KnE Life Sciences
ISSN 2413-0877 Volume 3 (2016) 35-39
ICoA Conference Proceedings, 7 – 9 November 2015

Possibility of Some Indigenous Spices as Flavor Agents to Enrich Indonesia Flavor Database

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Abstract

Indonesia has huge potency of herbs and spices, some of them are vetiver, lime leaves and Indonesian basil. They have contribution on foods, drinks and traditional treatments. To determine their characteristics, they were distillated by boiling them with water then extracted by rotary vapor, before they were tested by Gas Chromatography – Mass Spectrometry. The essential or volatile oils detected by GS-MS depicted their specific contents and approved by Similarity Index in WILEY.LIB.

Keywords: *Distillation, essential oil, flavoring agent, GC-MS, herbs*

1. INTRODUCTION

Currently development of food industries is very fast to fulfill consumer's need which is challenging and complex. Consumer expectation on food and drink they consumed increases constantly based on their experiences and dreams, like they want foods and drinks with special flavor and taste. These facts open an opportunity for developing flavoring agents for the industries. More than 10 years flavoring industries are growing in-line with the growth of food industries.

Indonesia is one of countries which have mega bio-diversity and it has certainly huge of potencies on indigenous plants or herbs. They have potencies as raw materials for foods, drinks and also natural food additives that make foods and drinks more delicious or attractive for consumers. Food additives from plants or agricultural products can be in form of fresh products, powder, liquid or others depend on their function and usage. Furthermore the utilization of some importance of agricultural products such as spices and herbs is not only for food industry but also for pharmaceutical products, aroma therapy, other products.

Some examples of them are vertiver (Vetiveria zizanioides), Indonesian basil (Ocimum citriodorum), and lime leaves (Citrus hystrix). They are already used in Indonesian daily activities, such as spices for cooking, cosmetics, pharmaceutical and flavoring agents for foods. For example vetiver could contribute for Garut, one district in West Java, because it has been planted at 2,400 ha area with production of its root was 20,000 tons raw vetiver roots and 75 tons of vetiver oils per year (Bappebti, 2012). The java vetiver root oil plays important role in health and cosmetic products.

Indonesian basil is usually used for ingredient of local foods, whether it is consumed in fresh or added to the foods before they are served. Beside its function in culinary, it contains important substances such as essential oils, phytochemicals as biological active substances in human body. In India it will be utilized for treatment for gastric, hepatic, respiratory and inflammatory disorders as well as a remedy for headache, fever, anxiety, nausea and hypertension (Molnar, 2010).

Lime leaves is a popular ingredient for flavoring the dishes and drinks because it has specific aroma and acidity. Indonesian lime fruits had some specification such as yellow skin color, smooth fruit surface, yellow flesh, low sweetness, high sourness with pH 2.1. Its leaves have dimension in average 53.6 mm length x 32.6 mm width x 8.5 mm length (Penjor et.al 2014).

Some indigenous flavors in Indonesia are already documented, but there are still huge potencies to explore indigenous plants that have specific ingredients as flavoring agents. Basically every plant has specific contents and differs slightly in same species depend on

DOI http://dx.doi.org/10.18502/kls.v3i3.413

growing location, environmental condition, climate or how the treatment of plants, etc. These facts encouraged to conduct research on indigenous flavors from some plants that are probably use as flavoring agents for Indonesian tea. The research results will be compiled and added to Database on Indigenous Flavor Indonesia (DIFI).

Objectives of the research are: a. to isolate extract of Indonesian plants samples; b. to identify components and volatile oils of the samples, c. to promote some results of DIFI. The research was conducted by mainly extracting plants to find out main ingredients of plants. These results were analyzed and identified based on references or primary analyzer equipment.

2. MATERIALS AND METHODS

Samples of this research were vetiver (*Vetiveria zizanioides*); Lime leaves (*Citrus hystrix*); Indonesian basil (*Ocimum citriodorum*) were provided and purchased in traditional markets in Yogyakarta, like Pasar Beringharjo and Pasar Colombo, Yogyakarta Special Province. They were fresh condition then selected and dried in the laboratory room by placing them on paper at ambient or room temperature for 1-2 days. This process was aimed to reduce water content so that extraction could minimize duration of process. They were cut to unify the size and to ease by weighing them before the extraction process was executed.

The extraction of specific ingredients was conducted by distillation method with water as solvent. The distillation was operated at temperature of 98 – 100^{o}C for 4 hours. The distillation equipment had size of diameter 30 cm, high of tube 45 cm and high of closure 18.5 cm and its capacity up to 3 kg samples and approximately 5 liter water. The distillation time was started after first condensed water dropped from cooler. The distillate was gathered in collection flask, then it was removed from water and other components by using rotary vapor apparatus for 40 minutes. The thickened distillate was kept in refrigerator before it was analyzed by gas chromatography.

The gas chromatography technique was used for analyzing content of volatile oils extracted from three samples. The Gas Chromatography Mass Spectrometry was operated for analyzing volatile components in samples. GCMS Shimadzu QP2010S was used under these conditions; length of column AGILENT HP5MS 30 meter; carrier gas was Helium with rate 40 mL/min; stationary phase 5% diphenyl/95% dimethyl-polycyloxane; temperature 50- 300oC. The chromatograms were compared with Similarity Index, so that determination of compounds in volatile oils was easier to be conducted.

3. RESULT AND DISCUSSION

Normally the volatile oils in vetiver roots was 1-2%, lime leaves 1.8% and Indonesian basil 1% respectively (Guenther, 1990 and Kawiji et al., 2015).

Table 1 Result of distillation

Plants	Availa-bility	Indigenous plants	Yield (%)
Vetiver	+++	Yes	0.20
Lime leaves	+++	Yes	0.67
Indonesian basil	+++	Yes	0.15

Vetiver (*Vetiveria zizanioides*)

Essential oils or volatile oils were largely composed by saturated or partly unsaturated cyclic or linear molecules of relatively low molecular mass, and within this range of hydrocarbons and oxygenated compounds, e.g. hydroxyl and carbonyl derivatives, occurred (Marriot et al., 2001).

Vetiver was very famous in the health and pharmacy, because it produced fragrance volatile compounds. Based on the result of GC-MS analysis the vetiver presented 52 peaks that were similar with 52 volatile compounds (Figure 1).

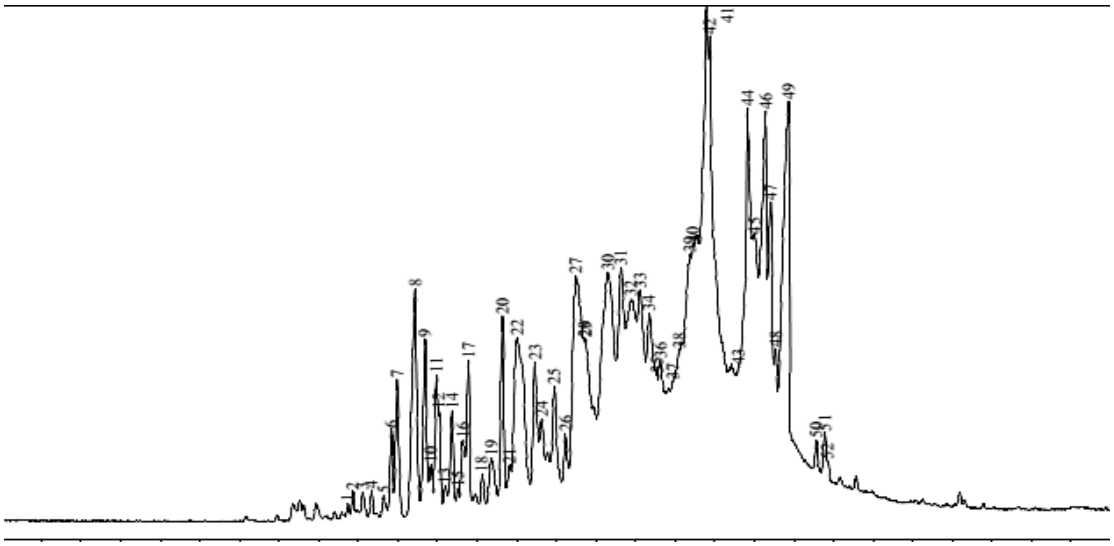


Figure 1 Chromatogram of vertiver root extract

Based on similarity index WILEY1 LIB, there were 5 main peaks of vetiver which was cultivated in Indonesia, namely: Aristolenepoxide (peak number 41); 2H-Cyclopropa a naphtalen-2-one (peak 49); Valerenol (peak 44); 1,5-Cycloundecadiene (peak 46); beta-Eudesmol 2-naphtalenemethanol (peak 42).

Lime Leaves (*Citrus hystrix***)**

Lime leaves was daily used for flavoring foods and sometimes drinks because of its volatile oils and oleoresin. Up to now the extraction of lime leaves was rare, but it would grow parallel with industrial growth. The extract of lime leaves contained 43 compounds which were represented by 43 peaks at chromatogram of GC-MS analysis (Figure 2). Based on Similarity Index with WILEY 1.LIB 5 main peaks were identified as Citronella (peak 12); Citronellyl acetate (peak 19); beta-Caryophyllene (peak 23); nerolidol Z and E (peak 31), Geranyl Acetate (peak 21).

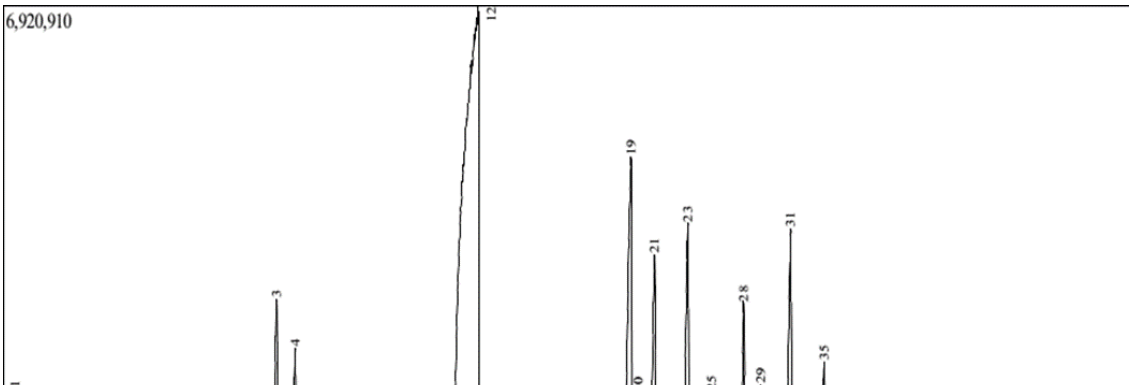
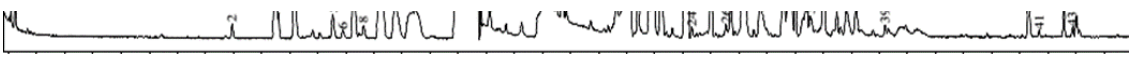


Figure 2 Chromatogram of lime leaves extract



Kawiji et al. (2015) reported that 17 oleoresin compounds were found in kaffir lime leaves and the five important components were citronella, citronellyl acetate, citronellol, trans-caryophyllene and germacrene B. The results were slightly difference, but it could be influenced by origin of lime leaves and

extraction methods.

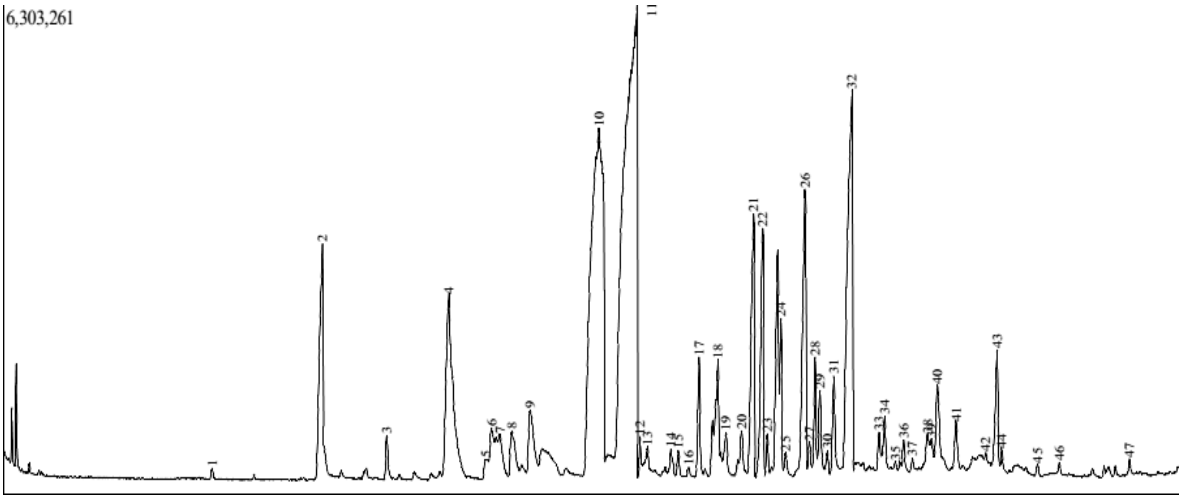


Figure 3 Chromatogram of Indonesian basil extract

Indonesian basil (*Ocimum citriodorum*)

Actually basil has more than 150 species around the world. The Ocimum genus comprises annual and perennial herbs and scrubs native to the tropical and subtropical regions of Asia, Africa and Central South America. Although traditionally used as medicinal herb in the treatment of headaches, coughs, diarrhea, worms and kidney malfunctions. Basil essential oils have been extensively used in the flavoring of confectionery and baked goods condiment sausages and meat, salad dressing, non-alcoholic beverages, ice cream. It has also found wide application in perfumery as well as dental and oral products (Labra et al., 2004).

Due to the essential or volatile oil composition, Indonesian basil or *Ocimum citriodorum* depicted 55 peaks or 55 compounds (Figure 3). The species name indicated major content of essential oil, namely citrus family. Based on Similarity Index WILEY229.LIB, five major compounds were Z-citral peak 11); Citral cis-trans (peak 10); beta-Selinene (peak 32); Linalool (peak 4); Germacrene-D (peak 26). There were different with *Ocimum basilicum*, which contained linalool (18-39% of total oils), eugenol, cineole, terpineol and farnesene (Labra et al., 2004). Eugenol was normally found in essential oil of clove. The different of volatile oils content showed that different species gave difference influence in usage of basil. The *Ocimum basilicum* played important role in Italian culinary and it gave special taste on pasta foods. In Indonesia the *Ocimum citriodorum* gave also contribution on foods and medical herb although it was not dominant in flavor and taste.

CONCLUSION

Based on the discussion some point could be concluded:

1. Vetiver, lime leaves and Indonesian basil have potency as indigenous flavoring agent
2. The hot distillation process was applied to extract their essential oils
3. The GC-MS was conducted to identify their specific components in essential oils.
4. They have to be verified and tested on more similar samples before adding to Database of Indigenous Flavoring Agents.

ACKNOWLEDGMENT

The authors would like to thank Directorate General of Higher Education (DIKTI) which funded this research through PUPT Program 2015 No. 025/SP2H/PL/Dit.Litabmas/II/2015.

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