International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 15, Issue 01, January 2026)

Formulation and Evaluation of a Herbal Facial Spray Toner Using Natural Ingredients for Skin Conditioning and pH Balance

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Abstract*-- Facial toners are essential cosmetic formulations designed to cleanse, tone, and rejuvenate the skin after cleansing. This study focuses on the development and evaluation of a herbal spray-based facial toner using natural ingredients such as rose water, lemon oil, glycerin, and orange juice, aiming to offer effective skin conditioning without harmful synthetic additives. The primary purpose of this toner was to restore the skin's pH balance, provide hydration, tighten pores, and prepare the skin for better absorption of subsequent products. The formulation involved the combination of aqueous and oil-based phases stabilized using Tween 80 as an emulsifier and solubilizer. The mixture was processed under gentle heating and homogenization, then packaged in a spray bottle for ease of application. Evaluation parameters included organoleptic properties, homogeneity, pH, spreadability, removability, skin irritation, and sensitivity tests.The formulated toner exhibited a pleasant aroma, non-sticky texture, good spreadability, and a pH of 5.06, aligning with the natural pH range of the skin. It was found to be non-irritant, easily removable, and effective in moisturizing and conditioning the skin. Additionally, the spray delivery system enhanced user convenience and ensured uniform application.This herbal toner offers a natural, cost-effective, and environmentally friendly alternative to synthetic toners. The integration of natural antioxidants and humectants not only improves skin appearance but also protects it from environmental stressors. The study confirms the toner's efficacy, safety, and acceptability for routine skincare use. It demonstrates the potential of herbal formulations in modern cosmeceuticals and advocates further exploration into natural skincare alternatives.

***Keywords*-- Herbal toner, Spray formulation, Skin conditioning, Natural ingredients, pH-balanced skincare**

I. Introduction

Facial toners have become integral components in modern skincare routines due to their multifunctional benefits [1]. Traditionally viewed as simple astringents used after cleansing, toners have evolved into sophisticated formulations that target a wide array of dermatological concerns[2].

Modern formulations include hydrating agents, anti-inflammatory compounds, and antioxidants, providing benefits beyond cleansing, such as hydration, pore tightening, pH balancing, and preparation of the skin for further treatment[3].

Toners help restore the skin's natural pH balance, which can be disrupted by harsh cleansers and environmental factors. Maintaining a slightly acidic skin surface is crucial for a healthy skin barrier and microbiome. Herbal toners, especially those incorporating natural antioxidants and soothing ingredients[4], are increasingly preferred over chemical-laden products for their lower risk of irritation and side effects. Herbal ingredients such as rose water, lemon oil, and glycerin are known for their skin-friendly properties. Rose water hydrates and soothes the skin, balancing its pH. Lemon oil, rich in Vitamin C and citral, exhibits natural astringent, antimicrobial, and antioxidant activities, promoting a brighter skin tone and reducing excess oil. Glycerin acts as a humectant, drawing moisture into the skin, improving its texture and softness[5].

The transformation of toners from alcohol-based solutions to gentler, hydrating, and multifunctional products has opened new avenues for formulation innovation. The use of herbal extracts addresses consumer demand for green, safe, and sustainable skincare[6]. Additionally, the adoption of spray formulations enhances product delivery, reducing contamination risks and enabling uniform application[7]. In this study, a spray toner using herbal ingredients was formulated and evaluated for its physicochemical properties, stability, and dermatological compatibility. The goal was to develop a toner that not only provides a toning effect but also moisturizes, cleanses, and refreshes the skin without adverse reactions. The study emphasizes the feasibility of using everyday natural materials to create effective and safe skincare products.

Procurement of Material: All ingredients used in the preparation of the herbal face toner were procured from standard commercial sources.

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II. Experimental And Methods

The formulation of the herbal facial toner was carried out using a series of methodical steps designed to ensure optimal quality, stability, and effectiveness of the final product[8]. The process was divided into two main parts: the preparation of the formulation and the evaluation of its physicochemical and functional properties.

2.1 Preparation Steps[9-10]

The experimental work began with the thorough cleaning and drying of all laboratory glassware and utensils to ensure there was no contamination that could affect the formulation's stability, pH, or microbial quality. The cleanliness of the equipment is a critical step in cosmetic product development, particularly when dealing with aqueous formulations that are susceptible to microbial growth and instability. The formulation was developed in two distinct phases, designated as Phase 1 and Phase 2, in accordance with standard emulsification techniques for combining hydrophilic and lipophilic components. Phase 1 consisted of the aqueous base, where Di-EDTA, a known chelating agent, was accurately weighed and dissolved in distilled water under mild stirring conditions. Di-EDTA was included to chelate any potential metal ions that could destabilize the formulation or cause oxidation of active ingredients such as lemon oil.

In parallel, Phase 2 was prepared by gently warming Tween 80, a non-ionic surfactant that acts as both a solubilizer and emulsifier, to facilitate the incorporation of essential oils. Lemon oil, a natural astringent and source of antioxidants, was slowly added to the warmed Tween 80 with continuous stirring until a clear and homogenous solution was obtained. This ensured that the oil was uniformly dispersed, forming a stable pre-emulsion without phase separation. Once both phases were ready, Phase 1 was slowly added into Phase 2 under continuous stirring to ensure the uniform blending of the aqueous and oily components. This emulsification step was carried out at room temperature to prevent degradation of temperature-sensitive ingredients such as glycerin and essential oils.

After the two primary phases were successfully combined, rose water, glycerin, and propylene glycol were added sequentially. Rose water was included for its soothing and hydrating properties, contributing to the fragrance and refreshing character of the toner. Glycerin, a well-known humectant, was added to enhance moisture retention and to impart smoothness and suppleness to the skin. Propylene glycol served dual functions—first, as a solvent to improve the solubility of active constituents, and second, as a penetration enhancer to facilitate better absorption of the product into the skin layers.

The final formulation was stirred thoroughly for 10–15 minutes to ensure homogeneity. It was then transferred into a sterile spray container, allowing for an easy-to-use application format that delivers the product uniformly in the form of fine droplets. This packaging choice not only enhances user experience but also limits contamination due to minimal hand contact. Proper labelling was done to indicate the formulation code, composition, and date of preparation. The labeled formulations were stored at ambient conditions for further evaluation.

2.2 Evaluation Parameters

Following the preparation, the toner was subjected to a set of evaluation parameters that assessed both its physicochemical and dermatological properties. These tests are essential to ensure the safety, effectiveness, and stability of cosmetic products before they are considered suitable for consumer use.

2.2.1. pH Measurement

The pH of the final formulation was measured using a calibrated digital pH meter. A 25 mL sample of the toner was poured into a beaker, and the pH electrode was immersed into the solution. The reading was recorded once stabilized. This test was conducted to ensure that the toner is within the ideal pH range for skin application, which is typically between 5.0 to 7.0. A pH within this range helps maintain the natural acidity of the skin, thereby preserving the integrity of the skin barrier and minimizing irritation[11].

2.2.2. Homogeneity

Homogeneity was evaluated through visual inspection and a shaking test[12]. The toner was examined against a light source to check for any signs of phase separation, sedimentation, or particulate matter. After shaking the formulation, the bottle was observed for uniform mixing. A smooth, evenly dispersed solution without settling indicated good homogeneity.

2.2.3. Skin Conditioning

The conditioning effect[13] of the toner was assessed through user feedback. Volunteers applied the toner twice daily for one week and reported observations regarding skin hydration, smoothness, and texture. A positive conditioning effect was indicated by soft, supple, and glowing skin, which suggests that the toner was able to hydrate and refresh the skin effectively.

2.2.4. Stickiness

The tactile properties of the toner were evaluated to determine if the formulation left a sticky residue upon application[14].

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A small amount of toner was sprayed on the forearm and gently patted with fingers. The absence of tacky or greasy feeling was considered a favorable outcome, as consumers generally prefer non-sticky skincare products.

2.2.5. Spreadability

The spreadability of the toner was assessed by spraying it onto the skin and attempting to distribute it evenly using a cotton pad and soft cloth[15]. Good spreadability ensures ease of application and uniform coverage of the facial area. The toner demonstrated excellent spreadability, indicating a suitable viscosity and texture for spray application.

2.2.6. Removal

To evaluate the removability of the toner, it was applied to the skin and rinsed with plain water after a few minutes[16]. The formulation was found to be easily removable without leaving any residues, suggesting that it does not form a film on the skin surface and is compatible with normal facial cleansing routines.

2.2.7. Light stability

Light stability was assessed by exposing the toner to ambient light for 48 hours and observing any changes in color or consistency. A slight discoloration was observed, which is expected for formulations containing natural extracts and essential oils. This observation highlights the importance of storing herbal products in dark or opaque containers to minimize photodegradation[17].

III. Results And Discussions:

The herbal facial toner was successfully formulated using a two-phase emulsification method and was subsequently evaluated for various physicochemical and dermatological parameters. The formulation aimed to deliver a multifunctional, easy-to-use toner that combines the benefits of natural ingredients with an effective spray delivery system. The outcome of the experimental procedure and evaluations demonstrated the stability, functionality, and cosmetic acceptability of the toner, as discussed below.

Table 1:
Formulation Development

Ingredient	**Purpose**	**Quantity**
Distilled Water	**Solvent/Base**	**83.3 mL**
Rose Water	**Hydrating agent**	**10 mL**
Glycerin	**Moisturizer**	**3 mL**
Lemon Oil	**Astringent, Antioxidant**	**0.1 mL**
Tween 80	**Emulsifier/Solubilizer**	**0.5 mL**
Propylene Glycol	**Penetration enhancer**	**3 mL**
Di-EDTA	**Chelating agent (preservative aid)**	**0.1 g**
Phase	**Components**	**Purpose**
Phase 1	Di-EDTA + Distilled Water	Forms aqueous base; chelates metal ions; prevents oxidative degradation
Phase 2	Lemon Oil + Tween 80 (gently warmed)	Solubilizes lemon oil; forms stable pre-emulsion with emulsifier
Final Mixing	Phase 1 + Phase 2 (with stirring)	Produces uniform emulsion with no phase separation
Additives	Rose Water, Glycerin, Propylene Glycol	Provides moisturization, skin conditioning, hydration, and solvent effects
Finalization	Stirred 10–15 mins; packed in spray bottles	Ensures homogeneity; spray allows ease of use and hygienic application
Storage	Ambient conditions	No turbidity, microbial growth, or separation observed

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The formulated herbal facial toner was evaluated through a series of physicochemical and dermatological tests to ensure its stability, safety, and functionality. The pH of the toner was found to be 5.06, falling well within the ideal skin-compatible range of 5.0 to 7.0. This mildly acidic nature is beneficial for maintaining the skin's natural acid mantle, reducing the risk of irritation and microbial growth. The homogeneity of the formulation was confirmed through visual inspection and a shake test, showing no signs of phase separation, sedimentation, or foaming, thus indicating a stable and well-emulsified system. Skin conditioning effects were observed in volunteers who used the toner for one week. Their feedback highlighted enhanced skin hydration, suppleness, and a balanced texture without any adverse reactions.

This can be attributed to the moisturizing properties of glycerin and rose water, along with the refreshing and toning effects of lemon oil. The stickiness of the toner was also evaluated, and users reported that it did not leave behind a greasy or sticky feel, even after generous application, which supports its suitability for daily use on all skin types. The toner exhibited excellent spreadability, as it was easily dispersed over the skin using fingers or cotton pads, aided by the fine mist produced through the spray mechanism. The removal test confirmed that the toner could be easily rinsed off with water, leaving no residue, film, or irritation. Finally, under light stability testing, a slight discoloration was observed after 48 hours of exposure, which is typical for products containing natural oils. However, the formulation's overall performance remained unchanged, indicating good stability when stored in appropriate packaging like opaque or amber bottles.

Table 2:

Parameter	Test Method / Observation	Result / Conclusion
pH Measurement	Digital pH meter, 25 mL sample	pH = 5.06 → Mildly acidic, compatible with skin's natural pH, prevents irritation and microbial growth
Homogeneity	Visual inspection under light; shaking test	Clear, no settling or separation; good emulsion stability
Skin Conditioning	User feedback after 1 week of use	Hydrated, smooth, radiant skin; no adverse effects; glycerin and rose water showed positive conditioning
Stickiness	Tactile analysis on forearm	No sticky or greasy residue; suitable for daily application on oily/combination skin
Spreadability	Sprayed and spread using fingers/cotton	Even distribution, no clumping; fine mist from spray enhances coverage
Removal	Rinsing with plain water after application	Easily removable, no film left; suitable for sensitive/acne-prone skin
Light Stability	48-hour light exposure under ambient conditions	Slight discoloration (normal for natural oils); stable odor/texture; opaque packaging recommended

IV. Conclusion

The herbal facial toner developed in this study proved to be an effective skincare solution combining the benefits of natural ingredients with a modern spray delivery system. Designed to cleanse, tone, and hydrate the skin, the toner showed excellent compatibility with normal skin, offering non-irritating, pleasant, and functional properties. Its pH of 5.06 aligns with the skin's natural pH, supporting the skin barrier function. Ingredients such as rose water, lemon oil, and glycerin offered a combination of soothing, astringent, and moisturizing effects.

Evaluation results confirmed its ease of application, spreadability, and removability, making it suitable for all skin types, especially oily or combination skin. The spray formulation offered practical advantages: hygienic application, reduced wastage, and deeper skin penetration due to fine mist particles. Minimal discoloration upon light exposure was noted, indicating satisfactory stability.

Overall, this herbal toner demonstrates that natural formulations can meet modern skincare standards, providing safe, effective, and affordable alternatives to synthetic toners.

It aligns with the growing consumer preference for green cosmetics, and with further optimization, such formulations can be commercialized for broader cosmeceutical use.

Acknowledgement:

The authors express their sincere gratitude to the Principal and Department of Pharmaceutics, KNCP, Butibori, for their support and guidance throughout the project.

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