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The Influence of Drying Temperature on Chemical Components of Herbal Tea Leaves (Spondias Dulcis, Soland)

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***Abstract*-Ambarella's leaves (Spondias Dulcis, Soland) is a plant that is rich in benefits. This study was conducted to determine the chemical components, the effect of drying temperature, antioxidant activity and toxicity of the leaves of Ambarella. This research has been carried out in the Laboratory of Agricultural Technology Andalas University Padang on December to February 2015. The study designed using Completely Randomized Design (CRD) with 5 treatments and 3 repetitions. Data were anlayzed statistically by using ANOVA and were continued with Duncan's New Multiple Range Test (DNMRT) at 5% significance levels. The treatments had done through a drying process at a temperature of 50^0C, 60^0C , 70^0C , 80^0C , and 90^0C. The chemical analysis which is observed such as of water content, ash content, and antioxidant activity carried out on the product. The best products is which observed such as tannin content, total polyphenols, antioxidant activity, triterpenoids compounds, flavonoids, and toxicity. Based on the analysis of raw materials Ambarella's leaves, was obtained by water content of 33.81%, ash content of 9.33%, and the antioxidant activity of 60.07%, while the qualitative test gave a positive result of the flavonoid. Leaf tea product is a leaf tea best ambarella with temperature 70^0C for 180 minutes. The product has a water content of 7.46%, ash content of 7,72%, 29,03% total polyphenols, antioxidant activity of 40.71%, 6,61% tanin contents and 1261,82 ppm LC_{50} value.**

Keywords : antioxidant, the chemical components, tea leaf ambarella

I. INTRODUCTION

Kedondong (Spondias dulcis, Soland), which in English is often called Ambarella, is a plant that comes from Southeast Asia, South Asia, and then spread to many tropical countries. Kedondong plant community is believed to have many benefits on the part of the fruit also leaves. Traditionally Kedondong leaf is very useful to cure dysentery and treat coughs. In public life, it usually leaves Kedondong used as vegetables. In addition, this stew is very helpful because many contain the active compound, one of them a high vitamin C as an antioxidant that can counteract free radicals in the body. Many plants that grow in the wild can be used as a medicinal plant. Encouragement society at this time to return to nature (back to nature) is very large because of treatment using synthetic chemical ingredients are quite expensive and have serious side effects. The advantage of the medicinal herb derived from plants, which makes it difficult and the cost is relatively cheap mixes. The expected side effects unlike chemical drugs considering the raw material is a natural material and one reason is the security of long-term use. For the use of traditional medicine (Ernst, 2000). Research on leaf Kedondong (Spondias dulcis, Soland) says there are three leaves Kedondong bioactive components, which are crucial to prevent blood clots. All three compounds are phenols, flavonoids and triterpenoids. Kedondong leaf can be processed by heating. Because the content of phenolic compounds found in the leaves Kedondong are more resistant to heat. Thus, treatment with high temperatures such as boiling does not reduce the activity of anti-aggregation. Phenol compounds inhibit prostaglandin, which is an activator of platelets (thrombocytes). The role of platelets or platelets as when a wound on the surface of the body, the blood will clot clogging

and heal wounds. Flavonoids acts to prevent platelet aggregation by inhibiting the activity of the enzyme cyclooxygenase. As a result, the synthesis of prostaglandin (platelet activator) is reduced [1]. Based on phytochemical test, [2] mentions that the antibacterial compounds contained in extracts of leaves Kedondong Bangkok are alkaloids, tannins and saponins. Alkaloids have many physiological activities that stand out, that are widely used in the medical field. Alkaloids in the fresh leaves is with a sense of bitterness on the tongue. Of the content contained in the leaves Kedondong and function of the active ingredient in the leaves Kedondong then leaves can be used as material for functional drinks. Functional beverages are the type of food or food product that has functional characteristics that play a role in the protection or prevention of disease, increased performance optimal body function, and slow the aging process [3]. As a material for health drinks, Kedondong leaves can be processed into herbal tea leaves Kedondong and stages of processing refer to the processing of tea leaves. Expected Kedondong leaf herbal tea can be developed as a natural based beverage that are beneficial to health. In principle the drying process in the factory is done with a dryer that uses hot steam. The drying temperature initially 95^{0}C100^{0}C then decreased gradually until 50-60^{0}C [4]. The purpose of drying is to stop the enzymatic oxidation process and to reduce the water content of up to 6% [5]. The drying temperature significantly affect the yield of dried leaf extract. The higher the drying temperature, the higher the yield of the extract. The higher the heat used in drying, the higher the breakdown of proteins, carbohydrates including cellulose fibers such as cell wall constituent found in tea leaves [6]. From the research [7] to conclude that the roselle leaves drying temperature at 50^{0}C to produce the best rosella tea leaves. [8] reported the results of his research on herbal teas from the bark of the aloe vera leaf meets the standard for drying at a temperature of 60^{0}C. According to [9] states that the drying temperature soursop leaf tea with the highest antioxidant activity produced at a temperature of 50^{0}C. While research [10] states leaf tea product is best dragon scales with a drying temperature of 70^{0}C. The purpose of this study was to 1). Knowing the effect of drying temperature on the chemical components of herbal tea from the leaves Kedondong and 2). 3. Know the highest antioxidant activity of tea leaves knowing toxicity Kedondong.

II. RESEARCH METHOD

A. Place and Time

This research was conducted at the Laboratory of Technology and Process Engineering, Chemistry Biochemistry Agricultural Products and Nutrition, Total Quality Control Faculty of Agricultural Technology Universitas Andalas in December up to February 2015.

B. Materials and Equipment

Raw materials used in this study is derived from the leaves Kedondong yard of a house in the village of Obsolete Market, Padang Pariaman regency. Chemicals used in this study is distilled water, filter paper, kaolin powder, solution indigokarmin, $KMnO_4$ 0,1 N, acid salt solution, gelatin solution, DPPH, Follin-Ciocalteu reagent (50%), methanol and $Na_2CO_3$7,5%. The tools used in this study is an analytical balance, a sieve 20 mesh, cup aluminum, saucer porcelain, electric furnace, tweezers, flask, funnel, test tubes, electric stove, erlenmeyer, oven, spectrophotometer, glass cup, measuring cups, burette, desiccator, pipette and aluminum foil.

C. Research Design

The design used in this study is completely randomized design (CRD) with 5 treatments and 3 repetitions. Data were analyzed by F test and if significantly different test followed by Duncan's New Multiple Range Test (DNMRT) at 5% level. The treatment in this study are:

A = drying leaves Kedondong leaf at a temperature of 50^{0}C
B = drying leaves Kedondong leaf at a temperature of 60^{0}C
C = drying leaves Kedondong leaf at a temperature of 70^{0}C
D = drying leaves Kedondong leaf at a temperature of 80^{0}C
E = drying leaves Kedondong leaf at a temperature of 90^{0}C

D. Making the Tea Leaves Kedondong [11]

1. Do Kedondong plucking leaves light green.
2. Leaves in steam for 5 minutes.
3. Milled using a blender until it resembles tea powder.
4. Sieving performed using 20 mesh sieve.
5. The leaves are dried using an oven with a temperature treatment 500C, 600C, 700C, 800C, 900C, until the moisture content of 5-8% with the characteristics of golden yellow and crumble if broken with the fingers, then noted a long drying.
6. Packaging and analysis.

F. Observations

The observations made are:

1. Observation of leaf Kedondong are: moisture content, ash content, tannin content, total polyphenols, antioxidant activity, test compounds terpenoids, flavonoids and test the active compound.
2. Observations of steeping tea leaves Kedondong are: moisture content, ash content, tannin content, total polyphenols, antioxidant activity, test compounds triterpenoids, and test active flavonoid compounds, toxicity tests.

G. Method of Analysis

1. Water Content [12].

The first phase was conducted to analyze the water content is drying aluminum plate in an oven at a temperature of 105^{0}C for 1 hour. The cup is placed into a desiccator (± 15 min) and allowed to cool and then weighed. The cup is weighed again until its weight is constant, as much as 2 grams of sample is inserted into the cup, then oven-dried at a temperature of 105^{0}C for up weighing constant. Once completed then the cup is inserted into the desiccator and allowed to cool and then weighed.

Water content (%) = (b - c) / (b - a) x 100%

2. Ash Content[12]

As much as 3-5 g samples were put in the cup ashing weighed. Cup containing the sample is inserted into the ashing furnace and burnt to ashes obtained were grayish. Ashing is performed at a temperature of 600^{0}C. cup containing the ash is cooled in a desiccator, and then weighed and calculated by the formula: The ash content = (Z - X) / Y x 100%

3. Tannins Content [13]
A total of 5 grams of finely ground plus 400 ml distilled water and then boiled for 30 minutes. Once cold put in a flask of 500 ml and added distilled water up to the mark tera, then filtered (filtrate I). I have taken 10 ml filtrate indigokarmin plus 25 ml and 750 ml of distilled water. Furthermore is titrated with 0.1 N $KMnO_4$ solution until golden yellow color, eg required A ml. Taken 100 ml of filtrate I plus consecutive 50 ml gelatin solution, 100 ml of acid salt solution, 10 grams of kaolin powder. Furthermore, shaken vigorously a few minutes and filtered (filtrate II). Taken 25 ml filtrate II, indigokarmin mixed with a solution of 25 ml and 750 ml distilled water. then titrated with 0.1 N $KMnO_4$ solution, eg, required B ml. 1 ml KMnO4 0,1 N = 0.00416 g tannin
Content of Tannin = (50A-50B) x N / 0.1x 0.00416 / 5) x 100%
A, B = volume of $KMnO_4$ used for titration
N = Normality $KMnO_4$

4. Total Polyphenols [14]
Modification total content of tea polyphenols were analyzed using Follin-Ciocalteu method. A total of 1 gram of powdered tea leaves Kedondong macerated with 20 ml of methanol in a test tube overnight. Then from the dilution, 1 ml pipette and put into a test tube, then add 1 ml Na_2CO_3 (7.5%) and divortex so that a homogeneous solution. The test tube mixture allowed to stand in a dark place in a manner wrapped in aluminum foil for 60 minutes, then measured value of absorbance at 670 nm wavelength. Standard curve was constructed in the same manner by replacing samples with gallic acid made with several concentrations. The concentration of gallic acid used is 6.25; 12.5; 25 and 50 ppm were diluted from the parent gallic acid at a concentration of 500 ppm. The content of total polyphenols in tea functional beverages expressed in%.

5. Analysis of Antioxidant activity with DPPH [15]
Modification of antioxidant activity was analyzed based on its ability to capture free radicals (radical scavenging activity) DPPH. Prior to measurement, as much as 1 gram of powdered tea leaves macerated Kedondong first with 10 ml of methanol in a test tube overnight. Then filtered and the filtrate dilution three times with methanol. Then 1 ml pipette and put into a test tube. Divortek mixture and allowed to stand for 30 minutes, then measured value of absorbance at 517 nm wavelength using a spectrophotometer. The antioxidant activity expressed in% inhibition. The amount of the antioxidant power is calculated by the formula: Antioxidant Activity (%) = (Absorbance control - absorbance sample x 100%) / Absorbance control

6. Test Active Compounds Terpenoid [16]
A total of 50-100 mg samples of tea that has been mashed, placed on a plate and add drops of anhydrous acetic acid until the samples were submerged everything, left for about 15 minutes, 6 drops of solution was transferred into a test tube and add 2-3 drops of concentrated sulfuric acid , The presence of triterpenoids indicated by the color pink.

7. Test Active Compounds Flavonoids [16]
A total of 200 mg of tea samples have been extracted with 5 ml of ethanol and heated for 5 minutes in a test tube. Furthermore, a few drops of concentrated HCl. Then added 0.2 g Mg powder. A positive result is indicated by the onset of a deep red color (magenta) within 3 minutes.

8. Toxicity Test methods Brine Shrimps [17]
The analysis was done using the experimental animals Artemian salina Leach shrimp larvae. Larvae obtained by dripping a breeding shrimp eggs in the container. Container breeding consists of two parts, where there are bright parts and dark parts are then filled with sea water and shrimp that will be hatched placed on the dark. After hatching the larvae will swim towards the light. In these analyzes and tests required 9 vial 3 vials of control for each sample. Vial test consists of three concentrations of 10, 100, and 1000 mg/mL were done each 3 times. Sample preparation is done by weighing the extract that has evaporated solvent 40 mg which are then dissolved in 4 ml of methanol, to obtain a concentration of 10 mg / mL (the mother liquor). Pipette 500 mL to obtain a final concentration of 1000 mg/mL and 100 mg/mL, while the test solution with a concentration of 10 ug/mL pipette test solution made with 1 000 mg/mL of 50 mL. Control solution prepared with three vials that do not contain a sample solution. Furthermore, the sample vial containing the solvent evaporated and added 50 mL of DMSO and 2 mL of sea water. The same was done in control. Into the vial and the vial of test sample included 10 shrimp larvae. Both ends of each volume about 5 ml vial with sea water. The number of dead larvae were calculated LC_{50} value using probit analysis and regression equations.

III. Result And Discussion

A. Identify Plants
Identification of plant leaves Herbarium Kedondong conducted in the Department of Biological Science, Andalas University Andalas University stated that the plant is Family Anacardiaceae, species Spondias dulcis, Soland.(Appendix 8).

B. Analysis of Raw Materials
Chemical analysis performed on the raw material compound leaves Kedondong includes analysis of triterpenoids, flavonoids, moisture content, ash content, and antioxidant activity. The results of chemical analyzes on leaves Kedondong can be seen in Table 1 and 2.

TABLE I. RESULTS OF PHYTOCHEMICAL ANALYSIS LEAF KEDONDONG

Analysis	Observations
Triterpenoid	-
Flavonoid	+

Note: (+) indicates a solution containing active compounds

TABLE II. RESULTS OF CHEMICAL ANALYSIS LEAF KEDONDONG

Parameter	Percentage (%)
Water Conten	33,81
Ash Content	9,33
Antioxydant Activity	60,07

C. Analysis of Herbal Tea Leaf Kedondong

1. Water Content

Water content ranged from tea leaves Kedondong 7.22% - 7.88%. The lowest water levels in the treatment E with a temperature of 90^{0}C at 7.22% and the highest water content in treatment A with a temperature of 50^{0}C at 7.88%. Based on an analysis of variance on water content that drying temperature had no significant effect on water content.The average yield Kedondong leaf water content can be seen in Table 3.

TABLE III. AVERAGE WATER CONTENT HERBAL TEA LEAF KEDONDONG

Treatment	Moisture Content (%)	Length of Drying
A(Drying leaves Kedon-dong at a temperature of 50^{0}C)	7.88	320 minutes
B (Drying leaves Kedon-dong at a tem-perature of 60^{0}C)	7.50	220 minutes
C (Drying leaves Kedon-dong at a tem-perature of 70^{0}C)	7.46	180 minutes
D (Drying leaves Kedon-dong at a tem-perature of 80^{0}C)	7.28	150 minutes
E (Drying leaves Kedon-dong at a tem-perature of 90^{0}C)	7.22	110 minutes
CC = 1.56%		

Manufacture of leaf tea products Kedondong give an average water content of ± 7%. This is in accordance with the standards established by the Indonesian National Standard (SNI-01-4453-1998), the quality requirements of green tea has a maximum water content of 8%. Kedondong leaf traits that has had moisture content below 8% ie Kedondong leaves golden yellow and crumble if broken with the fingers. Drying temperature differences lead to differences in water content where the higher the drying temperature, the lower the water content as shown in Table 4. During the drying process of evaporation of water that lowers the water content of the material. Evaporation occurs because the vapor pressure difference between the water on the material with water vapor in the air. Water vapor pressure materials are generally greater than the vapor pressure of the air, causing the mass transfer of water from the material into the air. This is related to the higher temperature during the drying process, the greater the heat energy is taken so that more air mass amount of fluid evaporated from the surface of the material is dried [18].

The greater the temperature difference between the heating medium with foodstuffs faster transfer of heat into the material and the sooner the removal of water from the material. The water coming out of the dried material will saturate the air, so its ability to get rid of the water is reduced. So the higher the drying temperature, the drying process will be faster. But if they do not correspond to the dried material, the result would be an event called "Case Hardening" is a condition where the outer material is dried while the inside is still wet [19]. Water is the main component in food as it can affect the texture, appearance and taste of food. The water content largely determines the shelf life of food because the water content influences the physical properties and the properties of the physico-chemical, chemical changes (non-enzymatic, browning), enzymatic changes, and microbiological damage [20].

2. Ash Content

Value ash content ranged from tea leaves Kedondong 6.21% - 8.25%. Lowest ash content in treatment A with a temperature of 50^{0}C at 6.21% and ash content of the highest in the treatment of D with a temperature of 80^{0}C at 8.25%. Based on the analysis of variance of the ash shows that the drying temperature significantly affect the ash content of tea leaves Kedondong so continued with test DNMRT. The average yield of ash content Kedondong leaf tea with a variety of treatments can be seen in Table 4.

TABLE IV. MEAN ASH CONTENT HERBAL TEA LEAF KEDONDONG

Treatment	Ash Content (%)
A (Drying leaves Kedondong at a temperature of 50^{0}C)	6,21 a
B (Drying leaves Kedondong at a temperature of 60^{0}C)	6,88 ab
C (Drying leaves Kedondong at a temperature of 70^{0}C)	7,06 b
D (Drying leaves Kedondong at a temperature of 80^{0}C)	7,72 bc
E (Drying leaves Kedondong at a temperature of 90^{0}C)	8,25 c
CC = 1.42 %	

The numbers on the same lane followed by lowercase letters are not the same, DNMRT significantly different according to the level of 5%

In Table 5 it can be seen that the ash content obtained quite high. Ash is a mineral component that does not evaporate in the combustion process or annealed organic compounds. Determination of ash content is closely related to the mineral content contained in the ingredients, purity and cleanliness of a material generated [13]. According to the quality standard ISO 01-4453-1998 maximum ash content in green tea 8%, this means Kedondong herbal tea leaves produced comply with quality standards ISO set. Foodstuffs consists of 96% organic matter and water, while the rest are mineral elements. These organic materials will burn in the combustion process but its mineral components were not burned. This component is known as an ash content [20].

The ash content is very different Kedondong leaf tea, ash content increases at temperatures of 80^{0}C but decreased at a temperature of 90^{0}C. This is in accordance with the opinion [21], that with increasing drying temperature of the ash tends to increase. However, drying by using too high a temperature can result in uneven drying. The proportion of ash content in a food can also be influenced by several factors such as species, soil nutrient state, the state of maturity of crop, climate, growing areas and planting treatment [22].

3. Tannins Content

Results of analysis of tannin content of tea leaves Kedondong ranged 5,396,61%. Results of variance showed that the average value of the levels of tannin in tea leaves Kedondong significantly different, so it continued with test DNMRT. The average value Kedondong leaf tanin contents are shown in Table 5.

TABLE V. AVERAGE LEVELS TANNIN HERBAL TEA LEAF KEDONDONG

Treatment	Tannin Content (%)
A (Drying leaves Kedondong at a temperature of 50°C)	5,39 a
B (Drying leaves Kedondong at a temperature of 60°C)	5,53 a
C (Drying leaves Kedondong at a temperature of 70°C)	6,61 a
D (Drying leaves Kedondong at a temperature of 80°C)	6,36 ab
E (Drying leaves Kedondong at a temperature of 90°C)	5,91 b
CC = 6,43 %	

The numbers on the same lane followed by lowercase letters are not the same, DNMRT significantly different according to the level of 5%

Drying temperature difference causes differences in levels of tannin in which the tanin contents increased up to a temperature of 70° C and then back downhill. [23] also says that in the tea leaves contained the enzyme catechol oxidase enzyme which is able to change tannin into derivatives. In the processing of green tea (tea without the process of enzymatic oxidation), with its inactive enzyme catechol oxidase is the tannins contained in the leaf do not undergo many changes and stored in plant tissue and thus levels of tannin green tea (tea that is processed without a process of enzymatic oxidation) remains high because only a slight enzymatic oxidation (Hartoyo 2003 cit Ria 2013). The content of tannins in tea can be used as a guide to quality, because the tannins give it a distinctive flavor to this tea is slightly astringent taste. (Winarno, 1992). According to SNI 01-3143-1992, the quality requirements of bottled tea drinks not specified the exact amount of tannin concentrations desired. So manufacturers are given the freedom to determine the concentration of tannin that is desired to determine the quality of tea produced.

4. Total Polyphenols

Results of analysis of variance to total polyphenols in tea leaf herbal Kedondong produced showed that the drying temperature was significantly different to the total polyphenol Kedondong leaf herbal tea and continued with test DNMRT. Total polyphenols in tea leaves Kedondong can be seen in Table 6. From Table 6 it can be seen that the total polyphenols in tea leaf herbal Kedondong ranged from 17.87 to 29.03%. Low drying temperature (50°C, 60°C) resulting in total polyphenols broken. Meanwhile, at a temperature of 70°C total polyphenols produced higher due to the use of high temperatures and a faster drying time. But the total polyphenol content decreased in the drying temperature (80°C, 90°C). This is due to the total polyphenols in it disrupted due to high drying temperature [24].

TABLE VI. TOTAL AVERAGE LEAF HERBAL TEA POLYPHENOLS KEDONDONG

Treatment	Total Polyphenols (%)
A (Drying leaves Kedondong at a temperature of 50°C)	17,87 a
B (Drying leaves Kedondong at a temperature of 60°C)	22,58 ab
C (Drying leaves Kedondong at a temperature of 70°C)	29,03 bc
D (Drying leaves Kedondong at a temperature of 80°C)	25,06 c
E (Drying leaves Kedondong at a temperature of 90°C)	24,35 c
CC = 3.14 %	

The numbers on the same lane followed by lowercase letters are not the same, DNMRT significantly different according to the level of 5%

With increasing temperature, the more it will facilitate the release of phenol from the leaf cells. Most components of the leaves are carbohydrates including cellulose fiber and protein. All of these components are not dissolved, only the components with small molecular weight diffused in hot water, namely polyphenols [25]. Heating during drying also serves to inactivation of the enzyme polyphenol oxidase [26]. The higher the drying temperature used will also be leading to higher inactivation of the enzyme polyphenol oxidase enzyme activity will be so low, and the damage will be smaller phenol. However, phenol content will also be affected by increasing the drying temperature so that the total amount of phenol was detected will reach the maximum peak and then a constant declining trend.

5. Antioxidant Activity

Results of analysis of variance of the activity of antioxidants in green tea leaves produced Kedondong indicated that treatment significantly different drying temperatures of antioxidant activity of herbal tea leaves Kedondong so continued with test DNMRT. Value of antioxidant activity in tea leaves Kedondong can be seen in Table 7.

TABLE VII. AVERAGE ACTIVITY ANTIOXIDANT HERBAL TEA LEAF KEDONDONG

Treatment	Antioxidant Activity
A (Drying leaves Kedondong at a temperature of 50°C)	21,46 a
B (Drying leaves Kedondong at a temperature of 60°C)	24,03 a
C (Drying leaves Kedondong at a temperature of 70°C)	40,71 a b
D (Drying leaves Kedondong at a temperature of 80°C)	31,23 b
E (Drying leaves Kedondong at a temperature of 90°C)	30,98 b
CC = 4.39 %	

The numbers on the same lane followed by lowercase letters are not the same, DNMRT significantly different according to the level of 5%

Processing of tea without enzymatic oxidation process is more able to retain compounds that are antioxidants in tea leaves [27]. Therefore, in this study treatment with the enzymatic oxidation method without Kedondong leaf herbal teas have higher antioxidant activity. It is also explained by (Hanafi and

Artanti, 2007) that the green tea (tea without enzymatic oxidation process) has antioxidant activity of about 1.1 to 3.4 times higher than black tea (tea with enzymatic oxidation process).

The antioxidant activity in herbal tea leaves Kedondong in treatment A (50^{0}C) amounted to 21.46% and sustain increase with increasing drying temperature that reaches the antioxidant activity of 40.71% in treatment C, but decreased on treatment D and E. in accordance with the statement [28] that the antioxidant easily damaged by light and high temperature, the higher the temperature and longer drying the antioxidant activity of the resulting increase until a certain time limit, and then declined. Antioxidant testing done using DPPH method. Test of antioxidant activity at a concentration of 1000 ppm. In this method, the radical becomes stable because the test sample donates a hydrogen atom, so that the color purple on DPPH turn into yellow. This analysis is done by measuring absorbance which has a wavelength of 517 nm. Gulcin (2006) says that there is a low absorbance when radical DPPH inhibited by antioxidant compounds through the process of a hydrogen donor, to form a stable radical, so there was a yellow discoloration of the previous purple.

6. Analysis of Active Compounds.

Qualitative test results of the active compound leaf green tea flavonoid Kedondong produced can be seen in Table 8.

TABLE VIII. ANALYSIS OF HERBAL TEA LEAVES PHYTOCHEMISTRY KEDONDONG

Observation Result	
Treatment	Flavonoids
A	+
B	+
C	+
D	+
E	+

Note: (+): Detected their bioactive compounds

In the analysis of flavonoids, with the addition of magnesium metal and hydrochloric acid to produce a deep red color on the leaves Kedondong extracted, indicating that the positive Kedondong leaf contains flavonoids. According to [29], leaves Kedondong are 1.55% of total flavonoids. Flavonoids function for the plant which is to measure the growth, photosynthesis, antimicrobial and antiviral work. Antioxidative activity which is also owned by a particular flavonoid active components used to inhibit bleeding [16]. Flavonoids are compounds reducing good because it can inhibit the oxidation reaction, either the enzyme or non enzyme. Flavonoids act as a reservoir of hydroxyl radicals and superoxide, thus flavonoids protect lipid membranes against destructive reactions [16]. The ability to reduce free radicals that play an important role in the activity of flavonoids as antioxidants. Some flavonoids shown to reduce free radicals DPPH (1,1-diphenyl-2-picrylhydrazyl) [30]. According to the results of research on anti-tuberculosis activity of the flavonoid [31], mentions that the alleged active compound as antituberculosis the plant Matricaria chamomilla is a class of flavonoid compounds. The mechanism of action of flavonoids as an antibacterial in general is by forming a complex bond with the protein in the bacterial cell wall.

7. Toxicity Test methods Brine Shrimp

Lethally From the results of toxicity testing methods are lethally Test Brine Shrimp Kedondong leaf tea with drying temperature variations 50^{0}C, 60^{0}C, 70^{0}C, 80^{0}C, and 90^{0}C can be seen in Table 9.

TABLE IX. RESULTS LC_{50} VALUE LEAF TEA KEDONDONG

Treatment	% Mortality shrimp larvae	LC_{50} value ug /mL
A (Drying leaves Kedondong at a temperature of 50^{0}C)	66,66	37153,52
B (Drying leaves Kedondong at a temperature of 60^{0}C)	66,66	7308,02
C (Drying leaves Kedondong at a temperature of 70^{0}C)	43,33	1261,82
D (Drying leaves Kedondong at a temperature of 80^{0}C)	43,33	1421,67
E (Drying leaves Kedondong at a temperature of 90^{0}C)	43,33	1027,54

The numbers on the same lane followed by lowercase letters are not the same, DNMRT significantly different according to the level of 5%

Based on test data and calculations toxicity LC_{50} Kedondong leaf tea is done by using the organism Artemia salina, Leach, LC_{50} values obtained an average of 37153.52 ug/mL to 1027.54 mg/mL. From the data obtained, Kedondong leaf extract is not toxic because it has a value of LC_{50} >1000 ppm. But if seen in the probit value calculation at a temperature of 50^{0}C and 60^{0}C is obtained at a concentration of 1000 ppm by more than 50% mortality of Artemia stating their toxic properties on leaves Kedondong. According to [17] a compound said to be active or cytotoxic if it has a value of LC_{50} (the concentration that kills 50 % of larvae shrimp) below 1000 ppm. While in the subsequent temperature is 70^{0}C-90^{0}C temperature did not prove their toxic properties. This relates to the compound found in the leaves Kedondong namely saponins, tannins, flavonoids and ethanol used in toxicity testing, which at certain levels can lead to death on the larvae Artemia salina Leach. Data calculations showed that the higher the temperature used, the lower the value of LC_{50} didapatkankan, it is suspected because of the higher temperatures can reduce the levels of saponins and flavonoids.

IV. CONCLUSIONS

Based on research that has been done can be concluded as follows:

1. The temperature of the drying tea leaves Kedondong significant effect on ash content, antioxidant activity, total polyphenols and tannins.
2. tea products with the highest antioxidant components based on the analysis results are products with C treatment (drying temperature of 70^{0}C) which is the 40.71% antioxidant activity, total polyphenols 29.03%, 7.46% moisture content, ash content of 7.72% , and the nt of 6.61%. 3. Test results showed toxicity at 50^0 and 60^{0}C prove their toxic properties, while at a temperature (70^{0}C, 80^{0}C, 90^{0}C) not toxic.

The suggestions put forward in order to obtain better results, namely:

1. Need for further research to make herbal tea in the form of an instant that the presentation will be faster, easier and practical.
2. Do more research on how to eliminate toxic compounds contained in herbal tea leaves Kedondong

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