# Spectroscopy Analysis of Antimicrobial Compound in *Centella asiatica* Extract

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**Abstract.** The usage of herbal medicinal is still the widespread among society today in their daily lives. This is mostly due to the tradition of our ancestors who really relied on traditional medicine to cure diseases and improve their intelligence. Next, herbal plants are said to have more and better nutrients and nourishment than modern medicine. This is because the compound have been mixed with the use of other chemicals to produce medicines. *Centella asiatica (pegaga)* is an herbal plant that is commonly heard about its benefits both internally and externally. However, scientific research is needed to prove its benefits. Thus, the society do not clarified much on the actual nutrients thoroughly. Besides that, *Centella asiatica* is generally known to come from the *Apiaceae* family and this plant is an important plant with a wide range of traditional, medicinal and therapeutic values. This plant has it own speciality or strong point in which it is choosen to be mentioned in the Quran. To prove its efficacy, a spectroscopy analysis of *Centella asiatica* extract was performed using ATR-FTIR. The use of *Centella asiatica* samples has also been diversified into leaf part and stem part. This is to compare the nutrient content in the leaves. The results from this research is that *Centella asiatica* leaves do have antimicrobial compound. Therefore, the usage of *Centella asiatica* leaves in society needs to be expanded so that its nutrients can be utilized to the maximum for the benefit of the people and improvement to the national economy.

***Keyword:*** *Centella asiatica*; Antimicrobial compound; Spectroscopy analysis; Functional group.

## Introduction

One of the most generally utilized therapeutic plants in Malaysia is *Centella asiatica*. A huge plant with a wide scope of customary, restorative, and helpful qualities, *Centella asiatica* (Linn.) has a place with the plant family Apiaceae (umbeliferae) (Zahara et. al., 2014). Around the world, this medicinal plant is available and is utilized as a wellspring of food, drink, and medication. *Centella asiatica* has been eminent for the treatment of wounds for a long time. Notwithstanding being utilized as conventional and elective medication, *Centella asiatica* is generally utilized as a vegetable and beverages like tea in this area. It flourishes plentifully in moist zones and is a little, yearly herbaceous plant of the Mackinlaya sub-family, recently remembered for *Hydrocotyle*, that happens in Malaysia's muggy zones (James & Dubery, 2009). *Centella asiatica* has been ordinarily utilized in people's medication for a long time to treat a wide assortment of infections. It has been highly regarded since prehistoric times for its use as a medicinal herb (Sabaragamuwa et. al., 2018). *Centella asiatica* likewise one of the therapeutic plants that show antimicrobial activities as it has potential in wound mending activities. Numerous therapeutic

plants have antimicrobial properties, which means they can kill organisms like microbes, growths, parasites, and infections. Thus, there are various active ingredients in *Centella asiatica* (L.) Urban, including triterpenoid saponins, triterpenoid genes, essential oils, flavonoids, phytosterols, and other active ingredients. Triterpenoid saponins are the most essential active component of many other active ingredients (Irham et. al., 2019). *Centella asiatica* leaves have several essential medicinal values that have not been scientifically established in the Malay community. Aside from its detoxifying activity, one of the common uses of *Centella asiatica* is its potential for wound healing activities. This research focuses on identifying antimicrobial compound in *Centella asiatica* using spectroscopy analysis. *Centella asiatica* will be collected and soaked for several days and is placed in a container in room temperature conditions. The antimicrobial properties of *Centella asiatica* will be calculated by the identification of the antimicrobial compound using this spectroscopy analysis. The identification of the antimicrobial compound using this spectroscopy analysis will determine the antimicrobial properties in *Centella asiatica.*

## Material and methods

### *Preparation of materials*

The *Centella asiatica* leaves was bought at market in Selangor, Malaysia. The leaves was dried at $80^0$C for 2h in oven. Grind the leaves using pestle and mortar and put it in a beaker. 2 g of *Centella asiatica* leaves was weighed and put into two conical flask. For the solvent, ethyl acetate originated from United States was chosen. 40 ml of ethyl acetate was poured into the conical flask which contains the *Centella asiatica* leaves. 2 sample prepared for *Centella asiatica* leaf part. The conical flask was covered with aluminium foil and left for 24h in room temperature. After 24h, the sample was filtered into conical flask using Whatman's No.1 filter paper. After that, ethyl acetate were added into the filtrate for extraction process. The extraction process was conducted using liquid-liquid extraction process. The remaining solvent was further removed using rotatory evaporator and the temperature is set at $76^0$C.

### *Characterisation*

*Centella asiatica*'s examples were exposed to FTIR examination. The ethyl acetate extract was put straightforwardly on the precious stone window of the leaf part of the *Centella asiatica* leaf tests. In the north-south setup, all examples were situated and lined up with the examining shaft to take out ghastly varieties because of test area. Attenuated Total Reflection (ATR) is an inspecting procedure utilized in blend with infrared spectroscopy that permits tests to be legitimately analyzed without additional planning in the solid or liquid state. Transmitted peak in ranges 4000 $cm^{-1}$ to 600 $cm^{-1}$ was generated in Microsoft Excel format (.xls) to facilitate the construction of graphs for further analysis.

## Results and discussions

Using spectroscopy analysis using ATR-FTIR, the functional group of antimicrobial compounds found in Centella asiatica leaves was determined. It will be identify through the spectrum and wavelength shown by ATR-FTIR. From that point, we can deduce the antimicrobial compound presents in *Centella asiatica* leaves through its functional group. Antimicrobial compounds in *Centella asiatica* leaves are cinnamaldehyde, eugenol, vanillin and safrole which indicates the antimicrobial properties in *Centella asiatica* (Bahrami et. al, 2020).

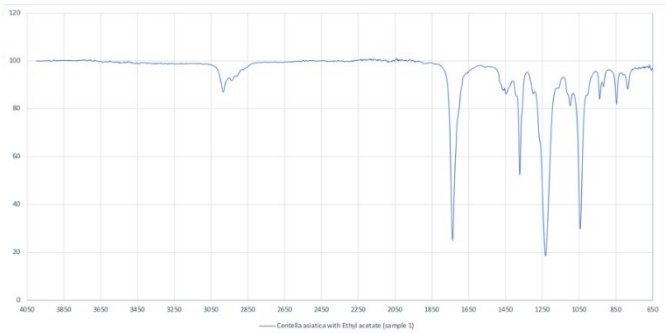

**Figure 1.** A spectrum graph of *Centella asiatica* extract obtained from ATR-FTIR

| Frequency ($cm^{-1}$) | Transmittance (%) | Functional group |
|---|---|---|
| 1447.50 | 85.68 | C–C stretch (in–ring) aromatics |
| 1741.05 | 25.67 | C=O stretch carbonyls (general) |
| 2988.09 | 87.20 | C–H stretch alkanes |
| 1233.23 | 18.28 | C–O stretch alcohols, carboxylic acids, esters, ethers |
| 1098.24 | 80.96 | C–N stretch aliphatic amines |
| 2940.95 | 91.66 | O–H stretch carboxylic acids |
| 937.54 | 84.02 | O–H bend carboxylic acids |
| 849.69 | 82.34 | C–Cl stretch alkyl halides |

**Table 1.** shows the functional groups and compounds identified from sample

Using ATR-FTIR, functional group of compound present in the *Centella asiatica*'s leaves was determined. From the spectrum graph Figure 1., the functional groups which are the C- H stretch alkanes, C=O stretch carbonyls, C–C stretch (in–ring) aromatics, C-N stretch carboxylic acids, C-N stretch aliphatic amines, O-H bend carboxylic acids and C-Cl stretch alkyl halides and C–O stretch alcohols, carboxylic acids, esters, ethers are present. From this study, functional group of vanillin, cinnamaldehyde, eugenol and safrole was identified. MIR spectra of *Centella asiatica*'s extract was characterized by absorption peaks of various intensities in the wave−1 number range 3800 $cm^{-1}$ to 800 $cm^{-1}$. Referring to Table 1., spectral absorption at 2940.95 $cm^{-1}$ was assigned to O–H stretch carboxylic acids, 14470 $cm^{-1}$ assigned to C–C stretch (in–ring) aromatics. While spectral absorption at 1741.05 $cm^{-1}$ assigned to C=O stretch carbonyls (general) and 2988.09 $cm^{-1}$ assigned to C–H stretch alkanes. Other than that, 1233.23 $cm^{-1}$ assigned to C–O stretch alcohols, carboxylic acids, esters, ethers while 1098.24 $cm^{-1}$ assigned to C–N stretch aliphatic amine. Next, spectral absorption at 937.54 $cm^{-1}$ assigned to O–H bend carboxylic acids and 849.69 $cm^{-1}$ assigned to C–Cl stretch alkyl halides. It can be seen that these functional groups existed in the *Centella asiatica*'s leaves. These functional groups are found in vanillin, cinnamaldehyde, eugenol and safrole which indicates the antimicrobial compounds. Thus, antimicrobial compunds are found in the *Centella asiatica*'s leaves which shows that *Centella asiatica*'s leaves has antimicrobial properties.

## Conclusions

The spectroscopy analysis determined the antimicrobial properties of *Centella asiatica* using Fourier Transform Infrared Spectroscopy (FTIR) by interpreting FTIR spectra beginning at the high frequency end by the presence of functional groups. The result for this research is the presence of functional groups in *Centella asiatica* leaves are vanillin, cinnamaldehyde, eugenol and safrole. which indicates as antimicrobial compound in *Centella asiatica*. Therefore, the usage of *Centella asiatica* leaves in society needs to be expanded so that its nutrients can be utilized to the maximum for the benefit of the people and improvement to the national economy.

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## References

[1] Prakash, V., Jaiswal, N. I. S. H. I. T. A., & Srivastava, M. R. I. N. A. L. (2017). A review on medicinal properties of Centella asiatica. Asian J Pharm Clin Res, 10(10), 69.

[2] Rani, K., Tyagi, M., Singh, A., Shanmugam, V., Shanmugam, A., Pillai, M., & Srinivasan, A. (2019). Identification of annotated metabolites in the extract of Centella asiatica. Journal of Medicinal Plants Research, 13(5), 112-128.

[3] Munajad, A., & Subroto, C. (2018). Fourier transform infrared (FTIR) spectroscopy analysis of transformer paper in mineral oil-paper composite insulation under accelerated thermal aging. Energies, 11(2), 364.

[4] Gupta, S., Bhatt, P., & Chaturvedi, P. (2018). Determination and quantification of asiaticoside in endophytic fungus from Centella asiatica (L.) Urban. World Journal of Microbiology and Biotechnology, 34(8), 111.

[5] Wang, J., He, Y., Yang, Y., Xie, W., & Ling, X. (2017). Research on quantifying the hydrophilicity of leached coals by FTIR spectroscopy. Physicochemical Problems of Mineral Processing, 53.

[6] Restuati, M., & Diningrat, D. S. (2018). Antimicrobial profile of premna pubescens. Blume and centella asiatica extracts against bacteria and fungi pathogens. International Journal of Pharmacology, 14(02), 272-275.