GC-MS Profile of *Centella asiatica* Ethanolic Extract

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Abstract

Centella asiatica is a plant commonly found in Indonesia which contains a complex array of phytochemicals, including terpenoids, phenolic compounds, and alkaloids; and has been used to treat skin conditions. This study aims to determine the phytochemical profile of the ethanolic extract of C. asiatica. The plant used was obtained from Yogyakarta. GC-MS was used to profile the extract, and the data was processed using Agilent software and compared against the NIST database. The results showed two highest peaks with the highest similarity index: a peak with retention time of 17.1808 minutes, predicted to be geraniol; and a peak with a retention time of 7.015 minutes, predicted to be tetraethyl silicate. Tetraethyl silicate is a synthetic compound used as an insulator, a cross-linking agent, binder, and a starting material in the synthesis of various chemical compounds. Therefore, the presence of this compound's peak can be assumed to be a result of contamination. Geraniol, a monoterpenoid alcohol, can be synthesized via both the mevalonate and MEP pathways. The synthesis of *C. asiatica* triterpenoids, such as asiaticoside and madecassoside, can also occur via the same pathways. Therefore, it is unsurprising that other terpenoids were also found in the extract. The composition of *C. asiatica* essential oil varies depending on its growing location. Essential oil from *C. asiatica* growing in grasslands and agricultural lands in Nepal shows a relatively high geraniol content. In contrast, the one grown in South Africa is more dominated by sesquiterpenes such as humulene and caryophyllene.

Keywords: Centella asiatica, phytochemical profile, GC-MS

Introductions

Centella asiatica is a wild plant that originated from tropical Asia, belonging to the Apiaceae family, native to regions including China, Sri Lanka, India, Malaysia, Indonesia, Madagascar, and South Africa[1]. C. asiatica contains several active constituents. The primary active constituents are triterpenoids and saponins—including centelloside, asiaticoside, asiatic acid, and madecassoside—as well as other components such as flavonoids, volatile oils, phytosterols, tannins, amino acids, and carbohydrates[2]. This research aimed to profile the component in the ethanolic extract of C. asiatica.

Materials and Methods

Materials and tools.

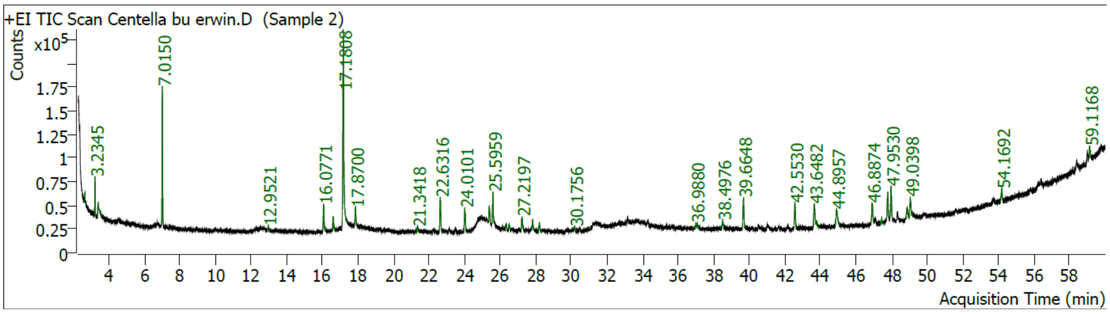
The crude dried C. asiatica was obtained from Yogyakarta. Extraction was done using technical grade 96% ethanol. Gas chromatographic analysis was done using GC-MS AGILENT 8890/5977.

Methods

The dried C. asiatica was cleaned of foreign matter, ground, and then sieved using a no. 30/40 mesh sieve. The resulting powder then was weighed 100 g, and was subjected to a digestion extraction process, placing the mixture in a closed vessel equipped with a thermometer and heating it on a hot plate stirrer at 40–50°C for one hour, using 1000 mL of 96% ethanol. The resulting mixture was then filtered using a straining cloth. The collected filtrate was then concentrated using a water bath at 60 °C to obtain a thick extract. The extract then was analyzed using GC-MS AGILENT 8890/5977.

Results and discussions

The GC-MS analysis gives the result in Picture 1. The result is compared to NIST database.



Picture 1. GC-MS result of the ethanolic extract of C. asiatica.

Table 1 presents the top results with a similarity of more than 80% to the database.

Table 1. Peaks with more than 90% similarity to the database

tR	compound	Similarity
7,0150	Tetraethyl silicate	94,30
16,0771	Citronellol	82,50
17,1808	Geraniol	96,30
22,6316	4-Hexen-1-ol, 5-methyl-2-(1-methylethenyl)-, acetate	85,00
24,0101	Caryophyllene	84,90
25,5959	(E)-.beta.-Farnesene	81,90
39,6648	2-Hexadecen-1-ol, 3,7,11,15-tetramethyl-, acetate, [R-[R*,R*-(E)]]-	81,00
42,5530	Hexadecanoic acid, methyl ester	80,50

Due to its operating principle, GC-MS results show only volatile compounds. From the obtained spectra, two highest peaks can be observed. The two tallest peak that shows similarity above 80% are predicted to be geraniol and tetraethyl silicate.
Tetraethyl silicate is a synthetic compound used as an industrial material and a starting material in the synthesis of various compounds. The presence of this compound's peak can be assumed to be a result of contamination[3]. Geraniol itself is a monoterpenoid alcohol. It can be synthesized via both the mevalonate and MEP pathways[4]. Other terpenoids such as citronellol, caryophyllene, and (E)-beta-farnesene were also found in the extract. The presence of monoterpenoids and sesquiterpenoids in C. asiatica is unsurprising because the synthesis of C. asiatica triterpenoids such as asiaticoside and madecassoside[5], can also occur via the mevalonate and MEP pathways[4].

The composition of C. asiatica essential oil varies depending on the growing location. Essential oil from C. asiatica growing in grasslands and agricultural lands in Nepal shows a relatively high geraniol content compared to other compounds[6]. Essential oil from Kirtipur, Nepal was found to be high in sesquiterpenes such as (E)-beta-farnesene, humulene, and beta-caryophyllene[7]. Similarly, C. asiatica essential oil from the ones grown in South Africa is more dominated by sesquiterpenes such as humulene and caryophyllene[8].

Since this chromatographic method can only detect volatile compounds, other compounds remain undetected. Consequently, the primary active components of C. asiatica—such as asiaticoside and madecassoside—could not be detected using the method employed in this study; therefore, further secondary metabolite profiling via LC-MS is required.

Conclusion

The ethanolic extract of C. asiatica from Yogyakarta contains the following terpenoids: geraniol, citronellol, beta-caryophyllene, and (E)-beta-farnesene. Fractionation and other methods of chromatography and spectroscopy are necessary to obtain a more complete phytochemical profile of the extract.

Acknowledgements

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