Contents lists available at IOCS

Science Midwifery

journal homepage: www.midwifery.iocspublisher.org

The Role of Essential Oils on Improving Elderly Skin Hydration

Linda Julianti Wijayadi[1], Kelvin[2]
[1]Department of DermatoVenereology, Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia
[2]Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia

ARTICLE INFO

Article history:

Received Aug 31, 2022
Revised Sept 07, 2022
Accepted Sept 28, 2022

Keywords:

Elderly
Essential Oils
Skin Hydration

ABSTRACT

Skin hydration has an important role in various diseases of the elderly. Skin hydration is determined by two factors, namely the ability of the stratum corneum (SC) to retain water due to natural moisturizing factors and the barrier function of the intercellular lipid lamellar structure and tight junctions. Several parameters are usually used for skin hydration, such as surface water content (SWC) and trans-epidermal water loss (TEWL). With age, several changes in the skin affect hydration, including changes in the cellular and intercellular lipid matrix, skin pH, SC protease enzymes, decreased sebaceous and sweat gland activity, and decreased estrogen levels in women. Therefore, a moisturizer is needed to minimize the unwanted effects of some of these changes. Selection of the type of moisturizer is very important for the elderly, especially moisturizers with antiseptic, antibacterial, and antioxidant effects are highly recommended. The ability of essential oils as components of moisturizers has been proven in various studies. Essential oils can improve the function of the epidermal barrier and help prevent transepidermal water loss. Therefore, this literature review discusses the role of various essential oils, namely green tea oils (*Camellia sinensis* or *Camellia assamica*), virgin coconut oils (*Cocos nucifera L.*), evening primrose oils (*Oenothera paradoxa*), grape seed oils (*Vitis vinifera L.*) .), rosemary oils (*Rosmarinus officinalis L.*), immortelle oils (*Helichrysum italicum*), and cannabis seeds oils (*Cannabis sativa L.*) on improving skin hydration in the elderly.

Corresponding Author:

Linda Julianti Wijayadi,
Department of DermatoVenereology,
Tarumanagara University,
5 Sawo Street, Central Jakarta, 10350, Indonesia,
Email: lindajuliantiwijayadi@gmail.com

INTRODUCTION

With age, many changes occur in the human body, especially in the skin. The skin is the largest organ in humans and in general has three layers that work individually and collectively to protect all internal tissues and vital organs from the daily environment. The skin also plays an important role in controlling hydration and regulating body temperature (Kaniuk et al., 2022).

In the elderly, the hydration ability of the skin is reduced and as a result, the skin becomes dry. Some studies even show a prevalence of between 29% to 85% in the world and 60% in the

elderly with an average age of 70 years (Augustin et al., 2019; Hahnel et al., 2016; Mekic et al., 2019). Dry skin is usually referred to as xerosis, which is one of the most common skin diseases in the elderly. This is caused by many things, such as decreased lipids in the stratum corneum as well as reduced activity of the sebaceous and sweat glands. Every time xerosis occurs, a vicious circle often occurs, namely the process of peeling, cracking, inflammation, and infection. To solve this problem, people in the tropics have used various types of essential oils as traditional moisturizers for centuries effectively (Escuadro-Chin et al., 2019).

Essential oils are classic ingredients that are usually used for the manufacture of medicines and cosmetics. As technology develops, considerable efforts are being made by industries to discover the various medical benefits of natural resources. Natural is considered safer than synthetic, because of minimal side effects (Viciolle et al., 2012). Therefore, this literature review aims to discuss the role of essential oils on xerosis and pruritus in the elderly.

METHOD

This literature review aims to determine the role of various essential oils on skin hydration of the elderly. In this literature review, 24 articles were used on 7 types of essential oils which are known to have a positive effect on skin hydration, namely green tea oils (*Camellia sinensis* or *Camellia assamica*), virgin coconut oils (*Cocos nucifera L.*), evening primrose oils (*Oenothera paradoxa*), grape seed oils (*Vitis vinifera L.*) .), rosemary oils (*Rosmarinus officinalis L.*), immortelle oils (*Helichrysum italicum*), and cannabis seeds oils (*Cannabis sativa L.*). The databases used include PUBMED, Science Direct, and Google Scholar. The terms used for unpatterned searches are "Skin Hydration", "Essential Oil", and "Elderly".

RESULT AND DISCUSSION

Reducing Skin Hydration Levels in the Elderly

The function and structure of the stratum corneum (SC) play an important role in keeping the epidermis hydrated, flexible, stable, and resistant. In this regard, the abnormal function of the epidermal permeability barrier (EPB) in elderly skin has been demonstrated in various studies. Several studies using tape stripping found that SC integrity was lower in the elderly when compared to younger skin. In addition, skin irritability in the elderly has also been shown to be significantly higher than in young people, especially in areas where the skin is exposed to sunlight (Blaak et al., 2017).

Some skin changes in the elderly are usually associated with reduced skin hydration which causes dry skin or xerosis. These changes include changes in SC barrier function including changes in the cellular and intercellular lipid matrix; changes in pH, changes in SC proteases, decreased activity of the sebaceous and sweat glands, and decreased levels of estrogen, especially in women (Stull & Yosipovitch, 2015).

SC consists of an intercellular lipid matrix. This matrix, which consists of ceramides, cholesterol, and free fatty acids, maintains skin hydration by preventing water loss from the epidermis, but in the elderly there is a decrease in ceramide levels in the SC, resulting in changes in these functions. In addition, the matrix also plays a role in regulating skin moisture, maintaining a strong bond between corneocytes, and regenerating cells (Kono et al., 2021; Stull & Yosipovitch, 2015). Corneocytes contain natural moisturizing factors, which are a collection of hygroscopic compounds, which attract and retain water within the cells. The natural moisturizing factors and free fatty acids in SC also help keep the pH low. This pH regulation plays a role in maintaining a balance between the formation and degradation (desquamation) of the epidermal barrier (Moncrieff et al., 2013). The pH of the skin becomes more alkaline with age. This change in skin pH can affect the enzymatic activity in SC. As a result of this change in enzymatic activity, the skin

becomes dry due to decreased production of natural moisturizing factors, reduced activity of ceramide-forming enzymes, and decreased lamellar body secretion (Stull & Yosipovitch, 2015).

The balance between protease and inhibitor activity controls the desquamation process, including the number of corneocyte cell layers in SC. Excessive protease activity can lead to SC thinning, while reduced protease activity can lead to SC thickening. In healthy skin, protease activity in SC varies at different body sites. Facial skin, for example, shows higher proteolytic activity. The facial SC is thinner than other body sites, and this increased protease activity may be related to the thickness of the skin (Stull & Yosipovitch, 2015). However, according to the study by Rawlings and Voegeli (2013), with age, this protease activity decreases, thus increasing the risk of dry skin.

The Role of Essential Oils in Improving the Hydration of Elderly Skin

Maintaining skin hydration is very important to delay the skin aging process because the skin becomes less elastic and more prone to wrinkling and infection when dry (Liao et al., 2022). Skin hydration is determined by two factors, namely the ability of SC to retain water due to natural moisturizing factors and the barrier function of the intercellular lipid lamellar structure and tight junctions. In measuring the level of skin hydration, several parameters are usually used, such as surface water content (SWC) and trans-epidermal water loss (TEWL). The two parameters were further grouped into four groups, namely group I (high SWC/low TEWL), group II (high SWC/high TEWL), group III (low SWC/low TEWL) and group IV (low SWC/high TEWL) (Masaki et al., 2018).

Using a good moisturizer can increase skin hydration through the corneo-desmosome degradation process. Moisturizers are skin care products that are usually used to increase skin hydration by minimizing skin friction, softening the skin, and filling cracks in the skin (Lodén, 2012). Moisturizers are the first line in the treatment of xerosis and pruritus in the elderly. Moisturizers with antiseptic, antibacterial, and antioxidant effects are recommended for senile xerosis. People in the tropics have effectively used various types of essential oils as traditional moisturizers for centuries. Significantly, essential oils can improve epidermal barrier function and help prevent transepidermal water loss (Escuadro-Chin et al., 2019; Yahya et al., 2020).

Essential oils are a mixture of complex compounds with low molecular weights that are volatile (monoterpenes and sesquiterpenes) and give rise to a distinctive aroma in each plant. This oil is usually extracted by distillation technique. The use of essential oils has been shown in various studies to help improve the balance of the skin's epidermal barrier (Andrade et al., 2021).

Effects of Some Types of Essential Oils on Skin Hydration

Green Tea Essential Oil

Green tea plants (*Camellia sinensis* or *Camellia assamica*) have long been known to have antioxidant effects and are active compounds in moisturizing creams. The study of Tjandra et al. (2018) found that the essential oil of this plant has a significant effect in increasing skin hydration when compared to vitamin E, on the skin on the left and right arms.

Green tea contains 75-80% water and polyphenolic compounds (flavanols, flavandiols, flavonoids, and phenolic acids), polysaccharides, and catechins which account for more than 75% of polyphenolic compounds in tea leaves. The presence of these bioactive compounds helps in many reactions that are beneficial to human skin. In an in vitro study, it was found that polyphenols and polysaccharides from tea protect the skin, such as the ability to retain water, especially in a dry environment (Bae et al., 2020; Liao et al., 2022).

Catechin compounds have antioxidant effects and representative physiological activities by counteracting free radicals, slowing the degradation of the extracellular matrix caused by ultraviolet (UV) radiation and pollution, activating collagen synthesis, and inhibiting the products of matrix metalloproteinase enzymes (Bae et al., 2020).

Epigallocatechin gall, which is one type of catechin (contributing more than 50% of the types of catechins), is known to inhibit the degradation of hyaluronic acid in the epidermis by reducing the level of hyaluronidase expression and increasing the hydration retention capacity of the skin barrier. So this compound can increase skin hydration (Kim et al., 2018).

Virgin Coconut Essential Oil

Virgin coconut essential oil (*Cocos nucifera* L.) has long been recognized in traditional skin care applications, especially in Southeast Asia. This oil is coconut oil that is processed within 24 hours after harvest to avoid the formation of fatty acids that can cause skin irritation. The oil is colorless at or above 30°C and turns white in solid form but with a characteristic aroma (Escuadro-Chin et al., 2019; Noor et al., 2013).

Virgin coconut essential oil has a high content of fatty acids, especially lauric acid, and has a higher phenolic content and antioxidant activity than ordinary coconut oil (Noor et al., 2013). The high levels of lauric acid in this oil, proven in several in vitro and in vivo studies, have antimicrobial and anti-inflammatory effects (Karagounis et al., 2019). In the study of Yahya et al. (2020), this oil can reduce TEWL and increase skin hydration. In addition, this virgin coconut essential oil does not cause side effects as long as it is used as a moisturizer. While in the study of Varma et al. (2019), the application of virgin coconut oil has been shown to exert an anti-inflammatory effect by inhibiting various levels of cytokines including TNF-α, IFN-γ, IL-6, IL-5, and IL-8, enhancing skin barrier function by regulating aquaporin-3(AQP-3), filaggrin, and involucrin mRNA expression, and also protects the skin against UVB rays.

Evening Primrose Essential Oil

Evening primrose (*Oenothera paradoxa*) essential oil has long been known to stabilize the keratinization process of the epidermis, exhibit anti-inflammatory effects, play an important role in skin hydration, and prevent excessive water loss from the skin. This is indicated by the parameters of TEWL, elasticity, firmness, stability, and level of skin roughness. The content of this oil mainly consists of linoleic acid and γ-linolenic acid. These two acids play important roles in normal skin function, including being part of the ceramides in the lipid layer of the epidermis, regulating epidermal keratinization, and having a strong anti-inflammatory effect (Kazmierska et al., 2022).

The high content of γ-linolenic acid in this oil was also proven in the study of Park et al. (2014) can maintain skin hydration. γ-Linolenic acid stimulates epidermal hyperproliferation, because its metabolites, namely anti-inflammatory eicosanoids, have antiproliferative properties, and can increase ceramide synthesis and skin barrier function.

Grape Seed Essential Oil

Grape seed (*Vitis vinifera* L.) contains about 3.95-16.6% essential oil. The wide ratio of the amount of oil is influenced by the extraction technique, the type of solvent, and the operating conditions used (Duba & Fiori, 2015). Cultivar diversity and environmental factors during the harvest year also play an important role. Grape seed essential oil has long been used as an ingredient for food and skin health. This oil is rich in linoleic acid (65-72%), oleic acid (12-23%), palmitic acid (4-11%) and stearic acid (8.5-15%) (Sotiropoulou et al., 2016).

Linoleic acid is mostly found in epidermal phospholipids and plays an important role in skin barrier function because it is incorporated in ceramides, which are the main components of intercellular lipids. In addition, this oil also contains other active substances with high antioxidant activity that can maintain skin health, including phytosterols, flavonoids, phenolic acids, carotenoids, tocopherols and tocotrienols (vitamin E isomer group in the range of 1-53 mg/100 g oil) (Lee et al., 2014; Surini et al., 2018).

Rosemary Essential Oil

Rosemary (*Rosmarinus officinalis* L.) is a plant of the Lamiaceae family originating from the Caucasus and the eastern Mediterranean. The essential oil of this plant is usually obtained by classical extraction methods, namely maceration, decoction, hydro distillation, and solvent extraction. Various kinds of bioactive components of this oil, including monoterpenes, diterpenes, and polyphenols are obtained from the steam distillation process or the like (González-Minero et al., 2020).

In the study of Malvezzi De Macedo et al. (2020) and Montenegro et al. (2017) regarding this oil, it was found that gels containing rosemary essential oil nanoparticles showed a greater capacity to hydrate and increase skin elasticity compared to gels that did not contain oil. In addition, its use topically has several advantages, namely avoiding the effects of the initial metabolism of the drug, providing a direct effect on the area to be treated, and reducing the risk of drug side effects.

Immortelle Essential Oil

The immortelle plant (*Helichrysum italicum*) belongs to the Asteraceae family. This plant is often called "immortelle" or perennial because the flowers do not wither and the color remains alive even after being collected and dried (Wijayadi & Kelvin, 2022). In the study of Granger et al. (2020), found that a night cream containing immortelle essential oil showed a 64.4% increase in skin hydration and a 10% reduction in TEWL after 1 hour of administration in 117 volunteers. Meanwhile, in the study of Tadić et al. (2021) who compared creams and emulgels containing immortelle essential oil, found that they significantly decreased TEWL and increased skin hydration after 28 days of the administration, when compared to controls, thereby improving the function of the epidermal barrier.

This is in line with the study of Lemaire et al. (2022) who found that the neryl acetate compound contained in this oil plays a role in the formation of the epidermal barrier. By increasing involucrine and transglutaminase-1 (TGM-1), these compounds contribute to maintaining the epidermal barrier and by regulating aquaporin-3 (AQP-3), they also facilitate osmotic transport of water, and glycerol. With increasing age, the three types of lipids, namely ceramides, cholesterol and fatty acids, decrease. Neryl acetate compounds can increase lipid production, thereby increasing the function of the epidermal barrier, increasing water retention, and decreasing penetration from the outside.

Hemp Seed Essential Oil

Hemp seed essential oil is derived from the cannabis plant (*Cannabis sativa* L.). This essential oil from cannabis seeds has long been known in the skin care field. This plant contains a large amount of oil in its seeds (25-35%), as well as unsaturated fatty acids consisting of 50-60% linoleic acid, 20-25% α-linolenic acid and γ-linolenic acid. These three fatty acids are the structure of phospholipid cell membranes, so they have an effect on cell immunology as well as on several cell membrane functions, namely on hormone activity, fluidity or electrolyte transport. These linoleic and linolenic acids improve skin structure and reduce dry and rough skin structure by increasing skin hydration function (Kowalska et al., 2017).

In the study of Şeker and Esen (2021) on the effect of these essential oils on the skin, a comparison was made of creams containing various concentrations of cannabis seed oil (0%, 0.5%, 1% and 1.5%). Skin hydration decreased in the first 15 minutes, but increased significantly after 15-30 minutes and 30-60 minutes. A decrease in TEWL was also seen, particularly effective at 15-30 minutes. Meanwhile, in the study of Metwally et al. (2021) who used electrospun polycaprolactone patches as carriers of cannabis seed essential oil, found an increase in moisture content of up to 20% studied on human skin.

CONCLUSION

The use of essential oils as a moisturizing agent has been shown to be effective in improving skin hydration in the elderly. Essential oils of green tea, virgin coconut, evening primrose, grape seed, rosemary, immortelle, and cannabis seeds have been shown in various studies to increase skin hydration. This of course can be considered as an alternative treatment for various skin diseases in the elderly caused by decreased skin hydration.

ACKNOWLEDGEMENTS

This study was carried out with financial assistance from the government. Therefore, we thank all parties, especially the academic market, professional editors, and all colleagues whom we cannot mention.

References

Andrade, S. F. de, Rijo, P., Rocha, C., Zhu, L., & Rodrigues, L. M. (2021). Characterizing the Mechanism of Action of Essential Oils on Skin Homeostasis—Data from Sonographic Imaging, EpidermalWater Dynamics, and Skin Biomechanics. *Cosmetics*, *8*(36). https://doi.org/10.3390/%0Acosmetics8020036

Augustin, M., Kirsten, N., Körber, A., Wilsmann-Theis, D., Itschert, G., Staubach-Renz, P., Maul, J.-T., & Zander, N. (2019). Prevalence, Predictors and Comorbidity of Dry Skin in the General Population. *J Eur Acad Dermatol Venereol*. https://doi.org/10.1111/jdv.15157

Bae, J., Kim, N., Shin, Y., Kim, S.-Y., & Kim, Y.-J. (2020). Activity of catechins and their applications. *Biomedical Dermatology*, *4*(1), 1–10. https://doi.org/10.1186/s41702-020-0057-8

Blaak, J., Dähnhardt, D., Dähnhardt-Pfeiffer, S., Bielfeldt, S., Wilhelm, K. P., Wohlfart, R., & Staib, P. (2017). A plant oil-containing pH 4 emulsion improves epidermal barrier structure and enhances ceramide levels in aged skin. *International Journal of Cosmetic Science*, *39*(3), 284–291. https://doi.org/10.1111/ics.12374

Duba, K. S., & Fiori, L. (2015). Supercritical CO2 extraction of grape seed oil: Effect of process parameters on the extraction kinetics. *The Journal of Supercritical Fluids*, *98*, 33–43. https://doi.org/10.1016/j.supflu.2014.12.021

Escuadro-Chin, M. O., Maanõ, M. M. C., & Dofitas, B. L. (2019). Randomized assessor-blinded controlled trial on the efficacy and safety of virgin coconut oil versus mineral oil as a therapeutic moisturizer for senile xerosis. *Acta Medica Philippina*, *53*(4), 335–343. https://doi.org/10.47895/amp.v53i4.31

González-Minero, F. J., Bravo-Díaz, L., & Ayala-Gómez, A. (2020). Rosmarinus officinalis L. (Rosemary): An Ancient Plant with Uses in Personal Healthcare and Cosmetics. *Cosmetics*, *7*(4), 77. https://doi.org/10.3390/cosmetics7040077

Granger, C., Brown, A., Aladren, S., & Narda, M. (2020). Night Cream Containing Melatonin , Carnosine and Helichrysum italicum Extract Helps Reduce Skin Reactivity and Signs of Photodamage : Ex Vivo and Clinical Studies. *Dermatology and Therapy*, *10*(6), 1315–1329. https://doi.org/10.1007/s13555-020-00443-2

Hahnel, E., Lichterfeld, A., Blume-peytavi, U., & Kottner, J. (2016). The epidemiology of skin conditions in the aged : A systematic review. *Journal of Tissue Viability*. https://doi.org/10.1016/j.jtv.2016.04.001

Kaniuk, Ł., Podborska, A., & Stachewicz, U. (2022). Enhanced mechanical performance and wettability of PHBV fiber blends with evening primrose oil for skin patches improving hydration and comfort. *Journal of Materials Chemistry B*, *10*(11), 1763–1774. https://doi.org/10.1039/d1tb02805g

Karagounis, T. K., Gittler, J. K., Rotemberg, V., & Morel, K. D. (2019). Use of "natural" oils for moisturization: Review of olive, coconut, and sunflower seed oil. *Pediatric Dermatology*, *36*(1), 9–15. https://doi.org/10.1111/pde.13621

Kazmierska, A., Bolesławska, I., Polanska, A., Pazdrowska, A. D., Jagielski, P., Drzymała-Czyz, S., Adamski, Z., & Przysławski, J. (2022). *Effect of Evening Primrose Oil Supplementation on Selected Parameters of Skin Condition in a Group of Patients Treated with Isotretinoin – A Randomized Double-Blind Trial*. 11–16.

Kim, E., Hwang, K., Lee, J., Han, S. Y., Kim, E. M., Park, J., & Cho, J. Y. (2018). Skin protective effect of epigallocatechin gallate. *International Journal of Molecular Sciences*, *19*(1), 1–14. https://doi.org/10.3390/ijms19010173

Kono, T., Miyachi, Y., & Kawashima, M. (2021). Clinical significance of the water retention and barrier function-improving capabilities of ceramide-containing formulations: A qualitative review. *Journal of*

Dermatology, *48*(12), 1807–1816. https://doi.org/10.1111/1346-8138.16175

Kowalska, M., Wozniak, M., & Pazdzior, M. (2017). Assessment of the sensory and moisturizing properties of emulsions with hemp oil. *Acta Polytechnica Hungarica*, *14*(8), 183–195. https://doi.org/10.12700/APH.14.8.2017.8.10

Lee, S. G., Kim, R., Cho, I., Kang, H., Yeom, W., Lee, S. H., Lee, S., & Choi, Y. W. (2014). *Hydrogel-Based Ultra-moisturizing Cream Formulation for Skin Hydration and Enhanced Dermal Drug Delivery*. *37*(10), 1674–1682.

Lemaire, G., Olivero, M., Rouquet, V., Moga, A., Pagnon, A., & Synelvia, L. S. (2022). *Neryl acetate , the major component of Corsican Helichrysum Italicum essential oil , mediates its biological activities on skin barrier Short Title : Neryl acetate increases skin barrier function 1 Laboratoires 2 QIMA M & L SA – Groupe L ' Occitane , ZI S*.

Liao, R., Parker, T., Bellerose, K., Vollmer, D., & Han, X. (2022). *A Green Tea Containing Skincare System Improves Skin Health and Beauty in Adults : An Exploratory Controlled Clinical Study*.

Lodén, M. (2012). Effect of moisturizers on epidermal barrier function. *Clinics in Dermatology*, *30*(3), 286–296. https://doi.org/10.1016/j.clindermatol.2011.08.015

Malvezzi De Macedo, L., Mendes, É., Militao, L., Lacalendola Tundisi, L., Artem Ataide, J., Barbosa Souto, E., & Gava Mazzola, P. (2020). Rosemary (Rosmarinus officinalis L ., syn Salvia rosmarinus Spenn.) A Review. *Plants*, *9*(651), 1–12.

Masaki, H., Yamashita, Y., Kyotani, D., Honda, T., Takano, K., Tamura, T., Mizutani, T., & Okano, Y. (2018). *Correlations between skin hydration parameters and corneocyte-derived parameters to characterize skin conditions*. *January*, 1–7. https://doi.org/10.1111/jocd.12502

Mekic, S., Jacobs, L. C., Gunn, D. A., Mayes, A. E., Ikram, M. A., Pardo, L. M., & Nijsten, T. (2019). *Prevalence and determinants for xerosis cutis in the middle-aged and elderly population: A cross-sectional study*. 1–9. https://doi.org/10.1016/j.jaad.2018.12.038

Metwally, S., Ura, D. P., Krysiak, Z. J., Kaniuk, Ł., Szewczyk, P. K., & Stachewicz, U. (2021). Electrospun PCL patches with controlled fiber morphology and mechanical performance for skin moisturization via long-term release of hemp oil for atopic dermatitis. *Membranes*, *11*(1), 1–13. https://doi.org/10.3390/membranes11010026

Moncrieff, G., Cork, M., Lawton, S., Kokiet, S., Daly, C., & Clark, C. (2013). Use of emollients in dry-skin conditions: Consensus statement. *Clinical and Experimental Dermatology*, *38*(3), 231–238. https://doi.org/10.1111/ced.12104

Montenegro, L., Pasquinucci, L., Zappalà, A., Chiechio, S., Turnaturi, R., & Parenti, C. (2017). Rosemary essential oil-loaded lipid nanoparticles: In vivo topical activity from gel vehicles. *Pharmaceutics*, *9*(4), 1–12. https://doi.org/10.3390/pharmaceutics9040048

Noor, N. M., Aziz, A. A., Sarmidi, M. R., & Aziz, R. (2013). The effect of virgin coconut oil loaded solid lipid particles (VCO-SLPs) on skin hydration and skin elasticity. *Jurnal Teknologi (Sciences and Engineering)*, *62*(1), 39–43. https://doi.org/10.11113/jt.v62.1248

Park, K. Y., Ko, E. J., Kim, I. S., Li, K., Kim, B. J., Seo, S. J., Kim, M. N., & Hong, C. K. (2014). The effect of evening primrose oil for the prevention of xerotic cheilitis in acne patients being treated with isotretinoin: A pilot study. *Annals of Dermatology*, *26*(6), 706–712. https://doi.org/10.5021/ad.2014.26.6.706

Rawlings, A. V., & Voegeli, R. (2013). Stratum corneum proteases and dry skin conditions. *Cell and Tissue Research*, *351*(2), 217–235. https://doi.org/10.1007/s00441-012-1501-x

Şeker, M., & Esen, Ö. (2021). the Effect of Hemp Seed Oil on Skin and Soap Performance. *International Journal of Life Sciences and Biotechnology*, *4*(3), 420–438. https://doi.org/10.38001/ijlsb.931795

Sotiropoulou, E. I., Varelas, V., Liouni, M., & Nerantzis, E. T. (2016). *GRAPE SEED OIL : FROM A WINERY WASTE TO A VALUE ADDED COSMETIC PRODUCT-A REVIEW*.

Stull, R. V. C., & Yosipovitch, G. (2015). *Chronic Pruritus in the Elderly : Pathophysiology , Diagnosis and Management*. 201–215. https://doi.org/10.1007/s40266-015-0246-0

Surini, S., Nursatyani, K., & Ramadon, D. (2018). *Gel Formulation Containing Microcapsules of Grape Seed Oil (Vitis vinifera L .) for Skin Moisturizer*. *10*(1), 41–47. https://doi.org/10.5530/jyp.2018.10.11

Tadić, V. M., Žugić, A., Martinović, M., Stanković, M., Maksimović, S., Frank, A., & Nešić, I. (2021). Enhanced skin performance of emulgel vs. Cream as systems for topical delivery of herbal actives (immortelle extract and hemp oil). *Pharmaceutics*, *13*(11). https://doi.org/10.3390/pharmaceutics13111919

Tjandra, O., Wijayadi, L. J., & Rumawas, M. E. (2018). Green tea moisturizer improves skin hydration in elderly. *Universa Medicina*, *37*(1), 3–12. https://doi.org/10.18051/univmed.2018.v37.3-12

Varma, S. R., Sivaprakasam, T. O., Arumugam, I., Dilip, N., Raghuraman, M., Pavan, K. B., Rafiq, M., &

Paramesh, R. (2019). In vitro anti-inflammatory and skin protective properties of Virgin coconut oil. *Journal of Traditional and Complementary Medicine*, *9*(1), 5–14. https://doi.org/10.1016/j.jtcme.2017.06.012

Viciolle, E., Castilho, P., & Rosado, C. (2012). In vitro and in vivo assessment of the effect of Laurus novocanariensis oil and essential oil in human skin. *International Journal of Cosmetic Science*, *34*(6), 546–550. https://doi.org/10.1111/j.1468-2494.2012.00745.x

Wijayadi, L. J., & Kelvin. (2022). *Effectiveness of Helichrysum italicum Essential Oil on Wound Healing*. *10*(2), 681–697.

Yahya, Y. F., Vani, O., Putra, D. E. W., Sovianti, C. S., Trislinawati, D., Marina, T., & Riviati, N. (2020). The Efficacy and Safety of Plant Oil Mixtures in the Treatment of Xerosis with Pruritus in Elderly People: Randomized double blind Controlled Trial. *Bioscientia Medicina : Journal of Biomedicine and Translational Research*, *5*(3), 255–262. https://doi.org/10.32539/bsm.v5i3.206