

Staphysagria-Enriched NDDS Shampoo: A New Horizon in Herbal Hair Care



Introduction

- **Dandruff** affects over **50%** of the global population, often caused by **microbial infections** (**C. albicans**, **S. aureus**), stress, diet, and pollution.
- Left untreated, dandruff can lead to **seborrheic dermatitis**, **hair loss**, and **scalp infections**, impacting both **physical health** and **confidence**.
- **Conventional shampoos** contain harsh chemicals (sulfates, parabens) that provide **temporary relief** but fail to address the **root cause** of dandruff, leading to **scalp irritation** and **long-term damage** to hair.
- **Herbal alternatives** often fail due to **poor absorption** into the scalp and lack of **comprehensive benefits**, typically only targeting one aspect like antifungal activity.
- **Staphysagria**, used for centuries for its **antifungal** and **antibacterial properties**, is a proven remedy but underutilized in modern formulations.
- By incorporating **Staphysagria into an advanced delivery system**, we enhance its **absorption**, ensuring **effective treatment** for both symptoms and the root cause of dandruff.
- This innovation offers a **safe, natural, and highly effective solution** for dandruff, promoting **long-lasting scalp health**.

Need and Objectives

- **Rising Hair & Scalp Issues:** Increasing cases of dandruff, infections, and hair loss demand safer and more effective alternatives.
- **Limitations of Conventional Shampoos:** Synthetic shampoos contain harsh chemicals that cause irritation, dryness, and long-term scalp damage.
- **Staphysagria with Phytosomal Advantage:** Staphysagria's antimicrobial and soothing properties are enhanced using a phytosomal system, improving absorption, stability, and efficacy.
- **Eco-friendly & Innovative Solution:** This research introduces a NDDS-based herbal shampoo, offering a sustainable, safe, and advanced approach to hair and scalp care.

Need and Objectives

1

To extract bioactive constituents from *Staphysagria* using an appropriate extraction method.

2

To perform preliminary phytochemical screening of *Staphysagria* extract to identify its bioactive constituents.

3

To develop and optimize a phytosome formulation using *Staphysagria* extract as the active ingredient.

4

To evaluate the phytosome formulation for key parameters such as entrapment efficiency, particle size, etc

5

To incorporate the prepared phytosome into a shampoo base to create a novel herbal shampoo formulation.

6

To evaluate the formulated shampoo for its antifungal and antibacterial activities for hair and scalp care concerns.

7

Effective Herbal Shampoo for Scalp & Hair Care

Experimental

1. Procurement of crude drug:

- The crude drug (seed of *Delphinium Staphysagaria* Linn.) was obtained as a gift sample.

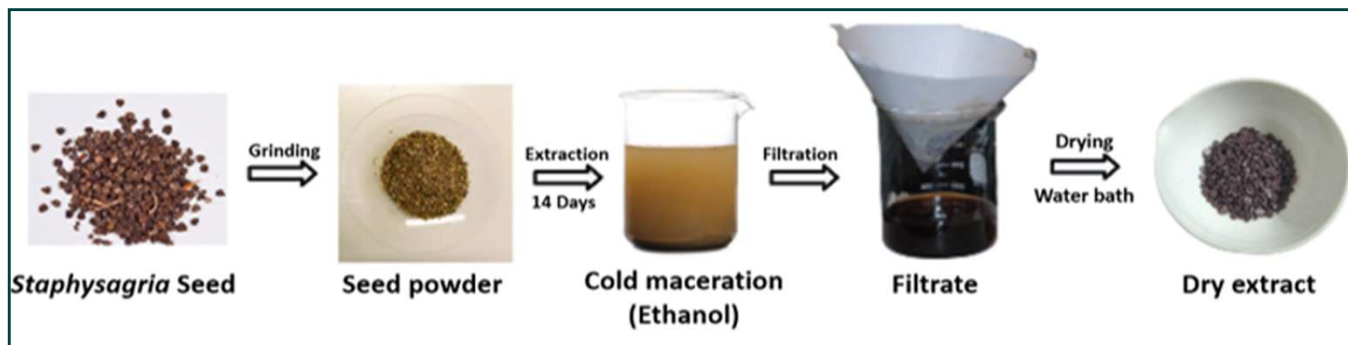
2. Authentication of crude drug:

- The authenticity of the procured seed was confirmed by a botanist.

3. Processing of crude drug:

- The seeds were subjected to drying under controlled shelter conditions and subsequently processed for extraction.

4. Extraction of crude drug:



5. Solubility analysis of extract:

- Extract was soluble in ethanol and insoluble in water.

Experimental

6. Preliminary phytochemical screening of seed extract:

- The analysis revealed the presence of key phytochemical which is alkaloids, which are known to contribute to its therapeutic properties.

7. Determination of Alkaloidal content:

- Alkaloidal content was determined by Titration method.

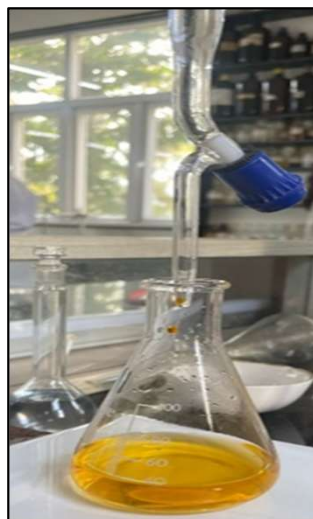
8. Standardization of Extract:

8.1. Thin Layer Chromatography (TLC):

- Co-TLC was performed with Delphinine using chloroform:methanol (9:1 v/v) as mobile phase and Dragendorff's reagent as a Spraying agent.



Phytochemical tests



Total Alkaloidal Content



TLC

Experimental

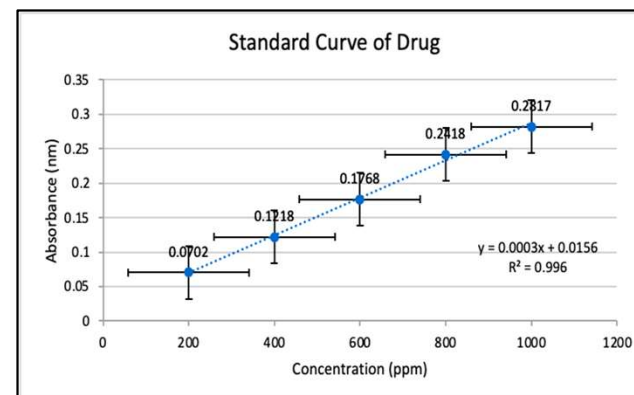
8.2. Ultraviolet-visible (UV-Vis) Spectroscopy:

8.2.1. Determination of maximum wavelength (λ_{\max}) and Standardization of extract:

- An Absorption Spectrum was compared with standard alkaloid (Delphinine), to confirm its presence.

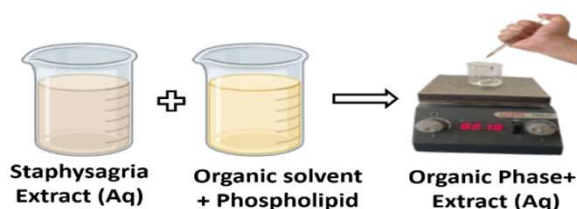
8.2.2. Preparation of standard calibration curve:

Concentration (ppm)	Absorbance (270nm)
200	0.0702
400	0.1218
600	0.1768
800	0.2418
1000	0.2817



9. Preparation and Optimization of Phytosome:

- Phytosome was prepared by solvent injection technique.
- Several batches was prepared and particle size (nm) and Entrapment efficiency (%) was calculated for optimization of Phytosome.



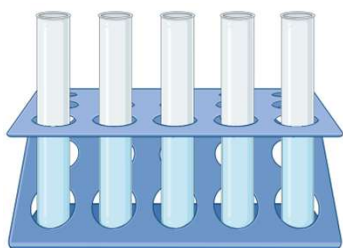
Batch No.	Extract (mg)	Lipid (mg)	Cholesterol (mg)	Entrapment Efficiency (%)	Particle size (nm)
B3	10	10	1	83	182
B7	30	20	3	58	195
B10	40	30	3	72	161
B11	60	50	5	81	154
B15	70	80	6	73	178
B17	90	100	8	77	207
B21	100	110	8	90	101

Experimental

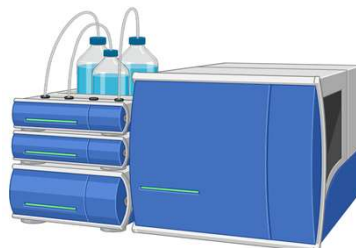
10. FT-IR study:

- FT-IR analysis was performed to identify the functional groups present in the staphysagria extract and confirm its chemical composition.

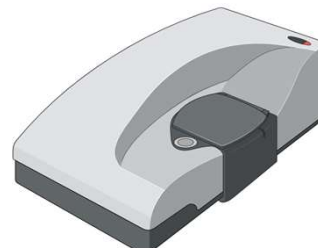
11. Evaluation of Phytosome:



Entrapment efficacy



Particle Size, PDI



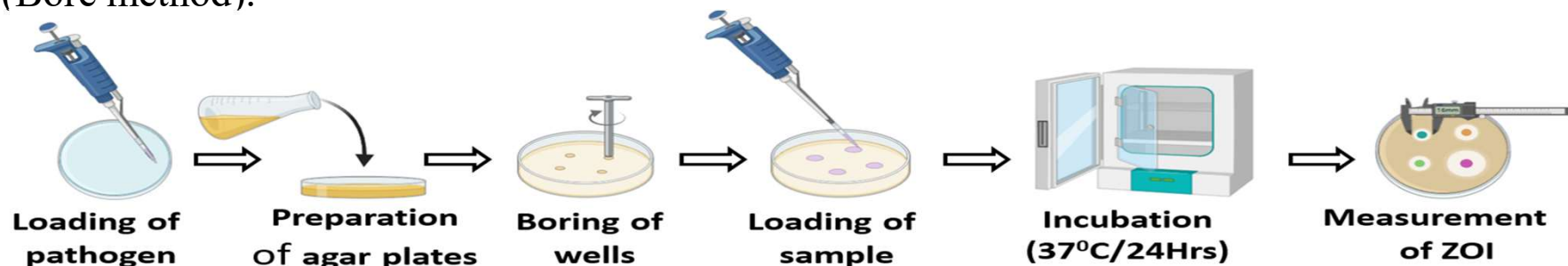
Zeta Potential



Diffusion Study

12. Antimicrobial study of prepared shampoo:

- The antimicrobial study of the formulation was conducted using the agar well diffusion method (Bore method).



Experimental

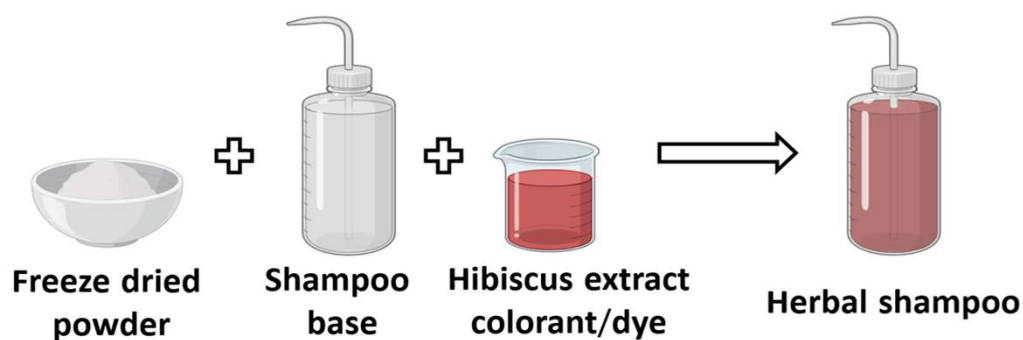
13. Formulation of staphysagria enriched phytosomal shampoo:

13.1. Steps for Water-Based Hibiscus Extract

- Fresh hibiscus petals are rinsed, separated, and added to boiling distilled water. The mixture is simmered for 15–20 minutes, then cooled and strained to remove residues, yielding a deep red extract.

13.2. Preparation of Phytosomal shampoo

- Coconut and castor oils were saponified with KOH under reflux.
- Glycerin and freeze-dried Phytosome were added with stirring, followed by ethyl alcohol, methyl paraben (preservative), lemongrass oil (fragrance), and hibiscus extract (colorant).



Sr. No.	Ingredients	Quantity (% w/w)
1	Castor oil	3
2	Coconut oil	10
3	Potassium hydroxide	3
4	Ethyl alcohol	4
5	Glycerin	2
6	Staphysagria Phytosome	0.2
7	Lemon grass oil	0.05
8	Methyl paraben	0.01
9	Distilled water q.s.	100
10	Hibiscus extract	0.01

Experimental

14. Characterization of prepared shampoo

14.1. pH:

- 0.2% shampoo solution was used to determine the pH by using the pH meter.

14.2. Foam formation (Shake test):

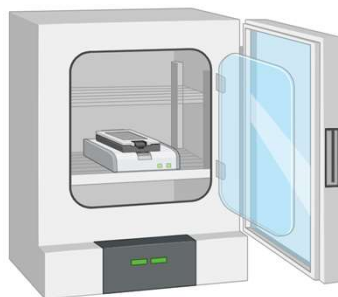
- 2 ml sample of 0.2% shampoo was mixed with water, shaken in a covered measuring cylinder, and retained foam for over 15 minutes, indicating good foaming stability.

14.3. Skin irritation test:

- The shampoo was applied to the skin for 5 minutes, showing no redness or irritation.

15. Stability Studies:

- The stability study of Staphysagria-loaded Phytosome and Staphysagria-Enriched Phytosomal Shampoo under $30 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ RH conditions was performed over three months, assessing particle size, entrapment efficiency, color, appearance, and pH, which remain stable with minimal variations



Stability Chamber

Results and Discussion

1. Extraction of crude drug and percentage yield:

- Extractive value of Staphysagria seed was found to be **17.84%**

2. Solubility analysis of extract:

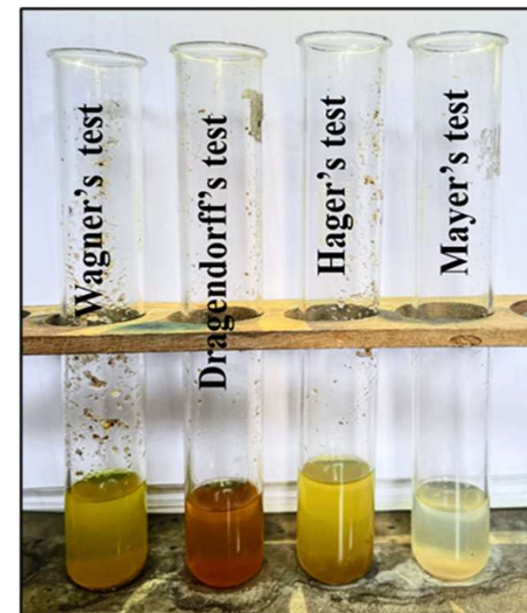
- Extract was found to be **soluble in ethanol** and insoluble in water.

3. Preliminary Phytochemical Screening:

- Phytochemical screening revealed the presence of **alkaloids**, a key phytochemical known for contributing to its therapeutic properties.

4. Thin Layer Chromatography (TLC):

- R_f value was found to be **0.55** which complies with the Delphinine of Homeopathic Pharmacopoeia of India Volume VI.



Phytochemical tests



TLC

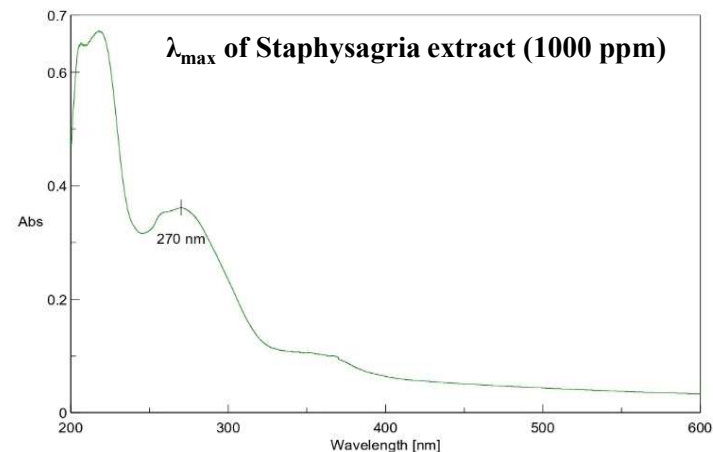
Results and Discussion

5. Determination of Total Alkaloidal Content:

- Total alkaloidal content was found to be **2.916% w/w**.

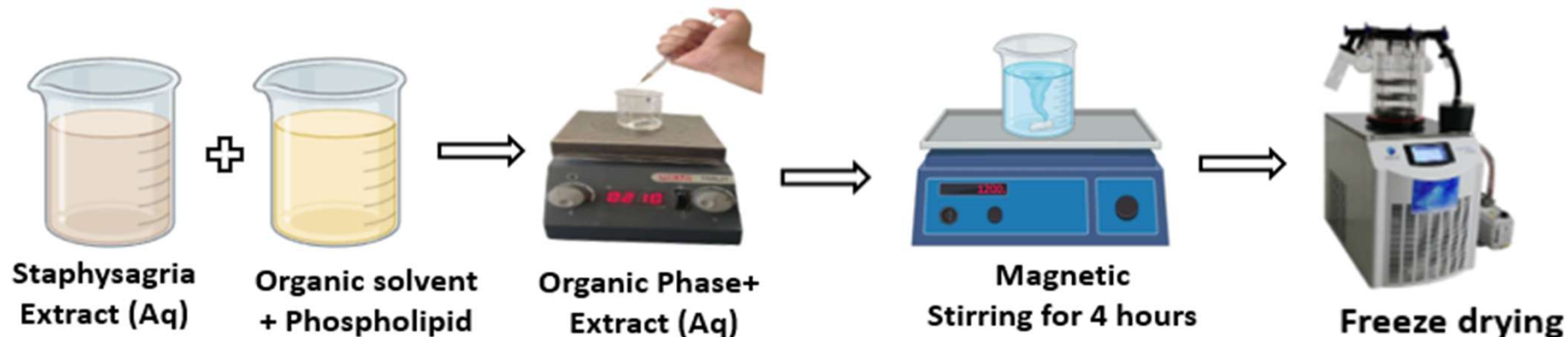
6. Determination of λ_{\max} :

- λ_{\max} of Staphysagria extract was found to be **270 nm** which complies with the λ_{\max} of Delphinine as per Homeopathic Pharmacopoeia of India Volume VI.



7. Preparation of Phytosome:

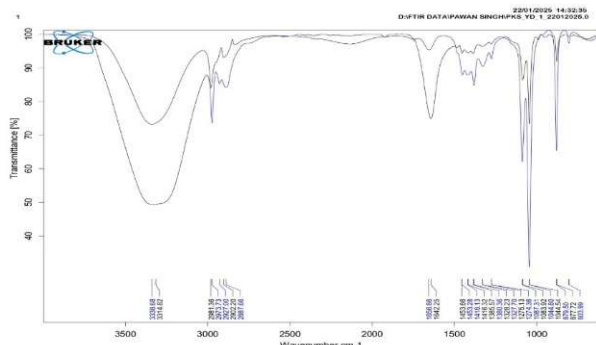
- Phytosome was prepared by **Solvent Injection Technique**.



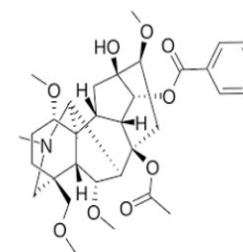
Results and Discussion

8. FT-IR Study:

- **Structure integrity:** Primary functional groups of staphysagria are retained.
- **Drug-Excipient interaction:** Reduced peak intensities and slight shift suggest possible interaction between drug and excipients in the formulation.
- **Formulation stability:** Similarity in the spectral patterns of drug and formulation confirms the stability of formulation.



Functional Group	Frequency range (cm ⁻¹)	Vibration type
O-H	~3300	stretching
C-H	~2800–3000	stretching
C=O	~1650–1750	stretching
C=C	~1500–1600	stretching
C-O	~1000–1300	stretching



Delphinine

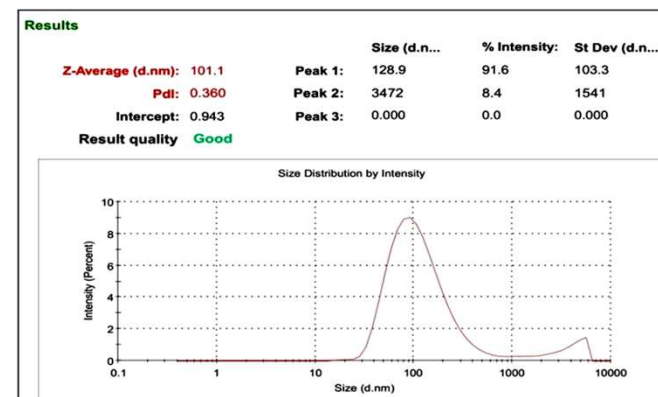
9. Evaluation of Phytosome:

9.1. Entrapment efficiency (%)

- Entrapment efficiency of phytosome was found to be **89.70%**

9.2. Particle size (nm)

- Particle size of prepared phytosome was found to be **101.1 nm.**



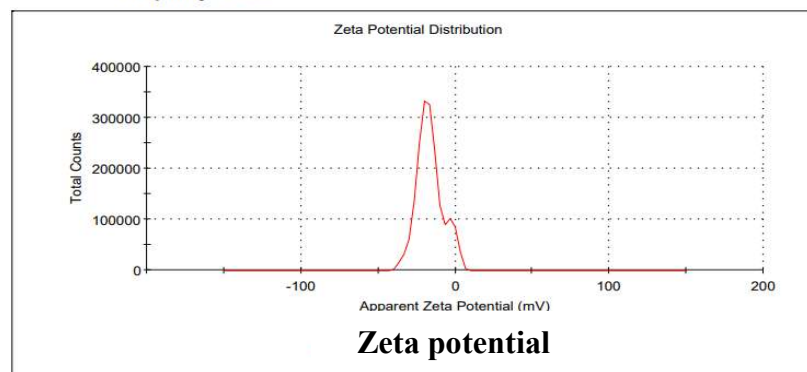
Results and Discussion

9.3. Zeta potential (mV)

- Zeta potential of prepared Phytosome was found to be **-16.30 mV**.

Results

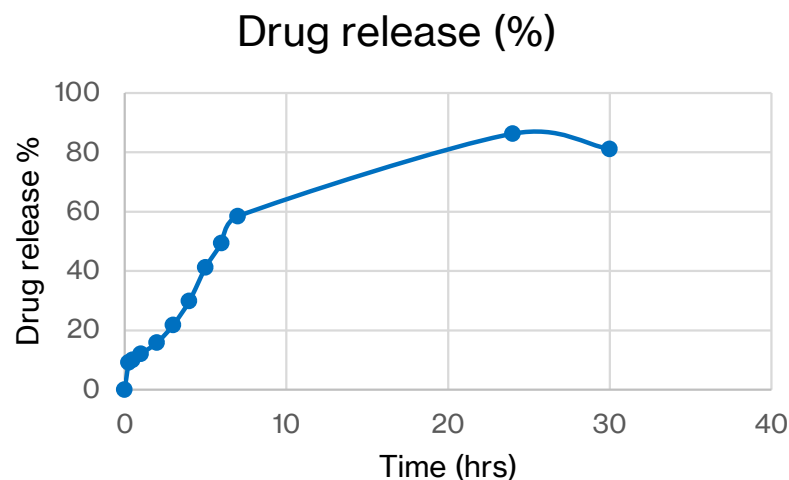
	Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -16.3	Peak 1: -18.7	92.7	6.42
Zeta Deviation (mV): 8.17	Peak 2: 1.25	7.3	1.83
Conductivity (mS/cm): 0.807	Peak 3: 0.00	0.0	0.00
Result quality Good			



9.4. Release study of Phytosome

- % drug release was found to be **86.31%** at 24 hours.

Time (hrs)	Drug release (%)
0	0
0.25	9.25
0.5	10.05
1	12.1
2	15.9
3	21.85
4	29.95
5	41.2
6	49.47
7	58.53
24	86.31
30	81.14

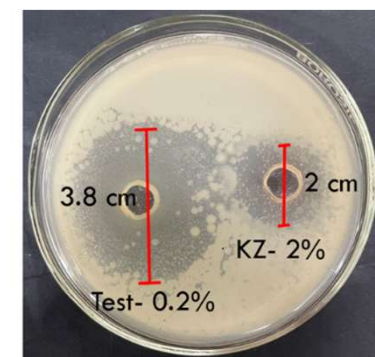


Results and Discussion

10. Anti-Microbial study of the prepared shampoo:

10.1. Antifungal Activity

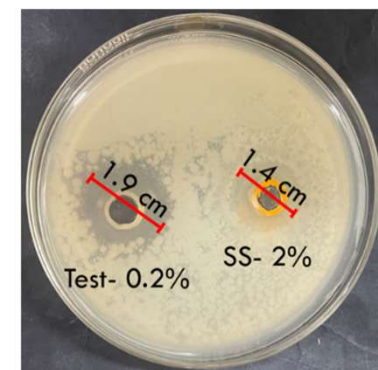
- The antifungal activity of the Staphysagria-based shampoo (0.2%) was evaluated against *Candida albicans*, with ketoconazole (2%) as the standard.
- The shampoo demonstrated a significantly larger zone of inhibition compared to ketoconazole, indicating superior antifungal efficacy.



KZ- 2%= Ketoconazole 2% solution
Test- 0.2%= Staphysagria shampoo 0.2%
Antifungal activity

10.2. Anti-bacterial Activity

- The antibacterial activity of the Staphysagria-based shampoo (0.2%) was assessed against *Staphylococcus aureus*, with selenium sulfide (2%) as the standard.
- The shampoo exhibited a greater zone of inhibition than selenium sulfide, suggesting enhanced antibacterial activity.

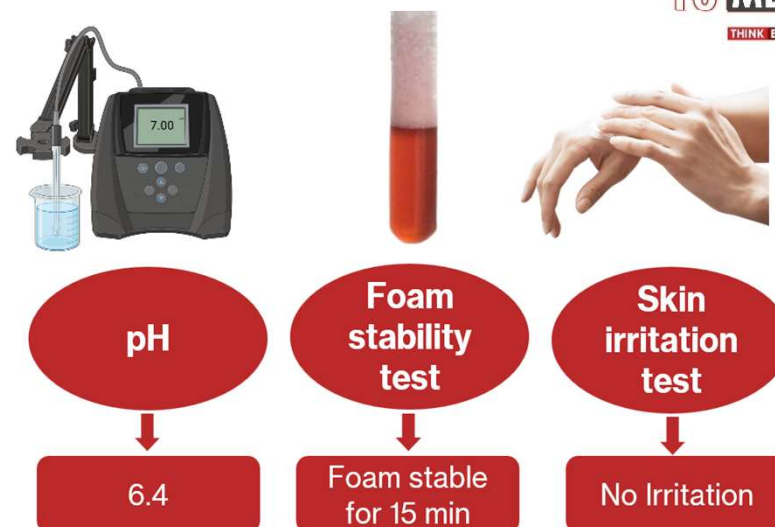


SS- 2%= Selenium Sulfide 2% solution
Test- 0.2%= Staphysagria shampoo 0.2%
Anti-bacterial activity

Results and Discussion

11. Evaluation of Staphysagria enriched phytosomal shampoo:

- Staphysagria enriched phytosomal shampoo was prepared and evaluated for pH, foam stability and skin irritation test.



12. Stability studies:

- Stability studies of prepared phytosomal batch and Staphysagria enriched phytosomal shampoo was performed as per ICH Guidelines.

Stability Studies					
Stability Condition	Staphysagria loaded Phytosome		Staphysagria-Enriched Phytosomal Shampoo		
30± 2°C/ 65±5%RH	Particle Size (nm)	Entrapment Efficiency (%)	Color	Appearance	pH
1 st Day	101.1	89.7	Reddish Orange	Clear	6.4
30 th Day	101.9	89.6	Reddish Orange	Clear	6.4
2 Month	102.4	89.3	Reddish Orange	Clear	6.4
3 Month	103.7	89.2	Reddish Orange	Clear	6.4

Conclusion

- The **Staphysagria-loaded phytosomal herbal shampoo** was successfully formulated and evaluated.
- The **phytosomal system enhanced bioavailability, stability, and scalp penetration**, making it more effective than conventional formulations.
- The shampoo exhibited **ideal physicochemical properties, antimicrobial activity, and therapeutic potential** for scalp health.
- This research highlights **a novel, eco-friendly, and effective NDDS-based approach** for herbal hair care, offering a **safer alternative to synthetic shampoos**.
- Further studies can explore **clinical efficacy and long-term stability** to establish its commercial viability.

References

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6. Miles JE. A survey of insecticidal activity from *Delphinium X cultorum* cv. *magic fountains* flowers. Michigan State University; 1998.



THANK YOU

