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Identification and Characterization of Fat Compositions Contained within Hexane Extracts of *Canarium* Seed Oils (*Canarium Indicum L*)

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ABSTRACTS

One of the plants producing fatty acids is a canary plant which is found everywhere in Alor Island, NTT province, Indonesia. This study aimed to determine the content and types of fatty acids of Canary seed oil *(Canarium indicum* L). The method used was extraction and continued by the GC-MS for fatty acid characterization. Results of the analysis showed that Canary seed oil contains saturated fatty acids and unsaturated fatty acids. The saturated fatty acids are palmitic acid and stearic acid while the unsaturated fatty acid is oleic acid.

Keywords: canary, fatty acids, GC-MS

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1. Introduction

Canary plant is one kind of plant that grows in the Indonesian jungle. These plants belong to the *canarium* genus of the *Burseraceae* family.There are some canary from evaluating plant species, among others, *Canarium Indicum, Canarium Lamili and Canarium* Vulgaree (Thomson and Evans, 2006). The distribution of their commercial values, of the three aforementioned species, with the most potential is *Canarium indicum* L. The *Canarium indicum* L species plants produce fruit or seeds containing high fat 65-70 % (Mailoa, 2015; Rahman et al., 2015; Sitompul et al., 2018). This plant is one of the species growing in Alor Regency, especially Lembur District, Village Waimi. The fruits and seeds are used as baking ingredients. The canary seeds, as well as the results, are now of the public commodity. Instead of the fruits and the seeds, the wood and the shell of the canary plant are important product of the Alor jungle. In general, society in the village utilize wood as a fuel and materials in the manufacture of home, while it's canary shellis used to make jewelry in decorating the house.

This fruit has a light green color and becomes dark purple or black as it ripes. It has a bright yellow flesh and a three-angled seed. This fruit has a high nutritional value containing large amounts of lipid, carbohydrates and minerals (Shakirin *et al*., 2010). About 21–25% of canarium pulp and 70 % of its kernel are composed of fats, especially SFAs that make up 44.4 % of pulp oil and 70 % of kernel oil (Djarkasi et al., 2011). The extracted crude oil has a yellowish color and is semi-solid in room temperature. The 16:0 and 18:0 are the major fatty acids in canarium oil, a characteristic which is similar to palm oil. Moreover, this oil contains large amounts of vitamin E as well as phenolic compounds which are associated with substantial antioxidant activities (Shakirin *et al*., 2010). The unsaturated fatty acids can be categorized as bioactive compounds because its function is to improve health. The unsaturated fatty acids can prevent the constriction of blood vessels due to the attachment of cholesterol in the blood vessels (Winarti, 2010). Oil is one class of lipids, ie organic compounds that exist in nature and are not soluble in water, but soluble in nonpolar organic solvents. Based on the fat content and its solubility properties, this research was carried out to identify and characterize the fatty acids of n-hexane extract contained within Canary oil *(Canarium indicum* L).

2. Materials and Procedures

2.1. Materials

Materials used in this study were the Seed Canary and n-hexane. The instrument used was glassware, filter paper, Rotary vacuum evaporator and GC-MS.

2.2. Exprimental Procedures

Canarium indicum L seed was dried and then pulverized. There after, the 500 mg powder canary seed was macerated with n-hexane for 24 hours and then filtered. The extract obtained was evaporated by Rotary vacuum evaporator to produce a concentrated extract. Concentrated extracts were then tested using GC-MS.

3. Results and Discussion

The results of GC-MS analysis of canary seed oil are shown in Fig.1. From the TIC chromatogram, there was appeared the three peaks that was successively detected, where

the number of the peak represents the number of compound contained in the sample analyzed. On the chromatogram, the *x* axis shows the retention time (retention time is the time between when the sample is injected until elution ends), while the *y* axis shows the intensity of the signal. Increasing the temperature causes the time difference better retention of analyses with the adjacent boiling point, resulting in separation occur properly.

The typical characteristics of the three peaks, compounds that have the greatest abundance among others, are briefly described that the first peak (1) with a retention time and area of the peak were 13.53 minutes and 103783533 (35.27%), respectively, a second peak (2) with a retention time andarea of the peak were 15.18 minutes and 161820990 (54.99%), respectively, and the third peak (3) with a retention time andarea of the peak were 15.27 minutes and 25544599 (8.68%), respectively. From those data, the major chemical constituents of the n-hexane extracts are the compounds reported by the retention time of 15.18 followed consecutively by the 13.53 and 15.27 minutes, respectively. From the data obtained spectrograms above, the fragmentation pattern of each compound are shown in Fig. 2, Fig. 4, and Fig. 6. Based on typical peakand the pattern of fragmentation, the basic structure of each compound is able to describe. The GC-MS analyzes for peak no. 1 provided the spectrums of fragmentation pattern as reported in Fig. 2 indicating molecular ions (m/z) of fragmentations. The m/z 256 indicates the molecular weight of the compound with a retention time of 13.53 minute that is 256 g/mol. The compound further underwent to fragmentize delivering the next molecular ion (m/z) equaled to 227 g/mol. The based peak, the highest relative abundance (100%) among the spectrums, of the peak no. 1 has molecular ion weight of 73 g/mol (Mogana and Wiart, 2011). This is the most abundant molecular ions among the stable fragments yielded from the peak 1. The other molecular ion peaks had lower abundance.

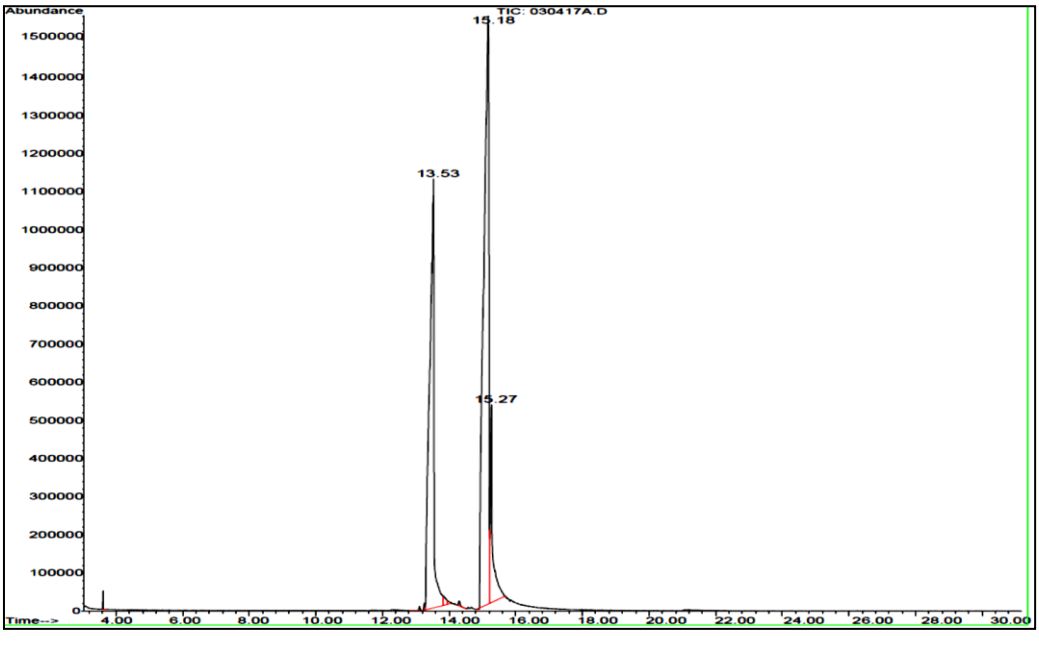

Fig. 1.GC Chromatogram

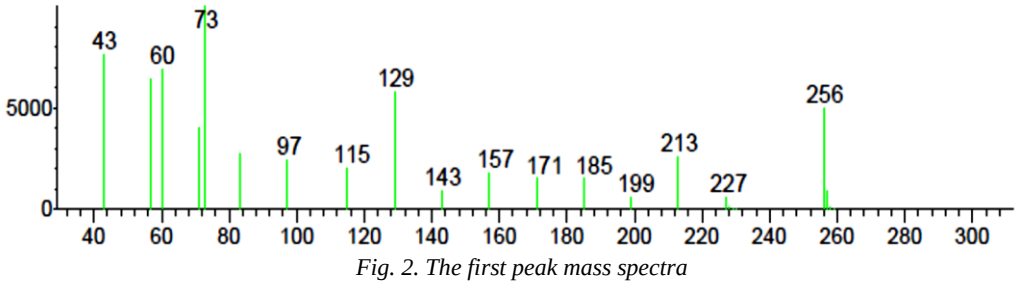

Fig. 2. The first peak mass spectra

In the first compound, molecular ion peak at m/z 256 allows the compound molecular formula $C_{16}H_{32}O_2$, which is derived from the palmitic acid (Fig. 3). Solving generate molecular ion fragment m/z 213 was derived from the release of the COOH group which indicates oxygen are of the $_{15}O$ isotope. The fragmentation releases m/z 185 which is from the release of the $(CH_2)_2$ group, and the m/z 157 is derived from the release of the $(CH_2)_2$ group, and them/z 129 is derived from the release of the $(CH_2)_2$ group, respectively. The emergence of fragment m/z 73 is the base peak which indicates that the palmitic acid fragments by releasing group $(CH_2)_4$ after m/z 129 fragmentation. The fatty acid is included in the saturated fatty acid composed of 16 carbon atoms ($CH_3(CH_2)_{14}COOH$).

The mass spectra of the compound present at the second peak, a retention time of 15.18 minutes are reported in Fig. 4. According to the reference data, the molecular ions

fragmentations reported in Fig. 4 are derived from reactive molecules that have MW of 282 g/mol. The molecular weight of the compound enables the molecular formula $C_{18}H_{34}O_2$, which as the carboxylate acid, is the oleic acid (Fig.5). Solving generate molecular ion fragment m/z 264 derived from the release of the OH group which has possible containing a deuterium isotope ($_2$H). The emergence of fragment m/z 138 derived from the release of the $(CH_2)_7CO^+$ group, the emergence of fragment m/z 98 is derived from the release of the C_3H_4 group, the emergence of fragment m/z 97 come from the release of the 1H group, besides the emergence of fragment m/z 55 is the peak release of oleic acid $(CH_3)_2$ such fatty acids include the unsaturated fatty acid because it has a double bond in the chain of its C=C atom bonds.

A based peak of the peak No. 3 has molecular ion weight of 73 g/mol. This is the most abundant among the molecular ions yielded fragments from the peak 3. The other stable molecular ion peaks recorded by the instrument involved of 17 molecular ion fragments. Those are with molecular weights of 284, 266, 255, 241, 227, 213, 199, 185, 171, 157, 143, 129, 111, 97, 85, 57 and 43 g/mol, respectively. In the third compound showed molecular weight 284 g/mol, allowing the compound with a molecular formula of $C_{18}H_{36}O_2$. Solving the molecular ion yield fragment m/z 241 derived from the release of the COOH group advent of fragment m/z 185 derived from the release of the $(CH_2)_4$ group, the emergence of fragment m/z 129 derived from the release of the $(CH_2)_4$ group in addition to the emergence of fragments m/z 73 is the base peak which indicates that stearic acid fragments by releasing $(CH_2)_4$ group.

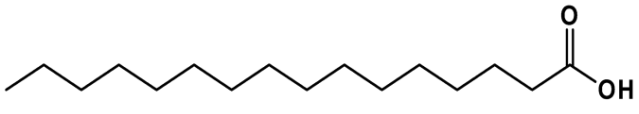

Fig. 3. Structure palmitateacid

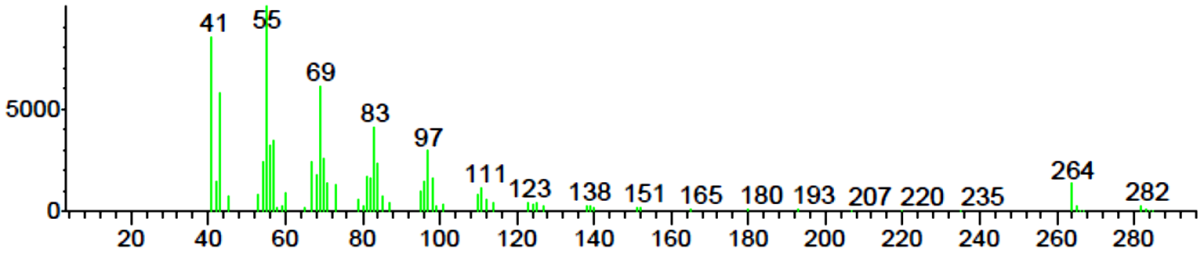

Fig. 4. Mass spectra of the second peak

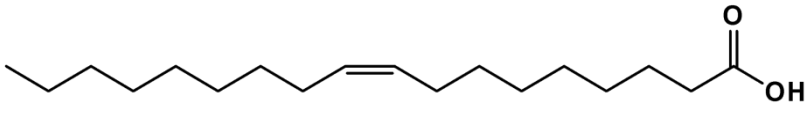

Fig. 5.Structure of oleic acid

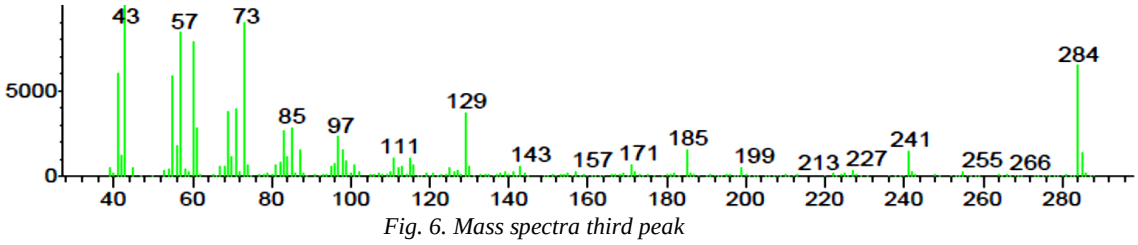

Fig. 6. Mass spectra third peak

4. Conclusion

The fatty acid contained by the canarium oil is a saturated fatty acid and unsaturated fatty acids. Hexa decanoate/palmitate acid is one component of the most easily available and is also the main source of the fatty acids. Both palmitic acid and stearic acid are the saturated fatty acid contained by the canary seed oil, while oleic acid is its unsaturated fatty acid

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Conflict of interest: Non declare