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Comparison of Bioactive Compounds in Local and Imported Coriander Leaf Extracts Using GC-MS

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Abstract. *Coriander leaves contain bioactive compounds that are beneficial to health, but the content can differ depending on the origin and environmental conditions where they grow. Coriander leaves of local Indonesian or imported origin differ in their characteristics and bioactive compound content, necessitating analysis of both types. This study aims to analyse the bioactive compounds in the extract of local Indonesian coriander leaves from Bukittinggi, West Sumatra, and imported coriander from Egypt using gas chromatography–mass spectrometry (GC–MS). Coriander leaves were extracted using 96% ethanol in an ultrasonic bath. The extract was analysed for pH, antioxidant and antibacterial activity, residual ethanol content, and GC–MS to identify the compounds present. The results showed that the local Bukittinggi coriander leaf extract had a pH of 4.01, antioxidant activity based on DPPH inhibition of 88.34%, antibacterial activity against Staphylococcus aureus with a clear zone diameter of 23.38 mm, and a residual ethanol content of 0.68%. Meanwhile, the imported Egyptian coriander leaf extract had a pH of 3.68, antioxidant activity of 83.25%, antibacterial activity of 26.00 mm, and a residual ethanol content of 0.00%. Imported Egyptian coriander leaves exhibited higher antibacterial activity and lower residual ethanol content than local Bukittinggi coriander leaves. However, local Bukittinggi coriander leaves demonstrated greater antioxidant activity than the imported Egyptian leaves. GC–MS analysis revealed that the local Bukittinggi coriander leaf extract contained organic compounds such as 3,5-bis(1,1-dimethylethyl) phenol, phytol, and dl-α-tocopherol, unlike the imported Egyptian coriander leaf extract.*

Keywords*: bioactive components; biological activity; coriander leaves; extraction; GC–MS.*

Type of the Paper: Regular Article.

1. Introduction

Coriander (*Coriandrum sativum* L.) is a spice plant with many benefits, serving both as a culinary spice and as a raw material in the pharmaceutical and cosmetic industries [1–3]. The *C. sativum* plant is rich in nutritional components and bioactive compounds, which can be extracted via microwave drying or ultrasonic-assisted extraction to maximise the recovery of substances into powder or ethanol extract [4]. Bioactive compounds obtained from *C. sativum* extracts are considered as beneficial functional foods for treating diabetes, obesity, and metabolic syndrome [5].

Coriander is reported to possess strong antioxidant, anti-inflammatory, and neuroprotective properties [6]. Coriander contains high levels of essential oils, polyphenols, flavonoids, terpenoids, and alkaloids, which contribute to its antioxidant, antimicrobial, and anti-inflammatory properties,

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making it a promising natural alternative to synthetic preservatives and additives [3,7,8,9]. Attaallah et al. [10] reported that coriander extract plays a strong role in ameliorating streptozotocin (STZ)-induced diabetic gonadal dysfunction in female rats and their offspring. The remedial role was attributed to the vital compounds identified via gas chromatography-mass spectrometry (GC-MS) analysis of coriander extract. The most dominant bioactive compounds in coriander extract were α-linalool, dodecamethylcyclohexasiloxane, digitoxin, oleic acid, cyclooctasiloxane, and 2,3-bis[(trimethylsilyl)oxy]propyl ester.

Coriander has a high phenolic content, especially in its leaves, which enhances its free radical scavenging capacity. This makes it a potential substitute for synthetic antioxidants such as butylated hydroxyanisole and butylated hydroxytoluene, which have raised health concerns due to their possible toxicity following long-term consumption [11]. The leaves of coriander are reported to contain various bioactive compounds, such as flavonoids, alkaloids, saponins, and tannins [12]. Owing to these bioactive compounds, coriander leaves represent a highly promising natural ingredient for the development of green or environmentally friendly products.

Coriander originates from the Mediterranean region and is now widely grown in Asia, Russia, Central Europe, and North Africa [13]. Asia has a larger number of *Coriandrum* species (approximately 289), followed by Europe and Africa with about 126 and 121 species, respectively [14]. In Indonesia, coriander is cultivated in highland areas, such as West Sumatra, Temanggung, Salatiga, Boyolali, and several other regions. However, coriander productivity in Indonesia remains relatively low owing to several factors, including limited cultivation in home gardens using intercropping systems and the rarity of monoculture farming [15]. Meanwhile, according to Mishra et al. [16], the application of appropriate agrotechniques helps increase crop productivity. Therefore, Indonesia still must import coriander from several countries to meet the high domestic market demand. One of the countries exporting coriander to Indonesia is Egypt. Egyptian coriander exports have increased significantly by 119.2% annually from 2017 to 2022 [17].

Coriander morphology varies depending on the species or region of cultivation. Coriander with small, round fruits contains higher levels of essential oils than does coriander with larger fruits [18]. This indicates that coriander of different morphologies also differs in its chemical composition. Therefore, it is necessary to analyse the chemical composition of coriander leaves from various sources—both locally grown in Indonesia and imported from Egypt—to determine differences in their bioactive compound content.

Coriander plants grown in Indonesia are generally cultivated in highland areas with cool temperatures, high humidity, and heavy rainfall, such as in Bukittinggi, West Sumatra. In contrast, Egypt has an arid climate characterised by high temperatures, intense sunlight, low humidity, and minimal rainfall. These environmental differences significantly influence coriander plant

metabolism, particularly in the biosynthesis of secondary metabolites such as essential oils, terpenoids, flavonoids, and phenolic compounds [19,20]. Gil et al. [21] also reported that the composition of coriander essential oil is greatly influenced by growing conditions, such that even plants of the same genotype can produce different compound profiles when grown under different climatic conditions.

The bioactive compound profiles of local and imported coriander leaves can be determined in greater detail through GC-MS analysis, which identifies volatile compounds in plant extracts [22]. This allows for a more comprehensive comparison of the compound profiles of coriander leaves from different origins. Therefore, this study aims to analyse the bioactive compounds in extracts of local coriander leaves from Bukittinggi, West Sumatra, and imported coriander from Egypt using the GC-MS method. The results of this study are expected to form the basis for developing high-quality local coriander and supporting the increased domestic self-sufficiency in natural raw materials.

2. Materials and Methods

2.1. Materials

Imported coriander leaves from Egypt were obtained from The Nut House, Surabaya, Indonesia. Local coriander leaves were obtained from farmers in Bukittinggi, Indonesia. Ethanol (96%) and distilled water were obtained from Kisbiokim Medialab, Padang, Indonesia. Materials for analysis included 2,2-diphenyl-1-picrylhydrazyl (DPPH) (Sigma-Aldrich), nutrient agar (NA) (Merck GranuCult), and a *Staphylococcus aureus* bacterial culture obtained from the Laboratory of the Faculty of Agricultural Technology, Universitas Andalas.

The analytical instruments used in this study included a pH meter (Az Instrument 86501), a UV-Vis spectrophotometer (Shimadzu UV-1900i), an autoclave (Hirayama HVE-50), an incubator (Memmert UN 450), gas chromatography-mass spectrometer (Perkin Elmer Clarus), and a gas chromatography–flame ionized detector (GC-FID) (Shimadzu QP-2010).

2.2. Research Procedure

2.2.1. Preparation of Coriander Leaf Powder

Coriander leaves were washed and cut into 4–6 pieces, then dried in direct sunlight for 1–2 days. The dried coriander leaves were subsequently ground and sieved using a 40-mesh sieve [12].

2.2.2. Preparation of Coriander Leaf Extract

Coriander leaves were placed in an Erlenmeyer flask, and 96% ethanol was added (1:4 w/v), then the flask was covered. Extraction was carried out using an ultrasonic bath at 30°C for 40 minutes [4]. The extract and solvent were separated using a vacuum rotary evaporator at 200 rpm and 50°C, until a thick extract that could no longer be poured was obtained [12].

2.2.3. pH Value

The pH was measured by inserting a pH meter electrode, previously rinsed distilled water, into a 10% sample solution [23].

2.2.4. Antioxidant Activity

A 1 ml sample was diluted with 9 ml of methanol and then sonicated for 15 minutes. One millilitre of 0.18 µm DPPH solution was combined with two millilitres of sample solution, and the mixture was allowed to stand at room temperature in the dark for 15 minutes. The absorbance of the solution was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm [24]. The percentage inhibition was calculated to determine the antioxidant activity of the samples based on the degree of free radical scavenging, using the formula shown in Eq. 1.

$$Inhibition\ (\%) = \frac{Control - Sample\ Absorbance}{Control} \times 100\% \quad (1)$$

2.2.5. Antibacterial Activity

A volume of 10 mL of nutrient agar (NA) medium were poured into a Petri dish. A cotton swab was dipped into a physiological saline solution containing the *Staphylococcus aureus* culture and then drained. The cotton swab was then swabbed onto the surface of the solidified agar. Disc paper was placed into a sample that had been dissolved in distilled water (1:1), then placed onto the agar surface and incubated for 48 hours at 37°C. Antibacterial activity was determined based on the diameter of the clear zone around the disc paper [25].

2.2.6. Residual Ethanol Content using the GC-FID Method

Sample analysis was carried out by dissolving 0.1 g of the sample in acetonitrile to a final volume of 5 ml, followed by vortexing and sonication. One millilitre of the sample solution was added to 1 ml of acetonitrile and filtered through a 0.22 µm PTFE filter. The gas chromatograph was injected with 0.2 µL of the sample solution [26].

2.2.7. GC-MS

A 10 µl sample was dissolved in 240 µl of methanol and injected into the GC-MS system. The oven conditions were set to three consecutive heating stages: an initial temperature of 110°C held for 2 minutes, then raised at a rate of 10°C per minute to 200°C with no holding period, and then increased again at a rate of 5°C per minute to 280°C, where it was held for 9 minutes. These settings were applied to ensure optimal separation of compounds before detection by the mass spectrometer [27].

3. Results and Discussion

3.1. Moisture Content of Dried Coriander Leaves

Moisture content can affect the quality of plant materials. If the moisture content of the material is sufficiently high, the material will be easily contaminated by microbes, and its physical

properties become more susceptible to damage [28]. Coriander leaves from both Egypt and Bukittinggi (Indonesia) have a high moisture content, as shown in Fig. 1. Therefore, it is important to determine the moisture content of dried cilantro leaves. Table 1 displays the findings of the moisture content analysis of dried coriander leaves.

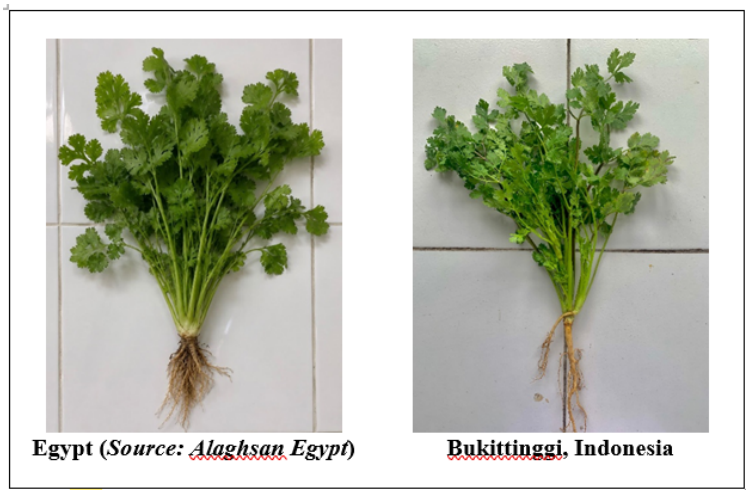

Fig. 1. Coriander leaves from Egypt and Bukittinggi, Indonesia.

Table 1. Moisture content of dried coriander leaves.

Raw Material	Moisture Content ± SD
Coriander leaves from Bukittinggi	9.75 ± 0.29
Coriander leaves from Mesir	9.31 ± 0.15

Table 1 shows that local coriander leaves from Bukittinggi and imported leaves from Egypt have low and relatively similar moisture contents of 9.75% and 9.31%, respectively. These values meet the moisture content requirements for herbal medicines according to SNI 16-4399-1996 [29], which sets a maximum of 10%.

3.2. Characteristics of Coriander Leaf Extract

The analysis performed on the coriander leaf extract included pH measurement, antioxidant activity (determined as the percentage of DPPH free radical inhibition), antibacterial activity against *Staphylococcus aureus* (measured by the diameter of the clear zone), and residual ethanol content. The results of the comparative analysis of the characteristics of local Bukittinggi and imported Egyptian coriander leaf extracts can be seen in Table 2.

Table 2. Characteristics of coriander leaf extracts from Bukittinggi and Egypt.

Parameters	Extract Samples	
	Coriander Leaves from Bukittinggi	Coriander Leaves from Mesir
pH value	4.01 ± 0.18	3.68 ± 0.03
Antioxidant activity (%)	88.34 ± 0.77	83.25 ± 0.75
Antibacterial activity (mm)	23.38 ± 1.57	26.00 ± 0.54
Residual ethanol level (%)	0.68 ± 0.01	0.00 ± 0.00

Table 2 shows that local coriander leaf extracts from Bukittinggi and imported extract from Egypt have acidic pH values of 4.01 and 3.68, respectively. These acidic pH values are attributed

to the presence of organic acid compounds and other bioactive compounds with antioxidant activity. Research on the effect of pH on the antioxidant activity of ethanol extracts of miana leaves reported that pH values of 3 and 4 exhibited better antioxidant activity than pH values of 5.3 to 8 [30].

Table 2 shows that local coriander leaf extract from Bukittinggi has greater antioxidant activity (88.34% at 1000 ppm) compared to imported Egyptian coriander leaf extract at the same concentration (83.25%). This antioxidant activity is attributed to the presence of antioxidant compounds in coriander leaves, such as linalool, carvone, 2-hexyn-1-ol, and (E)-2-hexenal [31,32]. These are polar compounds that dissolve in ethanol (a polar solvent) during the extraction process.

Table 2 shows that local coriander leaf extract from Bukittinggi has lower antibacterial activity (23.38 mm) compared to imported Egyptian coriander leaf extract (26.00) mm. Samples with an inhibition zone diameter of 21–30 mm are classified as having very strong antibacterial activity [33]. The antibacterial activity of both coriander leaf extracts is attributed to their content of alkaloids, flavonoids, phenols, and tannins, which possess antibacterial properties [34].

Table 2 shows that local coriander leaf extract from Bukittinggi has a higher ethanol residue content (0.68%) compared to imported Egyptian coriander leaf extract (0.00%). This indicates that the solvent removal process was more effective for the imported Egyptian coriander leaf extract than for the local Bukittinggi extract. In addition, Bukittinggi coriander leaves have a higher moisture content than Egyptian coriander leaves (Table 1), which may result in more ethanol remaining trapped within the extract matrix. Li et al. [35] explained that the presence of water in hydroalcoholic systems can help retain ethanol within the formulation matrix, as molecular interactions between water and ethanol can inhibit ethanol evaporation during the drying and removal processes. However, both extracts have residual ethanol levels of less than 1%, which complies with the requirements for solvent (ethanol) residue levels in extracts according to BPOM [36], where the maximum allowable limit is 1%.

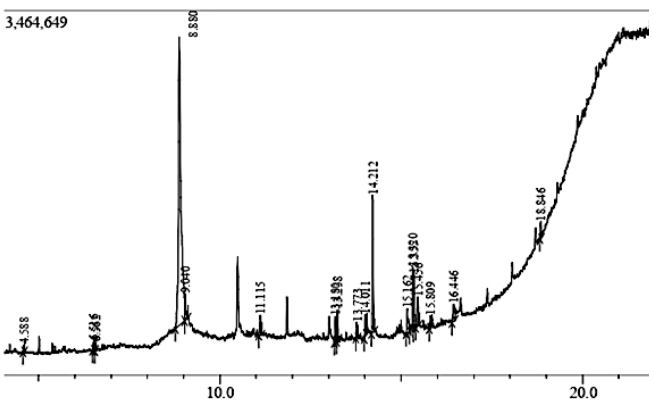

Fig. 2. GC-MS chromatogram of compounds detected in imported Egyptian coriander leaf extract.

3.3. GC-MS Analysis

One popular technique for identifying volatile compounds in plant extracts is GC-MS analysis. The results of GC-MS analysis, based on the peaks of compounds detected in the imported Egyptian coriander leaf extract, are shown in Fig. 2 and Table 3.

Table 3. Peak data of compounds detected in Egyptian imported coriander leaf extract.

Peak	Retention Time	Components	Base m/z	Area (%)
1	4.588	*2(5H)-Furanone*	55.05	0.32
2	6.516	*Isodecyl methacrylate*	69.05	0.45
3	6.562	*Acetic acid, 2-propylpentyl ester*	70.10	0.48
4	8.880	*6-Octenoic acid, 3,7-dimethyl-*	69.10	61.28
5	9.040	*Dodecyl nonyl ether*	57.05	2.71
6	11.115	*2(4H)-Benzofuranone, 5,6,7,7a- tetrahydro-4,4,7a-trimethyl-*	111.10	1.46
7	13.180	*Neophytadiene*	68.05	1.83
8	13.238	*2-Pentadecanone, 6,10,14-trimethyl-*	58.05	1.98
9	13.773	*Hexadecanoic acid, methyl ester*	74.10	1.16
10	14.011	*n-Hexadecanoic acid*	73.05	2.01
11	14.212	*Hexadecanoic acid, ethyl ester*	88.05	8.71
12	15.162	*2-Phenyl-2-(1-piperidinyl)acetamide, TMS*	174.10	2.62
13	15.320	*(E)-9-Octadecanoic acid ethyl ester*	69.05	4.61
14	15.355	*Ethyl Oleate*	55.00	4.13
15	15.456	*Octadecanoic acid, ethyl ester*	88.05	2.08
16	15.809	*Undecanoic acid, TBDMS derivative*	243.10	0.84
17	16.446	*3-methyl-5-(2,6-dimethylheptyl)-1,5-Pent-2-enolide*	111.10	2.32
18	18.846	*2,6,10,14,18-Pentamethyl-2,6,10,14,18-eicosapentaene*	69.10	1.01
		Total		**100**

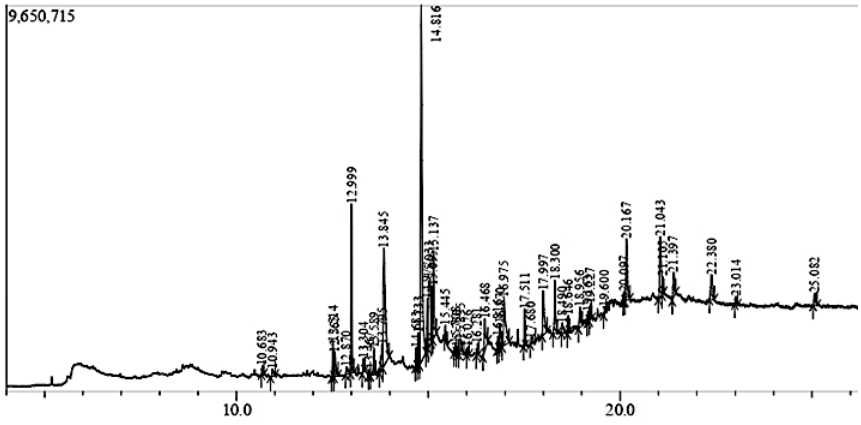

Fig. 3. GC-MS chromatogram of compounds detected in local Bukittinggi coriander leaf extract.

Fig. 2 shows that the highest peak appeared at a retention time of 8.880 minutes, corresponding to the compound 6-octenoic acid, 3,7-dimethyl-, with an area percentage of 61.28% (Table 3). This indicates that 6-octenoic acid, 3,7-dimethyl- is one of the main components of the imported Egyptian coriander leaf extract. Other compounds identified in the imported Egyptian coriander leaf extract include 2(5H)-furanone, isodecyl methacrylate, and acetic acid, 2-propenyl ester, which appear at early retention times (approximately 4.5–9 minutes). Compounds detected at longer retention times (approximately 11-18 minutes) include 2 (4H)-benzofuranone, 5,6,7,7a-

tetrahydro-4,4,7a-trimethyl-, neophytadiene, as well as fatty acids and their esters, such as hexadecanoic acid methyl ester and octadecanoic acid ethyl ester. The results of the GC-MS analysis of the local Bukittinggi coriander leaf extract are presented in Fig. 3 and Table 4.

Table 4. Peak data of compounds detected in local coriander leaf extracts from Bukittinggi.

Peak	Retention Time	Components	Base m/z	Area (%)
1	10.683	*Phenol, 3,5-bis(1,1-dimethylethyl)-*	191.10	0.36
2	10.943	*Phosphoric acid, diethyl octyl ester*	127.05	0.39
3	12.514	*Sedanolide*	108.05	1.83
4	12.565	*Octanoic acid, 2-methylphenyl ester*	108.05	1.68
5	12.870	*Loliolide*	111.00	0.51
6	12.999	*Neophytadiene*	68.05	6.31
7	13.304	*3,7,11,15-Tetramethyl-2-hexadecen-1-ol*	81.05	0.53
8	13.467	*9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-*	79.05	0.25
9	13.589	*Hexadecanoic acid, methyl ester*	74.05	1.01
10	13.795	*Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-methyl ester*	277.15	1.67
11	13.845	*n-Hexadecanoic acid*	73.05	9.83
12	14.683	*9,12-Octadecadienoic acid (Z,Z)-, methyl ester*	67.05	0.81
13	14.733	*9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-*	79.05	1.20
14	14.816	*Phytol*	71.05	22.90
15	14.972	*10E, 12Z-Octadecadienoic acid*	174.10	2.75
16	15.033	*9,12,15-Octadecatrienoic acid, (Z,Z,Z)-*	79.05	6.31
17	15.095	*(R)-(-)-14-Methyl-8-hexadecyn-1-ol*	55.05	2.75
18	15.137	*9,10-Epoxyoctadecane*	143.10	3.95
19	15.445	*2-(1-Butyl-2-nitroallyl)cyclohexanone*	193.10	0.54
20	15.708	*Dodecyl cis-9,10-epoxyoctadecanoate*	55.05	0.44
21	15.750	*N-[2-(Dimethylamino)ethyl]-5-(1,2-dithiolan-3-yl)pentanamide*	58.05	0.29
22	15.855	*2-(Dimethylamino)ethyl vaccenoate*	58.05	0.94
23	16.026	*Methyl (Z)-5,11,14,17-eicosatetraenoate*	193.10	0.27
24	16.281	*Z-2-Tridecen-1-ol*	57.05	0.35
25	16.468	*Pyridine*	79.05	2.25
26	16.816	*2-(Dimethylamino)ethyl vaccenoate*	58.05	0.55
27	16.870	*3-Cyclopentylpropionic acid, 2-dimethylaminoethyl ester*	58.05	1.30
28	16.975	*n-Tetracosanol-1*	55.05	4.26
29	17.511	*1-Cyclohexyldimethylsilyloxybutane*	131.05	1.26
30	17.680	*1-Indolizinecarboxylic acid, 2-amino-3-cyano-5,6,7,8-tetrahydro-, ethyl ester*	233.05	0.30
31	17.997	*1-Heneicosanol*	57.05	2.99
32	18.300	*5-Henicosyldihydrofuran-2(3H)-one*	85.05	2.59
33	18.490	*3,7-Dioxa-2,8-disilanonane, 2,2,4,4,6,8,8-heptamethyl-*	131.05	0.66
34	18.646	*Squalene*	69.05	0.51
35	18.956	*Octacosanol*	57.10	1.24
36	19.163	*Cyclohexene, 4-(4-ethylcyclohexyl)-1-pentyl-*	55.05	0.34
37	19.227	*3,7,11,15-Tetramethyl-2-hexadecen-1-ol*	55.05	0.67
38	19.600	*Cholestane-3-one, methoxime*	120.10	0.31
39	20.097	*Phytyl eicosanoate*	57.05	0.31
40	20.167	*dl-α-Tocopherol*	165.10	3.21
41	21.043	*Stigmasterol*	55.05	3.90
42	21.105	*Phytyl dodecanoate*	57.05	0.73
43	21.397	*β-Sitosterol*	81.10	1.58
44	22.380	*1-Ethynylcyclododecanol*	57.05	1.78
45	23.014	*2,6-Di-tert-butyl-4-methylphenol, O-trifluoroacetyl*	57.05	0.44
46	25.082	*Methyl 2α,3β-dihydroxyolean-12-en-28-oate*	203.10	0.94
		Total		**100**

The GC–MS analysis results in Fig. 3 show that the highest peak appeared at a retention time of 14.816 minutes, and the compound was phytol with an area of 22.9% (Table 4). This indicates that phytol is one of the main components of the local Bukittinggi coriander leaf extract. Phytol is a chlorophyll-derivative alcohol with various bioactive properties including antioxidant, antimicrobial, and anti-inflammatory effects [37]. The phenolic compounds identified in the local Bukittinggi coriander leaf extract include phenol, 3,5-bis(1,1-dimethylethyl)-, 2,6-di-tert-butyl-4-methylphenol, O-trifluoroacetyl; and benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-methyl ester. In addition, terpenoid compounds and their derivatives were also identified in the local Bukittinggi coriander leaf extract including neophytadiene, loliolide, sedanolide, and squalene, as well as the tocopherol derivative dl-α-tocopherol. Terpenoids are the largest and most diverse group of specialised metabolites, comprising more than 80,000 compounds. They are highly valued in the food industry for their characteristic flavours and aromas, as well as antioxidant properties, which are beneficial for food and nutraceuticals [36,37].

Based on the GC-MS analysis results (Table 3 and Table 4), the imported Egyptian and local Bukittinggi coriander leaf extracts share some similar compounds, including neophytadiene and n-hexadecanoic acid. Neophytadiene has also been detected in coriander leaves cultivated in Saudi Arabia and Turkey [38,39]. Neophytadiene is an important diterpene compound for plants and has been proven safe as a medicinal ingredient in laboratory and animal studies [40]. Meanwhile, n-hexadecanoic acid (palmitic acid) is a saturated fatty acid that acts as an antioxidant and antibacterial agent against both Gram-positive and Gram-negative bacterial strains, and has been shown to help prevent atherosclerosis in animal models [41]. Palmitic acid is also known as an emollient that can moisturises the skin by maintaining skin hydration [42].

Overall, the local Bukittinggi coriander leaf extract exhibits a different compound composition, with distinct peak numbers and similarity indices, compared to imported Egyptian extract. Furthermore, the compound composition and diversity are greater in the local Bukittinggi extract, as evidenced by the higher number of detectable peaks, compared to the imported Egyptian extract. This suggest that local Bukittinggi coriander leaf extract has greater potential for bioactive activity— including antioxidant, anti-inflammatory, or other pharmacological effects — compared to the imported Egyptian extract.

4. Conclusions

Dried local coriander leaves from Bukittinggi and imported Egyptian coriander leaves both have a moisture content of less than 10%. The extract of local Bukittinggi coriander leaves has a higher pH value (4.01) and greater antioxidant activity (88.34%) than the extract of imported Egyptian coriander leaves (pH 3.68 and antioxidant activity 83.25%, respectively). However, the

antibacterial activity of imported Egyptian coriander leaf extract (26.00 mm) is stronger than that of local Bukittinggi extract (23.38 mm). In addition, the residual ethanol content in the local Bukittinggi coriander leaf extract (0.68%) is still detectable, whereas in the imported Egyptian extract it is undetectable (0.00%). The extracts of Egyptian and Bukittinggi coriander leaves share some common compounds, including neophytadiene and n-hexadecanoic acid. However, the Bukittinggi coriander leaf extract also contains the phenolic compounds 3,5-bis(1,1-dimethylethyl)-, 2,6-di-tert-butyl-4-methylphenol, O-trifluoroacetyl, benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-methyl ester, phytol, and dl-alpha-tocopherol. Overall, the Bukittinggi coriander leaf extract contains more bioactive compounds than the Egyptian coriander leaf extract.

Abbreviations

GC-MS Gas Chromatography-Mass Spectrometry

Data availability statement

Data will be made available on request

CRediT authorship contribution statement

Alfi Asben: contributed to the writing of the manuscript, data analysis, and supervision of the study. **Silfi Indrian:** carried out the laboratory experiments and data processing. **Kurnia Harlina Dewi:** contributed to the data audit and acted as a research co-supervisor.

Declaration of Competing Interest

The authors of this manuscript declare no conflict of interest or competing interest.

Declaration of Use of AI in the Writing Process

The author(s) used DeepL and Grammarly during the preparation of this manuscript to improve grammar and enhance text clarity. After using the tool/service, the author(s) carefully reviewed and edited the content and take full responsibility for the content of the publication.

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