Phytochemical And FTIR Analysis Of Coriander Leaf Infusion As An Active Pharmaceutical Ingredient

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Abstract.

This study reported that the sample used in the study was an infusion using fresh coriander leaves samples taken in the Lubuk Pakam area. Several studies have shown that the active components of coriander seeds are essential oils such as sabiene, myrcene, alphaterpine, ocimene, linalool, graniol, decanal, desilaldehyde, trantridecen, petroselinic acid, octadesenic acid, d-mannite, scopoletin, psimena, kamfena and felandren. These components cause coriander to have a good effect as a medicinal component. In previous studies, Linalool is believed to have antioxidant, anxiety, antibacterial (especially gram-positive) and antifungal effects. This activity is suspected because coriander contains secondary metabolites such as alkaloids, saponins, flavonoids, tannins, steroids, triterpenoids, glycosides. So this research was conducted to determine the content of secondary metabolites in coriander leaves by phytochemical screening. Phytochemical screening is a test to determine the class of chemical compounds present in coriander leaf infusion samples. Fourier transform infrared spectroscopy (FTIR) analysis was performed to find the isolating compounds in coriander leaves. The results showed that one secondary metabolite compound was negative in examining steroid secondary metabolites. The results of extract assistance with FTIR showed the presence of saponins with a molecular weight of 873.0 g/mol at a retention time of 19,287 minutes, but the peaks produced were not dominant.

Keywords: *Coriander, FTIR, Phytocemical and Secondary Metabolites.*

I. INTRODUCTION

One source of medicinal raw materials is from nature, known as herbal medicine. Herbal medicines are defined as spices, herbal ingredients, herbal preparations and finished products which contain plant parts or plant components as active compounds that confer efficacy [1]. In plants, various secondary metabolites such as alkaloids, tannins, polyphenols and their derivatives later become a reference for developing herbal medicines.One of the plants used in herbal medicine is coriander. The coriander plant produces two main products: coriander seeds, which are used as a cooking spice to add aroma and flavouring, and coriander leaves, which are usually used as a vegetable. Besides these uses, coriander is traditionally believed to have many health benefits, such as treating diarrhoea, canker sores, insomnia and joint pain and many other properties contained in coriander leaves which are commonly used by the wider community [2].Several studies have shown that the active components of coriander seeds are essential oils such as sabiene, myrcene, alphaterpine, ocimene, linalool, geraniol, decanal, desilaldehyde, trantridecen, petroselinic acid, octadecenoic acid, d-mannite, scopoletin, psimena, kamfena and felandren. These components cause coriander to have a good effect as a medicinal component [3]. Coriander is also known to have the ability as an antioxidant with an IC50 value of the ethanol extract of coriander leaves with a value of 91.2287 µg/mL, which has antioxidant activity in the strong category.

In contrast, the ethyl acetate extract of coriander leaves with a value of 111.9513 µg/mL and n extract. -Cilantro leaf hexane with an IC50 value of 143.2908 µg/mL has moderate antioxidant activity [4, 5, 6]. Other studies have shown that the ethanol extract and ethyl acetate extract of coriander leaves have antibacterial activity with MIC values against Escherichia coli bacteria at concentrations of 25 mg/ml and 50 mg/ml against Vibrio cholera at concentrations of 50 mg/ml and 25 mg/ml, against Bacillus cereus at concentrations of 10 mg/ml and 10 mg/ml [7, 8, 9].This activity is suspected because coriander contains secondary metabolites such as alkaloids, saponins, flavonoids, tannins, steroids, triterpenoids, and glycosides. So this research was conducted to determine the content of secondary metabolites in coriander

leaves by phytochemical screening. Phytochemical screening is a test to determine the class of chemical compounds present in coriander leaf infusion samples. Fourier transform infrared spectroscopy (FTIR) analysis was performed to identify compound isolates in coriander leaves.

II. METHODS

Tools and materials

The material used in this study was coriander leaf simplicia, coriander leaf infusion. The chemicals used in this study were iron (III) chloride, lead (II) acetate, sodium hydroxide, hydrochloric acid, concentrated sulfuric acid, chloralhydrate, Mollish reagent, Mayer's reagent, Liberman-Bouchard reagent, Dragendorf, magnesium powder, hydrochloric acid concentrated, amyl alcohol, 96% ethanol, isopropanol, chloroform, methanol, toluene, n-hexane. The tools used in this study were electric balances, porcelain cups, test tubes, volumetric flasks, Erlenmeyer, cover glass desiccators, and other glassware.

Phytochemical Screening

Alkaloid Examination

0.5 grams of simplicia powder was weighed, added 1 ml of 2 N hydrochloric acid and 9 ml of distilled water were heated over a water bath for 2 minutes, activated and ignited; the filtrate was used to test for alkaloids. Three test tubes were taken, and 0.5 ml of the filtrate was put into each test tube. A white or yellow precipitate will form tube I: 2 drops of Mayer's reagent are added. In tube II: 2 drops of Dragendorf reagent are added, and a brown or orange-brown precipitate will form. In tube III: 2 drops of Bouchardat reagent are added, and a brown to black precipitate will form. The alkaloid is positive if precipitate or turbidity occurs in two or three of the above experiments [10].

Flavonoid Examination

The simplicia powder was weighed as much as 10 grams, added 10 ml of hot water, boiled for 5 minutes and dissolved in hot conditions. To 5 ml of the filtrate, add 0.1 gram of magnesium powder and 1 ml of concentrated hydrochloric acid, and 2 ml of amyl alcohol, shake and allow to stand. Split. Flavonoids are positive if a red or yellow, or orange colour occurs in the amyl alcohol layer [10].

Saponin Examination

Weigh 0.5 grams of simplicia powder, put it into a test tube, add 10 ml of hot distilled water, replace, then shake vigorously for 10 seconds. Saponins are positive if a stable foam is formed for not less than 10 minutes as high as 1 to 10 cm, and with one drop of 2 N hydrochloric acid, the foam does not disappear [10].

Examination of Tannins

Simplisia powder was weighed as much as 0.5 g, boiled for 2 minutes in 10 mL of distilled water, and then touched and rinsed. 1-2 drops of 1% iron (III) chloride reagent were added to the filtrate. If a blue-black or black-green colour occurs, it indicates the presence of tannins [10].

Terpenoid Examination

A preliminary qualitative test was conducted to determine terpenoid/steroid compounds in coriander leaves. In 10 g, the fine powder of coriander leaves was extracted by maceration with ethanol and then dissolved. The filtrate was tested using a reagent. The filtrate was tested using a reagent. The filtrate is added with three drops of Salkowsky reagent to form a red solution. The filtrate is added with three drops of Lieberman Burchard reagent to form a bluish-green solution. The filtrate was added to three 1% CeSO4 reagent solution drops in 10% H2SO4. A positive result for steroid compounds is the appearance of a blue or purple colour. In contrast, for triterpenoid compounds, a positive result is indicated by the appearance of a brownish-red colour [10].

Fourier-Transform Infrared Spectroscopy (FTIR) Analysis

Fourier Transform Infrared is an infrared spectroscopy equipped with Fourier transforms for detecting and analysing the spectrum results [11]. FTIR spectrophotometer, which functions to determine the vibrational spectrum of molecules and its benefits for predicting the structure of chemical compounds. In general, spectral sampling using FTIR has three spectral sampling techniques that have the characteristics of specific molecular vibration spectra, namely Demountable liquid cell, Diffuse reflectance measuring (DRS-8000), Total Attenuated Reflectance (ATR-8000) [12]. Infrared spectra were collected on the Varian 660IR

model paired with a VeeMax II reflection accessory (Pike Technologies), from 4000 to 400cm-1 and for 100 scans at 1cm-1 resolution, bounce angle at 51°. The Kubelka-Munk (K-M) function is used.

III. RESULT AND DISCUSSION

Phytochemical Screening

Phytochemical screening is a test to determine the class of chemical compounds present in coriander leaf infusion samples. The results of the coriander leaf infusion phytochemical screening can be seen in Table 1.

Table 1. Results of Phytochemical Screening

Secondary Metabolites	Reactan	Result	Information
Alkaloids	Dragendroff, Bouchardat, Meyer	+	Dragendorff: orange Wagner: brown Mayer: white precipitate
Saponins	Hot/shaken water	+	Bubbles/foam
Flavonoids	Mg Powder + Amyl Alcohol + HCl_p	+	Red
Tannins	$FeCl_3$	+	Green
Steroids	Lieberman-Bourchat	-	No discoloration
Triterpenoid	Lieberman-Bourchat	+	Brown orange
Glycosides	Mg Powder + Amyl Alcohol + HCl_p	+	Purple ring

Note: (+) positive = contains a group of compounds, (-) negative = does not contain a group of compounds

Based on the results of the phytochemical screening showed that coriander leaves contain secondary metabolites of alkaloids, saponins, flavonoids, tannins, triterpenoids, and glycosides. From the results of the phytochemical screening in the table above, the positive results contained alkaloid secondary metabolites, glycosides, saponins, flavonoids and tannins. However, we got negative results on examining secondary steroid metabolites, which, according to previous studies, could not attract secondary steroid metabolites in the water.

FTIR Result

Characterization using Infrared spectrophotometry is used to determine the functional groups of the isolated compounds coriander leaf infusion can be seen in Figure 1.

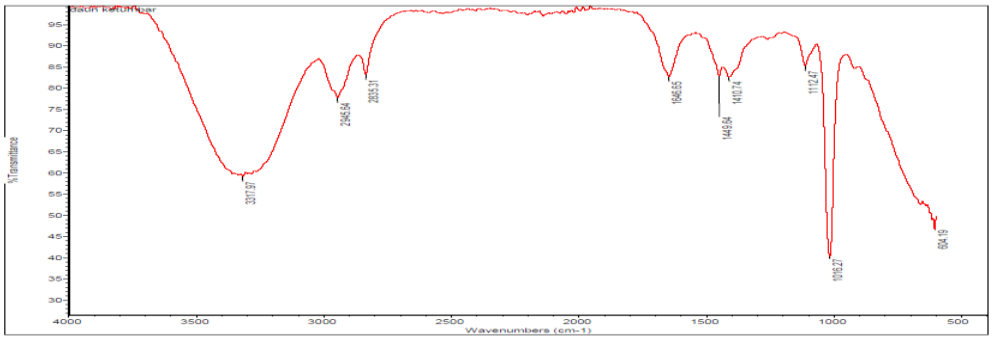

Fig 1. Compound Characterization Results Using FTIR Spectrophotometry

The FTIR spectrogram of coriander leaf infusion (*Coriandrum sativum* L.), which is suspected of containing saponin compounds, shows a broad absorption at a wavelength of 2930.50 cm-1 which indicates the presence of aliphatic C-H groups, not C-H aldehydes because the absorption peaks that appear are not sharp. A slightly sharp peak at a wavelength of 1710.28 cm-1 is an indication of the presence of a C=O group stretch; then, a slightly sharp peak appears at a wavelength of 1237.79 cm-1, indicating the presence of a C-O group, it is just that in the spectrum it does not indicate the presence of OH group, which has a broad peak at a wavelength between 3000-3600 cm-1. Based on the literature obtained, the structure of the saponin group has almost an average –OH group. It is suspected that the –OH group does not appear, characteristic of plant saponins, due to the presence of compounds and other actives that are also extracted by semipolar solvents that FTIR can measure.

IV. CONCLUSION

The results of the study with the phytochemical screening test showed that one secondary metabolite compound was negative in the examination of steroid secondary metabolites. The results of the identification of the extract with FTIR showed the presence of saponins with a molecular weight of 873.0 g/mol at a retention time of 19.287 minutes, but the resulting peaks were not dominant.

REFERENCES

[1] Mahomoodally M. F. Traditional medicines in Africa: an appraisal of ten potent African medicinal plants. ***Evidence-Based Complementary and Alternative Medicine.*** 2013;2013:14. doi: 10.1155/2013/617459.617459

[2] Mahendra, P., & Bisht, S. (2011). Anti-anxiety activity of Coriandrum sativum assessed using different experimental anxiety models. ***Indian journal of pharmacology***, 43(5), 574.

[3] Zore. et all. 2011. Terpenoids inhibit Candida albicans growth by affecting membrane integrity and arrest of cell cycle. ***Phytomedicine***, vol. 18, no. 13, pp. 1181-1190. PMid:21596542.

[4] Tansos. 2019. Aktivitas Antioksidan dari Ekstrak Daun Ketumbar (Coriandrum sativum L.). In Skripsi. Medan: Fakultas Farmasi Universitas Sumatera Utara.

[5] Chandra. 2019. Analisis Kandungan Mineral Besi, Kalium, Natrium dan Seng pada Daun Ketumbar (Coriandrum sativum L.) Secara Spectrofotometri Serapan Atom. In Skripsi. Medan: Fakultas Farmasi Universitas Sumatera Utara.

[6] Juniarti, E. 2012. Ekstraksi Minyak Ketumbar (Coriander Oil) Dengan Pelarut Etanol dan n-Heksan. ***Jurnal Bahan Alam Terbarukan***. Vol.1. No. 1.

[7] Aswanthy.2019.Uji Aktivitas Antibakteri Ekstrak Daun Ketumbar, Terhadap Bakteri Escerichia coli.Vibrio cholerae,dan Bacillus aureus.In Skripsi.Medan:Fakultas Farmasi Universitas Sumatera Utara.

[8] Tannady. 2019. Uji Aktivitas Antimikroba Ekstrak Daun Ketumbar (Coriandrum sativum L.) Terhadap Pertumbuhan Streptococcus sanguinis, Enterococcus faecalis dan Candida albican. In Skripsi. Medan: Fakultas Farmasi Universitas Sumatera Utara.

[9] Harahap.W.H. 2019. Uji Aktivitas Antibakteri Ekstrak Daun Ketumbar (Coriandrum sativum L.) Terhadap Bakteri Lactobacillus acidophilus, Staphylococcus aureus, dan Streptococcus mutans. In Skripsi. Medan: Fakultas Farmasi Universitas Sumatera Utara.

[10] Depkes RI. 1995. Materia Medika Indonesia. Jilid VI. Jakarta: Direktorat Jenderal Pengawasan Obat Dan Makanan. 297-307, 321-325, 333-337.

[11] Anam, Choirul. Sirojudin et al. 2007. Analisis Gugus Fungsi PadaSampel Uji, Bensin Dan Spiritus Menggunakan Metode Spektroskopi FT-IR. ***Berkala Fisika***. 10 (1). 79 –85.

[12] Beasley, M.M., E.J. Bartelink, L. Tailor & R.M. Miller. 2014. Comparison of Transmission FT-IR, ATR, and DRIFT Spectra: Implications for Assessment of Bone Bioapatite Diagenesis. ***Journal of Archaeological Science***, 46 (1): 16-22.