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“Green Shield: A Herbal Antifungal Spray From Guava And Neem Leaves.”

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1. ABSTRACT:

Fungal infections are a common health concern affecting skin and mucosal surfaces, often leading to discomfort and secondary complications. The increasing resistance to synthetic antifungal agents and their associated side effects have created a need for safer and more effective alternatives. Herbal medicines, due to their natural origin, biocompatibility, and minimal adverse effects, are gaining attention in the field of pharmaceutical research.

The present study aims to formulate and evaluate a herbal antifungal spray using extracts of guava (*Psidium guajava*) and neem (*Azadirachta indica*) leaves, both known for their potent antimicrobial and antifungal properties. The plant materials were collected, dried, and subjected to extraction using a suitable solvent system. The obtained extracts were incorporated into a spray formulation along with appropriate excipients such as solvents, preservatives, and stabilizers.

The formulated spray was evaluated for various physicochemical parameters including pH, viscosity, drying time, and stability. The antifungal activity was assessed using standard microbiological methods against common fungal strains. The results demonstrated that the formulation exhibited significant antifungal activity and acceptable physicochemical properties.

Keywords: *Psidium guajava*, *Azadirachta indica*, medicinal value, antifungal properties, Herbal medicine, Antifungal spray, Solvent.

2. INTRODUCTION:

Fungal infections are a common health problem affecting the skin, hair, and nails, especially in tropical and humid regions. The increasing resistance to conventional antifungal drugs and their associated side effects has created a need for safer, effective, and affordable alternatives. In recent years, herbal formulations have gained significant attention due to their natural origin, better compatibility with the skin, and fewer adverse effects.

Medicinal plants such as guava (*Psidium guajava*) and neem (*Azadirachta indica*) have been widely used in traditional medicine for their antimicrobial properties. Guava leaves are rich in flavonoids, tannins, and phenolic compounds, which exhibit strong antifungal and antioxidant activity. Similarly, neem leaves contain bioactive constituents like nimbidin and azadirachtin, known for their potent antifungal, antibacterial, and anti-inflammatory effects.

Ethanol is commonly used as a solvent in herbal extraction due to its ability to efficiently dissolve a wide range of phytochemicals and its antimicrobial nature, which also enhances the preservation of the formulation. The use of ethanol-based extracts ensures better penetration of active compounds into the skin, thereby improving therapeutic efficacy.

This study aims to develop and evaluate an antifungal spray formulation using ethanolic extracts of guava and neem leaves. The formulation is intended to provide a natural, effective, and user-friendly alternative for the management of fungal infections.

3. MATERIALS AND METHODS:

3.1. Sample Collection And Authentication:

The leaves of guava (*psidium guajava*) and neem (*azadirachta indica*) plant were selected for study. Its leaves were collected from college campus. The collected leaves were identified with the help of taxonomic keys available in departmental library and confirmed with departmental herbaria.

3.2. Extraction Of *Psidium Guajava* And *Azadirachta Indica* Leaves:

The guava and neem extract was prepared using the maceration method due to its straightforward nature, efficiency, and appropriateness for extracting bioactive compounds from plant materials. Guava and neem is rich in important phytochemicals like flavonoids, tannins, and antioxidants, which are prone to damage from heat. Since maceration is a cold extraction technique, it helps maintain these heat-sensitive compounds, thereby ensuring their therapeutic properties are preserved. To create the ethanol extract, 15g of guava leaf powder and 15g of neem leaf powder was combined with 180 mL of ethanol and allowed to sit for one day in a cool, dark location with occasional stirring. Following this period, the extract was filtered and kept in an airtight container. After completing the extraction, the solvent was allowed to evaporate at room temperature.



Fig 1: Maceration process Fig 2: Guava Leaf Fig 3: Neem leaf

3.3. Antifungal Assay:

The antifungal activity of the formulated guava and neem leaf spray was evaluated using a culture-based method. A nutrient agar plate was prepared under sterile conditions, and a suspension of curd (dahi), serving as a natural source of fungal microorganisms, was evenly spread over the surface of the medium. The prepared herbal antifungal spray was then spray onto the inoculated plate. The plate was incubated at 37°C for 24 hours. After the incubation period, the plates were observed for any visible fungal growth. It was found that no fungal colonies developed on the treated plates, indicating that the formulated spray exhibited effective antifungal activity and successfully inhibited fungal growth.



Fig 4,5,6: Before Incubation

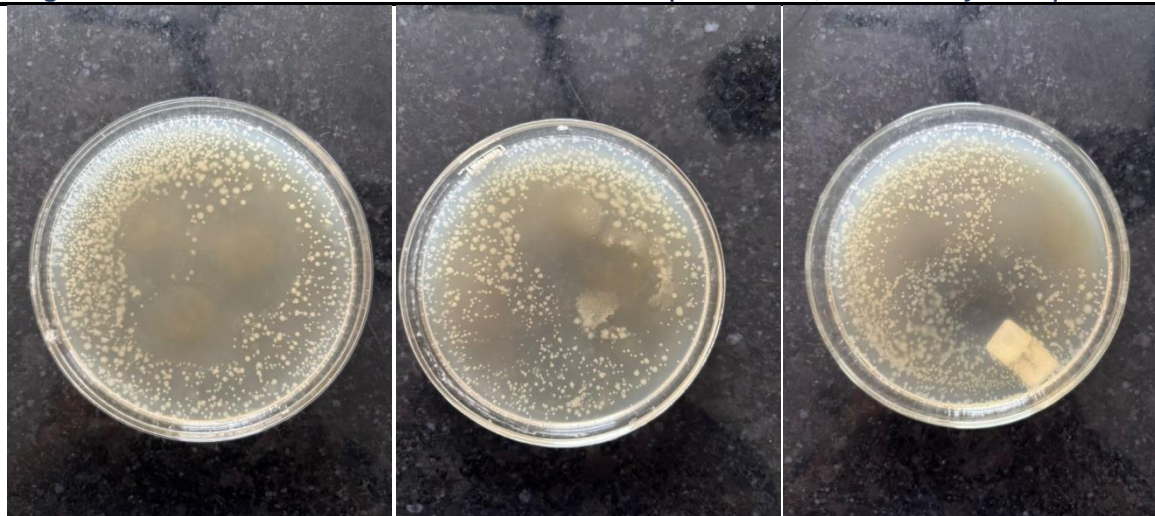


Fig 7,8,9: After Incubation

3.4. Formulation Of An Antifungal Spray:

a. Phase 1 – Blend Solvents:

In a clean beaker, combine ethanol and glycerine. Stir gently until the mixture is uniform.

b. Phase 2 – Add Guava and Neem Extract:

Incorporate guava and neem extract into the ethanol-glycerin blend. Stir thoroughly until the solution is well mixed.

c. Phase 3 – Introduce Triethanolamine and Methyl Paraben:

Add triethanolamine along with Methyl Paraben to the mixture.

d. Phase 4 – Dissolve ascorbic acid in distilled water.

Ascorbic acid was dissolved in distilled water and this solution was added to the mixture.

e. Final Adjustment: Add distilled water until achieving the precise final volume.

f. Filtration: If there is any sediment from the extract, filter the solution using whatmann filter paper and add guava perfume.

g. Packaging: Transfer the mixture into a clear spray bottle. Label it with the ingredient list, preparation date, and shelf life.

Table 1: Optimization of Formulation of Spray (4 batches)

INGREDIENTS	BATCH 1	BATCH 2	BATCH 3	BATCH 4	ROLE OF INGREDIENTS
Extract	3ml	3ml	3ml	3ml	Active ingredient
Ethanol	2.5ml	2ml	1.5ml	2ml	Solvent
Triethanolamine	1ml	1ml	1ml	1ml	Solubilizers
Glycerine	1ml	1ml	1ml	1ml	Humectant
Methyl Paraben	1ml	1 ml	1ml	1ml	Mild Preservative
Ascorbic acid	0.1g	0.1g	0.1g	0.1g	Antioxidant
Guava perfume	1 drop	1 drop	1 drop	1 drop	Perfume
Purified Water	Qs to 10ml	Qs to 10ml	Qs to 10ml	Qs to 10ml	Solvent

3.5. Evaluation Of Spray :

3.5.1. Physical Examination:

- Colour: Colour was checked visually.
- Odour: The odour was identified by smelling the formulation.
- Texture: The texture of the spray was tested visually.

3.5.2. Ph Measurement:

The pH level of a carefully prepared spray solution was measured with pH paper and Monitored for 15 Days.

3.5.3. Homogeneity Test:

The spray was inspected visually for consistency, making certain that no particles or air Bubbles Were Present.

3.7.4. Spray Angle:

The gap will be set between the surface of the nozzle. Following that, a single actuation is sprayed onto the surface, and the radius is recorded.

3.7.5. Spray Pattern:

A spray pattern analysis was conducted to verify uniformity in the distribution of the spray and to detect problems such as uneven or insufficient spraying.

3.7.6. No. Of Spray Per Container Test:

This assessment was conducted to evaluate the Spray Container Utilisation (SCU) at both the start and at the specified number of sprays.

3.7.7. Spray Coverage Area:

This assessment is conducted to evaluate the overall distribution of the spray when it is applied to the skin's surface.

4.RESULTS:

4.1.Physical Examination:

- Colour: Green colour
- Odour: Pleasant odour
- Texture: Non- greasy and Light weight.

4.2. pH Measurement:

The pH of the spray formulation was found to be between 7-8 which is suitable for application on skin.

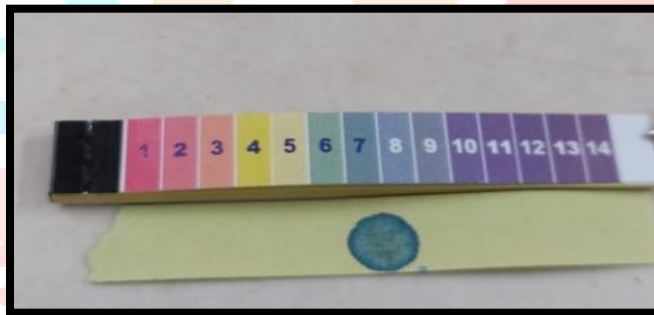


Fig 10: Measurement of pH



Fig 11: Spray Angle

Sprayed at an angle of 1cm

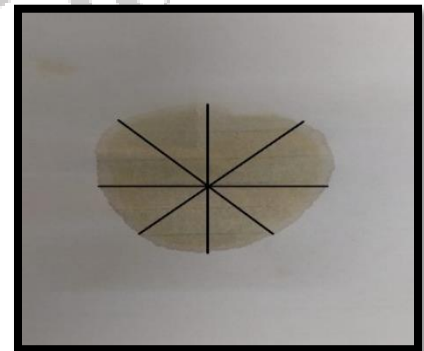


Fig 12: Result After Spraying At 1cm

Calculation:

$$\begin{aligned} D_{avg} &= D1 + D2 + D3 + D4/4 \\ &= 3.9 + 4.1 + 4 + 4.3/4 = 4.07 \text{ Cm} \end{aligned}$$

$$\begin{aligned} \text{Spray Angle} &= \tan^{-1} (1/ R) \\ &= \tan^{-1} (1/2.03) \\ &= \tan^{-1} (0.4850) \end{aligned}$$

4.4. Spray Pattern:



TRIAL 1



TRIAL 2



TRIAL 3



TRIAL 4



TRIAL 5

4.5. No. of Spray per Container Test:

Table 2: : Spray per container test readings

TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4
634 Spray	635 Spray	638 Spray	636 Spray

4.6.Spray Coverage Area:

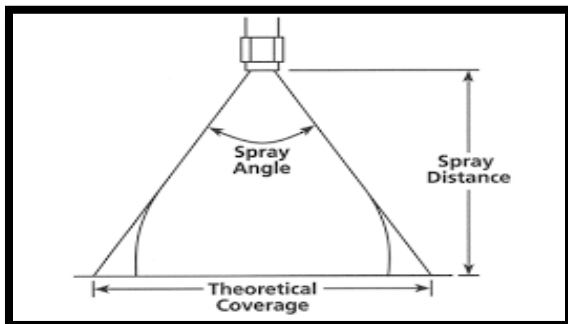


Fig 14: Spray coverage area

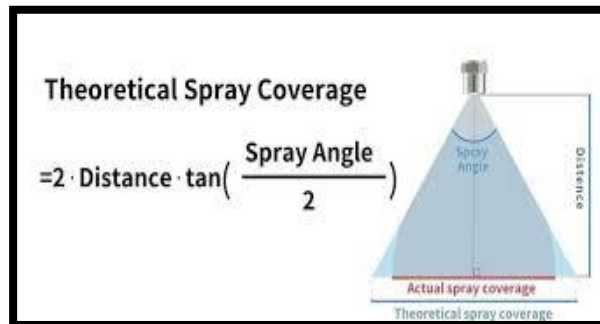


Fig 13: Spray distance

Distance = 10mm

Spray Angle = 25.87

Spray Coverage Area = 44 mm²

4.7. Evaporation Time:

Table 3: Evaporation time readings

TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4
21.9	25.5	22.4	23.7
SEC	SEC	SEC	SEC

4.8 .Drug Content Per Spray :

If we spray 5 times it will eject 1ml

Therefore, 1 spray will have 0.2ml

The new concentration of formulation is 0.04g/ml

Therefore, 1 spray will contain : 0.2ml x 0.04g/ml
= 8mg

8mg of active component will be ejected at 1 spray

(80 ml of formulation contains 3.2 g of active content)

5. CONCLUSION:

This study concludes that the antifungal spray formulated using guava and neem leaf extracts shows promising antifungal activity against common fungal pathogens. The presence of bioactive compounds in Guava leaves and Neem leaves contributes to its effectiveness in inhibiting fungal growth. The formulation was found to be simple, cost-effective, and based on natural ingredients, making it a safer alternative to synthetic antifungal agents. Additionally, the incorporation of Ascorbic acid helped improve the stability of the formulation due to its antioxidant properties.

Overall, the developed herbal antifungal spray has potential for use in managing minor fungal infections and can be further explored for commercial and therapeutic applications. However, further studies such as stability testing, toxicity evaluation, and clinical trials are recommended to confirm its safety and efficacy on a larger scale.

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