

The Potential of Bee Products as Cosmetic Active Ingredients: A Comprehensive Review

Rifka Najmi Sadiyah^{1*}, Sriwidodo², Patihul Husni²

¹Magister Program, Faculty of Pharmacy, Padjajaran University, Indonesia

²Department of Pharmacy and Pharmaceutical Technology, Faculty of Pharmacy, Padjajaran University, Indonesia

Article history:

Submitted: 8-8-2025

Revised: 28-8-2025

Accepted: 10-9-2025

Corresponding author e-mail:
rifka24002@mail.unpad.ac.id

Cite this article: Sadiyah, R.N., Sriwidodo., Husni, P. (2026). The Potential of Bee Products as Cosmetic Active Ingredients: A Comprehensive Review. Ad-Dawaa' J. Pharm. Sci. 9(1): 1-23.

Copyright:

This is an open-access article distributed under the terms of the CC BY-SA 4.0 license.



ABSTRACT

Introduction: The skin acts as a protective barrier against environmental exposure and contributes to sensory perception, temperature regulation, and vitamin D synthesis. Bee-derived products have gained attention in cosmetic research because they contain diverse bioactive compounds with antioxidant effect, antimicrobial, anti-inflammatory, moisturizing, and wound-healing properties. **Aims:** This review aimed to evaluate the potential of bee-derived products as active ingredients in cosmetic formulations and dermatological applications. **Methods:** A comprehensive literature search was conducted using PubMed, Scopus, and Google Scholar for studies published between 2010 and 2025. The review analyzed the bioactive composition, pharmacological activities, formulation characteristics, and cosmetic applications of bee-derived ingredients in topical preparations. **Results:** Bee-derived products contain various bioactive constituents, including flavonoids, phenolic compounds, amino acids, vitamins, enzymes, and antimicrobial peptides. These compounds contribute to antioxidant effect, antimicrobial, anti-inflammatory, moisturizing, and skin-repair activities. Several studies reported the successful incorporation of bee-derived ingredients into creams, gels, masks, soaps, lip balms, and serums with acceptable stability, safety, and skin compatibility. However, differences in botanical and environmental origins may influence their chemical composition and formulation consistency. **Conclusion:** Bee-derived products demonstrate strong potential as natural and multifunctional cosmetic ingredients. Their diverse biological activities support their application in skincare formulations, although further studies are required to improve standardization, optimize formulation processes, and confirm long-term safety and clinical efficacy.

KEYWORDS: Bee products, honey, propolis, royal jelly, bee pollen, beeswax, bee venom, cosmetics.

INTRODUCTION

Skin is the outermost and largest organ in the human body that functions as a protective layer against various external environmental factors, and can be an indicator of a person's health condition. The skin is composed of

three main layers: the epidermis, dermis and hypodermis. The epidermis acts as a protective barrier against various external environmental influences, while the dermis provides structural support and elasticity through the presence of connective tissue and collagen

fibers. As a complex organ, the skin has sensitive and elastic characteristics, and exhibits morphological and functional variations that are influenced by age, gender, climatic conditions, race, and anatomical location on the body (Tobin, 2017). The skin is an organ that integrates various major physiological systems, including the vascular, nervous, muscular, and immunological systems, as well as playing a role in psychoemotional mechanisms, ultraviolet radiation detection, and endocrine activity. This multisystem involvement makes the skin not only important in maintaining local homeostasis, but also contributes significantly to the systemic homeostasis of the human body (Hay et al., 2014).

Skin plays a vital role in protecting the inside of the body from direct contact with external factors, be it physical, chemical, UV radiation, or microbiological. According to the Federal Food, Drug & Cosmetic Act of the US FDA and Article L5131-1 of the French Public Health Code, cosmetic products are substances or preparations applied to the external parts of the body, such as the epidermis, external genitalia, nails, hair, lips, as well as teeth and mucous membranes of the oral cavity, for the purpose of cleansing, perfuming, protecting, modifying the appearance, or maintaining the condition of the body. Overall, cosmetic products serve for personal hygiene and aesthetics (Wang et al., 2015).

Various products produced by bees, such as honey, propolis, royal jelly, bee pollen,

beeswax, and bee venom, have benefits in treating various skin problems. Each type of bee product contains different bioactive compounds, with a complex chemical composition (Kurek-Górecka et al., 2020). In general, variations in the chemical composition of bee products are influenced by factors such as plant source, geographical origin, time of collection, as well as environmental conditions. Studies have shown that bee products have significant benefits for skin health. The use of honey, propolis, bee pollen and bee venom in the wound healing process has proven their therapeutic potential. (Goharshenasan et al., 2016; Komosinska-Vassev et al., 2015). Bee products are considered a natural source rich in antioxidants, which have the potential to counter the effects of oxidative stress. The antioxidants contained in bee products, such as honey, propolis and royal jelly are believed to reduce cellular damage caused by free radicals, thus aiding in the prevention and management of conditions caused by oxidative stress (Kocot et al., 2018).

Honey is a liquid produced by bees through a supersaturation process, the majority of which consisting of fructose and glucose. In addition, honey also contains some vitamins, amino acids, proteins, minerals, enzymes, and other minor components (Kurek-Górecka et al., 2020). Honey is also rich in vitamins such as A, B complex, D, K, and E that can support the health of the body as well as the beauty of the skin. Various theories point to the benefits

of honey, especially in beauty care, thanks to its abundant vitamin and mineral content as well as natural anti-bacterial and organic acids such as formic acid and lactic acid, which help maintain healthy skin (Hameed Gatea et al., 2023). Another antibacterial property of honey is due to the presence of a compound similar to lysozyme, known as inhibine. The higher the inhibine value, the stronger the antibiotic activity. The inhibine number is influenced by the type, age, and condition of the honey (Rintiswati et al., 2004).

Propolis is a resinous substance produced by honeybees (*Apis mellifera*) by collecting materials from various plants which are then mixed with wax and other secretions (Almeida et al., 2019). Propolis is a thin brown layer that coats honey sacs and bee pollen sacs (Khairunnisa et al., 2020). Due to its antimicrobial activity, propolis also creates an aseptic environment in the hive and is used to “mummify” the bodies of pests that are too large to be removed (Bonamigo et al., 2017). Propolis contains terpenes, waxy lipids, beeswax, vitamins, proteins, amino acids, minerals, and sugars. Propolis is known to have benefits as an anticancer, anti-inflammatory, and antimicrobial agent, and is able to stimulate skin tissue growth and accelerate wound healing (El-Sakhawy et al., 2023).

Bee pollen is a mixture of pollen from flowers obtained by honeybees, which is then mixed with nectar, enzymes, honey, and other secretions from bees. Bee pollen is formed by

a mixture of flower pollen from different species agglutinated by nectar and honey bee enzymes (e.g. amylase, catalase) secreted by the salivary glands and pollen (Xi et al., 2018).

Bee pollen is an active ingredient in cosmetics, generally used at a concentration of 0.5-5%. The significant effect of bee pollen on skin tissue is due to its high flavonoid content. The presence of flavonoids allows bee pollen to strengthen and close capillaries, this is also reinforced by the high vitamin C content. Bee pollen is also used in anti-dandruff shampoos for its ability to inhibit fungal growth and relieve scalp itching by providing moisturizing, nourishing, and regenerating properties (Kurek-Górecka et al., 2020).

Royal jelly is a thick, whitish-yellow substance produced from the mandibular and hypopharyngeal glands of *Apis mellifera* (young worker bees called nurses). Royal jelly possesses a sharp odor, exhibits mild acidity, and demonstrates a substantial buffering capacity. It comprises various bioactive components, including jellinein peptides I through IV, along with proteins, carbohydrates, lipids, vitamins, and minerals. The protein content is notably abundant in essential (exogenous) amino acids (Collazo et al., 2021). Royal jelly exerts multiple biofunctional effects on the skin due to its diverse biological properties, such as antimicrobial, anti-inflammatory, immune-regulating, anti-allergic, antioxidant effects, skin-tightening, hydrating, and anti-aging actions (Kurek-Górecka et al., 2020).

Beeswax is a natural substance resulting from the natural secretion of wax-producing glands in the abdomen of worker bees. Beeswax has lubricating and softening activity and reduces transepidermal water loss from the skin. Sterols, which are also components of the intercellular space, give beeswax these characteristics (Kurek-Górecka et al., 2020). Beeswax is commonly blended with propolis. Beeswax containing high levels of propolis helps provide antioxidant, antimicrobial and anti-inflammatory properties (Nong et al., 2023).

Bee venom is a complex mixture of various components, including the protein melittin, peptides, amino acids, phospholipids, sugars, as well as volatile compounds and minerals. Mellitin is the main component of bee venom with a concentration of about 40% to 60% and is used to characterize cosmetic products containing bee venom (Wehbe et al., 2019). However, bee venom can cause various side effects such as anaphylactic shock, edema, and allergies because melittin can form stable complexes with corneocyte cell membranes and cause cytotoxic effects on living cells (Elieh Ali Komi et al., 2018; Somwongin et al., 2018).

METHODS

This study employed a literature review method. Articles were searched through PubMed, ScienceDirect, and Google Scholar databases up to April 2025 using the following keywords: “bee”, “honey”, “propolis”, “bee

pollen”, “royal jelly”, “beeswax”, “bee venom”, “cosmetics”, and “formulation”.

The article selection process was conducted based on several inclusion criteria, including articles published in Indonesian or English up to April 2025, peer-reviewed research articles, and articles available in full-text access. To avoid duplicate data, all references were examined using Mendeley software. Furthermore, the researchers reviewed the titles and abstracts of the articles to assess their relevance to the research topic. Eligible articles were then analyzed further in the discussion section to obtain a comprehensive summary.

The initial search from the three databases yielded a total of 27,676 articles. After duplicate removal, application of the inclusion criteria, relevance screening based on titles and abstracts, and eligibility assessment, a total of 29 articles were finally included in this review study.

RESULTS

Molecular Properties and Structures

Pure honey has a complex chemical structure dominated by simple sugars such as fructose and glucose. In addition, honey contains disaccharides, oligosaccharides, organic acids (such as gluconic acid), amino acids (mainly proline), vitamins, minerals, and natural enzymes from bees. Honey is a supersaturated viscous liquid with a viscosity between 2-10 kPa-s and has the general molecular formula $C_{12}H_{22}O_{11}$. The elements

carbon, hydrogen and oxygen in honey are covalently bonded. The main composition is fructose and glucose, with about 1% sucrose, 17% water, and less than 10% other sugars (Usman Shamaki et al., 2014).

Propolis contains various secondary metabolites that function as antioxidants, including polyphenols (such as flavonoids, phenolic acids, and their esters), terpenoids, amino acids, and steroids (Sinala & Dewi, 2019). The location of the -OH group and the type of group that replaces it on the aromatic ring affect how strong the antioxidant activity of a compound is. The resonance of the aromatic ring causes the electrons on the oxygen atom to decrease, so hydrogen is easily released from the -OH group. As a result, phenolic compounds form phenoxyl radicals, which are quite stable due to the charge distribution in the aromatic ring (Kurek-Górecka et al., 2014).

Bee pollen contains phenolic acid compounds consisting of diverse structures. Structurally, the molecule consists of an aromatic ring and a carboxyl group. Common types of phenolic acids include benzoic acid, phenylacetic acid, and cinnamic acid (Rzepecka-Stojko et al., 2015). The content of bee venom consists of amino acids, peptides, proteins, enzymes, sugars, biogenic amines, volatile compounds, phospholipids, and pheromones. Bee venom is also very liquid as more than 80% of its volume consists of water. Of all these components, there are at least 18

compounds that are known to have pharmacological effects (Carpena et al., 2020).

Formulation of Bee Products in Cosmetic Products

Based on a literature review of relevant journals, there are a number of findings regarding the formulation of cosmetic preparations containing bee products, which are summarized in the following Table 1.

Honey

Honey contained in the formulation of facial moisturizing cream containing non-fermented cocoa bean methanol extract combined with honey serves to moisturize the skin and support the wound healing process. The vitamins and minerals in honey act as antioxidants, which help moisturize, soften, and improve skin structure (Yumas et al., 2016). The face cream formula based on methanol extract of non-fermented cocoa beans and bee honey is a face cream formula that has a viscosity of 2.72×10^5 cps, a pH value of 5.26 which is in accordance with the SNI 16-4399-1996 standard and normal skin pH (4.5-7.5), as well as a total plate number (ALT) and yeast mold value of 5×10^2 . The face cream showed a moisturizing effect with a moisture level of 73.8% within one hour. In addition, the cream did not cause skin and eye irritation, itching, or erythema (Yumas et al., 2016). Research by Andriani (2022), regarding the formulation of moisturizing cream made from watermelon rind extract (*Citrullus vulgaris*) and honey (*Mel depuratum*) showed

Table 1. Cosmetics formulation of bee product

Bee product	Formulation	Active ingredients	Benefit	Result	Reference
Honey	Face Cream	Rice, honey	Moisturizer	Face cream formulation B with concentration honey bees 2.34% give moisturizing power 73.8% for 1 hour.	(Yumas et al., 2016)
	Body scrub	Glutinous white rice, honey	Moisturizer	Formulation best for body scrub using sticky rice white with honey namely the formula with concentration of 4.6%, which has moisture level by 13.46%.	(Hairiyah et al., 2023)
	Peel Off Gel Mask	Turmeric and honey	Enhancer elasticity skin	Formulation The best peel off mask has concentration extract rhizome turmeric 1% and honey 4%.	(Cahnia et al., 2022)
	Moisturizing Cream	Skin watermelon and honey	Antioxidant	Formulation preparations F1, F2, and F3 show results that are classified as weak antioxidant, with the IC50 values were 447.92, 1037.40, and 1286.61, respectively.	(Andriani et al., 2022)
	Face Cream	Honey, herbal oil	Anti-aging	Formulation best selected, namely FS1, because in testing obtained results No There is redness, itching or irritation occurred on the skin volunteers due to dermatological testing.	(Altuntaş & Yener, 2015)
	Soap Congested	Skin orange fruit thin, honey	Antibacterial	Soap solid containing extract skin orange thin with addition honey at concentrations of 1% and 3% has been in accordance with quality test standards physique soap based on SNI 1.06-3532-2016.	(Aisiya, 2021)
	Hair tonic	Avocado, honey	Anti hair fall	The best hair tonic formulation obtained with composition extract fruit avocado with honey in a ratio of 3 ml : 3 ml, which has a pH of 6.83, ALT 2.3×10^1 colonies /ml, and free from bacteria and fungi.	(Diana & Wahini, 2014)
	Lip scrub	Honey	Moisturizer	Lip scrub formulation with addition honey show improvement water content. Stable lip scrub preparation and with quality good physical obtained in a formulation that has concentration honey as much as 6%.	(Sariningsih & Masyithah, 2021)

that this preparation has good physical that

Table 1. Cosmetics formulation of bee product (continue)

Product Bee	Formulation	Active Ingredients	Benefit	Result	Reference
	Liquid Soap	Bath Honey	Antibacterial	Concentration the most effective honey in liquid bath soap for hinder growth <i>Staphylococcus aureus</i> bacteria are in the range of 7.5–10%.	(Raisa et al., 2016)
Propolis	Body Scrub	Propolis, skin tongue crocodile	Antioxidant	The best formulation is with 5% propolis concentration and aloe vera crocodile 5%.	(Sylvia et al., 2022)
Bee Pollen	Gel Mask	Propolis, tongue crocodile	Anti- acne and Anti- aging	Gel mask formulation show activity antioxidant with percentage inhibition of 55.28% for F1, 79.75% for F2, and 92.43% for F3 respectively. In the test antibacterial, power the resulting barrier is 6 mm for F1, 10 mm for F2, and 12 mm for F3.	(Wardaniati & Islami, 2020)
	Cream	Propolis	Antioxidant	Making cream propolis extract can fulfil physical test requirements so that cream the stable.	(Kustiawan et al., 2022)
	Sunscreen Cream	Red Propolis	Protector rays	UV Formulated red propolis extract in cream curtain solar own characteristic photoprotective. High sun protection value found only with antioxidant activity.	(Valverde et al., 2023)
	Sunscreen Cream	extract and titanium dioxide	Protector rays	UV Formulation propolis extract and titanium dioxide own difference SPF value in different concentrations, the more high concentration of propolis and titanium dioxide so SPF value increases tall .	(Rohmani & Pangesti, 2024)
	Gel Mask	Bee Pollen	Antioxidant	Bee pollen shows activity Antioxidant and good formula that is has a neutral pH and produces the lowest IC50 value.	(Setianingsih, 2021)
	Soap Congested	Goat milk, bee pollen	Antibacterial	Formulation soap shows that the addition of 5.4% bee pollen can increase activity antibacterial and water content, as well as lower hardness and pH of the soap.	(Sinta W, 2019)
Beeswax	Lip Balm	Red sandalwood and beeswax	Moisturizer	Formulation of lip balm preparations made from wood sandalwood, beeswax is used as a base with the best concentration namely 5% and 10%.	(Ambari et al., 2020)

this preparation has good physical

Table 1. Cosmetics formulation of bee product (continue)

Product Bee	Formulation	Active Ingredients	Benefit	Result	Reference
Royal Jelly	Film Forming Gel	Royal jelly and honey		Royal jelly added in formulation can increase gel viscosity and properties film mechanics, with decline time significant drying when concentration low. Film -forming gel containing aromatic water honey and royal jelly go well together used as a peel-off mask.	(Thewanjuti wong et al., 2023)
Beeswax	Lip Balm	Skin fruit pomegranae black, beeswax, and carnauba wax.	Moisturizer	The best formula based on testing conducted namely on F4 with beeswax and carnauba wax concentration 7%;4%.	(Cholis Endriyatno et al., 2024)
	Cream	Red sandalwood and beeswax	Moisturizer	Cream formula extract sappanwood and beeswax sumbawa based on testing organoleptic best is F3 with Beeswax composition as much as 4 grams.	(Nealma, 2020)
	Lipstick	Skin red dragon fruit, beeswax, and paraffin wax.	Moisturizer	Beeswax in formulation play a role which can influence evaluation test results organoleptic, homogeneity, power smear, pH, and hardness lipstick.	(Febrianto & Apriliani, 2020)
	Cream Blush On	Skin fruit melinjo, beeswax	Decorative	Cream blush formulation skin fruit melinjo using beeswax as thickener. Increase beeswax concentration will cause consistency stock become more tall.	(Puspadina et al., 2022)
	Serum	Bee venom, honey	Antiwrinkles	Skin treated with bee venom serum experiences change significantly. Total wrinkle area decrease in accordance with period different treatments.	(Han et al., 2015)

properties, including positive results in organoleptic testing, pH, homogeneity, and spreadability. However, the preparation did not meet the adhesion test standard because the value was less than 4 seconds. However, the results of the irritation test and moisture test showed good performance within the required range, so this moisturizing cream has the potential to moisturize the skin and prevent dry

skin (Andriani et al., 2022). Honey formulated in cream preparations also has anti-aging potential. In a study conducted by Altuntas (2015), The development and assessment of creams formulated with herbal oils and honey were conducted to investigate their anti-aging potential. Skin hydration, specifically the moisture level in the stratum corneum the outermost layer of the skin is closely linked to

intrinsic aging processes and hormonal changes associated with menopause reduction in glycosaminoglycans compounds with hydrophilic characteristics is believed to contribute directly to diminished skin hydration (Altuntaş & Yener, 2015). The application of moisturizers supports the restoration of the skin's barrier function, promoting a smoother, more supple, and healthier appearance (Barel et al., 2009). The ability of honey to be used as a moisturizer can be derived from its natural humectant properties, namely its ability to attract and retain water in the skin (P. M. da Silva et al., 2016). The high glucose and fructose content in honey plays a role in forming hydrogen bonds with water molecules that help retain moisture in the stratum corneum layer, thus providing a hydrating effect on the skin. The moisturizing effect of honey not only comes from the high fructose and glucose content, but is also supported by various types of amino acids (mainly proline, as well as arginine, alanine, glutamic acid, aspartic acid, lysine, glycine, and leucine) and organic acids (mainly gluconic acid, as well as small amounts of lactic, citric, succinic, formic, malic, acetic, maleic, and oxalic acids). These components may reinforce the role of fructose and glucose in maintaining moisture in the stratum corneum layers (Burlando & Cornara, 2013a).

Honey-based facial cream products have gained increasing interest in cosmetic research due to their potential moisturizing and anti-

aging effects. The reviewed studies consistently demonstrated that honey enhances skin hydration through its natural humectant activity, which helps retain moisture in the stratum corneum (Altuntaş & Yener, 2015; Yumas et al., 2016). Nevertheless, variations in formulation performance were observed among the studies. Yumas et al. (2016) reported that the honey-containing cream fulfilled physicochemical quality requirements and showed no signs of skin irritation, whereas Andriani et al. (2022) found that although the product effectively increased skin hydration, it failed to meet the required adhesion standard. These inconsistencies suggest that the efficacy of honey in facial cream products may be influenced not only by the bioactive properties of honey but also by formulation-related factors, including the type of cream base, concentration of active compounds, and excipient composition. In addition, several methodological limitations were identified, such as limited sample sizes, short observation periods, and the lack of control groups or comparisons with commercial products, which may reduce the reliability of the reported outcomes. Furthermore, Altuntaş and Yener (2015) primarily discussed the theoretical mechanisms underlying skin hydration without providing sufficient clinical evidence regarding anti-aging efficacy. Therefore, further standardized and well-controlled studies are required to validate the long-term effectiveness, stability, and safety of honey-

based facial cream formulations for cosmetic applications.

Hairiyah's research (2023) developed a body scrub formulation made from white glutinous rice and honey with the best concentration of 4.6%, which functions to remove dead skin cells and provide moisture and nutrition to dry skin. This product has a yellowish white color, a distinctive aroma of glutinous rice and honey, a grainy texture, a neutral pH of 7, and is safe to use without causing irritation. Tests using Corneometer CM 825® showed a significant increase in skin moisture content after 4 and 8 weeks of use, from initial values of 54.40 to 73.42 and 79.65. In addition, pore and skin roughness measurements with the Aramo TS tool indicated a gradual decrease in pore size and skin roughness after use. However, the use of this body scrub also caused a significant decrease in skin elasticity. Overall, the formulation was effective in improving skin moisture and texture despite its impact on elasticity (Hairiyah et al., 2023). The decline in elasticity may indicate that the exfoliating particles in the scrub caused excessive mechanical abrasion or disruption of the skin barrier with prolonged application. In addition, the study did not include a control group or comparison with commercial exfoliating products, making it difficult to determine whether the reduction in elasticity was specifically caused by the formulation or by the exfoliation process itself. Therefore, despite the promising moisturizing effects, the

long-term safety and impact of the formulation on skin integrity require further investigation. Honey was also used in the lip scrub formulation as an exfoliating agent that helps remove dead skin cells. As a moisturizing ingredient, honey was tested using a skin analyzer after being applied to the lips and left on for 15 to 20 minutes. Lip moisture was measured every day for a week with regular use in the morning and at night. The results of the lip moisture test using honey showed an increase in moisture content of about 17.6% in all three panelists. Respondent 1 showed an increase of 19.7%, respondent 2 of 22.3%, and respondent 3 of 9.9%. Based on the evaluation, lip scrub formulation F2 with 6% honey concentration showed good and stable physical quality (Sariningsih & Masyithah, 2021).

In a study of peel off gel mask formulations combining turmeric rhizome extract and honey as ingredients to improve skin elasticity, it was found that the combination of 1% turmeric and 4% honey formulation was effective in gradually improving facial skin firmness. Improvements in skin firmness were seen weekly over four weeks of use, as indicated by an increase in the percentage of skin firmness after each application. This study employed both positive and negative control groups, allowing a clearer evaluation of the formulation's effectiveness. The negative control group (K-), which did not contain active ingredients, showed lower improvement in skin elasticity compared with the

formulation group (F1) and the positive control group (K+). These findings suggest that the improvement in skin firmness may be associated with the antioxidant activity of turmeric and honey, which can help protect skin collagen from damage caused by free radicals and UV exposure (Cahnia et al., 2022).

Other research shows that honey can also be formulated in solid soap with a combination of lime peel at a concentration of 1% and 3%. The results of homogeneity testing show that the formula made is stable and homogeneous, characterized by the absence of large particles so that it is not rough on glass objects for 3 weeks. In addition, in the stability test, it was found that the foam in solid soap containing lime peel extract and honey met the standard requirements, with values in the range of 0.22% to 0.25% (Aisiya Rahmawati et al., 2021). The addition of honey in liquid soap has proven effective in inhibiting the growth of *Staphylococcus aureus* bacteria. The most optimal concentration of honey is in the range of 7.5% to 10%, because in this range the maximum antibacterial effect is achieved without significant differences between the two. Soap with honey at a concentration of 5-10% produced an inhibition zone that was equivalent or even wider than that of soap with 0.3% triclosan. In addition, honey also affects the physical properties of the soap, decreasing pH and viscosity, but increasing specific gravity and the amount of foam produced (Raisa et al., 2016).

The hair tonic formulation consisting of 3 ml of avocado extract and 3 ml of honey has a greenish yellow color, looks clear, and has a distinctive aroma of avocado and honey. When used, this product feels a little astringent and slightly oily. The 3 ml honey contained in the formula has an active ingredient pinocembrin of 4.2 mg/100 ml, which functions to strengthen the hair (Diana & Wahini, 2014).

Propolis

Propolis has antimicrobial and anti-inflammatory properties, which can be used in scrub preparations. Body scrub containing propolis (*Trigona* sp) and aloe vera in cream form has a distinctive aroma, homogeneous texture, and pH between 4.5 to 7.0, which is in accordance with the natural pH of the skin. However, the spreadability is less than optimal as it does not meet the set standards. The viscosity ranges from 2266 cps to 24272 cps. Based on the hedonic test, the formula with the highest test score was considered the best formula. The best formula for the Body scrub made from propolis and aloe vera skin is formula 2 with a concentration of 5%:5% (Sylvia et al., 2022).

In a study conducted by Wardaniati (2020), a gel mask formulation with a composition of propolis and aloe vera extracts was made with the aim of anti-aging and anti-acne, so that the active substances can work longer on facial skin. The results showed that the evaluation of gel mask formulations made from aloe vera and propolis extracts met the quality standards

for testing, homogeneity, drying time, adhesion, and spreadability. However, the pH and viscosity tests did not meet the requirements. For inhibition against *Propionibacterium acnes*, formulas F1, F2, and F3 showed inhibition zones of 6 mm, 10 mm, and 12 mm, respectively, while the positive control reached 18 mm. The antioxidant activity of this gel mask resulted in an inhibition percentage of 55.28% for F1, 79.75% for F2, and 92.43% for F3 (Wardaniati & Islami, 2020).

Propolis can also be formulated in a cream dosage form that shows consistent stability evaluation results, with a light brown color, soft distinctive aroma, smooth semi-solid texture, homogeneous properties, pH 7, spreadability of 6.5 cm, and adhesion for 260 seconds. This cream fulfills the physical test standards that have been carried out and shows good physical stability during the storage period (Kustiawan et al., 2022).

Propolis is also found in sunscreen formulations. In a study conducted by Valverde (2023), research was conducted on red propolis extract in sunscreen formulations by conducting anti-inflammatory, antimicrobial, antioxidant, and photoprotective testing. The high value of sun protection is only determined by antioxidant activity. The results showed that the incorporation of ethanol extracts of propolis in photoprotective formulations, in addition to intensifying the sun protection value, ensures, for the preparation, other properties of

propolis, such as antimicrobial, anti-inflammatory, antioxidant and healing properties (Valverde et al., 2023). Another study was conducted by Almeida (2019) regarding photoprotective activity and SPF increase in sunscreen formulations added with red propolis extract. The study showed that red propolis has an important role in the formulation of sunscreen preparations obtained an increase in SPF and antioxidant activity which is relative enough to produce better skin protection (Almeida et al., 2019).

Propolis has potential as an anti-aging agent thanks to its bioactive compounds, such as phenolic acids (including caffeic acid, ferulic acid, and p-cumaric acid) and flavonoids (such as quercetin, myricetin, and pinocembrin). These compounds have antioxidant, anti-inflammatory, and antimicrobial activities that can inhibit the action of the collagenase enzyme, thus helping to prevent collagen damage, one of the main factors causing wrinkles due to aging and exposure to ultraviolet light. Cytotoxicity tests on HaCaT skin cells also showed that the propolis fraction with anti-wrinkle activity is non-toxic, making it a safe ingredient to use in cosmetic products to prevent and reduce fine lines naturally (Radić et al., 2024)

Bee Pollen

Bee pollen or also called bee pollen has antioxidant activity because it contains flavonoid and polyphenol compounds. In a study conducted by Setyaningsih (2021), it

was found that the formulation with the smallest IC₅₀ value or the highest antioxidant activity was obtained by formula III which had an IC₅₀ value of 66.11 µg/mL. In the research conducted, the addition of bee pollen was proven to have an effect on determining the IC₅₀ value in a preparation (Setianingsih, 2021).

Bee pollen has antibacterial properties that are beneficial for fighting various types of bacteria. Active substances found in bee pollen, such as flavonoids, phenolic acids, and terpenoids, are known to have antibacterial properties that can help fight skin infections and boost the immune system. Bee pollen added in goat milk solid soap formulations is useful as a moisturizer, and a nutrient provider and can determine the percentage that gives the most effective results in testing the moisture content, anti-bacterial activity, pH, and hardness test of the solid soap. The results showed that varying the percentage of bee pollen addition to goat milk solid soap affected the antibacterial quality, pH, hardness, and water content. The addition of bee pollen can increase water content and anti-bacterial activity, as well as reduce hardness and pH. The most optimal treatment was found at a percentage of bee pollen of 5.4%, with an average value of 20.53% water content, 5.73 mm anti-bacterial activity, 9.65 pH test, and 43.17 N hardness test (Sinta, 2019).

Royal Jelly

Royal jelly, secreted by the cephalic glands of worker nurse bees, possesses a complex and multifaceted chemical composition consisting of various elements and includes water, proteins, lipids, carbohydrates, amino acids, mineral salts, vitamins, enzymes, hormones, oligo-elements, and natural antibiotics (Pavel et al., 2011). Earlier research has indicated that adding royal jelly to emulsion-based formulations does not compromise their stability, while enhancing dermal absorption and avoiding the formation of a greasy residue. A concentration range of 0.5% to 1% is typically advised, as royal jelly demonstrates notable moisturizing effects at these levels. (Kurek-Górecka et al., 2020). Royal jelly added in formulations can increase the viscosity of the gel and the mechanical properties of the film, with a significant decrease in drying time when the concentration is low. On macroscopic investigation of the formulation without royal jelly added, irregular air gaps were found in the gel film. However, when royal jelly was added the air gaps became more regular. The addition of royal jelly and honey aromatic water did not alter the chemical composition or crystalline structure of the film. Consequently, it can be inferred that the gel-forming film containing both honey aromatic water and royal jelly is appropriate for use as a peel-off mask, exhibiting the desirable aesthetic properties of both gel and film forms (Thewanjutiwong et al., 2023).

Beeswax

Beeswax or also called beeswax is commonly used in cosmetic preparations as a thickener, film-former, and protector. Beeswax is usually found in topical preparations such as creams, ointments, and lip balms. Beeswax in the formulation of beeswax preparations functions as a base. The concentrations of beeswax used are 5% and 10% where these results meet the criteria for optimal physical stability, where the lip balm preparation produces a good texture, attractive color, pleasant aroma, and has effective adhesion and spreadability. In addition, the pH is in accordance with the natural pH of the lips, does not cause irritation, has a homogeneous consistency, and remains stable during storage (Ambari et al., 2020). In lipbalm formulations, beeswax can also be combined with carnauba wax as a base with different concentrations, which will affect the test. The combination of beeswax and carnauba wax produces a homogeneous preparation, has moist to very moist moisture, as well as spreadability, and pH of the preparation that meets the requirements. Based on research conducted by Cholis (2024), the best physical testing of lipbalm preparations is with a concentration of 7% beeswax and 4% carnauba wax (Cholis Endriyatno et al., 2024).

Beeswax can also be added in decorative cosmetic formulations such as cream blush and lipstick. In a study conducted by Puspadina (2022), a cream blush preparation made from

melinjo fruit peel was made with the addition of beeswax with a concentration of 20% which had an influence on the consistency of the preparation. A high concentration of beeswax will increase the consistency of the cream blush preparation, but reduce the spreadability, because beeswax functions as a thickening agent in this formulation (Puspadina et al., 2022).

Bee Venom

Serum made from bee venom has been developed as a cosmetic product that aims to reduce the appearance of wrinkles due to the aging process. In a study conducted by Han (2015) found that bee venom serum treatment was clinically able to improve facial wrinkles by reducing the total area of wrinkles, the total number of wrinkles, and the average depth of wrinkles. The study results demonstrated a significant improvement in the subjects visual assessments following the application of bee venom serum, with reductions of 6.64% ($P = 0.002$) at week 8 and 11.83% ($P = 0.0003$) at week 12, compared to a 2.49% decrease at baseline. The total wrinkle area showed a gradual, time-dependent decrease from $26.04 \pm 3.46 \text{ mm}^2$ at baseline to $25.75 \pm 3.31 \text{ mm}^2$, $24.84 \pm 3.61 \text{ mm}^2$, and $24.44 \pm 2.69 \text{ mm}^2$ at weeks 4, 8, and 12, respectively. The total wrinkle count varied across treatment periods (week 0: 104.05 ± 31.96 ; week 4: 103.05 ± 32.39 ; week 8: 105.00 ± 42.11 ; week 12: 99.91 ± 32.17). Similarly, an average decrease in wrinkle depth was observed over time (week

0: $361.46 \pm 94.48 \mu\text{m}$; week 4: $345.15 \pm 85.72 \mu\text{m}$; week 8: $330.14 \pm 81.24 \mu\text{m}$; week 12: $321.08 \pm 78.91 \mu\text{m}$). Statistical analysis revealed that significant differences were present only at week 12. These findings suggest a substantial anti-wrinkle effect of bee venom serum after prolonged use (Han et al., 2015). However, the study provided limited information about long-term safety evaluation, which may affect the reliability and broader applicability of the findings.

Bee venom also has potential as an anti-acne agent. The study evaluated bee venom serum's effectiveness in treating acne by counting lesions using visual and image analysis. Findings revealed significant improvement in acne severity and lesion reduction after 3 and 6 weeks. Bee venom's anti-inflammatory effects, mainly from melittin, were shown to inhibit key inflammatory pathways linked to acne. Image analysis supported clinical results, highlighting the serum's fast and effective action. Bee venom serum appears to be a safe and promising option for long-term acne treatment with minimal skin irritation (Han et al., 2016).

DISCUSSION

Bee products have attracted increasing attention in cosmetic and dermatological applications due to their rich composition of bioactive compounds and multifunctional biological activities. Based on the reviewed studies, honey, propolis, bee pollen, royal

jelly, beeswax, and bee venom demonstrate distinct functional properties that may contribute to skin hydration, antioxidant protection, antimicrobial activity, anti-inflammatory effects, photoprotection, and anti-aging activity. However, the effectiveness of bee-derived ingredients in topical formulations is not solely determined by their intrinsic biological properties, but is also strongly influenced by formulation characteristics, excipient interactions, dosage form, physicochemical stability, and penetration ability through the skin barrier.

Honey was the most extensively investigated bee product in cosmetic formulations, particularly as a natural moisturizing agent. The humectant activity of honey is mainly attributed to its high fructose and glucose content, which can attract and retain water molecules within the stratum corneum through hydrogen bonding mechanisms. In addition, amino acids and organic acids present in honey may contribute to maintaining skin hydration and improving skin barrier function (Burlando & Cornara, 2013b). Several reviewed studies consistently demonstrated that honey-containing formulations improved skin moisture content in creams, body scrubs, lip scrubs, and soap preparations. The moisturizing effect observed by Yumas et al. (2016), Hairiyah et al. (2023), and Sariningsih and Masyithah (2021) supports the hypothesis that honey acts as an effective natural humectant capable of enhancing stratum corneum hydration.

Despite these promising effects, variations in formulation performance were observed among studies. For example, the honey-containing facial cream developed by Yumas et al. (2016) fulfilled physicochemical quality requirements and showed no irritation potential, whereas Andriani et al. (2022) reported insufficient adhesion properties despite acceptable moisturizing performance. These discrepancies indicate that the functionality of honey in cosmetic preparations depends not only on its biological activity but also on the optimization of formulation parameters such as emulsifier composition, viscosity modifiers, and oil-water phase balance. Due to its hygroscopic nature, honey may influence emulsion consistency and rheological behavior, potentially affecting spreadability and adhesion. Similar formulation-related limitations have also been reported in other natural product-based cosmetics (M. V. da Silva et al., 2020). Therefore, future studies should focus on formulation optimization and long-term stability evaluation to ensure consistent product performance.

Compared with other bee products, honey primarily functions as a moisturizing and skin-conditioning agent rather than a potent antimicrobial or anti-aging compound. Although honey demonstrated antibacterial activity against *Staphylococcus aureus*, particularly at concentrations of 7.5–10%, its antimicrobial potency appears lower than that reported for propolis or bee venom. This

difference may be explained by the distinct phytochemical compositions of these bee products. Honey exerts antibacterial activity mainly through osmotic effects, acidity, hydrogen peroxide generation, and phenolic compounds, whereas propolis and bee venom contain more specific antimicrobial bioactives with stronger mechanisms of action (Pasupuleti et al., 2017).

Propolis exhibited broader and more potent biological activities compared with honey, particularly in antioxidant, anti-inflammatory, antimicrobial, and photoprotective applications. The high content of flavonoids and phenolic acids, including caffeic acid, ferulic acid, quercetin, pinocembrin, and caffeic acid phenethyl ester (CAPE), contributes significantly to the inhibition of reactive oxygen species (ROS) and inflammatory pathways associated with skin aging (Bankova et al., 2014). Furthermore, propolis demonstrated the ability to enhance sunscreen performance by increasing SPF values and antioxidant activity in photoprotective formulations (Almeida et al., 2019; Valverde et al., 2023). This photoprotective property distinguishes propolis from most other bee products, which are primarily associated with moisturizing or antimicrobial functions.

The anti-aging potential of propolis is also supported by its ability to inhibit collagenase activity and protect dermal collagen from oxidative degradation. Radić et al. (2024) reported that propolis fractions rich in phenolic

compounds exhibited anti-wrinkle activity without cytotoxic effects on HaCaT cells, suggesting promising safety and efficacy profiles for cosmetic applications. Compared with honey and bee pollen, propolis appears to possess stronger antioxidant and anti-inflammatory activities due to its higher concentration of phenolic constituents. Nevertheless, the major limitation of propolis-based formulations is the lack of chemical standardization. The chemical composition of propolis is highly dependent on botanical source, geographical origin, season, and bee species, leading to considerable variability in biological activity among studies (Sforcin & Bankova, 2011). This variability complicates reproducibility and may limit large-scale industrial application unless standardized extraction and characterization methods are established.

Bee pollen demonstrated potential mainly as an antioxidant and antibacterial ingredient due to its flavonoid, polyphenol, and terpenoid content. The reviewed studies indicated that bee pollen contributed to improved antioxidant activity and antibacterial performance in cosmetic formulations. In addition, bee pollen contains proteins, vitamins, amino acids, and minerals that may support skin nourishment and regeneration. Compared with propolis, however, bee pollen generally exhibits weaker antioxidant potency because of its lower phenolic concentration. The use of bee pollen in goat milk soap formulations also revealed that increasing bee pollen concentration

elevated water content and reduced product hardness. Although this may improve moisturizing performance, excessive water retention could compromise microbiological stability and shorten shelf life if preservation systems are inadequate. Therefore, future formulation strategies involving bee pollen should carefully consider water activity and preservation optimization.

Royal jelly possesses a unique composition rich in proteins, lipids, vitamins, enzymes, and bioactive fatty acids such as 10-hydroxy-2-decenoic acid (10-HDA), which are associated with regenerative and moisturizing effects (Pavel et al., 2011). Unlike honey, whose moisturizing activity mainly relies on humectancy, royal jelly may improve skin hydration through both nutritional support and enhancement of dermal absorption. Kurek-Górecka et al. (2020) reported that royal jelly enhanced dermal penetration without compromising formulation stability. Furthermore, Thewanjutiwong et al. (2023) demonstrated that royal jelly improved the mechanical and aesthetic properties of peel-off mask films by producing more uniform structures and reducing drying time at low concentrations. These findings suggest that royal jelly may serve as a multifunctional ingredient capable of improving both formulation performance and skin conditioning properties. However, compared with honey and propolis, research involving royal jelly in topical cosmetics remains

relatively limited, particularly regarding clinical efficacy and long-term safety.

Beeswax differs substantially from other bee products because its primary role in cosmetics is related to formulation structure rather than biological activity. Beeswax functions mainly as a thickening agent, film former, emollient, and stabilizer in topical preparations such as lip balms, creams, and decorative cosmetics. Several studies demonstrated that beeswax improved texture, consistency, spreadability, and product stability. However, increasing beeswax concentration may reduce spreadability due to excessive viscosity, indicating the need for careful concentration optimization. Compared with propolis, honey, or bee venom, beeswax contributes less to direct pharmacological effects but plays an essential role in maintaining physical stability and sensory acceptability of cosmetic products.

Among all reviewed bee products, bee venom demonstrated the most targeted biological activity, particularly for anti-aging and anti-acne applications. Melittin, the principal active peptide in bee venom, has been reported to suppress inflammatory mediators such as $\text{TNF-}\alpha$, $\text{IL-1}\beta$, and IL-6 , which are associated with acne pathogenesis and skin aging (Han et al., 2016). Clinical findings by Han et al. (2015) showed that prolonged application of bee venom serum significantly reduced wrinkle area, wrinkle depth, and wrinkle count after 12 weeks of treatment. Compared with other bee products,

bee venom appears to provide more direct cellular and molecular effects related to inflammation regulation and collagen metabolism. Nevertheless, despite its promising efficacy, bee venom presents important safety concerns due to the risk of hypersensitivity reactions and irritation. Most reviewed studies also involved relatively small sample sizes and limited long-term safety evaluation, which may reduce the generalizability of the findings. Consequently, additional large-scale clinical studies are necessary before bee venom can be widely implemented in commercial cosmetic formulations.

Overall, the reviewed evidence demonstrates that each bee product possesses distinct advantages and limitations in cosmetic applications. Honey primarily acts as a humectant and moisturizing agent, propolis exhibits superior antioxidant and photoprotective properties, bee pollen contributes nutritional and antioxidant benefits, royal jelly enhances hydration and dermal conditioning, beeswax improves formulation stability, and bee venom provides potent anti-aging and anti-inflammatory effects. These complementary characteristics suggest that combining multiple bee products within a single formulation may produce synergistic effects and broader cosmetic functionality. However, most available studies remain preliminary and are frequently limited by short observation periods, insufficient control groups, small sample sizes, and lack of

ingredient standardization. Therefore, future research should prioritize standardized extraction methods, comprehensive safety assessments, long-term clinical evaluations, and mechanistic studies to validate the efficacy and reproducibility of bee product-based cosmetic formulations for dermatological applications.

CONCLUSION

Bee products, including honey, propolis, royal jelly, bee pollen, beeswax, and bee venom, represent a rich and diverse source of bioactive compounds with significant potential as active ingredients in cosmetic formulations. Their complex chemical compositions, encompassing antioxidants, vitamins, peptides, and phenolic compounds, contribute to various dermatological benefits such as antimicrobial, anti-inflammatory, antioxidant, moisturizing, and skin-repairing effects. The variability in bioactive constituents, influenced by botanical origin and environmental factors, underscores the importance of standardization in cosmetic applications. Given their multifunctional properties and natural origin, bee-derived substances offer promising alternatives for developing safe and effective skincare products that support skin health and aesthetic improvement. Despite these promising findings, this review has several limitations. Most of the included studies were derived from local journals with relatively small sample sizes and non-standardized research

methodologies. In addition, several studies did not include control groups, long-term stability evaluations, or comprehensive safety assessments, thereby limiting the validity and generalizability of the findings. Therefore, further studies, including long-term safety assessments and stability studies conducted in accordance with the International Council for Harmonisation (ICH) guidelines, are required to ensure the efficacy, safety, and quality of cosmetic formulations containing bee-derived products.

REFERENCES

- Aisiya Rahmawati, P., Purwati, E., Ardianti, F. P., & Ikhda Nur Hamidah Safitri, C. (2021). Formulasi dan Uji Mutu Fisik Sediaan Sabun Padat Herbal Ekstrak Kulit Buah Jeruk Nipis (*Citrus aurantifolia*). *Seminar Nasional Pendidikan Biologi Dan Saintek*, (2527-533X), 486491.
- Almeida, W. A. da S., Antunes, A. dos S., Penido, R. G., Correa, H. S. da G., Nascimento, A. M. do, Andrade, Â. L., Santos, V. R., Cazati, T., Amparo, T. R., Souza, G. H. B. de, Freitas, K. M., Santos, O. D. H. dos, Sousa, L. R. D., & Santos, V. M. R. dos. (2019). Photoprotective activity and increase of SPF in sunscreen formulation using lyophilized red propolis extracts from Alagoas. *Revista Brasileira de Farmacognosia*, 29(3), 373–380. <https://doi.org/10.1016/j.bjp.2019.02.003>
- Altuntaş, E., & Yener, G. (2015). Anti-aging potential of a cream containing herbal oils and honey: Formulation and in vivo evaluation of effectiveness using non-invasive biophysical techniques. *IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)*, 10(6), 51–60. <https://doi.org/10.9790/3008-10615160>
- Ambari, Y., Nanda Dwi Hapsari, F., Wahyu Ningsih, A., & Hanifa Nurrosyidah, I.

- (2020). Studi Formulasi Sediaan Lip Balm Ekstrak Kayu Secang (*Caesalpinia sappan* L.) dengan Variasi Beeswax. *Journal Islamic Pharm*, 5(2), 36–45. <https://doi.org/10.18860/jip.v5i2.10434>
- Andriani, D., Fadhila, Z. N., Dewayanti, A. A., Farmasi, P. S., Tinggi, S., & Nasional, I. K. (2022). Formulasi Moisturizing Cream Kombinasi Ekstrak Kulit Semangka (*Citrullus vulgaris*) Dan Madu (*Mel depuratum*) Sebagai Antioksidan. *Medihealth: Jurnal Ilmu Kesehatan Sains*, 2(2797–7560), 27–34. <https://doi.org/10.35799/pha.13.2024.49564>
- Bankova, V., Popova, M., & Trusheva, B. (2014). Propolis volatile compounds: Chemical diversity and biological activity: A review. In *Chemistry Central Journal* (Vol. 8, Number 1). BioMed Central Ltd. <https://doi.org/10.1186/1752-153X-8-28>
- Barel, A. O., Paye, Marc., & Maibach, H. I. (2009). *Handbook of cosmetic science and technology*. Informa Healthcare.
- Bonamigo, T., Campos, J. F., Oliveira, A. S., Torquato, H. F. V., Balestieri, J. B. P., Cardoso, C. A. L., Paredes-Gamero, E. J., Souza, K. de P., & Dos Santos, E. L. (2017). Antioxidant and cytotoxic activity of propolis of *Plebeia droryana* and *Apis mellifera* (Hymenoptera, Apidae) from the Brazilian Cerrado biome. *PLoS ONE*, 12(9). <https://doi.org/10.1371/journal.pone.0183983>
- Burlando, B., & Cornara, L. (2013a). Honey in dermatology and skin care: a review. In *Journal of Cosmetic Dermatology* (Vol. 12). <https://doi.org/10.1111/jocd.12058>
- Burlando, B., & Cornara, L. (2013b). Honey in Dermatology and Skin Care: A Review. *Journal of Cosmetic Dermatology*, 12, 306–313. <https://doi.org/10.1111/jocd.12058>
- Cahnia, M. S., Muhaimin, Yuliawati, Lestari, U., & Sani, F. (2022). Formulasi, Uji Eefektivitas dan Uji Hedonik Masker Gel Peel Off Kombinasi Ekstrak Rimpang Kunyit (*Curcuma longa* L.) dan Madu (*Mel depuratum*) Sebagai Peningkat Elastisitas Kulit. *Medical Sains : Jurnal Ilmiah Kefarmasian*, 7(2), 23–36.
- Carpena, M., Nuñez-Estevez, B., Soria-Lopez, A., & Simal-Gandara, J. (2020). Bee venom: An updating review of its bioactive molecules and its health applications. In *Nutrients* (Vol. 12, Number 11, pp. 1–27). MDPI AG. <https://doi.org/10.3390/nu12113360>
- Cholis Endriyatno, N., Walid, M., Nurani, K., & Aifa, A. L. (2024). Formulasi dan Penentuan Nilai SPF Lip Balm Ekstrak Kulit Buah Delima Hitam (*Punica granatum* L.) dengan Variasi Konsentrasi Basis Beeswax dan Carnauba Wax. *Jurnal Mandala Pharmacon Indonesia (JMPI)*, 10(1), 290–301. <https://doi.org/10.35311/jmpi.v10i1.516>
- Collazo, N., Carpena, M., Nuñez-estevez, B., Otero, P., Simal-gandara, J., & Prieto, M. A. (2021). Health promoting properties of bee royal jelly: Food of the queens. In *Nutrients* (Vol. 13, Number 2, pp. 1–26). MDPI AG. <https://doi.org/10.3390/nu13020543>
- da Silva, M. V., de Moura, N. G., Motoyama, A. B., & Ferreira, V. M. (2020). A review of the potential therapeutic and cosmetic use of propolis in topical formulations. In *Journal of Applied Pharmaceutical Science* (Vol. 10, Number 1, pp. 131–141). Open Science Publishers LLP Inc. <https://doi.org/10.7324/JAPS.2020.101018>
- da Silva, P. M., Gauche, C., Gonzaga, L. V., Costa, A. C. O., & Fett, R. (2016). Honey: Chemical Composition, Stability and Authenticity. *Food Chemistry*, 196, 309–323. <https://doi.org/10.1016/j.foodchem.2015.09.051>
- Diana, W., & Wahini, M. (2014). Penggunaan Ekstrak Buah Alpukat dan Madu sebagai Bahan Aktif Hair Tonic untuk Rambut Rontok. *E-Journal*, 03, 226–235.
- Elieh Ali Komi, D., Shafaghat, F., & Zwiener, R. D. (2018). Immunology of Bee Venom. In *Clinical Reviews in Allergy and Immunology* (Vol. 54, Number 3, pp. 386–396). Humana Press Inc.

- <https://doi.org/10.1007/s12016-017-8597-4>
El-Sakhawy, M., Salama, A., & Tohamy, H.-A. S. (2023). Applications of Propolis-Based Materials in Wound Healing. *Archives of Dermatological Research*, 316(1), 61.
<https://doi.org/10.1007/s00403-023-02789-x>
- Febrianto, Y., & Apriliani, F. N. (2020). Formulasi Sediaan Lipstik Menggunakan Ekstrak Kulit Buah Naga Merah (*Hylocereus Costaricensis*) Dengan Kombinasi Beeswax dan Paraffin Wax. *Jurnal Farmasi Udayana*, 11(01), 2301–7716.
<https://doi.org/10.24843/JFU.2021.v11.i01.p04>
- Goharshenasan, P., Amini, S., Atria, A., Abtahi, H., & Khorasani, G. (2016). Topical Application of Honey on Surgical Wounds: A Randomized Clinical Trial. *Forschende Komplementarmedizin*, 23(1), 12–15.
<https://doi.org/10.1159/000441994>
- Hairiyah, N., Nuryanti, & Nordiyah, F. (2023). Formulasi Pembuatan Bodyscrub Berbahan Dsaar Beras Ketan Putih (*Oryza sativa* var glutinous) dan Madu. *Jurnal Teknologi Pertanian Andalas*, 6(2579–4019), 1.
- Hameed Gatea, A., Anatheil, A. H., & Mohammed Ali, A. (2023). Overview on Bee products in Skin care and Hair care. *Modern Medical Laboratory Journal*, 6(1), 22–28.
<https://doi.org/10.30699/mmlj17.6.1.22>
- Han, S. M., Hong, I. P., Woo, S. O., Chun, S. N., Park, K. K., Nicholls, Y. M., & Pak, S. C. (2015). The beneficial effects of honeybee-venom serum on facial wrinkles in humans. *Clinical Interventions in Aging*, 10, 1587–1592.
<https://doi.org/10.2147/CIA.S84940>
- Han, S. M., Pak, S. C., Nicholls, Y. M., & Macfarlane, N. (2016). Evaluation of anti-acne property of purified bee venom serum in humans. *Journal of Cosmetic Dermatology*, 15(4), 324–329.
<https://doi.org/10.1111/jocd.12227>
- Hay, R. J., Johns, N. E., Williams, H. C., Bolliger, I. W., Dellavalle, R. P., Margolis, D. J., Marks, R., Naldi, L., Weinstock, M. A., Wulf, S. K., Michaud, C., J.I. Murray, C., & Naghavi, M. (2014). The global burden of skin disease in 2010: An analysis of the prevalence and impact of skin conditions. *Journal of Investigative Dermatology*, 134(6), 1527–1534.
<https://doi.org/10.1038/jid.2013.446>
- Khairunnisa, K., Mardawati, E., & Putri, S. H. (2020). Karakteristik Fitokimia dan Aktivitas Antioksidan Ekstrak Propolis Lebah Trigona Sp. *Jurnal Industri Pertanian*, 02(2656–6559), 124–129.
<http://jurnal.unpad.ac.id/justin>
- Kocot, J., Kielczykowska, M., Luchowska-Kocot, D., Kurzepa, J., & Musik, I. (2018). Antioxidant potential of propolis, bee pollen, and royal jelly: Possible medical application. In *Oxidative Medicine and Cellular Longevity* (Vol. 2018). Hindawi Limited.
<https://doi.org/10.1155/2018/7074209>
- Komosinska-Vassev, K., Olczyk, P., Kaźmierczak, J., Mencner, L., & Olczyk, K. (2015). Bee pollen: Chemical composition and therapeutic application. In *Evidence-based Complementary and Alternative Medicine* (Vol. 2015). Hindawi Publishing Corporation.
<https://doi.org/10.1155/2015/297425>
- Kurek-Górecka, A., Górecki, M., Rzepecka-Stojko, A., Balwierz, R., & Stojko, J. (2020). Bee products in dermatology and skin care. In *Molecules* (Vol. 25, Number 3). MDPI AG.
<https://doi.org/10.3390/molecules25030556>
- Kurek-Górecka, A., Rzepecka-Stojko, A., Górecki, M., Stojko, J., Sosada, M., & Swierczek-Zieba, G. (2014). Structure and antioxidant activity of polyphenols derived from propolis. In *Molecules* (Vol. 19, Number 1, pp. 78–101).
<https://doi.org/10.3390/molecules19010078>
- Kustiawan, P. M., Nur, D., Hanifa, C., Alib Batistuta, M., & Zulfa, A. F. (2022). Evaluasi Stabilitas Formulasi Krim Ekstrak Propolis Geniotrigona thoracica. *Journal Syifa Sciences and Clinical Research (JSSCR)*, 4(3).

- <https://doi.org/10.37311/jsscr.v4i3.14239>
- Nealma, S. (2020). Formulasi dan Evaluasi Fisik Krim Kosmetik dengan Variasi Ekstrak Kayu Secang (*Caesalpinia sappan*) dan Beeswax Sumbawa. *Jurnal Tambora*, 4(2), 8–5. <https://doi.org/10.36761/jt.v4i2.634>
- Nong, Y., Maloh, J., Natarelli, N., Gunt, H. B., Tristani, E., & Sivamani, R. K. (2023). A review of the use of beeswax in skincare. In *Journal of Cosmetic Dermatology* (Vol. 22, Number 8, pp. 2166–2173). John Wiley and Sons Inc. <https://doi.org/10.1111/jocd.15718>
- Pasupuleti, V. R., Sammugam, L., Ramesh, N., & Gan, S. H. (2017). Honey, Propolis, and Royal Jelly: A Comprehensive Review of Their Biological Actions and Health Benefits. *Oxidative Medicine and Cellular Longevity*, 2017(1). <https://doi.org/10.1155/2017/1259510>
- Pavel, C. I., Al Mărghitaș, L., Bobiș, O., Dezmirean, D. S., Șapcaliu, A., Radoi, I., & Mădaș, M. N. (2011). Biological Activities of Royal Jelly-Review. In *Scientific Papers: Animal Science and Biotechnologies* (Number 2).
- Puspadina, V., Suci, P. R., Ikhda N.H.S, C., Alfiaur Ro'is, W., & Sari, S. (2022). Formulasi dan Uji Mutu Fisik Ekstrak Kulit Buah Melinjo (*Gnetum gnemon* L.) Sediaan Blush On Cream sebagai Pewarna Alami. *Jurnal Wiyata: Penelitian Sains Dan Kesehatan*, 9(2), 133. <https://doi.org/10.56710/wiyata.v9i2.692>
- Radić, B., Radić, S., Mašek, T., & Šuran, J. (2024). Anti-wrinkle efficacy of standardized phenolic acids polymer extract (PAPE) from propolis: Implications for antiaging and skin health. *Journal of Cosmetic Dermatology*. <https://doi.org/10.1111/jocd.16405>
- Raisa, A., Hutagaol, R. P., Studi Kimia, P., Mipa, F., Bogor, U., Studi Biologi, P., & Bogor Jl Sholeh Iskandar Km, U. K. (2016). Optimasi Penambahan Madu sebagai Zat Anti Bakteri *Staphylococcus aureus*, pada Produk Sabun Mandi Cair. *Jurnal Sains Natural Universitas Nusa Bangsa*, 6(2), 52–63.
- Rintiswati, N., Winarsih, N. E., & Malueka, R. G. (2004). Potensi Antikandida Ekstrak Madu Secara In Vitro dan In Vivo. *Berkala Ilmu Kedokteran*, 36.
- Rohmani, S., & Pangesti, T. B. (2024). Sunscreen cream formulation from a combination of propolis extract and titanium dioxide. *Journal of Advanced Pharmacy Education and Research*, 14(2), 77–83. <https://doi.org/10.51847/wzPc0dCU6c>
- Rzepecka-Stojko, A., Stojko, J., Kurek-Górecka, A., Górecki, M., Kabała-Dzik, A., Kubina, R., Moździerz, A., Buszman, E., & Iriti, M. (2015). Polyphenols from Bee Pollen: Structure, absorption, metabolism and biological activity. In *Molecules* (Vol. 20, Number 12, pp. 21732–21749). MDPI AG. <https://doi.org/10.3390/molecules201219800>
- Sariningsih, A., & Masyithah, N. Z. (2021). Formulasi dan Evaluasi Sediaan Lip Scrub dari Madu (*Apis dorsata*). *Mulawarman Pharmaceutical Conference*. <https://doi.org/10.25026/mpc.v13i1.442>
- Setianingsih, A. (2021). *Formulasi dan Uji Aktivitas Antioksidan Sediaan Masker Gel dari Serbuk Sari Lebah (Bee Pollen) dengan Peredaman Radikal DPPH*. Politeknik Harapan Bersama.
- Sforcin, J. M., & Bankova, V. (2011). Propolis: Is There a Potential for The Development of New Drugs? *Journal of Ethnopharmacology*, 133(2), 253–260. <https://doi.org/10.1016/j.jep.2010.10.032>
- Sinala, S., & Dewi, S. T. R. (2019). Penentuan Aktivitas Antioksidan Secara In Vitro dari Ekstrak Etanol Propolis Dengan Metode DPPH (1,1-Difenil-2-Pikrilhidrazil). *Media Farmasi*, 15(1), 91. <https://doi.org/10.32382/mf.v15i1.820>
- Somwongin, S., Chantawannakul, P., & Chaiana, W. (2018). Antioxidant activity and irritation property of venoms from *Apis* species. *Toxicon*, 145, 32–39.

- <https://doi.org/10.1016/j.toxicon.2018.02.049>
Sylvia, D., Safitri, M., & Alhuda, Y. R. (2022). Physical Properties Test on The Formulation of Honey Propolis (Trigona Sp) Scrub and Aloe Vera (Aloe Vera) Skin for Body Treatment Article History. *Jurnal Ilmiah Farmako Bahari*, 13(2), 184–194. www.journal.uniga.ac.id
- Thewanjutiwong, S., Phokasem, P., Disayathanooowat, T., Juntrapirom, S., Kanjanakawinkul, W., & Chaiyana, W. (2023). Development of Film-Forming Gel Formulations Containing Royal Jelly and Honey Aromatic Water for Cosmetic Applications. *Gels*, 9(10). <https://doi.org/10.3390/gels9100816>
- Tobin, D. J. (2017). Introduction to skin aging. *Journal of Tissue Viability*, 26(1), 37–46. <https://doi.org/10.1016/j.jtv.2016.03.002>
- Usman Shamaki, B., Abba, Y., Jimeta Balla, H., & Idris Gambo, H. (2014). *Evaluation of Chemical Composition and the Comparative Wound Healing Effect of Natural Honey and Olive Oil in Rabbits*. <https://www.researchgate.net/publication/266029955>
- Valverde, T. M., Soares, B. N. G. de S., Nascimento, A. M. do, Andrade, Â. L., Sousa, L. R. D., Vieira, P. M. de A., Santos, V. R., Seibert, J. B., Almeida, T. C. S. de, Rodrigues, C. F., Oliveira, S. R. M. de, Martins, F. dos S., Júnior, J. G. F., & Santos, V. M. R. dos. (2023). Anti-Inflammatory, Antimicrobial, Antioxidant and Photoprotective Investigation of Red Propolis Extract as Sunscreen Formulation in Polawax Cream. *International Journal of Molecular Sciences*, 24(6). <https://doi.org/10.3390/ijms24065112>
- Wang, H. M. D., Chen, C. C., Huynh, P., & Chang, J. S. (2015). Exploring the potential of using algae in cosmetics. In *Bioresource Technology* (Vol. 184, pp. 355–362). Elsevier Ltd. <https://doi.org/10.1016/j.biortech.2014.12.001>
- Wardaniati, I., & Islami, D. (2020). Formulasi Masker Gel Dari Ekstrak Propolis Dan Lidah Buaya Sebagai Anti-Aging. *Jurnal Farmasi Higea*, 12(2).
- Wehbe, R., Frangieh, J., Rima, M., Obeid, D. El, Sabatier, J. M., & Fajloun, Z. (2019). Bee venom: Overview of main compounds and bioactivities for therapeutic interests. In *Molecules* (Vol. 24, Number 16). MDPI AG. <https://doi.org/10.3390/molecules24162997>
- Xi, X., Li, J., Guo, S., Li, Y., Xu, F., Zheng, M., Cao, H., Cui, X., Guo, H., & Han, C. (2018). The potential of using bee pollen in cosmetics: A review. In *Journal of Oleo Science* (Vol. 67, Number 9, pp. 1071–1082). Japan Oil Chemists Society. <https://doi.org/10.5650/jos.ess18048>
- Yumas, M., Besar, B., Hasil, I., Jl, P., Basalamah, A., & 28 Makassar, N. (2016). Formulasi Sediaan Krim Wajah Berbahan Aktif Ekstra Metanol Biji Kakao Non Fermentasi (Theobroma cacao L) Kombinasi Madu Lebah. *Jurnal Industri Hasil Perkebunan*, 11, 75–87. <https://doi.org/10.33104/jihp.v11i2.3414>