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

INTRODUCTION

- The development of a ***Staphysagria*-enriched NDDS shampoo** integrates traditional herbal medicine with modern **Novel Drug Delivery System (NDDS)** technology.[1,2]
- This formulation enhances the stability and bioactivity of Staphysagria, offering a safer and natural alternative for scalp and hair health.[3,4]

NEED AND OBJECTIVES

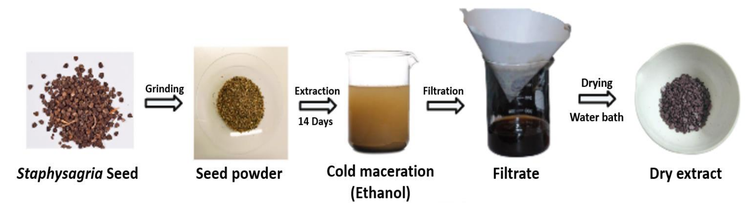
- **Rising Hair & Scalp Issues:** Increasing cases of dandruff, infections, and hair loss demand safer and more effective alternatives.
- **Limitations of Conventional Shampoos:** Synthetic shampoos contain harsh chemicals that cause irritation, dryness, and long-term scalp damage.
- **Staphysagria with 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.

➢ **Objectives:**

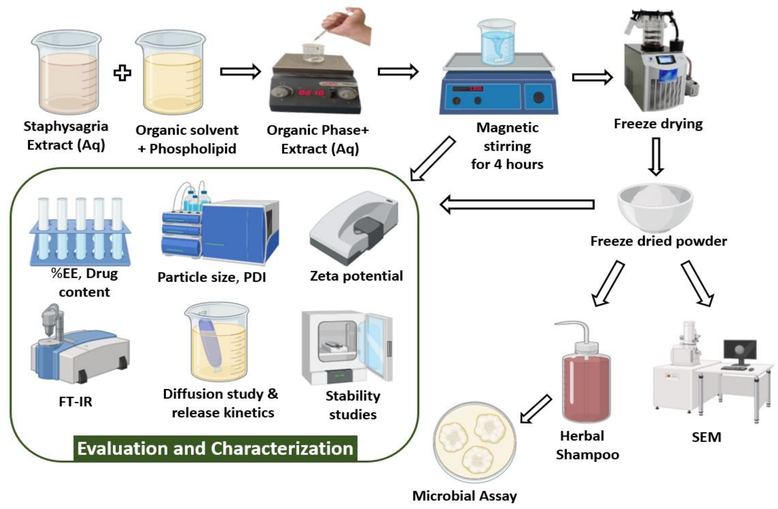
1. **To extract bioactive constituents** from *Staphysagria* using an appropriate extraction method.
2. **To perform preliminary phytochemical screening** of *Staphysagria* extract to identify its bioactive constituents.
3. **To develop and optimize a phytosome formulation** using *Staphysagria* extract 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**

METHODS AND MATERIALS

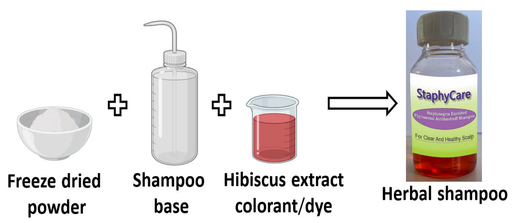
1. Procurement, Authentication and Extraction of crude drug:
Staphysagria seeds were procured from an authenticated herbal supplier and were identified and authenticated based on **macroscopic, microscopic, and physicochemical parameters** as per **pharmacopoeial standards**.



2. Preparation and evaluation of Phytosome

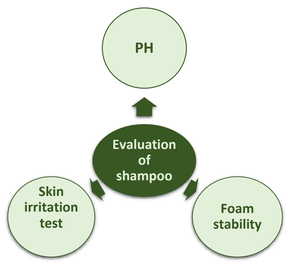


3. Preparation and Optimization of *Staphysagria* shampoo



Composition of Shampoo

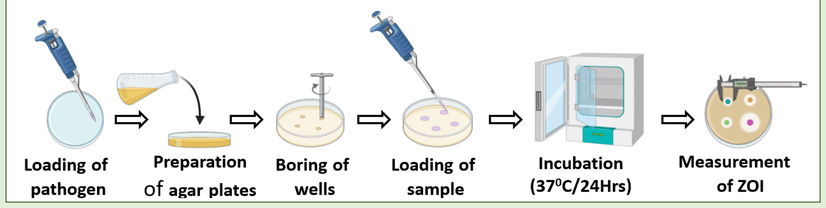
Sr. No.	Ingredients	Quantity (% w/w)
1	Castor oil	3
2	Coconut oil	10
3	Potassium hydroxide	3
4	Ethyl alcohol	4
5	Glycerin	2
6	Staphysagria phytosome	0.2
7	Lemon grass oil	0.05
8	Methyl paraben	0.01
9	Distilled water q.s.	100
10	Hibiscus extract	0.01



Optimization of phytosomes

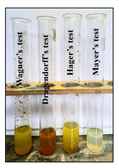
Batch No	Extract (mg)	Lipid (mg)	Cholesterol (mg)	Entrapment Efficiency (%)	Particle size (nm)
B3	10	10	1	83	182
B7	30	20	3	58	195
B10	40	30	3	72	161
B11	60	50	5	81	154
B15	70	80	6	73	178
B17	90	100	8	77	207
B21	100	110	8	90	101

4. Antimicrobial assay of *Staphysagria* Phytosomal Shampoo



RESULTS

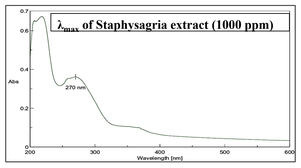
Extractive Value: 17.84%



Phytochemical Screening: Alkaloids present

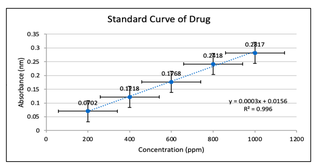
TLC: Rf value= 0.55

Total Alkaloidal Content: 2.916 % w/w

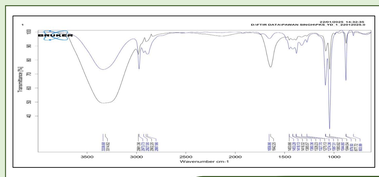


λ_{max} of *Staphysagria* extract: 270nm

Phytosome Preparation: Solvent injection method

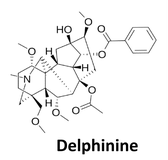


Standard curve of *Staphysagria* extract: 270nm



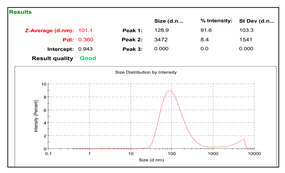
FT-IR Analysis

Functional Group	Frequencyrange (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

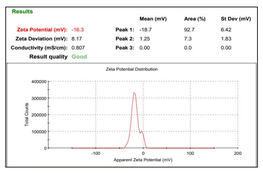


Delphinine

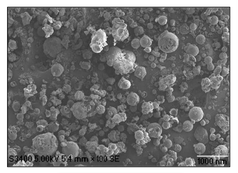
FTIR study: Overlay of Extract and Phytosome



Particle size: 101.1 nm

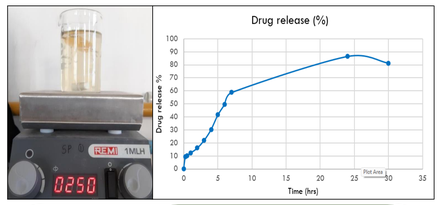


Zeta potential: -16.3 mV



SEM

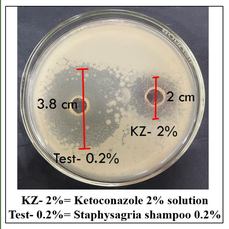
Entrapment efficiency (UV): 89.7%



In Vitro Release Kinetics: 86.31% at 24 hours

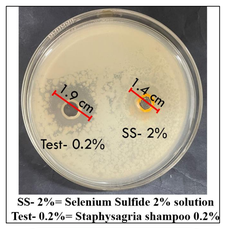
Evaluation of Staphysagria enriched phytosomal shampoo

Test	Result
pH	6.4
Foam stability test	Stable foam
Skin irritation test	No redness or irritation observed



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

Antifungal Activity: *Candida albicans*



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

Antibacterial Activity: *Staphylococcus aureus*

Stability Studies

Stability Condtion	Staphysagria loaded Phytosome		Staphysagria-Enriched Phytosomal Shampoo		
30± 2°C/65± 5%RH	Particle Size (nm)	Entrapment Efficiency (%)	Color	Appearance	pH
1st Day	101.1	89.7	Reddish Orange	Clear	6.4
30th 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

Stability Studies

DISCUSSION

- The phytosomal encapsulation of *Staphysagria* improved its stability, bioavailability, and penetration, making it more effective than conventional extracts in hair care applications.
- The formulated herbal shampoo exhibited optimal pH, viscosity, and foamability, ensuring scalp compatibility and user acceptability.
- Antimicrobial and therapeutic evaluations confirmed its potential in treating dandruff, scalp irritation, and microbial infections, proving its superiority over chemical-based shampoos.
- The study bridges the gap in NDDS-based herbal hair care by demonstrating a novel approach to herbal shampoo formulation with enhanced therapeutic efficacy and safety.

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

1. Espinosa F, Deroin T, Malécot V, Wang W, Pinedo M, Nadot S, Jabbour F. Historical note on the taxonomy of the genus *Delphinium* L.(Ranunculaceae) with an amended description of its floral morphology. Adansonia. 2021 Jan;43(2):9-18.
2. Yin T, Cai L, Ding Z. An overview of the chemical constituents from the genus Delphinium reported in the last four decades. RSC advances. 2020;10(23):13669-86.
3. Xu Y, Zhang Z, Liu B, Sun D, Li H, Chen L. Polyphenols with anti-inflammatory activity isolated from the whole herbs of Delphinium forrestii var. Viride. Fitoterapia. 2024 Dec 1;179:106259.
4. Shurovi FS. Determination of Antioxidant and Antimicrobial Activity of Dichloromethane Extract of *Garcinia cowa* stem (Doctoral dissertation, East West University).