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“Synergistic Effects Of Guava And Tecoma Leaf Extracts In A Herbal Face Serum Formulation”

Bobade.R.R, Kadam.P.D, Jadhav.S.B, Panaskar.A.N and Panaskar.B.A

Padmini collage of pharmacy,Dighanchi,Tal-Atpadi,Dist-Sangli,Maharastra,India-415315

Corresponding author: Mr.Bobade.R.R

Padmini collage of pharmacy,Dighanchi,Tal-Atpadi,Dist-Sangli,Maharastra,India-415315

➤ ABSTRACT:

The increasing interest in natural and plant-based skincare products has led to research on various botanical extracts known for their anti-inflammatory and antioxidant properties. This study primarily aims to develop and evaluate a face serum made from leaf extracts of tecoma and guava. Guava leaves are rich in flavonoids, tannins, and vitamin C, which contribute to their strong antibacterial, anti-aging, and antioxidant effects. Tecoma leaves possess alkaloids and flavonoids that have demonstrated effective results in reducing inflammation and soothing the skin. The developed face serum was evaluated for its pH level, viscosity, stability, and compatibility with the skin. Initial findings indicate that the mixture of guava and Tecoma extracts boosts the serum's effectiveness in enhancing skin texture, minimizing acne, and delivering hydration while remaining non-irritating. This emphasizes the promise of lesser-known plant extracts in formulations for natural skincare.

Key words:- Herbal face serum, Antioxidant, Antimicrobial, Anti-aging, Anti-inflammatory, Reduce acne.

❖ INTRODUCTION:

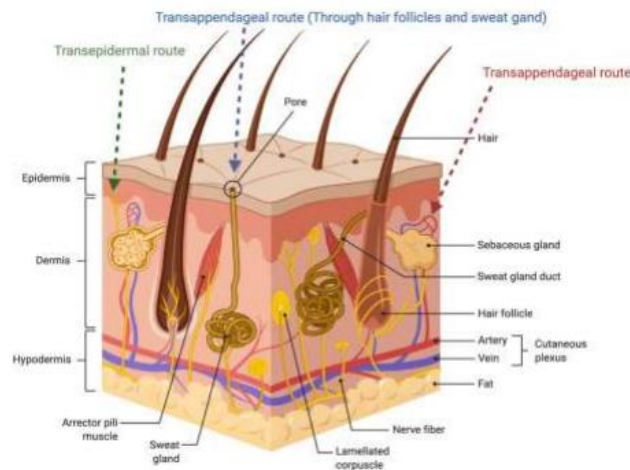
Serums are lightweight, viscous topical formulations containing highly concentrated active ingredients known as serums. A commonly utilized concentrated element in skincare formulations is serum. In the realm of professional cosmetology, this term is straightforward. The concentration of cosmetic serums is comparable to that of other creams. Serums have ten times the amount of organic ingredients compared to creams. The skin, which is the body's largest and most protective organ, can become dehydrated for various reasons, including exposure to UV rays, pollution, and makeup that can irritate or cause allergic reactions if not removed overnight. One type of skincare product that can be applied to your skin after cleansing, but prior to moisturizing, is a skin serum, as it allows for the direct delivery of beneficial ingredients. The worth of cosmetics has grown as an increasing number of individuals seek to maintain their youth and beauty. A specific type of skin care item that blends a gel, lightweight lotion, or moisturizer is known as a serum. Its ability to penetrate deeply facilitates the delivery of its active components to the skin. Furthermore, it aids in reducing the visibility of your pores.

A good face serum can make your skin firmer, smoother and more moisturized. All skin care products, whether they are serums, anti-aging, anti-wrinkle, or moisturizing, should contain antioxidants, cell-based components, and skin-like substances. For all skin types to be healthy, these ingredients are essential. Among other body parts, serums have local effects on the face, and neck. They can be used by people of any age. A polyhedral serum was created by combining extracts of guava and tecoma leaves, glycerin, aloe vera gel, vitamin E, coconut oil, and rose water. It was intended to lead to prompt action for equity.⁽¹⁾

❖ Face serum:

Face serums contain a high level of active ingredients and are free from unnecessary additives. Their thinner consistency and absence of heavy oils enhance absorption and penetration, making them effective for nourishing and layering on the skin. The best possible distribution of active substances, like vitamins or plant extracts, is ensured by concentrating on key constituents and avoiding emulsifiers.⁽²⁾

Fig- Mechanism of drug penetration through skin

Fig.no.1.Mechanism of drug penetration throught skin⁽²⁾

❖ TYPES OF ORGANIC FACIAL SERUM FORMULATIONS:

1. **OIL SERUM** The most basic type of face serum is called an oil serum, which uses a carrier oil as an absorbent base for dry skin. The moisturizing qualities of the oil serum have been enhanced by the use of premium oils.



Fig.no.2.Oil serum

2. **GEL SERUM** The areas of skin that get the gel serum experience a firming impact. It is possible to add a water-based plant extract to the gel serum to boost its efficacy.



Fig.no.3. Gel serum

3. **WATER BASED SERUM** A thick, watery serum with a little gum in it. In order to apply the hydrophilic plant extract that remains on the skin, a water-based serum should be used underneath creams or lotions. Serums that are water-based are the most effective at releasing the active components into the skin and penetrating deeply.



Fig.no.4. Water based serum

4. **EMULSION SERUM** The serum is a hydrating formula that provides active ingredients to the skin while also reinforcing it. An emulsion is created when two immiscible phases oil and water combine. An emulsifier is used to produce a stable emulsion condition. The active components are efficiently delivered deep into the skin by the emulsion serum. Emulsions provide a hydrating impact that strengthens the skin's protective function. ⁽³⁾



Fig.no.5. Emulsion serum

❖ ACNE:

Sebum accumulation inside clogged pores brought on by oil and dead skin cells causes acne, an inflammatory skin condition. A chronic skin condition arises when dead skin cells clog hair sacs. Acne vulgaris is the most commonly recognized term for the condition. Patients between the ages of 16 and 25 are impacted by this. Although mild acne is common in adolescents, severe acne can still leave scars and look unpleasant even after therapy. The symptoms of acne can be classified into three levels: mild, moderate, and severe.

Acne is affected by two major factors:

- Heredity
- Hormones

✓ **Types:-**

When the skin produces too much oil, bacteria proliferate and clog the pores, causing swelling and redness that leads to spots or pimples. It is not possible to spread pimples. These small bumps that stay underneath the outer layer of skin are known as whiteheads. Despite their strikingly black hue and propensity to rise to the skin's surface, blackheads are not caused by dirt. Black skulls are just black dirt does not give them that color. The keratin protein is frequently oxidized by air.

- **Papules:** These tiny, pink pimples are uncomfortable to the touch and are visible on the skin.
- **Pustules:** Pimples or zits are visible on the skin's surface. They have pus at the top and are crimson at the bottom.
- **Nodules:** Noticeable growths on the epidermis. These painful, large, firm pimples can be seen both deep within the skin and on the skin's surface.⁽⁴⁾

❖ **Guava Leaf Extract in Skincare:**

Guava leaves are rich in polyphenols, flavonoids, and sesquiterpenes, which possess antibacterial, anti-inflammatory, and antioxidant qualities. Guava leaf extract is a promising component in cosmetic compositions meant to improve skin health because of these qualities.

- **Antioxidant Properties:** Significant free radical scavenging activity has been shown by guava leaf extracts, suggesting that they may be able to shield the skin from oxidative stress and early aging.
- **Tyrosinase inhibition:** Research has indicated that guava leaf extracts may be used to treat skin whitening and hyperpigmentation because they can suppress the activity of tyrosinase an enzyme involved in the synthesis of melanin.
- **Anti-Aging Effect:** According to research guava leaf extract can promote skin suppleness and lessen the appearance of wrinkles by blocking the activity of enzyme collagenase, which breaks down collagen⁽⁵⁾

❖ **Tecoma leaf extract in skincare:**

The plant tecoma also called yellow bells, is indigenous to the indian subcontinent. Bioactive substance, including flavonoids, phenols, saponins, and alkaloids, are found in its leaves and contribute to arrange of pharmacological action.

- **Antioxidant Activity:** Tecoma leaf extracts have strong antioxidant qualities that help to shield the skin from oxidative damage and promote general skin health.
- **Anti-Aging Effects:** Enzymes implicated in skin aging processes, such as collagenase, elastase, and hyaluronidase, have been shown to be inhibited by the leaf extracts. This shows promise for enhancing skin suppleness and lessening the visibility of wrinkles.
- **Skin Protection:** Tecoma leaves include substances including flavonoids and phenols that support their anti-inflammatory and antibacterial qualities, providing further advantages for skin health and protection.⁽⁶⁾

- **Synergistic Potential in Face Serum Formulation:**

The complementary advantages of both plants can be utilized by combining extracts from Tecoma and guava leaves in a face serum composition. Tecoma leaf extract's anti-aging qualities can promote skin suppleness and lessen the appearance of wrinkles, while guava leaf extract's antioxidant qualities can shield the skin from oxidative stress. When combined, these extracts can offer a thorough skincare regimen that takes into account several facets of skin health.⁽⁷⁾

- ❖ **MATERIAL AND METHOD**

- **Active ingredient used in formulation:**

- A. Guava leaf:**



Fig.no.6. Guava leaf

- **Synonym:-** Psidium Littorane

- ✓ **Kingdom:** Plantae

- ✓ **Order:** Myrtales

- ✓ **Genus:** Psidium

- ✓ **Species:** Psidium guajava.

- **Medicinal properties of guava leaves are:**

- ✓ Antioxidant activity

- ✓ Anti inflammatory activity

- ✓ Fight against acne

- ✓ Provide anti-ageing

- ✓ Improve skin texture

- ✓ Lighten the skin⁽⁵⁾

B. Tecoma leaf:**Fig.no.7.Tecoma leaf****▪ Synonym:** Tecoma Juss. ex Kunth

- ✓ Kingdom: Plantae
- ✓ Division : Dicotyledon
- ✓ Order : Lamiales
- ✓ Family : Bignoniaceae
- ✓ Genus : Tecoma
- ✓ Species : Tecoma stans
- ✓ Phylum : Tracheophyta
- ✓ Class : Magnoliopsida

▪ Medicinal Properties of Tecoma leaf

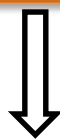
- ✓ Antibacterial activity
- ✓ Antimicrobial
- ✓ Antioxidant
- ✓ Wound healing

▪ Other ingredient used for the formulation of the herbal face serum

- ✓ Aloe vera
- ✓ Rose water
- ✓ Glycerin
- ✓ Propyl paraben
- ✓ Carbapol 934
- ✓ Coconut oil
- ✓ Vitamin E⁽⁶⁾

❖ PREPARATION OF POWDER:

Firstly collect fresh leaves of Guava and Tecoma leaves



Wash with Water

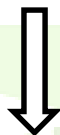


Dried leaves for 6-7 days in shade



Fig.no.8.Tecoma Leaf

Fig.no.9. Guava Leaf



After drying blend the leaf to form powder



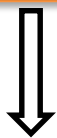
Fig.no.10.Guava Powder



Fig.no.11.Tecoma Powder

❖ PREPARATION OF EXTRACT

Take about 50 gm powder of both guava and tecoma leaves.



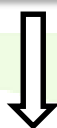
Take separately both leaves powder in separate beaker with 100 ml ethanol (maceration process).



Seal the beaker with the help of foil paper and place both beaker in dark place for 7 days.



After 7 days filter the filterate with the help of conical flask and filter paper.



Collect the extract and fill in the amber colour bottle



Use the extract as active ingredient to prepare the face serum of guava and tecoma⁽⁷⁾



Fig.no.12.Extract

❖ **Ingredients for 30 ml Face serum:**

Sr. No	Ingredients	Function	Approximate Quantity F1 30ml	F2	F3
1	Tecoma leaf extract	Antioxidant, Antiaging	3ml	-	5ml
2	Guava leaf extract	Antibacterial, brightening	3ml	5ml	-
3	Aloe vera gel	Soothing, Hydrating	6ml	5ml	5ml
4	Coconut oil	Moisturizing, nourishing	3ml	3ml	3ml
5	Glycerin	Humectant	4ml	4ml	4ml
6	Vitamine E	Antioxidant, preserves formula	0.5ml	0.5 ml	0.5 ml
7	Propyl paraben	Preservative	0.1gm(0.1%)	0.1gm	0.1gm
8	Carbapol 934	Gelling agent, pH adjuster	0.1gm	0.1gm	0.1gm
9	Rose water	Base, fragrance, soothing	Upto 30 ml	30ml	30ml

Table.no.1.Ingredients

❖ **PREPARATION OF FACE SERUM**✓ **Phase A- Aqueous phase**

1. **Hydrate carbapol 934:** In a clean container, add 10 ml of rose water and sprinkle 0.1g of carbapol934. Allow it to hydrate for 30-45 minutes, stirring occasionally to prevent clumping.
2. **Add glycerin:** Incorporate 4ml of glycerin into the hydrated carbapol mixture stir well to ensure uniformity.
3. **Add extracts:** Mix in 3 ml each of tecoma and guava leaf extracts, followed by 6ml of aloe-vera gel .stir until the mixture is homogeneous.
4. **Incorporate propyl paraben:** Dissolve 0.1g of propyl paraben in a small amount of rose water and add it to the mixture stir thoroughly to ensure complete dissolution.

✓ **Phase B –Oil phase**

5. **Blend oils and vitamins:** In a separate container, combine 3ml of coconut oil, 0.5ml of vitamin E oil, mix well to create a uniform oil phase.

✓ **Emulsification and final blend**

6. **Combine phases:** slowly add the oil phase (Phase B) into the aqueous phase (Phase A) With continuous stirring, use a hand blender or homogenizer for better emulsification.
7. **Final volume Adjustment :** Add rose water to the mixture to bring the total volume to 30 ml .Mix thoroughly to ensure uniform consistency.

8. **Packaging :** Transfer the serum into a sterilized dark glass dropper bottle to protect the product from light and preserve its efficacy.

❖ Storage and usage

Storage: keep the serum in a cool, dry place, away from direct sunlight.

Shelf life: Approximately 6 months to 1 year, depending on storage conditions.

Usage: Apply 1-2 drops to a clean face , preferably at night, and gently massage in upward circular motions.

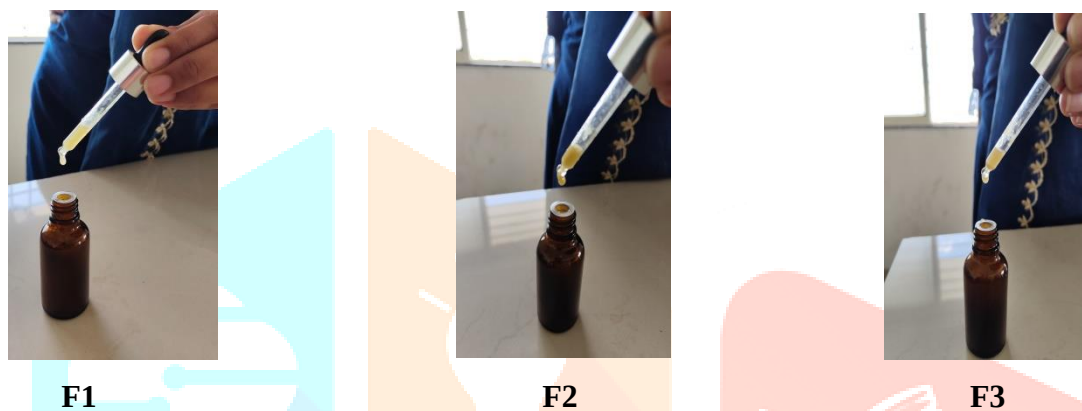


Fig.no.13.Formulation of face serum

❖ Evaluation test:

- ✓ **Organolaptic test:** The formulations were evaluated for homogeneity, colour, and odour, among other organoleptic characteristics. The formulations are examined visually to determine whether they are clear and free of extraneous particles.
- ✓ **pH of the serum:** A pH meter is used to measure the pH. To calibrate the pH meter, a standard buffer solution was used. After precisely weighing and dissolving about 1 milliliter of face serum in 50 milliliters of pure water, the pH of the mixture was determined. The pH of the skin serum should be between 4.1 and 6.7 because the skin has an acidic range.



Fig.no.14.pH meter

Viscosity of serum: viscosity measured by digital viscometer model LMDV-100 At 20 rpm.



Fig.no.15.Vicometer

- ✓ **Phase separation:** The prepared preparation was stored at room temperature, between 25 and 1000 °C, in a covered container that was shielded from the light. After a day, phase separation was examined. No Phase separation observed.
- ✓ **Irritancy:** This area was treated with serum, and the time was recorded. Irritation, redness, and potential edema are then assessed and reported every 24 hours. The results showed that the composition showed no symptoms of edema, erythema, or irritation.



Fig.no.16.Patch test day 1



Fig.17.Patch test day 3

✓ **Spreadability test:**

Firstly take 2 glass plates, a weight and a measuring device. A method involves placing the serum between the 2 plates, adding weight and measuring the time. It takes for the plates to separate. The time taken is directly related to the serum's spreadability.

✓ **Stability test:**

The prepared serum formulation batch(F1,F2,F3) is kept for one week at different temp.(20,40,60°C) then observe for one week. There is no any changes observe in formulation F1 than F2 & F3. The prepared F1 formulation is more stable.

✓ **Anti-microbial:** Using the agar well diffusion method, the antimicrobial activity of an herbal facial serum was tested against a Ecoli bacteria microbiological culture.

- Ecoli a bacterial strain of interest, is cultivated in pure culture.
- A sterile swab is used to evenly distribute a culture suspension onto a sterile agar plate.
- A hole can be punched in the middle of an agar plate to accommodate a liquid substance.
- The antimicrobial agent is administered to the center of the agar plate. For 18 to 24 hours, the agar plate is incubated at a temperature appropriate for the test microbe.
- A clear zone, also known as the zone of inhibition, surrounds the test product if an antimicrobial agent seeps into the agar and then inhibits growth.
- The degree of antimicrobial activity in the sample or product is typically correlated with the extent of the zone of inhibition; a larger zone of inhibition typically indicates a more potent microorganism.

❖ **Preparation of culture media**

1. Take 2.8 gm of agar in 100 ml distilled water and heat until dissolving agar.
2. After heating add beef extract, sodium chloride, calcium, peptone.
3. Shake until ingredients are dissolved.
4. Then kept in autoclave for 15 min.
5. Transfer the media in petridish.
6. Incubate the media at 30°C.



Fig.no.18.Culture media

❖ RESULT AND DISCUSSION :

In order to determine the anti-bacterial activity of face serum, The current study was conducted to formulate and asses a herbal anti-bacterial face serum employing ethanolic extract. By using phytochemical screening the ethanolic extraxt of guava and tecoma leaves was also. A range of physical evaluation factor including physical characteristics, pH, phase separation,spredability,washability,consistancy,non-irritancy,viscosity,patch test were applied to formulation .The following are the out come of the same.

1. Phytochemical Test (Guava):

Test	Observation	Inferance
1.Test For Alkaloids: a)Dragandroffs test: 2ml of sample was treted with dreagandroff reagent.	Red ppt.	Positive
2.Test For Tannins: 0.5gm sample + few drops of $FeCl_3$ solution	brownish green colour or blue-black coloration	Positive
3.Test for Saponin: 5ml of sample + 3ml dist.water and shake for 5 min	Froth formation.	Positive
4.Test for Flavonoids: 5ml of extract +1ml of 10% solution hydroxide.	Yellow colour appear.	Positive

Table.no.2 . Phytochemical Test (Guava)

2. Phytochemical Test (Tecoma)

Test	Observation	Inferance
1.Test For Alkaloids: a)Dragandroffs test: 5ml extract+10ml alcohol+ammonia+5ml chloroform+shake(base)+acetic acid+. This was divided into two portions. b)Mayer's reagent was added to one portion and Draggendorff's reagent to the other.	formation of a cream (with Mayer's reagent) or reddish brown precipitate (with Draggendorff's reagent)	Positive Positive
2.Test For Tannins: 0.5gm sample + few drops of $FeCl_3$ solution	Green or blue black colour.	Positive

3.Test for Saponin: 5ml of sample + 2ml of water+heated to boil.	Froth formation. (appearance of creamy miss of small bubbles)	Positive
4.Test for Phenol: 2ml extract + few drops of 10% FeCl ₃ added	Formation of bluish black colour	Positive

Table.no.3 . Phytochemical test (Tecoma)

3. Evaluation Test:

Sr.no	Test	F1	F2	F3
1	Colour	Yellow Green	Faint Yellow Green	Dark Yellow Green
2	Odour	Plesant	Plesant	Plesant
3	Appearance	Smooth-grecy	Smooth-sticky	Smooth
4	pH	5.04	5.02	5.0
5	Viscosity	144.4 Cp	127.3 Cp	111.0 Cp
6	Spredability	Easily spread	Easily spread	Easily spread
7	Irritation test	No irritation	No irritation	No irritation
8	Degredation of product	Nill	Nill	Nill
9	Phase sepration	No phase sepration	No phase sepration	No phase sepration
10	Stability test	More Stable	Stable	Stable

Table.no.4.Evaluation test

❖ Anti-bacterial Activity:

The antibacterial activity of the herbal serum is good. The bacteria that develop in culture media are killed by the produced herbal serum. Antimicrobial activity was tested for face serum and zone of inhibition is measured.The area around the antibiotic disk that has no bacterial growth is know as zone of inhibition.

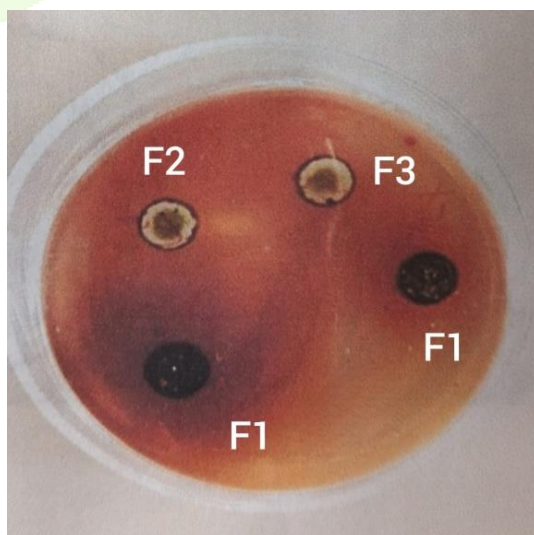


Fig.no.19.Antibacterial activity

Content	Zone of inhibition
Formulation 1	D=18.4 mm
Formulation 2	D=17 mm
Formulation 3	D=16.8 mm

Table.no.5.Antibacterial activity zone

❖ Conclusion:

The need for herbal formulations is rising globally. The attempt to create an herbal face serum with guava and tecoma extract is excellent. A variety of extract concentrations are used to make the plant, which has been reported in the literature to have good antibacterial, anti-inflammatory, antimicrobial, refreshing, and cleaning properties as well as to reduce acne. A number of criteria, including color, appearance, consistency, washability, spreadability, and skin irritation, were assessed for prepared formulations F1, F2, and F3. Following evaluation research, the formulation demonstrates a good effect when compared to a drug extract formulation used alone. It performs exceptionally well in combination formulation form and does not exhibit any negative side effects. Natural remedies have advantages. On the international market, herbal formulas are highly sought after. Herbal medicines are believed to be less harmful than allopathic ones. The F1 formulation batch was optimized based on evaluation. This study concludes that formulation batch F1, or the face serum that combined the two extracts, was noticeably better than formulation F2 and F3.

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