Identification of Natural Compound in Agar Wood and Arabic Gum with Respect to Anti-Cancer Properties

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***Abstract* - For the cancer treatment, the further analysis of anticancer plant had been conducted. For natural component related with anticancer, phenolic compound as well as sesquiterpenes and flavonoid compound have potential in reducing cancer cells. For anti-oxidant, alkaloid is one of natural component that have potential in that aspect. Agar wood and Arabic gum plant has taken for analysis of these properties. By using hydro distillation process, the grounded agar wood and Arabic gum were extracted with the product of these extraction were collected, which is essential oil, condensate and hydrosol. The hydrosol and condensate of both plant was taken and analyzed using GC-MS for determination of compound. The resulting analysis found that there is presence of sesquiterpenes compound such as Caryophyliene, α-Farnesene, α-Vatirenene and α-Caryophyllene. It can be concluded that the condensate and hydrosol of Agar wood and Arabic gum does capable to serve as anti-cancer and anti-oxidant for medicinal approach.**

Keywords— Anti-cancer, Hydro distillation, Natural compound, Condensate, Hydrosol

I. INTRODUCTION

Nowadays, the technologies in medicine have reach a new level where there are many methods and medicine that can treat chronic diseases. It can be seen that there are many hospitals and medical institutions that have many excellent doctors which are well-experienced in their medical field and enough medicine supplement that can cure diseases [1]. However, most of the medicine that are available are mostly chemically-based medicine, which is the major ingredients are chemical. As there are many chemicals used, the cost for the making are also high [2]. Some patient cannot afford to buy expensive medicine and treatment thus they will suffer for their disease for a long time. For cancer treatment, the only method for reducing the cancer cell in the body is by undergo chemotherapy [3]. However the cost for this treatment is not cheap and most of people are willing to bear with this disease during early stage. Besides that, current treatment will cost some side effect [4]. As cancer cell is eliminated, normal cell are also damaged from chemotherapy. This is why most patient have after effect such as white hair, hair loss, and their skins become pale. Some patient cannot accept this effect occur on them. This is why most patient are looking for an alternative for cancer treatment with lower cost and more natural based medicine [5]. Natural medicine will not cause side effect and affordable in price [6]. That is why scientists and doctors try to conduct research if there is plant that can be used as medicine. There are many plant that have been used in experiment for their potential in reducing and preventing cancer from spread. One of the plant that have been thoroughly researched is *agar wood* and *Arabic gum*

Hydro distillation method is conducted by heating the mixture with solvent until its boiling point [7]. After that condensation is done and the oil is collected at the end on the process. Supercritical liquid extraction is done by heating any substance above its critical temperature and raising its pressure above its critical limit as well [8]. Supercritical fluid extraction have been works for essential oil extracts by for flavor, fragrance, cosmetics and pharmaceutical industries whereas shown attractive technology compared to conventional process with respect to the product quality [10].

The objective of this study is to identify the natural compounds in condensate and hydrosols of Agar wood (*Aquilaria Malaccescis*) and Arabic gum stem bark with respect to anti-cancer and anti-oxidant properties.

II. METHODOLOGY

A. Apparatus and procedure for plant extraction

Hydro distillation extraction process was used for both plant. The Agar wood and Arabic gum stem bark was cut into small pieces and grounded mechanically using grinder. The grounded stem bark (10 kg) was soaked with water at ratio of 1:3. After mixing, hydro distillation was carried out at boiling temperature of water for 10 hours. After 10 hours, a layer of EO and hydrosol was formed. EO and hydrosol was separated while condensate for both plant was observed for its present. Material of construction for hydro distillation equipment is stainless steel 304 (SS304) for both pot and hydrosol collector. The product of distillation, which is hydrosol and condensate for both plant was collected.

Table 1: Specification for hydro distillation equipment

Specification	Value
Ratio water to sample	1:3
Temperature	105°C
Pressure	1.5 bar
Raw material type	Fresh raw material
Pot material	Stainless steel 304
Condenser	Stainless steel 304

From hydro distillation process, the product yield are essential oil, hydrosol and condensate for both plant. In order to get the hydrosol, the essential oil produced will be recover first. Hydrosol was recovered after that.

From the hydro distillation process, there are two types of yield that need to be analyzed;

I. Hydrosol, which is the product of condensation of steam produced from the hydro distillation process and
II. Condensate, which is the bottom product of hydro distillation

Both condensate and hydrosol of Agar wood and Arabic gum was analyzed using GC-MS for identification of natural compound presence.

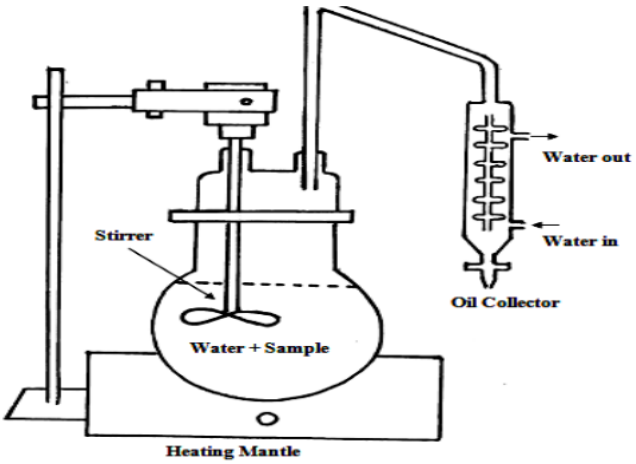
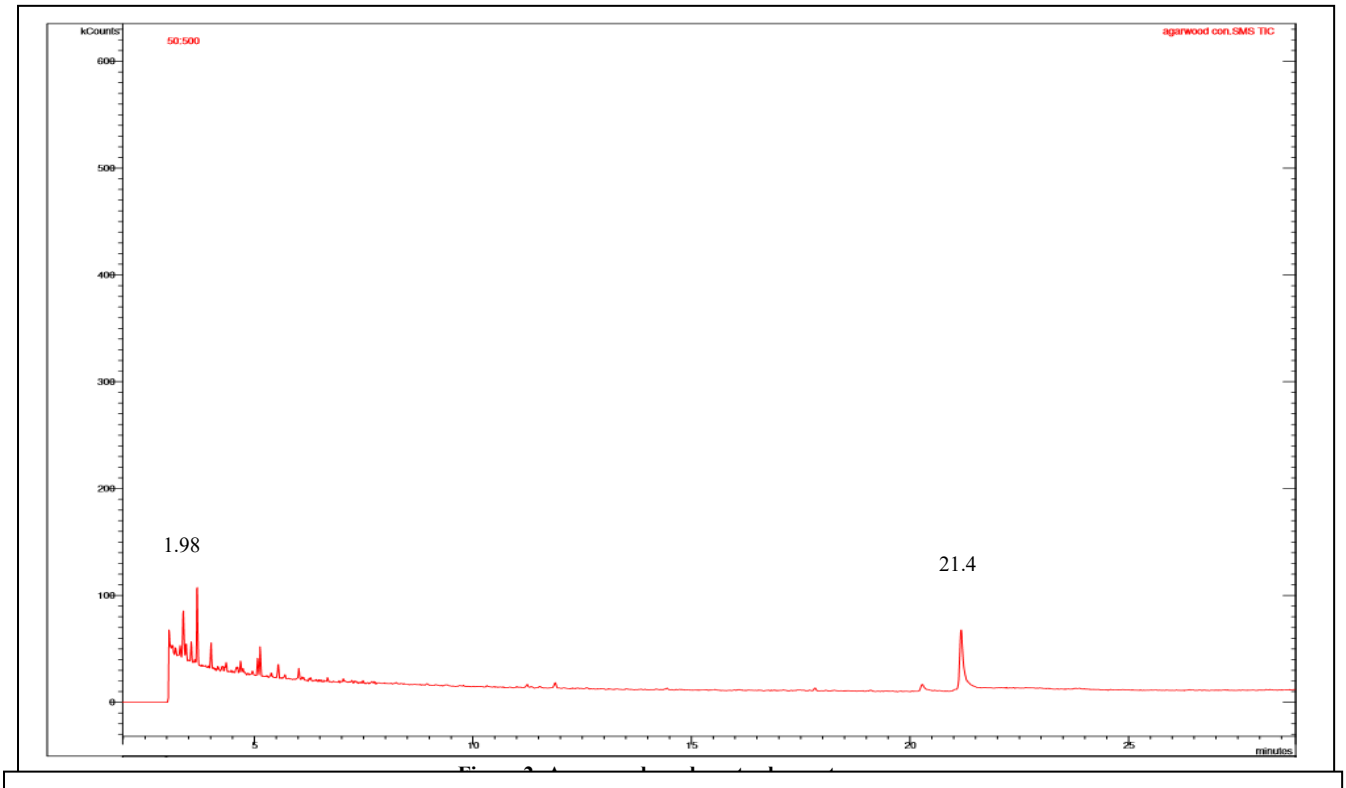


Figure 1: Schematic diagram for hydro distillation process

III. RESULTS AND DISCUSSION

A. Characterization of natural compound present using GC-MS

About 10 mL of sample from both plant condensate and hydrosol was mixed with 5mL of n-Hexane. The mixture was shake for 5 minutes and a layer of n-Hexane and sample was formed. The n-Hexane layer was taken and analyzed.



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1.68 24.56

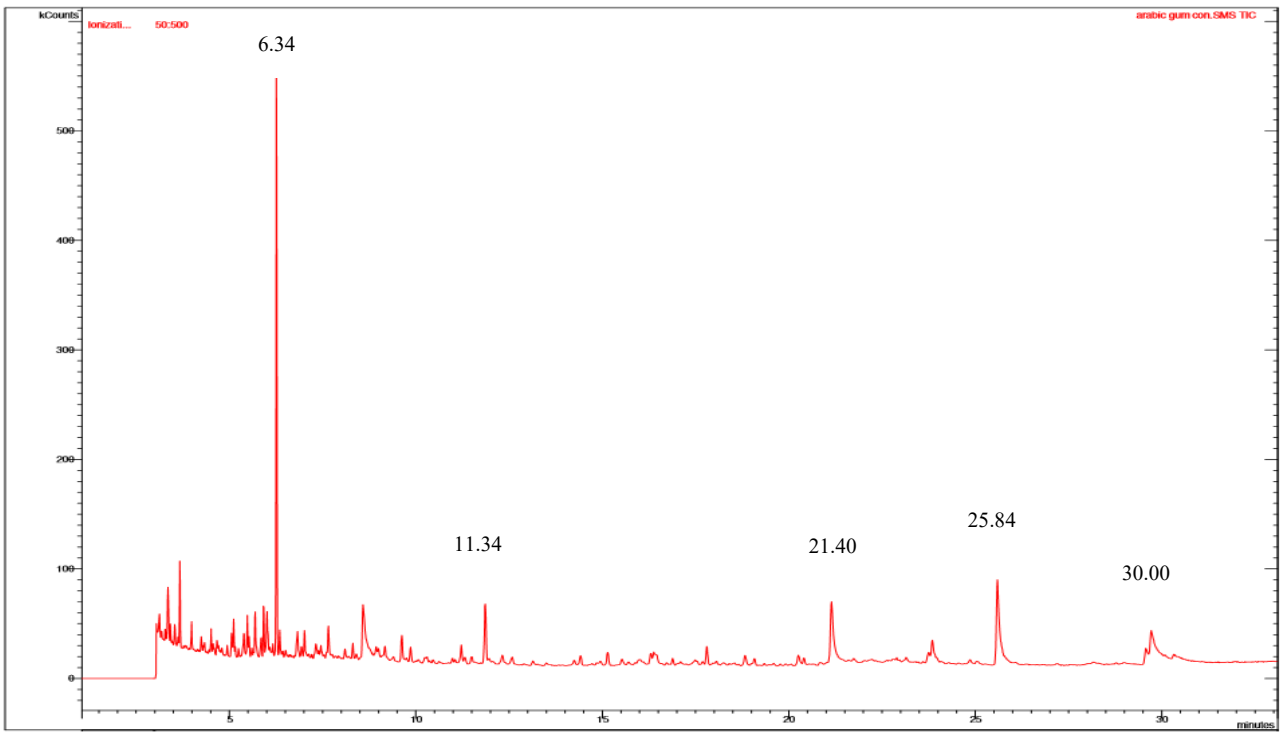

Figure 4: Arabic gum condensate chromatogram

5.8

21.4

Both hydrosol and condensate of agar wood and Arabic gum was obtained and analyzed by using gas chromatography mass spectrometry (GC-MS). From the analysis, a total of 24 compound was detected in both agar wood condensate and hydrosol. For Arabic gum, a total of 39 compound was detected in both condensate and hydrosol. All of the compound for both plant was tabulated as shown in table 4.1 and 4.2. From the compound analysis, there are presence of sesquiterpenes in both plant. Sesquiterpenes, alkaloid, and phenolic compound was able to aid in inhibit and minimizing cancer and able to serve as anti- oxidant.

Table 2: Compounds related to anti-cancer and anti-oxidant in agar wood and Arabic gum.

Source	Compound	Area (%)	Benefit
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Citronellal	0.438 3.435 7.330 3.531	-Anti oxidant -Anti-inflammatory -Relaxant - Stress reducer
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	α-Phellandrene	0.714 0.945 2.392 3.142	Used in fragrances because of their pleasing aromas
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Mequinol	0.743 1.158 1.310 0.996	Used in skin whitening agent
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Spathulenol	1.468 - 1.595 -	-Suppression of tumor -Anti inflammatory -Anti septic
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Caryophyliene	0.792 - 0.436 0.114	-Anti inflammatory -Anti cancer -Anti depressant
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	α-Farnesene	1.220 0.607 0.174 0.086	-Anti oxidant -Anti- septic -Anti bacterial -Anti-cancer
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Squalene	0.749 - 0.268 0.209	Cholesterol lowering drug
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Ecgonine	3.336 4.315 0.641 0.340	-Anesthetic -Vasoconstrictor for nasal surgery
Agar wood condensate	α-Vatirenene	-	-Anti oxidant

Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol		0.461 - -	-Anti diabetic
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	α-Pinene	- 0.366 1.366 3.142	-Anti inflammatory -Anti microbial -Anti biotic
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Arginine	- 0.337 0.277 0.132	Used for heart and blood vessels conditions such as coronary artery disease, and high blood pressure.
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Piperidine	3.413 2.823 1.253 42.55	-Stimulant and sedative in drugs
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	α-Panasinsene	- 25.430 0.614 0.326	-Anti-inflammatory component - Serve as anti-oxidant
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	α-Caryophyllene	- - 1.336 -	-Anti inflammatory -Anti cancer -Anti depressant
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Camphor	- - - 0.802	-Treat fungal infection -Relieve pain and reduce itching
Agar wood condensate Agar wood hydrosol Arabic gum condensate Arabic gum hydrosol	Camphene	- - - 3.531	-Fragrance making - Food additive for flavoring

The components related to anti-cancer and anti-oxidant properties was tabulated on table 1. All the compound that was labelled are sesquiterpenes that was found on both plant extract. There are some component that are present in agar wood and not present in Arabic gum and vice versa. From here, it can be seen that agar wood and Arabic gum have potential to serve as anti-cancer and anti-oxidant inhibitors based on the analysis.

For agar wood and Arabic gum, the most common extraction part that was taken as core is the essential oil [11]. Most of the compound present are extracted in oil. This is why most extraction does not take condensate and hydrosol into account since it is not expected to have any valuable component present. Based on analysis, it can be seen that there is also valuable component present in condensate and hydrosol of both plant. Alpha Farnesene (α-Farnesene) for example is one of sesquiterpene compound that can related to anti-cancer and anti-oxidant inhibitors [12]. It was found on both plant condensate and hydrosol, ranging from 0.6-1.2% in agar wood and 0.08-0.2% in Arabic gum. Same goes to another compound as stated in table 1. From here, it can be confirmed that the condensate and hydrosol of both plant still possess valuable compound which can be utilized well in the future.

In most of plant extraction process, for hydrosol there is only small amount of essential oil present, with high aromatic and its composition is different from the essential oil [13]. The reason for the presence of compound in the hydrosol is due to the parameter used in the distillation process and the type of plant used for the extraction [14]. Typically after the oil is taken, the hydrosol is discarded unless there is the need for it to be used. It can be seen that there is minimum utilizations of condensate and hydrosol in extraction [16].

IV. Conclusion

In most of plant extraction, essential oil is the valuable compound that produced since it possess many natural compound extracted from the plant. Different plant will yield different essential oil [17]. Even though the parameter for extraction is same, not all extraction process will produce complete extraction in essential oil. Some component will present also in condensate and hydrosol. By looking at the current medicinal approach, plant that able to contribute to inhibiting anti-cancer and serve as anti-oxidant is on high demand since it can be as alternative rather that fully dependence on chemical treatment [18]. Therefore, the extraction product that comes from extraction process should be utilized well in the future for sustainability for human health. By referring to the early development of medicine approach, plant has been a major contribution to human being. The development of medicine were growing together with the innovations of new technologies. Many new drugs have been created and aid in humanity. As for some diseases, chemical medicine have been created. When using chemical medicine, it was obvious that after effects from consuming that will happen after a while. Therefore, why we need chemical drugs as we can afford to utilize natural medicine from natural resources?

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