






## Article

# Impact of Raspberry Seed Oil, Sesame Oil, and Coconut Oil on Skin in Young Women

Adrianna Dzidek <sup>1</sup>, Olga Czerwińska-Ledwig <sup>2</sup>, Aleksandra Ziembla <sup>3</sup>, Karolina Matysiak <sup>3</sup>, Karolina Zawadzka <sup>3</sup>, Małgorzata Kulesa-Mrowiecka <sup>4</sup>, Ivan Uher <sup>5</sup>, Tomasz Pałka <sup>6</sup>, Janka Poráčová <sup>7</sup> and Anna Piotrowska <sup>2,\*</sup>

<sup>1</sup> Doctoral School of Physical Culture Science, University of Physical Education, 31-571 Krakow, Poland; adrianna.dzidek@doctoral.awf.krakow.pl

<sup>2</sup> Institute for Basic Sciences, Faculty of Physiotherapy, University of Physical Education, 31-571 Krakow, Poland; olga.czerwinska@awf.krakow.pl

<sup>3</sup> Scientific Club at the Department of Chemistry and Biochemistry, University of Physical Education, 31-571 Krakow, Poland

<sup>4</sup> Department of Rehabilitation in Internal Diseases, Faculty of Health Sciences, Jagiellonian University Medical College, ul. P. Michalowskiego 12, 31-126 Krakow, Poland

<sup>5</sup> Institute of Physical Activity and Sports, Pavol Jozef Šafárik University, 04001 Košice, Slovakia; ivan.uher57@gmail.com

<sup>6</sup> Department of Physiology and Biochemistry, Faculty of Physical Education and Sport, University of Physical Education in Kraków, 31-571 Kraków, Poland; tomasz.palka@awf.krakow.pl

<sup>7</sup> Faculty of Humanities and Natural Sciences, University of Prešov, 080 01 Prešov, Slovakia; janka.poracova@unipo.sk

\* Correspondence: anna.piotrowska@awf.krakow.pl

**Abstract:** The skin serves protective roles for internal organs and is responsible for maintaining homeostasis between the body and the environment. The outermost and most exposed part of the skin to environmental factors is the stratum corneum (SC). SC hydration and transepidermal water loss (TEWL) values provide information about the physiological state of the skin. Plant oils, owing to their chemical structure, possess moisturizing and protective functions. This study assessed the impact of a single application of drying oil (*Rubus idaeus* seed oil), semi-drying oil (*Sesamum indicum* seed oil), and nondrying oil (*Cocos nucifera* (coconut) oil) on specific skin characteristics in young, healthy women. Thirty-five female volunteers (age:  $20.03 \pm 1.69$ ) participated in the study. Before commencing the investigation, a questionnaire survey on the subjective assessment of skin condition and a body composition test were conducted. Subsequently, each participant had three oils applied to nonoverlapping skin areas on the forearms. Skin characteristics were assessed before and 1 h after the oil application using specialized probes: a corneometer and a tewameter. An enhancement in skin hydration was evident after the application of each of the tested oils ( $p = 0.001$ ). Raspberry oil demonstrated the most significant moisturizing effect, while coconut oil showed the weakest impact. Only raspberry seed oil ( $p = 0.012$ ) resulted in a noteworthy decrease in TEWL. The initial skin condition did not correlate with the subjects' body composition, and the improvement induced by the application of the oils was not dependent on body weight, body water content, or BMI (body mass index). The applied vegetable oils positively influence the level of SC hydration. Improvement in barrier function, as measured by TEWL, was observed only for raspberry seed oil.

**Keywords:** vegetable oils; *Rubus idaeus* seed oil; *Sesamum indicum* seed oil; *Cocos nucifera* (coconut) oil; skin parameters; skin hydration; stratum corneum; TEWL



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## 1. Introduction

The skin serves as an effective barrier between the body and the external environment, offering protection against chemical agents, pathogens, and, to some extent, UV radiation. It also receives and transmits impulses from the external world while safeguarding against

excessive water loss [1]. The hydration levels of the stratum corneum (SC) and the measurement of transepidermal water loss (TEWL), which determines the rate at which water evaporates from the body through the skin, are crucial indicators of epidermal barrier function [2].

Due to the skin's robust barrier against the external environment, it presents a challenge for cosmetics manufacturers. On the one hand, it hinders the penetration of active ingredients into the deeper layers of the skin. On the other hand, a well-functioning skin barrier ensures proper tissue function [3]. Most cosmetic products are applied topically to protect the skin and enhance the epidermal barrier. The ingredients comprising the cosmetic formula are intended to accumulate in the outermost layers of the skin or remain on the skin surface [4]. However, certain chemical compounds used in cosmetics as active ingredients can penetrate more deeply, such as retinol, commonly found in anti-aging preparations [5].

Plant oils have been utilized in skin protection and care since ancient times. They can be employed as individual ingredients or components of cosmetic preparations, integrated into a cosmetic base, or included as active ingredients [6]. There are various methods for obtaining vegetable oils. Cold-pressed vegetable oils are considered the best for cosmetic purposes as they undergo no heat treatment or refining that could impact their composition and biological action [7].

Oils are hydrophobic and comprise a mixture of compounds with diverse chemical structures, predominantly made up of triglycerides. These triglycerides contain varying proportions of monounsaturated (MUFA), polyunsaturated (PUFA), and saturated fatty acids (SFAs). Most vegetable oils exhibit a liquid consistency and a relatively low proportion of saturated acids [8].

Oils utilized in skincare are primarily recognized for their moisturizing properties. Given their chemical nature, they do not supply water; instead, their moisturizing function is associated with supporting the native SC lipids to ensure the proper functioning of the epidermal barrier [9]. In addition to fatty acids, these components encompass phenolic compounds, tocopherols and tocotrienols, phospholipids, and compounds from the phytosterol group [7,8]. Frequently, these nontriglyceride elements of vegetable oils play a crucial role in defining the significance of a particular vegetable oil in skincare and skin appendages.

Vegetable oils can be categorized in various ways. Based on the presence of fatty acid residues, distinctions can be made between oleic, linoleic, and linolenic oils. Another classification method is based on the extraction of oils from different botanical parts of plants, such as seed oils and nut oils. PUFA content is also a common basis for classification [10]. Based on fatty acid composition and the iodine value, vegetable oils can be categorized into non-drying (iodine value: 75–100), semi-drying (iodine value: 100–150), and drying oils (iodine value: 150–190). Each of these groups includes oils with a long history of use in cosmetic preparations [8]. Examples of oils belonging to the drying, semi-drying, and nondrying groups are provided in Table 1.

**Table 1.** Examples of oils belonging to the groups of drying, semi-drying, and nondrying oils [11,12].

Drying Oils	Semi-Drying Oils	Nondrying Oils
Juglans	Glycine Soja Oil	Persea Gratissima Oil
Regia Seed Oil	Tall Oil	Ricinus Communis Seed Oil
Rustins Tung Oil	Tobacco ( <i>Nicotiana tabacum</i> L.) Seed Oil	<i>Gossypium herbaceum</i> (cotton seed) Oil
Linum Usitatissimum Seed Oil	Carthamus Tinctorius Oil	Pongamia Glabra Seed Oil

The health-promoting properties of vegetable oils are expanding their utilization in the food, pharmaceutical, and cosmetic industries. Aligned with the concept of zero waste and efforts to minimize the environmental impact of industrial waste production, there is a growing focus on researching the use of postproduction waste as raw materials for producing oils and other ingredients with additional applications. Examples of such

products include seed middlings, which serve as a source of dietary fiber, plant protein, or antioxidants. Currently, middlings from sesame, soy, hemp, or chia seeds are commonly employed [13]. Another example is fruit pomace, which is increasingly utilized in the pharmaceutical and cosmetic industry as a source of nutraceuticals [14].

Raspberry seed oil (*Rubus idaeus* L.) is an abundant source of PUFAs from the  $\omega$ -6 and  $\omega$ -3 families. It boasts a high concentration of bioactive compounds, including a favorable composition of fatty acids, tocotrienols, tocopherols, carotenoids, phytosterols, polyphenols, and monoterpenes [15]. It also enhances the skin barrier function and mitigates skin conditions such as photoaging, psoriasis, and atopic dermatitis (AD) [16]. However, these claims are often marketing statements or indications grounded in the traditional use of this raw material. A study conducted by Oomah et al. [17] also highlights the potential of using the seed oil as a UV protective filter (in the UV-B and UV-C range). Apart from the oil, *R. idaeus* offers other valuable ingredients to the cosmetic industry. Their incorporation, along with other red berries, into skincare formulations, among other benefits, contributes to improved skin regeneration [18].

Sesame seed oil (*Sesamum indicum* L.) comprises various components with well-acknowledged cosmetic effects. Alongside triglycerides that encompass a significant quantity of unsaturated fatty acids, the raw material also contains lignans, tocopherols, phytosterols, and bioactive compounds, including natural antioxidants [19]. The impact of topically applying sesame oil on the severity of pain has also been investigated [20].

Coconut oil (*Cocos nucifera* (coconut) oil) is derived from the fruit of the coconut palm tree (*Cocos nucifera* L.), primarily grown in Africa. Abundant in medium-chain fatty acids, it also contains phenolic compounds, vitamins E and K, and signaling antioxidant and has anti-aging effects [21]. It exhibits reparative effects on the skin barrier, and it finds application in individuals with conditions such as AD [22]. Coconut oil's content of monolaurin contributes to its antibacterial activity against *Propionibacterium Acnes*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* [8]. Additionally, it exhibits a relatively high Sun Protection Factor (SPF) index compared to other oils [23,24]. It is one of the most widely used [21] and safe [22] oils in cosmetics.

Despite the abundance of studies on the properties and phytochemical composition of vegetable oils, there is a surprisingly low number of reports on their direct effects on skin characteristics following external application. This study aimed to assess the effects of a single application of raspberry seed oil, sesame oil, and coconut oil on specific skin characteristics in young, healthy women.

## 2. Materials and Methods

### 2.1. Study Group

Thirty-five female students meeting the following criteria were recruited for the study: female sex; age between 18 and 24 years; absence of allergic lesions in the area of the tested skin fragment; no history of chronic dermatological or endocrine diseases; and written consent for voluntary participation in the study.

The study protocol did not violate any principles outlined in the Declaration of Helsinki. Each participant received information about the scope, method, and purpose of the study, as well as potential side effects. Participation was voluntary, and all participants successfully completed the study. The study received approval from the bioethical committee of the Regional Medical Chamber in Krakow (no: 177/KBL/OIL/2023).

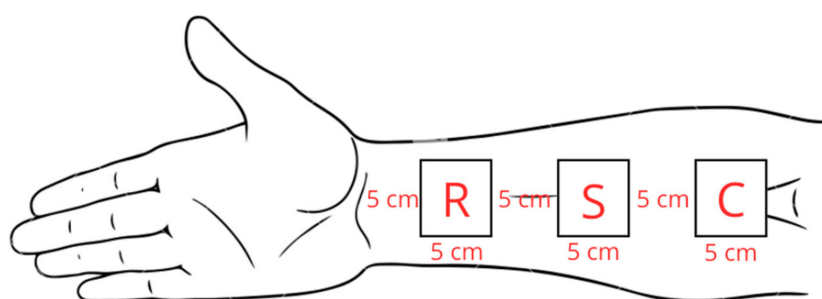
### 2.2. Oils Studied

One representative of each type of oil was selected: drying oil—raspberry seed, INCI (International Nomenclature of Cosmetic Ingredients): *Rubus idaeus* (raspberry) seed oil (Nature Queen; unrefined oil; Poland); semi-drying oil—sesame seed, INCI: *Sesamum indicum* seed oil (Beaute Marrakech; Morocco); and nondrying oil—coconut, INCI: *Cocos nucifera* (coconut) oil- (Nacomi; unrefined oil; Poland). All oils were procured from a general cosmetics store.

### 2.3. Study Protocol

Before the study, participants completed the author's survey questionnaire, which comprised 16 questions, including single-choice, multiple-choice, and open-ended short-answer questions. Each participant's body height was measured. Following that, body composition was assessed using a body composition analyzer—Jawon Medical IOI 353 (Yuseong, Daejeon, Republic of Korea). Parameters such as body weight, BMI, and total body water content (TBW) were determined.

Measurements of selected skin features were taken on the inner side of the forearm of the nondominant hand. Subsequently, at the measurement site, each volunteer had three oils applied simultaneously to three nonoverlapping areas of the skin. A volume of 0.5 mL of oil was applied to an area of 25 cm<sup>2</sup> (a 5 cm × 5 cm square) (Figure 1). After 1 h, the participants had their skin features remeasured in the areas previously marked as the application sites for a particular oil. The room where the measurements took place maintained constant thermoclimatic conditions (humidity 45%, air temperature 21 °C) throughout the study, with these conditions being monitored. These conditions adhered to the standards specified by the manufacturer.



**Figure 1.** Diagram illustrating the use of oils. C: coconut oil; S: sesame oil; R: raspberry seed oil.

### 2.4. Measurement Methods for Selected Skin Characteristics

The Multi Probe Adapter MPA base (Courage + Khazaka GmbH, Cologne, Germany) was employed to measure specific skin characteristics. The following measurement probes from the same manufacturer were connected: Corneometer CM 825 (measurement error:  $\pm 3\%$ ) and Tewameter 300 (measurement error for water loss:  $\pm 0.5$  g/h/m<sup>2</sup> for RH  $\geq 30\%$ ;  $\pm 1.0$  g/h/m<sup>2</sup> for RH  $\leq 30\%$ ). Corneometry measurements were conducted using a 1 s method with three repetitions to evaluate SC hydration levels. Tewameter measurements to assess skin barrier function were performed using a continuous 20 s method. The average of the three corneometry measurements yielded a single result for each participant. Following the measurements, 1 mL of each selected oil was applied to the location of the measurement probes using a Pasteur pipette, ensuring uniform distribution on the skin.

### 2.5. Statistical Analysis

The measurement results were analyzed using basic descriptive statistics, primarily mean values  $\pm$  standard deviation (SD). The distribution type of variables was examined with the Kolmogorov–Smirnov test, revealing no deviations from a normal distribution. Outliers were identified and excluded based on the Grubbs test, which detected results significantly different from the others. Pre- and post-oil differences were evaluated using Student's *t*-test for dependent variables and one-way analysis of variance (ANOVA) with Benferoni's test as a post hoc analysis. Pearson's test was employed to assess correlations between study variables. A significance level of  $p = 0.05$  was applied for each test. The effect strength was gauged using the  $\eta^2$  test, with values of 0.01 indicating low effect strength, 0.06 for medium effect strength, and 0.14 and above for high effect strength.

### 3. Results

The essential data regarding the study group are presented in Table 2. The findings from the survey questionnaire are detailed in Table 3.

**Table 2.** Basic characteristics of the project participants.

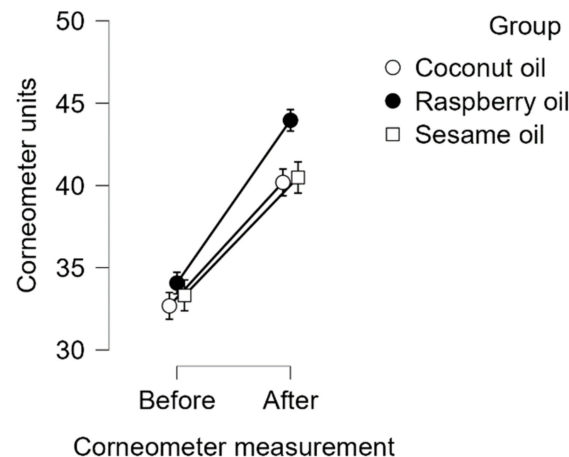
	Min.	Maks.	M	Me	SD	<i>p</i>
<b>BH (cm)</b>	150.4	180.0	166.0	167.0	6.8	0.9440
<b>Age</b>	18.0	24.0	19.9	19.5	1.4	0.0206
<b>BM (kg)</b>	44.0	86.3	58.7	56.8	8.5	0.3326
<b>LBM (kg)</b>	35.2	54.5	43.4	43.4	4.6	0.5371
<b>TBW (%)</b>	25.3	39.2	31.4	31.2	3.3	0.4463
<b>BMI</b>	15.8	28.8	21.3	20.6	2.8	0.2436

BH: body high; BM: body mass; LBM: lean body mass; TBW: total body water; BMI: body mass index; Min.: minimum value; Maks.: maximum value; M: mean; Me: median; SD: standard deviation; *p*: level of statistical significance.

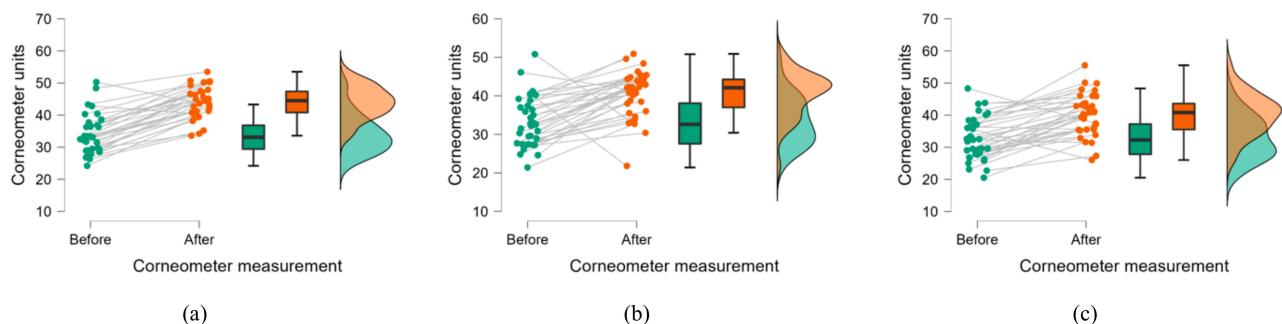
**Table 3.** Results of the survey questionnaire.

	Number	%
<b>Frequency of smoking</b>		
more than 5 per day	2	5.88%
up to 5 per day	1	2.94%
e-cigarette	5	14.71%
I don't smoke	26	76.47%
more than 5 per day	2	5.88%
<b>Frequency of alcoholic beverage consumption</b>		
every day	0	0
several times a week	0	0
once a week	6	17.65%
once a month	5	14.70%
several times a year	20	58.82%
I don't drink alcohol	3	8.82%
<b>The amount of water drunk per day (L)</b>		
0.5–1	12	35.29%
1–2	16	47.06%
2–3	5	14.71%
More than 3	1	2.94%
<b>Diet</b>		
no special and exclusion diets	28	82.35%
vegetarian diet	4	11.76%
diet with dairy restriction	1	2.94%
diet for insulin resistance	1	2.94%
<b>Physical activity level</b>		
training at least 3 times a week	7	20.59%
irregular training about once a week	17	50.00%
no training outside of college classes	10	29.41%
<b>Dietary supplements</b>		
yes	13	38.24%
<b>Skin type</b>		
dry	4	11.76%
oily	7	20.59%
normal	4	11.76%
mixed	15	44.12%
sensitive	7	20.59%
<b>Subjective assessment of hydration status</b>		
well	5	14.71%
moderated	18	52.94%
poorly	10	29.41%
dry	1	2.94%

Figures 2 and 3 display the outcomes of the corneometric measurements. Analysis of variance unveiled noteworthy variations in the corneometric measurements with a substantial effect size ( $p < 0.001$ ;  $\eta^2 = 0.303$ ). The significance of time was evident, indicating a difference between measurements taken before and 1 h after oil application ( $p = 0.001$ ). Examination of individual oils indicated that, within each group, skin hydration at the specific oil application site was markedly higher 1 h after the oil was applied to the skin (Figure 3).



**Figure 2.** Hydration levels of the stratum corneum before and after the application of oils.



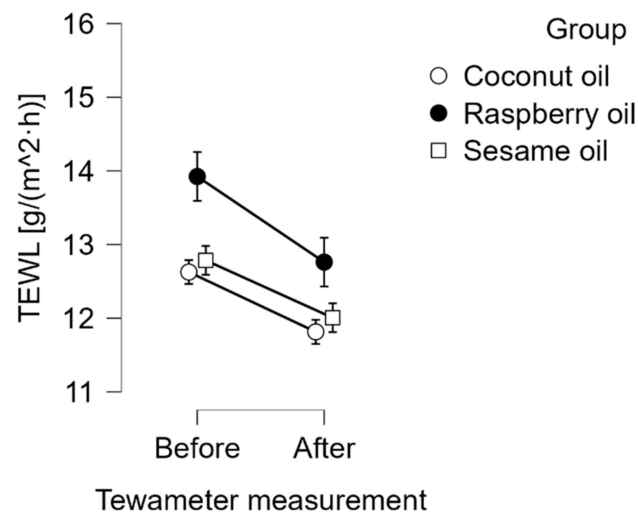
**Figure 3.** Results of corneometer measurements showing skin hydration before (green) and after (orange) the application of (a) raspberry seed oil; (b) sesame seed oil; (c) coconut oil.

The results after 1 h, when compared to each other, did not show statistically significant differences. However, there were notable trends in statistical differences for the results following the application of coconut oil and raspberry oil ( $p = 0.072$ ). The observed increase after applying raspberry oil averaged 9891 IU, whereas for coconut oil, the increase averaged 7506 IU.

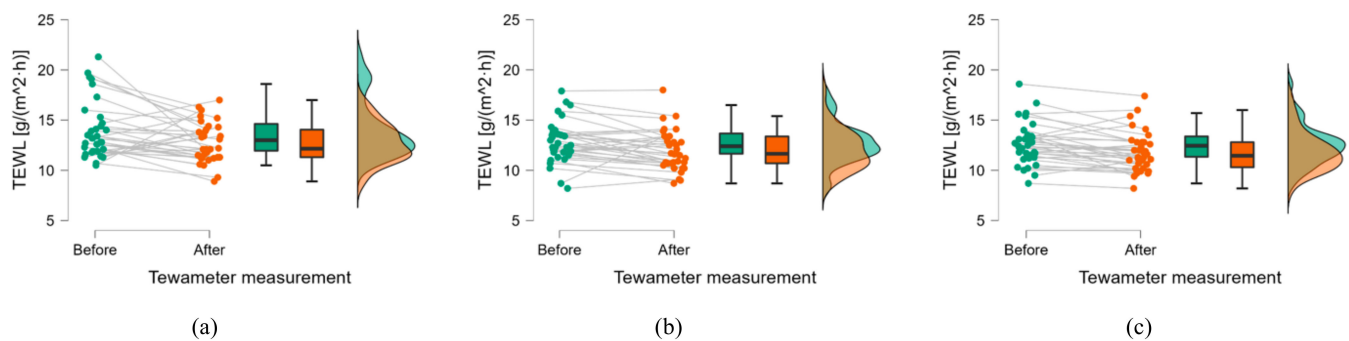
The TEWL measurement results are depicted in Figures 4 and 5. Although statistically significant differences were observed, the effect size ranged between small and average ( $p = 0.001$ ;  $\eta^2 = 0.041$ ). A group effect is evident ( $p = 0.042$ ;  $\eta^2 = 0.048$ ). The outcomes for the skin area where raspberry oil was applied exhibited higher TEWL values than the other tested areas, both before and after applying the tested oils.

A post hoc test revealed that the TEWL measurement results after applying the oils were significantly lower ( $p < 0.001$ ). When comparing the results for each oil (before and after), differences in statistical trends were observed between the results for coconut oil and raspberry seed oil ( $p = 0.059$ ). Further analysis, comparing the results for each oil at different time points, demonstrated that only raspberry seed oil caused a significant reduction in TEWL values 1 h after application to the skin ( $p = 0.012$ ) (Figure 5a). TEWL values did not show significant differences for the other oils (Figure 5b,c).





**Figure 4.** TEWL levels before and after oil application.



**Figure 5.** Results of tewametric measurements before (green) and after (orange) the application of (a) raspberry seed oil; (b) sesame seed oil; (c) coconut oil.

No statistically significant correlations were observed for body water content, BMI, or weight concerning the measured skin characteristics or the effects of a single application of the tested oils to the skin.

#### 4. Discussion

This paper explores the impact of a singular application of oils with diverse physicochemical properties on skin hydration levels and trans-epidermal water loss (TEWL). Significantly, it marks the first comparison of the effects of applying drying, semi-drying, and nondrying oils on the fundamental characteristics of the skin in young, healthy women.

The stratum corneum serves as a barrier against various molecules, microorganisms, and allergens [24,25]. Several factors, such as hormonal disorders, skin diseases, systemic illnesses, medications, diet, and the aging process, influence the proper functioning of the epidermal barrier. Garg et al. [26] also highlighted the impact of psychological stress on alterations in stratum corneum hydration.

Skin hydration and TEWL serve as crucial markers for assessing the biophysical properties of the epidermis [27]. The study of these characteristics represents a fundamental measurement in evaluating the efficacy of cosmetics. To enhance the results' homogeneity, the recruitment process targeted volunteers of similar age who were students in the field of cosmetology. This approach aimed to mitigate the impact of various chemical, biological, and physical factors to which the participants' skin might be exposed. Additionally, the decision was made to simultaneously apply three oils to each participant. This facilitated a more precise evaluation of how a specific oil influenced selected skin characteristics and allowed for comparisons with the other oils applied. However, as the results indicated,

the study protocol could have been improved. Initial TEWL values on the skin of the forearms exhibited significant differences. The skin closer to the elbow bend demonstrated lower barrier properties compared to the skin in the middle part of the forearm and the skin nearer to the wrist. Another recognized limitation was the variation in TEWL values between the dominant and nondominant hand. Treffel et al. [28] highlighted higher TEWL values in the dominant limb of women compared to the nondominant limb, potentially linked to frequent limb use. In this project, measurements were conducted on the forearm of the nondominant hand, ensuring that the results obtained were not susceptible to errors arising from differences between the dominant and nondominant hand.

The current study highlights the positive impacts of the oils on the skin, including enhanced hydration of the stratum corneum and, notably, a reduction in TEWL for one of the oils. The vegetable oils employed, owing to their phytochemical composition, facilitated increased water retention in the outer layer of the epidermis, as evidenced by the corneometer. Moreover, it is worth noting that only raspberry seed oil demonstrated an improvement in the skin barrier function.

The lipid matrix that fills the spaces between corneocytes is crucial for maintaining the skin barrier function. This matrix is primarily composed of three classes of lipids: ceramides, free fatty acids, and cholesterol [29]. A deficiency in unsaturated fatty acids can lead to SC dysfunction, characterized by abnormal exfoliation and a diminished barrier capacity [30]. Drying oils, with a composition containing over 50% PUFAs, can induce more robust, positive changes in skin characteristics due to the high percentage of PUFA in the triglycerides that constitute oils like raspberry seed oil. However, it is important to emphasize that these results are based on a single application. It has been noted that prolonged use of oils with a very high content of polyunsaturated acids may have the opposite effect and lead to skin dryness. Firstly, such oils lack a lubricating effect and typically do not form an occlusive film when applied to the skin. Secondly, their long-term use can alter the chemical characteristics of sebum, making it more liquefied but less protective [31]. While this effect may be beneficial for seborrheic and acne-prone skin, it can have negative consequences for skin with reduced sebum production [32].

One of the frequently employed semi-drying oils in cosmetics is argan oil, whose moisturizing properties were previously discussed in the work by Boucetta et al. [33]. In their study involving 60 menopausal women, they reported a noteworthy decrease in TEWL and an elevation in SC hydration with daily application to the skin. In the current project, sesame oil was selected, despite having less research on its cosmetic properties. The modest yet statistically significant enhancement in SC hydration observed after just a single application may be attributed to the similarity in phytochemical composition between sesame oil and argan oil.

Among the three oils investigated, coconut oil stands out as the most extensively studied and widely used vegetable oil for cosmetic purposes [21]. It is utilized as a moisturizer suitable for all skin types, with its high safety profile emphasized, exemplified by its use [22] in the care of newborns and even premature babies [34,35]. Literature sources suggest its application in aging individuals to delay the onset of wrinkles due to its moisturizing properties [35]. Our study aligns with this, indicating a statistically significant improvement in skin hydration after just a single application [36]. While this project does not specifically address the impact of coconut oil on barrier function, repeated use of this oil has been clinically documented to reduce TEWL [37], a finding supported by various laboratory models. Studies conducted in an *in vitro* model by Varma et al. [38] underscore the protective effect of virgin coconut oil by strengthening the skin barrier function. Similarly, Kim et al. [39], working with an *ex vivo* model, obtained comparable results.

Oils are widely recognized as lubricating agents. Kang [40] highlighted the positive correlation between skin hydration and oiliness. These properties are beneficial for the effective care of dry skin, which occurs not only as a component of aging but also in specific conditions such as AD [41], thyroid disorders [42], psoriasis [40], and diabetes [43].



Based on traditional uses, raspberry seed oil is employed in moisturizing cosmetics. The oil's effect is to establish a hydrolipidic barrier, preventing the loss of natural skin moisture [26]. In the present study, favorable trends in TEWL changes were observed for all oils. However, a *post hoc* test revealed a significant statistical difference only for raspberry oil; others exhibited no notable effect. This unique observation indicates that only drying oil, such as raspberry seed oil, enabled a distinct improvement in the skin barrier function. A study by Saraogi et al. [44] demonstrated the protective effect of coconut oil on the lipid barrier against repeated exposure to 70% ethanol over a 15-day application period. Similarly, in a study by Evangelista et al. [45], a significant decrease in TEWL was reported among patients with mild-to-moderate AD after 8 weeks of coconut oil use. The variations between these cited studies and the present one may stem from the repeated vs. one-time use of the oil and the different skin conditions examined. The cited studies focus on skin exposed to irritants and skin affected by disease. In pathologically altered skin, the correlation is reversed—as SC hydration decreases, TEWL increases [30]. In this study, baseline TEWL values did not exceed 25 g/m<sup>2</sup>/h, indicating normal (average) skin condition. Typical TEWL values help to maintain natural moisturizing factor (NMF) elements in the epidermis, enhancing its hydration. For healthy skin, hydration levels and TEWL are strongly inversely correlated. This study does not conclusively indicate that raspberry oil moisturizes the skin the most, but the result falls within the range of the statistical trend. Therefore, the three oils tested could potentially have had comparable moisturizing effects, contributing to an improved barrier function. The relationship could also have operated in the opposite direction, where the most robust interference with barrier function resulted in the most substantial moisturizing effect. Raspberry seed oil exhibited the best effect because, as a drying oil, it penetrated the deepest and replenished intercellular lipids. Semi-drying and drying oils, while remaining on the skin's surface, did not penetrate as deeply, thus not restricting water escape from the body.

The results of corneometric measurements are categorized as follows: skin adequately hydrated if above 40 IU, skin dry in the range of 30–40 IU, and skin very dry if below 30 IU [46]. In the current study, baseline assessments revealed only four subjects with adequately hydrated skin, 19 with dry skin, and 12 with very dry skin. Our findings indicate that the water determined by a bioimpedance measurement (TBW) does not correlate with the skin hydration level, signifying no direct association with water availability to the skin, particularly its outermost layer, the SC. However, corneometer and tewameter measurements pertain specifically to the stratum corneum and the functioning of the hydrolipid barrier. The stratum corneum serves to decelerate the diffusion of water from the deeper layers of the dermis, and its distinct structure prevents extrinsic substances, including water, from penetrating the skin [47]. Therefore, it cannot be presumed that a well-hydrated body will necessarily correlate with the hydration of the dermis. Our own research only suggests that oral hydration alone, without additional proper care, may not positively influence the condition of the SC.

The correlation between BMI and skin characteristics has been demonstrated in previous studies. Ye et al. [48] found a positive correlation between BMI and SC hydration levels and a negative correlation between BMI and TEWL in a study involving 1405 individuals aged 21–98. Similar results were obtained by Mekič et al., who studied a cohort of more than 5500 people [49]. However, in the present study, there was no indication of an association between corneometry or tewametry results and body weight or BMI. It is noteworthy that the participants in this study were of very similar ages (18–23), and the majority had BMIs within the normal range. The lack of variation in these aspects may have contributed to the failure to observe a correlation between body composition and epidermal hydration and TEWL.

Throughout the project, none of the participants reported any side effects from the oils used. No tool was employed to quantify adverse reactions. Information on individual reactions was obtained through oral interviews with participants. The observed improvement in hydration may imply a positive impact of the oils on the skin with regular use. However,

it is essential to consider that changes may vary over an extended period, as demonstrated, for instance, by coconut oil, which does not affect TEWL with a single application. Nevertheless, its repeated application has been proven to be an effective method for enhancing the barrier function. Conversely, opposite effects may be anticipated for raspberry seed oil, but this requires clinical confirmation.

## 5. Conclusions

The application of raspberry seed oil, sesame seed oil, and coconut oil exhibits a positive impact on the hydration of the stratum corneum after a single use. The enhancement in the skin barrier function, as measured by the magnitude of TEWL, was evident only with raspberry seed oil. The effectiveness of applying oils to the skin is not influenced by the body weight, body water content, or BMI of women.

### Study Limitations

The study presented here examined the effects of a single application of oils on the skin of young, healthy women. It is important to note that the current results cannot be automatically extrapolated to other populations, particularly patients with various dermatological dysfunctions. Another limitation is the absence of a random selection of application sites for the selected oils.

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**Institutional Review Board Statement:** The study was conducted in accordance with the principles outlined in the 7th revision of the Declaration of Helsinki and received approval from the bioethical committee of the Regional Medical Chamber in Krakow (25.09.2023; no: 177/KBL/OIL/2023).

**Informed Consent Statement:** Consent for participation in the study was obtained from all subjects. Additionally, written informed consent has been acquired from the patient(s) for the publication of this paper.

**Data Availability Statement:** The data presented in this study are accessible upon request from the corresponding author. The data are not publicly available due to ethical considerations (making the data public was not included in the application to the bioethics committee).

**Conflicts of Interest:** The authors declare no conflict of interest.

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