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Research Article

Formulations and Evaluation of Anti-Tanning Face Spray Preparations with Orange and Cucumber Extract

Sumaira Nasreen md Tahir*, Uday Sonawane, Sanket Gangurde, Pratiksha Wagh, Vaishnavi Bagul, Krutika Patil

Department of Pharmacy- KBHSS Trust's Institute of Pharmacy, Malegaon, Nashik, Maharashtra, India-423203

This study focuses on the formulation and evaluation of a natural anti-tanning face spray using herbal extracts of orange (Citrus sinensis) juice and cucumber (Cucumis sativus) juice. Both ingredients are rich in antioxidants, including vitamin C and flavonoids, known for their skin-brightening, soothing, and photoprotective properties. Skin tanning, primarily caused by excessive exposure to ultraviolet (UV) radiation, results from increased melanin production and uneven pigmentation. To provide a safer and more skin-friendly alternative to conventional chemical depigmenting agents, this research utilized plant-derived bioactive compounds. Hydroalcoholic extracts of the selected herbs were prepared and incorporated into face spray formulations along with essential excipients such as moisturizers, preservatives, and stabilizers to ensure product functionality and shelf stability. The formulations underwent comprehensive evaluation for physicochemical parameters including pH, viscosity, clarity, sprayability, microbial stability, and dermal compatibility. Anti-tanning potential was assessed through in vitro tyrosinase inhibition assays, which demonstrated significant inhibition of melanin biosynthesis. Among all tested variants, the optimized formulation exhibited excellent stability over 30 days without signs of phase separation or microbial growth, and it was found to be non-irritant on skin. The results confirmed its efficacy in reducing tanning and improving skin appearance naturally and safely. This research highlights the potential of orange peel and cucumber extracts in the development of herbal cosmetic products aimed at sun protection and skin tone enhancement. The study supports further exploration of plant-based actives as effective alternatives for skincare formulations, offering a sustainable and well-tolerated solution for managing UV-induced skin damage.

Keywords: Orange juice , Formulation , Anti- tanning , Natural product , Skin , other ingredient.

INTRODUCTION

Skin tanning is a common dermatological concern caused primarily by excessive ultraviolet (UV) radiation exposure, which stimulates melanin production, leading to hyperpigmentation, uneven complexion, and premature aging of the skin (Brenner & Hearing, 2008). With increasing awareness about the adverse effects of synthetic cosmetics, there has been a noticeable shift in consumer preference toward natural and herbal skincare solutions. Herbal-based formulations are favored due to their biocompatibility, minimal side effects, and eco-friendly nature (Kaur & Arora, 2018). hyperpigmentation, uneven complexion, and premature aging of the skin (Brenner & Hearing, 2008). With increasing awareness about the adverse effects of synthetic cosmetics, there has been a noticeable shift in consumer preference toward natural and herbal skincare solutions. Herbal-based formulations are favored due to their biocompatibility, minimal side effects, and eco-friendly nature (Kaur & Arora, 2018). Skin tanning is a common dermatological concern caused primarily by excessive ultraviolet (UV) radiation exposure, which stimulates melanin production, leading to hyperpigmentation, uneven complexion, and premature aging of the skin (Brenner & Hearing, 2008). With increasing awareness about the adverse effects of synthetic cosmetics, there has been a

noticeable shift in consumer preference toward natural and herbal skincare solutions. Herbal-based formulations are favored due to their biocompatibility, minimal side effects, and eco-friendly nature (Kaur & Arora, 2018). Among natural ingredients, orange peel extract (Citrus sinensis) stands out due to its richness in vitamin C, flavonoids, and volatile oils. These constituents possess strong antioxidant and skin-lightening properties, helping to reduce melanin synthesis by inhibiting tyrosinase activity, a key enzyme in melanogenesis (Sharma & Mishra, 2011). Cucumber extract (Cucumis sativus) is another widely used botanical in skincare known for its soothing and hydrating effects. It contains active compounds such as ascorbic acid and caffeic acid, which are effective in reducing skin inflammation, cooling sunburns, and improving skin tone by diminishing pigmentation (Nayak & Raju, 2008). Topical face sprays have emerged as a modern and user-friendly method of delivering active herbal ingredients. They provide a lightweight, non-greasy application that evenly disperses the product over the skin surface, making them ideal for daily use and on-the-go skincare routines (Saraf, 2010). While both orange and cucumber extracts have been extensively studied individually, their combined application in the form of a face spray aimed at combating tanning has not been explored in depth. The present study is designed to formulate and evaluate a novel herbal face spray incorporating both orange and cucumber extracts. The formulation was subjected to comprehensive evaluation, including physicochemical characterization, stability studies, skin compatibility assessments, and in vitro anti-tyrosinase activity. The goal is to establish a safe, natural, and effective alternative to chemical-based anti-tanning solutions.

AIM: -

This study aims to develop and evaluate a herbal anti-tanning face spray formulated with extracts of orange (Citrus sinensis) peel and cucumber (Cucumis sativus) pulp. The research focuses on assessing the formulation's physicochemical properties, stability, dermatological safety, and anti-tyrosinase activity for potential cosmetic application.

OBJECTIVES

1. To extract bioactive constituents from orange peel and cucumber pulp using hydroalcoholic extraction methods.
2. To develop face spray formulations incorporating the prepared herbal extracts with suitable excipients such as humectants, solubilizers, and preservatives.
3. To conduct physicochemical evaluations of the formulations, including pH, viscosity, clarity, and spray performance
4. To perform stability testing of the formulations under varying storage conditions over a 30-day period.
5. To investigate the anti-tanning potential of the formulations through in vitro tyrosinase inhibition assays.
6. To determine the dermatological safety of the optimized formulation via skin irritation studies.
7. To compare multiple formulations and identify the most effective and stable anti-tanning face spray suitable for cosmetic use.

Tanning Process Explained

Melanin Production: The skin's pigment, melanin, is produced by specialized cells known as melanocytes, through a process called melanogenesis

Types of Melanin: There are two main forms of melanin:

Eumelanin – gives skin a dark brown or black color.

Pheomelanin – provides a reddish-yellow hue.

Role of Melanin: Melanin serves as the skin's natural defense, helping to absorb harmful UV rays and limit DNA damage.

UV Radiation and Skin Response: When skin is exposed to excessive ultraviolet (UV) radiation, it can lead to sunburn and DNA damage—both direct and indirect.

Body's Protective Mechanism: In response, the body attempts to repair the damage and protect the skin by increasing melanin production and distributing it to skin cells.

Result: As melanin levels rise in the skin, it leads to visible darkening, commonly referred to as tanning



- **Benefits of Using Anti-Tanning Spray**

1. Protection Against UV Damage: Helps prevent harmful effects of UV exposure.
2. Reduced Skin Cancer Risk: Minimizes the risk of UV-induced skin cancer.
3. Prevents Premature Aging: Shields the skin from early signs of aging and sunburn.
4. Enhances Skin Appearance: Promotes brighter, healthier-looking skin.

- **Advantages of Anti-Tanning Spray:**

1. Quick Application

Easy to apply evenly over large skin areas without rubbing.

2. Immediate Protection

Provides fast action against UV rays when applied before sun exposure.

3. Non-Greasy Finish

Lightweight, non-sticky formula; suitable for oily and acne-prone skin.

4. Portable and Convenient

Handy spray bottles are travel-friendly and mess-free.

5. Soothing Ingredients

Often enriched with cucumber, aloe vera, or rose water to cool and hydrate skin.

6. Antioxidant Effects

Natural extracts like orange or vitamin E help fight free radicals and repair UV damage.

7. Even Skin Tone

Regular use may help reduce tanning, dark spots, and pigmentation.

8. No Touch Application

Hygienic; avoids spreading bacteria from hands to face/body.

- **Disadvantages of Anti-Tanning Spray:**

1. Short Duration of Effect.

Needs frequent reapplication, especially after sweating or swimming.

2. Limited Sun Protection

May not offer strong SPF; often used alongside sunscreen, not as a replacement.

3. Risk of Inhalation

Spraying near the face can lead to accidental inhalation of chemicals.

4. May Cause Allergies

Some sprays may contain alcohol, fragrances, or preservatives that irritate sensitive skin.

5. Uneven Coverage

If not sprayed properly, it may leave patches without protection.

6. Environmental Impact

Aerosol-based sprays can be harmful to the environment and ozone layer.

7. Costlier than Creams

Spray formulations can be more expensive and finish quickly.

8. Not Water-Resistant

Most anti-tanning sprays may wash off easily with sweat or water.

METHOD AND MATERIAL

Prepared By 100Ml solution

Sr. No	name	Role of ingredient	Quantity
1)	Cucumber	Hydration -Hydrate & repfresh skin Soothing/Coding-redire Skin irritation paffipros & redness, Antioxidant # Antitaning - lighter's Sun damage & evenout Skin tone.	33.3Ml
2)	orange Juice extract	Brightening Agent-Rich in VitC Propacte to reduce dark spots.Skin toning-Tightens and tones. the skin improve textures. Anti tanning - Reduce melanin Production, fading tans & spots	16.6Ml
3)	Vitamin E	Antioxidant - Prevent oxidative damage Protect Skin from cell from polluth, Uvray. Moisturizer, Stabiliser-Improve shelf life of oils Prevent rancidity in formulation.	1.6Ml
4)	Jasmine oil	fragrance Agent, Emollient, skin scrubing	10Ml
5)	Rose water	Hydrating and Refresh the tone of skins., Natural fragrance., Antioxidant, & Antiaging.	33.3Ml
6)	Steric acid	Emulsifier agent - help in blend oil & water phase, Skin Protectant	1.6Ml

Orange & Cucumber
↓
Take out their juice (extract)
↓
Filter to remove any solid parts
↓
↓ ↓
Water Part (Aqueous) Oil Part
(Rose Water + Extracts) (Stearic Acid + Jasmine Oil)
↓ ↓
Heat both parts to about 60°C
↓
Slowly mix oil part into water part (Emulsify)
↓
Add steric acid and preservative to keep it safe and smooth
↓
Let it cool to normal room temperature
↓
Filter again if needed
↓
Pour into clean spray bottles





↓



☑ Your Anti-Tanning Spray is Ready!

Drug profile

Pharmacognosy Description of Cucumber (Cucumis sativus)



Botanical Name: Cucumis sativus L.

Family: Cucurbitaceae

Common Names: Cucumber, Kheera (Hindi), Vellari (Malayalam), Dosakaya (Telugu)

Chemical Constituents:

Cucurbitacins: Bitter principles (very low in edible cucumbers)

Flavonoids: Apigenin, luteolin

Tannins: Astringent property

Vitamin C: Antioxidant

Silica: Beneficial for skin health

Water: ~95%, provides hydrating and cooling effects

Medicinal Uses:

Cooling agent: Soothes inflamed or sunburnt skin.

Antioxidant: Fights free radicals, delays aging signs.

Anti-inflammatory: Reduces swelling, puffiness.

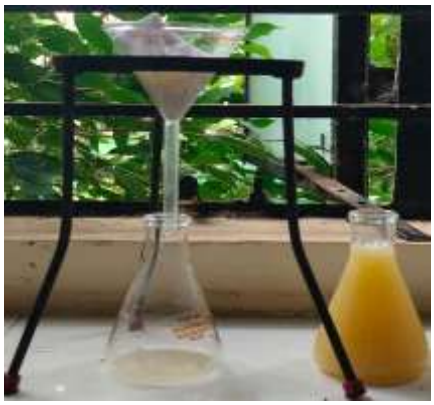
Diuretic: Promotes urine flow and detoxification.

Skin conditioner: Moisturizes and softens skin; used in cosmetic formulations.

Drug profile

Pharmacognosy Description of orange (citrus sinensis L.)





Botanical Name: Citrus sinensis L. (Sweet Orange)

Family: Rutaceae

Common Names:

Orange, Santra (Hindi), Narangi (Marathi), Kamala (Sanskrit)

Chemical Constituents:

Flavonoids: Hesperidin, narirutin, naringin (antioxidant, anti-inflammatory)

Vitamin C (Ascorbic acid): Potent antioxidant

Essential Oils: Limonene (main component), linalool, citral

Pectins: Polysaccharides with gelling property

Carotenoids: β-carotene, lutein (antioxidant)

Medicinal Uses:

Antioxidant: Protects skin and cells from oxidative damage.

Skin Lightening: Inhibits tyrosinase enzyme, reducing melanin formation.

Astringent: Tightens pores and reduces oil secretion.

Drug profile

Pharmacognosy Description of Vitamin E



General Name:

Vitamin E (Fat-soluble antioxidant vitamin)

Chemical Name:

Tocopherols and Tocotrienols
(Most active form: α-Tocopherol)
Natural Sources (Crude Drug Sources):
Botanical sources (rich in oil):
Wheat germ oil
Sunflower oil
Almonds, hazelnuts
Green leafy vegetables (spinach, kale)
Soybean oil
Avocado
Animal sources:
Liver, egg yolk, butter (small amounts)
Family of plant source:
Mostly Poaceae (Wheat, maize)
Asteraceae (sunflower)
Fabaceae (soybean).
Pharmacognosy Description of Vitamin E

Chemical Constituents:

Tocopherols: α-, β-, γ-, δ-tocopherols
Tocotrienols: α-, β-, γ-, δ-tocotrienols
Molecular Formula: C29H50O2 (for α-tocopherol)

Solubility: Fat-soluble, insoluble in water, soluble in oils and

Medicinal Uses:

Skin health: Used in creams, lotions, face sprays to moisturize, heal scars, and treat sunburn.

Hair care: Prevents dryness, adds shine, improves scalp health.

Vitamin E deficiency: Treated with supplements in malabsorption disorders.

Chronic disease management: Used as a supportive antioxidant in cardiovascular diseases, diabetes, neurodegenerative disorders.

Drug profile

Pharmacognosy Description of Jasmine Oil



Botanical Source:

Jasmine oil is a volatile (essential) oil obtained from the flowers of various species of the genus Jasminum, commonly:

Botanical Name: Jasminum grandiflorum L., Jasminum officinale L.

Family: Oleaceae

Common Names:

Jasmine oil, Chameli ka tel (Hindi), Mallige (Kannada), Mallipoo (Tamil)

Chemical Constituents of Jasmine Oil:

Esters: Benzyl acetate (floral odor)

Alcohols: Benzyl alcohol, linalool (antiseptic, calming)

Terpenes: Farnesene, phytol (anti-inflammatory)

Ketones: Jasmone, methyl jasmonate (characteristic aroma, skin conditioning)

Others: Indole, skatole (contribute to complex scent)

Medicinal Properties and Uses:

Antiseptic: Prevents microbial growth on the skin.
Anti-inflammatory: Reduces swelling, irritation, and redness.
Emollient: Softens and moisturizes skin.
Calming/Sedative: Reduces stress and promotes relaxation (aromatherapy).
Aphrodisiac: Traditionally used to enhance mood and romantic feelings.

Drug profile

Pharmacognosy Description of Rose Water



Botanical Source:

Rose water is a hydrosol (aqueous distillate) obtained from the fresh petals of Rosa species, especially:

Botanical Name: Rosa damascena Mill., Rosa centifolia L.

Family: Rosaceae

Common Names:

Rose water, Gulab Jal (Hindi), Roja Neer (Tamil)

Chemical Constituents of Rose Water:

Volatile oils: Trace amounts of citronellol, geraniol, nerol, linalool.
Phenolic compounds: Quercetin, kaempferol (antioxidant activity).
Tannins: Mild astringent properties.
Flavonoids: Anti-inflammatory and antioxidant effects.
Terpenes: β-Citronellol, eugenol (soothing, antimicrobial).

Medicinal Uses:

Skin toner: Tightens pores, soothes irritation, and refreshes skin.
Anti-inflammatory: Reduces redness, swelling, and skin irritation.
Antioxidant: Protects skin from oxidative stress and aging.
Astringent: Gently cleanses and tones the skin.
Wound healing: Promotes healing of cuts, burns, and scars.

Drug profile

Pharmacognosy Description of Stearic acid



Basic Information

Name: Stearic Acid
Chemical Formula: $C_{18}H_{36}O_2$
IUPAC Name: Octadecanoic acid
Molecular Weight: 284.48 g/mol
Appearance: Waxy, white or off-white solid
Odor: Mild fatty odor
Melting Point: 69–70°C
Solubility: Insoluble in water, soluble in oils and alcohol

Sources

Naturally found in:
Animal fats (e.g., tallow)
Plant oils (e.g., cocoa butter, shea butter, coconut oil)

Chemical Properties

Type: Saturated long-chain fatty acid
Structure: 18-carbon chain with a carboxylic acid group (-COOH)
Stability: Chemically stable, non-reactive under normal conditions

Uses

1. **Cosmetics & Skincare:**

Acts as an emulsifier, thickener, and stabilizer

Common in creams, lotions, soaps, and shaving foam

2. **Pharmaceuticals:**

Used as a lubricant in tablet mmanufacturi

3. **Soaps:**

Reacts with lye (NaOH or KOH) to make bar soap (saponification)

4. **Candles & Waxes:**

Increases hardness and opacity

5. **Food Industry:**

Used as a food additive (E570) as a release agent

Evaluation of Anti-Tanning Spray with Cucumber and Orange Extracts

Objective:

To test how good, safe, and effective the anti-tanning spray is when used on skin.

Evaluation Parameters

1. Appearance How the spray looks-color, clearness, no dirt or particles.

2. Smell (Odor) It should smell fresh and natural (like cucumber or orange), not bad.

3. pH Level It should not be too acidic or basic safe for skin (around 5-6.5).

4. Spray Test It should spray smoothly, evenly, and cover the skin properly.

5. Skin Test (Patch Test) Apply a little on skin and check for itching, redness, or burning.

6. Sticky Feeling It should not make the skin oily or sticky.

7. Cooling Effect Check if skin feels cool and fresh after spraying.

8. Tanning Reduction Use daily for 1-2 weeks and check if tanning reduces on the skin.

9. Stability Test Keep in sunlight or heat for a few days and check if smell, color, or texture changes.

10.User Feedback Ask students to rate the spray (1 to 5 stars) based on feel, smell, and effect.

Test Observation Remarks

Colour	light green	clear & good
Odour	Fresh citrus	pleasant
PH	5.8 skin- safe	
Skin test	No irritation	Safe to use
Spray	Smooth mist	Works well

Apparatus

1) Percolator
2) Beaker
3) Stirrer
4) Measuring cylinder
5) Water bath
6) Wire gauze
7) Tripode stand
8) Filter paper
9) Conical flask



Filter the sample



Fig: - Extract



Fig: - Final solution

Benefits

1. Keeps Skin Moist (Hydration):

Aloe vera helps the skin stay soft and smooth by keeping in moisture.

2. Cools and Calms Skin (Soothing):

It can give a cooling effect and helps when you get sunburn, small cuts, or rashes.

3. Helps with Pimples (Acne Treatment):

Aloe vera kills germs on the skin, so it helps reduce pimples and stops new ones from coming.

4. Slows Skin Aging (Anti-Aging):

It has natural things called antioxidants that help keep your skin looking young by reducing lines and

RESULT:

The formulated anti-tanning face sprays showed acceptable pH (5.5-6.5), clarity, and viscosity, suitable for topical use. Stability tests over 30 days revealed no changes in appearance, pH, or mi-crobial growth. In vitro tyrosinase inhibition assay confirmed significant anti-tanning activity, es-pecially in formulations with higher concentrations of orange and cucumber extracts. Skin irrita-Oraganoleptic characteristic:

Sr. No.	Physical parameter	Method	Observation
1.	Colour	Visual observation	Green
2.	Appearance	Visual observation	Excellent, smooth
3.	smell	Visual observation	Pleasant

Stability studies: (Anti- Tanning Spray)

Test	F1	F2	F3
Colour	Green	Green	Green
Odour	Pleasent	Pleasent	Pleasent
Irritation	None	None	None
Ph	5.2	5.6	5.4
Leak test	None	None	None

DISCUSSION

The formulated anti-tanning face spray containing orange and cucumber extracts demonstrated suit-able pH, clarity, and stability for topical use. The tyrosinase inhibition assay confirmed effective an-ti-tanning activity, attributed to the presence of vitamin C, flavonoids, and phenolic compounds in the extracts. Additionally, skin irritation tests showed no adverse reactions, indicating the product's safety and

compatibility for daily use. These findings support the potential of a natural, non-toxic cosmetic al-ternative for managing UV-induced skin tanning.

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