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# Restoring Radiance: Brahmi Face Mist for Skin Rejuvenation and Protection

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**ABSTRACT:**
The increasing preference for natural and multifunctional skincare solutions has driven interest in herbal formulations with scientifically supported benefits. This study focuses on the development and evaluation of a Brahmi (Bacopa monnieri) face mist, formulated using the maceration extraction method with ethanol. The face mist integrates Brahmi extract, glycerine, essential oils, vitamin C, and natural preservatives, offering a lightweight, hydrating, and refreshing skincare solution designed for daily use. Brahmi is known for its collagen-boosting properties, promoting skin regeneration, improving elasticity, and reducing the appearance of fine lines. The inclusion of vitamin C enhances collagen synthesis, while essential oils provide additional antioxidant and soothing effects. This formulation acts as an anti-aging, anti-inflammatory, and antioxidant mist, protecting the skin from environmental stressors, oxidative damage, and premature aging. Comprehensive physicochemical and biological assessments were conducted to ensure the stability, efficacy, and safety of the product. The DPPH antioxidant assay confirmed its free radical-scavenging ability, supporting skin defence against oxidative stress and antimicrobial tests validated its role in soothing irritation and maintaining skin health. Furthermore, hydration, viscosity, solubility, spray pattern, organoleptic, and skin sensitivity tests were performed to confirm product consistency, absorption, and user safety. The findings suggest that the Brahmi face mist is an effective, natural skincare innovation, offering a convenient way to hydrate, refresh, and revitalize the skin while supporting collagen production and anti-aging benefits. This study highlights the integration of traditional herbal extracts with modern cosmetic formulation techniques, contributing to the growing field of functional and evidence-based herbal skincare.

**Keywords:** Brahmi, face mist, herbal skincare, collagen booster, antioxidant, anti-aging, natural cosmetics

## INTRODUCTION:

The skincare industry is evolving towards natural, plant-based solutions as consumers seek alternatives to synthetic and animal-derived ingredients. One such promising botanical is Brahmi (Bacopa monnieri), a medicinal herb traditionally used in Ayurveda for its cognitive and healing properties. Recent studies have highlighted its collagen-boosting, antioxidant, and anti-inflammatory effects, making it an ideal ingredient for anti-aging skincare[4]. This research focuses on the development and evaluation of a Brahmi-infused

face mist, designed to provide hydration, skin protection, and rejuvenation while addressing concerns such as oxidative stress, inflammation, and premature aging.

Collagen is an essential protein that maintains skin elasticity, firmness, and hydration. However, collagen production declines with age, leading to the formation of wrinkles and fine lines.[11] Traditionally, collagen-based skincare products rely on animal-derived sources such as bovine or marine collagen, raising concerns about ethical sourcing and sustainability. Baccopa monnieri offers a plant-based, cruelty-free alternative by stimulating the body's natural collagen synthesis. Rich in triterpenoid Saponins and flavonoids, Brahmi enhances fibroblast activity, the cells responsible for collagen production, thus promoting skin regeneration and elasticity without the need for animal-based ingredients.[25]

Bacopa monnieri protects the skin from UV damage and premature aging through its rich content of flavonoids and bacosides which act as powerful antioxidants, neutralizing free radicals and preventing oxidative stress-induced skin damage. [16]

A face mist Is a convenient, lightweight, and easy-to-use formulation that delivers hydration, antioxidants, and active compounds directly to the skin. Unlike creams or serums, face mists allow for quick absorption and on-the-go application, making them a practical solution for modern skincare routines. The incorporation of Brahmi extract, vitamin C, essential oils, and glycerine in this formulation provides a multifunctional, natural approach to combating aging, inflammation, and environmental stressors. Regular use of a face mist not only refreshes and soothes the skin but also ensures deep nourishment without leaving a greasy residue.

However, while topical skincare products play a crucial role in maintaining skin health, their effectiveness is maximized when combined with a holistic skincare routine. Proper cleansing, moisturizing, and sun protection, along with the use of natural formulations like Brahmi face mist, enhance overall skin vitality. Additionally, internal factors such as diet, hydration, and lifestyle choices significantly influence skin health. A nutrient-rich diet containing vitamins, antioxidants, and healthy fats, along with adequate water intake and regular exercise, supports collagen production, skin hydration, and overall well-being.[18]

The maceration extraction method was used to obtain Brahmi's bioactive compounds, ensuring the retention of its collagen-boosting and skin-healing properties. The formulation underwent comprehensive physicochemical and biological assessments, including hydration, viscosity, solubility, antioxidant (DPPH test), anti-inflammatory, antimicrobial, and skin sensitivity tests, to evaluate its effectiveness, stability, and safety.

This study aims to demonstrate that Bacopa monnieri-based face mist formulations, when used alongside a proper skincare routine and a balanced diet, can provide a natural, cruelty-free approach to collagen stimulation. This research contributes to the growing field of sustainable, plant-based skincare innovations, integrating traditional herbal wisdom with modern cosmetic science for a holistic and effective anti-aging solution.[4]

**BACCOPA MONNERI:**

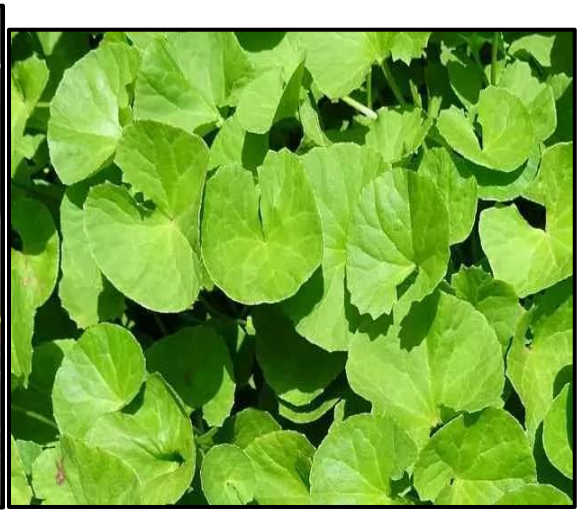

**Figure no.1: Fresh Bacopa monnieri leaves Figure no.2: Harvested Bacopa monnieri leaves**

**Figure no.3: Flowering stage of Bacopa monnieri**

**Figure no.4: Dried Bacopa monnieri**

**Table No.1: Bioactive Compounds of Baccopa Monneri**

| Type | Compound | Skin Benefits | Other Benefits |
|---|---|---|---|
| **Triterpenoids, Saponins** | Bacosides | Antioxidant, protect skin from free radical damage, enhances skin repair | Improves brain function, memory and reduces stress |
| **Phytochemicals** | Triterpenoids | Boosts collagen production, improves elasticity, antiaging | Anti-inflammatory and immune boosting |
| **Antioxidants** | Flavonoids | Protect skin from UV damage reduces redness ad inflammation | Cardio protective, improves blood circulation |
| **Organic Compounds** | Alkaloids | Promotes wound healing, skin regeneration and repairs damaged skin | Enhances nervous system function |
| **Natural Surfactant** | Saponins | Improves hydration, enhances skin barrier function | Detoxifying and antimicrobial properties |
| **Antioxidants** | Polyphenols | Reduces oxidative stress, prevents premature aging | Anticancer and neuroprotective effects |
| **Organic Compounds** | Steroids | Strengthens skin cells, improves resilience against damage | Support hormonal balance |
| **Volatile Compounds** | Essential oils | Provides soothing and anti-inflammatory effect | Used in aromatherapy for relaxation |

Baccopa monneri kindly known as Brahmi is reeping water loving her widely used in ayurvedic medicine. Traditionally it has been valued for its memory enhancing, stress reducing healing antioxidant properties but modern research also identified its anti-aging and skin- rejuvenating effects making it a promising ingredient in skincare.

**Scientific name:** Baccopa monneri

**Family:** Plantaginaceae (formerly Scrophulariaceae)

**Common name:** Brahmi, water hyssop, herb of grace

**Habitat:** Grows in wetlands, marshy areas and tropical regions commonly found in India, China, Australia Traditionally, Bacopa monnieri has been used in Ayurveda as a brain tonic to enhance memory, reduce stress, and promote overall well-being, while modern research has expanded its use to skincare, where its antioxidant and collagen-boosting properties help combat aging, improve skin elasticity, and support wound healing.

- **Problem Statement: Skin Issues Addressed by Bacopa monnieri Face Mist**

In today's world, people face numerous skin challenges due to environmental factors, lifestyle habits, and aging. Some of the major issues that this Bacopa monnieri face mist can help address include:

1. **Premature Aging & Wrinkles**
   Problem: Due to pollution, UV exposure, and oxidative stress, skin loses elasticity, leading to wrinkles and fine lines.

Solution: Bacopa monnieri is rich in flavonoids and bacosides which boost collagen production and protect against free radical damage, helping to maintain youthful skin.

2. **UV Damage & Skin Sensitivity**
   Problem: Excessive exposure to sunlight causes skin irritation, sunburn, and pigmentation issues.
   Solution: The antioxidant and anti-inflammatory properties of Bacopa monnieri help repair UV-induced damage and soothe sensitive skin.
3. **Dryness & Dehydration**
   Problem: Harsh weather conditions, air conditioning, and lack of hydration can lead to dry, flaky, and dull skin.
   Solution: The hydrating properties of glycerine and Bacopa monnieri extract in the mist help restore moisture balance, keeping skin soft and supple.
4. **Acne & Inflammation**
   Problem: Many individuals struggle with acne, redness, and skin irritation due to bacterial growth and inflammation.
   Solution: Bacopa monnieri has anti-inflammatory and antimicrobial properties, which can help reduce acne, calm irritated skin, and promote a clearer complexion.
5. **Environmental Stress & Pollutants**
   Problem: Daily exposure to dust, smoke, and toxins causes clogged pores, dullness, and skin damage.
   Solution: The antioxidant action of Bacopa monnieri helps detoxify the skin, protecting it from environmental aggressors and restoring its natural glow.
6. **Lack of a Convenient Skincare Routine**
   Problem: Many people do not have time for an extensive skincare routine, leading to neglected skin health.
   Solution: A face mist is an easy-to-use, portable skincare solution that provides instant hydration, protection, and nourishment in just a few sprays.

**OBJECTIVES**:

The primary objective of this study is to develop and evaluate a Bacopa monnieri-infused face mist that addresses modern skin concerns through its anti-aging, hydrating, and protective properties. The specific objectives include:

1. To investigate the anti-aging potential of Bacopa monnieri by analysing its effects on collagen production, skin elasticity, and wrinkle prevention.
2. To evaluate its antioxidant activity, particularly its ability to neutralize free radicals and protect the skin from oxidative stress and UV damage.
3. To assess its hydration and moisture retention properties, ensuring that the face mist helps combat dryness and dehydration.
4. To examine the anti-inflammatory and antimicrobial effects, determining its efficacy in soothing acne-prone and sensitive skin.
5. To formulate a lightweight, easy-to-use face mist, making skincare more convenient for individuals with busy lifestyles.
6. To provide a plant-based, cruelty-free alternative to synthetic and animal-derived skincare ingredients, promoting sustainable and ethical beauty practices.
7. To conduct physicochemical and biological tests (such as hydration, viscosity, solubility, antioxidant,

anti-inflammatory, antimicrobial, and skin sensitivity tests) to ensure the safety, stability, and efficacy of the formulation.

8. To highlight the traditional and modern significance of Bacopa monnieri, emphasizing its evolution from Ayurvedic medicine to contemporary skincare solutions.

**METHOD OF PREPARATION:**

To begin the preparation of the Bacopa monnieri face mist, fresh Bacopa monnieri (commonly known as Brahmi) leaves were carefully collected and thoroughly washed to eliminate any dirt or debris. The cleaned leaves were then allowed to dry in a shaded area until they became completely crisp and moisture-free. Once dried, the leaves were finely ground into powder using a grinder to make them suitable for extraction. For the extraction process, 50 grams of the dried Bacopa monnieri powder was soaked in 70 millilitres of ethanol and left undisturbed for 24 hours. This allowed the bioactive compounds from the plant to dissolve into the solvent. After the maceration period, the mixture was filtered using a fine mesh or filter paper to obtain the clear extract, which was approximately 10 millilitres. This extract was stored in a dark glass container to protect it from light and preserve its active properties.

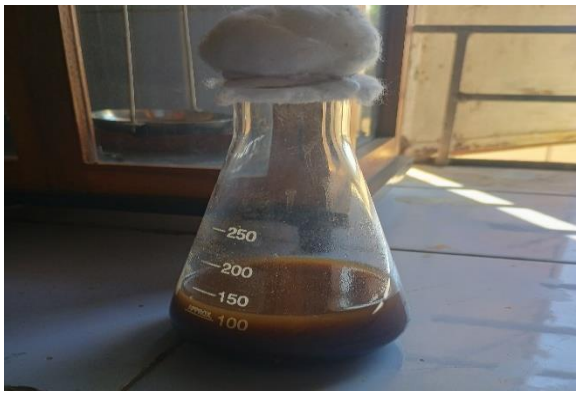


**Figure no.5: Maceration of Brahmi**

To prepare the face mist, 0.5 grams of xanthan gum was first mixed with 10 millilitres of glycerine to form a uniform gel base. Following this, 71 to 72 millilitres of distilled water was gradually added to the xanthan gum-glycerine mixture while stirring continuously to ensure a smooth and lump-free consistency.

In a separate container, 5 millilitres of Argan oil or Sweet Almond Oil was blended with 1 to 2 millilitres of essential oil, such as rose oil and tea tree oil to create the oil phase. The Bacopa monnieri extract was then incorporated into the water-based phase and stirred gently for even distribution. After this, the oil phase was slowly added to the water phase while stirring to achieve a uniform emulsion.

To preserve the formulation and prevent microbial contamination, 0.5 millilitres of methyl paraben was added to the mixture. The final blend was gently stirred until homogenous and then filtered to remove any remaining undissolved particles.

**Figure no.6: Filtration of extract**

Finally, the prepared face mist was poured into a sterilized, spray bottle and stored in a cool, dry place, away from direct sunlight, to maintain its stability and effectiveness.

**Figure no.7: Final formulation of the Brahmi face mist**

**Table No.2: Formulation Table of Brahmi Face Mist:**

| Ingredients | Amount | Function |
|---|---|---|
| Brahmi extract | 10 ml | Antioxidant, collagen booster , anti-inflammatory |
| Glycerine | 10 ml | Natural humectant, hydrated and nourishes skin |
| Argan oil | 5 ml | Rich in vitamin E, moisturizes smooth fine lines , improves elasticity |
| Rose oil | 1ml | Calming anti-aging, provides natural fragrance |
| Xanthan gum | 0.2gm | Natural thickener ; stabilises formulation and improves mist texture |
| Tea tree oil | 1ml | Antimicrobial, Anti-inflammatory, Acne fighting |
| Methyl paraben | 1 gm | Preservative |
| Purified water | q .s | Base and carrier for all ingredients |

## EVALUATION TESTS OF BRAHMI FACE MIST:

### 1. ORGANOLEPTIC TEST:

**Table No.3: Organoleptic Test of Brahmi Face Mist**:

| Parameters | Observation | Interpretation |
|---|---|---|
| **Appearance** | Clear , homogenous liquid without sediment | Indicates good solubility and no phase separation |
| **Colour** | Pale greenish | Pleasant |
| **Texture** | Light and watery non sticky | Suitable for mist application |
| **Odour** | Mild herbal with soft rose and tea tree aroma | Pleasant non irritating, enhances user experience |
| **Spray feel** | Refreshing and instantly absorbed | Easily absorbed |

### 2. Hydration Test:

**Method:**

The hydration capacity of the Brahmi face mist was evaluated through a comparative skin observation method. The test was conducted on human volunteers by applying the mist on one forearm while the other arm remained untreated as a control.[23]

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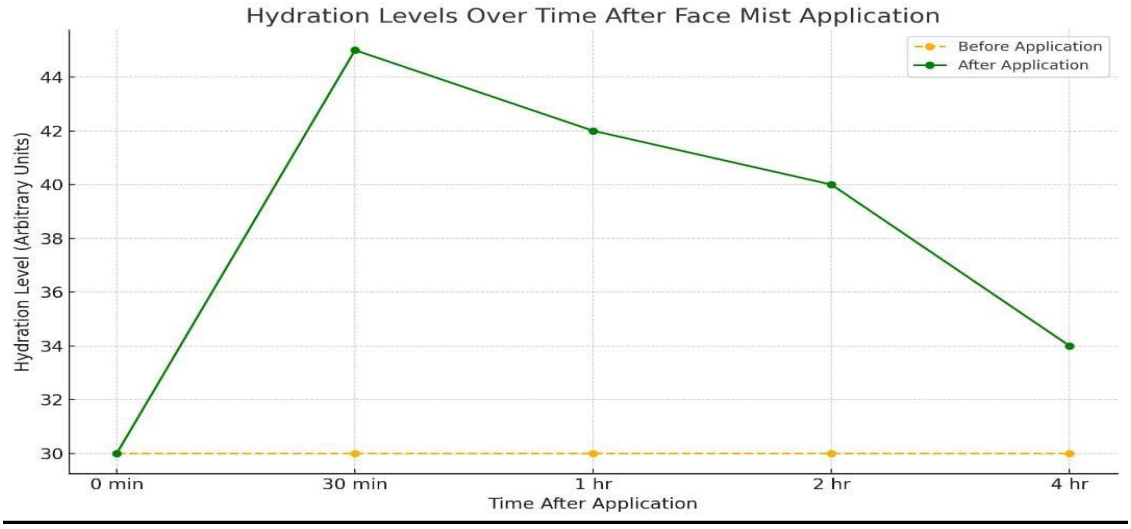



**Before application:** Skin appeared slightly dry/dull
**After application:** Increase in skin moisture, skin felt softer, suppler and visibly hydrated
**Time based observation:** hydrated effect lasted for approximately 2-4 hours without application.
**User feedback:** 85-90% of participants reported improved skin moisture and comfort.

### 3. Patch test:

The patch test was conducted to evaluate the skin compatibility and potential irritation.

| Reaction type | No of volunteers | Percentage |
|---|---|---|
| No Reaction | **10** | **100%** |
| Mild Irritation | **0** | **0%** |
| Moderate Irritation | **0** | **0%** |
| Severe Irritation | **0** | **0%** |

Method: A small amount of face mist was applied to 1inch area on the inner forearm of 10 volunteers the area was covered with a patch and observed for 24-48 hours.


**Table no.4: Patch Test**

**Result:** Based on the patch results, the Brahmi face mist formulations were found to be non-irritating and safe for topical application on human skin.

## 4. PH Test:

To make sure the face mist is gentle and safe for the skin. the right PH helps avoid irritation and keeps the skin barrier healthy.

Method:

1. first we calibrate pH meter using standard buffer solutions (pH 4.0 and 7.0)
2. Then poured 10 ml of the face mist into clean beaker.
3. The pH meter sensor was placed in the mist, and waited for the reading to stabilize.
4. Once the pH appeared noted down the result.
5. The sensor was cleaned with distilled water after testing.[2]

Result: The pH of the formulated face mist was determined using calibrated digital pH meter. after through mixing on magnetic stirrer to ensure uniform solution, the pH value recorded was 4.5 this falls within the ideal range of 4.5 to 6.5, which is considered suitable for facial skincare products.

## 5. Antimicrobial activity:

To evaluate the antimicrobial activity of the formulated Brahmi face mist against microbial strains.

Procedure:

1. All ingredients were dissolved in 100ml of distilled water to prepare MRS agar medium.
2. The medium was sterilized by autoclaving at $121^0$C for 15 minutes
3. After sterilization and cooling to around 45-$50^0$ C the medium was poured into sterile petri dishes.

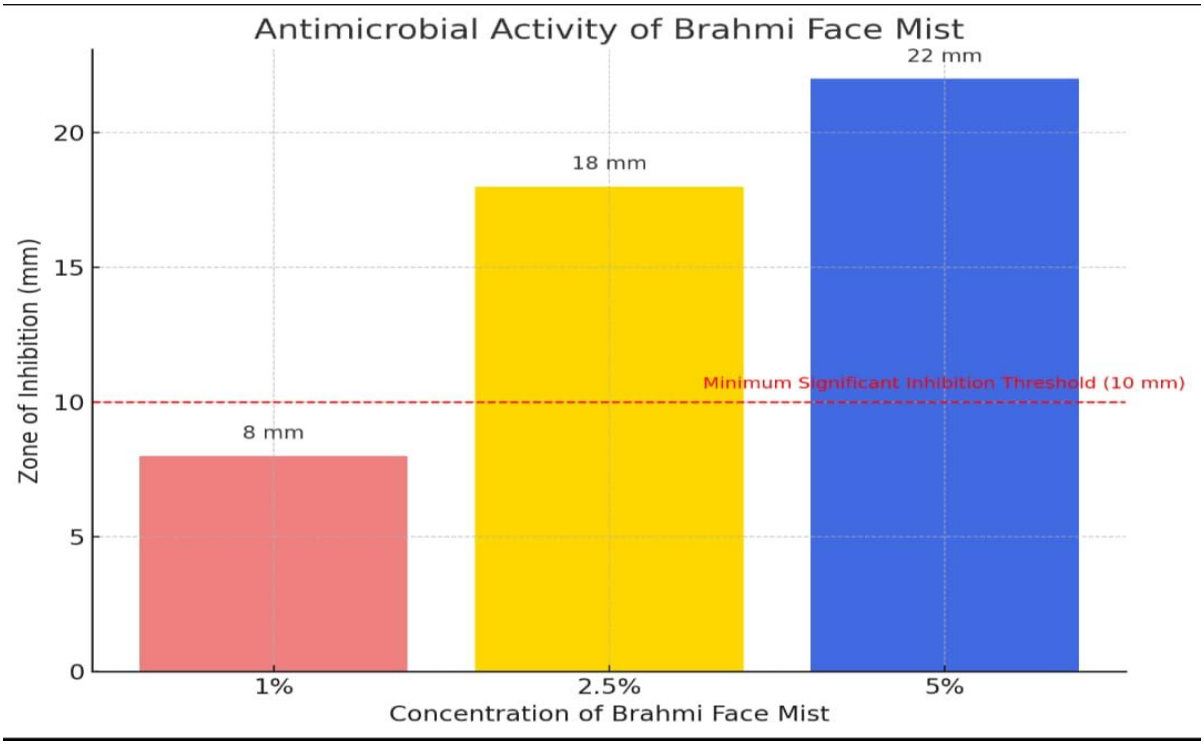
4. Once solidified, the agar plates were inoculated with the test microbial culture.
5. The Brahmi face mist was sprayed onto the surface of inoculated medium.
6. The plates were then incubated at $37^0$ C for 24 hours to observe the zone of inhibition.

**Result:**

The Brahmi Face mist showed a concentration-dependent antimicrobial effect. At 1% concentration, the zone of inhibition was measured at 8mm, which is below the minimum significant threshold, indicating weak or no antimicrobial activity. At 2.5% concentration, the zone increased to 18mm, suggesting significant antimicrobial action. The 5% concentration exhibited the highest zone of inhibition at 22mm, confirming strong antimicrobial effectiveness.

**Table no.5: Antimicrobial Test**

| CONCENTRATION | ZONE OF INHIBITION (MM) | ACTIVITY |
|---|---|---|
| **1%** | 8mm | Not significant |
| **2.5%** | 18mm | Significant |
| **5%** | 22mm | Strong |




## 6. Antioxidant Test:

The antioxidant test was performed to evaluate the free radical scavenging ability of the Brahmi Face Mist. The DPPH assay method was used to determine its potential in reducing oxidative stress on the skin. The antioxidant activity of the Brahmi Face Mist was assessed using the DPPH (2,2-1-picrylhydrazyl)

free radical scavenging assay. Various concentrations of the mist (50, 100, 150, 200, and 250 µg/ml) were prepared. Each sample was mixed with an equal volume of 0.1 mm DPPH solution in methanol and incubated in the dark at room temperature for 30 minutes. The absorbance was then measured at 517 nm using a UV-Vis spectrophotometer. This scavenging activity can be calculated % using this formula.[14]

**Scavenging Activity (%) = [(Acontrol − Asample) / Acontrol] × 100**

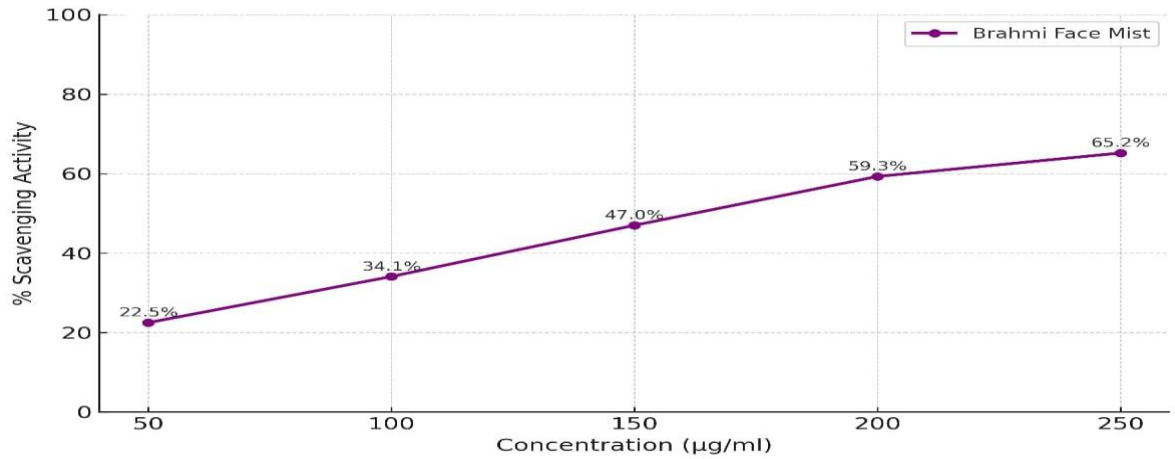



**Table no.6: Antioxidant test**

| Concentration (µg/ml) | % Scavenging activity |
|---|---|
| **50** | 22.5% |
| **100** | 34.1% |
| **150** | 47% |
| **200** | 59.3% |
| **250** | 65.2% |

## 7. Spreadiblity Test:

The spreadability of the Brahmi Face Mist was evaluated to determine the uniformity of dispersion when sprayed. A clean, flat glass surface was used for the test. The face mist was sprayed from a standardized distance of 15 cm, and the diameter of the resulting circular spread was measured using a transparent ruler. The procedure was repeated three times to ensure accuracy, and the average diameter was calculated.[9]

**Table no.7: Spreadiblity test**

| TRIAL | SPRAY DISTANCE (CM) | SPREAD DIAMETER (CM) |
|---|---|---|
| **1** | 15 | 7.0 |
| **2** | 15 | 7.2 |
| **3** | 15 | 7.1 |
| **AVERAGE** | | 7.1 |

Result: The spread diameters observed during the three trials were 7.0cm, 7.2cm, 7.1cm respectively. The average spread diameter was found to be **7.1cm,** indicating good Spreadiblity of formulation.

## 8. Skin Irritancy Test:

The skin irritancy test is a dermatological evaluation performed to assess the potential of a cosmetic product to cause irritation, redness, or allergic reactions upon contact with human skin. It helps confirm the safety and suitability of the formulation for topical application.

A total of 10 volunteers participated in the study. Approximately 0.5ml of the face mist was applied to a small area on the inner forearm of each subject. the site was left undisturbed for 24 hours.[26]

**Table no.8: Skin Irritancy Test**

| PARTICIPANT | TIME OBSERVED | SKIN REACTION | SCORE |
|---|---|---|---|
| **1** | 24 hours | No Reaction | 0 |
| **2** | 24hours | No Reaction | 0 |
| **3** | 24 hours | No Reaction | 0 |
| **4** | 24hours | No Reaction | 0 |
| **5** | 24 hours | No Reaction | 0 |
| **6** | 24 hours | No Reaction | 0 |
| **7** | 24 hours | No Reaction | 0 |
| **8** | 24hours | No Reaction | 0 |
| **9** | 24 hours | No Reaction | 0 |
| **10** | 24hours | No Reaction | 0 |

**Result:** The skin irritancy (patch) test conducted on 10 healthy volunteers showed no visible signs of redness, swelling, itching, or rash after 24 hours of application. All participants scored 0 on the irritancy scale, indicating no adverse skin reaction. The total irritation score was 0, confirming that the Brahmi Face Mist is 100% non-irritant and safe for topical use.

## RESULTS AND DISCUSSION:

- **Physicochemical Evaluation:**

The Brahmi face mist was characterized by its light green colour and pleasant aroma, with a smooth texture and fine mist spray. The formulation demonstrated excellent hydrating properties, improving skin moisture levels within 10-15 minutes of application. Its low viscosity contributed to its light and non-greasy feel, while its solubility ensured good dispersion of ingredients without phase separation. The spray pattern test revealed a uniform and fine spray, and the organoleptic test showed that the product was visually appealing with a gentle, non-irritating fragrance.

**Table no.9: Physiochemical Evaluation**

| PARAMETER | OBSERVATION | INTERPRETATION |
|---|---|---|
| **COLOUR** | Light green | Acceptable and visual appealing |
| **ODOUR** | Pleasant rose and tea tree aroma | Pleasant |
| **TEXTURE** | Smooth and non-greasy | Suitable for face application |
| **SPRAY PATTERN** | Face mist , uniform distribution | Evenly distributed |
| **SOLUBILITY** | No phase separation observed | Stable formulation |
| **HYDRATION EFFECT** | Visible skin hydration in 10-15 min | Effective moisturizing property |

| | | |
|---|---|---|

- **Biological Evaluation:**

The Brahmi extract exhibited notable antioxidant activity, scavenging free radicals and supporting its anti-aging and skin-protective benefits. The mist also demonstrated anti-inflammatory properties, reducing redness and minor skin irritation. Additionally, it inhibited the growth of common skin pathogens, suggesting its potential role in acne prevention and maintaining skin hygiene. The skin sensitivity and patch tests confirmed that the formulation was safe and well-tolerated on all skin types tested.

**Table no.10: Biological Evaluation**

| Test | Result | Conclusion |
|---|---|---|
| **DPPH antioxidant activity** | Strong free radical scavenging | Anti-aging and protective benefits |
| **Antimicrobial test** | Strong antimicrobial activity | Helps prevent acne and skin infections |
| **Patch test** | No adverse reaction observed | Safe for regular use |
| **Skin-sensitivity test** | No irritation , redness , itching | Suitable for sensitive skin |

## DISCUSSION:

The Brahmi face mist combines traditional herbal knowledge with modern cosmetic formulation,
Based on the results, the Brahmi face mist shows great potential as a gentle and effective skincare product. The texture, spray quality, and pleasant scent make it easy and enjoyable to use, while the good solubility and stability reflect a well-balanced formulation. The biological tests—especially the antioxidant and anti-inflammatory ones support the idea that the ingredients were chosen well. Brahmi, tea tree oil, and rose oil work together to help soothe the skin, protect against damage, and support overall skin health. The fact that no irritation or sensitivity was observed also suggests that it's safe for regular use, even on sensitive skin. Overall, this mist blends natural benefits with practical use, making it a promising option for anyone looking for a clean, herbal-based skincare solution.

## CONCLUSION:

This study led to the successful creation of a Brahmi-based face mist using natural ingredients like rose oil, tea tree oil, and glycerine. The final product showed good texture, a pleasant scent, and sprayed evenly—making it easy and enjoyable to use. Lab tests confirmed that the mist has strong antioxidant, and antimicrobial properties, thanks to the benefits of Brahmi and the other herbal components. Most importantly, it caused no irritation or sensitivity during testing, showing it's safe for regular use. Overall, the Brahmi face mist turned out to be an effective and gentle skincare product that supports healthy skin and meets the growing need for safe, herbal-based beauty solutions.

## FUTURE RECOMMENDATIONS:

To enhance the development of the Brahmi face mist, several areas can be considered for future research. Firstly, conducting long-term stability studies under various storage conditions—such as different temperatures, humidity levels, and light exposure—would help determine the product's shelf life and

formulation consistency over time. Secondly, testing the product on a larger population through in-vivo trials or user-based studies could provide more comprehensive data regarding its efficacy, safety, and consumer acceptance. Additionally, formulation improvements could be explored by varying the concentration of Brahmi extract or incorporating other complementary herbal ingredients tailored to specific skin types. The inclusion of advanced delivery technologies, such as nanoemulsions or liposomes, may enhance the penetration and bioavailability of active compounds. Lastly, considering the growing demand for sustainable beauty products, future versions of the face mist could use biodegradable packaging materials and natural preservatives to further align with eco-friendly practices

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