we are also going to use bael fruit extract, olive oil, coconut oil, orange oil and Acacia powder which shows action like antioxidant, moisturiser also used as brightening agent, toner and emulsifying agent. Which overall help to nourish the skin and improve the appearance.
- Alovera have anti-inflammatory and moisturising property that hydrates and heals the skin.
- In this research we have formulated herbal face serum from bale fruit, papaya pulp, aloe Vera, vitamin E, olive oil, coconut oil, flax seed oil, orange oil, Acacia powder and evaluation test like pH, irritancy, stability, wash ability etc. were performed.

FORMULATION AND EQUIPMENTS: -

Selected Ingredient And Their Role In Face Serum.

Papaya pulp-

Papaya face serums can contain enzymes like papain and chymopapain, which can help to break down dead skin cells and unclog pores. Papaya fruit extract is also rich in antioxidants, including lycopene, which can help to fight free radical damage and promote healthy skin aging.

Flaxseed oil-

Flaxseed gel can help prevent skin drying, and the fatty acids in it can make skin look smooth and shiny. Flaxseed gel can also act as an anti-aging gel, removing dead skin cells and fighting acne and dark spots. The alpha linolenic acid in the gel can also help manage oily skin and sebum production, which can prevent acne.

Bale fruit extract-

Incorporating bael fruit extract into a face serum formulation enriches it with potent antimicrobial and anti-inflammatory properties, ideal for combating acne and soothing skin irritations. Additionally, its high vitamin C content promotes collagen synthesis, contributing to skin rejuvenation and a vibrant complexion.

Aloe vera gel-

Aloe vera gel, when included in a face serum, offers soothing hydration and gentle nourishment to the skin, making it suitable for all skin types, especially sensitive or irritated skin. Its natural anti-inflammatory properties help calm redness and irritation, while its antioxidants support skin repair and rejuvenation, leaving the complexion refreshed and revitalized.

Olive Oil:

Rich in antioxidants and fatty acids, olive oil deeply hydrates the skin, restores moisture balance, and helps protect against environmental damage, leaving the complexion soft and supple.

Coconut Oil:

With its antibacterial and antifungal properties, coconut oil nourishes and soothes the skin, promoting a clear and radiant complexion while providing lightweight hydration.

Orange Oil:

Bursting with vitamin C, orange oil brightens dull skin, promotes collagen production, and helps reduce the appearance of dark spots and hyperpigmentation, leaving the skin refreshed and rejuvenated.

Acacia powder-

It is often used in face serums for its gentle exfoliating properties. Acacia powder helps to slough off dead skin cells, unclog pores, and promote skin renewal, resulting in a smoother, brighter complexion. Additionally, its natural astringent properties can help tighten and firm the skin, reducing the appearance of fine lines and wrinkles over time.

1. **Papaya pulp-**

Figure 4. Papaya pulp.

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Eudicots
- Order: Brassicales
- Family: Caricaceae
- Genus: Carica
- Rank: Species
- Species: C. papaya
- Scientific Name: Carica papaya

- Part Used: The entire papaya fruit is commonly used, including the pulp and seeds, for consumption and various applications in cooking, skincare, and medicine.
- Height: Papaya trees can reach heights of up to 10 meters (about 33 feet).
- Leaves: Papaya leaves are large, palmately lobed, and can grow up to 50-70 cm in diameter. They are typically arranged spirally at the apex of the stem.

- **Synonyms:** Papaw, Pawpaw, Tree melon, Fruit of the angels
- **Biological Source:** Papaya (Carica papaya) belongs to the family Caricaceae.
- **Habitat:** Papaya is native to the tropics of the Americas but is now widely cultivated in tropical and subtropical regions around the world. It thrives in warm climates with well-drained soil and plenty of sunlight.
- **Chemical Constituents:**

Enzymes: Papain, chymopapain, caricain
Vitamins: Vitamin C, vitamin A, vitamin E
Carotenoids: Beta-carotene, lycopene
Flavonoids: Quercetin, kaempferol
Phenolic compounds: Gallic acid, caffeic acid
Fatty acids: Oleic acid, palmitic acid, stearic acid
Sugars: Glucose, fructose
Minerals: Potassium, magnesium, calcium, phosphorus.

Uses:

1. **Culinary:** Papaya fruit is consumed fresh, in juices, salads, and various culinary dishes. Unripe papaya is used in cooking for its tenderizing properties, especially in meat marinades.
2. **Medicinal:** Various parts of the papaya plant, including the fruit, leaves, and seeds, are used in traditional medicine for their purported health benefits. Papain, an enzyme found in papaya, is used in digestive enzyme supplements. Papaya leaf extract is also used for its potential medicinal properties, including as an antimalarial agent and for its potential to boost platelet count in cases of dengue fever.
3. **Skincare:** Papaya extract is a common ingredient in skincare products due to its exfoliating properties, which help remove dead skin cells and promote skin renewal. It is often found in facial cleansers, masks, and exfoliating scrubs.

1. Flaxseed oil-

Figure 5. Flaxseed oil

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Eudicots
- Order: Malpighiales
- Family: Linaceae
- Genus: Linum
- Species: L. usitatissimum
- Scientific Name: Linum usitatissimum.
- Part Used: The seeds of the flax plant are primarily used.
- Height: Flax plants typically grow to about 1 to 1.2 meters in height.
- Leaves: The leaves of the flax plant are lanceolate (long and narrow), alternate, and sessile (attached directly to the stem).

- **Synonym**: Common synonyms for flaxseed include linseed and linum.
- **Biological Source:** Flaxseed comes from the flax plant, Linum usitatissimum. Belonging to family Linaceae.
- **Habitat:**

Flaxseed is cultivated in temperate climates worldwide, but its origins trace back to the Mediterranean region. It thrives in well-drained soils and is commonly grown in regions with moderate temperatures and adequate rainfall. Cultivation of flaxseed is widespread in countries such as Canada, China, India, and the United States.

In India, flaxseeds are primarily grown in the states of Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, and Punjab. These regions provide suitable climatic conditions and soil for the cultivation of flaxseed.

- **Chemical Constituents:**

Flaxseed is rich in various nutrients including omega-3 fatty acids,
lignans, fiber, and protein.
It also contains vitamins such as vitamin E, B vitamins.
minerals like magnesium, manganese, and phosphorus.

Uses:

1. **Dietary Supplement:** Flaxseed is often consumed as a dietary supplement due to its high content of omega-3 fatty acids, which are beneficial for heart health.
2. **Culinary Purposes:** Flaxseed is used in cooking and baking, often ground into meal or used whole to add texture and nutrition to dishes.
3. **Fiber Source:** Flaxseed is a good source of dietary fiber, promoting digestive health and regularity.
4. **Alternative Medicine:** Some traditional medicine systems use flaxseed for various purposes including as a laxative and to alleviate symptoms of menopause.
5. **Industrial Uses:** Flaxseed oil is extracted from flaxseeds and used in the production of paints, varnishes, and linoleum.
6. **Skincare:** Flaxseed oil is used in skincare to moisturize, nourish, and protect the skin, thanks to its rich content of omega-3 fatty acids and antioxidants. It can help soothe dryness, reduce inflammation, and promote a more youthful complexion. flaxseed oil contains linoleic acid, which can help regulate sebum production and improve overall skin texture.

1. Bael fruit-

Figure 6. Bale tree and Fruit

- Kingdom: Plantae
- Division: Angiosperms
- Class: Eudicots
- Order: Rutales
- Family: Rutaceae
- Genus: Aegle
- Species: Aegle marmelos
- Scientific Name: Aegle marmelos.
- Part Used: Various parts of the Bael tree are used, including the fruit, leaves, and bark.
- Height: Bael trees can grow up to 15-20 meters in height.
- Leaves: Bael tree leaves are alternate, long-petioled, trifoliate, and aromatic when crushed.

- **Synonym:** Bengal quince, Indian bael, and stone apple.
- **Biological Source:** Bael consists of the unripe or half-ripe fruits or their slices or irregular pieces of Aegle marmelos Corr., belonging to family Rutaceae.
- **Habitat:** Bael, is native to the Indian subcontinent, including India, Nepal, Sri Lanka, and Bangladesh. It is widely distributed across tropical and subtropical regions, with cultivated varieties found in other parts of Asia, such as Southeast Asia and Indonesia. Additionally, Bael has

been introduced to various tropical regions worldwide, including parts of Africa, the Caribbean, and South America, where it is cultivated for its fruit and medicinal properties.

- **Chemical Constituents:** The chemical composition of the Bael tree varies across its different parts. The fruit contains essential oils, flavonoids, tannins, and mucilage. The leaves contain alkaloids, flavonoids, and saponins. The bark contains alkaloids and tannins.
- **Essential Oils:** These oils are primarily found in the leaves, fruit, and flowers of the Bael plant. They contain various volatile compounds such as terpenes, aldehydes, and ketones.
- **Flavonoids:** Flavonoids found in Bael include rutin, quercetin, and kaempferol. These compounds help scavenge free radicals, reducing oxidative stress and inflammation in the body.
- **Tannins:** Bael contains tannins, they have been shown to possess antimicrobial, antidiarrheal, and anti-inflammatory properties.
- **Alkaloids:** The alkaloids found in Bael include marmelosin, aegeline, and skimmianine. they show potential effect on smooth muscle contraction and neurotransmission.
- **Mucilage:** Bael fruit contains mucilage, a type of gel-like substance composed of polysaccharides.
- **Vitamins and Minerals:** Bael fruit is rich in vitamins and minerals, including vitamin C, vitamin A, calcium, potassium, and magnesium.
- **Other Bioactive Compounds:** Bael also contains other bioactive compounds such as lignans, phenolic acids, and saponins

Uses:

1. Medicinal Purposes: Various parts of the Bael tree, including the fruit, leaves, and bark, are used in traditional medicine systems such as Ayurveda and Unani for treating digestive disorders, respiratory problems, skin conditions, and more.
2. Culinary Uses: The ripe fruit of the Bael tree is consumed fresh or used to make juices, jams, and preserves. It is also used in traditional sweets and desserts.
3. Religious and Cultural Significance: Bael tree is considered sacred in Hinduism and is often planted near temples. The leaves and fruit are offered to deities during religious ceremonies.
4. Timber: The wood of the Bael tree is used for making furniture, agricultural implements, and construction materials.
5. Ornamental: Bael tree is also planted as an ornamental tree in gardens and parks for its attractive foliage and fragrant flowers.
6. Skincare: Bael fruit extract is utilized in skincare for its moisturizing and antioxidant properties, helping to hydrate the skin and protect against environmental damage. It also possesses anti-inflammatory qualities, soothing irritated skin and potentially reducing redness and inflammation.

7. Alovera gel-

Figure 7. Alovera gel

- Kingdom: Plantae
- Division: Angiosperms
- Class: Monocotyledons
- Order: Asparagales
- Family: Asphodelaceae (formerly included in the Xanthorrhoeaceae family)
- Genus: Aloe
- Species: Aloe vera
- Scientific Name: Aloe vera.
- Part Used: The gel and latex obtained from the leaves
- Height: Aloe vera plants typically grow between 60 to 100 centimetres (2 to 3 feet) in height.
- Leaves: Aloe vera leaves are succulent, lanceolate (long and tapering), and arranged in a rosette pattern. They contain a gel-like substance in the inner leaf parenchyma and a bitter yellow latex beneath the outer skin.
- **Synonym: true** aloe, medicinal aloe, Aloe, Musabbar, kumari, korphad.
- **Biological Source:** Aloe is the dried juice collected by incision, from the bases of the leaves of various species of Aloe. which belongs to the family Asphodelaceae (formerly included in the Liliaceae family).

- **Habitat:** Aloe vera, a succulent plant species, is native to the Arabian Peninsula but is cultivated in various tropical and subtropical regions worldwide. It thrives in well-drained sandy soils and is commonly grown in countries such as India, Mexico, South Africa, and the United States. Aloe vera is cultivated in various regions of India, with significant cultivation found in states such as Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh, Maharashtra, and Karnataka.
- **Chemical Constituents:**

Aloe vera contains a variety of bioactive compounds, including
polysaccharides (such as acemannan),
glycoproteins,
anthraquinones (including aloin),
vitamins (such as vitamin C and vitamin E),
minerals (such as calcium, magnesium, and zinc),
enzymes (such as bradykinase),
amino acids.
The gel obtained from the inner leaf parenchyma is particularly rich in polysaccharides and glycoproteins, which contribute to its soothing and moisturizing properties.

Uses:

1. **Medicinal Purposes:** Aloe vera has been used for centuries in traditional medicine to treat various skin conditions, including burns, wounds, eczema, and psoriasis. It is also used internally for digestive health, immune support, and as a general tonic.
2. **Cosmetic Applications**: Aloe vera gel is a popular ingredient in skincare and haircare products due to its moisturizing, soothing, and healing properties. It is used in creams, lotions, sunscreens, shampoos, and conditioners to hydrate the skin, reduce inflammation, and promote wound healing.
3. **Dietary Supplement:** Aloe vera juice or supplements are consumed for their potential health benefits, including digestive support, detoxification, and immune modulation. However, it's essential to use them cautiously and consult with a healthcare professional, as excessive consumption may have adverse effects.

EQUIPMENTS USED: -

Weighning balance-

Used to wigh the ingridents as per the requirement. Max. 200g weight can be measured. And minimum 0.001g weight can me measured using High percision balance of WENSAR ISO 9001-2008 certified.
While weighing ingridents butter paper, spatula and hand gloves were used.

Figure 8. weighing balance

Conical percoloator:
Conical percolator was used for extraction of chemical constituents from drug. It was conical in shape hanging on its stand with knob closed.
While usking conical percolator we cleaned it with distilledd water and keepdor drying in hot air oven for 10-15 min. Then to it we added cotton at bottom, and drug and solvent medium for extraction.

Figure 9. Percolation apparatus

Magnetic stirrer:

It utilizes a rotating magnetic field to induce the rotation of a stir bar submerged in a liquid, facilitating rapid stirring and mixing of the solution. While using magnetic stirrer we have cleaned beaker and magnetic bead and mixing speed was maximum.

Figure10. Magnetic stirrer.

FORMULATION TBALE AND COLLECTION OF INGREDIENTS: -

FORMULATION TABLE: -

SR.NO	DRUG	USE	Batch 1	Batch 2	Batch 3
1.	Papaya pulp	Revitalization	5ml	8ml	10ml
2.	Flaxseed oil	Regulate sebum production.	5ml	6ml	7ml
3.	Bael fruit extract	Antioxidant	5ml	10ml	10ml
4.	Alovera gel	Moisturizer	5ml	5ml	5ml
5.	Vit. E	Skin brightening.	1ml	4ml	3.5ml
6.	Olive oil	Prevent moisture loss and environmental damage.	1.8ml	5ml	4ml
7.	Coconut oil	Anti-bacterial and anti-fungal.	0.4ml	3ml	3ml
8.	Orange oil	Exfoliation of dead skin cells.	1ml	3ml	3ml
9.	Lemon juice	Exfoliation and Controls excess oil production	1ml	1ml	1ml
10.	Rose water	vehicle	q.s	-	q.s
11.	Acacia powder	Soothing.	0.2g	0.1g	0.1g

Table 1. Formulation Table

Figure 11. Ingredients used for formulation

COLLECTION OF INGREDIENTS FOR FORMULATION: -

INGRIDENTS	COLLECTED FROM
Papaya pulp	Online ordered from amazon
Flaxseed oil	From local market
Bael fruit powder	From local market
Alovera gel	Online order from amazon
Vit. E	From local market
Olive oil	From local market
Coconut oil	From local market
Orange oil	From local market
Lemon juice	From local market
Rose water	From local market
Accasia powder	From local market

Table 2. Collection of Ingredient.

PROCEDURE: -

Formation of bael fruit extract-

Figure 12. Extraction of bael fruit.

Step 1. –
Take a clean conical percolation / maceration apparatus. aand lock the knob.
Step 2. –
Add cotton at the bottom of apparatus.
Step 3. –
Add drug i.e bael fruit powder 10gm.
Step 4. –
Add the organic solvent disttiled water / ethanol . we have added 100 ml of ethanol for the extraction process.
Step 5. –
Keep the apparatus in dark place for 24 hours.
Step 6. –
Open the knob in such a way that drop wise extraction is collected in beaker.
Step 7. –
Filter the collected extract using whatman filter paper. And keep the extract in well closed container.

Figure 13. Filtration of bael extract

Flow chat of procss: -

Preparation of oil phase

⇩

Preparation of aqueous phase

⇩

Separation of aqueous phase

⇩

Drop wise Mixing of oil phase in water phase

⇩

Keep the formulation in air tight container.

STEPS OF PROCEDURE:-

Step 1 – preparation of oil phase:

Take a clean mortar and pestle and add ingredients such as flaxseed oil, olive oil, coconut oil, vit.E., orange oil in mortar and mix for 10 min. continously and later use magnetic stirrer for mixing for 5 min.

Figure14. Oil phase

Step 2 – preparation of oil aqueous phase:

Again clean the mortar and pestle and add ingredients such as papaya pulp, alovera, bael fruit extract, lemon juice, rose water in mortar and mix for 10 min. and again mix for 5 min using magnetic stirrer uniformly.

Figure15. Aqueous phase.

Step 3 – Separation of aqueous phase:

From the above aqueous phase prepared, make 2 equal half parts of it and use one part and discard other. And in that one part add acacia powder and again mix for 10 min using magnetic stirrer.

Figure16. separation of Aq. phase

Step 4 – Mixing of oil phase in water phase:

Add drop wise oil phase in water phase with continous stirriring for about 15-20 mins.

Figure 8. Addition of oil in water phase.

Figure18. Mixing of oil in water phase.

EVALUATION: -

Physical evaluation:-

Colour, odour, texture, and state of serum.

Sr.no.	Evaluation parameter	Batch 1	Batch 2	Batch 3	Std. parameter
1.	Colour	Brown	Yellow	Yellow	Yellow
2.	Odour	Rose like	Pleasant	Pleasant	Pleasant
3.	Texture	smooth	Smooth	Smooth	Smooth
4.	State.	Viscous	Viscous	liquid	Viscous

Table 3. Physical evaluation

Figure19. Batch 2 formulation image

pH: -

pH measures the acidity or alkalinity of a solution on a scale from 0 to 14, with 7 being neutral, below 7 acidic, and above 7 alkaline. It's the negative logarithm of hydrogen ion concentration in moles per Liter.

The pH of human skin typically ranges from 4 to 6, slightly acidic, which helps maintain the skin's natural barrier function and protect against harmful microbes.

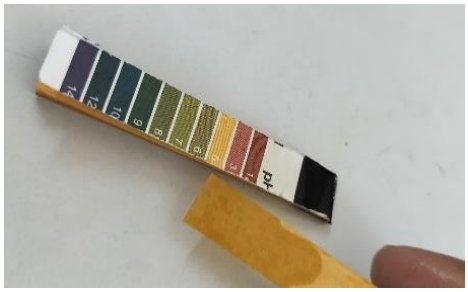


Figure 9. batch 2 pH result

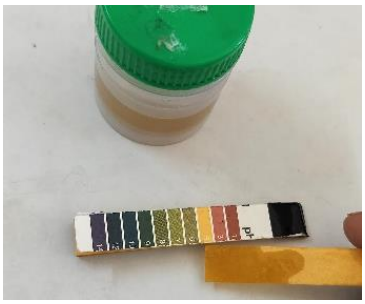


Figure21. batch 3 pH result

Sr. no.	Evaluation parameter	Batch 1	Batch 2	Batch 3	Std. value
1.	pH	3.5	5	5	4-6

Table 4. pH values.

Phase separation: -

The prepared cream was kept at Room temperature for about 15-30 days. Away from light, in a sealed / air tight container.

Sr. no.	Evaluation parameter	Batch 1	Batch 2	Batch 3	Standard value
1	Phase separation	Within 5 days 2 phase were separated	No phase separation	Within 12 days phase were separated.	No phase separation

Table 5. Phase Separation.

Irritation and Edema: -

On the dorsal surface of the left hand, a 1cm^2 mark was made. Serum was applied to the area. The area was monitored for 24 hours, and any signs of irritancy or edema were noted and reported.

Sr.no.	Evaluation parameter	Batch 1	Batch 2	Batch3	Std.value
1.	Irritation	yes	no	no	No
2.	Edema	no	no	no	No

Table 6. Irritation and edema result.

COMPARISON WITH MARKETED FORMULATION: -

From evaluation of all the batches we formulated, we finalised that batch 2 formulation fits the standards of face serum.
Now let's compare the herbal formulated face serum with synthetic face serum.

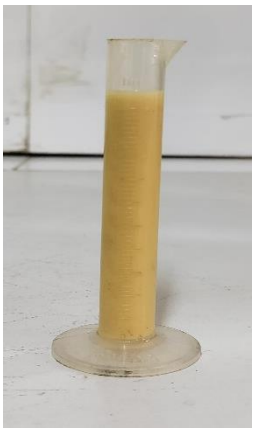


Figure22. Herbal face serum formulated

Figure23. Synthetic face serum from market

Compare between herbal face serum and marketed synthetic face serum.

Sr.no.	Evaluation parameter	Herbal Face Serum of 2nd Batch	Marketed Synthetic Face Serum
1.	**Nature of chemical used.**	Herbal ingredients.	Synthetic ingredients.
2.	**Side effects of excess use**	No effect.	Small skin bumbs.
3.	**Colour**	Milky yellow	Transparent yellow.
4.	**Odour**	pleasant	Pleasant
5.	**Texture**	Smooth	Smooth
6.	**State**	Viscous	Viscous
7.	**pH**	5	3.6
8.	**Phase separation**	no	no
9.	**Irritation**	no	no
10.	**Edema**	no	no

Table 7. Comparison with marketed formulation.

CONCLUSION: -

Efficacy of Herbal Ingredients

The herbal face serum, combining Carica papaya leaf extract, bael, and aloe vera gel, demonstrated impressive antioxidant, anti-inflammatory, and moisturizing properties. Carica papaya leaf extract, rich in flavonoids and phenolics, provided potent antioxidant effects, effectively neutralizing free radicals and protecting the skin from oxidative stress. Bael, known for its anti-inflammatory properties, contributed to reducing skin irritation and enhancing skin texture. Aloe vera gel, with its well-documented hydrating and soothing properties, further improved skin hydration and elasticity.

Comparison with Marketed Formulation

When compared with the marketed Derma Co formulation, the herbal serum showed comparable, if not superior, results in several key areas. Both formulations improved skin hydration and texture, but the herbal serum had a slight edge in reducing oxidative stress and skin irritation, likely due to the synergistic effects of the natural ingredients. The herbal serum's ability to penetrate the skin and deliver active compounds effectively was on par with the commercial product, demonstrating that natural formulations can achieve similar efficacy as synthetic counterparts.

Consumer Preferences and Sustainability

The study also highlighted a growing consumer preference for natural and sustainable skincare solutions. The herbal face serum, formulated using readily available and sustainable ingredients, aligns well with this trend. Carica papaya leaves, often considered agricultural waste, and bael, a common plant in traditional medicine, offer a sustainable source of potent bioactive compounds. Aloe vera, widely cultivated and known for its minimal environmental impact, further enhances the sustainability profile of the serum.

Conclusion :

In summary, the herbal face serum containing Carica papaya leaf extract, bael, and aloe vera gel presents a viable and sustainable alternative to conventional skincare products. It matches the efficacy of marketed formulations like those from Derma Co while offering additional benefits of sustainability and natural ingredient appeal. This study underscores the potential of herbal formulations to meet the evolving demands of consumers for effective and environmentally responsible skincare solutions.

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