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Research Article

Formulation and Evaluation of Herbal Facewash Tablets: Development, Characterization, and Comparative Assessment of Three Formulations

Aman Padarshi*

KCT's R.G. Sapkal College of Pharmacy, Nashik, Maharashtra, India

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ABSTRACT

Conventional facewash products are commonly aqueous gels/creams packaged in large tubes or bottles, increasing preservative needs, cost, and travel inconvenience. Solid facewash tablets may improve portability, reduce packaging, and minimize the need for preservatives. To formulate herbal facewash tablets via direct compression, evaluate pre- and post-compression parameters, and compare three formulations (F1–F3) to identify an optimal composition for performance and skin-compatibility. Liquorice (*Glycyrrhiza glabra*) and neem (*Azadirachta indica*) were selected as herbal actives. Sodium lauryl sulfate (SLS) served as surfactant; sodium starch glycolate (SSG) as disintegrant; starch and lactose as binder/fillers; Span 60 as emulsifier/wetting aid; sandalwood powder for sensorial attributes. Pre-compression properties (bulk/tapped density, Hausner's ratio, Carr's index, angle of repose) and post-compression quality attributes (appearance, thickness, hardness, friability, weight variation), pH of 1% dispersion, foaming capacity (cylinder shake method), washability, preliminary skin irritancy observation, and accelerated stability were assessed. All batches met basic quality criteria. F3 showed optimal balance: pH 5.7 (skin-compatible), hardness 4.6 kg/cm², friability 0.5% (lowest loss), foaming height 2.9 cm (highest among batches), good washability, and no visible irritancy under brief observation. F1 and F2 met acceptance but were inferior in foaming (F2) or friability (F2). Herbal facewash tablets prepared by direct compression are feasible, travel-friendly, and functionally effective. F3 demonstrated the best overall profile within the tested set. Future work should include replicated statistical validation, standardized dermatological safety testing, microbial quality evaluation, and longer-term stability studies.

INTRODUCTION

Face cleansing is a key step in skincare, yet conventional liquid/gel facewashes can be bulky, rely on preservatives due to high water content,

*Corresponding Author: Aman Padarshi

Address: KCT's R.G. Sapkal College of Pharmacy, Nashik, Maharashtra, India

Email ✉: amanpadarshi7890@gmail.com

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and increase cost/logistics for transport. Growing consumer interest in herbal ingredients and sustainable packaging supports exploration of solid, unit-dose formats.

Tableting is well established in pharmaceuticals but underutilized for cosmetic cleansers. A tablet facewash could reduce packaging, enable dose consistency, and minimize preservative needs by keeping the product anhydrous until point-of-use. This study develops herbal facewash tablets using neem and liquorice as actives and systematically evaluates their physico-functional properties

across three formulations (F1–F3) to identify an optimized composition.

Objectives:

- Formulate herbal facewash tablets via direct compression using neem and liquorice.
- Evaluate pre- and post-compression properties and functional parameters (pH, foaming, washability).
- Compare F1–F3 to identify the optimal formulation.
- Conduct a preliminary stability and skin-compatibility assessment.



Fig 1: Herbs for Dermal Care

Advantages of herbal tablet face wash over synthetic face wash:

- The current face wash products on the market are typically available in gel or cream forms, packaged in collapsible tubes or plastic containers. This packaging can be inconvenient, especially when traveling.
- Because regular face washes are water-based, they often require preservatives to maintain their stability and effectiveness.
- Standard face washes can be costly due to packaging and transportation expenses.
- Synthetic face washes tend to have more pronounced side effects, while herbal face wash tablets generally have fewer or no side effects.

2. MATERIALS AND METHODS

2.1 Materials

Table 1: Materials

Sr. No.	Material	Role	Supplier
1.	Liquorice powder (Glycyrrhiza glabra)	Soothing/ brightening, oil-control	Local market
2.	Neem powder (Azadirachta indica)	Antibacterial/ clarifying	Natural Source
3.	Sodium lauryl sulfate (SLS)	Anionic surfactant/ foaming agent	R G. SAPKAL COLLEGE
4.	Sodium starch glycolate (SSG)	Superdisintegrant	R G. SAPKAL COLLEGE
5.	Strach	Binder and filler	RG. SAPKAL COLLEGE
6.	Span 60	Emulsifying agent	RG. SAPKAL COLLEGE
7.	Lactose	Filler	RG. SAPKAL COLLEGE
8.	Sandalwood powder	Fragrance/ sensory attribute	Local market

EQUIPMENTS: -**Table 2: Equipments**

Sr. No.	Equipment	Model No.	Maker
1.	Digital pH meter	6319	Eltek
2.	Friability Test appt.	DBK5163	Labline
3.	Direct compression machine	Nill	Karnavti
4.	Bulk and Tapped density appt.	Nill	Cos Lab

2.2 Formulation Design (percent w/w)**Table 3: Composition of Herbal Face Wash Tablet Formulation**

INGREDIENTS	F1	F2	F3
LIQUORICE	10%	10%	10%
SSG	30%	30%	30%
STARCH	10%	10%	10%
SPAN	10%	15%	10%
SLS	10%	15%	20%
NEEM	20%	10%	10%
LACTOSE	10%	5%	5%
SANDALWOOD	0%	5%	5%

Rationale: SLS was varied (10–20%) to optimize foaming; SSG (30%) supported rapid dispersion; starch/lactose balanced compressibility and strength; Span aided wetting; neem/liquorice provided cosmetic benefits; sandalwood improved aesthetics.

2.3 Pre-compression Studies

- Bulk and tapped density; Hausner's ratio; Carr's index; angle of repose (fixed-funnel).

Acceptance references:

- Hausner's ratio ≤ 1.25 (good flow)
- Carr's index $\leq 15\%$ (good compressibility)
- Angle of repose $\leq 30-35^\circ$ (acceptable flow for direct compression)

2.4 Tablet Preparation (Direct Compression)

All powders were sieved, geometrically blended, and directly compressed using flat-faced punches. Compression force was optimized to achieve target hardness while minimizing defects (capping, lamination). In-process checks ensured weight and hardness consistency.

2.5 Post-compression Evaluation

- Appearance/color: visual inspection
- Thickness: caliper, mm
- Hardness: kg/cm² (Pfizer/Monsanto)
- Friability: ~100 rotations; target $\leq 1.0\%$
- Weight variation: 20 units per formulation
- pH: 1% w/v dispersion in purified water at ambient temperature (calibrated meter)
- Foaming capacity: cylinder shake method (250 mL cylinder; standardized shaking); foam height (cm)



- Washability: apply/rinse, qualitative assessment
- Preliminary primary irritancy: small-area occlusion observation (brief, non-GLP screening)

2.6 Accelerated Stability

40°C ± 2°C / 75% RH ± 5% RH for 3 months, sampling at 0, 1, 2, 3 months for appearance, hardness, friability, pH, foaming.

3. RESULTS

3.1 Pre-compression Properties

All blends exhibited acceptable flow/compressibility suitable for direct compression based on bulk/ tapped density, Hausner's ratio, Carr's index, and angle of repose.

3.2 Post-compression Quality Attributes

- **Appearance/color:**

Physically, the prepared face wash tablets were evaluated for parameters such as colour and appearance.

Table 4: Appearance/ colour

Batch	Colour
F1	Dark Green
F2	Green
F3	Light Green

Batch F3 was in good colour and appearance.



Fig 2: Appearance of herbal facewash tablets

- **Thickness (mm):**

Table 5: Thickness

Batch	Thickness (kg/cm ²)
F1	4.2
F2	4.5
F3	4.0

The Thickness of tablet of Batch F3 was 4.0, which was good As per standards.



Fig 3: Caliper

- **Hardness (kg/cm²):**

Table 6: Hardness

Batch	Thickness (kg/cm ²)
F1	4.2
F2	4.5
F3	4.0

The Thickness of tablet of Batch F3 was 4.0, which was good As per standards.



Fig 4: Pfizer Hardness Tester

- **Friability (%):**

Table 7: Friability

Batch	Wt Loss
F1	0.8%
F2	1%
F3	0.5%

The weight loss of the tablet of Batch F3 was less.



Fig 5: Friabilator

• **Weight variation:**

For the weight variation test, 20 tablets of each formulation were taken. Each tablet was weighed separately on an electronic balance, and the average weight was calculated, with the deviation recorded by comparing the average value to the deviation. The maximum weight variation should not exceed 7.50.

Formula: % Of Weight variation = $\frac{\text{Individual weight} - \text{Average Weight}}{\text{Average weight}} * 100$

• **pH (1% dispersion):**

Table8: pH

Batch	PH
F1	5
F2	4
F3	5.7

Batch F3 was determined with No skin irritation.

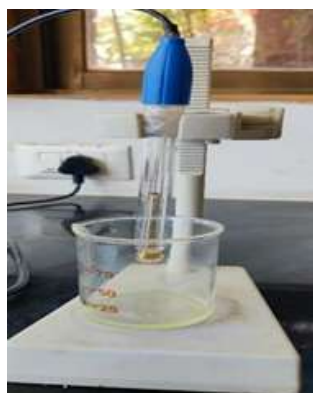


Fig 6: pH meter

• **Foaming height (cm):**

Table9: Foaming height (cm)

Batch	Foam Ht (In cm)
F1	2.5
F2	1.9
F3	2.9

F3 highest

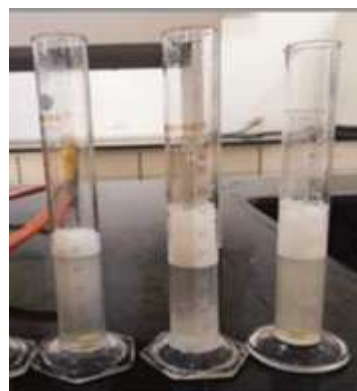


Fig 7: Foaming height

• **Washability:**

All acceptable; F3 best rinse-off feel (qualitative).



Fig 8: washability

• **Preliminary irritancy:**

No visible erythema/edema with F3 under brief observation.

3.3 Accelerated Stability

F3 showed no notable change in appearance, hardness, friability, pH, or foaming over 3 months at accelerated conditions.

3.4 Comparative Performance Summary

F3 provided the most favourable balance of skin-compatible pH, highest foaming, lowest friability, and acceptable hardness and washability

4. DISCUSSION

This study demonstrates the feasibility of solid herbal facewash tablets manufactured by direct compression. Among the formulations tested, F3 (20% SLS, 30% SSG, 10% liquorice, 10% neem, 10% Span, 10% starch + 5% lactose + 5% sandalwood) achieved the best performance. Increased surfactant content likely contributed to higher foaming and improved cleansing perception while the fixed disintegrant level supported rapid dispersion. The skin-compatible pH (5.7) of F3 aligns with maintaining barrier integrity and user comfort.

Herbal actives likely contributed complementary benefits: neem for antibacterial/anti-acne support and liquorice for soothing and brightening effects, consistent with cosmetic literature. Compared with gels/liquids, tablet format offers portability, dosage consistency, and potentially lower packaging footprint and preservative burden.

Limitations include small sample sizes, limited statistical analysis, non-GLP preliminary irritancy checks, lack of microbial quality testing, and short accelerated stability duration. Future studies should include:

- Replicate testing with full statistical analysis and confidence intervals.
- Dermatologist-supervised patch testing (and HRIPT where indicated).
- Microbial limits and preservative efficacy (if needed) or water activity control strategy.
- Consumer sensory/acceptability and comparative benchmarking versus commercial liquid facewashes.

- Scale-up feasibility and extended stability (12–24 months real-time).

CONCLUSION

Herbal facewash tablets prepared by direct compression are feasible and promising as portable, dose-consistent, and potentially preservative-sparing cleansers. Within the tested set, F3 exhibited the optimal balance of pH, foaming, friability, and overall usability. With further validation (statistics, dermatological safety, microbiological quality, and extended stability), this format shows strong potential for practical use and commercialization.

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DATA AVAILABILITY: Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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