Analysis on Agarwood Vapour using Headspace Volatile DVB-CAR-PDMS SPME with Different Sampling Time

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Abstract—**Due to its popularity and high market demand, critical analysis on agarwood vapour chemical compounds may provide an alternative quality discrimination of agarwood oil. The proposed work involves the extraction of high quality agarwood using headspace volatile divinylbenzene-carboxen-polydimethysiloxane (DVB-CAR-PDMS) solid phase microextraction (SPME) with different sampling time at 15, 30 and 60 minutes. Then, Gas chromatography – Mass Spectroscopy (GC-MS) is performed to identify the chemical compounds. Generally, agarwood vapour is rich in terpene group especially monoterpene, sesquiterpene and oxygenated sesquiterpene. Analysis showed that at least 52, 50 and 54 compounds are extracted at 15, 30 and 60 minutes, respectively. Among all, duration of 60 minutes produced the highest abundance (%) for caryophellene oxide. The finding proves that caryophellene oxide as one of the important compounds in high agarwood and different sampling time plays a major role that effects the extraction. Thus, the analysis in this study is significant and brings benefit especially to the agarwood and its essential oil research area.**

Keywords-high quality, SPME, agarwood, quality, GC-MS and GC-FID

I. INTRODUCTION

Agarwood is one of the richest sources of odorants and medicinal components from terpenes group such as sesquiterpenes, sesquiterpenes alcohol, oxygenated compounds and their chromon derivatives [1, 2]. The wood usually is used for incense, perfumery and pharmaceutical industries. Agarwood is traded as wood, wood chips, powder, and oil under several names including agar, aloeswood, eagle wood, *gaharu*, *jinkoh*, and *kalambak* [2]. Arguably, agarwood is the most expensive wood with the cost approximating over USD3000/kg [2].

The quality of agarwood is generally determined from the chemical composition of its oil [3]. Even the geographical location of the plant growth affects the relative contents of the above compounds in the oil thereby significantly altering the quality. Among several agarwood species [3], *Aquilaria* species mainly found in Malaysia is *Aquilaria Malaccensis* (Thymelaeaceae) and could be planted together with vegetable farms in agro forestry without destroying the ecosystem thereby providing opportunities to be developed with a high degree of sustainability [4].

The sampling or extraction time has been found as one of the parameters in effecting chemical compounds extraction [3, 5]. In year 2012, this parameter has shown significant influence especially by using SPME technique [5]. Therefore, the objective of this paper is to analyse agarwood vapour chemical compounds using headspace volatile DVB-CAR-PDMS SPME and varying its sampling time at. 15, 30 and 60 minutes.

The rest of the paper is arranged as follows: Section II is Data Extraction and Analysis. It consists of SPME and GC-MS used in this study. Section III describes the general procedures performed for this paper. Section IV presents the Result and Discussion. Lastly, the conclusion for the paper is discussed in Section V.

II DATA EXTRACTION & ANALYSIS

Solid phase micro-extraction (SPME) is one of the latest chromatography techniques to extract volatile compounds from essential oils and incense. The SPME is a sorbent extraction where it is a simple technique, fast and solvent free extraction [6] and it is in small size which can mobile depend on field work [7]. Fig. 1 shows the (a) external and (b) internal view of SPME manual fibre assembly holder. Basically, the fibre is a build of plunger, barrel, needle and fused silica to coat the needle. This technique is a substitute of conventional technique for extracting volatile organic compounds; it is combination step of extract analytes from sample matrix into the fibre coating and forward into an analytical instrument [8].

Gas chromatography – mass spectroscopy (GC-MS) is a combination two techniques; gas chromatography is for mixture compounds separation and mass spectroscopy for an individual compound characterization. With these combined techniques, GC-MS able to evaluate qualitative and quantitative the mixture compounds [9]. Generally, GC-MS is used for identification and quantitation of mixture compounds (volatile and semivolatile) as well as for unknown compounds structure determination with matching