



“FORMULATION AND EVALUATION OF A MOISTURIZING CREAM ENRICHED WITH AEGLE MARMELLOS LEAVES EXTRACT”

Ms. Vedanti Vijay Arekar^{1st}, Ms. Sakshi Prabhakar Bhogekar^{2nd}, Ms. Manisha Bibhishan Rathod^{3rd},
Mr. Saqlain Khan Gaffar Khan^{4th}
Student¹²³⁴

Guidance By: - Assistant Prof. Unnati T. Rathod^{5th}

M.pharm (Pharmaceutical Chemistry)⁵

Ishwar Deshmukh Institute Of Pharmacy, Digras (Maharashtra)¹²³⁴⁵

Abstract - Herbal cosmetics are the preparations used to beautify and enhance the human appearance. The present research aimed to formulate and evaluate the moisturizing cream using Aegle marmelos leaves extract is a fascinating area of research in cosmetic technology. the leaves of Aegle marmelos, also known as Bael, are known for their potential pharmacological activities such as hypoglycemic, anti-inflammatory, antimicrobial, anticancer, chemopreventive, and antioxidant activities due to their rich content. The extract of these leaves is known to have a high content of phytosterols, tannins, phenol, fatty acids, and phenolic compounds. These compounds contribute to the cream's moisturizing properties by helping replenish the natural oils of the skin and increasing the skin's ability to retain moisture. The formulated cream is evaluated for its ability to increase the water content in the stratum corneum, the outermost layer of the skin, providing an oily barrier that reduces water loss. The cream base, formulated through various trials, is selected based on optimal pH and thermal stability results.

Keywords - Aegle marmelos, Moisturizing property, Skin hydration, herbal cosmetics.

1. INTRODUCTION

Cosmetics have evolved significantly over time, with historical associations ranging from hunting and fighting to religion and superstition. Herbal cosmetics, known for their natural origins and potential benefits, have gained popularity. The use of herbs in cosmeceutical production has greatly increased in recent years, leading to a high demand for herbal cosmetics. Herbal products in cosmetics, also known as botanical-origin products, are substances applied to the human body to cleanse, beautify, and enhance attractiveness without harming the body's structure or functions. Herbal cosmetics can be grouped into the following major categories. In this context, the use of Aegle marmelos leaves extract in moisturizing cream formulation shows promise.

History

Cosmetics have a long history, with the earliest evidence dating back to around 6000 years ago in Ancient Egypt. Aloe, myrrh, and frankincense were commonly used by the Egyptians. They believed that these products, especially frankincense, possessed anti-aging properties, and used them as anti-wrinkle creams. As far back as 10,000 BC, both men and women in Egypt used scented oils and ointments to cleanse, smooth their skin, and mask body odor. These practices were essential for protection against the harsh sun and dry winds.

Interestingly, Egyptian customs and beauty practices were not confined to their civilization. They were exported and adopted by the Greeks and Romans as well. Meanwhile, in India, the ancient system of medicine known as Ayurveda held herbs in high regard for their therapeutic value. Among these herbs, Aegle marmelos leaves, rich in phytochemicals, found their place in various herbal formulations.

Skin Health and Environmental Challenges:

- The beauty of our skin and hair depends on factors such as health, habits, routines, and climatic conditions.
- Excessive heat exposure during summer can lead to dehydration, wrinkles, freckles, blemishes, pigmentation, and sunburn
- Conversely, extreme winter conditions cause skin damage in the form of cracks, cuts, maceration, and infection.
- Skin diseases are prevalent across all age groups and can result from exposure to microbes, chemical agents, biological toxins, and even malnutrition.

Moisturizing Cream

Moisturizers are cosmetic preparations used to protect, moisturize, and lubricate the skin. These creams restore moisture to the stratum corneum. When applied to the body, the water contained in the cream is lost through evaporation. Moisturizers are complex mixtures of chemical agents. They are often occlusive, helping to retain water in the skin after application. Additionally, humectants attract moisture, and emollients help smooth the skin.

Need of moisturizer

There is a growing body of literature that recognizes the importance of moisturizers. They are essential across a wide range of fields, including cosmetics and pharmacy. Dermatologists frequently prescribe moisturizers due to their proven efficiency in preventing and treating various dermatological conditions. Although the terms ‘moisturizer’ and ‘emollient’ are often used interchangeably, it’s important to note that occlusives and humectants are typically included in moisturizers to enhance the water-binding capacity of the stratum corneum (SC) of the skin. Clinicians encounter a variety of skin problems, such as eczema, chapping, seborrheic dermatitis, ichthyosis, mild psoriasis, and atopic dermatitis, all of which exhibit the same scaling, flaking, and roughness associated with dry skin. In the process of treating these dermatoses, moisturizers find widespread use for both normal and dry skin. By applying these preparations, the water content in the stratum corneum increases, thereby exerting their most vital action—moisturization. Additionally, moisturizers help maintain a normal skin pH and facilitate the lipid bilayers in the skin to more easily normalize and re-establish their capacity to connect corneocytes, allowing for moisture retention in the intercellular spaces.

Consequently, hydration interrupts the dry skin cycle, resulting in a smoother, softer, more pliable, and more extensible skin surface.

Furthermore, moisturizers exhibit other plausible actions, including anti-inflammatory effects by blocking cyclooxygenase activity, antimitotic properties, antipruritic effects through downregulation of cytokines, photoprotective benefits, antimicrobial activity, and wound healing."

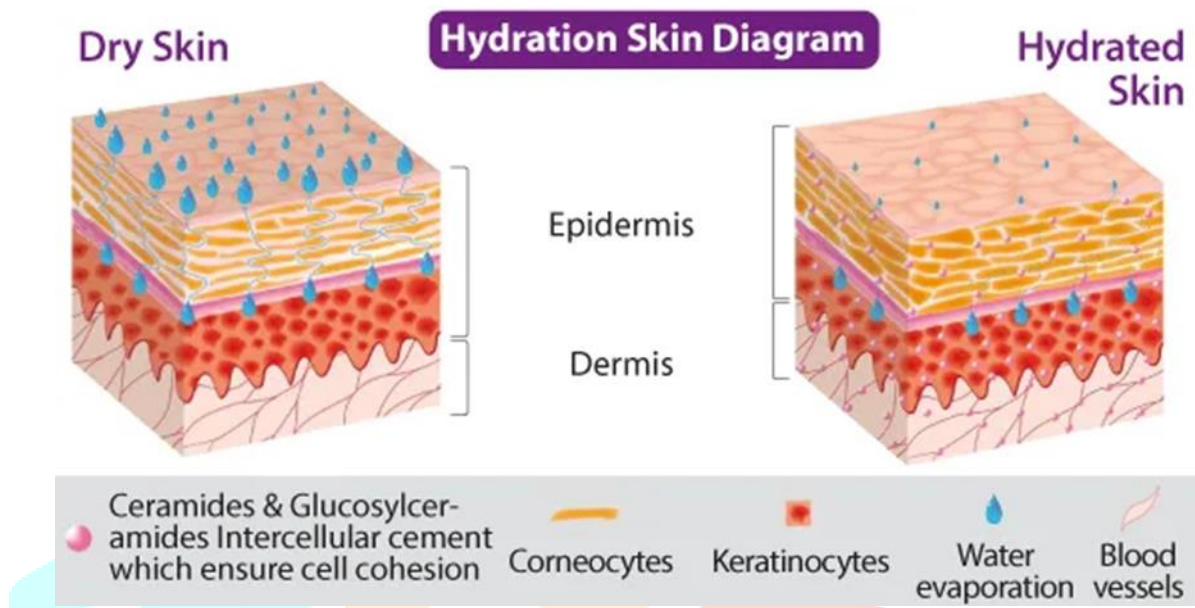


Fig.no.1 Hydration of skin diagram

Type of moisturizer

Moisturizers can be broadly categorized into two types based on their base: water-based and oil-based.

1. Water-Based Moisturizers: These moisturizers are formulated with humectants like glycerin, amino acids, peptides, urea, and hyaluronic acid, which attract moisture from the surroundings to the skin. Typically, lighter than their oil-based counterparts, they are an excellent option for warm climates and the summer season. To prevent water loss, these moisturizers may also contain oils. They are available in various forms, including water creams, lotions, or gels. The key distinction among these products lies in their water content, which influences their consistency.
2. Oil-Based Moisturizers: In oil-based moisturizers, the active ingredients are solubilized in an oil foundation. These moisturizers are denser and richer than water-based types, providing additional oil to the skin and softening its outer layer. They are particularly beneficial for individuals with dry or flaky skin. Available as thick creams, ointments, body butters, or facial and body oils, the choice between water-based and oil-based moisturizers hinges on one's skin type and personal requirements. For example, those with oily skin may find water-based moisturizers more fitting, whereas those with dry skin may derive greater benefits from oil-based options.

Classification of moisturizing cream:

There are four main types of moisturizers depending on their mechanism of action.

- 1) Emollients
- 2) Humectants
- 3) Occlusives
- 4) Protein rejuvenators

	Emollients	Humectants	Occlusives Protein	Rejuvenators
Mechanism of action	Saturated & unsaturated hydrocarbons with variable lengths improve skin barrier function, membrane fluidity, and cell signaling, resulting in overall improvement of skin texture and appearance. Often combined with an emulsifier.	Low molecular substances in the majority, with the capability to attract water into the stratum corneum. Frequently used with other compounds which may retain the water content	Consist of oils and waxes, forming an inactive layer on the skin surface to physically block water evaporation from the skin (transepidermal water loss)	Small molecular weight proteins are believed to aid skin rejuvenation by replenishing the skin's essential proteins
Indication	Routine skin care, dry and rough skin, papulosquamous skin disease	Xerosis, ichthyosis	Prevention of contact dermatitis, xerosis, atopic dermatitis	Photodamaged skin, skin rejuvenation
Adverse effect	Contact irritation (seldom)	Irritation (lactic acid, urea)	Oily application, cosmetically disagreeable, folliculitis (mineral oil), contact dermatitis (lanolin),	Contact dermatitis

			acneiform eruption	
Substance	Fatty acids, fatty alcohols, cholesterol, squalene, pseudo ceramides	Urea, sorbitol, panthenol, glycerol, propylene glycol, hyaluronic acid, alpha hydroxy acids	Mineral oil, petroleum jelly, beeswax, silicones, zinc oxide	Collagen, elastin, keratin

Fig.no.2 Type of moisturising agent

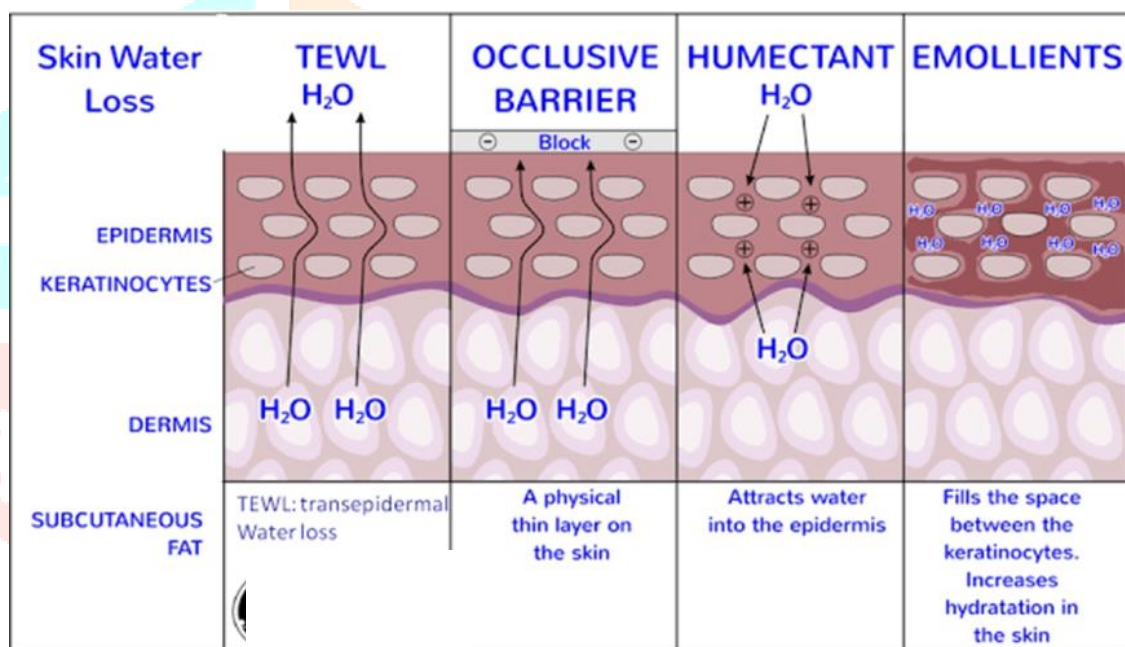


Fig. no.3 Mecanism of moisturizing agent

Significance of the Problem

Skin health is crucial for overall well-being. Excessive heat exposure during summer and extreme winter conditions can lead to various skin issues.

The quest for effective moisturization drives research in cosmetic formulations. Moisturizing creams play a vital role in maintaining skin health by preventing water loss and enhancing the skin's barrier function.

Objectives and Scope

- ✓ Investigate Phytochemical Composition.
- ✓ We aim to explore the active compounds present in Aegle marmelos leaves extract.
- ✓ Phytochemical screening will reveal the richness of this botanical ingredient.

Research Objectives

- ✓ Investigate the phytochemical composition of Aegle marmelos leaves extract.
- ✓ Formulate a moisturizing cream using a simple oil-in-water base.
- ✓ Evaluate the moisturizing properties of the formulated cream.

Advantages:

1. Hydration provides essential moisture, especially beneficial for dry skin.
2. Protective barrier Forms a shield against environmental damage.
3. Improved skin Texture Regular use can lead to softer, smoother skin.
4. Anti-Aging may contain ingredients that help reduce the appearance of fine lines.
5. Radiant glow can plump up skin cells, making the complexion appear more radiant.
6. Skin defences strengthens the skin's barrier to defend against pollutants and UV rays.
7. Even skin tone some are designed to target hyperpigmentation and dark spots.
8. Boosts confidence healthy skin can enhance self-assurance.
9. Makeup base provides a smooth base for makeup application.
10. Prevention of skin disorders.

Disadvantages:

1. Pore clogging rich creams may lead to breakouts, especially in oily skin.
2. Preservatives necessary to prevent bacterial growth, but some may wish to avoid them.
3. Rancidity oils in creams can become rancid, affecting safety and efficacy.
4. Synthetic chemicals may contain chemicals that could cause skin sensitivity.
5. Interference with medication can affect the use of certain skin treatments like Retin-A.
6. Increased acne some moisturizers can increase acne in prone individuals.
7. Allergic reactions ingredients may trigger allergies in sensitive individuals.
8. Cost: high-quality moisturizers can be expensive.
9. Over-reliant skin may become reliant on added moisture, reducing natural hydration.
10. Environmental impact packaging and ingredients may not be eco-friendly.

2. MATERIAL AND METHOD

Aegle marmelos

The Aegle marmelos, also known as bael, is a tree species native to the Indian subcontinent and Southeast Asia. It is also known by several other names such as Bengal quince, golden apple, Japanese bitter orange, stone apple, and wood apple. This plant is the only member of the Aegle genus in the Rutaceae family and holds significant medicinal value in Ayurveda. The bael tree is a slow-growing, spiny, robust subtropical tree that can reach a height of up to 13 meters. It is found growing wildly across India, Ceylon, Burma, Thailand, and Indochina. The tree has slender branches that droop, forming an uneven crown, with axillary leaves measuring 2.5 cm long and alternate trifoliate leaves. Its flowers are brief, and its fruits are globular. Aegle marmelos is renowned for its numerous therapeutic properties and is extensively used in the indigenous system

of Indian medicine. It contains several phytoconstituents, including marmenol, marmin, marmelosin, marmelid, psoraien, alloimperatorin, rutartein, scopoletin, aegling, marmelin, fagarin, anhydromarmelin, limonene. It also contains Tannin (0.985%) and riboflavin (0.005%).

The Bael plant is highly effective in treating skin anomalies due to its antibacterial, antifungal, and anti-inflammatory properties. Bael oil and bael leaf extract can eliminate harmful fungi that can lead to minor to serious skin infections. It may also be beneficial in treating skin rashes and itchy skin bumps. Bael's natural and moderate astringent properties are found in its roots, bark, leaves, and fruit, which also possess anti-inflammatory, antibacterial, antiviral, and antifungal properties. With all these potent properties, this remarkable fruit can balance an unbalanced pitta dosha and reduce skin swelling.



Fig. No.4 Aegle Marmelos Leaves

The Benefits & uses of Bilva Leaves

- Relieves Pain and Gastritis:
 - Bilva leaves are effective in relieving pain, dyspepsia, gastritis, and abdominal colic pain.
 - They also help balance all three doshas in Ayurveda.
- Heart Health and Digestion:
 - Bilva stem is good for the heart and has positive effects on rheumatoid arthritis.
 - It improves the secretion of digestive enzymes, aiding digestion.
- Diarrhoea and Dysentery Relief:
 - Bilva flowers are beneficial in relieving diarrhea, dysentery, thirst, and vomiting.
 - Spiritual and Religious Significance:
 - Bilva is considered sacred and is used as an offering to Hindu Gods, especially Lord Shiva.
 - Ancient scriptures refer to it as the “Shiva druma” or the tree of Shiva.

- Blood Sugar Control:
 - Bilva is being explored for its ability to keep blood sugar levels under control.
 - It contains antioxidants that aid in insulin secretion, leading to lower blood sugar levels.
- Respiratory Health:
 - Bilva leaves and roots are used to treat respiratory conditions like cough, cold, bronchitis, and asthma.
 - They possess expectorant properties and help relieve congestion.
 - A decoction of the leaves is a favourite remedy for ailments that often occur during seasonal changes, such as fever, flu, and fatigue.
- Culinary Uses:
 - The fruits can be eaten fresh or dried, and their rich vitamin C content makes them beneficial.
 - Fresh juice from Bilva fruits, when strained and sweetened, resembles lemonade.
- Digestive Aid:
 - Bilva leaves contribute to healthy digestion and help keep the intestines in good condition.
 - The chilled juice is refreshing during hot summers.
- Medicinal Properties of Different Parts:
 - Unripe fruits: Balance Kapha and Vata doshas.
 - Ripe fruits: Difficult to digest and aggravate all three doshas.
 - Roots: Improve digestion, prevent vomiting, and balance all three doshas.
 - Stem: Good for the heart, effective in rheumatoid arthritis, and improves secretion of digestive enzymes

Methodology and experimental work

Plant material:

- Aegle marmelos leaves were collected and authenticated.
- The fresh leaves of the plant were washed with water and ground into a paste for further extraction

Preparation of extract:

Maceration is an extractive technique that is conducted at room temperature. It consists of immersing a plant in a liquid (water, oil, alcohol, etc.) inside an airtight container, for a variable time based on the plant material and liquid used. The mixture is filtered (by pressing moist solid particles). filtration and decoction are used to clarify the combination liquid 24 hours of maceration are spent at room temperature.

1. Extraction with Water (Active A):

A paste of 300g fresh A. marmelos leaves were extracted with water for 12 hours at room temperature using the maceration method. The supernatant was filtered out after 12 hours, yielding a liquid extract labeled as Active A.

2. Extraction with Chloroform (Active B):

The leaves were air-dried after filtering out the supernatant, and a further extraction process with chloroform was carried out using the maceration method. This process was repeated for 72 hours at room temperature until the extract turned pale. The extract was then filtered using Whatman No.1 filter

paper and dried on a water bath until a constant weight was achieved. The resulting dried extract was stored at 4°C in a small sterile glass bottle and labeled as Active B. The percent extractive values were calculated using a specific formula.



Fig.no.5 Active A
(Water extract)

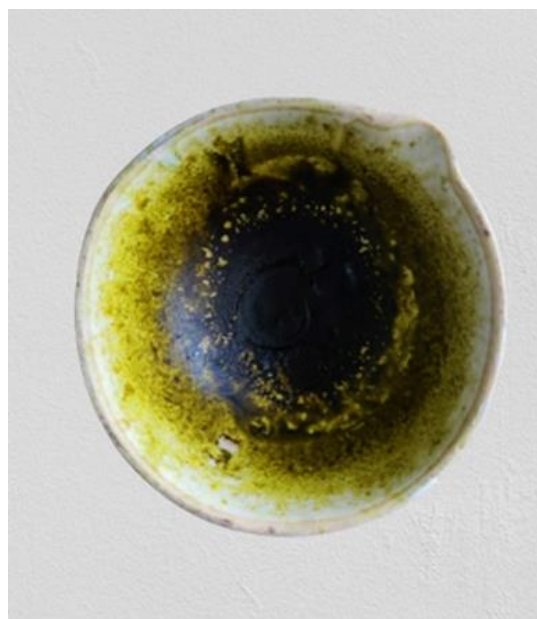


Fig. no.6 Active B
(Chloroform Extract)

3. Formulation of Moisturizing Cream Base:

A simple oil-in-water base was chosen to avoid interference with the evaluation of the moisturizing property of the Active ingredient. The cream base was formulated by taking all the ingredients of phase A (oil phase) and phase B (water phase) in separate beakers. These ingredients were melted completely by heating up to a temperature of 70-80°C. The oil phase was then added to the water phase with constant stirring until a cream was formed. The cream was triturated to achieve the desired consistency and appearance.



Fig no.7 Formulation of cream

Sr.no.	Ingredients
1.	Stearic acid
2.	Cetyl alcohol
3.	Mineral oil
4.	Propyl paraben
5.	Triethanolamine
6.	Glycerine
7.	Water

Fig.no.8 Ingredients

3. EVALUATION OF CREAM

- Physical Parameters:** The cream is evaluated for its physical parameters such as color, odor, and appearance.
- pH Test:** The pH of the cream is tested to ensure it's safe and suitable for skin application.
- Viscosity:** The viscosity of the cream is measured to ensure it has the right consistency for easy application and absorption.
- Homogeneity:** The cream is tested for homogeneity to ensure the ingredients are evenly distributed.
- Irritancy Test:** An irritancy test is conducted to ensure the cream does not cause any skin irritation. The cream was applied on left hand dorsal side surface of 1 sq.cm and observed in equal intervals up to 24hrs for irritancy, redness and edema. The did not produce any irritation or redness on skin.
- Spread ability Test:** The spread ability of the cream is tested to ensure it spreads evenly on the skin.
- Stability Test:** The cream is tested for its stability under different conditions to ensure its shelf life.
- Moisturizing Property:** The moisturizing property of the cream is assessed by measuring the hydration levels of the skin after its application.
- Performance Evaluation:** The overall performance of the cream is evaluated by comparing its properties and effects with a control cream without the extract.
- Washability:** The quality of cream is also tested using this method. In this first of all we have to add small amount of cream which was applied on the hand. We must then wash with tap water after that.

4.RESULT

Aegle marmelos leaf extract was found to significantly enhance skin hydration and improve skin texture. It was more effective than the control cream. Additionally, the water extract of Aegle marmelos provided better hydration than the chloroform extract, indicating its potential as a valuable ingredient in skincare products.

5.CONCLUSION

The study successfully developed and evaluated a moisturizing cream using Aegle marmelos leaves extract, meeting relevant pharmaceutical characteristics. The primary focus was to evaluate the moisturizing properties of the cream formulated with Aegle marmelos leaf extract. The cream exhibited favorable properties such as spreadability, washability, optimal pH, and non-irritation. It also demonstrated therapeutic effects. In comparison to a control cream, the formulated cream showed better performance in enhancing skin hydration and improving texture, likely due to the phytochemicals in the extract. The water extract of Aegle marmelos provided better skin hydration than the chloroform extract. The study concluded that different concentrations of the extract are suitable for skin use.

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