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Original Article

Identification of the Chemical Compound of Essential Oil from Ketumbar (*Coriandrum sativum* L.) Leaves with Gc-Ms

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ABSTRACT

Introduction: *Coriandrum sativum* L. leaves are plants used as a cooking spice that has a distinctive aroma. Various components of bioactive compounds are known from various parts of this plant, but the components of the bioactive compounds of essential oils from the leaves have never been reported. **Objective**: This research was designed to analyze the components of bioactive compounds contained in the essential oil of *C. sativum* leaves using a modified simple distillation tool. **Method**: *C. sativum* leaves essential oil component analysis with GC-MS (Shimadzu QP-2010 Plus). **Results**: Analysis GC-MS of the content of the bioactive compounds of essential oils contained various bioactive compounds. The dominant bioactive compounds are 2-Decen-1-ol (17.01%), 9-Octadecenal (9.59%), 1-Decanol (8.20%), Dotriacontane (4.40%), and Tetrapentacosan (3.68%). **Conclusion**: The results of the research showed that there were various bioactive compound contents from the essential oil of *C. sativum* leaves and it was important to test the activity of each component of the bioactive compound as an important recommendation for pharmaceutical natural ingredients.

Key words: Bioactive compounds, *Coriandrum sativum,* Distillation, Essential oil and GC-MS.

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INTRODUCTION

Ketumbar (*Coriandrum sativum* L.) is a plant that is widely used as a spice, especially in cooking spices. This plant has a distinctive aroma. The distinctive aroma that is owned because this plant contains essential oils.[1] Phytochemical screening results of coriander seeds have diverse secondary metabolites, including steroids, flavonoids, saponins, tannins, coumarin,[2] volatile compounds[3] and coriander leaves are contain phenolic acid, poliyphenols, glycosides, saponins, flavonoids and tannins.[4,5] These coriander plants have diverse biology activities including antioxidant,[6] antimicrobial, hypoglycemic, hypolipidemic, anxiolytic, analgesic, anti-inflammatory, anti-convulsant[3] and anti-cancer activities and gastrointestinal, anti-inflammatory, antiseptic, tranquilizing nervous system, lipolytic and miorelaksan, rerigeran, tonic, dieretic, rheumatic, neuralgia, and flatulence[7] and antimicrobials.[8] This study aims to characterize, isolate essential oils and analyze the content of bioactive compounds of *C. sativum* leaves using Gas Chromatography-Mass Spectrocopy (GC-MS).

MATERIALS AND METHODS

Preparation sample

Fresh of ketumbar (*C. sativum*) leaves were obtained from the Berastagi area, Karo district, North Sumatera, Indonesia. The *C. sativum* leaves is authorized by the Indonesian scientific institution: Biology Research Center (3533/MEDA/2019). Samples are cleaned in running water, drained, and dried in open spaces which avoid direct contact with sunlight. The dried sample was mashed using a blender to obtain the simplicia powder of *C. sativum* leaves.

Preparation of isolation essential oil of *C. sativum* leaves

Isolation of essential oils of simplicia of *C. sativum* leaves was carried out by means of modified distillation (Figure 1). Simplisia *C. sativum* leaves are put into a round pumpkin, plus boiling stones and distilled water to taste. The distillation process is carried out for 1-2 days per 500 g simplicia of *C.*

Figure 1: Modified distillation of essential oil *C. sativum* leaves.

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sativum leaves. The isolated essential oil was separated from the water mixture and stored in a vial bottle. The residue of water was removed by adding anhydrous Na_2SO_4, to obtain water-free essential oil. The essential oil obtained was determined by the yield.

GC-MS (Gas Chromatography-Mass Spectrometry) analysis

Investigation of essential oil chemical compounds was carried out using Gas Chromatography-Mass Spectrometry equipment (Shimadzu QP-2010 Plus) with the condition of the tool specifications as follows: Rtx-5MS capillary column type, column length of 30 meters, column diameter of 0.25 mm, column thickness of 0.25 µm, injector temperature of 300°C, pressure of 53 kPa, carrier gas He with flow rate of 0.99 ml/min, methyl silicon the stationary phase, temperature of the programmed column (temperature programming) with an initial temperature of 50°C, then slowly increased with a rate of increase of 10°C until reaching the final temperature of 300°C and maintained. The volume of essential oils injected 5 µl, the results were compared using the Wiley spectral library database program.[9]

RESULTS AND DISCUSSION

Isolation of essential oil *C. sativum* leaves and GC-MS analysis

The results of isolation of *C. sativum* essential oil with a yield of 0.2% with a reddish yellow color, produce a distinctive aroma (Figure 2). Essential oils from GC-MS analysis obtained 35 peaks with different retention times, eighteen compounds identified with six compounds identified repeatedly (Figure 3 and Table 1).

Components of bioactive compounds found essential oils in *C. sativum* leaves have been reported to have diverse potential activities. Potential activities of essential oils include antibacterial, antifungal, Antioxidant, Anti Inflammatory,[8,9] irritant to mouth, throat and stomach,[10] antimicrobial, antifibrinolytic, hemolytic, lubricant, nematicide, antialopecic, and hypocholesterolemic.[11] The results of analysis of essential oils of *C. sativum* leaves with the 5 biggest components are 2-Decen-1-ol (t_R 14.298 min; $C_{10}H_{20}O$ and peak area 17.01%), 9-Octadecenal (t_R 16.860 min; $C_{18}H_{34}O$ and peak area

Figure 2: Essential oils from *C. sativum* leaves.

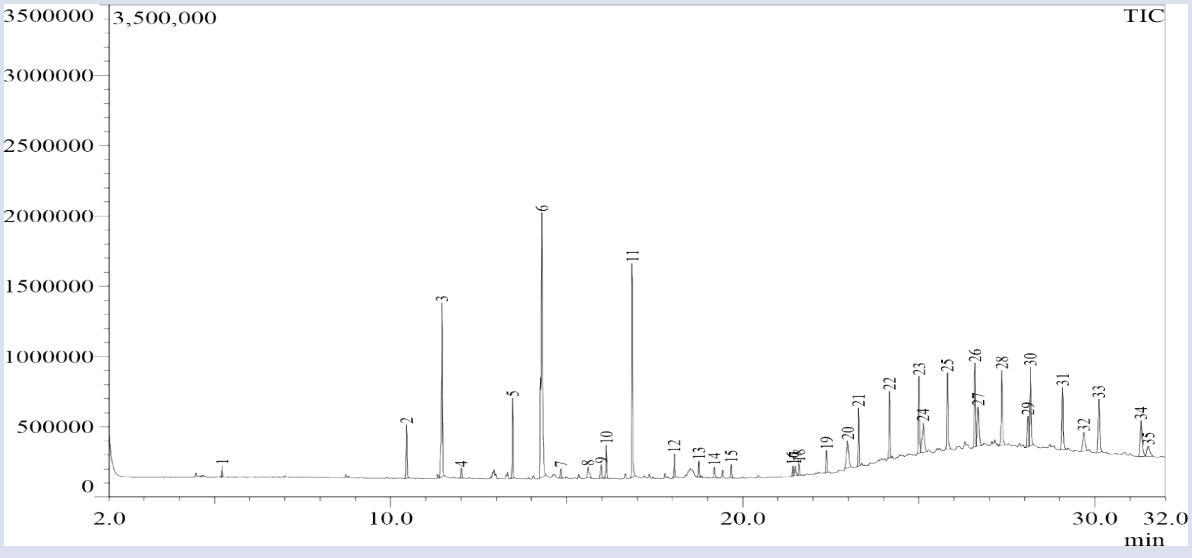

Figure 3: GC-MS chromatogram spectrum essential oils of *C. sativum* leaves.

Table 1: Identification essential oil of *C. sativum* leaves compound using GC-MS.

No. Peak	Component name	Retention time/t_R (min)	Molecular formula	Molecular weight (g/mol)	Peak Area (%)
1	Nonane	5.214	C_9H_{20}	128	0.42
2	Decanal	10.458	$C_{10}H_{20}O$	156	2.14
3	1-Decanol	11.459	$C_{10}H_{22}O$	158	8.20
4	Undecanal	12.008	$C_{11}H_{22}O$	170	0.43
5	Tetradecanal	13.462	$C_{14}H_{28}O$	212	3.38
6	2-Decen-1-ol	14.298	$C_{10}H_{20}O$	156	17.01
7	Tridecanal	14.833	$C_{13}H_{26}O$	198	0.45
8	Octadecanal	15.608	$C_{18}H_{36}O$	268	0.84
9	9-Octadecenal	15.984	$C_{18}H_{34}O$	266	0.79
10	Tetradecanal	16.126	$C_{14}H_{28}O$	212	1.35
11	9-Octadecenal	16.860	$C_{18}H_{34}O$	266	9.59
12	9-Octadecenal	18.055	$C_{18}H_{34}O$	266	1.10
13	Neophytadiene	18.756	$C_{20}H_{38}$	278	0.70
14	9-Octadecenal	19.196	$C_{18}H_{34}O$	266	0.51
15	Hexadecanoic acid	19.674	$C_{17}H_{34}O_2$	270	0.59
16	9,12,15-Octadecatrienoic acid	21.489	$C_{19}H_{32}O_2$	292	0.52
17	9,12,15-Octadecatrienoic acid	21.489	$C_{19}H_{32}O_2$	292	0.49
18	Neophytadiene	21.598	$C_{20}H_{38}$	278	0.60
19	Pentadecane	22.380	$C_{21}H_{44}$	296	0.99
20	Dotriacontane	22.979	$C_{32}H_{66}$	450	2.77
21	Hexacosane	23.291	$C_{26}H_{54}$	366	2.48
22	Tetracontane	24.165	$C_{40}H_{82}$	562	2.94
23	Dotriacontane	25.004	$C_{32}H_{66}$	450	3.61
24	Dotriacontane	25.122	$C_{32}H_{66}$	450	2.95
25	Dotriacontane	25.813	$C_{32}H_{66}$	450	3.76
26	Dotriacontane	26.592	$C_{32}H_{66}$	450	3.92
27	Dotriacontane	26.683	$C_{32}H_{66}$	450	3.13
28	Dotriacontane	27.353	$C_{32}H_{66}$	450	3.81
29	Tetrapentacosan	28.098	$C_{54}H_{110}$	758	2.22
30	Dotriacontane	28.169	$C_{32}H_{66}$	450	4.40
31	Dotriacontane	29.079	$C_{32}H_{66}$	450	3.89
32	Tetrapentacosan	29.679	$C_{54}H_{110}$	758	1.98
33	Tetrapentacosan	30.112	$C_{54}H_{110}$	758	3.68
34	Tetrapentacosan	31.313	$C_{54}H_{110}$	758	3.06
35	Tetrapentacosan	31.511	$C_{54}H_{110}$	758	1.32

9.59%), 1 -Decanol (t_R 11.459 min; $C_{10}H_{22}O$ and peak area 8.20%), Dotriacontane (t_R 28.353 min; $C_{32}H_{66}$ and peak area 4.40%), and Tetrapentacosan (t_R 30.112 min; $C_{54}H_{11}O$ and peak area 3.68%).

CONCLUSION

The components of the bioactive compounds contained essential oils in *C. sativum* leaves after being analyzed by GC-MS were very diverse. This strongly supports the use of *C. sativum* leaves for various treatments and traditional cooking spices. An ongoing evaluation needs to be carried out to determine for certain the potential activities of each component as important information on phytopharmacy.

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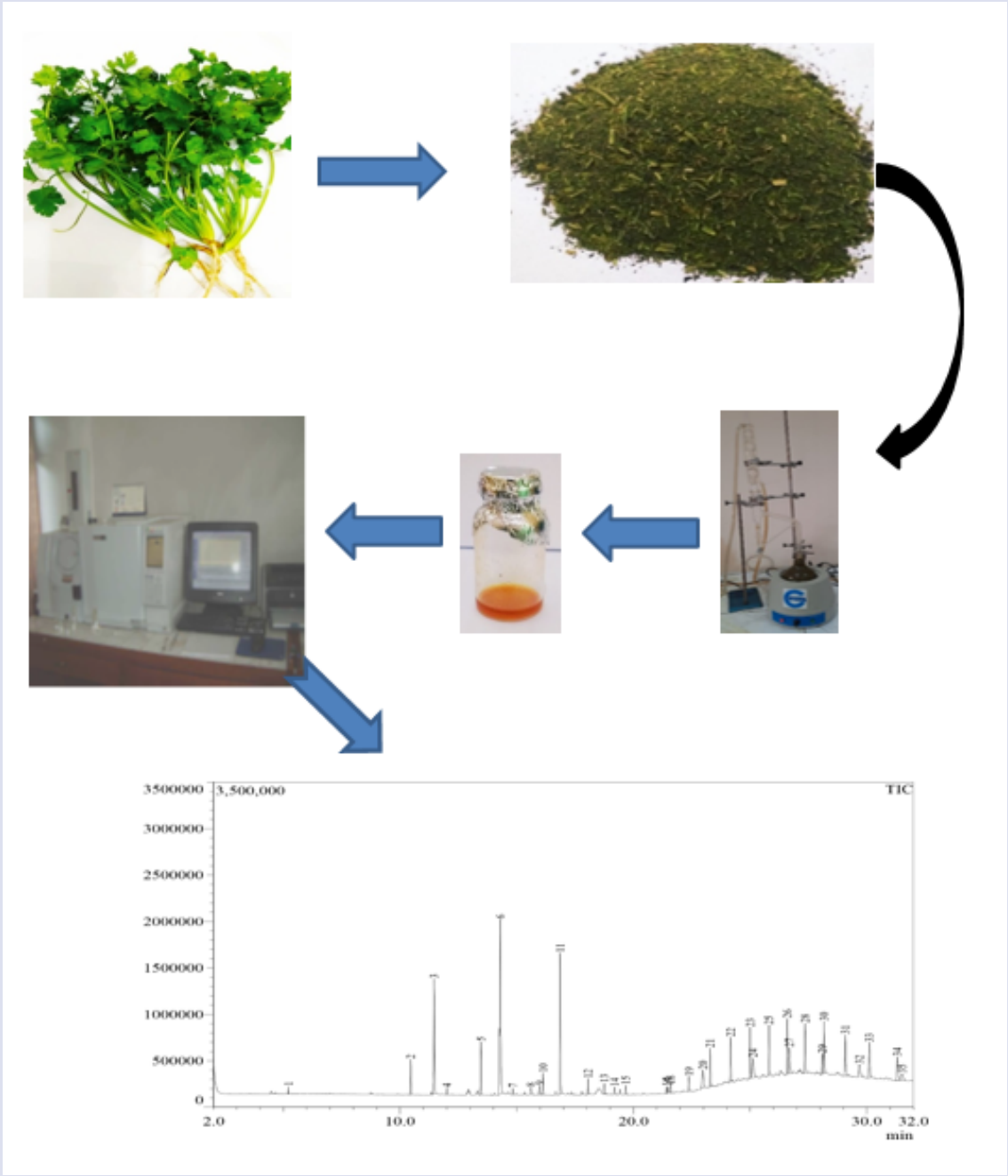
GRAPHICAL ABSTRACT



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