Chemicalcomposition and antimicrobial characteristicon theCurryLeafEssential Oil(*Murraya koenigii*L) in Kecamatan Medan Sunggal, Sumatera Utara

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Abstract
The use of herbal medicines is considered safer, cheaper, and has no side effects today. One source of herbal medicine is essential oil. Indonesia is also quite potential in the production of essential oils. The use of essential oils from natural ingredients as medicine is increasingly in demand by the society, along with the "back to nature" carried out by the society. Essential oils are used to give flavor and aroma to food, drinks, perfumes and cosmetics, antiseptic, drugs, flavoring agents in food or beverages, and anti-microbial. As a source of essential oil, curry (*Murraya koenigii* L), known as curry leaf. This review is to discuss the chemical composition of curry leaf essential oil, and various uses of essential oils from curry leaves as a source of herbal medicine ingredients.
Keywords: *chemical composition, Essential oils, curry leaves*

A. INTRODUCTION

Indonesia is a country that has tropical forest plants that are quite extensive, and superior in engineering chemicals than similar plants elsewhere. Therefore, the discovery of new chemicals from various tropical plants is very high. Besides that, Indonesia is also quite potential in the production of essential oils. The use of essential oils from natural ingredients as medicine is increasingly in demand by the public, along with the "*back to nature*" movement carried out by the community. Essential oils are very important as a source of flavor and medicine. Essential oils are used to give flavor and aromatic in food, drinks, perfumes, cosmetics, antiseptic, drugs, *flavoring agents* in food or beverages, and anti-microbial. Essential oils known as etheric oil or flying oil (*essential oil, volatile*) which is one of the results of metabolism of plants, can be obtained from the roots, stems, leaves and flowers of plants. It is volatile at room temperature, has a bitter taste, and smells fragrant according to the smell of the plants it produces. Essential oils dissolve in organic solvents and are not soluble in water.

Essential oils, volatile oils, or flying oils are mixtures of liquids or solids that have various compositions and boiling points. Refining can be defined as the process of separating the components of a mixture consisting of two or more liquids based on the difference in their vapor pressure or based on the difference in the boiling point of the components of the compound(Sastrohamidjojo, 2004).

Medicinal plants or bioactive compounds have been used by developing countries for primary and traditional health systems since a long time ago in some ancient system treatments including Ayurveda, Siddha and Unani. *Murraya koenigii*, an important health ingredient originating from Asia and used to overcome problems in bronchitis, skin diseases, diabetes, and stomach aches. Curry plant (*Murraya koenigii.* L), commonly known as *curry leaf* or curry patta in the Indian dialect, including the Rutaceae family has more than 1600 species. *M. Koenigii* is an important export commodity in India, because it is a source of foreign exchange.

M. koenigii is widely used in Indian cuisine for centuries and has a versatile role in traditional medicine. Bark and roots are used as stimulants and external to cure venomous animal bites. Green leaves are eaten raw to cure dysentery, diarrhea and vomiting. Leaves and roots are also used traditionally as an anthelmintic, analgesic, cure hemorrhoids, inflammation, hives and are useful in leucoderma. Several systematic scientific studies are also being conducted on the effectiveness of all plants or their parts in the form of different extracts for the treatment of different diseases. *M. koenigii* contains a number of chemical constituents that interact in complex ways to examine pharmacological effects.

In Indonesia, curry leaves are widely found in several regions in Sumatra, especially in Aceh and North Sumatra, including Medan City. This leaf is widely used as a spice leaf and as spice in several types of cruisine

(a)(b)

Figure 1. (a) *Murraya koenigii*
(b) *curry leaves*

A. CHEMICAL COMPOSITION

Essential oils obtained by distilling water distillation were analyzed by Gas Chromatography-Mass Spectrophotometry (GC-MS). GC chromatogram data from essential oils of Kari (*Murraya koenigii* L.) leaves showed 16 spectra shown in Figure 1. with different retention times (RT).

Further component identification was carried out with a mass spectrometer. From the results of the mass spectrometer, a mass spectra from each peak was detected in the GC chromatogram.
The following are 9 components of the compounds from the analysis of Kari essential oil from Medan Sunggal Subdistrict with GC-MS shown in Table 1.

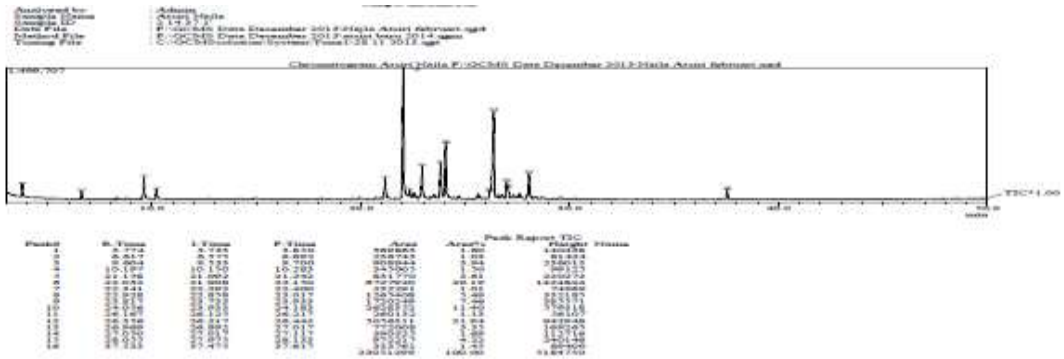

Figure2. MSChromatogramsCurryLeafEssential OilofMedan Sunggal, Sumatera Utara, Indonesia

The biggest chemical composition of the essential oils of curry leaf are *Trans*-caryophyllene compounds (29.19%), Caryophyllene oxide (21.94%), and Germacrene A (11.40%).

Tabel 1. Composition of (%) Volatile compounds in essential oil of Murraya Koenigii L from Sumatera Utara, Indonesia

No	RT (min)	Compound	Chemical Formula	Concentration (%)
1	9,604	Sabinene	$C_{10}H_{16}$	3,94
2	21,158	β-Elemene	$C_{15}H_{24}$	3,61
3	22,032	Trans-Caryophyllene	$C_{15}H_{24}$	29,19
4	22,928	α - Humulene	$C_{15}H_{24}$	5,49
5	23,817	Trans-Caryophyllene	$C_{15}H_{24}$	7,46

6	24,056	Germacrene A	$C_{15}H_{24}$	11,40
7	26,356	Caryophyllene oxide	$C_{15}H_{24}O$	21,94
8	26,969	Spiro 4,5 decane	$C_{10}H_{18}$	3,35
9	28,055	Veridiflorol	$C_{15}H_{26}O$	4,22

The composition of the chemical compounds in the essential oil of curry leaf above shows the difference from the results of previous studies in other countries, where there are 39 different components found in curry leaves obtained from Bangladesh and India which mostly consist of 3-carene (54.2 %), and caryophyllene (9.5%) (Chowdhury, JU, et al, 2008). This can be caused by other things, differences in the level of nutrients and the water content contained in the soil, climate, weather, and other factors due to differences in geographical location of the country where plants grow

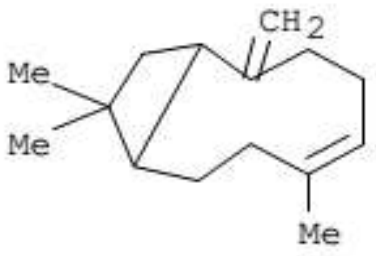

Figure 3.The chemical structureof theTrans-caryophyllene

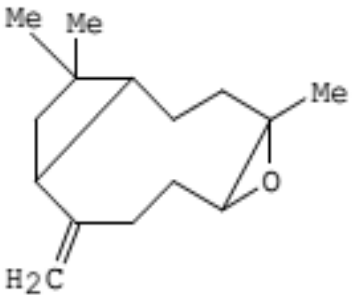

Figure 4.Chemicalstructureofcaryophylleneoxide

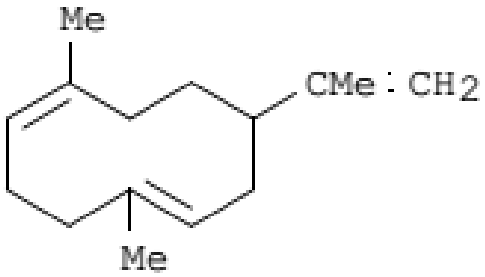

Figure 5.Chemical Structureof germacrene

C. ANTIMICROBIAL ACTIVITY

Activity test results of curry leaf essential oil on 3 types of bacteria, *Staphylococcus aureus*, *Eschericia coli* and *Salmonella typhi*, at a concentration of essential oils of 6.25%, 12.5%, 25%, indicating the inhibitory power of bacterial activity. The result of this research shown that at a concentration of 6.25% Curry leaf essential oil (*M. koenigii* L.) had been able to inhibit the growth of these three bacteria, namely the formation of inhibitory zones (clear zones) around the wells.

The diameter of the inhibitory zone obtained from the three test bacteria is not too striking. The lowest inhibitory zone in *S.tiphy* bacteria at a concentration of essential oils is 6.25% where the inhibition zone diameter is 1 mm, while the highest inhibition zone is at a concentration of 25% in *S. aureus* bacteria where the inhibition zone diameter was 35 mm.

The activity of essential oils in inhibiting growth or killing bacteria through disrupting the process of cell wall formation, damaging cell membranes, inhibiting the action of enzymes and or destroying genetic material in bacteria. This mechanism does not all occur separately, but there are several mechanisms that occur as a result of other mechanisms (Ajizah, 2004).

The bacterial cell wall is composed of a layer of peptidoglycan. The presence of essential oil in the bacterial cell wall causes an increase in osmotic pressure in the cell, causing lysis of bacterial cells. Antibacterial substances in essential oils can also dissolve phospholipids which are the constituent components of bacterial cell membranes. This is

because phospholipids have two parts: one is hydrophilic because it contains phosphate groups and the other part is hydrophobic which contains fat. Components of essential oils containing branching phenol and alcohol groups can dissolve phospholipids.

In this study the components of Kari essential oil (*M. koenigii* L) containing branching phenol or alcohol groups were veridiflorol compounds. So that these two compounds are thought to be active anti-bacterial compounds against the bacteria tested.

The test results on the fungus Candida albicans showed that Kari essential oil (*M. koenigii* L.) was able to inhibit the growth of microbial assays. The inhibitory activity of essential oils was made at a concentration of essential oils of 6.25%, 12.5%, 25%, able to inhibit the growth of fungi, namely the formation of inhibitory zones (clear zones) around the wells.

Work activity of essential oils in inhibiting growth clear fungi through inhibition of ergsoterol biosynthesis in fungal cells, this mechanism is a mechanism caused by imidazole derivatives because it can cause fungal cytoplasmic membrane irregularities by changing membrane permeability and changing membrane fungi in the process of transporting compounds essential which can cause metabolic imbalances that inhibit growth or cause fungal cell death.

D. CONCLUSION

1. Based on the results of GC-MS analysis of curry leaf essential oil showed that the essential oil of curry leaf obtained from Medan Sunggal Subdistrict, Kota-madya Medan, obtained 16 compounds, in which there were 9 chromatogram peaks that could be adjusted to the spectrum available at the standard library, namely trans-charyophillene (29.19%), Caryophillene oxide (21.94%), Germacrene-A (11.40%), trans-caryophillene (7.46%), α-Humulene (5.49%), Veridoflorol (4.22%), Sabinene (3.94%), β-Elemene (3.61%), and Spiro 4.5 decane (3.35%).
2. From the results of the anti-bacterial activity test, it turns out that the essential oil from curry leaves has active properties as an anti-microbial, against the test bacteria Staphylococcus aureus, Eschericia coli and Salmonella typhi; and Candida albicans mushrooms.

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