STUDY CONCENTRATION ACETONE AND MACERATION TIME TO CHARACTERISTICS OF FRUIT CAMPOLAY CAROTENOID PIGMENTS (Pouteria campechiana) AS NATURAL COLOR

ARTICLE

Asked to Meet One Of Terms Bachelor Assemblies Food Technology Study Program

By :

Melia Fajar Juniarti
12.302.0244

STUDY PROGRAM OF FOOD TECHNOLOGY
ENGINEERING FACULTY
PASUNDAN UNIVERSITY
BANDUNG
2016

STUDY CONCENTRATION ACETONE AND MACERATION TIME TO CHARACTERISTICS OF FRUIT CAMPOLAY CAROTENOID PIGMENTS (Pouteria campechiana) AS NATURAL COLOR

Melia Fajar Juniarti 123020244 *)
Dr. Ir. Hj. Hasnelly, MSIE **) Dr. Ir. Yusman Taufik, M.P ***)

*) Students of Food Technology University of Pasundan
) Top Advisors, *)Second Advisors

ABSTRACT

Natural dye is a dye that is naturally found in plants and animals. The materials used in the making of carotenoid pigments are tjampolay fruit and acetone. This study aims to determine the use of acetone concentration, the maceration time, and the interaction between two carotenoid pigments in order to produce good tjampolay fruit. The method used involves two steps of research; preliminary study and prime study. In preliminary study, the writer determined the precise ratio between acetone and tjampolay fruit. Then, in the prime study, the writer uses Randomized Complete Block design (RCB) and treatment design that consists of two factors, namely factor P (acetone concentration) and factor M (maceration time).The responses used in the preliminary study are remenden total and total carotenoid content. The draft analysis used in the main study are the physical response (rendemen total), the chemical response (total carotenoid content and pH measurement), and the advanced test on the selected samples which is the stability test of the total carotenoid pigment. The results of the first step is getting a good comparison between acetone and tjampolay fruit (1 : 3). Then, the results of the second step is showing that the interaction between the concentration of acetone and maceration time have no significant effect on the physical and chemical response, whereas the concentration factor of acetone has significant effect on rendemen total but it does not affect the pH of the carotenoid pigment. Moreover, the factor of maceration time affects the total carotenoid levels significantly but it does not affect the pH.The samples that were selected based on scoring test are p2m2 (80% acetone concentration and 4-day-maceration) with 21.08% total rendemen, 271.44 mg/gtotal carotenoid content and pH 4.87. The result of the stability test shows that the the carotenoid pigment tjampolayis stable forthe low temperature not for the high temperature. Then, the treatment temperature and storage time do not affect the pH value on tjampolay fruit.

I. PRELIMINARY

1.1 Background

The dye based source is divided into two types, namely natural dyes and synthetic dyes (Cahyadi, 2008). Natural dye (pigment) is a dye that is naturally present in plants and animals. Natural dyes can be classified as green, yellow and red. The use of natural dyes for the food and drinks are not a bad effect on health, as well as synthetic dye that is in growing use. Synthetic dye used more often because it has several advantages, including higher stability and use a small amount is sufficient to provide the desired color so as to assist in minimizing production costs, but the use of synthetic colors can be dangerous for consumers because it can cause skin cancer, oral cancer, brain damage, as well as the impact on the environment such as pollution of water and soil are also impacted indirectly to human health because it contains heavy metals such as lead (Pb), Copper (Cu), zinc (Zn) are dangerous (Djuni, 2002). The limitations on the use of some kind of synthetic colors lead to the need for research and development innovation that comes from natural dyes.

Other alternatives to replace the use of synthetic dyes is to use natural dyes such as pandan leaf extract, suji leaf, saffron and fruit extracts are generally safer (Effendi, 2009). Some examples of natural dyes used for coloring food is carotene, biksin, caramel, chlorophyll, anthocyanins, flavonoids, quinone, betalain, xanton, and tannins (Winarno, 2006(Winarno, 2006).

Campolay (Pouteria campechiana) comes from the Central American region and southern Mexico and including plant-sawoan sapodilla (Laoli, 2012). Campolay fruit often called Sawo Butter, Sweet Sawo, Alkesa, or Kanistel. Fruit name refers to the name of the city in Mexico "Campeche", in English this fruit called Canistel, Egg Fruit, or Yellow Sapote, and see the benefits of this fruit is cultivated in several countries, including Indonesia, which is only a small portion of land cultivation campolay (Rizky, 2012).

Campolay fruit can be used as natural food colorants because it produces yellow to orange color produced by pigments called carotenoids.

Carotenoid compounds are fat-soluble pigments responsible for the colors red, orange, to yellow. Carotenoid compounds known as provitamin A carotenoids other functional properties is its ability as an antioxidant that can capture free radicals in the body (Palozza & Krinsky, 1992).

Carotenoids usual obtained from extraction of some ingredients, such as carrots, broccoli, citrus peel, Spirulina plantesis, dunaella sp, tomatoes. Color of the carotenoids attracted much attention from a variety of disciplines for a variety of functions and properties that are important, the color ranges from pale yellow to orange is associated with the structure. Due to the high demand of carotenoids also raises a carotenoid synthesis technology (Watson, 2002).

One of the factors that influence the process of extracting the dye is a solvent type. Carotenoids are insoluble in water, methanol, ethanol cold, soluble in organic solvents such as carbon disulfide, benzene, chloroform, acetone, ether and petroleum ether (Ketaren, 2005). Gunawan (2009) states that the fractionation Crude Palm Oil (MSK) with solvent hexane produce a concentrate with a total weight and total recovery yield of β-carotene were higher, while the acetone solvent to produce β-carotene concentration levels higher

The time extraction factor is also a pretty important thing to be considered in the process of extracting carotenoids since it can also affect the quality of the extraction. The extraction process is too long will cause damage to the content of the dye (Shinta et al, 2008). The extraction process is too short will produce a dye content of less than optimal. The maximum conditions for extraction of a product occurs at a temperature and time. After reaching the maximum condition if continued warming may lead to a decomposition of the pigment. Therefore, it is necessary to study the optimum extraction time so that an extract that has the quantity and quality are good also (Bieber et al, 2014).

1.2 Identification of problems

The problems that can be identified in connection with this issue is as follows :

1. How does the concentration of acetone on the characteristics of carotenoid pigments in fruits campolay produced.
2. How long does the effect of maceration on the characteristics of carotenoid pigments in fruits campolay.
3. How is the interaction between the solvent concentration and the duration of maceration on the characteristics of carotenoid pigments in fruits campolay produced.

1.3 Purpose and Objective

The purpose of this research is to make the extract dyes from fruits campolay as an alternative natural dyes that can be used or applied in some processed food products are safe for health.

This study aims to determine the influence of the concentration of acetone on the characteristics of carotenoid pigments in fruits campolay generated and how the influence of a long period of maceration on the characteristics of carotenoid pigments in fruits campolay produced, and how the interaction between the concentration of the solvent and the duration of maceration on the characteristics of carotenoid pigments Reviewed campolay fruit produced.

1.4 Benefits Research

The expected outcome of the study is to provide an alternative natural dyes that can be used for food and drinks, to add insight that campolay fruit contains carotenoid compounds that act as dye and antioxidant.

In addition, this research is expected to encourage creativity to improve psychomotor abilities and disciplines studied so as to contribute to industry and society.

1.5 Framework

Carotenoids are a group of fat-soluble pigments and yellow to red-orange. These pigments are often formed along chlorophyll in chloroplasts but there is in other chromoplast can also occur freely in droplets of fat (Potter, 1995).

The dye carotenoids can be obtained using the extraction method of maceration. Maceration is done by soaking the samples in an organic solvent at a certain time at room temperature. Methods ethyl acetate bangle rhizome showed positive results against the withdrawal of flavonoid compounds, tannins, essential oils and glycosides(Artini, 2013).

Maceration method is a simple method to soak simplicia powder in the solvent for several days at room temperature and protected from light. The advantage of this method is simple equipment, while the disadvantage is a long time sample extraction, a solvent used more and can not be used on materials that have a waxy texture, tiraks, and benzoin (Sembiring, 2013).

The preliminary study conducted to determine the ratio of the coconut husk with 96% ethyl acetate solvent based yield were generated yield of 3.62% at a ratio of 1: 2, and by the organoleptic test shows the ratio of fiber to the solvent in terms of color is the same (Octaviandini, 2015).

Extraction of carotenoids and chlorophyll in Seagrass (Enhalus acoroides) using acetone at different concentrations (90%, 95% and 100%). Differences in concentrations significantly different solvent to the carotenoid and chlorophyll is produced, and the best results for extracting carotenoids in Seagrass is acetone with a concentration of 95%. The results of the impairment test pigment against environmental influences, showed that the longer the pigment is exposed to environmental conditions, the pigment content also decreased (Zendrato et al, 2014).

Study time extraction of the tannin from the old avocado leaves with extraction time of 150 minutes and 180 minutes. The best treatment results by using the Multiple Attribute method, namely the treatment of extraction time of 180 minutes with the following characteristics: yield of 68.07%; pH of 4.49; total tannins of 22.07% and 0.86 absorbance. In the resulting measurements with the spectrophotometer wavelength of 614 nm, which indicates the red color that absorbs the complementary color of green-blue (Bieber et al, 2014).

Extraction of antioxidants (lycopene) of tomatoes assessed with different extraction time ie 30, 40, 50, 60, 70, 80, 90, 100, 110, 120 min. From the observation obtained optimum conditions lycopene extraction operation is a long extraction time of 90 minutes. In this condition lycopene extracted by 5.14 mg / 100 grams, or by 40.15% (Maulida & Naufal, 2013).

Determination of carotenoids and tocopherols can be done by means of concentrated extract was dissolved in 10 ml acetone and absorption measured by UV-Vis spectrophotometer at the appropriate wavelength (Hegazi et al., 1998).

1.6 Research Hypothesis

Based on the framework above hypothesis could be that is anticipated concentration of acetone, long maceration time, and their interaction effect on carotenoid pigments in fruits campolay produced..

1.7 Place and Time Research

The study was conducted at the Research Laboratory of Food Technology Faculty of Engineering, University of Pasundan Bandung Jl. Dr. Setiabudhi 193 Bandung in May 2016 to August 2016.

II. MATERIALS, EQUIPMENT, AND METHODS

2.1 Materials and Equipment Research

2.1.1 Material Used

The materials needed in this research is the fruit flesh campolay obtained from the Padalarang-West Bandung regency, acetone

65%, 80% acetone and 95% acetone obtained from the Research Laboratory of the University of Pasundan.

2.1.2 Equipment Used

The equipment used in the extraction of dye carotenoids from the fruit flesh campolay which this is digital scales with a brand Mettler Toledo, knives, blender brand Miyako, basin, beaker 500 ml measuring cup 100 ml, funnel, filter paper, vacuum evaporator with brands Buchi, Uv-Visible spectrophotometer with a brand Genesis 20, and tools for analysis.

2.2 Research Methods

The study was divided into two phases covering the preliminary study and the main study.

2.2.1 Preliminary Research

The purpose of the preliminary research is done that determines the ratio of the material with a solvent which would then be used in the main study. Comparison between the material with a solvent to be used in the preliminary experiment consists of three levels: material: solvent 1: 1, 1: 2, 1: 3. The solvent use is 80%.

Response in the preliminary study is the calculation of the yield of carotenoid extract dye and dye assay carotenoid produced in the third level of the comparison materials and solvents.

2.2.2 Primary Research

The main research is to determine the concentration of acetone and the duration of maceration to manufacture carotenoid pigment campolay fruit.

Primary research conducted are:

a. acetone concentrations (P) Factors, consisting of 3 levels:
   p1 = 65%
   p2 = 80%
   p3 = 95%
b. time of maceration (M factor consisting of 3 levels:
   m1 = 2 days
   m2 = 4 days
   m3 = 6 days

The experimental design was conducted randomized block design (RAK) with a 3 x 3 factorial design with three replications.

Response analysis of the carotenoid pigments campolay fruit includes analysis of total carotenoids by Uv-Vis spectrophotometry method (AOAC, 1995), Analysis of the degree of acidity (pH) by using a pH meter (SNI 2004: 06-6989.11), and test the stability of the carotenoid pigments the heating temperature is different, different storage temperature, pH stability and CIE color analysis method for the selected.

III. RESULTS AND DISCUSSION

3.1 Preliminary Research

The preliminary study conducted to determine the ratio of fruit campolay with acetone 80%. Measurements carried out on the yield of carotenoid pigment extracts of the fruit campolay and total carotenoid content measurement to extract carotenoid pigments of fruits produced campolay.

3.1.1 Yield Fruit Extract Pigments Carotenoids From Campolay

The result of the calculation of the yield of carotenoid pigment extracts of the fruit campolay can be seen in Table 1.

Table 1. Yield (%) Fruit Extract Pigments Carotenoids From Campolay

Comparison of Fruit Campolay with Acetone Solvent	*The yield*
(1:1)	9,39 ± 0,39
(1:2)	8,63 ± 0,32
(1:3)	21,08 ± 0,21

The data in Table 1 is a comparison of fruit campolay with acetone 1: 3 produces yields greater carotenoid pigment extracts ie 21.08% of the fruit comparison campolay with acetone 1: 1 and 1: 2 ie 9.39% and 8, 63%. This is caused by the amount of solvent in comparison campolay fruit with acetone 1: 3 can extract more carotenoid pigments, in this case the solvent can penetrate well into the material. Purwanto (2012), explains that the volume of solvent greater will be able to extract more substance in the material but the use of solvent is too much to be considered. According Manasika & Simon (2015), in his research that the extraction of carotenoid pigments pumpkin kobucha states that the components other than carotenoids that participate dissolved in a solvent and solvent residues remaining can also affect the high yield. Comparison of fruit campolay with acetone 1: 1 and 1: 2, acetone will more quickly saturate so that the process of extracting a substance extracted a little more, this is explained by Wulan (2001), if the amount of solvent is too small then only a little solvent binding extract solutes. Solvents will also be faster saturated. Based on the results of the calculation of the yield of carotenoid pigment extracts of the fruit campolay campolay fruit comparison with acetone chosen is 1: 3.

3.1.2 Levels of Carotenoids Total Carotenoids Of Fruit Extract Pigments Campolay

The result of the calculation of total carotenoid content of carotenoid pigment extracts of the fruit campolay can be seen in Table 5.

Table 2. Total Carotenoid Levels (ug / g) Extract Pigments Carotenoids Of Fruit Campolay

Fruit Campolay comparison with Solvent Acetone	Levels of Carotenoids
(1:1)	162,14 ± 10,85
(1:2)	165,25 ± 17,97
(1:3)	354,02 ± 10,06

The data in Table 2 is a comparison of fruit campolay with acetone 1: 3 produce high levels of total carotenoids carotenoid pigment extract greater the 354.02 ug / g of the fruit comparison campolay with acetone 1: 1 and 1: 2 ie 162.14 ug / g and 165.25 mg / g. The higher the proportion of acetone used can increase the levels of total carotenoids generated. Comparison of materials with a solvent that is low are less capable of dissolving the solute to the maximum, it is supported from research Maulida & Naufal (2014), regarding the extraction of antioxidants (lycopene) of tomatoes, that the optimum conditions for variable ratio F / S is 1: 4, because the ratio of the amount of material to solvent amount is sufficient, so that the solvent can penetrate well into the material as a result of the solute can be dissolved by the solvent. Based on the results of the calculation of the total carotenoid content of carotenoid pigment extracts of the fruit campolay campolay fruit comparison with acetone chosen is 1: 3.

3.2 Primary Research

3.2.1 Total Yield

The calculation result of analysis of variance showed that differences in the concentration of acetone significant effect on the total yield of carotenoid pigments of fruits campolay, while treatment long time maceration and interaction between the concentration of acetone and the duration of maceration did not significantly affect the total yield of carotenoid pigments of fruits campolay viewable in Appendix 8.

Differences in treatment concentration of acetone solvent to the total yield of fruit campolay carotenoid pigments that give real effect then conducted a further test Duncan can be seen in Table 3.

Table 3. Effect Concentration Solvents Acetone Response Against Total Yield (%)Fruit Carotenoid Pigment Campolay

Campolay Solvents Acetone concentration	The Yield	significance level 5%
p_3 (95%)	14,83 ± 5,10	a
p_2 (80%)	16,8 ± 3,90	b
p_1 (65%)	20,36 ± 5,13	c

Description: Each number is followed by the same small letter in each column show not significantly different by Duncan test at 5% significance level .

The data in Table 3 shows the total yield of carotenoid pigments extracted from fruit campolay using different concentrations of acetone give significantly different results.

Total yield is the percentage by weight pigment paste rotary vacuum evaporator results from the weight of the fruit pulp campolay. The yield is the ratio between the weight of the material with the results. The size of the yield value can not express the quality of the product, because the yield of small value does not necessarily have products with good quality, otherwise, the yield large values are not necessarily the product has a low quality score (Fennema, 1976).

Analysis of physics in carotenoid pigments of fruits campolay showed that the treatment given acetone concentration affect the total yield of the product. Treatment with maceration using acetone system with varying concentrations caused total product yield of carotenoid pigment became different. Soaking using acetone solvent concentration of 65% resulted in an average total yield of carotenoid pigments of fruits campolay highest of 20.36%, while soaking using acetone solvent concentration of 95% resulted in an average total yield of carotenoid pigments of fruits to its lowest campolay 14 83%, while soaking treatment using acetone solvent concentration of 80% was significantly different from soaking treatment using acetone solvent concentration of 65% and 95%. Total average yield resulting from the concentration of acetone 80% is not greater than immersion using acetone concentration of 65% and not less than immersion using acetone concentration of 95%.

Treatment acetone concentration of 95% resulted in the degradation of the color pigment in fruit campolay, bringing the total yield of the resulting average total yield will vary with average use lower solvent concentration, ie the concentration of acetone 80% and 65%. The purity of solvent used affect the extraction or dissolution of color pigments dissolved in a solvent, in addition to the other components other than carotenoids that participate dissolved in a solvent and solvent residues can remaining.

Factors that may affect the process of dissolving a compound contained in the raw material during the extraction process including the purity of the solvent, the temperature of the solvent, the size of the particles of material extracted, the chemical properties of the solvent and solute, extraction time or contact between the material with a solvent, moisture content of materials extracted and extraction systems that do (Fellow, 1990).

3.2.2 Levels of Carotenoids Total

The result of the calculation of variance analysis showed that the length of time maceration significant effect on levels of carotenoids total carotenoid pigments of fruits campolay, while treatment differences in the concentration of acetone and the interaction between the concentration of acetone and the duration of maceration did not significantly affect levels of carotenoids total carotenoid pigments of fruits campolay in Appendix 9.

Treatment long time maceration of the total carotenoid content of fruit campolay carotenoid pigments that give real effect then conducted a further test Duncan can be seen in Table 4.

Table 4. Effect of maceration Long Time Response Against Total Carotenoid Levels (ug / g) Fruit Carotenoid Pigment Campolay

maceration Long Time (M)	**Total Carotenoid Levels**	**significance level 5%**
m_3 (6 day)	151,357 ± 81,87	a
m_2 (4 day)	235,467 ± 64,16	b
m_1 (2 day)	236,468 ± 77,05	b

Description: Each number is followed by the same small letter in each column show not significantly different by Duncan test at 5% significance level.

The average value of total carotenoid levels shown in Table 4, show that the time maceration for 2 days did not differ significantly with time maceration for 4 days and significantly different from the time of maceration for 6 days. The highest total carotenoid levels indicated by the length of time maceration for 2 days with a value of 236.468 g / g, while the lowest levels of total carotenoids is indicated by the length of time maceration for 6 days with a value of 151.357 g / g. The ability of a solvent to dissolve the compounds depends on the duration, according Maulida & Naufal (2014), the longer the extraction process, the contact between the solvent with the solute will be longer so that the process of dissolving the solute by solvent will continue to occur until the solvent saturated with solute, but it is not in tune with the research extraction of carotenoid pigments of fruits campolay, where the longest maceration time showed the lowest levels of total carotenoids. This is due to the heat coming out of the solvent acetone during the immersion process campolay fruit, so that the carotenoid pigments extractable degraded when immersed in a long time and produces a lower levels value. The results of this study also was supported by the opinion of Purnamasari, et al (2013), which states the difference in total carotenoids from each sample due to carotenoids have conjugated double bonds which cause carotenoids are particularly sensitive to oxidative degradation when dealing with air and heat. Carotenoid oxidation is accelerated in the presence of light. According Belitz & Grosch (1987), if oxygen and light prevented the carotenoid is stable against heating even at high temperatures. Shinta (2008), stating the extraction time on each material has optimum limit, where the addition of the optimum time exceeds the limit will have no effect, this is because of possible compounds that have been moved to the solvent will decompose due to continuous.

3.2.3 The degree of acidity (pH)

The results of the analysis of the average pH of the fruit extract carotenoid pigments campolay by treatment with acetone and the duration of maceration in Annex 10. Treatment acetone concentration and the duration of maceration no significant effect on the pH of carotenoid pigments of fruits campolay.

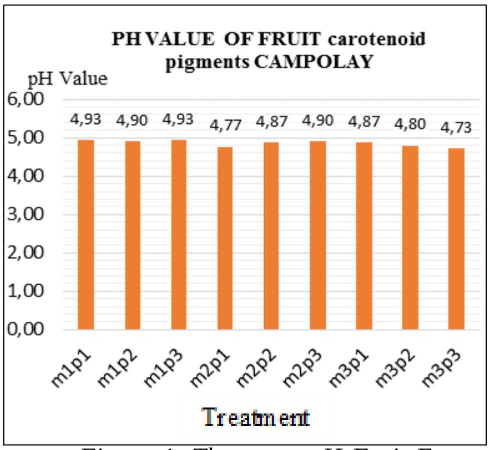

Figure 1. The mean pH Fruit Extract Pigments Carotenoids Campolay Due Effect Concentration Solvent Acetone and Old Time maceration

The data in Figure 1 shows that the pH value carotenoid pigment extracts ranged from 4.73 to 4.93. carotenoids pH is between acidic to alkaline (pH 2-8) where the pH stability will affect the colors produced by carotenoids (Ando et al, 1996). According to research Wahyuni, et al (2015), treatment types of solvents and extraction time no significant effect on the pH pumpkin extract carotenoids, the pH value ranged from 6.49 to 6.55, the research indicates acidic pH obtained weak and netral pH. The carotenoid content of pumpkin mostly β-carotene, α-carotene and lutein (Murkovic, 2002). Limantara et al (2006), expressed β-carotene and lutein are compounds selabil other carotenoids that are more resistant to acidic conditions, so it can be presumed types of carotenoids found in fruits campolay with the same type of carotenoids found in pumpkin.

3.3 Selected Samples

Based on the scoring result of the response of physics and chemistry, it is known that the sample chosen by the largest number of scores is a sample p2m2 by treatment with acetone 80% and the duration of maceration 4 days. Selected samples were then tested its stability against temperature heating different, different storage temperature, pH stability at different temperatures and storage heating, as well as color measurements were taken using a colorimeter. Selected samples scoring result can be seen in Table 5.

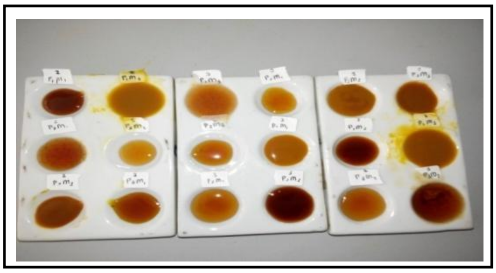

Figure 2. Pigmen Karotenoid Buah Campolay

Table 5. Scoring Result of Determining The Selected Sample

Perlakuan	Analisis Fisika	Analisis Kimia		Jumlah
	Total Rendemen	Kadar Karotenoid Total	Derajat Keasaman (pH)	
p1m1	4	1	5	10
p1m2	5	2	4	11
p1m3	3	3	5	11
p2m1	2	2	2	6
p2m2	4	5	3	12
p2m3	1	4	4	9
p3m3	1	1	3	5
p3m3	1	3	2	6
p3m3	1	4	1	6

3.3.1 Stability of Carotenoid Pigment Fruit Campolay On Warming Temperatures

Campolay fruit carotenoid pigment stability against temperature heating is carried out at a temperature of 60C, 80C and 100C for 5 hours, the results can be seen in Table 6.

Table 6 shows that the levels of total carotenoids in fruit carotenoid pigment campolay decrease with increasing temperature and heating time. Decreased levels of total carotenoids to indicate that the carotenoids are degraded due to the heat.

Table 6. Total Pigments Carotenoids Carotenoid Levels Fruit Campolay In contrast Heating Temperature (ug / g)

Heating Time (hours)	Heating Temperature		
	60˚C	80˚C	100˚C
0	208,64 (100%)	208,64 (100%)	208,64 (100%)
5	183,71 (88,05 %)	135,22 (64,81 %)	119,65 (57,35 %)

Results Table 6 shows the 60C temperature decreased levels of total carotenoids is not too significant, only about 88.05%, but at temperatures of 80C and 100C decreased levels of total carotenoids is high enough, where the lowest carotenoid levels at a temperature of 100˚ C. for 5 hours reached 57.35%. The results of this study in rhythm with the results of research on the extraction of carotenoids in pumpkin conducted by Wahyuni, et al (2015), which states heating up to temperatures of 60C does not cause decomposition of carotenoids but stereoisomers changes. The effect of temperature on the oxidation of carotenoids namely carotenoids has not been damaged due to heating at a temperature of 60C (Muchtadi, 1993).

3.3.2 Stability of Carotenoid Pigment Fruit Campolay On Storage Temperature

Campolay fruit carotenoid pigment stability against temperature storage is done at a temperature of 0C, 10˚C and 30 ° C for 48 hours, the results can be seen in Table 7.

Table 7. Total Pigments Carotenoids Carotenoid Levels Fruit Campolay In Different Storage Temperature (ug / g))

Storage Time (hours)	Storage Temperature		
	0˚C	10˚C	30˚C
0	208,64 (100%)	208,64 (100%)	208,64 (100%)
48	197,64 (94,73 %)	166,54 (79,82 %)	122,39 (58,66 %)

The data in Table 7 shows that after storage for 48 hours campolay fruit extract carotenoid pigments stored at 0C contain levels of total carotenoids most large compared to storage temperature 10˚C and 30C because the lower the temperature of storage used increasingly can retain more levels of total carotenoids, in accordance with the statement of Rodriguez & Kimura (2009) in the Dawn A, et al (2014), states that to maintain the levels of carotenoids more able to maintain a low temperature as the temperature of storage.

Levels of carotenoid pigments that stored for 48 hours decreased at all temperatures. This was due to the degradation of carotenoids during cold storage and temperature of the space as stated by Rodriguez and Kimura (2009), also states that at the stage of storage at a lower temperature and room temperature, carotenoid pigments are highly perishable.

3.3.3 Fruit Carotenoid Pigment pH stability Campolay In Temperature and Storage Time

The observed data pH stability of carotenoid pigments campolay fruit at a temperature of 0C, 10˚C, and 30C are kept for 48 hours can be seen in table 8.

Table 8. pH value Carotenoid Pigment Fruit Campolay In Temperature and Storage Time

Storage Time (hours)	**Storage Temperature**		
	0˚C	**10˚C**	**30˚C**
0	4,94	4,94	4,94
48	5,16	5,10	4,97

Data in Table 8. The results can be seen that the storage campolay fruit extract carotenoid pigments at a temperature of 30C for 48 hours no significant effect on the pH value campolay fruit extract carotenoid pigments. Unlike the case with fruit carotenoid pigment extracts storage campolay at 0C temperature and the temperature of 10˚C for 48 hours showed an increase of pH value, which is at a temperature of 0C of pH 4.94 becomes 5.16 and at a temperature of 10˚C of 4 , 94 to 5.10. It also occurs in some fruit extracts stored at cold temperatures as stated by Alaka et al., (2003) that the mango fruit extract stored at 5˚C for 2 weeks increased the pH value of as much as 1.

3.3.4 Analysis of Carotenoid Pigment Colors Fruit Campolay

Data from the carotenoid pigment color measurements using the color reader campolay fruit can be seen in Table 9 and Table convert LAB can be seen in Figure 3.

Table 9. Brightness and Carotenoid Pigment Yellowish Fruits Campolay

Selected Sample Code	**Brigh tness (L *)**	**Level Redness (a *)**	**Level Yellowis h (b *)**
p_2m_2	46,71	1,17	12,55

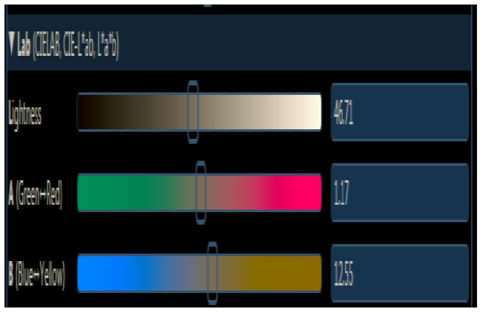

Figure 3. Table Convert LAB Fruit Carotenoid Pigment Campolay

Table 10. Brightness and Carotenoid Pigment Yellowish Fruits Campolay

Selected Sample Code	**Brigh tness (L *)**	**Level Redness (a *)**	**Level Yellowis h (b *)**
p_1m_1	64,88	1,97	11,97

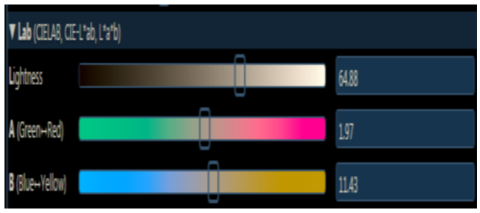

Figure 4. Table Convert LAB Fruit Carotenoid Pigment Campolay

Data in Table 9. seen that campolay fruit by soaking treatment using acetone 80% and macerated for 4 days to produce carotenoid pigments campolay fruit that has a brightness (L *) with a value of 46.71, the level of redness (a *) with value of 1.17, and the degree of yellowness (b *) with a value of 12.55, while the data in Table 10 shows that the campolay fruit by soaking treatment using acetone 65% and macerated for 2 days to produce carotenoid pigments campolay fruit that has the level of brightness (L *) with a value of 64.88, the level of redness (a *) with a value of 1.97, and the degree of yellowness (b *) with a value of 11.43. L value is expressed as the brightness level to a value of 0 for black (dark) and 100 for white (light). Value a * denotes the red color intensity (value +) and green (value -), where the higher the value of a * then the tendency of red color on a product or ingredient is getting stronger. B * value indicates the intensity of the yellow color (value +) and blue (value -), where the higher the value of b *, the tendency of yellow color on a product or ingredient is getting stronger (Pomeranz et al, 1994).

IV. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Based on this research, it can be concluded as follows :

1. Interaction between acetone concentration factor and long maceration time did not affect response to physical and chemical response.
2. The acetone solvent concentration factor significantly affected the total yield of carotenoid pigments campolay fruit, in which the highest total yield of carotenoid pigments of fruits campolay is 20.36% which is soaked with acetone 65%, while the lowest yield total yield of carotenoid pigments of fruits campolay is 14.83% were soaked with acetone 95%.
3. Factors long time maceration significantly affected the total carotenoid content of fruit campolay carotenoid pigments, ie the longer the time of maceration, the total carotenoid content of carotenoid pigments of fruits campolaynya any the less. The highest total carotenoid levels indicated by the length of time maceration for 2 days with a value of 236.468 g / g, while the lowest levels of total carotenoids is indicated by the length of time maceration for 6 days with a value of 151.357 µg/g.
4. Carotenoid with 80% acetone concentration and the duration of maceration 4 days show less stable against temperature high heating is at a temperature of 80C and 100C, steady against low storage temperature is at a temperature of 0C, as well as maintain the pH stable pigment campolay fruit carotenoids at a temperature of 30C and kept for 48 hours. Measurement of the carotenoid pigment color using the color reader campolay fruit produce levels of brightness (L *) with a value of 46.71, the level of redness (a *) with a value of 1.17, and the degree of yellowness (b *) with a value of 12.55.

4.2 Recommendations

Suggestions to convey the author of the need for research on campolay fruit extract carotenoid pigments are applied to processed food. Need further research on extracts of carotenoid pigments of fruits campolay as a natural dye for food.

BIBLIOGRAPHY

AOAC. 1995. *Official Method of Analysisnof The Association of Officoal Agriculture Chemistry*. USA : Washington DC.

Artini, W. (2013). *Uji Fitokimia Etil Asetat Rimpang Bangle*. Retrieved Maret 11, 2016, from Ojs.unud.ac.id.

Fellow, P. (1990). Food *Processing Technology Principles and Practice*. Ellis Horword, New York.

Fennema, O.R. (1976). *Principle of Food Science*. Marcel Dekker Inc. New York.

Manasika, A., & Simon Bambang Widjanarko. (2015). *Ekstraksi Pigmen Karotenoid Labu Kabocha Menggunakan Metode Ultrasonik (Kajian Rasio Bahan : Pelarut dan Lama Ekstraksi)*. Jurusan Teknologi Hasil Pertanian, FTP Universitas Brawijaya. Malang.

Maulida, Dewi., & Naufal Zulkarnaen. (2014). *Ekstraksi Antioksidan (Likopen) Dari Buah Tomat Dengan Menggunakan Campuran n-Heksana, Aseton, dan Etanol*. Jurusan Teknik Kimia, Fakultas Teknik, Universitas Dipenogoro. Semarang.

Octaviandini, Mayang. (2015). *Kajian Perbedaan Konsentrasi Pelarut Etil Asetat Terhadap Karakteristik Ekstrak Zat Warna Dari Sabut Kelapa (Cocos nucifera, L).*Skripsi. Fakultas Teknik-Universitas Pasundan. Bandung.

Pomeranz, S.Y and C.E. Meloand. 1994. *Food Analysis, Theory and Practice*. The AVI Publishing Company Inc. Wesport Connecticut.

Purwanto, Ritaningsih, dan Parasetia. (2012). *Pengambilan Zat Warna Alami Dari*

Kayu Nangka. Jurnal Teknologi Kimia dan Industri, Vol. 1, No. 1 : 502-507.

Rizky. (2012). *Buah Alkesah*. Retrieved Maret 01, 2016, from Rizumablog: http://www.rizumablog.com/2012/buah-alkesah.htm

Shinta, Endro & Anjani P. (2008). *Pengaruh Konsentrasi Alkohol dan Waktu Ekstraksi Terhadap Ekstraksi Tannin dan Natrium Bisulfit dari Kulit Buah Manggis*. Makalah Seminar Nasional Soebardjo Brotohardjono. Surabaya. Hal 31-34.

SNI. (2004). *Prosedur Analisa Derajat Keasaman No : 06-6989.11*. Badan Standardisasi Nasional : Jakarta.

Winarno, F. G. (2006). *Kimia Pangan dan Gizi Edisi Ke 3.* Jakarta: Gramedia Pustaka Utama.

Wulan, Siti Narsito. (2001). *Kemungkinan Pemanfaatan Limbah Kulit Buah Kakao (Theobroma cacao, L) Sebagai Sumber Zat Pewarna (β-karoten)*. Jurnal Teknologi Pertanian, Vol. 2, No, 2 : 22-29.

Zendrato, I. A., Swastawati, F., & Romadhon. (2014). Ekstraksi Klorofil Dan Karotenoid Dengan Konsentrasi Pelarut Yang Berbeda Pada Lamun (Enhalusacoroides) Di Perairan Laut Jawa. *Jurnal Pengolahan dan Bioteknologi Hasil Perikanan Vol.3 No.1* , 30-39.