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Galactomyces ferment filtrate in cosmetics: A jurisprudential analysis via *Istihalah*

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Received: 18/5/2026
Accepted: 28/7/2026
Published: 31/7/2026

Keywords:

Galactomyces
ferment filtrate;
Istihalah; Halal
cosmetics;
Transformative
purification; *Taharah*

Abstract

This study examines the permissibility (halal) status of Galactomyces Ferment Filtrate (GFF) in cosmetic products through the Islamic jurisprudential principle of *Istihalah* (transformative purification). Commercially known as Pitera (TM), GFF is a yeast-derived bioactive ingredient widely used in skincare yet associated in popular discourse with sake (Japanese rice wine), raising purity (*I*) concerns among Muslim consumers. Using a qualitative library research methodology, the study analyses GFF across three stages: its biological source and characteristics; its industrial production process; and the application of *Istihalah* to assess the completeness of the transformation. Classical juristic positions from the four *Sunni* schools and contemporary scholarly opinions are surveyed alongside scientific literature. The findings demonstrate that downstream processing eliminates all ethanol from the final ingredient, satisfying the conditions for *Istihalah Sahihah*. GFF is therefore classified as *tahir* (pure) and halal for cosmetic use.

1. Introduction

The global cosmetic industry has experienced extraordinary growth, driven by continuous biotechnological innovation and sustained consumer demand for effective skincare solutions (Elder *et al.*, 2020). For Muslim consumers, ingredient selection carries an additional religious dimension: products must be permissible (halal) and wholesome (*tayyib*) under Islamic law. The *Qur'an* states: "O mankind, eat from whatever is on earth that is lawful and good" (*Al-Baqarah*, 2:168). A related verse prohibits intoxicants: "O you who have believed, indeed, intoxicants, gambling, [sacrificing on] stone altars, and divining arrows are but defilement from the work of Satan, so avoid it that you may be successful" (*Al-Ma'idah*, 5:90). These injunctions situate Islamic jurisprudence at the intersection of consumer ethics and modern cosmetic science.

Among the ingredients attracting contemporary halal discourse is Galactomyces Ferment Filtrate (GFF), a bioactive yeast derivative used by leading brands including SK-II, COSRX, and Manyo Factory (Personal Care Products Council, 2025). Digital media and beauty commentary have popularised the claim that GFF originates as a by-product of sake (Japanese rice wine) production (Santaella-Lam, 2024; Ng, 2021). Since sake is classified as *khamr*—a prohibited and ritually impure substance under unanimous scholarly consensus (an-Nawawi, 2010; Mazri, 2020)—this association raises the question of whether GFF inherits the legal ruling of *khamr*.

Scientific literature extensively validates GFF's cosmetic efficacy: it reduces wrinkles, hyperpigmented spots, and skin roughness over long-term use (Miyamoto *et al.*, 2021, 2023); strengthens the skin's anti-inflammaging defense at the cellular level (Yan *et al.*, 2022); and facilitates wound closure through keratinocyte activation (Chan, 2023; Rovito *et al.*, 2025). Despite this commercial and scientific prominence, no prior academic work has subjected GFF to a systematic examination within Islamic jurisprudence. The only relevant ruling, issued by Dr. Zulkifli Mohamad al-Bakri (2023), conditionally permits GFF not produced through the sake-making process, leaving the question open pending detailed process analysis.

This study aims to bridge that gap by applying the classical principle of *Istihalah*—the doctrine of transformative purification—to a systematic analysis of GFF's production. Three objectives guide the inquiry: (1) to establish the biological profile of GFF and the jurisprudential foundations of *Istihalah*; (2) to investigate the stages of GFF production from cultivation to final cosmetic ingredient; and (3) to apply the principle of *Istihalah* to determine GFF's permissibility ruling.

2. Materials and methods

This study adopts a qualitative, non-empirical library research methodology. Data were gathered from three primary source categories: (1) classical Islamic legal texts (*kutub al-fiqh*) representing the four *Sunni* schools of jurisprudence (*Hanafi*, *Maliki*, *Shafi'i*, and *Hanbali*), particularly works about the

doctrine of *Istihalah*, the concept of *najasad* (ritual impurity), and rulings on alcohol and fermentation; (2) contemporary Islamic scholarship including *fatwa*, journal articles in Islamic law, and halal industry standards published by recognised authorities such as Jabatan Mufti Wilayah Persekutuan Malaysia; and (3) peer-reviewed scientific literature on GFF, including studies on its biological taxonomy, fermentation chemistry, cosmetic efficacy, and production processes, as well as relevant patent documents from South Korea and China.

Textual analysis was employed to extract and synthesise relevant juristic positions on *Istihalah* and to map the three constituent elements of the doctrine—raw material (*al-asl*), transformation process (*at-tahawwul*), and final product (*an-natijah*)—onto the documented stages of GFF production. Ingredient analyses of commercial GFF products listed on the INCI (International Nomenclature of Cosmetic Ingredients) database (INCIDecoder) were used to verify the composition of the final formulation, particularly with respect to the presence or absence of ethanol.

3. Results

3.1 Biological profile and cosmetic functions of GFF

Galactomyces is a genus of fungi in the class Saccharomycetes, family Dipodascaceae (Cherian, 2024). The most commercially relevant species is *Galactomyces candidus* (synonym: *Geotrichum candidum*), which is found across fermented food substrates including dairy, kimchi, and kefir (Bae *et al.*, 2024; Kalamaki & Angelidis, 2016; Sipiczki & Hrabovszki, 2023). *Galactomyces geotrichum* holds Generally Recognised as Safe (GRAS) status from the United States Food and Drug Administration (Szudera-Konczal *et al.*, 2023). GFF is formally defined as a filtrate obtained by fermenting a growth medium using *Galactomyces candidus*, *Galactomyces fermentans*, or *Galactomyces reessii* (Cherian, 2024), and is commercially marketed as Pitera (TM) by Procter and Gamble (P&G, 2026). Its bioactive composition—vitamins, minerals, amino acids, small peptides, and oligosaccharides—is readily bioavailable through the skin (Cooper *et al.*, 2019).

GFF has demonstrated multi-functional cosmetic efficacy across four domains. First, anti-aging and texture improvement: long-term application significantly reduces wrinkles, improves skin smoothness, and enhances firmness by stabilising actin cytoskeleton proteins (Crabtree *et al.*, 2025; Miyamoto *et al.*, 2023). Second, pigmentation correction: GFF reduces hyperpigmented spots and suppresses reactive oxygen species in melanocytes via the Nrf2-ARE antioxidant pathway (Cooper *et al.*, 2019; Miyamoto *et al.*, 2021). Third, barrier function and wound repair: GFF activates proliferative genes in keratinocytes and strengthens intercellular adhesion, facilitating wound closure and enhancing the epidermal barrier (Chan, 2023; Nakamizo *et al.*, 2024; Rovito *et al.*, 2025). Fourth, cellular defense and moisturization: GFF upregulates the antioxidative enzyme GPX2 and downregulates the senescence biomarker CDKN2A, thereby delaying cellular aging (Yan *et al.*, 2022). It is used at concentrations up to 90.7% in leave-on moisturising formulations (Cherian, 2024).

The Asia-Pacific region accounts for over 52% of the global *Galactomyces* skincare market in 2024, and the global fermented face mask market is projected to grow from USD 1.33 billion in 2025 to USD 2.56 billion by 2035 at a compound annual growth rate of 6.8% (Future Market Insights, 2025). This market trajectory underscores both the commercial

significance of GFF and the practical importance of establishing its halal status.

3.2 The doctrine of *Istihalah*: Definition, typology, and conditions

The term *Istihalah* derives from the Arabic root *h-w-l*, denoting transformation or change. Technically, al-Husayni (1994) defines it as "the transformation of something from one state to another," while al-Juwayni (2007) specifies that it entails a change in the attributes of the transformed substance without the disappearance of its essence. Wahbah al-Zuhayli (2014) offers the most comprehensive formulation: the inversion of one substance into another differing in its qualities, encompassing the transformation of impure or contaminated substances into pure ones, and of legally prohibited substances into permissible ones.

Two types of *Istihalah* are distinguished in Islamic jurisprudence. First, *Istihalah Sahihah* (accepted transformation) occurs when any substance—licit or illicit in origin—undergoes change through natural or artificial agents such that the resultant substance is categorically halal and legally distinct from the original. Second, *Istihalah Fasidah* (corrupted transformation) involves a change from a permissible to a prohibited substance; the end-product is haram, though it may, under specific conditions, revert to a halal status (Jamaludin & Wan Mohamed Radzi, 2009).

Classical juristic schools hold divergent positions on whether *Istihalah* affects purification. The *Hanafi* school, together with some *Maliki* scholars and Ibn Taymiyyah, affirms that *Istihalah* purifies impure substances when a genuine change in name and qualities has occurred. Ibn Qayyim al-Jawziyyah (1991) articulates this position:

It is impossible for the ruling of impurity to remain when its name and qualities have ceased to exist. The ruling is dependent on the name and qualities, revolving around them in both existence and non-existence. Therefore, the texts that address the prohibition of carrion, blood, pig meat, and khamr do not encompass crops, fruits, ash, salt, soil, or vinegar—literally, meaningfully, textually, or analogically.

On this basis, these scholars accept *Istihalah* through three principal forms: fermentation (as when wine becomes vinegar), combustion (as when filth becomes ash), and dissolution (as when a carcass decomposes in salt) (Abdullah *et al.*, 2011). The *Shafi'i* and *Hanbali* schools adopt a more restrictive position, recognizing transformation only in specific instances—most notably, the natural transformation of wine into vinegar—and rejecting purification by combustion (al-Shirazi, 1995; al-Bahuti, 1968).

Contemporary conditions for *Istihalah Sahihah* in cosmetics have been articulated by Abdul Rab *et al.* (2018) and Redzuan and Mohd Kashim (2025). These scholars require: (1) complete transformation—the process must wholly alter the substance's chemical and physical nature; (2) irreversibility—the change must be permanent with no possibility of reverting to the original state; (3) a new legal identity—the end-product must not carry the legal ruling of the original impure substance; (4) non-interference with acts of worship such as ablution (*wudu*); (5) harmlessness to the user; and (6) the absence of any

remaining trace of the original *najis* substance in the final product.

3.3 The production process of *Galactomyces* ferment filtrate

GFF production proceeds through three consecutive stages: preparation and cultivation, fermentation, and downstream processing (filtration, sterilization, and standardisation).

a) Preparation and cultivation - Production begins with the activation of a selected *Galactomyces* yeast strain in a liquid starter culture (inoculum) (South Korea Patent No. KR101884411B1, 2017). This culture is then introduced into a carbohydrate-rich medium, most commonly rice, though some manufacturers use flour or starch combinations (China Patent No. CN116218694B, 2023). Rice is preferred for its high levels of branched-chain starches, proteins, and polyphenolic compounds, which serve as substrates for yeast metabolism (Sun *et al.*, 2025). Optimal conditions maintain a pH of 5.0-5.5 at approximately 30°C (Szudera-Konczal *et al.*, 2023). The raw materials at this stage—rice, starch or flour, and *Galactomyces* yeast—are plant-derived and categorically permissible (*mubah*) under Islamic law.

b) Fermentation - Under controlled parameters of temperature (25-37°C), pH, aeration, and agitation, *Galactomyces* fungi break down complex starches into simpler sugars, which are then metabolized to yield bioactive compounds: amino acids, peptides, organic acids, vitamins, polyphenols, and polysaccharides (Yang *et al.*, 2025). Fermentation is conducted for 35-60 hours (Klimek-Szczykutowicz *et al.*, 2024). Critically, like other yeasts catabolising carbohydrate substrates, *Galactomyces* can produce ethanol as an incidental metabolic by-product (Valinhas *et al.*, 2018; Mohd Azhar *et al.*, 2017). This is a biochemical consequence of carbohydrate fermentation, not the intended outcome: the explicit purpose of GFF fermentation is the harvest of beneficial metabolites for cosmetic application, a distinction confirmed by manufacturer statements (Mary, 2021). The fermentation process for GFF is thus categorically distinct from sake production, which employs *Aspergillus oryzae* (koji mould) and *Saccharomyces cerevisiae* as primary organisms to achieve ethanol concentrations of 20% or more (Nishida, 2021; Wilkowska & Dzwonnik, 2025).

c) Filtration, sterilisation, and standardisation - Following fermentation, the broth undergoes centrifugation to remove fungal biomass and insoluble particles, followed by multi-stage filtration—including heating to 90°C for 30 minutes and passage through diatomaceous earth—before standardisation for commercial consistency (China Patent No. CN116218694B, 2023; Klimek-Szczykutowicz *et al.*, 2024). Analysis of ingredient lists from five leading commercial GFF products—SK-II Facial Treatment Essence, Mixsoon *Galactomyces* Ferment Essence, COSRX *Galactomyces* 95 Whitehead Power Essence, Mizon Skin Power Original First Essence, and Some By Mi *Galactomyces* Glutathione Glow Milky Toner—confirms the complete absence of ethanol in their formulations (INCIDecoder, 2018, 2022, 2024, 2025). Alcohols present in these products (butylene glycol, pentylene glycol, 1,2-hexanediol) are non-intoxicating synthetic solvents and humectants with no relation to *khamr*.

4. Discussion

4.1 Application of *Istihalah*: Analysis of the raw material (*al-Asl*)

The first element in an *Istihalah* analysis is the assessment of raw materials. Where the raw material is an impermissible substance—such as porcine-derived gelatine—the analysis must verify whether the transformation is sufficiently complete to alter the legal ruling. Jamaludin *et al.* (2012) note that the conversion of animal bones and hides to gelatine is physical rather than chemical and therefore does not constitute *Istihalah Sahihah*. However, where both the raw material and the conversion agent are permissible—as in the case of GFF—the question shifts to whether the transformation process and the final product raise new jurisprudential concerns.

In GFF production, the raw materials—rice, starch or flour, and *Galactomyces* yeast—are plant-derived substances that are categorically *mubah*. The initial production stage is therefore free of jurisprudential concern. The *Istihalah* analysis must accordingly focus on the intermediate fermented broth and the final downstream product.

4.2 Application of *Istihalah*: Analysis of the transformation (*at-Tahawwul*)

The key jurisprudential issue arises at the fermentation stage, where ethanol is produced as an incidental metabolic by-product. This must be distinguished from intentional *khamr* production. *Its purpose defines Khamr*—an intoxicating beverage produced for consumption—and the *Qur'anic* prohibition is grounded in its intoxicating nature and the intent to produce it (*Al-Ma'idah*, 5:90). The principle *al-umur bi-maqasidiha* ("matters are judged by their objectives") supports the view that the incidental generation of ethanol in a process directed toward cosmetic metabolite production does not automatically trigger the rulings applicable to *khamr*.

This interpretation is consistent with the *fatwa* of Malaysia's National Council for Islamic Religious Affairs, as summarised by Mohd Noor (2019), which holds that ethanol produced as a by-product of food or non-*khamr* manufacturing is not automatically *najis*. Alzeer and Hadeed (2016) add that naturally occurring ethanol at concentrations below 1% may be treated as *mubah* when it is an essential, incidental result of fermentation rather than the product of deliberate anaerobic alcohol production. Dzulkifly Mat Hashim further distinguishes industrial ethanol—defined by its chemical properties—from *khamr*, which is defined by its intoxicating effect and the intent of its production (Ab Ghani & Ismail, 2010).

Nevertheless, the presence of ethanol in the intermediate fermented broth introduces a degree of ambiguity (*shubhah*) that must be resolved by examining the final product. This is precisely the function of the *Istihalah* doctrine: to determine whether the downstream transformation produces a substance that is qualitatively and legally distinct from the impure intermediate.

4.3 Application of *Istihalah*: Analysis of the final product (*an-Natijah*)

Ibn Taymiyyah (1997) provides the decisive jurisprudential principle for this analysis:

Once it is known that the impurity has transformed, the water becomes pure, whether in small or large amounts, and the same applies to all liquids. This is because Allah has permitted good things and forbidden impure things, and the impure is distinguished from the good by its qualities. Therefore, when the qualities of water or anything else are those of the good and not the impure, it must be included in the permissible and not the forbidden.

Al-Tarabulus (1992) specifies that *Istihalah Sahihah* requires a complete transformation of the qualities (*sifat*) of the original substance, accompanied by a change of name and identity. Measuring the commercial GFF formulation against the conditions stipulated by Abdul Rab *et al.* (2018) and Redzuan and Mohd Kashim (2025), the following findings are obtained.

First, a complete and irreversible transformation has been achieved. The fermented broth—containing ethanol and living microorganisms—is converted through centrifugation, heat sterilization at 90°C, and multi-stage filtration into a standardized, ethanol-free filtrate. This represents not merely physical removal but a transformation of chemical composition and biological character that cannot be reversed.

Second, the absence of *najis* residue in the final product is confirmed by commercial ingredient analyses of five GFF products, all of which are free of ethanol. The incidental ethanol produced during fermentation has been eliminated in the downstream process, leaving no trace in the final formulation.

Third, GFF is water-soluble and does not form a barrier that would impede ablution (*wudu'*), satisfying the condition that the product must not prevent acts of worship. Fourth, the final product is demonstrably beneficial to skin health rather than harmful. Fifth, GFF possesses a distinct internationally recognized INCI name and a specific set of cosmetic functions entirely unrelated to sake or *khamr*. This constitutes the new legal identity required by classical jurists.

It is also necessary to directly address the widespread claim that GFF is a by-product of sake production. Sake fermentation employs *Aspergillus oryzae* (koji mould) and *Saccharomyces cerevisiae* as its primary organisms, achieving final ethanol concentrations exceeding 20% (Nishida, 2021; Wilkowska & Dzwonnik, 2025; Walker & Stewart, 2016). These organisms are taxonomically and functionally distinct from the *Galactomyces* species used in GFF production. While *Galactomyces* organisms may be found as environmental contaminants in sake breweries, they are not the primary fermentation agents, and commercial GFF is produced in controlled industrial fermenters specifically designed for cosmetic ingredient production. The claim's origin in digital media rather than peer-reviewed scientific literature further undermines its credibility.

The conditional *fatwa* of Dr. Zulkifli Mohamad al-Bakri (2023)—that GFF produced through a distinct process from sake-making is permissible—is thus satisfied by the scientific and manufacturing evidence. All conditions for *Istihalah Sahihah* are met: the transformation is complete, irreversible, and yields a product with a new chemical identity, new name, and new legal status, free from any *najis* residue, non-interfering with worship, and safe for use.

This analysis aligns with the broader jurisprudential framework applied to other fermentation-derived ingredients. Jamaludin and Wan Mohamed Radzi (2009) confirm that vinegar produced from wine represents the paradigmatic case of *Istihalah Sahihah* accepted by the *Hanafi* school and condoned by Ibn Taymiyyah, in which complete chemical transformation yields a new, permissible substance. The transformation of the GFF-fermented broth through heat sterilization and filtration is complete.

5. Conclusion

This study presents the first systematic jurisprudential analysis of *Galactomyces Ferment Filtrate* (GFF) in cosmetics, applying the classical Islamic doctrine of *Istihalah* across its three analytical dimensions: raw material (*al-asl*), transformation process (*at-tahawwul*), and final product (*an-natijah*). The following conclusions are drawn.

The raw materials of GFF production—rice, starch, and *Galactomyces* yeast—are categorically permissible (*mubah*), with no impure substance entering the process at the initial stage. The fermentation process produces ethanol as an incidental metabolic by-product, not as its intended output. It is therefore governed by the principle of intentionality in Islamic law (*al-umur bi-maqasidiha*) rather than by the rulings on *khamr* production. Downstream processing—comprising centrifugation, heat sterilization, and multi-stage filtration—removes all ethanol from the final filtrate, as confirmed by ingredient analyses of multiple commercial GFF products. The final ingredient is chemically and physically distinct from the intermediate fermented broth, bears its own internationally recognized name and cosmetic identity, does not interfere with acts of worship, and is safe for use. All conditions for *Istihalah Sahihah* are thereby satisfied.

This study concludes that commercial GFF qualifies as *tahir* (pure) and *halal* (permissible) for cosmetic use. This finding carries practical significance for multiple stakeholders: Muslim consumers may use GFF-containing skincare products without the doubt (*shubhah*) that has hitherto surrounded the ingredient; halal certification bodies may employ the *Istihalah* framework developed here as a template for evaluating other fermentation-derived cosmetic ingredients; and manufacturers seeking halal certification should document the absence of ethanol in their final formulations and the distinction of their production process from sake manufacturing.

Future research should extend this jurisprudential methodology to other biotechnology-derived cosmetic ingredients—including bacterial ferment filtrates and fermented plant extracts—and should engage the broader question of how Islamic law should systematically accommodate the increasingly complex transformations enabled by modern industrial biotechnology.

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