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Aloe barbadensis Miller Leaf Extract in Facial Skincare [Bio Wash]: An Ingredient-Based Narrative Review of Hydration, Cleansing-Vehicle Compatibility, Even Tone, Blemish Control, Surface Smoothness and Radiance

Dr. Leroy Rebello[1], Dr. Sreesudha Chepyala[2], Sahithi Polineni[3]*

[1,2,3] *Department of Research and Development, Biotex Life Solutions Pvt. Ltd., Hyderabad, Telangana, India*

*Address for correspondence: **Sahithi Polineni**
Email: sahithi.biotexlife@gmail.com

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Abstract

Background: *Aloe vera* (*Aloe barbadensis* Miller) inner-leaf gel extract is widely used in cosmetic and dermatological preparations because of its high water content and polysaccharide composition. These characteristics make it relevant to facial-cleansing products intended to combine surface cleansing with hydration and skin conditioning.

Objective: This narrative review examines the relevance of *Aloe vera* inner-leaf gel extract to facial skincare, with emphasis on extraction, acemannan, processing, stability, hydration, skin comfort, cleanser compatibility, blemish-prone skin, even tone, surface smoothness, radiance and safety.

Methods: The literature concerning Aloe vera gel composition, acemannan, polysaccharide extraction, stabilisation, drying, fermentation, skin hydration, transepidermal water loss, skin pH, surfactants, cosmetic formulation, acne, pigmentation, and toxicology was reviewed. Evidence from leave-on preparations, fermented products, whole-leaf materials, beverages and multi-ingredient formulations was distinguished from evidence directly relevant to rinse-off facial cleansers.

Results: *Aloe vera* inner-leaf gel is a hydrophilic, polysaccharide-rich material. Acemannan contains mannose, glucose and galactose units, while processing may influence polysaccharide yield, molecular weight and acetylation. Studies of topical *Aloe vera* preparations have reported improvements in skin hydration and reductions in transepidermal water loss. Mild-cleansing research indicates that appropriate surfactant systems, pH and conditioning agents may support skin comfort and hydration under wash conditions. Evidence concerning acne, pigmentation and radiance provides a rationale for further investigation but does not establish treatment effects for *Aloe vera* cleansers.

Conclusion: Standardised *Aloe vera* inner-leaf gel extract is a relevant ingredient for facial-cleansing formulations. Bio Wash may combine cleansing with *Aloe vera*-supported hydration, conditioning, softness and post-cleansing comfort. Controlled testing of the finished formulation is required to confirm its specific performance, tolerability and cosmetic benefits.

Keywords: *Aloe barbadensis* Miller; *Aloe vera* inner-leaf gel; acemannan; facial cleanser; skin hydration; cosmetic formulation

Abbreviations

ATCC, American Type Culture Collection; CI, confidence interval; DNA, deoxyribonucleic acid; DOPA, 3,4-dihydroxyphenylalanine; EFSA, European Food Safety Authority; HPLC, high-performance liquid chromatography; INCI, International Nomenclature of Cosmetic Ingredients; kDa, kilodalton; MS, mass spectrometry; pH, negative logarithm of hydrogen ion activity; PMID, PubMed identifier; ppm, parts per million; TEER, transepithelial electrical resistance; UV, ultraviolet.

1. Introduction

Facial cleansing removes sebum, sweat, particulate matter, sunscreen residues, makeup and other substances that accumulate on the skin surface. This process is primarily achieved through surfactant action, which lowers surface tension and facilitates dirt removal [6]. However, cleansing should remove surface impurities without unnecessarily disrupting the stratum corneum.

Harsh surfactants can interact with skin proteins and lipids, causing after-wash tightness, dryness, irritation and barrier damage [5]. Modern cleanser research therefore focuses on surfactant selection, cleanser pH, barrier compatibility and the incorporation of conditioning agents [7]. Clinical evaluation of a polymeric-surfactant cleanser in 85 people with sensitive skin reported reductions in stinging, itching, burning, tightness and sensitivity, together with improvements in smoothness, softness, clarity, radiance and overall appearance [8]. Epidemiological data support this emphasis: in a cross-sectional study of 3,439 Chinese adolescents comprising 310 rosacea cases and 3,129 controls, use of facial cleansers twice daily or more was positively associated with rosacea (adjusted odds ratio 1.70, 95% CI 1.17-2.36), as was a bath duration of 11 minutes or longer (adjusted odds ratio 2.60, 95% CI 1.01-6.72), whereas bath frequency, water temperature and sun protection were not[45]. Cleansing practice is therefore a modifiable determinant of barrier-related facial disease, which is the clinical case for mild cleansing systems. A recent programme illustrates how a barrier-respecting cleanser can be substantiated: a 2% salicylic acid cleanser using polymeric cleansing technology was assessed on epidermal equivalents for transepithelial electrical resistance and interleukin-1-alpha release, then in a five-day exaggerated arm-wash study (n=33) and a 12-week facial study (n=35), showing decreased transepidermal water loss ($p<0.001$), dryness ($p<0.01$) and erythema ($p<0.001$) alongside acne reduction[44]. The same three-stage design applies to an *A. vera*-containing cleanser.

Cleanser pH is also important. Syndets are generally neutral or acidic, whereas traditional soap-based cleansers are commonly alkaline. High-pH solutions can increase stratum-corneum swelling and alter lipid rigidity, and soap-based cleansers have a higher irritation potential than syndets [9]. Mild synthetic surfactants and emollient-containing cleansers are therefore relevant to individuals with xerosis, dermatitis, eczema, psoriasis, acne, rosacea or a compromised skin barrier [10].

Aloe vera inner-leaf gel extract is relevant to this formulation approach because *Aloe vera* gel contains an acetylated mannose-rich polysaccharide associated with acemannan and a galacturonic-acid-rich polymer associated with parenchymatous tissue [1]. Acemannan is an acetylated glucomannan containing β-(1–4)-linked mannose, glucose and galactose units [2]. *Aloe vera* gel also contains enzymes, minerals, lignin, saponins, salicylic acids, amino acids, sugars and vitamins [11].

The hydrophilic composition of *Aloe vera* gel provides a rationale for its use in hydration-oriented skincare. Freeze-dried *A. vera* extract has been reported to improve skin hydration, possibly through a humectant mechanism [3]. A facial formulation containing 10% *A. vera* extract improved stratum-corneum hydration, firmness and elasticity and decreased transepidermal water loss in a small single-blind study of healthy adults [4].

Bio Wash, developed by Biotex Life Solutions using *Aloe vera* inner-leaf gel extract, provides a practical example of incorporating *A. vera* into a facial cleanser. In this review, Bio Wash is discussed as an *A. vera*-supported cleansing product: the cleansing system performs the primary removal of surface impurities, while *A. vera* inner-leaf gel extract contributes to the hydration and conditioning dimensions of the cleansing experience.

2. Review Scope and Evidence Appraisal

This review covers:

- inner-leaf gel identity;
- acemannan and related polysaccharides;
- extraction and purification;
- stabilisation, drying and fermentation;
- commercial *A. vera* variability;
- hydration and transepidermal water loss;
- skin pH and cleanser mildness;
- skin comfort and appearance;
- acne and microbiome considerations;
- aloesin and pigmentation; and
- hydroxyanthracene derivatives and safety.

A. vera products vary according to species, cultivation conditions, harvesting period, leaf fraction, processing and preservation. A review of *Aloe vera* gel describes mannose polymers with glucose and other sugars, together with glycoproteins, enzymes, amino acids, vitamins and minerals [12]. Another review describes more than 75 bioactive compounds in *A. vera* materials, including polysaccharides, phenolics and phytosterols [13].

Evidence was considered in four categories:

1. Composition and processing evidence, concerning *Aloe vera* gel, acemannan and extraction.
2. Human topical evidence, concerning hydration, transepidermal water loss, erythema or clinical outcomes.
3. Mechanistic and experimental evidence, concerning inflammation, pigmentation, antimicrobial activity and wound-related mechanisms.
4. Formulation and safety evidence, concerning mild cleansing, stability and hydroxyanthracene control.

Evidence from leave-on creams was not treated as direct evidence for a rinse-off cleanser. Evidence from fermented *A. vera*, whole-leaf materials, *A. vera* beverages and multi-ingredient products was used as supporting context rather than direct evidence of Bio Wash efficacy.

The evidence categories used in this review, together with their relevance to Bio Wash, are summarised in **Table 1**. The overall relationship between *A. vera* raw-material identity, processing, formulation, cosmetic outcomes and product-specific testing is illustrated in **Figure 1**.

Table 1: Review scope and evidence categories

Evidence category	Main focus	Examples of evidence	Relevance to Bio Wash
Composition and processing	*A. vera* inner-leaf gel, acemannan, extraction, stabilisation and drying	Polysaccharide composition, molecular weight, acetylation and extraction studies [1,2,11]	Supports raw-material identification and ingredient standardisation
Human topical evidence	Hydration, transepidermal water loss, skin comfort and appearance	*A. vera*-containing creams and moisturising preparations [3,4]	Provides supporting evidence for hydration-oriented and conditioning claims
Mechanistic and experimental evidence	Acemannan, antimicrobial activity, wound-related activity and pigmentation	Acemannan, fermented *A. vera* and aloesin investigations [14–17]	Provides ingredient-level rationale but does not establish finished-product efficacy

Facial-cleansing evidence	Surfactant mildness, cleanser pH, barrier compatibility and cleansing performance	Mild-cleansing and syndet research [5,6,9,10]	Supports design and evaluation of the complete Bio Wash formulation
Safety and quality evidence	Hydroxyanthracene derivatives, topical tolerability and quality control	Toxicology, aloin analysis and commercial-product testing [18–21]	Supports raw-material testing and finished-product safety assessment
Formulation evidence	*A. vera*-containing gels, creams and cleansing preparations	*A. vera*-containing cosmetic formulations [22]	Demonstrates formulation feasibility but is not direct evidence for Bio Wash

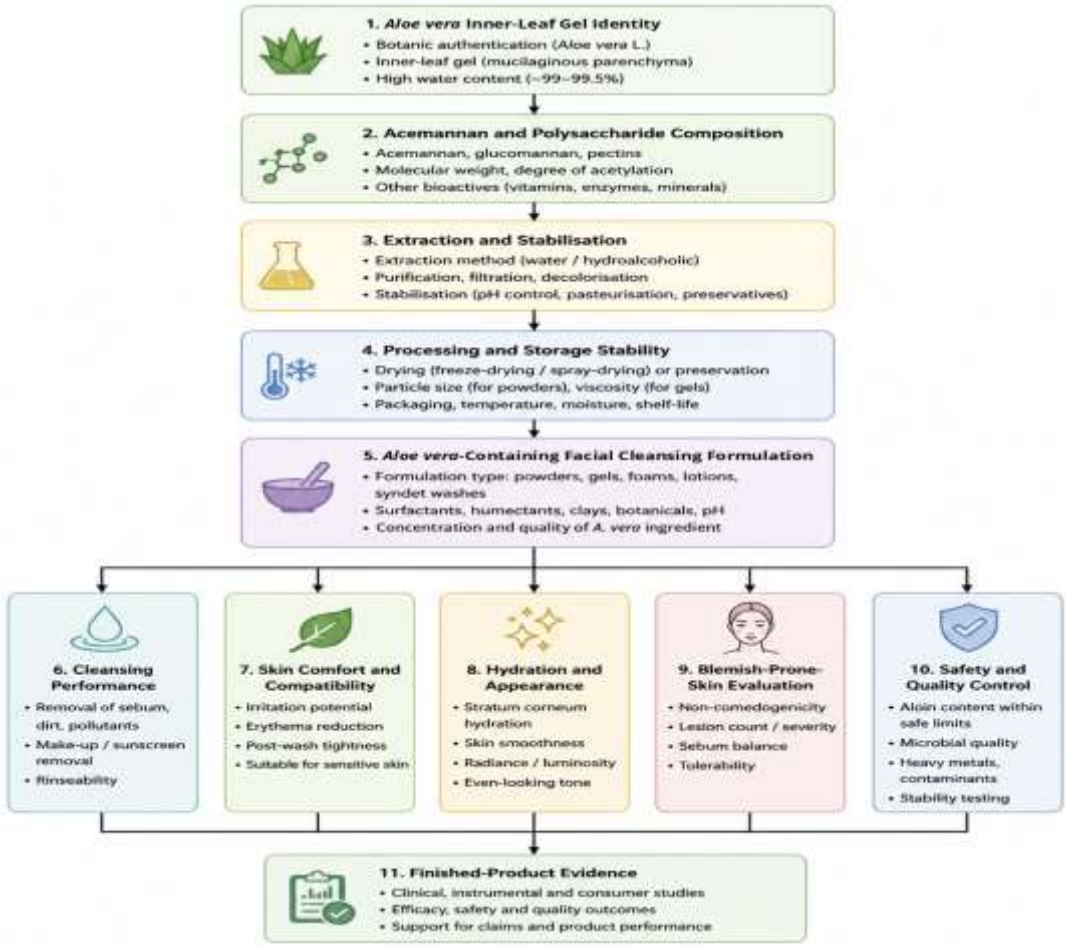

Fig 1: Conceptual framework for evaluating *Aloe barbadensis* Miller inner-leaf gel extract in facial skincare. The framework links *A. vera* identity and processing with formulation development, cosmetic outcomes, safety control and product-specific evaluation.

3. Inner-Leaf Gel Identity and Extraction

3.1 *Aloe vera* Leaf Materials

A. vera-derived materials are not chemically interchangeable. Inner-leaf gel, whole-leaf extract and latex-associated material may differ in polysaccharide and hydroxyanthracene content. Acemannan is found in internal *Aloe vera* gel and is associated with parenchyma cells containing polysaccharides in the cell-wall matrix [2].

Aloe vera gel has been described as containing approximately 96% water, with the remaining dry matter including dietary fibre, ash, protein, fat and ascorbic acid [23]. The dry fraction also includes polysaccharides, enzymes, minerals, lignin, saponins, salicylic acids, amino acids and vitamins [11]. These

values describe particular *A. vera* materials and should not be assumed to represent every commercial extract.

The distinction between inner gel and latex is important because latex-associated materials may contain aloin and aloe-emodin. The toxicology literature recommends monitoring anthraquinones in whole-leaf extract and latex because of reported cytotoxicity, mutagenicity and carcinogenicity concerns [20].

The distinction among inner-leaf gel, latex-associated material and whole-leaf preparations is shown schematically in **Figure 2**. The principal *A. vera* leaf fractions and their relevance to cosmetic formulation are summarised in **Table 2**.

Table 2: *Aloe vera* leaf materials and their relevance to cosmetic formulations

***A. vera* material or fraction**	**Relevant characteristics**	**Main quality consideration**	**Relevance to Bio Wash**
Inner-leaf gel	Contains an acetylated mannose-rich polysaccharide associated with acemannan and a galacturonic-acid-rich polymer associated with parenchymatous tissue [1]	Confirmation of inner-leaf identity and polysaccharide composition	Preferred material for the intended *A. vera*-supported cleansing concept
Acemannan-containing gel fraction	Contains β-linked mannose, glucose and α-linked galactose units [2]	Molecular weight and degree of acetylation may vary with processing [11]	Relevant to hydration-oriented and conditioning properties
Whole-leaf material	May contain gel, latex-associated constituents and other leaf components	Hydroxyanthracene derivatives require monitoring [20,24]	Should not be treated as equivalent to purified inner-leaf gel
Latex-associated material	*A. vera* latex contained more aloin than *Aloe vera* gel in the cited analytical study [19]	Aloin and related hydroxyanthracene control	Requires careful exclusion or purification when an inner-leaf ingredient is intended
Stabilised or filtered gel	May be filtered, pasteurised, treated with activated carbon or dried [25]	Processing may alter colour, viscosity, microbial quality and polysaccharide structure	Requires documentation of processing history
Fermented *A. vera* preparation	Fermentation can alter phytochemical composition and biological activity [26,27]	Fermented material is not chemically equivalent to conventional inner-leaf gel	Supporting evidence only unless Bio Wash uses the same preparation

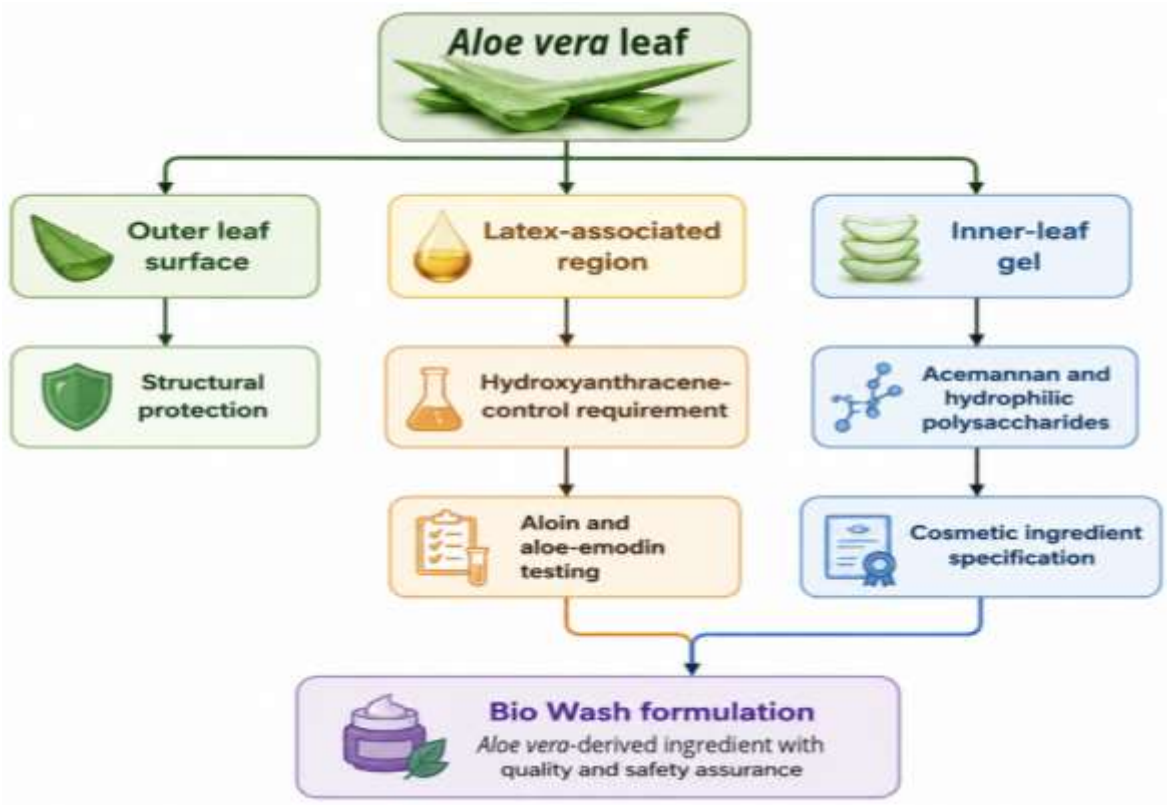

Fig 2: Schematic representation of *A. vera* leaf regions relevant to cosmetic ingredient selection. The figure distinguishes the inner-leaf gel from latex-associated and outer-leaf materials and highlights the need for raw-material identity and hydroxyanthracene control.

3.2 Acemannan

Acemannan is an acetylated mannose-rich polysaccharide associated with *Aloe vera* gel. It contains β-linked highly acetylated mannose, β-linked glucose and α-linked galactose [2]. The degree of acetylation, molecular weight and distribution of glucose and galactose may vary according to cultivation, harvesting, extraction and analytical method [11].

The polysaccharide composition provides a rationale for using *A. vera* in skin-conditioning preparations because it contributes a hydrophilic material with potential relevance to viscosity, film formation and surface feel. However, the structure–activity relationship of acemannan remains incompletely resolved [2]. Its presence therefore supports an ingredient-level formulation rationale but does not establish a universal clinical effect for every *A. vera*-containing cleanser.

The structural features of acemannan and their possible formulation relevance are presented in **Table 3**.

Table 3: Structural and formulation relevance of acemannan

Feature	Description	Formulation relevance
Principal identity	Acemannan is an acetylated glucomannan associated with *A. vera* inner-leaf gel [2]	Provides a defined *A. vera*-derived polysaccharide target for ingredient characterisation
Mannose component	Acemannan contains β-linked mannose units [2]	Contributes to the identity of the principal *A. vera* polysaccharide
Additional sugars	The structure includes glucose and galactose units [2]	Indicates that commercial *A. vera* materials may contain structurally heterogeneous polysaccharides

Acetylation	The degree and distribution of acetyl groups may vary [11]	Should be considered when comparing raw materials or processing methods
Molecular weight	Heating was reported to increase average molecular weight from 45 kDa to 81 kDa in one cited study [2]	Processing may influence viscosity and ingredient consistency
Drying sensitivity	Reported drying processes reduced acemannan yield by approximately 40%, with mannose deacetylation greater than 60% [2]	Drying conditions should be controlled and documented
Extraction sensitivity	Cold-water extraction at pH 5.3 and 25°C for 4 h produced polysaccharide recovery of 69.4 ± 0.1% in one study [28]	Extraction conditions may influence yield and composition
Biological interpretation	Relationships between acemannan structure and activity remain incompletely elucidated [2]	Ingredient-level evidence should not be presented as proof of a specific clinical effect

3.3 Gel Stabilisation and Recovery

Fresh *Aloe vera* gel is susceptible to degradation and microbial contamination. Reported stabilisation methods include hydrogen-peroxide oxidation, ultraviolet treatment, heat treatment, high-temperature treatment and quenching-pasteurisation [25]. After stabilisation, the gel may be filtered to remove pulp, treated with activated carbon to reduce colour and bitterness, and freeze-dried to produce a dry gel powder [25].

A. vera processing can also involve centrifugation, pasteurisation, concentration and dehydration. The selected process influences water content, viscosity, colour, microbial quality and polysaccharide composition.

The general pathway from *A. vera* raw material to its incorporation into Bio Wash is presented in **Figure 3**.

Fig 3: General processing pathway from *A. vera* raw material to incorporation into Bio Wash. The pathway includes material selection, inner-leaf recovery, stabilisation, clarification, processing, quality control, formulation and finished-product testing.

3.4 Extraction and Purification

Acemannan extraction may involve cleaning, homogenisation, separation and centrifugation. In one described method, the supernatant was mixed with absolute ethanol at a ratio of 1:3 for 12 h, followed by centrifugation, dialysis and freeze-drying [2].

A 2025 extraction study reported that cold-water extraction at pH 5.3 and 25°C for 4 h produced polysaccharide recovery of 69.4 ± 0.1%. Fractionation reduced molecular weight from 150 to 30 kDa and reduced protein content from 4.9 ± 0.1 to 0.00% [28]. The A3 fraction contained approximately 97.8 ± 1.5% sugar and was dominated by glucomannan, including mannose at 77.3 ± 6.5% and glucose at 18.7 ± 2.8% [28].

These findings demonstrate that "*Aloe vera* extract" is not a sufficiently precise description of a cosmetic ingredient. The specification should identify the leaf fraction, extraction method, polysaccharide content, molecular-weight distribution and safety markers.

4. Processing, Stability and Commercial Variability

Processing can modify acemannan. Heating has been reported to increase the average molecular weight of *A. vera* polysaccharides from 45 kDa to 81 kDa, possibly through deacetylation and loss of galactose-rich side chains [2]. Pasteurisation at 65, 75 and 85°C for 15 and 25 min was also reported to promote physical and chemical modification of acemannan [2].

Drying may substantially alter polysaccharide structure. Spray drying, industrial freeze-drying, refractive-window drying and radiation-zone drying reduced acemannan yield by approximately 40%, while methylation analysis confirmed mannose deacetylation greater than 60% [2].

Commercial products may vary despite similar label claims. An analysis of 15 commercial *A. vera* beverages found that flavoured beverages labelled as containing 30% to 77% *A. vera* had acemannan levels below 30 mg/100 g in the investigated samples. Among eight unflavoured beverages labelled as containing more than 99% *A. vera*, only three contained more than 160 mg/100 g, while four contained less than 35 mg/100 g. Degree of acetylation was below 35% in all but one sample [29].

Storage can also affect *A. vera* constituents. During storage of whole-leaf *Aloe vera* gel and dried powders, aloin contents decreased by more than 50% at 50°C and 70°C, while pH affected aloin stability [24]. A separate study of aloin in fresh and dry *Aloe vera* gel and latex found that *A. vera* latex contained more aloin than *Aloe vera* gel [19].

The principal processing-related factors affecting *A. vera* quality and their implications for Bio Wash are summarised in **Table 4**.

Table 4: Processing factors affecting *Aloe vera* quality

Processing factor	Reported effect	Quality-control implication
Stabilisation	*Aloe vera* gel may be stabilised using oxidation, ultraviolet treatment, heat treatment, high-temperature treatment or quenching-pasteurisation [25]	The stabilisation method should be recorded and validated
Filtration	Filtration may remove pulp and produce a clearer gel or juice [25]	Filtration may influence texture, appearance and polysaccharide recovery
Activated-carbon treatment	Activated carbon may reduce red colour and bitterness [25]	The effect on hydroxyanthracene derivatives and other constituents should be evaluated
Pasteurisation	Pasteurisation can modify acemannan and may promote physical and chemical changes [2]	Temperature and exposure time should be controlled

Drying	Drying processes reduced acemannan yield by approximately 40% in the cited review [2]	Drying method should be specified when comparing extracts
Heating	Average polysaccharide molecular weight increased from 45 kDa to 81 kDa in one cited study [2]	Heating may influence viscosity and functional properties
Storage temperature	Aloin content decreased by more than 50% at 50°C and 70°C in one stability study [24]	Stability should be assessed under defined storage conditions
pH	Aloin concentration showed a substantial reduction at pH 6.7 but remained unaffected at pH 3.5 in the cited study [24]	Product pH and storage pH should be monitored
Commercial variability	Commercial *A. vera* beverages showed variable acemannan content and degree of acetylation [29]	Supplier documentation should be supplemented with analytical verification

A suitable Bio Wash raw-material specification should therefore include:

- botanical identity;
- inner-leaf designation;
- extraction and stabilisation method;
- acemannan or total-polysaccharide content;
- molecular-weight distribution;
- degree of acetylation;
- aloin and aloe-emodin;
- microbial quality; and
- storage stability.

5. Relevance to Bio Wash

Bio Wash is a facial cleanser developed by Biotex Life Solutions using *Aloe vera* inner-leaf gel extract. Its development represents the application of a polysaccharide-containing *Aloe vera* gel ingredient in a facial-cleansing format.

The ingredient-based rationale for Bio Wash includes:

- *A. vera*'s hydrophilic composition;
- acemannan and related polysaccharides;
- reported hydration effects of *A. vera* topical preparations;
- compatibility with mild-cleansing technology; and
- potential support for post-cleansing comfort and skin feel.

A. vera is complementary to the cleansing system. Surfactants lower surface tension and assist in removing dirt [6]. *A. vera* does not replace the surfactant system as the primary soil-removal agent. Instead, it may function as a botanical conditioning component.

Mild-cleansing research indicates that humectants, occlusives and skin lipids may be delivered under wash conditions to improve hydration and reduce surfactant-related damage [5]. This provides the formulation basis for discussing Bio Wash as a cleanser that combines removal of surface impurities with *A. vera*-supported hydration and conditioning.

The proposed relationship between the *A. vera* ingredient and the cosmetic functions of Bio Wash is illustrated in **Figure 4**.

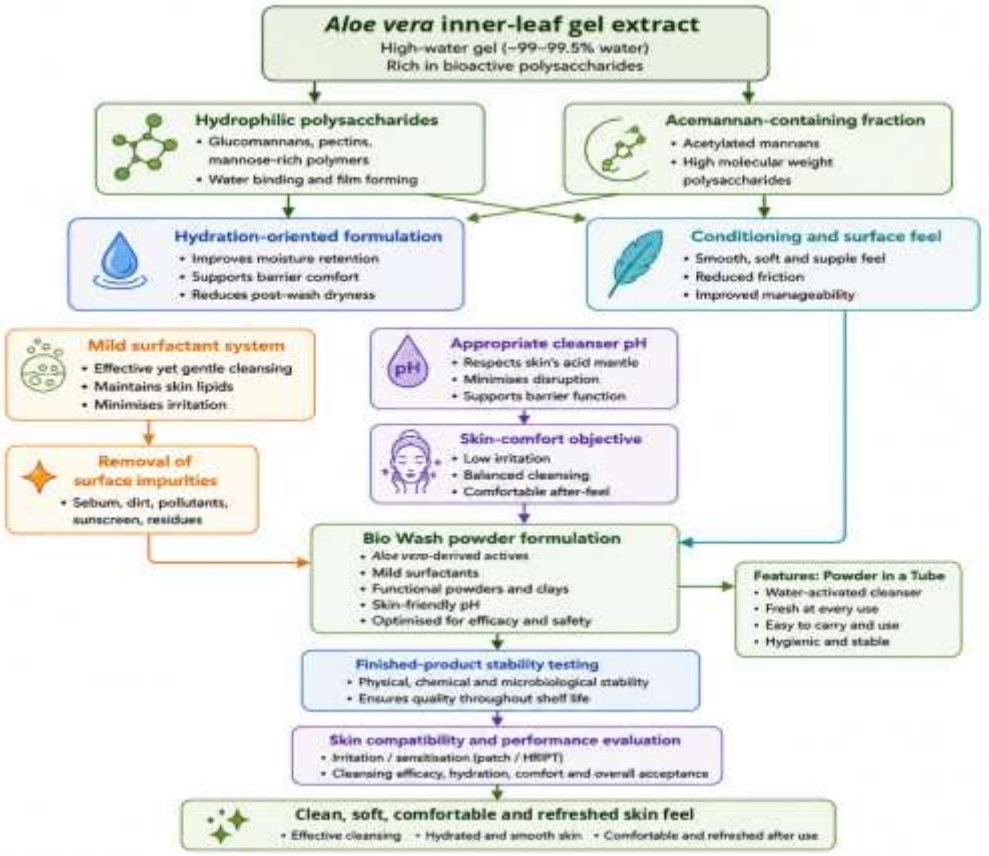

Fig 4: Proposed cosmetic relevance of *A. vera* inner-leaf gel extract in Bio Wash. *A. vera*-derived polysaccharides are presented as complementary conditioning components, while the surfactant system provides the primary cleansing function and cleanser pH contributes to the skin-compatibility objective.

A suitable description is:

Bio Wash is a facial cleanser developed by Biotex Life Solutions using *Aloe vera* inner-leaf gel extract. The *A. vera* extract contributes a hydrophilic, polysaccharide-rich conditioning component, while the cleansing system assists in removing surface impurities. Based on studies of *A. vera*-containing topical preparations and mild-cleansing technology, Bio Wash is intended to support a comfortable, hydrated and refreshed post-cleansing skin feel.

This wording identifies Bio Wash and connects it with *A. vera* evidence without attributing every result from *A. vera* studies directly to the finished product.

6. Hydration and Skin Comfort

6.1 Leave-On *Aloe vera* Preparations

Freeze-dried *A. vera* extract has been reported to improve skin hydration, possibly through a humectant mechanism [3]. A facial formulation containing 10% *A. vera* extract significantly improved stratum-corneum water content, firmness and elasticity and decreased transepidermal water loss in a small single-blind study of healthy adults [4].

In a randomised clinical trial, 35 patients with chronic kidney disease receiving haemodialysis applied a 30% *Aloe vera* cream to one arm and a 20% urea cream to the other, with skin moisture assessed weekly by corneometry over four weeks. Both treatments significantly increased corneometer readings and decreased overall dry skin scores relative to baseline ($p<0.05$), and no significant difference was found between them ($p>0.05$)[41]. Because urea 20% is an established reference humectant and keratolytic, this equivalence is the strongest available indication that an *A. vera* preparation can perform at a clinically recognised standard for skin hydration.

An intra-individual instrumental comparison in 30 skin-healthy participants evaluated an *A. vera* cream against dexpanthenol and a natural plant oil, each applied daily to a defined area for at least 28 days and assessed using Visioscan, Tewameter and Cutometer. On healthy skin the *A. vera* cream improved scaliness by 22% ($p<0.001$), softness by 14% ($p=0.046$), roughness parameters R1 by 16% ($p<0.001$) and R2 by 17% ($p=0.000$), volume by 22% ($p<0.001$) and surface area by 7% ($p<0.001$); most participants rated it best of the three products tested[42]. These outcomes concern surface texture and skin feel rather than barrier repair, and they are the outcomes most relevant to the post-cleansing sensory experience.

Evidence with more direct relevance to a rinse-off format comes from a combination of *Aloe barbadensis* leaf extract with trimethylglycine developed to target aquaporin-3, the epidermal channel that transports water and glycerol and whose reduced expression is associated with skin dryness. The combination increased aquaporin-3 in cultured keratinocytes by up to 380% relative to the negative control ($p<0.001$), and a shower gel containing it improved skin hydration in 60 healthy volunteers both after a single use and across 28 days of twice-daily use[43]. This is the only identified study in which an *A. vera*-containing wash-off product produced a measurable hydration response, and it indicates that meaningful deposition can occur despite short contact time. Two limitations should be stated: the effect is attributable to the combination rather than to *A. vera* alone, since trimethylglycine is itself an osmolyte and humectant, and the clinical arm had no placebo control. It therefore supports the formulation rationale for an *A. vera*-containing cleanser without establishing efficacy for any particular product.

A pilot study of *A. vera* moisturising gel investigated skin moisture and texture while comparing storage at 4°C and 25°C [30]. This supports the importance of formulation and storage conditions when evaluating *A. vera*-containing products.

6.2 Fermented *Aloe vera* and Instrumental Measurements

Aloe vera gel and kombucha-fermented *A. vera* preparations were evaluated using a TEWAmeter TM 300 and Corneometer CM825. The study involved 10 volunteers, with three 2 × 2 cm forearm areas marked on each participant; two were treated with 100 µL of *Aloe vera* gel and kombucha ferments, while one remained untreated. Measurements were taken after 1 and 3 h [27].

The highest hydration level was observed for F20 at 3 h, reaching an increase of 21.40 ± 0.93% compared with the control field [27].

The cited study does not establish that kombucha fermentation converted 200–300 kDa polysaccharides into 600–900 Da oligosaccharides. That conversion claim should therefore not be included in the manuscript.

The hydration-related studies considered in this review are compared in **Table 5**, with leave-on and fermented preparations distinguished from rinse-off cleansing applications.

Table 5: Evidence relating *Aloe vera* preparations to hydration and skin comfort

Preparation or formulation	Study context	Outcome assessed	Reported observation	Relevance to Bio Wash
Freeze-dried *A. vera* extract	Cosmetic formulation study	Skin hydration	Reported to improve hydration, possibly through a humectant mechanism [3]	Supports hydration-oriented ingredient rationale
Facial formulation containing 10% *A. vera* extract	Healthy adults, small single-blind study	Stratum-corneum water content, transepidermal water loss, firmness and elasticity	Improved water content, firmness and elasticity and decreased transepidermal water loss [4]	Supporting evidence from a leave-on facial formulation
Cream containing 30% *Aloe vera* vs 20% urea cream	35 patients with chronic kidney disease on haemodialysis	Corneometry and overall dry skin score, weekly over 4 weeks	Both significantly improved hydration vs baseline ($p<0.05$); no difference	Randomised trial evidence that *A. vera* performs comparably to a

			between creams ($p>0.05$)	reference humectant
A. vera cream vs dexpanthenol and plant oil	30 skin-healthy participants, daily use for at least 28 days	Visioscan, Tewameter and Cutometer surface parameters	Scaliness +22%, softness +14%, roughness R1 +16% and R2 +17%; rated best of three	Instrumental evidence for surface texture and skin feel
Kombucha-fermented *A. vera*	10 volunteers; *Aloe vera* gel and ferments applied to forearm areas	Transepidermal water loss and hydration	F20 produced the highest hydration response at 3 h, with an increase of 21.40 ± 0.93% compared with the control field [27]	Supporting evidence only; fermented *A. vera* is not equivalent to conventional inner-leaf gel
Mild-cleansing systems	Cleansing-technology research	Skin comfort, hydration and barrier-related effects	Humectants and other beneficial agents may be delivered under wash conditions [5]	Directly relevant to the design of a conditioning cleanser

6.3 Implications for Facial Cleansing

A cleanser containing *A. vera* may support post-cleansing comfort through the combined effects of:

- a mild surfactant system;
- appropriate cleanser pH;
- reduced interaction with skin proteins and lipids;
- hydrophilic *A. vera* polysaccharides; and
- conditioning agents delivered under wash conditions.

Mild cleanser research reports that harsh surfactants may cause tightness, dryness, barrier damage, irritation and itch, whereas cleanser technology can deliver humectants, occlusives and skin lipids under wash conditions [5].

A. vera inner-leaf gel extract may therefore complement facial cleansing by supporting hydration and conditioning. Hydration should not be equated with structural barrier repair, because a temporary change in water content or transepidermal water loss does not prove restoration of ceramides or long-term barrier architecture.

7. Soothing and Skin-Comfort Relevance

A. vera has been investigated for antioxidant, antimicrobial, anti-inflammatory and wound-related activity [31]. Reviews of acemannan describe immunoregulatory, antioxidant and wound-healing activities in experimental and clinical research [14]. Acemannan has also been investigated for cell proliferation, collagen-related expression and wound-healing activity in experimental models [15].

Clinical *A. vera* research includes wound-related applications. A systematic review identified 23 clinical trials involving *Aloe vera* gel, cream or derivatives for prevention or treatment of wounds, burns, postoperative wounds, cracked nipples, genital herpes, psoriasis and chronic wounds [32]. A meta-analysis comparing *Aloe vera* gel with 1% silver sulfadiazine evaluated 18 full-text randomised controlled trials and found a pooled mean healing difference of −2.73 days in four trials [33]. These studies provide context for *A. vera*'s broader topical use but are not direct evidence for facial-cleanser performance.

For facial cleansing, the relevant function is skin comfort. Cleansing involves contact among water, surfactants, mechanical application and the stratum corneum. Surfactant type and cleanser pH influence dryness, irritation and barrier effects [5,9].

Bio Wash can therefore be positioned as supporting:

- comfort during cleansing;
- reduced perception of tightness;
- a softer post-cleansing feel;
- hydration-oriented skincare; and
- a refreshed facial appearance.

The term "soothing" is appropriate as a cosmetic descriptor. Claims that Bio Wash is a clinically anti-inflammatory treatment would require direct finished-product research.

8. Relevance to Facial Cleansing

Facial cleansers remove surface impurities primarily through surfactant action. Surfactants lower surface tension and facilitate removal of dirt, while syndets can maintain skin structure and function more effectively than soap-based products [6].

Mild-cleansing products should also be evaluated for pH. Syndets are generally neutral or acidic, while soap-based cleansers are usually alkaline. High-pH solutions can increase stratum-corneum swelling and alter lipid rigidity [9].

A. vera inner-leaf gel extract supports facial cleansing as a complementary skincare ingredient. Freeze-dried *A. vera* extract has been described as improving hydration through a possible humectant mechanism [3], and *A. vera*-containing facial formulations have improved hydration and reduced transepidermal water loss [4].

A formulation study developed a cleansing gel containing 1.00% *Aloe vera* gel together with carbomer, preservatives, allantoin, niacinamide, glycerin and other formulation components. The preparation was evaluated for loss on drying, organoleptic properties, pH, viscosity and cleaning power [22]. This supports the feasibility of incorporating *Aloe vera* gel into a cleansing-gel format, although it is not a study of Bio Wash.

A. vera inner-leaf gel extract may support facial cleansing through four complementary functions:

1. The cleansing vehicle assists in removing dirt and other surface impurities.
2. *A. vera* contributes a hydrophilic, polysaccharide-rich conditioning component.
3. The formulation is intended to leave the skin feeling clean, comfortable and refreshed.
4. Hydration support may contribute to a softer and smoother perceived skin surface.
5. Bio Wash represents this combined cleansing-and-conditioning approach.

9. Acne-Prone Skin and the Skin Microbiome

9.1 *Aloe vera*-Containing Acne Formulations

A randomised double-blind trial reported that topical *Aloe vera* gel combined with tretinoin was well tolerated and significantly more effective than tretinoin and vehicle for mild-to-moderate acne vulgaris [34].

Another double-blind study evaluated a cream containing 20% propolis, 3% tea tree oil and 10% *Aloe vera* in 60 participants with mild-to-moderate acne. The combination reduced erythema scars, acne severity index and total lesion count compared with placebo [35]. Because this was a multi-ingredient formulation, the specific contribution of *A. vera* cannot be isolated.

A review of medicinal plants for acne describes a clinical trial in which 50% *Aloe vera* gel combined with tretinoin was well tolerated during 8 weeks in 60 patients with mild-to-moderate acne [36].

These studies support investigation of *A. vera* as an adjunct in blemish-prone skincare. They do not establish that an inner-leaf *A. vera* cleanser alone prevents acne, controls sebum, removes comedones or treats inflammatory lesions.

The acne-related evidence is summarised in **Table 6**, with the contribution of *A. vera* distinguished from the effects of multi-ingredient formulations.

Table 6: Evidence concerning *Aloe vera*-containing formulations for blemish-prone skin

Formulation or preparation	Study context	Main reported outcome	Interpretation for Bio Wash
Aloe vera gel combined with tretinoin	Randomised, double-blind trial in mild-to-moderate acne	The combination was well tolerated and significantly more effective than tretinoin and vehicle [34]	Supports *A. vera* as a possible adjunct, not *A. vera*-alone cleanser efficacy
Cream containing 20% propolis, 3% tea tree oil and 10% *Aloe vera*	60 participants with mild-to-moderate acne	Reduced erythema scars, acne severity index and total lesion count compared with placebo [35]	The contribution of *A. vera* cannot be isolated from the multi-ingredient formulation
Fermented *A. vera* supernatant containing *Lactobacillus plantarum* HM218749.1	In vitro pathogen-inhibition study	Inhibited tested pathogens, including *P. acnes* ATCC 11827, with an inhibition-zone diameter of 27 mm [17]	Applies to a fermented supernatant and not directly to conventional Bio Wash
Skin-microbiome evidence	Review of inflammatory acne	Loss of diversity among *Cutibacterium acnes* phylotypes is associated with inflammatory acne [37]	Supports a microbiome-aware, non-sterilising cleansing approach
A. vera and acemannan literature	Mechanistic and review evidence	*A. vera* components have been investigated in relation to antimicrobial and skin-related activity [23]	Provides rationale for further research but not a treatment claim

9.2 Skin Microbiome

Inflammatory acne involves sebum production, follicular keratinisation, microbial factors and innate immune interactions. Loss of diversity among *Cutibacterium acnes* phylotypes is associated with inflammatory acne, and both *C. acnes* and *Staphylococcus epidermidis* participate in inflammatory processes [37].

Aloe vera gel has been discussed in relation to skin commensals and *Propionibacterium acnes* [23]. A fermented *A. vera* supernatant containing *Lactobacillus plantarum* HM218749.1 inhibited tested pathogens, including *P. acnes* ATCC 11827, with an inhibition-zone diameter of 27 mm in the reported experiment [17].

This result concerns a fermented supernatant and does not establish that conventional inner-leaf gel or Bio Wash clinically treats acne. Facial cleansing should not aim to sterilise the skin; a microbiome-aware approach should remove excessive soil and sebum while minimising unnecessary barrier disturbance.

10. Pigmentation, Even Tone and Radiance

Aloesin is an *A. vera*-derived chromone that competitively inhibits tyrosinase and inhibits tyrosine hydroxylase and DOPA oxidase activity in human melanocyte lysates [16].

In a human UV-induced pigmentation study, aloesin suppressed pigmentation by 34%, arbutin by 43.5% and combined aloesin and arbutin by 63.3% compared with control [38]. These findings support further research into *A. vera*-derived tone-related compounds.

Fermentation can alter *A. vera* phytochemistry. Fermented *A. vera* leaf-skin extract contained 2.96 ± 0.09 mg/g aloesin compared with 2.03 ± 0.02 mg/g in the water extract. At 0.3% (w/v), the fermented extract produced greater inhibition of tyrosinase activity and melanin synthesis than the comparison treatments in the reported experimental model [26].

These studies involve aloesin-rich or fermented materials and do not establish pigmentation correction by a conventional inner-leaf gel cleanser. For Bio Wash, the more appropriate appearance-

related discussion is that cleansing, hydration and reduced visible dryness may contribute to a cleaner, fresher and more even-looking appearance.

Claims of permanent whitening, pigment removal or durable brightening require controlled testing of the finished product.

11. Smoothness, Softness and Radiance

The sensory and visual effects of a cleanser depend on the complete formulation. In the 4-week clinical study of a polymeric-surfactant cleanser, improvements were reported in smoothness, softness, clarity, radiance and overall appearance, together with reductions in stinging, itching, burning and tightness [8].

Although that cleanser did not contain *A. vera*, the study illustrates how facial-cleansing research can evaluate both tolerability and appearance-related outcomes.

A. vera-containing leave-on formulations have improved hydration, firmness, elasticity and transepidermal water loss [4]. A 30% *A. vera* cream was also statistically indistinguishable from a 20% urea reference cream on corneometry in a randomised trial, and an *A. vera* cream outperformed dexpanthenol and plant oil on instrumental measures of scaliness, softness and roughness [41,42]. These findings support the possibility that *A. vera*-containing skincare may improve softness and surface feel.

For Bio Wash, relevant outcomes include:

- clean-feeling skin;
- soft-feeling skin;
- smooth-feeling skin;
- reduced perception of post-cleansing dryness;
- refreshed-looking skin; and
- improved appearance of dry-looking skin.

A rinse-off cleanser should not automatically be expected to reproduce the effects of a leave-on cream. Product-specific studies should include corneometry, transepidermal water loss, sensory evaluation, standardised facial imaging and comparison with an *A. vera*-free control.

12. Safety and Quality Control

12.1 Hydroxyanthracene Derivatives

A. vera safety depends on the preparation. The inner-gel polysaccharide material was described as noncytotoxic in the cited cosmetic safety assessment, whereas anthraquinones in whole-leaf extract and latex require monitoring because of cytotoxicity, mutagenicity and carcinogenicity concerns [20].

The European Food Safety Authority concluded that aloe-emodin, emodin and danthron showed evidence of genotoxicity in vitro, while aloe-emodin showed evidence of genotoxicity in vivo and whole-leaf *A. vera* extract was associated with carcinogenicity concerns in its food-safety assessment [18].

Purified *A. vera* extracts are processed to reduce hydroxyanthraquinone contamination. Reported contaminant levels include below 50 ppm and, in some preparations, below 1 ppm [39].

In five commercial *A. vera* beverages, aloin A ranged from 6.05 to 337.98 ng/mL and aloin B from 8.84 to 346.89 ng/mL. *A. vera*-emodin was detected in three samples at 80.30–109.40 ng/mL, and four samples contained aloin A and B above 1 ppm [21].

A separate purified whole-leaf dry-juice study evaluated material containing 0.3 ppm total aloins and non-detectable aloe-emodin. No marked increases in mutant frequency were observed in the mouse-lymphoma assay, and no statistically significant increases in DNA strand breaks were detected in the colon or kidney under the reported experimental conditions [40]. This applies to the studied preparation and does not replace testing of the *A. vera* extract used in Bio Wash.

12.2 Topical Tolerability

Topical *A. vera* is generally well tolerated, although burning, itching and contact dermatitis may occur [39]. Another review describes burning, stinging, redness and generalised dermatitis, particularly in association with anthraquinone-containing preparations [31].

Bio Wash quality control should include:

- authentication of the inner-leaf gel extract;
- acemannan or total-polysaccharide measurement;
- aloin and aloe-emodin testing;
- microbiological testing;
- finished-product pH;
- viscosity and stability;
- preservative efficacy;
- repeat-use patch testing;
- irritation and sensitisation assessment; and
- instrumental hydration and transepidermal water-loss evaluation.

The principal safety and quality-control requirements for an *A. vera*-containing facial cleanser are summarised in **Table 7**.

Table 7: Safety and quality-control considerations for Bio Wash

Parameter	Rationale	Proposed assessment
Botanical identity	*A. vera* materials vary according to plant source, leaf fraction and processing [1,11]	Botanical authentication and supplier documentation
Inner-leaf designation	Inner-leaf gel should be distinguished from latex-associated material	Verification of the specified leaf fraction
Acemannan or polysaccharide content	Acemannan structure and yield may change during processing [2]	Quantification of acemannan or total polysaccharides
Aloin and aloe-emodin	Hydroxyanthracene derivatives require monitoring [18,20,21]	Analytical testing of raw material and finished product
Microbiological quality	*Aloe vera* gel is water-rich and may require stabilisation and preservation	Microbial limits and preservative-efficacy testing
Finished-product pH	High-pH cleansers may increase stratum-corneum swelling and irritation potential [5,9]	pH measurement during development and stability testing
Stability	Temperature and pH may influence *A. vera* constituents [24]	Accelerated and real-time stability testing
Topical tolerability	Burning, itching and contact dermatitis may occur in some users [39]	Patch testing, irritation assessment and repeat-use evaluation
Cleansing compatibility	Surfactants may interact with skin proteins and lipids [5]	Assessment of tightness, dryness, stinging and barrier-related outcomes
Finished-product claims	Ingredient-level evidence does not establish Bio Wash efficacy	*A. vera*-free control and controlled product testing

13. Evidence-Based Cosmetic Positioning

The translation of *A. vera*-related evidence into appropriate Bio Wash claims requires separation of ingredient-level, formulation-level and finished-product evidence, as shown in **Figure 5**.

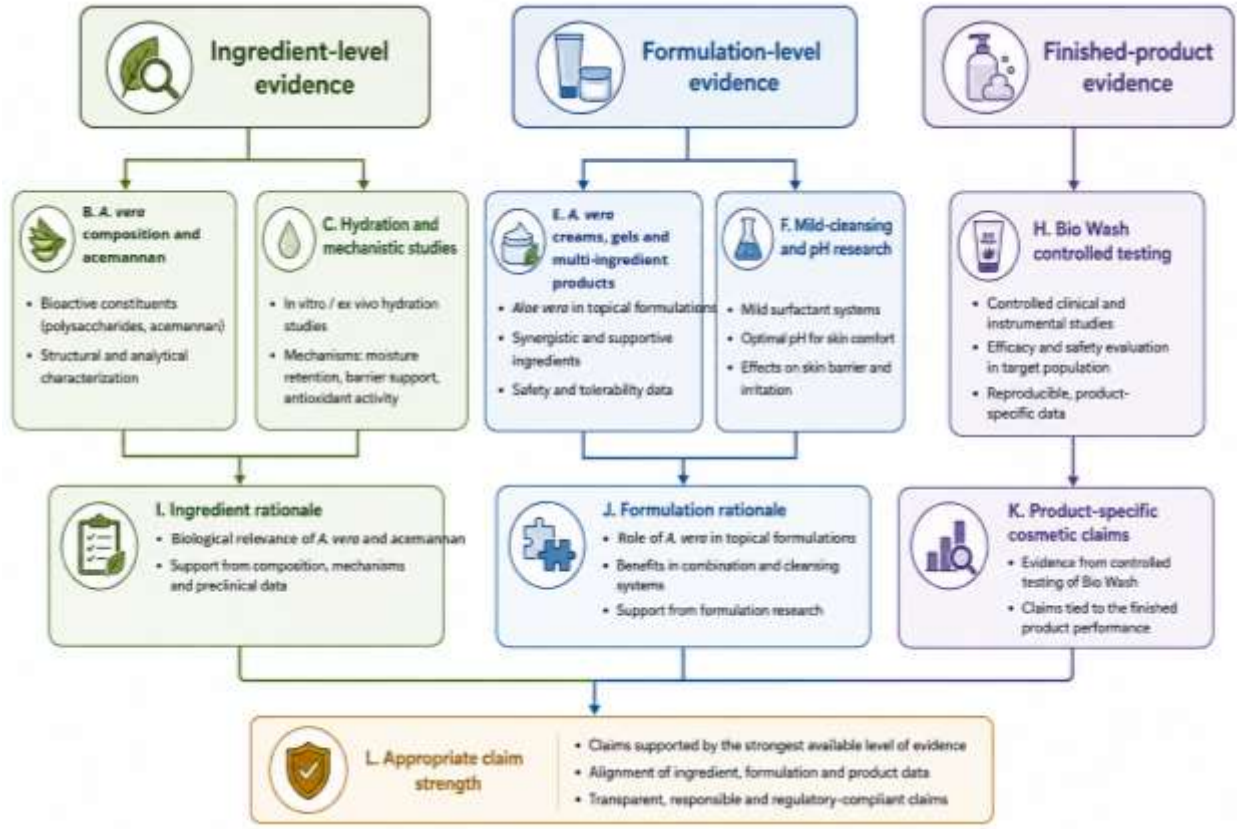

Fig 5: Framework for translating *A. vera*-related evidence into appropriate cosmetic claims for Bio Wash. Ingredient-level and formulation-level evidence support product development, whereas claims about the finished cleanser require testing of the complete Bio Wash formulation.

Claim domain	Evidence-based position
Inner-leaf composition	*Aloe vera* gel contains acetylated mannose-rich and galacturonic-acid-rich polysaccharides [1]
Acemannan	Acemannan is an acetylated glucomannan containing mannose, glucose and galactose units [2]
Hydration	Freeze-dried *A. vera* extract may improve hydration through a humectant mechanism [3]
Facial topical evidence	A 10% *A. vera* facial formulation improved hydration and reduced transepidermal water loss [4]
Cleanser compatibility	Mild-cleanser technology supports delivery of humectants and other beneficial agents under wash conditions [5]

Primary cleansing	Surface-soil removal is mainly performed by the surfactant system [6]
Skin comfort	*A. vera* may complement a mild cleanser as a conditioning ingredient
Blemish-prone skin	*A. vera* may be considered as a hydrating adjunct; combination acne studies do not establish *A. vera*-alone efficacy [34,35]
Pigmentation	Aloesin supports further tone-related research but does not establish rinse-off pigmentation correction [16,38]
Smoothness and radiance	May be associated with cleansing, hydration and conditioning; finished-product testing is required
Safety	*A. vera* raw materials should be tested for aloin and related hydroxyanthracene derivatives [20,21]

Appropriate Wording for Bio Wash

- "Bio Wash is a facial cleanser developed with *Aloe vera* inner-leaf gel extract."
- "*A. vera* inner-leaf gel extract supports the hydration and conditioning aspects of facial cleansing."
- "Combines facial cleansing with *A. vera*-supported skin comfort."
- "Helps leave facial skin feeling clean, soft and refreshed."
- "Contains *A. vera*-derived polysaccharides associated with hydration-oriented skincare."
- "Designed to support a comfortable cleansing experience."
- "Supports a hydrated and healthy-looking facial appearance."
- "*A. vera*-supported facial cleansing for soft and comfortable skin."

These are ingredient-based or cosmetic-positioning statements. Claims of clinical hydration, acne treatment, antibacterial activity, pigmentation correction, barrier repair or permanent brightening require finished-product evidence.

14. Proposed Evaluation of Bio Wash

A controlled Bio Wash study should compare the *A. vera*-containing product with an *A. vera*-free control having the same base formulation.

The proposed sequence for evaluating Bio Wash is presented in **Figure 6**, and the product-evaluation strategy is summarised in **Table 8**.

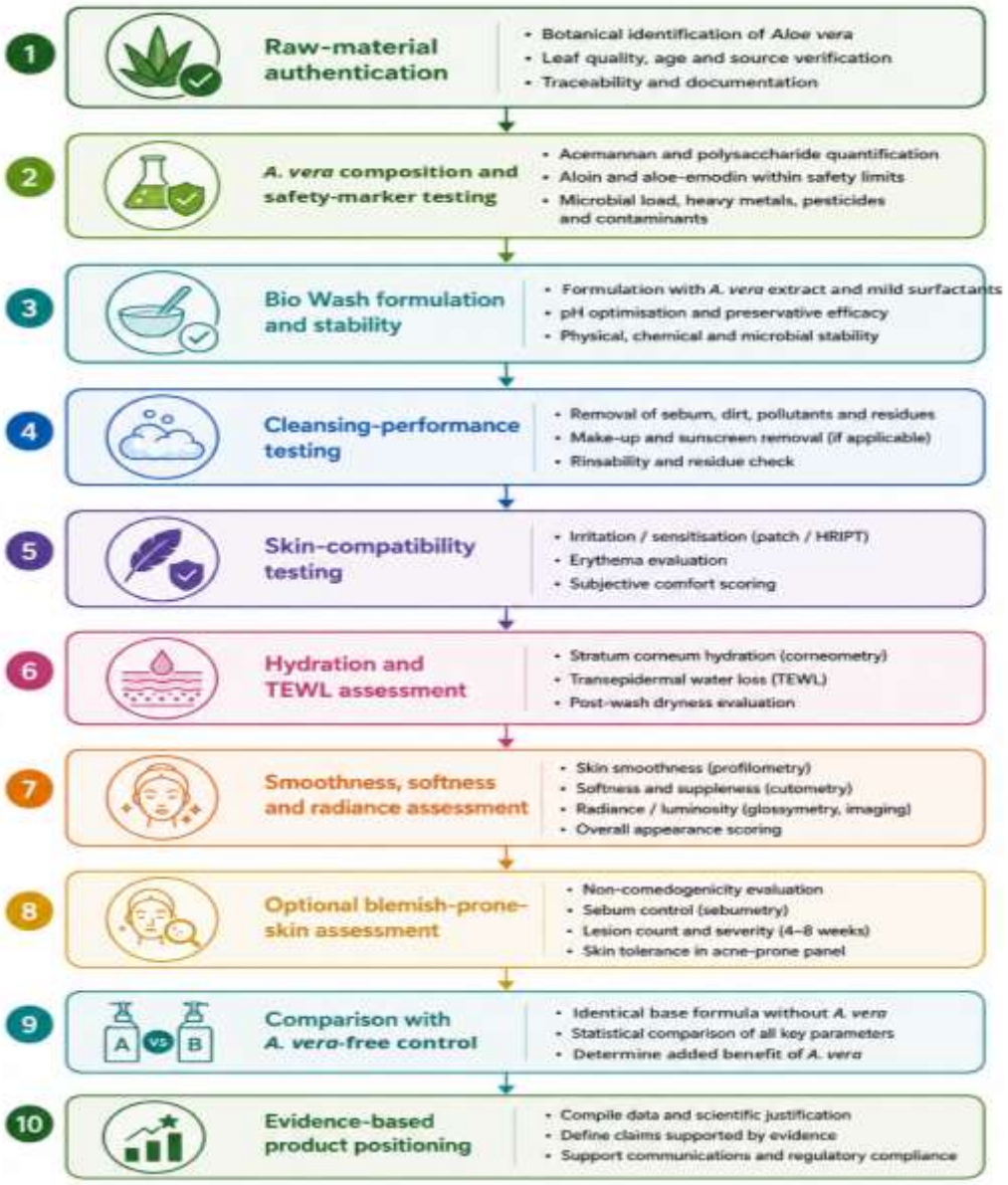

Fig 6: Proposed workflow for evaluating Bio Wash containing *Aloe vera* inner-leaf gel extract. The workflow progresses from raw-material authentication and safety testing to formulation stability, cleansing performance, skin compatibility, hydration, appearance and optional blemish-prone-skin assessment.

Table 8: Proposed evaluation plan for Bio Wash

Evaluation domain	Suggested assessment	Primary outcome
Chemical characterisation	Botanical identity, inner-leaf verification, acemannan or total-polysaccharide content, molecular-weight distribution and degree of acetylation	Consistency of the *A. vera* raw material
Safety markers	Aloin and aloe-emodin analysis	Control of hydroxyanthracene derivatives
Stability	Appearance, odour, pH, viscosity, microbial quality and active-marker stability during storage	Finished-product stability
Cleansing performance	Removal of artificial sebum, cosmetic residue and sunscreen residue	Cleansing efficiency and rinsability

Skin compatibility	Burning, stinging, itching, tightness, dryness, erythema and repeat-use tolerability	Cosmetic acceptability
Hydration	Corneometry and transepidermal water loss before and after use	Short-term hydration and barrier-related response
Skin appearance	Standardised imaging, smoothness, softness, radiance and refreshed appearance	Appearance-related cosmetic outcomes
Blemish-prone skin	Non-comedogenicity, lesion count, erythema, sebum-related outcomes and tolerability	Suitability for blemish-prone skin
Microbiome considerations	Optional assessment of microbial diversity and selected skin microorganisms	Evaluation without assuming sterilisation is desirable
Comparator design	*A. vera*-containing Bio Wash compared with an *A. vera*-free base formulation	Specific contribution of the *A. vera* ingredient

14.1 Chemical Characterisation

The study should report:

- botanical identity;
- inner-leaf gel designation;
- extraction method;
- acemannan content;
- molecular-weight distribution;
- degree of acetylation;
- aloin and aloe-emodin levels; and
- stability during storage.

14.2 Cleansing Performance

Evaluation should include:

- removal of artificial sebum;
- removal of cosmetic residue;
- removal of sunscreen residue;
- rinsability;
- residue after washing; and
- sensory perception of cleanliness.

14.3 Skin Compatibility

The study should evaluate:

- skin pH;
- erythema;
- burning;
- stinging;
- itching;
- tightness;
- dryness; and
- repeat-use tolerability.

14.4 Hydration and Appearance

Relevant outcomes include:

- corneometry;
- transepidermal water loss;
- surface smoothness;
- softness;
- standardised facial imaging;
- radiance or gloss measurements; and
- subjective assessment of refreshed appearance.

14.5 Blemish-Prone Skin

Where relevant, the study may include:

- non-comedogenicity;
- total lesion count;
- erythema;
- sebum-related outcomes;
- tolerability in acne-prone participants; and
- microbiome measurements.

The study should not assume that elimination of all microorganisms is desirable because inflammatory acne is associated with microbiome diversity and interactions among skin microorganisms and the innate immune system [37].

15. Limitations

Many *A. vera* clinical studies involve leave-on preparations rather than rinse-off cleansers. Some studies evaluate multi-ingredient products, so the specific contribution of *A. vera* cannot always be isolated. Fermented *A. vera*, whole-leaf extract, leaf-skin extract and inner-leaf gel are chemically different materials. *A. vera* polysaccharide composition varies according to plant source and processing [1,11]. Several studies concern wounds, burns, psoriasis or oral products rather than facial cleansing.

Accordingly, this review provides an ingredient-based formulation rationale rather than proof that Bio Wash has demonstrated every discussed benefit. Bio Wash can appropriately be described as a facial cleanser developed with *A. vera* inner-leaf gel extract, while the scientific evidence supports its proposed roles in hydration, conditioning and skin comfort.

16. Conclusion

Aloe vera inner-leaf gel extract is a relevant botanical ingredient for facial-cleansing preparations. *Aloe vera* gel contains an acetylated mannose-rich polymer associated with acemannan and a galacturonic-acid-rich polymer associated with parenchymatous tissue [1]. Acemannan contains β-linked mannose, glucose and galactose units, but its molecular characteristics vary with cultivation, harvesting, extraction, processing and analytical method [2,11].

Processing is particularly important. Stabilisation may involve filtration, pasteurisation, activated-carbon treatment and freeze-drying [25]. Heating and drying can alter acemannan yield, molecular weight and acetylation [2]. Commercial *A. vera* products may also vary substantially in acemannan content and degree of acetylation despite similar label descriptions [29]. These findings support chemical characterisation and quality control of the inner-leaf extract used in cosmetic products.

Human topical studies provide evidence for *A. vera*-associated hydration benefits. Freeze-dried *A. vera* extract has been reported to improve hydration, possibly through a humectant mechanism [3]. A facial formulation containing 10% *A. vera* extract significantly improved stratum-corneum water content and reduced transepidermal water loss in a small single-blind study of healthy adults [4]. *Aloe vera* gel and fermented *A. vera* preparations have also been evaluated using corneometry and transepidermal water-loss measurements, with the highest hydration response for F20 at 3 h reported as an increase of 21.40 ± 0.93% compared with the control field [27].

A. vera supports facial cleansing by complementing the primary cleansing vehicle. Surfactants facilitate the removal of dirt and surface impurities [6], while mild-cleansing systems can incorporate humectants and other beneficial agents to improve hydration and skin feel under wash conditions [5]. Product pH and surfactant selection are also important for limiting irritation and barrier disturbance [9].

Bio Wash, developed by Biotex Life Solutions using *Aloe vera* inner-leaf gel extract, represents a practical application of this *A. vera*-supported cleansing concept. It may be described as a facial cleanser designed to combine surface cleansing with *A. vera*-derived support for hydration, skin comfort, softness and a refreshed appearance.

A. vera-related research also provides a basis for investigating blemish-prone skincare, even-looking tone, smoothness and radiance. However, evidence from fermented extracts, aloesin studies, combination acne products and leave-on formulations should not be presented as direct evidence that Bio Wash treats acne, corrects pigmentation or repairs the skin barrier.

Overall, *Aloe vera* inner-leaf gel extract supports the development of facial-cleansing products intended to provide a clean, comfortable, hydrated, soft and refreshed skin experience. A controlled study comparing Bio Wash with an *A. vera*-free control would provide the strongest evidence for its finished-product performance.

Declarations

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Competing interests. All authors are employees of Biotex Life Solutions Pvt. Ltd., a company engaged in the research, development, and production of nutraceutical and personal-care products and interested in the botanical cosmetic ingredients market. The company has launched a cosmetic product named Bio Wash, which contains the inner-leaf gel extract of Aloe vera, mentioned in this review as a real-world example of a rinse-off preparation. This circumstance creates a potential conflict of interest for this review, which is formally declared. Clinical, instrumental, and analytical data on the Bio Wash product are not presented or discussed in this article. The authors declare no other potential conflicts of interest.

Author contributions. Each author contributed to the conception and design of the review, performed a literature search and appraisal, synthesised and interpreted the results, drafted the manuscript, and critically revised the article for important intellectual content and provided approval of the final version of the manuscript submitted for publication.

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Use of artificial intelligence. The authors declare that generative artificial-intelligence tools were used to assist with literature retrieval and language editing. All scientific content, interpretation and conclusions are the authors' own, and the authors accept full responsibility for the integrity and accuracy of the work.

Disclaimer. This article reviews the published literature on *Aloe barbadensis* Miller inner-leaf gel extract as a class of cosmetic ingredient. The findings apply to the ingredient as characterised in the cited studies and not to any finished product, including Bio Wash. No claim is made that any *Aloe vera*-containing product has been shown to diagnose, treat, cure or prevent any disease. Structure–function statements must remain within the framework of the Drugs and Cosmetics Act, 1940 and the Cosmetics Rules, 2020, and must be supported by the certificate of analysis for each production batch.

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