Review On the Formulation and Evaluation of Herbal Okra Face Wash

Nimonkar Vinod Babasaheb[1], Rahinj Sangram Sanjay[2], Bagav Aniket Dattatraya[3], Gadakh Namrata[4]
[1,2,3,4]*Hon. Shri. Babanrao Pachpute Vichardhara Trust's Group of Institutions, Faculty of Pharmacy, Kashti, Maharashtra, India*
doi.org/10.64643/IJIRT209661

***Abstract*—Okra (Abelmoschus esculentus (L.) Moench) contains water-soluble, polysaccharide-rich mucilage with hydrocolloid properties that may be useful in topical formulations. This review focuses on the formulation and evaluation of herbal okra face wash, with emphasis on the identity and preparation of the okra ingredient, its possible role in a cleansing gel, appropriate excipient selection, and tests needed to characterize the finished rinse-off product. A focused narrative literature search was conducted on 6–9 October 2026 using journal and scholarly search pages and combinations of terms relating to okra, mucilage, extraction, facial wash, topical formulation, cleansing, and evaluation.**

The search was targeted rather than systematic, and no claim of exhaustive coverage or screening counts is made. Published reports include one facial-wash gel study containing 3% okra fruit extract with varied hydroxypropyl methylcellulose concentrations, preclinical work on wound formulations, and extraction or material-science studies showing that processing can alter okra-polysaccharide properties. These sources provide useful formulation context, but they do not establish clinical benefit or comprehensive safety for a different rinse-off cleanser. Physical tests such as appearance, pH, viscosity, foam, and short-term stability answer product-quality questions; they cannot alone prove skin benefit. Experimental work for the present project is planned and has not started. A future study should define the extract, document its preparation, include suitable controls and replicate batches, and assess physical quality, stability, microbial protection, tolerability, and any claim-specific outcome using appropriate methods. The available evidence supports careful formulation research rather than definitive efficacy claims.

***Index Terms*—Abelmoschus esculentus; okra mucilage; facial cleanser; topical formulation; hydrocolloid; skin care**

AIM OF THE REVIEW

The aim of this review is to examine the published evidence and formulation principles relevant to the formulation and evaluation of herbal okra face wash, and to identify a practical, evidence-based framework for future experimental work. The present manuscript reports no completed formulation or evaluation results.

I. INTRODUCTION

Botanical ingredients are widely explored as components of pharmaceutical and cosmetic products because they may provide useful physical or sensory properties and are familiar to consumers. Their use still requires careful ingredient identification, reproducible processing, compatibility testing, and safety assessment. A product described as herbal is not automatically effective, non-irritating, or microbiologically protected. These questions are especially important for a water-rich face wash that remains in contact with skin only briefly and is then rinsed away.

Okra (Abelmoschus esculentus (L.) Moench; family Malvaceae) is cultivated as a vegetable, and its fruit releases a viscous water-soluble material. Okra mucilage is a polysaccharide-rich hydrocolloid, commonly described as containing galactose, rhamnose, and galacturonic acid residues, with composition that varies according to source and processing [1,2]. Water-binding and rheological behavior can make the material relevant to thickening or gel formation. These technological functions should be distinguished from a therapeutic or cosmetic benefit on human skin.

The terms “okra extract” and “okra mucilage” are not interchangeable. A crude fruit extract can contain a mixture of water-soluble constituents, whereas an isolated mucilage or polysaccharide fraction is enriched using additional separation steps. Plant part, maturity, cultivar, drying, solvent, temperature, pH, and isolation procedure can change the material obtained [1,2]. Clear material identity is therefore essential when interpreting percentages, comparing formulations, or reproducing a preparation.

Reviews describe okra mucilage in food, pharmaceutical, and wound-care contexts [1–3]. Original work has examined wound-healing models [4], and a 2025 paper reports a facial-wash gel containing 3% okra fruit extract with different hydroxypropyl methylcellulose (HPMC) levels [5]. This provides a directly relevant formulation example, but it does not resolve questions about finished-product clinical efficacy or broad safety. This review therefore separates cleanser-specific formulation evidence from adjacent topical, preclinical, and material-science findings.

The project topic is formulation and evaluation of herbal okra face wash. Its scope is therefore narrower than general applications of okra: the key questions concern what okra preparation is incorporated, how it behaves with a cleanser base, how product quality and microbial protection are assessed, and what evidence would be needed to support a skin-related claim. Antioxidant, antimicrobial, or wound-related findings are not treated as proof of benefit from a rinse-off cleanser. This review first considers okra materials and extraction, then formulation design and published evidence, and finally evaluation parameters and research needs.

II. REVIEW APPROACH AND EVIDENCE CLASSIFICATION

A focused narrative search was conducted on 6–9 October 2026 using PubMed records, journal websites, scholarly search pages, and available full-text repositories. Search terms combined “okra” or “Abelmoschus esculentus” with “mucilage,” “polysaccharide,” “extraction,” “topical,” “facial wash,” “facial cleanser,” “gel,” “cream,” and “wound healing.” Priority was given to reviews of okra mucilage, studies of extraction or material characterization, and original research on topical preparations or facial-wash formulations. Bibliographic descriptions were checked against publisher, PubMed, or institutional pages where available.

This was not a systematic review. There was no registered protocol, duplicate screening, exhaustive database search, or complete eligibility log. The search may have missed relevant research; no PRISMA counts or claim of exhaustive coverage is presented. Before journal submission, the authors should conduct and document a reproducible search with the databases, dates, full search strings, inclusion criteria, and screening records.

Evidence was interpreted by the question actually measured: (i) extraction and material characterization, (ii) finished-product physical quality, (iii) in-vitro biological activity, (iv) animal or other preclinical observations, or (v) human outcomes. Findings from these categories were not pooled because they use different materials, exposure conditions, and endpoints.

III. OKRA MATERIAL IDENTITY AND MUCILAGE PROPERTIES

3.1 Plant part and preparation identity

Most studies considered in this review concern mucilage or polysaccharides from okra fruit or pods. However, a freshly prepared aqueous fruit extract, a dried crude extract, and a purified or precipitated polysaccharide fraction are distinct test materials. The extraction process may also retain or remove proteins, minerals, phenolic compounds, and other soluble components [1,2]. Reports should state the botanical name, plant part, source or cultivar where known, maturity, cleaning and storage conditions, and whether botanical authentication was performed.

3.2 Composition and functional properties

Okra mucilage is commonly discussed as an acidic, pectin-rich heteropolysaccharide. Reported monosaccharides include galactose, rhamnose, arabinose, glucose, galacturonic acid, and glucuronic acid, but proportions differ among isolates [1,2,11]. Molecular weight, degree of esterification or acetylation, protein content, and chain conformation can also vary. These characteristics help explain why two materials both called “okra mucilage” may behave differently in water or a formulation.

Water binding and viscosity make okra polysaccharides candidates for thickening or stabilizing systems. Some studies report emulsifying, antioxidant, or antimicrobial properties in laboratory or food-material contexts [11–14]. Such properties provide hypotheses for product development. They do not demonstrate a consumer benefit, preserved cleanser, or antimicrobial effect on facial skin. Product claims must be supported by evidence from the intended finished product and use conditions.

IV. EXTRACTION AND CHARACTERIZATION

4.1 Conventional aqueous extraction

Water is commonly used to extract okra mucilage. Procedures differ in fresh versus dried material, particle size, solid-to-liquid ratio, temperature, extraction duration, pH, and the later operations used for filtration, concentration, precipitation, dialysis, or drying [1,2,7].

A simple aqueous extract may be useful for initial formulation screening, but it should not be assumed to have the same composition or consistency as isolated mucilage. For reproducibility, each study should report the sequence and conditions of each processing step, rather than describing the preparation only as "okra extract."

4.2 Assisted extraction and structure–property effects

Research comparing extraction techniques shows that process conditions can alter recovery, molecular-weight distribution, monosaccharide composition, rheology, and functional properties. Enzyme-assisted and combined enzyme–ultrasonic extraction changed physicochemical attributes of okra polysaccharides in a study directed toward material and food applications [11]. Ultrasound frequency also affected yield and measured properties in another polysaccharide study [12]. Recent work on okra varieties and extraction techniques likewise reports variation among the resulting materials [13]. These studies support the principle that extraction is a structure–property decision, rather than simply a way to maximize yield.

Studies of okra polysaccharides as emulsion stabilizers further show that extraction route and pH can influence interfacial behavior [14]. This may inform hypotheses about ingredient compatibility, but the studies concern model emulsions rather than facial-wash performance. Extraction approaches involving acid, enzymes, ultrasound, or other energy-intensive steps should not be adopted solely because they yield a material with desirable food-system properties; suitability, residuals, cost, safety, and compatibility with the intended cosmetic process also require assessment.



Figure 1. Conceptual extraction-to-product evidence pathway

Alt-text description: Five connected stages: plant source, extraction, material profile, formulation, and product evidence.

4.3 Minimum characterization for formulation research

A practical characterization set can include extraction yield, appearance, pH, moisture or solids content, and viscosity under stated conditions. More detailed work may report total carbohydrate, protein, ash, monosaccharide composition, molecular-weight distribution, and degree of esterification or acetylation when these measures address the study question. The authors should define batch acceptance criteria and explain how the ingredient will be stored. A concentration such as "3% okra" is difficult to reproduce unless the form and solids content of the ingredient are stated.

V. FORMULATION RELEVANCE TO A RINSE-OFF CLEANSER

A facial wash is a rinse-off product with brief contact time followed by dilution and removal. Its performance depends on cleansing, foam behavior where relevant, ease of rinsing, after-feel, and

acceptable storage stability. A polymeric plant ingredient may influence viscosity, flow, dispensing, spread, or the sensory feel of the gel. The direction and magnitude of these effects depend on polymer concentration, surfactant system, pH, salts, co-solvents, preservatives, and manufacturing sequence.

Ingredients in a proposed formulation should be described by their intended formulation role, while recognizing that a role is not proof of efficacy or compatibility. Table 1 summarizes the excipients recorded in the project draft. The proposed concentrations and corresponding 100 mL amounts are listed separately in Table 2 so that their tentative status is clear. Natural origin alone does not establish mildness, non-irritancy, or adequate preservation.

A matched vehicle control is particularly useful when the study aims to determine what the okra ingredient contributes. Without a formula that is identical except for the okra material, changes in viscosity, foam, or user perception cannot confidently be attributed to okra rather than to the surfactant, gelling agent, or other excipients. If the research question is optimization of the overall gel rather than the specific contribution of okra, the design and conclusions should state that distinction.

Table 1. Typical roles of ingredients considered in a proposed okra facial-wash base

Ingredient	Typical formulation role	Key development question
Okra fruit extract or mucilage	Botanical/hydrocolloid ingredient; possible contribution to viscosity or sensory properties	Is the material crude extract or isolated mucilage? What is its solids content, batch consistency, and compatibility?
HPMC	Gel-forming and viscosity-modifying polymer	How does concentration affect viscosity, dispensing, foam, rinsing, and stability in the chosen base?
Glycerin	Humectant / solvent in topical formulations	Does the level support acceptable texture without impairing cleanser performance?
Propylene glycol	Co-solvent and humectant	Is it compatible with the extract, polymer, preservative, and intended use?
Sodium lauryl sulfate (SLS)	Anionic surfactant / cleansing and foaming agent	Is the selected surfactant system appropriate for the intended rinse-off product and tolerability assessment?
Methylparaben	Preservative	Does the complete formula pass a suitable preservative-efficacy assessment? Ingredient presence alone is insufficient.
Disodium EDTA	Chelating agent; may support formulation robustness	Does it remain compatible with the selected ingredients and preservation system?
Triethanolamine (TEA)	pH adjustment / neutralization, depending on formula	Is the final pH measured, justified, and controlled throughout stability testing?
Purified water	Vehicle / solvent	Is water quality controlled and the finished water-rich product microbiologically protected?

Table 2. Project-proposed formulation composition for a nominal 100 mL batch

Ingredient	Proposed concentration	Corresponding quantity for 100 mL	Function
Okra aqueous extract	3% w/v	3.0 g per 100 mL	Herbal ingredient / mucilage source
Hydroxypropyl methylcellulose (HPMC)	1%, 1.5%, and 2% w/v trial levels	1.0 g, 1.5 g, or 2.0 g per 100 mL	Gelling and thickening agent; select a trial level after evaluation
Sodium lauryl sulfate (SLS)	1% w/v	1.0 g per 100 mL	Surfactant / cleansing and foaming agent
Glycerin	3% w/v	3.0 g per 100 mL	Humectant
Propylene glycol	15% w/v	15.0 g per 100 mL	Solvent / humectant

Methylparaben	0.2% w/v	0.20 g per 100 mL	Preservative; finished-product efficacy must be tested
Disodium EDTA	0.1% w/v	0.10 g per 100 mL	Chelating agent
Triethanolamine (TEA)	1% w/v listed, or q.s. for pH adjustment	1.0 g if using the fixed 1% w/v otherwise add q.s. to target pH	pH adjustment / neutralization; target pH is not yet specified
Purified water	q.s. to final volume	Add sufficient quantity to make the final batch volume 100 mL	Vehicle / solvent

Step 1. Prepare the work area and batch record
Clean and dry the work area and suitable equipment. Assemble purified water, the prepared okra aqueous extract, HPMC, SLS, glycerin, propylene glycol, methylparaben, disodium EDTA, and TEA. Record the supplier, grade, lot number, expiry or retest date, and intended quantity of each material. Use a calibrated balance for ingredients weighed by mass and a suitable volumetric vessel for final volume. Reserve a portion of the purified water for the separate phases and final volume adjustment.

Step 2. Prepare and cool the okra extract
Inspect and wash fresh okra, slice it, and prepare the aqueous extract using the project's planned hot-water procedure: soak in distilled or purified water, heat in a water bath at approximately 60°C for about 1 hour with intermittent or continuous stirring, cool, and filter through clean muslin. Record the mass of fresh okra, water quantity, extraction time and temperature, and recovered filtrate. Allow the extract to cool before adding it to the gel base. The formulation table lists 3% w/v; before weighing this amount, define whether the ingredient is a liquid filtrate, concentrated extract, or dried extract equivalent, because these bases are not interchangeable.

Step 3. Disperse and hydrate the HPMC
For each 100 mL trial, weigh the selected HPMC amount: 1.0 g, 1.5 g, or 2.0 g for the proposed 1%, 1.5%, or 2% w/v batches. Disperse the powder gradually into a reserved portion of purified water with steady mixing to reduce clumping. HPMC grades differ in surface treatment and hydration behavior; follow the supplier's preparation instructions for the exact grade. Some grades disperse in cold water, whereas other grades require a hot-dispersion-and-cooling method. Continue mixing and allow sufficient time for hydration until the base is uniform. Do not proceed with visible dry lumps or use a heating method without confirming that it is suitable for the selected grade.

Step 4. Prepare the aqueous and preservative portions
Dissolve the proposed 0.10 g disodium EDTA in a separate reserved portion of purified water, mixing until no visible particles remain. In another clean vessel, combine the proposed 15.0 g propylene glycol with 0.20 g methylparaben and mix to prepare the preservative portion. Confirm that the methylparaben fully dissolves at the intended temperature and concentration before adding it to the batch. If it does not dissolve completely, do not assume that undissolved material will be effective; consult the supervisor about solubility and a suitable formulation adjustment. Add the proposed 3.0 g glycerin to the planned phase according to the approved batch sheet.

Step 5. Prepare the surfactant portion
Dissolve the proposed 1.0 g SLS in a separate portion of purified water using gentle stirring. Avoid vigorous agitation, which can create excess foam and make volume adjustment difficult. Once dissolved, add this portion gradually to the hydrated HPMC base while mixing gently. Maintain a uniform mixture and avoid introducing unnecessary air.

Step 6. Combine the phases and incorporate okra extract
Add the EDTA solution and the propylene glycol–methylparaben portion to the hydrated base in small portions while stirring. Add the glycerin as specified in the approved batch sequence. When the mixture is uniform and has cooled to a suitable temperature, slowly add the measured, cooled okra extract with gentle mixing. Continue until the preparation appears evenly distributed. Record the order of addition, mixing equipment, approximate mixing conditions, and any visible change such as thinning, clumping, or precipitation.

Step 7. Adjust pH and make up the final volume
Measure the pH using a calibrated pH meter and a consistent sample-preparation method. The project draft lists TEA as 1% w/v or quantity sufficient, but does not state a target pH.
Therefore, first obtain a target range approved by the supervisor. If TEA is used for pH adjustment, add it gradually while mixing and recheck the pH after each addition; do not automatically add the full 1.0 g when the instruction is q.s. to pH. After adjustment, add purified water to a final volume of 100 mL and mix gently until uniform.

Step 8. Deaerate, fill, and document
Allow the batch to stand, or use another approved gentle deaeration method, until entrapped air and foam have decreased. Transfer the preparation into clean, suitable, labelled containers. Identify the batch and HPMC level, date, ingredient lots, actual quantities, final volume, pH, appearance, and any deviations from the planned process. Retain representative samples for the proposed physical, stability, and microbiological evaluations. The presence of methylparaben does not itself demonstrate that the product is adequately preserved.

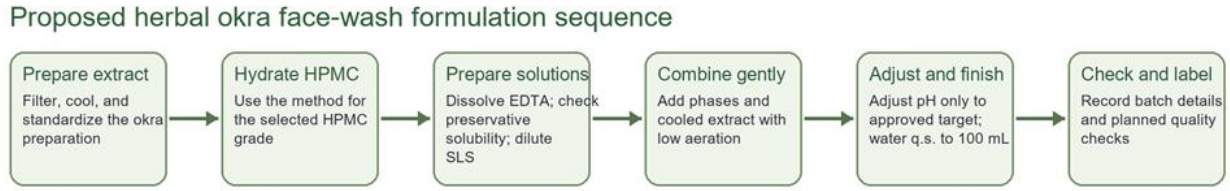


Figure 2. Proposed herbal okra face-wash formulation sequence

VI. EVIDENCE FROM TOPICAL FORMULATIONS AND RELATED STUDIES

6.1 Facial-wash gel

Yulyana and colleagues reported a facial-wash gel containing 3% okra fruit extract and compared HPMC concentrations of 1%, 1.5%, and 2% [5]. The paper describes physical evaluations over a 28-day observation period, including properties such as homogeneity, syneresis, pH, viscosity, spreadability, and foam stability. The 2% HPMC formula was reported as the most stable among the tested formulations.
This is useful direct evidence that an okra-containing facial-wash gel has been formulated and physically evaluated. It does not establish long-term shelf life, clinical skin benefit, broad tolerability, or superiority to a comparator cleanser. The reported formulation optimum is specific to the tested materials and conditions.

The study is also not, by itself, evidence that okra caused any observed formulation property if the design did not include a matched formula without okra. Physical observations over 28 days should not be interpreted as a commercial shelf-life claim. The result is best used to inform formulation design and test selection, not as a universal recipe.

6.2 Wound-care and other topical evidence

A topical mucilage review discusses plant-derived materials, including okra, in wound-related formulations [3]. Sipahi and colleagues examined okra fruit extracts in in-vitro and in-vivo wound-healing models and developed a wound gel [4].

Such work may provide biological rationale for further investigation, but a wound gel differs from a daily facial wash in purpose, formulation, dose, contact time, user population, and endpoints.
Results from wound models cannot establish anti-acne, anti-aging, moisturizing, or healing benefit for a rinse-off product.

6.3 Extraction and material-science evidence

Extraction studies and model-emulsion studies deepen understanding of material variability [11–14]. They show that extraction can change the properties relevant to viscosity or interfacial behavior.
Their value for this topic is mechanistic and technological: they help identify what should be characterized and controlled. Since several were conducted for food or general materials applications, they are not direct evidence of skin compatibility or facial-cleanser efficacy. Table 3 places these reports alongside the directly relevant cleanser and adjacent topical studies.

Table 3. Selected evidence relevant to okra materials and topical formulation

Study	Material / evidence type	What it contributes	Limit for facial-wash interpretation
Fatima et al. [1]	Review of extraction, composition and applications	Context for mucilage preparation and material variability	Broad review; not a clinical cleanser study.
Dantas et al. [2]	Review of okra mucilage and technological uses	Composition and hydrocolloid functions	Much evidence concerns food or non-skin uses.
Oliveira Filho et al. [3]	Review of plant mucilages in topical wound materials	Topical material functions and wound-care context	Wound dressings and creams differ from rinse-off cosmetics.
Sipahi et al. [4]	Preclinical extracts and wound-gel research	Supports further investigation of topical preparations	Preclinical wound outcomes do not establish cleanser efficacy.
Yulyana et al. [5]	Facial-wash gel with 3% okra extract; HPMC variation	Direct formulation example; physical evaluation	Single formula study; does not establish clinical benefit or broad safety.
Archana et al. [6]	Mucilage preparation and characterization	Example of physicochemical material characterization	Biomedical material work, not facial-cleanser testing.
Alba et al. [7]	Review of okra mucilage formation and extraction	Explains extraction-related variability	Hydrocolloid-focused review; no clinical cleanser assessment.
Manda et al. [8]	Experimental report on immature pod proteolytic activity and extract fraction	Safety context for preparation-specific assessment	Older mechanistic/animal evidence; not finished cleanser testing.
Olawuyi et al. [11]	Enzyme and enzyme-ultrasound extraction of polysaccharides	Shows extraction method can change physicochemical properties	Material/food application; no facial-use endpoint.
Chen et al. [12]	Ultrasound extraction at different frequencies	Shows process conditions affect measured material properties	Does not test cosmetic compatibility or skin benefit.
Fatima et al. [13]	Variety and extraction-method comparison	Highlights source and process as reproducibility variables	Not a finished topical formulation study.
Lv et al. [14]	Model emulsions stabilized by okra polysaccharides	Links material properties and interfacial/emulsion behavior	Model emulsions are not facial-wash efficacy or safety evidence.

6.4 Safety interpretation

An older experimental report described proteolytic activity on immature okra pod surfaces and allergenic potential in a fraction of pod extract in an animal test [8]. This does not establish that a processed cleanser or purified mucilage is unsafe. It does reinforce the need to assess the exact plant material, processing, concentration, and finished formula rather than assuming safety from food use or natural origin. Safety assessment should be proportionate to intended use and applicable regulations. Human-use testing requires the appropriate ethical review, informed consent, and a prespecified protocol.

VII. PRODUCT EVALUATION AND INTERPRETATION

Evaluation should separate physical quality, stability, microbial protection, safety, and any product-benefit claim. Appearance, odor, homogeneity, pH, viscosity or flow, spread, foam, and rinseability can describe formulation performance. These measures cannot

independently establish a skin-health benefit. Stability observations should use justified conditions, suitable packaging, and a duration appropriate to the question; accelerated testing may assist screening but does not automatically establish real-time shelf life.

Because a water-rich botanical product can support microbial growth, microbial quality and preservative efficacy must be assessed with an appropriate method. The presence of methylparaben or another preservative in a formula does not prove effective preservation. ISO 11930 provides an approach for evaluating antimicrobial protection of cosmetic products [9].

If a benefit such as moisturization or reduced acne is claimed, the finished product should be evaluated with a prespecified, appropriate design and comparator. The proposed domains and the limits of interpretation are summarized in Table 4.

Table 4. Evaluation domains and limits of interpretation for future studies

Domain	Example observations / tests	What they can support	What they cannot establish alone
Raw material	Botanical identity; plant part and maturity; extraction ratio, pH, time, temperature; yield and solids	Identity and reproducibility of the test ingredient	Finished-product efficacy or safety
Physical quality	Appearance, odor, homogeneity, pH, viscosity/flow, spread, foam, rinseability	Whether the tested formula meets prespecified physical targets	Moisturization, anti-acne, healing, or other clinical benefit
Stability	Defined storage conditions and package; appearance, pH, viscosity and phase separation over time	Stability during the observed conditions and duration	Commercial shelf life without suitable supporting data
Microbiological quality	Microbial quality and suitable preservative-effectiveness method	Performance against the selected microbiological criteria	Safety from all hazards or effectiveness in all use situations
Safety / tolerability	Ingredient review; appropriate finished-product methods; ethics-approved human evaluation if justified	Evidence for the tested product, method, population, and exposure	Universal safety for all users or all okra preparations
Claim-specific benefit	Prespecified endpoint with appropriate comparator and adequate design	Only the specific outcome directly measured	Benefits not measured, or effects inferred from foam, pH, or antioxidant assays

VIII. RESEARCH GAPS AND PROPOSED DIRECTION

The most important gap is the limited cleanser-specific evidence. One facial-wash formulation study provides an initial physical-formulation example, while much of the surrounding literature concerns mucilage characterization, food hydrocolloids, model emulsions, wound gels, or preclinical observations. More direct comparisons are needed before conclusions can be drawn about performance or user benefit in routine facial cleansing.

Future work should define the raw material and distinguish crude aqueous fruit extract from isolated mucilage. A reproducible ingredient specification, multiple independently prepared batches, a matched vehicle control, and predeclared test methods would improve interpretability.

The order of testing should proceed from material identity and formulation quality to stability and microbiological quality, then to safety and only then to appropriately justified human use.

Figure 1 summarizes the conceptual relationship between material preparation and claims; Figure 2 shows a proposed future workflow. These figures describe research directions only: the project's experimental work has not yet started.



Figure 3. Proposed future research workflow

Research priorities and the question each would answer are summarized in Table 5. Human studies should be considered only after adequate product characterization and safety rationale, with institutional ethics approval and a protocol suitable for the claims being evaluated. These are recommendations, not completed project activities.

Table 5. Research gaps and practical next steps

Evidence gap	Recommended next step	Reason
Unclear identity of tested ingredient	Define fruit extract versus isolated mucilage; authenticate and report source, maturity, and preparation	Different materials may not be compositionally or functionally equivalent.
Extraction variability	Record extraction conditions, solids/yield, storage and batch criteria; prepare replicate batches	Enables reproducibility and interpretation across studies.
Uncertain contribution of okra	Use a matched vehicle control without okra when testing ingredient contribution	Separates okra effects from the base formulation.
Short-term physical assessment only	Predefine storage conditions, time points, packaging, and critical quality attributes	Supports interpretation of stability without overclaiming shelf life.
Preservation not established by ingredient list	Assess microbial quality and preservative efficacy using a suitable method	Water-rich botanical products need product-specific microbial evaluation.
Limited cleanser-specific user evidence	After suitable characterization and safety assessment, conduct ethically approved studies with relevant outcomes	Rinse-off benefits need evidence in the intended product and use context.

IX. LIMITATIONS

This review used a targeted narrative search and may not include all relevant publications. It did not follow a registered systematic-review protocol or provide formal risk-of-bias scoring. Some extraction and emulsion studies were included for material-science context although their applications were not facial skin care. The available evidence is heterogeneous and was not quantitatively synthesized. A journal submission should be preceded by a documented database search, verification of full-text study details and bibliographic records, and confirmation that each in-text citation supports the associated claim.

X. CONCLUSION

Okra mucilage is a variable plant-derived hydrocolloid with properties that may be useful in topical formulation. Published studies show that extraction conditions can alter material characteristics, and one study has evaluated the physical properties of a facial-wash gel containing okra fruit extract. Related wound-care and food-material studies provide context but are not equivalent to evidence for a rinse-off facial cleanser.

Current findings support further formulation research, not definitive claims of skin benefit or comprehensive safety. Reproducible material characterization, suitable controls, stability and preservative testing, and appropriately designed product-specific safety and human studies are needed before stronger conclusions can be drawn.

DECLARATIONS

Funding: No external funding was received. Project expenses are being met by the authors.
Conflicts of interest: The authors declare no conflicts of interest.

Ethics approval: Not applicable to this literature review. Any future human or animal research must receive required approval before initiation.

Generative AI disclosure:
Generative AI tools were used to assist with drafting, language editing, and preparation of conceptual figures. The authors reviewed the manuscript and are responsible for its accuracy and final content

Author Contributions:
Nimonkar Vinod Babasaheb: Conceptualization, methodology, literature search, evidence synthesis, visualization, writing—original draft, and project administration. Rahinj Sangram Sanjay: Literature search and data curation. Bagav Aniket Dattatraya: Literature search and reference validation. Gadakh Namrata: Supervision and review and editing. All authors reviewed and approved the final manuscript.

REFERENCES

[1] M. Fatima, A. Rakha, A. B. Altemimi, F. Van Bockstaele, A. I. Khan, M. Ayyub, and R. M. Aadil, "Okra: Mucilage extraction, composition, applications, and potential health benefits," *Eur. Polym. J.*, vol. 215, Art. no. 113193, 2024, doi: 10.1016/j.eurpolymj.2024.113193.

[2] T. L. Dantas, F. C. A. Buriti, and E. R. Florentino, "Okra (*Abelmoschus esculentus* L.) as a potential functional food source of mucilage and bioactive compounds with technological applications and health benefits," *Plants*, vol. 10, no. 8, Art. no. 1683, 2021, doi: 10.3390/plants10081683.

[3] J. G. Oliveira Filho, M. M. Lira, T. L. de Sousa, S. B. Campos, A. C. Lemes, and M. B. Egea, "Plant-based mucilage with healing and anti-inflammatory actions for topical application: A review," *Food Hydrocolloids Health*, vol. 1, Art. no. 100012, 2021, doi: 10.1016/j.fhfh.2021.100012.

[4] H. Sipahi, D. Orak, R. Reis, K. Yalman, O. Senol, S. S. Palabiyik-Yucelik, *et al*., "A comprehensive study to evaluate the wound healing potential of okra (*Abelmoschus esculentus*) fruit," *J. Ethnopharmacol.*, vol. 287, Art. no. 114843, 2022, doi: 10.1016/j.jep.2021.114843.

[5] A. Yulyana, A. M. Putri, and E. Mugiyanto, "Development and optimization of facial wash gel with okra fruit (*Abelmoschus esculentus*) extract: A study on HPMC concentration variations," *J. Nat. Prod. Degener. Dis.*, vol. 2, no. 2, pp. 71–84, 2025, doi: 10.58511/jnpdd. v2i2.8392.

[6] G. Archana, K. Sabina, S. Babuskin, K. Radhakrishnan, M. A. Fayidh, P. A. Azhagu Saravana Babu, *et al*., "Preparation and characterization of mucilage polysaccharide for biomedical applications," *Carbohydr. Polym.*, vol. 98, no. 1, pp. 89–94, 2013, doi: 10.1016/j.carbpol.2013.04.062.

[7] K. Alba, A. P. Laws, and V. Kontogiorgos, "Mucilage formation in food: A review on the example of okra," *Int. J. Food Sci. Technol.*, vol. 52, no. 1, pp. 59–67, 2017, doi: 10.1111/ijfs.13270.

[8] F. Manda, K. Tadera, and K. Aoyama, "Skin lesions due to okra (*Hibiscus esculentus* L.): Proteolytic activity and allergenicity of okra," *Contact Dermatitis*, vol. 26, no. 2, pp. 95–100, 1992, doi: 10.1111/j.1600-0536. 1992.tb00891. x.

[9] International Organization for Standardization, *ISO 11930:2019—Cosmetics—Microbiology—Evaluation of the Antimicrobial Protection of a Cosmetic Product*. Geneva, Switzerland: ISO, 2019. Includes Amendment 1:2022.

[10] Scientific Committee on Consumer Safety, *The SCCS Notes of Guidance for the Testing of Cosmetic Ingredients and Their Safety Evaluation*, 12th rev. European Commission, 2023.

[11] I. F. Olawuyi, S. R. Kim, D. Hahn, and W. Y. Lee, "Influences of combined enzyme-ultrasonic extraction on the physicochemical characteristics and properties of okra polysaccharides," *Food Hydrocolloids*, vol. 100, Art. no. 105396, 2020, doi: 10.1016/j.foodhyd.2019.105396.

[12] Z. L. Chen, C. Wang, H. Ma, Y. Ma, and J. K. Yan, "Physicochemical and functional characteristics of polysaccharides from okra extracted by using ultrasound at different frequencies," *Food Chem.*, vol. 361, Art. no. 130138, 2021, doi: 10.1016/j.foodchem.2021.130138.

[13] M. Fatima, A. Rakha, M. Saeed, M. Shahid, and F. Van Bockstaele, "Okra varieties: Effect of different extraction techniques on the physicochemical, functional, and morphological attributes of okra polysaccharides," *J. Food Meas.*

Charact., vol. 19, pp. 549–564, 2025, doi: 10.1007/s11694-024-02988-8.

[14] Y. Lv *et al*., "Emulsions stabilized by okra polysaccharides: Physicochemical, interfacial, and emulsification properties," *Food Hydrocolloids*, vol. 156, Art. no. 110338, 2024, doi: 10.1016/j.foodhyd.2024.110338.