

MANUFACTURING OF THINGS AND CHARACTERISTICS OF CHILLI, ORANGE SKIN, AND CINNAMON EXTRACT USING MACERATION METHOD

Yustika Yusuf¹⁾, Dwi Mulyana Salsabila Baladraf²⁾, Agusrianto Yusuf³⁾

^{1,2,3)} University of Bina Mandiri Gorontalo

Email: dwimulyana08@gmail.com

ABSTRACT

This study aims to identify the chemical compounds in the extracts of cinnamon, orange and chili by maceration method.

The maceration method is a method of extracting the juice from simplicia by immersing the simplicia in a liquid extract at a temperature usually 15-25°C. Maceration is also a preliminary process for percolation manufacturing. The method used is the experimental method.

The results showed that in the making of the tincture in this study, including the original tincture, Original Tincture is a tincture made by maceration or percolation. Example: Macerated tincture; Opii Tinctura, Valerianae Tinctura, Capsici Tinctura, Myrrhae Tinctura, Opii Aromatica Tinctura, Polygalae Tinctura. Tinctures made by percolation, for example: Belladonae Tinctura, Cinnamomi Tinctura, Digitalis Tinctura, Lobeliae Tinctura, Strychnini Tinctura, Ipecacuanhae Tinctura, because based on the method of manufacture, namely by maceration.

Keywords: chemical compounds, cinnamon, orange peel, chili, maceration

INTRODUCTION

Indonesia is one of the countries in the world whose land surface is rich in biological natural resources (animals and plants). Natural resources are everything provided by nature that can be used by humans to meet their needs, so that the previous people have used plant natural resources as medicinal ingredients to cure a disease. With the development of the times and technology, science education is trying to develop technology in the pharmaceutical field. Where the development of pharmaceutical industry technology plays an active role in improving the quality of drug production. Pharmacy is a science that studies how to mix drugs, mix formulas, identify, combine and analyze drugs and treatments. As pharmacists, we are required to be able to make good pharmaceutical preparations in a broad

sense. That is, all aspects must be considered for patient safety. In pharmacy, also taught about the science of Pharmacognosy.

Pharmacognosy is the science of medicinal ingredients, especially those originating from nature, namely vegetables, animals, and minerals. One of the medicinal ingredients that come from nature is simplicia. This simplicia will be processed in various ways and methods to produce new drugs that can be used as treatment. One of them is tincture.

Tincture is a liquid preparation made by maceration or percolation of vegetable or animal simplicia or by dissolving chemical compounds in the solvents listed in each monograph, unless otherwise stated, made using 20% active substances and 10% for strong substances. In this study, in order to know the various tinctures and how to make them.

Tincture is a liquid preparation made by maceration or percolation of vegetable or animal simplicia or by dissolving chemical compounds in the solvents listed in each monograph. Unless otherwise stated, tinctures are made using 20% of the active substance and 10% for the strong substance [4].

Tincture is a solution containing ethanol or hydroalcohol made from plant materials or chemical compounds. The amount of the drug in different tinctures is not always uniform, but varies according to each established standard. Traditionally, tinctures from medicinal plants have shown activity of 10 g of drug in every 100 mL of tincture. The potency is determined after the determination of the level. Most other plant tinctures contain 20 g of plant material in every 100 mL of tincture [4].

Traditionally, tinctures from medicinal plants show the activity of 10 grams of drug in every 100 ml of tincture. The potency is determined after the determination of the level. Some other plant tinctures contain 20 grams of plant material in every 100 ml of tincture [5].

The method of making tincture is divided into 2, namely:

1. How to Percolate, Percolation is a method of drawing using a device called a percolator, which is simply immersed in a liquid filter where the substances are dissolved and the solution will drip regularly out of compliance with the requirements in the Pharmacopoeia. Carefully mix the powdered drug substance or mixture of medicinal ingredients with sufficient solvent or mixture of solvents until smooth and wet enough, leave for 15 minutes. Transfer to a suitable percolator and compress. Pour enough solvent or a certain solvent mixture to completely submerge, cover the top of the percolator and if the liquid is

almost dripping from the percolator, close the bottom hole. Percolation was carried out for 24 hours or according to the time stated in the monograph. If the grading is not stated otherwise, percolate slowly or at a predetermined rate, and gradually add sufficient solvent or solvent mixture to obtain 1000 mL of the tincture. The working principle of percolation is that the simplicia powder is placed in a cylindrical vessel, the bottom of which is given a porous bulkhead. The liquid filter is flowed from top to bottom through the powder. The liquid filter will dissolve the active substance of the cells that are passed until it reaches a saturated state [10].

Percolation, unless otherwise stated as follows:

- a. Wet 10 parts of simplicia or a mixture of simplicia with a suitable degree of smoothness using 2.5-5 parts of the liquid, put it in a closed vessel for at least 3 hours, transfer the mass little by little in the percolator while each time being pressed carefully, pour it with the filter liquid. sufficiently until the liquid begins to drip, and above the simplicia there is still a layer of filter fluid, close the percolator, leave for 24 hours,
 - b. Allow the liquid to drip at a rate of 1 mL per minute, adding enough filter fluid repeatedly so that there is always a layer of filter fluid on top of the simplicia so that 80 parts of percolate are obtained,
 - c. Squeeze the mass, mix the juice into the percolate, add enough liquid to make 100 parts. Transfer to a vessel, cover, leave for 2 days in a cool place protected from light [12].
2. Maceration Method, Maceration is a method of extracting the juice from simplicia by immersing the simplicia in

Extract Using Maceration Method

a liquid at a temperature of 15-25°C. Maceration is also a preliminary process for percolation manufacturing [1].

The working principle of maceration is the washing of the active substance which is carried out by immersing the simplicia powder in a suitable solvent at room temperature, protected from light. The filter fluid will enter the cell through the cell wall. The contents of the cell will dissolve because of the difference in concentration between the solution inside the cell and outside the cell. A solution with a high concentration will be pushed out and replaced by a filter fluid with a low concentration (diffusion process). This event is repeated until there is a concentration balance between the solution outside the cell and inside cell.

Maceration of the drug substance with 750 mL of solvent or a mixture of certain solvents in a container that can be closed, put in a warm place. Let stand for 3 days, shaking occasionally or until dissolved. Transfer the mixture to a filter, and when most of the liquid has drained out, wash the residue on the filter with a sufficient amount of solvent or solvent mixture to obtain 1000 mL of the tincture. Tincture should be stored in a tightly closed container, impermeable to light, away from direct sunlight and excessive heat. According to other literature, tincture is a liquid preparation made by percolation or maceration of vegetable or animal simplicia, or by dissolving chemical compounds in the solvents listed in each monograph. Unless otherwise stated,

Maceration, unless otherwise stated, is carried out as follows:

a. Put 20 parts of simplicia with a suitable degree of fineness into a vessel, pour it with 75 parts of the

liquid, cover, leave for 5 days protected from light while stirring, then squeeze. Wash the dregs with enough liquid to get 100 parts.

b. Transfer to a closed vessel, leave in a cool place protected from light for 2 days. Pour and strain [10].

The advantages and disadvantages of the maceration method:

a. Advantages of the maceration method:

- 1) The equipment used is very simple;
- 2) The working technique is relatively simple and easy to do;
- 3) Relatively low operating costs;
- 4) Can be used to extract thermolabile compounds because maceration is carried out without heating;
- 5) The extraction process is more efficient on the filter

b. Disadvantages of Maceration Method:

- 1) The main disadvantage of this maceration method is that it takes a lot of time,
- 2) The filtering process is not perfect, because the active substance is only able to be extracted by 50%,
- 3) The solvent used is quite a lot,
- 4) Most likely there are some chemical compounds lost during extraction,
- 5) Some compounds are difficult to extract at room temperature,
- 6) The use of water solvents will require additional ingredients such as preservatives which are given at the beginning of the extraction. The addition of preservatives is intended to prevent the growth of bacteria and molds [7].

Kinds of Tinctures

Tincture can be divided into several types, namely as follows:

1. Original Tincture is a tincture made by maceration or percolation. Example: Macerated tincture; Opii Tinctura, Valerianae Tinctura, Capsici Tinctura, Myrrhae Tinctura, Opii Aromatica Tinctura, Polygalae Tinctura. Tinctures made by percolation, for example: Belladonae Tinctura, Cinnamomi Tinctura, Digitalis Tinctura, Lobeliae Tinctura, Strychnini Tinctura, Ipecacuanhae Tinctura.
2. Non-Genuine (Fake) Tincture is a tincture made by dissolving basic ingredients or chemicals in certain solvents. Examples: Iodii Tinctura, Secalis Cornuti Tinctura.
3. Hard Tincture is a tincture made using 10% simplicia which has strong properties. Examples: Belladonae Tinctura, Digitalis Tinctura, Opii Tinctura, Lobeliae Tinctura, Stramonii Tinctura, Strychnin Tinctura, Ipecacuanhae Tinctura.
4. Weak Tincture is a tincture made using 20% simplicia which is not potent. Examples: Cinnamomi Tinctura, Valerianae Tinctura, Polygalae Tinctura, Myrrhae Tinctura.
5. Other Tinctures Based On the Attractive Liquid:
 - a. Tincture aetherea, if the withdrawing fluid is ether or a mixture of ether with ethanol. Example: Tincture Valerianae Aetherea.
 - b. Tincture Vinosa, if the liquid used is a mixture of wine with ethanol. Example: Tincture Rhei Vinosa (Vinum Rhei)
 - c. Tincture Acida, if the ethanol used as an attractant is added a sulfuric acid. Example: Tincture Acida Aromatica

- d. Tincture Aquosa, if the withdrawal fluid used is water. Example: Rhei Aquosa Tinctures.
- e. Tincture Composita, is a tincture that is obtained when the withdrawal is carried out with a solvent other than ethanol. This should be stated in the name of the tincture, for example a mixture of simplicia. Example: Tincture Chinae Composite [11].

Plant Classification and Morphology

1. Red Chili (*Capsicum annuum*)
 - a. Classification [2].

Regnum : *Plantae*
Division : *Magnoliophyta*
Class : *Magnoliopsida*
Order : *Solanaless*
Family : *Solanaceae*
Genus: *Capsicum*
Species : *Capsicum annum*
 - b. Morphology, Chili comes from tropical America, spread from Mexico to the northern part of South America. In Indonesia, chili is generally cultivated in coastal areas to the mountains, only occasionally being wild [2].

Upright shrub, 1-2.5 m tall, per year or perennial. Stem woody, knuckle, wide branching, cross section faceted, young stems with fine green hair. Single leaf, stemmed (0.5 to 2.5 cm long), scattered. The leaf blade is oval to elliptical in shape, pointed tip, tapered base, flat edge, pinnate bone, 1.5-12 cm long, 1-5 cm wide, green. Single flower, star-shaped, white, out of the leaf axils. The fruit is a buni fruit, elongated cone-shaped, straight or bent, tapered at the end, hanging, glossy smooth surface, 1-2 cm in diameter, 4-17 cm long, short-stemmed, spicy taste. The young fruit is dark green, after ripening it becomes bright red. The young seeds are yellow

Manufacturing of Things and Characteristics of Chilli, Orange Skin, and Cinnamon Extract Using Maceration Method

after they are oldbrown, flattened, about 4 mm in diameter [2].

2. Sweet Orange (*Citrus aurantium* subspecies *sinensis*)

a. Classification [9].

Regnum : *Plantae*
Division : *Magnoliophyta*
Class : *Magnoliopsida*
Order : *Rutales*
Family : *Rutaceae*
Genus : *Citrus*
Species : *Citrus aurantium* subspecies *sinensis*

b. Morphology, the large citrus plant is a perennial (Perennial) plant with a characteristic tree height of 5-15 m. plant stems are strong, slightly bent, 10-30 cm in diameter, and slightly thick-skinned. The outer skin is yellowish brown, while the inside is yellow. Large citrus trees have many branches that are located far from each other and bend at the ends. The young branches are angular and green, but over time they turn round and dark green. The tree canopy is rather low and irregular [9].

The leaves of the plant are oval and large in size, with a blunt apex or tip and an almost flat edge, with a slightly wavy edge near the tip. The leaves are scattered with broad-winged petioles, yellowish green in color, and slightly gloomy hairy [9].

Plant flowers are compound flowers that are arranged singly or in bunches. Flowers are large, shaped like a bell or cup, and smell good. Each flower has 25-35 stamens of unequal length [9].

The characteristic of large oranges is their large fruit and thick skin, so they can be stored or transported over long distances for a long time. The fruit is spherical or pressed like a ball and has a slightly

thick to thick skin, containing 11-16 segments. Flesh color varies: pink, white, light green or yellowish. The flesh of the fruit is hard to soft textured, sweet to slightly sour and has few seeds [9].

3. Cinnamon (*Cinnamomum burmannii*)

a. Classification [2].

Regnum : *Plantae*
Division : *Tracheophyta*
Class : *Magnoliopsida*
Order : *Laurales*
Family : *Lauraceae*
Genus : *Cinnamomum*
Species : *Cinnamomum burmannii*

b. Morphology, Cinnamon plant has a single leaf that has a rigid nature like the bark, located alternately with a stalk length of about 0.5–1.5 cm and has 3 leaves that grow curved. Cinnamon leaves are elongated ellipses that are about 4-4 cm and a width of about 1.5–6 cm. The tip of the leaf is pointed with a flat leaf edge, the upper leaf surface is smooth green, while the underside is grayish in color. The color of young leaves is pale red [2].

The flowers of the small cinnamon plant have a yellow color that grows on the panicles. This flower has two sexes which are commonly called perfect flowers. The flower petals on the cinnamon plant are 6 strands which are in two series. The flowers that are owned are not titled flowers. They have 12 stamens that have been arranged in four groups and have a space of four stamens. The extraction process on cinnamon plants uses the help of a third party, insects [2].

The fruit of the cinnamon plant has one seed and has flesh. The fruit is round and elongated and dark green in color for young fruit, while

for old fruit it will be dark purple. The length of the fruit is about 1.3 - 1.6 cm with a diameter of about 0.35 - 0.75 cm. The seeds of the cinnamon fruit are about 0.84 - 1.32 cm long and about 0.59 - 0.68 cm in diameter [2].

Cinnamon plants grow up to a fairly high height of about 5-15 meters whose bark is dark gray with a distinctive odor, while Ana's wood is light brown red. The branches and twigs of the cinnamon plant contain essential oils which are an export commodity [2].

RESEARCH METHODS

Experimental research is a systematic research method that seeks to find the effect of a certain treatment given on variables to other variables without being given treatment with controlled conditions. Experimental research is one type of quantitative research that is very strong in measuring causal relationships. Experimental research is intended to prove a hypothesis. the experimental method is a systematic and planned experiment to prove the truth of a theory [6].

The experimental method is an activity for teachers or students to conduct an experiment and then observe the process and results of the experiment [8]. Meanwhile, according to Sugiyono, experimental research can be interpreted as a research method used to find the effect of certain treatments on others under controlled conditions.

Tools and materials

The tools used in this study, namely aluminum foil, stirring rod, beaker, sprite bottle and filter paper.

The materials we use in this study, namely aquades, 95% alcohol, chili fruit (*Capsicum annum*), sweet orange peel

(*Citrus aurantium* subspecies *sinensis*) and cinnamon (*Cinnamomum burmannii*).

RESEARCH RESULT

This research has been carried out at the Laboratory of the University of Bina Mandiri Gorontalo with the following research procedures:

1. Initial step:
 - a. Prepare tools and materials;
 - b. Sprite bottle calibration 200 ml;
 - c. Dry the sample and make it into a very coarse powder;
 - d. For the orange peel sample, let it remain wet or not dry, then chop it into small pieces:
2. Processing of each sample:
 - a. Sweet Orange Tincture (*Aurantii Tinctura*),
 - 1) Take 150 ml of 95% alcohol;
 - 2) Perform a 95% alcohol dilution to alcohol with a concentration of 30%;
 - 3) Maceration of 100 grams of orange peel that has been chopped into small pieces with 150 ml of diluted alcohol;
 - 4) Stir the maserat using a stirring rod for 1-2 hours;
 - 5) Filter maserat 3X filtering;
 - 6) Put it in a calibrated sprite bottle;
 - 7) Add 200 ml of distilled water;
 - 8) Label and store in a closed, dry and protected from light.
 - b. Chilli Tincture (*Capsici Tinctura*)
 - 1) Take 150 ml of 95% alcohol;
 - 2) Perform a 95% alcohol dilution to alcohol with a concentration of 93%;
 - 3) Maceration of 100 grams of powdered chili with 150 ml of diluted alcohol;
 - 4) Add honey and palm sugar that has been crushed;
 - 5) Stir the maserat using a stirring rod for 1-2 hours;
 - 6) Filter maserat 3X filtering;

Manufacturing of Things and Characteristics of Chilli, Orange Skin, and Cinnamon Extract Using Mac

- 7) Put it in a calibrated sprite bottle;
- 8) Add 200 ml of distilled water;
- 9) Label and store in a closed, dry and protected from light.

c. Sweet Orange Tincture (Aurantii Tinctura)

- 1) Take 150 ml of 95% alcohol;
- 2) Perform a 95% alcohol dilution to 70% alcohol;
- 3) Maceration of 100 grams of crushed cinnamon with 150 ml of diluted alcohol;
- 4) Stir the maserat using a stirring rod for 1-2 hours;
- 5) Filter maserat 3X filtering;
- 6) Put it in a calibrated sprite bottle;
- 7) Add 200 ml of distilled water;
- 8) Label and store in a closed, dry and protected from light.



Figure 4. Cinnamon is put in a container and covered with aluminum foil



Figure 5. Cinnamon in a closed container



Figure 1. Cinnamon as a sample,



Figure 6. Turmeric is weighed by the weight of the material to be used as a sample



Figure 2. Cinnamon weighed



Figure 7. Turmeric is put in a closed container



Figure 3. Cinnamon pieces

Table 1. Observation Results

No	Tincture Sample	Solution Volume	Organoleptic Observation
1	Chilli Fruit Tincture	154 ml	Color : Red Smell : Typical Form : Liquid

Extract Using Maceration Method

			Taste : Spicy
			Color : tanned
2	Cinnamon Tincture	136 ml	Smell : Typical
			Form : Liquid
			Taste : Sweet
			Color : Yellow
3	Orange Peel Tincture	475 ml	Smell : Typical
			Form : Liquid
			Taste : Sweet

Source: Data processed (2019)

because molds and germs are difficult to grow in 20% and above, non-toxic, neutral, good absorption, and ethanol can mix with water [10].

In this study, we took three samples, namely: chili (*Capsicum annum*), sweet orange peel (*Citrus aurantium subspecies sinensis*) and cinnamon (*Cinnamomum burmannii*).

The calculation results

1. Chilli Fruit Tincture

$$V_1 M_1 = V_2 M_2$$

$$V_1 93\% = 150 \text{ ml } 95\%$$

$$V_1 = \frac{142.5 \text{ ml } \%}{93\%}$$

$$V_1 = 154 \text{ ml}$$

2. Cinnamon Tincture

$$V_1 M_1 = V_2 M_2$$

$$V_1 70\% = 100 \text{ ml } 95\%$$

$$V_1 = \frac{95 \text{ ml } \%}{70\%}$$

$$V_1 = 136 \text{ ml}$$

3. Orange Peel Tincture

$$V_1 M_1 = V_2 M_2$$

$$V_1 30\% = 150 \text{ ml } 95\%$$

$$V_1 = \frac{142.5 \text{ ml } \%}{30\%}$$

$$V_1 = 475 \text{ ml}$$

DISCUSSION OF RESEARCH RESULTS

In this research, what is done is making tincture. Tincture is a liquid preparation made by maceration or percolation by dissolving chemical compounds in the solvent listed in each monograph. Unless otherwise stated, the tincture is made up of 20% active substances and 10% for strong substances [3].

In this study, we will make a tincture of chili fruit, sweet orange peel and chili powder using the maceration method. Where the solvent used is alcohol because the ethanol filter solution is more effective

a. Chili (*Capsicum annum*), the first step is washing the chilies using water and then separating them from the stalks. Then weighed 89 grams of chili and then blended until smooth. Then diluted 95% alcohol to alcohol with a concentration of 93% with the dilution formula to produce 154 ml. After that, the alcohol that has been diluted into alcohol with a concentration of 93% is put into a jar that has been coated on the outside with aluminum foil so as not to be penetrated by light, as much as 150 ml then the crushed chili was added to a jar that already contains alcohol for maceration, after that The macerate was stirred using a stirring rod. Then allowed to stand for 1 X 24 hours and then filtered three times using filter paper and then put into a sprite bottle that has been calibrated 200 mL using aquadesh. Furthermore, organoleptic observations were carried out, namely having a distinctive chili odor, the color of the chili tincture is red, in liquid form and has a spicy taste. Furthermore, when finished, label and store in a closed, dry and protected from light.

b. Sweet orange peel (*Citrus aurantium subspecies sinensis*), the first step is to wash the sweet orange using water and then separate it from the fruit. Furthermore, 150 grams of sweet orange peel was weighed and then the chopping process was carried out. Then diluted 95% alcohol to alcohol with a concentration of 30% with the dilution

Manufacturing of Things and Characteristics of Chilli, Orange Skin, and Cinnamon Extract Using Maceration Method

formula to produce 475 ml. After that, the alcohol that has been diluted into alcohol with a concentration of 30% is put into a jar that has been coated on the outside with aluminum foil so as not to be penetrated by light, 150 ml then the chopped sweet orange peel is added to the jar that already contains alcohol for maceration. After that, the macerate was stirred using a stirring rod. Then allowed to stand for 1 X 24 hours and then filtered three times using filter paper and then put into a sprite bottle that has been calibrated 200 mL using aquadesh. Furthermore, organileptic observations were carried out which had a distinctive sweet orange odor, the color of the sweet orange peel tingtum was yellow, in liquid form and had a sweet taste. Furthermore, when finished, label and store in a closed place.

- c. Cinnamon (*Cinnamomum burmannii*), the first step is to wash the cinnamon using water and then do the chopping process. Then weighed 100 grams of cinnamon. Then diluted 95% alcohol to alcohol with a concentration of 70% with the dilution formula to produce 136 ml. After that, the alcohol that has been diluted into alcohol with a concentration of 70% is put into a jar that has been coated on the outside with aluminum foil so as not to be penetrated by light, as much as 150 ml then the chopped cinnamon is added to the jar that already contains alcohol for maceration. The maserate was stirred using a stirring rod. Then allowed to stand for 1 X 24 hours and then filtered three times using filter paper and then put into a sprite bottle that has been calibrated 200 mL using aquadesh. Furthermore, organileptic observations were carried out which had a characteristic cinnamon odor, the color of the cinnamon tingtum was brown,

liquid in shape and had a sweet taste. Furthermore, when finished, label and store in a closed place. As in the research that has been done by (Anastasia, et al) on the manufacture of The results showed that bandotan leaf extract tincture preparations with concentrations of 5%, 15%, and 45% had effectiveness on wound healing in white rats with perfect wound closure compared to the administration of povidone iodine. The conclusion of this study was that bandotan leaf extract tincture preparations with varying concentrations of 5%, 15%, and 45% had effectiveness on wound healing in white rats and there was a significant difference in wound healing in white rats.

CONCLUSION

After conducting this research, it can be concluded that the tincture is a liquid preparation that can be made by maceration, namely soaking chili simplicia, cinnamon and orange peel in ethanol solvent, where the tincture in this study can be classified in the original tincture group based on the method of manufacture, namely by maceration.

Future research should be more careful in conducting experiments and be careful in using equipment so that accidents do not occur in the experiment and do not make noise while conducting the experiment.

REFERENCES

- [1] Afifah, Riski. 2012. Maceration Method. Bandung: Alfabeta
- [2] Dalimartha, S. 2000. Atlas of Indonesian Medicinal Plants 2. Jakarta: Trubus Agriwidya
- [3] Director General of POM. 1979. Indonesian Pharmacopoeia IV edition. Jakarta: Ministry of Health of the Republic of Indonesia

- [4] Director General of POM. 1995, Indonesian Pharmacopoeia, third edition, Ministry of Health of the Republic of Indonesia, Jakarta
- [5] Hargono, D. et al, 1986, Galenik Preparations, Directorate General of Drug and Food Control (BPOM), Ministry of Health of the Republic of Indonesia, Jakarta
- [6] Hasan Alwi. et al. 2005. Big Indonesian Dictionary. Jakarta: Balai Pustaka.
- [7] Marjoni, R. (2016). Phytochemical Fundamentals, Trans Info Media, Jakarta.
- [8] Mudjiono, and Dimiyati. 1992. Teaching and Learning Strategy. Jakarta: Ministry of Education and Culture
- [9] Grace. 2005. Big Orange. Yogyakarta: Casino
- [10] Syamsuni. 2005. Basic pharmacy and pharmaceutical calculations. Jakarta: EGC
- [11] Syamsuni, H, A. (2006). Tincture Making. Medical Book Publisher. Jakarta: EGC
- [12] Sulaiman, Sepha Diadara. 2011. Maceration. Bandung: Rosdakarya Teenagers