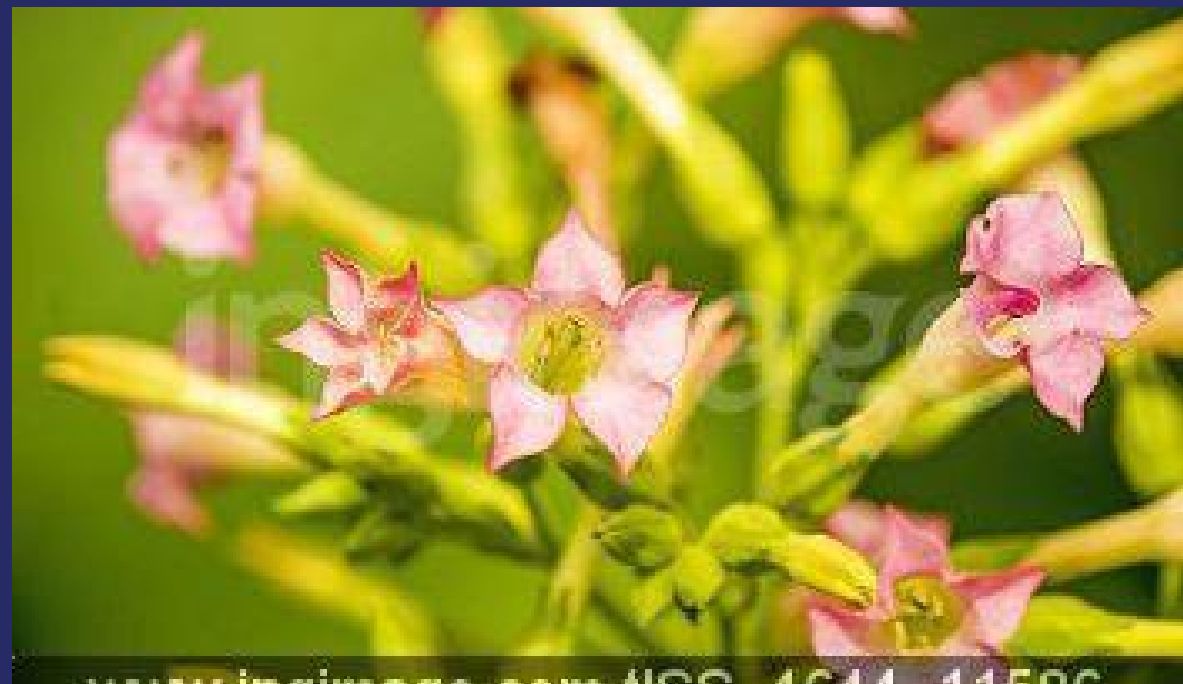


Tobacco belongs to the genus *Nicotiana tabacum* species *Nicotiana l. b.* utilization of tobacco cultivation so far just to take the leaves that are used as raw materials in the manufacture of cigarettes. The increasing interest in and use of the community will request smoking from year-to year. This research aims to determine the time of distillation in the process of production of essential oil of tobacco with water distillation methods. By using the ratio of the tobacco comparison with solvent at different times. Results of research production oil essential oil steam distillation method with tobacco, has benefits: Enhancing the effectiveness of tobacco plant, which was originally only used as raw materials in the industry, can be used as raw material in the manufacture of essential oils, which can then be processed into raw materials in the manufacturing process material control tool for attractant of fruit on fruit and plants can also be used to relieve the pain of the teeth. Developing the science that deals with the production of essential oils with the basic ingredients of tobacco, as well as be able to examine the quality of essential oils are produced with the use of tobacco



Ni Ketut Sari
Intan Yuniar
Edith Bertha Malaihollo

In this book the author introduces the theory and Application of manufacture of essential oils from tobacco to be used as a reference for students and research. In this book discussed about the distillation process using cohobation water media, the basic manufacture of perfumes using tobacco plants into essential oils.

Production of Tobacco Essential Oil



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CHAPTER I

INTRODUCTION

I.1. Background

Tobacco belongs to the genus *Nicotiana tabacum* species *Nicotiana l. b.* utilization of tobacco cultivation so far just to take the leaves that are used as raw materials in the manufacture of cigarettes. The increasing interest in and use of the community will request smoking from year-to year. Utilization of tobacco became the raw material other than cigarettes so far still do research in scale only, the resulting products including pesticides, and as raw material in the manufacture of perfumes. The main content of the tobacco is an alkaloid. The presence of alkaloid content in tobacco plant makes the effects of poison for insect (pest) but not toxic to plant tobacco itself. Nicotine is an alkaloid contained the compounds in the tobacco leaves. The dried tobacco leaves contain 2 – 8% nicotine. In addition it contains alkaloids, tobacco leaves also contain essential oils, essential oil because generally there are many at the plant that has a smell or aroma (Nurnasari and subiyakto, 2011). Essential oil is one of the results the rest of metabolism in plants that formed due to reaction between the different chemical compounds in water. Essential oils disintesa in cells on the network and there are formed in vessels of the resin. These oils contain volatile substances with a boiling point of composition varies (Sipahelut, 2012).

Essential oil has many of its use is extensive, such as raw materials in the industry of perfumes, cosmetics, pharmaceuticals, food and beverages, natural flavoring, in addition to treatment even used to treat chronic diseases such as cancer (Sipahelut, 2012). Essential oils can also be as antimicrobial but not all essential oils can be mneghambat the growth of microbes. Essential oils for humans especially at high doses may cause depression or excessive nerves are accompanied by symptoms of seizures and death (Attorney, 2010). On this occasion the researchers try to make use of

essential oils to tobacco with the levels that can be gained 0.13% to utilized as the basic ingredients of making perfume (*Puspita*, 2011).

Based on research conducted by the tobacco Plant Research Hall and fiber in August 2011, the process of distilling essential oils from some kind of tobacco, including tobacco Madura, Temanggung, bondowoso tobacco (Tobacco Virginia), Blitar and tobacco (oriental tobacco) is done by the method of steam distillation which lasts for approximately 4 hours, with essential oil produced in numbers slightly. As a comparison, in the year 2014 research of Rhizome jeringau obtained the best yield response to step 1:17.94 with a time of 9 hours. Our research aims to determine an alternative method, optimization of the process of distillation to produce a product with maximum volatile oil content. Review of the various research that is already done by previous researchers with the steam distillation method, we decided to choose distilled water as a method of research. Development of the research that we do lies in the selection of the method of distillation are used, water Distillation is one way to separate the essential oil from within the material. In this method, the material is going to be direct contact with boiling water (*Effendi and Djanarko*, 2014). Water distillation process is done with a variable ratio of tobacco and water, as well as operating time distillation.

I.2. Research Objectives

This research aims to determine the time of distillation in the process of production of essential oil of tobacco with water distillation methods. By using the ratio of the tobacco comparison with solvent at different times.

I.3. The Benefit of Research

Results of research production oil essential oil steam distillation method with tobacco, has benefits:

1. Enhancing the effectiveness of tobacco plant, which was originally only used as raw materials in the industry, can be used as raw material in the manufacture of essential oils, which can then be processed into raw materials in the manufacturing process material control tool for attractant of fruit on fruit and plants can also be used to relieve the pain of the teeth.
2. Developing the science that deals with the production of essential oils with the basic ingredients of tobacco, as well as be able to examine the quality of essential oils are produced with the use of tobacco as well as the method of distillation of different types.

CHAPTER II

A REVIEW OF THE LITERATURE

II.1. Tobacco

Poisonous plants of the group including tobacco. In the order of the tobacco family Solanaceae include taxonomy and genus Nicotiana. This genus has 3 subgenus are:

Rustica has 3 sections with 9 species

1. have 2 sexy Tabacum with 6 species
2. Petunioides has 9 sections with 45 species.

The two species have a sense the economy was *n. tabacum* (n = 24) and *n. rustica* (n = 24). *N. rustica* much laboured in Russia under the name of Mahorka as a producer of raw materials for the drug nicotine insecticide. The species is also widely planted in North India. Taxonomic composition of *n. tabacum* l. are as follows:



Figure 1 Tobacco *N. tabacum* L.

Famili	: Solanaceae
Subfamili	: Nicotianae

Genus	: <i>Nicotiana</i>
Subgenus	: Tabacum
Seksi	: Genuinae
Speies	: <i>tabacum</i>

(Herwati, 1991)

II.1.1 Chemical Content Of Tobacco

The plant produces a variety of aromatic organic compound part, known as secondary metabolites. This substance is usually only prescribed in a species. Secondary metabolites can be divided into three groups in accordance with the classification in its biosynthesis. Secondary metabolites are divided into terpene phenolic, and the compound containing nitrogen (Bezi'c. 2013).

The leaves of the tobacco plant, *Nicotiana tabacum*, has been demonstrated by the Tso and Stedman consists of a wide variety of organic and inorganic compounds. For the general classification, the components of the leaf can be described as volatile, semi volatile and non-volatile (Coleman, 2000). Substances that influence on the quality of tobacco and smoke, among others:

1. Fertilization of nitrogen (protein-nicotine). Nicotine (β -pyridil- α -N-methyl pyrrolidine) is the specific organic compounds contained in tobacco leaves. When this compound is sucked up, it will cause a psychological stimulus for smokers and make it become hooked. In suction, nicotine impact severity suction flavor. The higher levels of nicotine the taste is heavier. While the opposite, the lower level of nicotine contained in tobacco, the taste is light (bland). Protein makes sense of the suction is very spicy and biting, so during processing (curing) this compound should be completely revamped into other compounds, such as amides and amino acids.
2. Compound carbohydrates (starch, pectin, cellulose, sugar). Starch, pectin, and high-powered cellulose compounds the injurious aromas and flavors, so for

processing suction must be overhauled into sugars. Sugar has a role in easing the heavy in suctioning smoking, but when too high causing heat and irritation of the esophagus, causing tobacco readily absorbs the lengas (water) so it becomes moist. In the balance of sugar and nicotine will determine the pleasure in smoking.

3. Resins and essential oils. The SAP of leaves in the leaf hairs containing essential oils, resins and in combustion will generate this scent on the cigarette smoke.
4. Organic Acids. Acid-organic acids like oxalic acid, citric acid, Malic acid and help power the incandescent and give freshness in the sense of suction.
5. Color: Substance chlorophyll (green), xanthophyll (yellow), beta-carotene (red). When chlorophyll is still there on the leaves of tobacco, then in a glowing smoking will cause the smell awful ("musty"), are xanthophyll and beta-carotene had no effect against the aroma and flavor of the suction.

Table 1. Chemical content of Tobacco cigarette ingredients

Component	The composition of the (% bk)
Total Nitrogen	2.20
Protein Nitrogen (Protein)	1.58
Nikotin	0.67
Nitrogen dari asam α -amino	0.30
Water Soluble Carbohydrates	25.9
Selulosa	12.3
Pektin	13.4
Polypentose	4.90
Essential Oil	0.13

Resin in the extract using benzene	7.42
Resin in the extract using petroleum ether	6.20
Polyphenol	4.39
Volatile karbonil (asetaldehid)	0.26
Organic acid	9.12
Oxalit acid	2.18
Citric acid	1.27
Malic acid	4.57
Volatile acids	1.12
the pH of the water extracted	5.54
Abu	15.4

(Puspita, 2011)

II.1.2. Essential Oil

Essential oils in general have a volatile molecular structure or known by the volatile derivative bonds that originated from some plants that produce essential oils. The essential oil, has more than a hundred smells and chemical bonds, which provided the basis of the characteristics of natural aromas. Essential oils can also be used as the raw material mix of paper, as deodorizers. Essential oils can be produced by some plants either in the form of stems, leaves, roots and flowers (Sulaiman, 2014). This definition is intended to distinguish the fatty oils and essential oils of different producing plants. It was found that the oil was mainly composed of compound volatile chemistry including the acyclic and isocyclic hydrocarbons and hydrocarbon derivatives that have been tying up oxygen. Some of the compounds contain hydrogen and sulfur, although essential oil contains a variety of chemical components of sorts – different, but these components can be classified into 4 major groups dominant determines the properties of essential oils, namely:

1. The others, that there is a connection with isoprene isopentena.

2. straight-chain Compounds, containing no chains branch
3. Derivatives of benzene
4. Various kinds of other compounds —. (Guenther, 1947)

The separation of essential oils from some mix of complex molecules, can be separated by means of chromatography, distillation and extraction with solvents. The main molecule is 95% will compound, alcohol and various other organic molecules. Essential oils can be grouped homogeneously the physical properties as follows: liquid state, volatility, pale yellow, usually a high refractive index, low polarity, susceptibility to oxidation, and also tend to polymerize to form resin products. Essential oils contain many chemicals that varies according to the proportion of its origins and are classified into two groups: terpene hydrocarbons (monoterpene, sesquiterpen), a product of oxygen as the aromatic compounds (alcohols, esters, ethers) type phenylpropanoid. (Sulaiman, 2014).

II.1.3 Essential Oil Component

Basically all the essential oil contains a mixture of chemical compounds and the mixture is usually very complex. Such as hydrocarbons, alcohol, oxides, aldehydes, esters, and ethers. Chemical components of essential oil very complex, but usually does not exceed 300 compounds. That determines the aroma of essential oils usually the components that percentage is high. However, losing a small percentage component can allow the occurrence of a change of the essential oil aromas. If the essential oil has a hydrocarbon content not oxygenated in bulk and stearoptena in small portions, so its usefulness is preferred as the giver of a specific smell or scaffolding (flavoring), whereas if they contain essential oil more compounds of hydrocarbons, ketones, phenol, alcohol, esters of phenols, oxide, and Esther, more allows for use as a drug, because in theory it is known that all compounds that have an active force that acts against a This type of the disease. (In Elyana,2014)

II.1.4 Essential Oil Benefits

a. Health and aromatherapy

The content of essential oil has a soothing effect (relaxing). Essential oil compounds belonging to the body can affect the emotions of the limbic system or a regulator. Essential oils that smell by the nose will bind to the receptor catcher scent. Afterwards, will send a chemical signal receptor to the brain and will set someone's emotions. Therefore, the essential oil is usually used as an aromatherapy concoction mixed to address the issue of psychic. In addition to having a soothing scents, essential oils also have benefits for health, such as anti-inflammatory and anti-insect.

b. Have the scent of

Fragrant essential oils produced by many as mixed fragrances or perfumes. Not only as a source of fragrance, essential oils also acts as a binder smells (perfume fixative). The effects of fragrances that comes from the essential oil is also used for some products such as SOAP, toothpaste, shampoo, lotion, deodorant, cleaners, fresheners, and hair tonic. In addition, essential oils can be used as room deodorizers and air. For example, the essential oil is able to remove toxic metals from the air, the lure of oxygen, and adding negative ions. The use of essential oils as raw material for fragrances can make the air in the room be cleaner, fresher, and not stuffy.

c. Food additive

In the manufacture of foods essential oils also have an important role. Essential oils useful as aroma and flavor enhancer, particularly for processed foods. In addition, essential oils can add flavor to food. Natural pesticides in agricultural cultivation, some fragrant essential oils produced by disliked by insects and pests pest plants. Therefore, many farmers use essential oils to eradicate the insect. For example, farmers often use oil of vetiver as a termite exterminator. Some essential oil

contains eugenol meti, i.e. substances that are utilized by farmers to eradicate fruit flies. Essential oils containing meti eugenol clove leaf oil, including oil, nutmeg oil, oil scented leaves and greetings. (In Elyana,2014)

Effects of essential oil to the central nervous system are grouped into 3 types namely softly or soft (kilemo, Basil oil, Lemongrass and kitchen), medium (eucalyptus oil and laja gowah), and hardly (nutmeg seed oil) and chemically classified in 2 classes, namely monoterpen and seskuiterpen, in the form of isoprenoids C₁₀ and C₁₅ are the boiling points of different term (the boiling point of 140 monoterpen-1800C, seskuiterpen > 2000C boiling point). Economically it is necessary as a basic component of natural fragrances and also spices and flavor compounds in the food industry. (Attorney, 2010)

II.1.5. Essential Oil Distillation Technique

Some methods that have been made to obtain the essential oil, among others, extraction, distillation (distillation) and others. In terms of Economics and based on the yield generated, how the most widely used today are distillation. This distillation technique consists of 3 kinds, i.e. steam distillation, distilled water and steam-distilled water. Steam distillation can yield more than it is to use distilled water. However steam distillation takes longer. While the steam-distilled water is a combination of the two, so it has the advantages of both. (Hutama, 2014).

Excess distillation methods, low production costs, but the use of high temperatures and the presence of water can cause damage to the essential oil of tobacco because of the high heat and hydrolysis reaction with water, so that it can lower the quality of essential oil of tobacco. The difference method of isolation effect on the quality of the oil produced. Distillation method shortcomings can be overcome by the use of solvent extraction methods. The temperature of the extraction can be performed at room temperature and does not involve water in oil retrieval process.

Some types of solvents frequently used i.e. ethanol, hexane, benzene, acetone, methanol and iso propyl alcohol. (Pratiwi dkk, 2016)

Table 2. Difference method of distillation

Parameters and Operating	A. Water Distillation	B. Water and steam distillation	C. Steam Distillation
Type tool Distiller	Cheap, simple tools refiners could be moved, easily installed in production areas.	A bit more complicated, the cost is greater than A, the smaller type can be moved and can be installed in the field.	If construction is good, usually more powerful and durable (long-lasting) than the A and B allow on a large scale.
The State of the results of the pieces	The best results are obtained from the materials in the form of fine powder.	Materials must be uniform, but not too smooth. Granulation against seeds and roots will produce good quality oil.	Same as B.
The steam pressure in the boiler distillation	Usually about 1 atmosphere.	Usually about 1 atmosphere.	Can be modified (high or low pressure steam). In accordance with the condition of the materials.
The efficiency of distillation	Relatively low.	Quite good.	Height.
Type of material	The greatest advantage is obtained against	Suitable for herbaceous and foliage.	Suitable for all kinds of materials in which the steam

	<p>certain materials, especially the mashed; also for the flowers that are easy to rotate with direct steam. Less well adapted the materials contain constituents, which can be made into soaps, and soluble in water or boiling dotted high.</p>		<p>will form steam flow (rat holes). Especially suitable for wood, roots and seeds contain oil dotted high-boiling.</p>
The temperature in the boiler	<p>$\pm 100^{\circ}\text{C}$. must be careful not to overheat the boiler temperature distillation. The water is evaporated to be replaced continuously.</p>	About 100°C .	<p>Can be modified (saturated steam or steam heat) in accordance with the State of the materials though.</p>
Parameters and Operating	A. Water Distillation	B. Water and steam distillation	C. Steam Distillation
Hydrolyzed oil constituents	<p>The State does not usually benefit the</p>	<p>Hydrolyzed original contents rather slow Kettle not too cool,</p>	<p>Good condition, usually hydrolyzed oil is relatively</p>

	hydrolyzed ester with high levels.	which is by extending the distillation.	small.
			Good condition, if the material is well stocked. Extension of time of distillation with steam condensation causing an abundance of wet steam in the boiler the flute and the onset of clotting ingredients in kettle.
The quality of oil	Depending on the treatment; the "hollowing out" the contents of the kettle should be avoided, especially when the heating is done by direct fire.	Usually good.	Well, if the work was done with reasonable.
The charging condition of the materials	Well, if the material is completely submerged and move freely in	Well, if the material is finely chopped and well stocked. Extension of time refining cause wetting	

	water.	materials by steam condensation and clumping of the ingredients in a kettle. The boiler must be isolated properly distilled.	
The way of filling material	Materials must be completely submerged in water.	Materials must be filled with either into the boiler Distiller.	Same as b. how good airing is very important, otherwise there will be built a steam line between materials, resulting in a low yield.
The State of the diffusion	Well, if the material is stocked with evenly and can move freely in the boiling water.	Either.	Either. If steam is a little wet, the distillation with steam heat or steam avail high pressure would dry up and condense steam back into the kettle.
Parameters and Operating	A. Water Distillation	B. Water and steam distillation	C. Steam Distillation
Oil yield	In some ways, because of the relative low hydrolysis, also because of the oil	Well, if the ingredients are finely chopped, filled with average refining is done well. Clumping of the	Well, if not the occurrence of excessive cooling, and clotting ingredients. This

	constituents of dotted high-boiling behind in the water in the kettle flute.	contents or the distribution of vapor can cause low oil yield and not normal.	will prevent vapor through transpiration throughout the material and will result in low oil yield and not normal.
Distilled water	Distilled water in some respects must be returned, or better returned to the boiler for distiller cohobation. Distilled water mainly contain the results of hydrolyzed oil.	If the separation of good oil, distilled water can be disposed of.	Same as B.

(Guenther, 1947)

Key events occur in the process of distilled water are:

1. The diffusion of essential oil and hot water through the membrane of the plant, called hydro diffusion;
2. Hydrolysis to some of the components of essential oil;
3. The decomposition which is usually caused by the heat.

Most essential oil component will dissolve in distilled water and different composition with a separate oil in a bottle main oil called florentine, while oils are dissolved in distilled water called oil water. Components are soluble in distilled water is mostly composed of oxygenated compounds that have a weight greater than type

compounds of non-oxygenated (terpene, sesquiterpene, and others). That is why it is usually water oil has weight type of oil greater than the primary. This difference is not so great, as distilled water does not contain a solution of oil, but also small particles or other emulsion forms. The color of murky from the distilled water showed still the existence of oil in the water. (Guenther, 1947)

II.2. The Theory Cornerstone

In the process of taking the oil atisiri of the tobacco leaves is by the process of multilevel water distillation process i.e. craft made refining process twice. The first process is done on refining process of water using boiler, water distillation process takes place at a temperature of 100⁰C with atmospheric pressure (1 atm). Because the essential oil has a component that is soluble to water such as phenol, then conducted the process of distillation back against destilat the results of the first distillation, known as the cohobation process. treatment on the process of cohobation is done by addition of salt NaCl which is aimed at reducing the solubility of the components of essential oil to water, so the process of distilling essential oils can take optimal. (Guenther, 1947).

In doing this research we are using a comparison between the ratio of ingredients with pelarutnya i.e. 1:11; 1:13; 1:15; 1:17 and 1:19 w/w with the set operating time is 4, 5, 6, 7 and 8 hours. We use such comparisons because in previous research using the method of De Garmo to figure out the best treatment on yield, with the results of the step response of the best yield is at a ratio of 1:17.94. (Effendi, 2014)

II.2.1. Water Distillation

There are several methods for extracting essential oils, which are different from each other. One of them is hydrodistillation, in which aromatic plant material soaked in heavy two or three ingredients multiple times. Which is then heated by steam or direct warming (Abarca. 2015).

There are several factors that determine the amount of oil that can be distilled together with the water – either on a method of distillation, i.e. the vapor pressure is used, each molecular weight components of the oils in the ingredients and the speed of oil out of such materials (Tobacco) (Attorney, 2010).

Water distillation is a method in which materials will be distilled direct contact with boiling water. The material floats on water or submerged in depending on the type and weight of materials which will be distilled. Water is heated with heating method are wont to do, i.e. with direct heat, steam, the steam pipe coat is a closed circular, or by wearing open-wound steam pipe or hollow. The characteristic of this method is the direct contact between materials with boiling water. Several types of materials (e.g. fruit powder almond, rose, and orange blossoms) must be distilled by this method, because the materials must be soaked and can move freely in the boiling water. If distilled with direct steam method, this material will glue together and large clots forming compact so that steam cannot penetrate into the material. (Guenther, 1947)

Essential oil treatment by distillation method of water is known as the conventional method which is based on the principle that mix (steam oil and water vapor) has a boiling point lower than the boiling point of pure water vapor, so that vapor contain the oil has a larger sum. Yield obtained from the method of distillation water is determined by several factors, among others, the size of the material, quantity (ratio) of materials and water used, treatment time and stirring process. (Gani, 2010)

In water, the distillation refining speed needs to be maintained because by setting the speed of the distillation, then a pile of leaves in the boiler can be maintained in a State of fairly loose, so as to guarantee the continuity of steam penetration into materials and can vaporize essential oils.

On the method of distillation of water, the entire pile of leaves is driven by the boiling water. Essential oil will diffuse towards the epidermis, on the distillation with

water has some shortcomings, the extraction cannot progress to perfection. In addition, some types of esters, such as linalil acetate will be hydrolyzed sensitive compounds such as aldehydes, undergoing polymerization due to the influence of boiling water. Besides the oil component of high-boiling and dotted compounds that are dissolved in the water cannot evaporate completely, so that the oils that contain incomplete tersuling which resulted in a number of essential oil. (Wakura, 2007).

II.3. The hypothesis

At any given time will be obtained as a result of the distillate which is best, the more solvent (water) are used then the distillate obtained is also more and more anyway because at this water solvent distillation method acts as the agent of the carrier oil components essential.

CHAPTER III

RESEARCH METHODOLOGY

III.1 Raw Materials

1. Tobacco
2. Water
3. NaCl

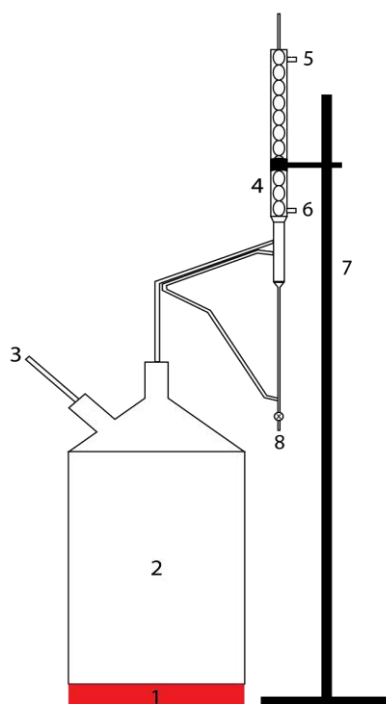


Figure 2. Water Distillation Tools Series (Water Distillation)

Description figure 2:

- | | |
|---------------------------------|----------------------|
| 1. Heating (Stove) | 6. Air Intake hose |
| 2. Kettle (Distillation Vessel) | 7. Statif then Clamp |
| 3. Thermometer | 8. Defider |
| 4. Condenser Upright | |
| 5. Drain Hose | |

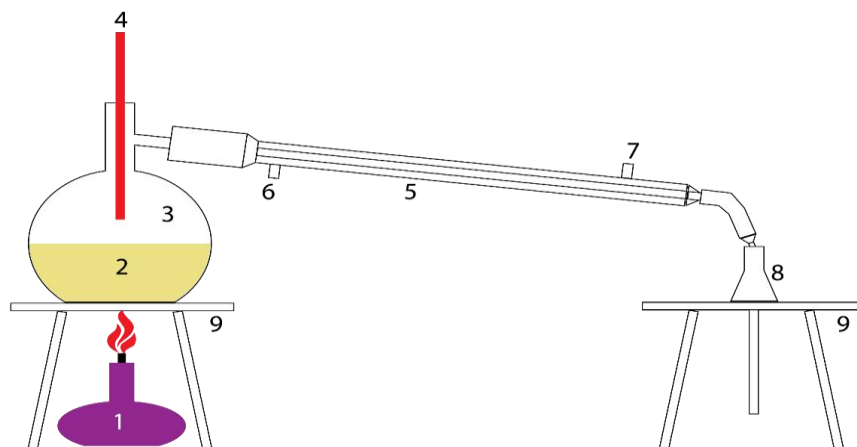


Figure 3. Cohobation Tool sets

Description figure 3:

- | | |
|--------------------------|------------------------------|
| 1. Bunsen | 6. The cold water coming out |
| 2. Solution Distillation | 7. Cold water entry |
| 3. Distillation Flask | 8. Erlenmeyer |
| 4. Thermometer | 9. Walk Three |
| 5. Condenser Libik | |

III.2 Research Methods

Type of this research is quantitative research data collection method, i.e. the method of experimentation. The condition is executed in the form of the ratio of ingredients: solvents, the time required for the distillation operation 1 time (h). Whereas the conditions fixed in the form of pressure on the operation of distilled water (atm), temperature of operation ($^{\circ}\text{C}$)

- Conditions of stay

- | | |
|--|-----------------------|
| 1. Distillation Operation pressure (atm) | : Atmospheric (1 atm) |
| 2. Distillation operating temperature ($^{\circ}\text{C}$) | : 100 |

- The condition of being run

1. The Ratio of Ingredients (gr): Solvent (ml) : 1:11; 1:13; 1:15; 1:17; 1:19.
2. Operating Time Distillation (hours) : 4, 5, 6, 7, and 8.

III.3 Research Procedure

1. Preparation materials

Tobacco leaves are cleaned by rinsing with clean water. After they were finely chopped, it was cleaned (cut) with a certain size or according to the size required for the process of distilled water. The chopping process aimed to expand contacts between the ingredients with water, as well as to accelerate the process of drying winds to reduce the water content in the materials. Tobacco was then air-dried at room temperature (29-32° C) and avoid the Sun to reduce evaporation of essential oils that excessive drying process takes place. The results were then weighed in accordance with the specified variable.

2. Water Distillation Process

1. Sets the tools of distilled water, then enter the water with the ratio of a given volume (according to a variable) to a distillation kettle.
2. Enter the tobacco that has already chopped into the distillation Kettle, so that all parts of the inundated materials so that it will result in maximum essential oil. The next step is heating and kept at distillation temperature of 100⁰C.
3. Wait until a period of time (the time required for the distillation operation 1 time) according to the variable.
4. After operating time distillation is finished, take the distillate that consists of a mixture of water and essential oils, and then separate them by using a separator funnel to separate the essential oil with water. The water is expelled through the bottom of the separator funnel, and essential oils are taken using the pipette through the top of the funnel of the separator.

5. Place the essential oils on the closed bottle was dark and avoid sunlight, so that the oxidation does not occur that can affect the quality of essential oils are produced.
6. Water refining results then saturated with NaCl and done refining process back "Cohobation". This process aims to separate the components of the essential oil that dissolves in water, phenol and some kind of alcohol and acids bound in water. The process of cohobation done up to the amount of oil left in the kettle of cohobation relative minor.
7. Distillat of cohobation was merged with the main essential oils.

III.4 Analysis Method

1. Analysis of Volatile Oil Content By Specifying %(w/w)

A. The principle of the Test

The density of obtained essential oil of tobacco (ml) is then calculated using pycnometer. The volume of the essential oil obtained is then converted into a weight (gr) by multiplying by its density(gr/ml), then specify the concentration of essential oils in% (w/w).

B. Materials

1. Essential oil of tobacco

C. Tool

1. Pycnometer
2. Analytical Balance
3. Pipette drops

D. Procedures

1. Obtained essential oils from the results of distillation, is then calculated its density using pycnometer.
2. Weigh the empty pycnometer as W1
3. Weigh the pycnometer that contains essential oils of tobacco as a W2

4. Count its density.
5. Convert volume of essential oil into the unit of weight.
6. Determine the concentration of essential oils in% w essential oils (gr)/w dry tobacco leaves (gr).

E. Statement of Results

The content of essential oil in tobacco can be expressed by the equation:

$$\rho_{\text{essential oil}} \left(\frac{\text{gr}}{\text{ml}} \right) = \frac{w_2 - w_1 (\text{gr})}{\text{Volume pycnometer (ml)}}$$

$$w_{\text{essential oil}} (\text{gr}) = \text{Volume of essential oil (ml)} \times \rho_{\text{essential oil}} \left(\frac{\text{gr}}{\text{ml}} \right)$$

$$\text{the concentration of essential oils (\% w/w)} = \frac{w_{\text{essential oil}} (\text{gr})}{w_{\text{materials}} (\text{gr})} \times 100\%$$

Where:

W1 = weight empty pycnometer (gr)

W2 = weight pycnometer content (gr)

III.5 Flowchart

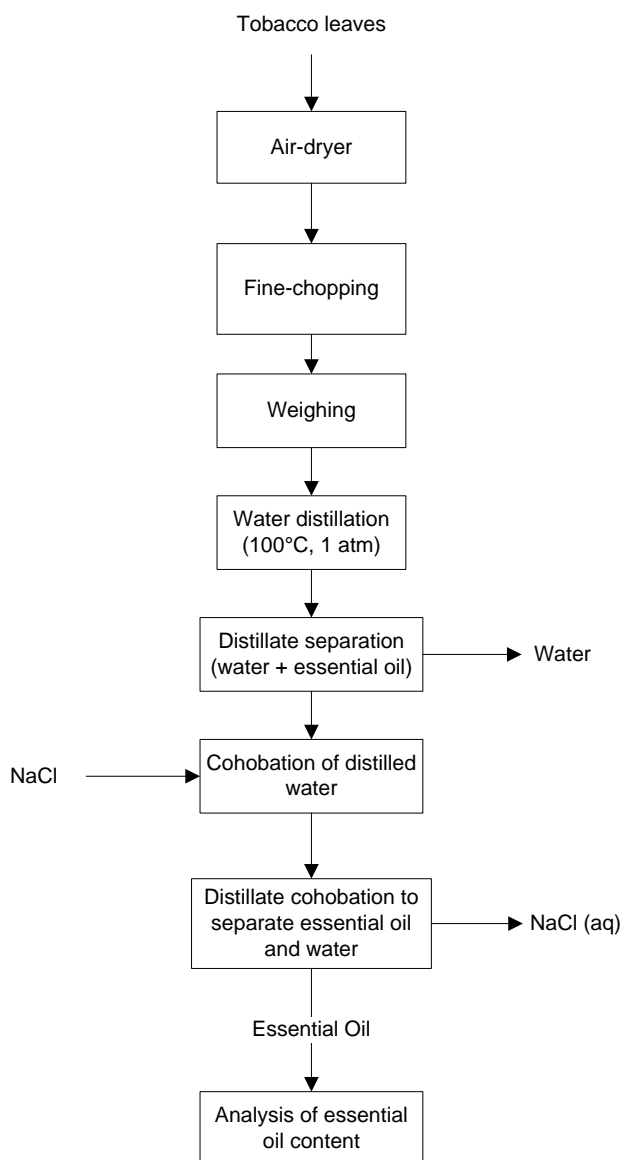


Figure 4. Flow Diagram Of The Manufacturing Process Essential Oil

How It Works :

1. Preparation of raw tobacco, where the material has been obtained are sorted and cleaned with water.
2. Materials are finely chopped with a certain size in order to expand the surface contact between the material with water,
3. Tobacco is air-dried (avoid the Sun) at room temperature so to happen excessive evaporation of volatile oil in the process of drying the material. Chopped tobacco then weighed in with a particular variable.
4. The process of distilled water, where the material is put into a Kettle which was later filled by water in accordance with the ratio, we recommend materials must be submerged by water.
5. Distillate obtained are then separated using a separator funnel, to separate water and essential oil of tobacco.
6. Refining the results of the Water still contains the components of the essential oil saturated with salt (NaCl) and performed the process cohobation to separate components of oil dissolved with water. Then connect with the results of cohobation essential oil with essential oils are the main results of the distilled water.
7. Specify the density of the essential oil of tobacco (gr/ml) to convert volume of essential oil (ml) obtained into weight (gr).
8. Declare the concentration in essential oil (% w/w) between the weight of the essential oils produced by the weight of tobacco used in the distillation process.

CHAPTER IV

RESULTS and DISCUSSION

IV.1 Result

Table 3. The Observation Volume Essential

Tobacco and water ratio	Time (hours)				
	4	5	6	7	8
	Volume (ml)				
1: 11	1,8	4,2	6,4	13,4	16,2
1: 13	1,2	2,6	4,8	5,6	6,6
1: 15	1,1	4	7	10,4	16,2
1: 17	3,9	7,9	10,9	17,5	19,7
1: 19	0,9	1,3	1,7	2,1	2,4

Table 4. The Calculation of Essential Yield of Essential

Tobacco and water ratio	Time (hours)				
	4	5	6	7	8
	Yield (%b/b)				
1: 11	0,1451	0,3385	0,5158	1,08	1,3057
1: 13	0,0967	0,2096	0,3869	0,4514	0,532
1: 15	0,1153	0,4191	0,7335	1,0897	1,6974
1: 17	0,8173	1,6555	2,2842	3,6673	4,1283
1: 19	0,1886	0,2724	0,3563	0,44	0,5029

IV.2 Discussion

IV.2.1 The Observation Volume Essential Oil

In the observation volume destilat volume ratio for each result at any time change has increased, this shows that in the process of distilling essential oils depending on the time and the ratio between tobacco and water used in the process of distillation. The longer distillation process then the more it will earn yield, it also supports our hypothesis that the longer the process of distillation is run then it will accrue to results of distillate oil volumes are more essential. Yet at a different ratio shows the number of the volume of the distillate obtained also varies with the range at the same time.

On the ratio of tobacco and water 1:11 on a 4 hour time obtained essential oil distillate volume of 1.8 ml, at the time of 5 hours increased to 4.2 ml, at which time 6 hours increased to 6.4 ml, at which time 7 hours increased to 13.4 ml, and at the time of 8 hours increases be on the ratio of 16.2 ml. tobacco and water 1:13 on a 4 hour time obtained essential oil distillate volume of 1.2 ml, at the time of 5 hours increased to 2.6 ml, at which time 6 hours increased to 4.8 ml, at which time 7 hours increased to 5.6 ml, and at the time of 8 hours of me ningkat be 6.6 ml. Comparison between ratio 1:11 ratio 1:13 volume of the distillate obtained results of different essential oil, at a ratio of 1:11 obtained the result destilat is greater than 1:13, it is inversely proportional to our hypotheses, i.e. the more amount of water used will then be retrieved results destilat that more and more, but in fact the hypothesis with the results obtained do not fit, according to effendi in 2014 alleged decline occurred as more and more the amount of water in the distillation process then the amount of alcohol and acid are also getting bigger and hidrolisa process will take place to further stages. This resulted in the yield of oil produced will be reduced. On the ratio of tobacco and water 1:15 on a 4 hour time, we obtained essential oil distillate volume of 1.1 ml. At the time of 5 hours increased to 4 ml, at which time 6 hours

increased to 7 ml, at which time 7 hours increased to 10.4 ml, and at the time of 8 hours increased to 16.2 ml. The comparison between the back ratio 1:13 to ratio 1:15 showed that there is a difference, where on the 1:15 ratio of increase in volume of the distillate is greater than the increase in the volume of destilat in the ratio 1:13 at any time. In accordance with the conditions, the hypothesis in which the water molecules as a carrier agent acted as essential oils, the more water used, the more distillate volume retrieved.

On the ratio of tobacco and water 1:17 on a 4 hour time obtained essential oil distillate volume of 3.9 ml, at the time of 5 hours increased to 7.9 ml, at which time 6 hours increased to 10.9 ml, at which time 7 hours increased to 17.5 ml, and at the time of 8 hours increases be 19.7 ml. On ratio of 1:17, the largest distillate volume results was obtained during the time of 8 hours with a volume of distillate as much as 19.7 ml. From this condition, it can be known that by the ratio of 1:17 with a time of distillation for 8 hours will be the maximum volume of the distillate obtained and is relatively good at the process of distilling essential oils to tobacco. On the ratio of tobacco and water 1:19 on a 4 hour time obtained essential oil distillate volume of 0.9 ml, at the time of 5 hours increased to 1.3 ml, at which time 6 hours increased to 1.7 ml, at which time 7 hours increased to 2.1 ml, and at the time was increased to 8 hours 2.4 ml. On the conditions of saturation levels occur 1:19 ratio on the process of transporting essential oil molecules when the distilling process is underway. Just as the ratio 1:13 volume decrease in distillate, allegedly essential oil tobacco occurs due to the greater number of water distillation process then the amount of alcohol and acid are also getting bigger and hydrolysis process will take place to further stages. This resulted in the yield of oil produced will be reduced.

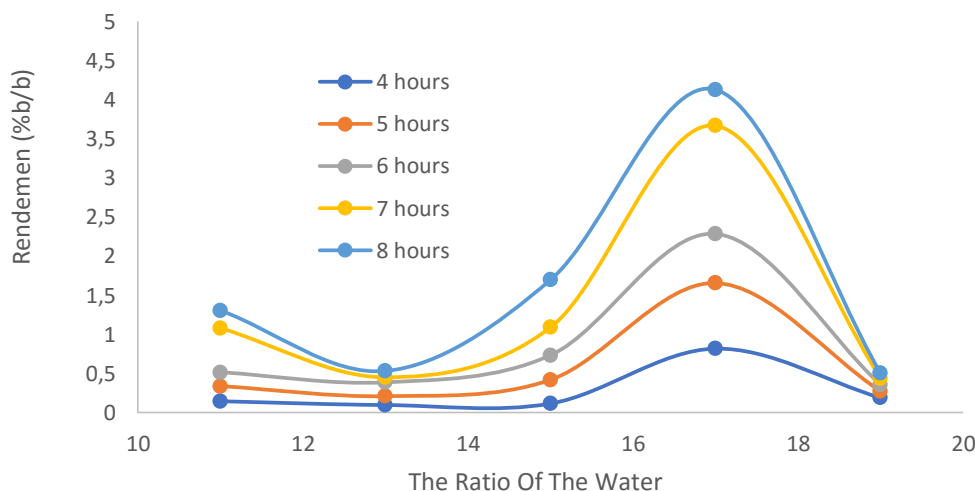


Figure 5. The relationship between Ratio with Yield

In accordance with the variables that are run i.e. the ratio between the water with tobacco, namely 1:11, 1:13, 1:15, 1:17, 1:19 (gr/gr) and time i.e., 4, 5, 6, 7, and 8, retrieved the relationship to determine the best ratio is 1:17. Where in the ratio 1:17 at any point or condition is a stone is the most best in obtaining essential oil yield. On the ratio of 1:11 obtained the starting point and continue at a ratio of 1:13 has decreased, this happens due to the occurrence of resistance in the process of refining mechanism of essential oil, both on the process of hidrodifusi or the process of transport of molecules (transfer) essential oil. However, in the conditions of the 1:15 ratio occurs the increase it is influenced by the amount of the ratio between the tobacco and water, because in accordance with the hypothesis that the more water used then it will be more and more yield essential oil that will be retrieved because water is the carrier's agents in the process of distillasi. On the condition ratio 1:17 retrieved the cusp with the highest yield results, but at this point it also starts decline which occurred up to yield results on the conditions the ratio 1:19. On the conditions of the ratio 1:19 retrieved the most steep decline in point terms this is inversely proportional against the hypothesis is taken, the decline occurred as more and more number of water distillation process then the amount of alcohol and acid are also

getting larger and hydrolysis process will take place to further stages. This resulted in the yield of oil produced will be reduced (Effendi, 2014).

If compared to the comparison of journals written by effendi in 2014 by use of jeringau Rhizome plants, the results obtained in the same approach, where the optimum results for the process of distillasi Rhizome jeringau essential oil obtained at the condition is relatively good ratio between jeringau Rhizome with water is 1:17.94. For distillasi essential oil from the leaves of tobacco earned the best point conditions on the ratio between the tobacco leaves and water 1:17.

IV.2.2 Essential Oil Yield

On the ratio of tobacco and water 1:11 at the time of 4 hours, obtained yield essential oil of 0.1451%, at the time of 5 hours increased to 0.3385% at 6 hours increased to 0.5158%, at the time of 7 hours rose to 1.0800 percent, and at the time of 8 hours increases be 1.3057%. On the ratio of tobacco and water 1:13 at the time of 4 hours, obtained yield essential oil of 0.0967%, at the time of 5 hours increased to 0.2096% at 6 hours increased to 0.3869%, on a 7-hour increase to 0.4514%, and at the time of 8 hours increases be 0.5320%. If compared between ratio 1:11 ratio 1:13 retrieved results yield a different essential oil, at a ratio of 1:11 obtained the result destilat is greater than 1:13, it is inversely proportional to our hypothesis, that is, the more amount of water the results obtained will be used destilat which is getting a lot, but in fact the hypothesis with the results obtained do not fit, according to effendi in 2014 alleged decline occurred as more and more number of water distillation process then the amount of alcohol and acid are also getting bigger and hidrolisa process will take place to further stages. This resulted in the yield of oil produced will be reduced. On the ratio of tobacco and water 1:15 at the time of 4 hours, obtained yield essential oil of 0.1153%, at the time of 5 hours increased to 0.4191% at 6 hours increased to 0.7335%, on a 7-hour increase to 1.0897%, and at the time of 8 hours increases be 1.6974%. Comparison between the back ratio 1:13 ratio 1:15 there is a difference

where on the 1:15 ratio of increase yield of essential oil of tobacco was greater than the increase in yield of essential oil in the ratio 1:13 at any time, on this condition in accordance with the hypothesis in which the air carrier as agent berberan molecules of essential oils, the more water used then it will yield an essential oil obtained more and more.

On the ratio of tobacco and water 1:17 at the time of 4 hours, obtained yield essential oil of 0.8173%, at the time of 5 hours increased to 1.6555% at 6 hours increased to 2.2842%, on a 7-hour increase to 3.6673%, and at the time of 8 hours increases be 4.1283%. on perbandigan ratio 1:17 obtained the largest essential oil yield results in time 8 hours with the results yield as much as 4.1283%, resulting in condition it can be known that by the ratio of 1:17 with a time of distillation for 8 hours will be retrieved maximum essential oil yield and is relatively good point conditions on the process of distilling essential oils to tobacco. On the ratio of tobacco and water 1:19 at the time of 4 hours, obtained yield essential oil of 0.1886%, at the time of 5 hours increased to 0.2724% at 6 hours increased to 0.3563%, on a 7-hour increase to 0.4400 percent, and at the time of 8 hours increases be 0.5029%. On the condition of ratio of saturation levels occurred in the 1:19 process of transporting essential oil molecules when the distilling process is underway just as the ratio 1:13 allegedly decrease yield essential oil tobacco occurs, due to the greater number of water at distillation process then the amount of alcohol and acid are also getting bigger and hydrolysis process will take place to further stages. This resulted in the yield of oil produced will be reduced (Effendi, 2014).

In the journal written by Podlejski & Olejniczac in 1983 cited by puspita in 2011 the method of distillation (Distillation) can separate the essential oil from the leaves of tobacco up to 0.13%, but on the results of our research results that yield retrieved from 25 data, 24 of which shows the results of more than 0.13%. This is because the water in the event of cohobation although it has been dijenuhi by the salts

NaCl and can increase the boiling point of water based on the nature of the koligatif solution, however, allegedly due to the nature of the insoluble between essential oil with salt solutions it This affects the vapor pressure of a mixture of two components that is not mutually soluble. The operating pressure in the event of cohobation is atmospheric (1 atm), because there are two components that is not mutually soluble lead each component has a tekanan pure steam can affect the temperature in the process of cohobation. In a State of pure as water temperature requires 100°C to achieve a pressure of 1 atmosphere, however due to the insoluble components between solutions of salts with phenol which is a component of the essential oil, causing a steam pressure to the mixture faster by 1 the atmosphere before it reaches the boiling point so that the mixture is already boiling. It is in accordance with the laws of physical chemistry of steam pressure mixture that is not mutually soluble. Because the boiling point to less than 100°C then the cohobation operating temperature has been reached before the mixture is already simmering in advance, so that the distillate which accommodated a mixture between essential oil with salt solutions.

From the data obtained in the ratio of the smallest tobacco yield and the water 1:13 with a time of 4 hours, i.e. of 0.0967 (% b/b). the small the yield is affected by the events of hydrodiffusion which takes to water molecules penetrate the cell wall portion of tobacco leaves that contain essential oils that are synthesized on the network and the inside of the vessels of the resin. Essential oil of tobacco was the result of secondary metabolism of plant activities of tobacco caused due to a chemical reaction of water with chemical compounds (Ketaren, 1987). On the conditions of relative point both for distillate essential oils of tobacco is 6-7, so that at the time of 4 hours including early phase into where the essential oil is starting to get carried away by the water molecules that evaporate. Molecules of essential oils such as terpene is a compound that is shaped like a molecular colloid, terpene molecules carrying water mechanism begins with the process of hydrodiffusion where the water

enters through the cell wall has been broken due to the influence of operating temperature distillation to reach 100°C. After water vapor molecules diffuse in the cells of tobacco, leaves that are terpene molecules such as colloidal molecular surface stuck to water vapor, so water vapor in distillation process is as agents of the carrier or transport for the components of the essential oil.

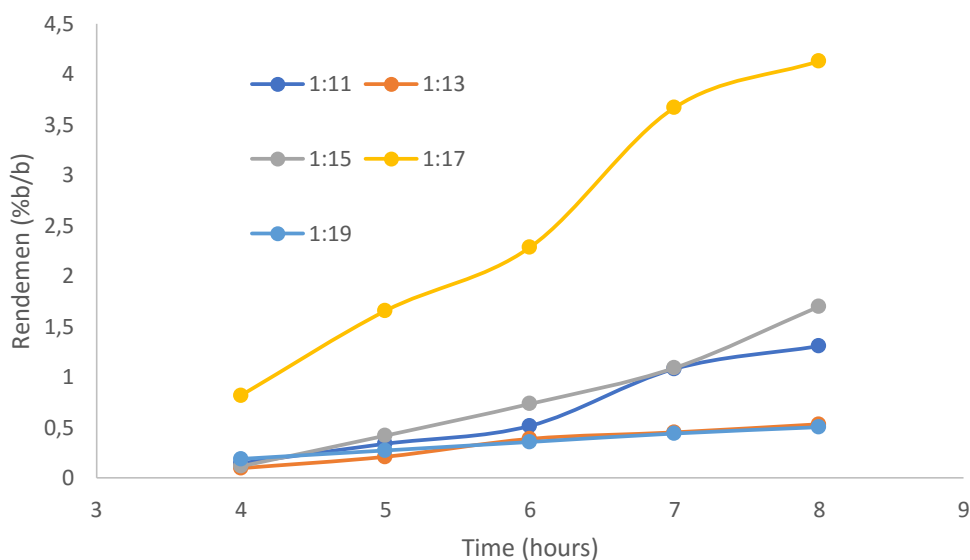


Figure 6. The relationship between yield and water distillation process

On a 4 hour time variables shows the values of the volatile tend to its increase is not too significant, indicated by the graph of the increased yield every time always increases gradually, where for every average yield ratio which acquired for 0.2726%. On the variables time of 5 hours of shows a fluctuating value tends to be nearly a not too significant, indicated by the graph of the increased yield ready time always increases gradually, where for every average yield ratio which acquired for 0.579%. On the variables time of 6 hours of shows a fluctuating value tends to be nearly a not too significant, indicated by the graph of the increased yield ready time always increases gradually, where for every average yield ratio which acquired for 0.8553%. On the variables of time 7 hours shows a fluctuating value tends to be nearly a not too significant, indicated by the graph of the increased yield every time always

increases gradually, where for every average yield ratio which acquired for 1.3457%. On the variables time of 8 hours the fluctuating value of the shows tend to be nearly a not too significant, indicated by the graph of the increased yield every time always increases gradually, where for every average yield ratio which acquired for 1.6333%.

Based on the graph, it can be noted that on the operating conditions of distillation with a ratio of 1:17 with a time of 8 hours is the best conditions that result in an increase in the average number of the most essential oil yield maximum. However it is possible on conditions of time above 8 hours would decline because of the longer distillation solvent with materials opportunity to get in touch, so that substances that terekstrak will also increase until the solution becomes saturated and extract power decreased so that, the addition of time will not give real concentrations increased (Effendi, 2014).

IV.3 GC-MS Analysis of Results

Based on the test results against the results of the best yield of essential oil of tobacco with a 1:17 ratio (w/w) with a time of 8 minutes, obtained the spectral components with the highest peak is nicotine with percent normalization (based on the area 100% of the largest). This influenced the results against other summits that shows the results of the less dominant when compared to nicotine. Nicotine is emerging as the most dominant in the components of the essential oil, occur because is affected by several factors. The first factor that can be caused by the selection of the method of distillation, essential oil is basically essential oil distillation method of selection is determined by the type of materials used. Tobacco leaves are used as an ingredient for distillation has a structure which is divided into layers of the epidermis and tissues mesofil or network supporter. In the network of the epidermis is divided into into two parts namely adaxial (upper epidermis tissue) and abaxial (epidermal tissues below), on the network there is no space between cells, but the cells of the epidermis cells there was among the guards who formed stomata (where the

exchange of water and air). The network under the epidermis is called the mesophyll network, where the network is divided into two parts, namely a network of palisade tissue cavities or sponge. Palisade tissue is the most tissue containing chloroplasts, so that this chain reaction of photosynthesis is ongoing. Sponge tissue forming acute vessels and between cells.

Essential oil and nicotine is located inside the vacuole in the plant cell, the essential oil is stored as a result of secondary metabolism. On the outside of the vacuole is coated by a membrane called the tonoplast that is spring permeable (Aryulina, et al, 2007). The mechanism of transport of essential oils on water distillation begins with rupture (Lysis) of the cell wall due to materials contacted with boiling water. Water will do the process of diffusion and osmosis against components of essential oils through the tonoplast membrane since water acts as a solvent was cast as the high concentration with liquids. The essential oil component located in the membrane of the tonoplast plays the role of liquids lower concentrations due to the emergence of a difference between the solvent concentration gradient with the components of the essential oil, so passive transport processes occurring is diffusion and osmosis. On the diffusion of water into the membrane to remove the existing oil components in the membrane, osmosis and acted to bring molecules from the inside of the membrane to reach the surface of the material. The components of the essential oil, insoluble to water, will evaporate because of the heat generated by the boiling water, and taken with the molecules of water vapor as a carrier agent to accelerate the speed of evaporation on the essential oil distillation process. It is then condensate to form liquid phase (Tutuarima, 2007), but nicotine that have properties that are more soluble in water will evaporate along with the water and condensate and mixed together with essential oil distillate. Additionally, on the process of distillation of water contact, materials that will directly lead to cavities between cells and other components will evaporate in addition to essential oils, so that the essential oil produced is not just pure essential oil but there is also other components evaporated,

especially components that dissolves in water. In addition, water distillation process will also be shipped with distillate water temperatures resulting reaches 100⁰C. This is because the high temperature distillation of a vibrating water molecules are larger so that the kinetic energy between molecules will rise and speed up the process of distillation yielding that much, but the result still contains enough many water (Regina,2015). It is actually very avoidable because water can cause hydrolysis and cause rancid smell.

Another influential factor is the process of early treatment of the material, where the material used is the dried tobacco leaves from the process after picking will be out of contact with sunlight. It can also affect the results of the yield obtained. (GC-MS Analysis Results can be seen in Appendix).

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

V.1 Conclusion

Based on the results of our research titled "production of essential oil of tobacco with a water Distillation Method" it can be concluded that:

1. Essential oil is a compound that generated by secondary metabolites in tissues and vessels of the resin which can be isolated with a variety of methods including hydrodiffusion through the process of distillation of water.
2. The amount of yield in the essential oils isolated by water distillation methods were influenced by the ratio between the tobacco (materials) with water used as a medium as well as the length of time between water contact with tobacco in the process of distillation of the oil tobacco which is essential.
3. The abundance of water used strongly influenced the amount of yield obtained in the distillation process, water is the water serves as the carrier media components of essential oil, but the amount of water can cause a decline because of the amount of water used too much that will lower the efficiency of the distillation process and give little yield. The decline occurred as more number of water distillation process then the amount of alcohol and acid are also getting bigger and hydrolysis process will take place to further stages. This resulted in the yield of oil produced will be reduced, so that the research results obtained from the optimum condition for comparison the ratio between tobacco and water is 1:17 (gr/gr) with a volume of destilat as much as 19.7 ml.

4. Operating time used to process a distillation of essential oils of tobacco is very influential because the longer distillation solvent with materials opportunity to get in touch, the extracted substances will also increase until the solution becomes saturated and extract power is decreased. This way, the addition of time will not give real increased concentrations; so that the optimum time is obtained in the distillation of essential oils of tobacco is 8 hours with a volume of distillate as much as 19.7 ml.

V.2 Advice

In the process of refining, it is recommended that when mixing the ingredients with water, the water should be ensured, because of all the submerged specific characteristics of distillation of water is to contact ingredients with boiling water. Water distillation process will happen in the events of hydrodiffusion where water diffuses through the membrane material to bring components of the essential oil.

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ATTACHMENT


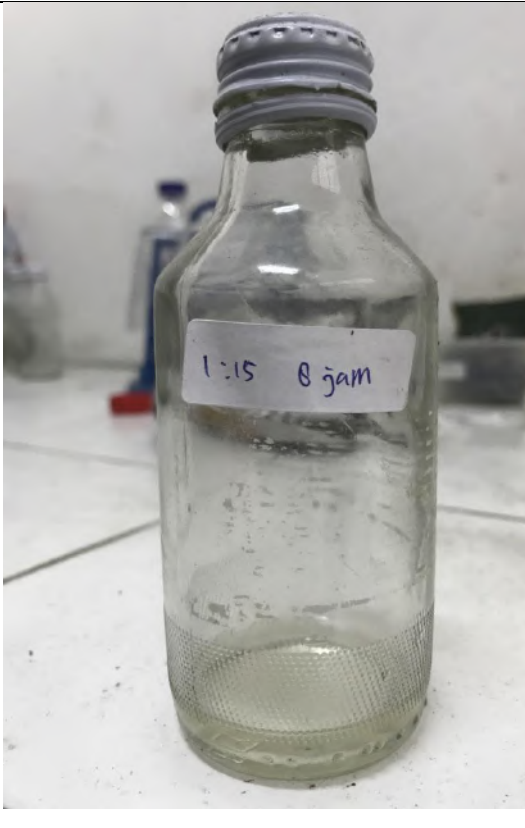
No .	Pictures	Description
1.		<p>The preparation of a series of tools and the addition of water distillation water in the distillation kettle. The addition of water in accordance with a predetermined ratio.</p>
2.		<p>The addition of dried tobacco in accordance with the ratio of the weight of tobacco to be used, the temperature and the pressure must be maintained in the process of distilling essential oils.</p>

3.		<p>Tobacco became the basic ingredient in the production of essential oil which has been previously dried anginkan to reduce the levels of water, so water distillation process is expected to contain only ingredients essential oils only.</p>
4.		<p>Distilled water is atmospheric pressure conditions take place, and the temperature is 1000C. water distillation processes have characterized the special ingredients (Tobacco) dikontakkan directly with boiling water. Principal events that occurred at a water distillation process include:</p> <ol style="list-style-type: none"> 1. diffuse essential oils and hot water through a membrane plant. 2. Hidrolisa against some components of the essential oil. 3. The decomposition of some of the components of essential oils because the temperature is hot. <p>(Guenther, 1947).</p>

5.



Cohobation process is a process of distillation back distillate obtained from the distillation of water. On the process of cohobation is done the saturation with salt NaCl which is aimed at reducing the solubility of some components of the essential oil to water soluble such as phenols. Solubility of phenol in water is 8.3 grams/100 grams, whereas the solubility of NaCl in water is 35.9 grams/100 grams, so cohobation process can take place efficiently with salt NaCl as an agent that acts against a reduction in solubility of the components of essential oils against the water.

6.		<p>On the process of refining the water retrieved distillate liquids dilute colored nodes, with the typical aroma of tobacco that characterize the essential oil of tobacco. To separate the essential oil of tobacco with water carried out a process of cohobation.</p>
7.		<p>On the process of cohobation by the amount of distillate obtained fewer, it participated and influenced by the addition of NaCl which acts as an agent that reduces the solubility of the components of essential oil with water.</p>



REPUBLIK INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

SURAT PENCATATAN CIPTAAN

Dalam rangka perlindungan ciptaan di bidang ilmu pengetahuan, seni dan sastra berdasarkan Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta, dengan ini menerangkan:

Nomor dan tanggal permohonan : EC00202006697, 17 Februari 2020

Pencipta

Nama : **Ni Ketut Sari, Ir, MT, Dr., Intan Yuniar Purbasari, S.Kom., , dkk**
Alamat : Wisma Medokan WMJ/6, RT/RW 008/008, Kel/Desa Medokan Ayu,
Kec. Rungkut, Surabaya, Jawa Timur, 60295
Kewarganegaraan : Indonesia

Pemegang Hak Cipta

Nama : **LPPM UPN Veteran Jawa Timur**
Alamat : Jl. Raya Rungkut Madya, Gunung Anyar, Surabaya, Jawa Timur,
60294
Kewarganegaraan : Indonesia
Jenis Ciptaan : **Buku**
Judul Ciptaan : **Production Of Tobacco Essential Oil**
Tanggal dan tempat diumumkan untuk pertama kali di wilayah Indonesia atau di luar wilayah Indonesia : 8 Mei 2018, di Surabaya
Jangka waktu perlindungan : Berlaku selama 50 (lima puluh) tahun sejak Ciptaan tersebut pertama kali dilakukan Pengumuman.
Nomor pencatatan : 000179746

adalah benar berdasarkan keterangan yang diberikan oleh Pemohon.
Surat Pencatatan Hak Cipta atau produk Hak terkait ini sesuai dengan Pasal 72 Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta.



a.n. MENTERI HUKUM DAN HAK ASASI MANUSIA
DIREKTUR JENDERAL KEKAYAAN INTELEKTUAL

Dr. Freddy Harris, S.H., LL.M., ACCS.
NIP. 196611181994031001

LAMPIRAN PENCIPTA

No	Nama	Alamat
1	Ni Ketut Sari, Ir, MT, Dr.	Wisma Medokan WMJ/6, RT/RW 008/008, Kel/Desa Medokan Ayu, Kec. Rungkut
2	Intan Yuniar Purbasari, S.Kom.	Mojoklanggru Wetan 2/16, RT/RW 009/005, Kel/Desa Mojo, Kec. Gubeng
3	Edith Bertha Ellen Angelique M.	Bratang Satu 1-D/6, RT/RW 003/006, Kel/Desa Ngagelrejo, Kec. Wonokromo

