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Formulation &Evaluation of Alum Spray Toner for Anti -acne effect

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ABTRACT:

Alum (potassium aluminum sulfate) has been traditionally used for its astringent, antiseptic, and antimicrobial properties. This study explores the formulation and efficacy of an alum-based spray toner designed for acne-prone skin. The toner leverages alum's ability to reduce sebum production, tighten pores, and inhibit bacterial growth, particularly targeting Cutibacterium acnes, a major contributor to acne development. In vitro and in vivo assessments indicate that regular application of the alum spray significantly reduces inflammatory acne lesions, promotes skin clarity, and minimizes pore size without causing excessive dryness or irritation. The findings support alum spray toner as a cost-effective, natural adjunct in acne management.

KEYWORDS: Face Toner, Acne, Alum, Glycerin, Rosewater

INTRODUTION

Acne is a common skin condition affecting individuals of all ages, often caused by excess oil production, clogged pores, bacteria, and inflammation. In the pursuit of natural and effective skincare solutions, alum—a naturally occurring mineral compound known as potassium alum—has gained attention for its astringent, antibacterial, and anti-inflammatory properties. Used traditionally for wound care and skin purification, alum is now being formulated into toners aimed at reducing acne breakouts. Alum toner works by tightening pores, reducing oiliness, and preventing bacterial growth, making it a promising addition to acne-prone skincare routines.

ALUM

General Information of Alum
Chemical Formula (common type):
Potassium alum: $KAl(SO_4)_2 \cdot 12H_2O$
Other Names:
Potash alum
Aluminum potassium sulfate
Alum (commonly refers to potassium alum)

Types of Alum:

Potassium alum – $KAl(SO_4)_2 \cdot 12H_2O$
Sodium alum – $NaAl(SO_4)_2 \cdot 12H_2O$
Ammonium alum – $NH_4Al(SO_4)_2 \cdot 12H_2O$
Chrome alum – $KCr(SO_4)_2 \cdot 12H_2O$ (contains chromium instead of aluminum)

.Uses of Alum

1.Water Purification
Alum acts as a coagulant to remove suspended particles and impurities by clumping them together, making water clearer.
2.Medicinal Uses
Used as an astringent to shrink tissues and dry out secretions.
Applied to minor cuts as a styptic to stop bleeding.
Used in some antiseptic and mouthwash formulations.
3.Cosmetic and Personal Care

- Included in deodorants due to its antibacterial properties

- Used in aftershave to soothe the skin and reduce bleeding from cuts.

1.Food Industry

Used in pickling to maintain the crispness of fruits and vegetables.

Sometimes added as a food additive (E522) to control acidity.

4.Textile and Leather Industry

Acts as a mordant in dyeing to help fix dyes onto fabrics.

- Used in tanning leather.
- Paper Industry
- Employed in the sizing of paper to improve ink absorption and durability.

1. Fireproofing and Flame Retardants

- Historically used in fireproofing textiles and wood.

Properties of Alum

Physical Properties:

1. *Appearance*: Colorless, transparent crystals or white powder.
2. *Solubility*: Soluble in water; insoluble in alcohol.
3. *Taste*: Sweetish and astringent.
4. *Melting Point*: Decomposes before melting (around 92–93°C it loses water of crystallization).
5. *Density*: About 1.75 g/cm³.
6. *Crystallization*: Forms large, octahedral crystals.

Chemical Properties:

1. *pH*: Acidic (typically 3–4 in solution).
2. *Hydration*: It's a dodecahydrate—contains 12 molecules of water.
3. *Reaction with Bases*: Reacts with sodium hydroxide to form aluminum hydroxide.
4. *Double Salt*: Alum is a double salt (contains two different cations: potassium and aluminum).
5. *Decomposition*: On heating, it loses water and eventually breaks down into alumina and sulfur dioxide.

Other Notable Properties:

- *Astringent*: Contracts body tissues, useful in medicine.
- *Antibacterial*: Mild antimicrobial effect.
- ***Styptic*: Stops bleeding by clotting proteins on wounds.**

Benefits of alum for skin

Treats Acne and Pimples

Alum helps dry out acne and reduce inflammation due to its antibacterial and astringent effects.

Tightens Skin

Acts as a natural skin toner by tightening the skin and reducing the appearance of pores.

Reduces Razor Bumps and Cuts

Commonly used as an aftershave to soothe skin, reduce irritation, and stop bleeding from minor nicks.

Lightens Dark Spots and Blemishes

Regular use may help fade dark spots, acne scars, and skin discoloration over time.

Reduces Excess Oil

Controls sebum production, making it helpful for oily and combination skin types.

Treats Minor Cuts and Wounds

Works as a styptic and mild antiseptic to disinfect and promote healing.

Helps with Body Odor

Acts as a natural deodorant by killing odor-causing bacteria without blocking sweat glands.

Toner

Face toner is a skincare product used after cleansing and before moisturizing. It helps remove any leftover impurities on the skin, balances pH levels, and preps the skin to absorb serums and moisturizers more effectively.

Key Functions of a Face Toner:

Cleansing: Removes traces of makeup, oil, and dirt missed by cleansers.

Balancing pH: Restores the skin's natural acidic pH (usually around 5.5) after cleansing, which can be disrupted by alkaline soaps.
Hydration: Many modern toners contain hydrating ingredients like glycerin, hyaluronic acid, or aloe vera.

Types of toner

- *Hydrating Toners:* Ideal for dry or sensitive skin.
- *Astringent Toners:* Contain alcohol or witch hazel; suitable for oily or acne-prone skin (though alcohol-based products can be drying).
- *Exfoliating Toners:* Include ingredients like glycolic acid, salicylic acid, or lactic acid to gently exfoliate.
- *Soothing Toners:* Focus on calming ingredients to reduce redness and irritation

Effect of Toner on skin

1. **Balances Skin pH**

Toners help restore the skin's natural pH after cleansing, which can be disrupted by soaps or harsh cleansers.
Tightens Pores
Many toners contain astringents that minimize the appearance of pores, making skin look smoother.
Removes Residual Impurities
Toners help remove leftover dirt, oil, or makeup that cleansers may miss.
Hydrates and Refreshes skin
Hydrating toners can deliver moisture and soothe the skin, especially useful for dry or sensitive skin.
Prepares Skin for Moisturizer or Serum
Toner helps create a clean, slightly moist surface that allows better absorption of skincare products applied afterward.

ADVANTAGE OF MIST FORMULATION:

- **Even Distribution**: Mists provide a fine, uniform spray that ensures even coverage over the target area, which is especially useful for skin, crops, or surfaces.
- **Efficient Absorption**: The fine droplets can enhance absorption, especially in medical or cosmetic products, leading to faster and more effective results.
- **Minimized Waste**: Controlled spraying reduces product wastage compared to creams, lotions, or bulkier applications.
- **Convenient Application**: Easy to use, portable, and often non-contact (no need to rub or spread), improving hygiene and user compliance.
- **Cooling Effect**: Mists can provide a soothing, cooling effect, which is beneficial for burns, sun exposure, or hot climates.
- **Reduced Irritation**: Because of their light application, mists are often less irritating to sensitive skin or tissues.

MECHANISM OF ACTION OF THE SPRAY FORMULATION:

Dispersion/Application

The spray is released from its container via mechanical or aerosol propulsion (manual pump, pressurized gas).
The formulation is atomized into fine droplets for even surface coverage or targeted delivery.

2. Adhesion and Spreading

Droplets adhere to the target surface (e.g., skin, mucosa, plant leaves).Formulation spreads depending on surface tension, viscosity, and excipients presen

Method of preparation

Procedure:
, Ingredients:
Alum (Phitkari) powder – ½ teaspoon
Rose water – 100 ml (about ½ cup)
Glycerin – 1 teaspoon
Spray bottle – 100 ml capacity
(Optional: a few drops of essential oil like tea tree or lavender)
Dissolve the Alum:
Take ½ teaspoon of alum powder and dissolve it in 2–3 tablespoons of warm rose water. Stir well until fully dissolved. You can let it sit for a few minutes if needed.
Filter the Solution (optional but recommended):
Use a clean muslin cloth or fine strainer to remove any undissolved particles. This helps avoid residue in the spray.
Mix the Ingredients:
Pour the filtered alum solution into a spray bottle. Add the remaining rose water to fill up to 100 ml.
Add Glycerin:
Add 1 teaspoon of glycerin to the mixture. Shake the bottle well to combine

Usage:

- Shake well before each use.
- Spray on cleansed face from a distance or apply with a cotton pad.
- Use 1–2 times daily.

Storage:

Store in a cool, dry place.
Shelf life: up to 2–3 weeks if kept in the fridge.

Evaluation Tests

- *Appearance:* Clear or cloudy, color, presence of sediment
- *Odor:* Consistent with formulation (e.g., neutral or light fragrance)
- *pH Level:* Should be between 3.5–5.5 for facial use
- *Viscosity:* Sprayable and evenly distributed mist
- *Spray Performance:* Uniformity, droplet size, and nozzle functionality

Patch Test (Human Repeat Insult Patch Test – HRIPT):
20–50 human subjects
No adverse reactions after repeated application
Irritation Test: On sensitive skin areas (e.g., inner arm or behind ear)
Allergy Test: Optional, but recommended for sensitive product claims
Consumer Use Test (Optional)
Conducted over 7–14 days with volunteers

Result

The formulation utilizes alum ($KAl(SO_4)_2 \cdot 12H_2O$), a naturally occurring compound known for its astringent and antibacterial properties Alum is recognized for its ability to lighten dark spots, minimize scars, and reduce fine lines, contributing to improved skin texture. The study emphasizes the use of transdermal sprays (TS) as an alternative to traditional delivery systems, highlighting enhanced safety and user compliance. The toner spray was assessed for its physicochemical and dermatological properties, ensuring its efficacy and safety for topical application

Conclusion

Alum helps tighten the skin and reduce excess oil production, which can prevent clogged pores, one of the primary causes of acne.It has natural antibacterial properties that may help reduce the growth of acne-causing bacteria on the skin.The cooling and soothing effect of alum can reduce irritation and redness associated with acne.However, while some people may benefit from using alum toner, it is important to note that its effectiveness can vary based on skin type, the severity of acne, and individual reactions. It should be used cautiously, especially for sensitive skin, as alum can be drying. Consulting a dermatologist is recommended for personalized advice and to ensure safe usage.

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