Andika Putra Setiawan

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Chemical Analysis and Shelf Life Estimation of Rose Flower Tea With Variation of Drying Time

Rofita Eka Damayanti[1], Ara Nugrahayu Nalawati[1*], Andika Putra Setiawan[1]
[1] Universitas Muhammadiyah Jember; aranugrahayu@unmuhjember.ac.id

*Correspondence: Ara Nugrahayu Nalawati
Email: aranugrahayu@unmuhjember.ac.id

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Abstract: Roses from Karangpring Village are a mainstay of Jember Regency and are widely used as sowing flowers. In addition to sowing flowers, roses can also be processed into various processed products such as tea bags, rose jam, candy agar. In making rose tea, the drying process greatly affects the quality and chemical content of the tea. This study aims to determine the effect of temperature variation and drying time on chemical characteristics, organoleptic test, and shelf life of rose flower tea. The materials used were rose flowers, DPPH solution, ethanol, distilled water, amylum solution, ascorbic acid, gallic acid, Na2CO3 7.5%, Follin-Ciocalteu, KCL, HCL, acetic acid, sodium acetate, AlCl3, quercetin. The main tools used in this study are measuring flask, centrifuge, micro pipette, erlenmeyer, UV-VIS spectrophotometer, oven, cup, balance, vortex tube, test tube. Based on SNI dry tea in packaging 3836: 2013 polyphenol content in tea products has a minimum value of 5.2% and a maximum value of water content of 8.0%, thus the polyphenol content and water content of rose flower tea are included in the category set by SNI dry tea in packaging. The highest water content value was found in the P3 treatment of 0.940%, antioxidant content value of 39.181%, polyphenol content of 32.312 mg GAE/g, anthocyanin content value of 4.713%, vitamin C content value of 29.371%, flavonoid content value of 42.521 mg QE/g. The results of the organoleptic test showed that panelists gave scores to treatment P2 with a drying temperature and time of 60oC for 5 hours, and had a shelf life of 17 days.

Keywords: Rose Flower, Drying, Tea Chemical Characteristics, Shelf Life

INTRODUCTION

The wealth of tropical flowers in Indonesia that can be consumed has become part of the archipelago's culinary, traditionally used as medicine, as a natural colorant for food and beverages, and research results show that these flowers can be functional food and beverage ingredients because they contain antioxidant compounds. Karangpring Village is the largest rose producing village in Jember, administratively roses from Karangpring Village are a mainstay for Jember Regency and are widely used as sow flowers. In addition to sowing flowers, roses can also be processed into various processed products such as tea bags, rose jam, candy agar. According to Aggraito's research (2018) the red color pigment in rose flowers is part of the anthocyanin group flavonoid compounds, namely peanidin which has benefits as a free radical capture material or antioxidant substance, functional for body health. According to the Central Bureau of Statistics (BPS) the production of rose flower crops in 2023 in Jember Regency, which is 607,721. Especially in Sukorambi District, the production of rose plants according to the Central Bureau of Statistics (BPS) 2023 is 504,750. Based on the results of the study, it is known that flavonoids are secondary metabolites that act as exogenous antioxidants (Hu et al, 2013). To utilize the compound content contained in the rose flower, it is necessary to process the rose flower into a processed rose tea product that has its own characteristics. In making rose tea, the drying process greatly affects the quality and chemical content of the tea. The production process of rose tea is not much different

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from making tea in general. To maintain good quality tea, there are several factors that affect the shelf life of tea, one of which is the drying process time and length of storage. Food storage is done so that it has a long shelf life by preventing the spoilage of the food (Sari et al, 2017). In making a product, shelf life is one of the parameters that must be present in food product packaging. The purpose of this study was to determine the effect of variations in temperature and drying time on chemical characteristics, shelf life, and organoleptic tests of rose flower tea.

METHOD

Time and Place

Research on chemical analysis and shelf life estimation of rose flower tea with variations in temperature and drying time is located at the Agricultural Industrial Technology Laboratory of Muhammadiyah University of Jember, and will be carried out from March 2024 to June 2024.

Tools and materials

The main material used is rose flowers. Materials used for testing are DPPH solution, ethanol, distilled water, amylum solution, ascorbic acid, gallic acid, Na2CO3 7.5%, Follin-Ciocalteu, KCL, HCL, acetic acid, sodium acetate, AlCl3, quercetin. The main tools used in this study are measuring flask, centrifuge, micro pipette, erlenmeyer, UV-VIS spectrophotometer, oven, cup, balance, vortex tube, test tube.

Methods

Red rose flower tea drink using rose flower crown samples with the following treatment variations:

Table 1 Variations of Drying Treatments

Description	Temperature (T)	Time (t)
P1	60°C	4 hours
P2	60°C	5 hours
P3	65°C	4 hours
P4	65°C	5 hours
P5	70°C	4 hours
P6	70°C	5 hours

Each treatment was carried out as many as 3 replicates. Using a completely randomized design (CRD).

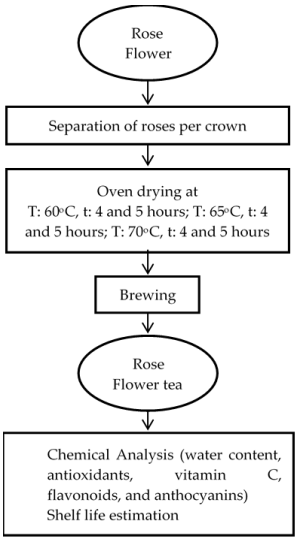

Figure 1 Research Stages

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Observations and Data Analysis

Organoleptic Test

The number of panelists used was 30 people. the sample presented was rose flower tea with 6 treatments. Panelists were asked to taste and evaluate rose flower tea samples based on their sensory attributes, namely level of liking, color, and aroma. the assessment is expressed by numbers, ranging from 1 (very dislike), 2 (dislike), 3 (slightly like), 4 (like), 5 (very like).

Antioxidant Test

Antioxidant testing is done using the DPPH method. Analysis of antioxidant testing DPPH method is done by looking at the color changes of each sample after incubation with DPPH. If all DPPH electrons pair with electrons in the extract sample then there is a change.

$$\% \text{ Antioxidant Activity} = \frac{\text{Absorbance of blank} - \text{Absorbance of sample}}{\text{Absorbance of blank}} x\ 100\%$$

Moisture Content Test

Determination of moisture content is based on the difference in sample weight before and after drying. The percentage of water content obtained is then calculated using the following formula:

$$\text{Moisture content (\%)} = \frac{a-b}{a} \text{ x } 100\%$$

Description:
a : Initial Sample Weight (g)
b : Final Sample Weight (g)

Vitamin C Test

The analysis of vitamin C content in this study begins with the determination of the maximum wavelength using ascorbate solution at a wavelength of 300-400 nm. Determination of vitamin C content is done by inserting the sample solution into the cuvette and then inserted into the UV-Vis spectrophotometer with the maximum wavelength that has been determined. Then the level is calculated using the equation:

$y = bx + a$

With:

y: absorbance value

x: vitamin C content

a,b: concentration of ascorbate solution

Flavonoid Test

Samples will be analyzed for flavonoid content by observing the changes that occur under UV light 415 nm and see the wavelength or frequency opposite the intensity of absorption (absorbance) which shows the

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results of flavonoid analysis on the use of UV-Vis Spectrophotometer. The flavonoids analyzed can be calculated using the flavonoid content calculation formula:

y = ax + b

With:

y: absorbance value

x: flavonoid content

a,b: concentration of quercetin standard solution

Anthocyanin Test

Anthocyanin analysis in this study used a Spectrophotometer tool with the Differential pH method or pH difference. the pH used is pH 1.0 and pH 4.5. at pH 1.0 anthocyanins are in the form of oxonium compounds and at pH 4.5 are colorless carbinol. Then the absorbance of each solution was measured using a UV-VIS Spectrophotometer with wavelengths of 510 nm and 700 nm. The absorbance of the reconstituted sample (A) is stopped by the formula:

$A = (A_{510} - A_{700})_{pH\ 1,0} - (A_{510} - A_{700})_{pH\ 4,5}$

$$\%\ \text{Total anthocyanin} = \frac{\text{absorbance}}{\varepsilon \times L} \times MW \times \frac{Vd}{Wt} \times \frac{1}{1000} \times 100\%$$

Description:

Ɛ : Molecular absorptivity of cyanidin 3 glucose = 26900 L (mol.cm)

L : Width of cuvette = 1 cm

MW: Molecular weight of cyanidin 3 glucose = 449.29/mol

Vd: Final volume or volume of pigment extract

Wt: Weight of starting material

Polyphenol Test

Determination of the maximum wavelength using gallic acid solution at a wavelength of 500-850 nm using a UV-Vis Spectrophotometer. Then the absorbance was measured with the maximum wavelength. A total of 0.1 ml of sample solution was included in the cuvette coupled with 1 ml of Follin-Ciocalteu reagent plus 0.8 ml of Na2CO3, The linear regression equation of the gallic acid calibration curve was used to calculate total polyphenols. The linear regression equation of the gallic acid calibration curve was used to calculate total polyphenols.

y = ax + b

With:

y: absorbance value

x: flavonoid content

a,b: concentration of gallic acid standard solution

Shelf Life Estimation

Estimation of shelf life in this study uses the Accelerated Shelf Life Test (ASLT) method with the Arrhenius model. With the Arrhenius equation obtained, the Arrhenius constant value can be calculated with each

storage temperature. The parameter that has the lowest activation energy value is the key parameter. Furthermore, the shelf life is calculated using the reaction equation based on In k (1/T). The value of k obtained is entered in the reaction order equation to obtain the shelf life.

Data Analysis

Observation data were analyzed using Analysis of Variance (ANOVA). ANOVA test is a special form of statistical analysis that is widely used in experimental research. If it has a significant effect, it is continued with the Duncam Test or Duncam Multiple Range Test (DMRT) at the 5% level.

RESULTS AND DISCUSSION

Table 2 Average value of rose flower tea chemical test

Parameter	Unit	Average Result
Moisture content	%	0,929
Polyphenols	mg GAE/g	32,312
Antioxidant	%	39,181
Anthocyanin	%	4,713
Flavonoids	mg QE/g	42,521
Vitamin C	mg/100g	1,546

Water Content

(a)

(b)

Figure 2. Fresh Rose Flower (a); Dried Rose Flower (b)

Table 1 shows that the treatment of temperature and drying time 70oC for 5 hours was able to reduce the highest water content of 0.929%. The results of the ANOVA test analysis showed a significant effect of temperature variations and length of drying time on the water content of rose flower tea. Where f count < f table (0.466 < 3.105), and p value = 0.793 > α = 0.05. This shows that the higher the drying temperature and the longer the drying time, the lower the moisture content obtained, these results are in accordance with the research of Yuliani (2013) that the higher the temperature during heating used, the moisture content contained in the material will decrease. Based on SNI dry tea in packaging 3836: 2013 water content in tea products has a maximum value of 8.0%, thus the water content of rose flower tea is included in the category set by SNI 3836: 2013.

Polyphenols

The results of the Analysis of Variance (ANOVA) test showed that the temperature and drying time greatly influenced the polyphenol content of rose flower tea. Where f count > f table (5967.167 > 3.105), and p value = 6.188 > α = 0.05. There is a further test of DMRT 5% to determine the difference. The highest total

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polyphenols can be seen in Table 1, which is found in the 60ºC temperature treatment with a drying time of 5 hours, which produces total polyphenols of 32.312 mg GAE/g. Drying time greatly affects the decrease in polyphenol content because long drying time can destroy phenol compounds in cell components so that extraction of phenol compounds becomes difficult (Jahangiri et al., 2011). Based on SNI dry tea in packaging 3836: 2013 polyphenol content in tea products has a minimum value of 5.2%, thus the polyphenol content of rose flower tea is included in the category set by SNI dry tea in packaging.

Vitamin C

Analysis of Variance (ANOVA) test results show that temperature and drying time affect the vitamin C content of rose flower tea. Where f count > f table (9638.14 > 3.105), and p value = 3.49 > α = 0.05. Vitamin C content can be seen in table 1, the highest vitamin C content of rose flower tea is found in the treatment of 60ºC temperature with 4 hours drying time, which produces vitamin C content of 1.546 mg/100g. According to Mukaromah et al (2010) vitamin C is damaged by oxidation, especially at high temperatures and this vitamin is lost during processing and storage.

Antioxidant Test

The results of the Analysis of Variance (ANOVA) test showed that temperature and drying time had a significant effect on the antioxidant activity of rose flower tea. Where f count> f table (1288.069> 3.105), and p value = 6.05 > α = 0.05. Then continued the DMRT test at the 5% level to prove the existence of a very real influence. antioxidant activity in rose flower tea showed the highest results in treatment P6 with temperature and drying time 70ºC for 5 hours with a result of 39.181%. According to Wijana (2014), drying time affects the antioxidant activity the longer the drying time, the antioxidant activity will also decrease. In line with research conducted by Dewi et al (20170 stated that antioxidant activity will decrease if the drying temperature is too high.

Anthocyanins

Analysis of Variance (ANOVA) test results showed the effect of temperature variation and drying time on anthocyanin content of rose flower tea. Where f count < f table (2.204 < 0.105), and p value = 0.121 > α = 0.05. 70ºC temperature drying treatment with a drying time of 5 hours produces the highest total anthocyanin content of 6.111%. According to Martini et al., (2020) the anthocyanins of telang flower tea that the more the drying temperature increases, the smaller the anthocyanins. According to Andarwulan's research (2012), heat is able to degrade anthocyanin pigments and assist chalcones in these changes. Changes in the stability and durability of anthocyanin dyes result in anthocyanin damage caused by high temperatures.

Flavonoid Test

Analysis of Variance (ANOVA) test results showed the effect of temperature variation and drying time on flavonoid content of rose flower tea. Where f count > f table (10.104 > 3.105), and p value = 0.0005 < α = 0.05. Based on the research data in table 1 above, it is known that the 60ºC temperature drying treatment with a duration of 4 hours produces the highest total flavonoid content of 42.521 mg QE/g. The loss of flavonoids was found to be less in air drying than conventional drying. heating may break down some phytochemicals that affect cell wall integrity and cause migration of some flavonoid components (Martini et al, 2020).

Organoleptic test

Table 3 Average Value of Organoleptic Test of Rose Flower Tea

Sample	Color	fragrance	flavor	favorite
P1 (60ºC 4 jam)	17	9	10	14
P2 (60ºC 5 jam)	15	14	13	14
P3 (65ºC 4 jam)	11	11	11	15
P4 (65ºC 5 jam)	17	14	11	11
P5 (70ºC 4 jam)	17	15	13	14
P6 (70ºC 5 jam)	12	8	13	14

Based on the average value of the organoleptic test in table 3, it shows that panelists like the color of rose flower tea in the P1, P2, P4 and P5 treatments compared to P3 and P6, this is because in the P3, P6 treatment the color of rose flower tea is less attractive to the panelists. According to Fitrayana (2014) states that the higher the drying temperature used can cause a decrease in the natural color of the herbs produced, this is due to the drying process which damages colors such as chlorophyll in the leaves. The level of panelists' liking for the aroma of rose flower tea which is much liked is in the P2, P4, and P5 treatments. The role of the aroma of a product is very important will determine consumer acceptance of the product. Aroma also determines the delicacy of a food product, as well as taste which consists of three components, namely odor, taste, and oral stimulation. Taste can be assessed by chemical responses by the taste buds. panelists chose the category of slightly like the rose flower tea found in the P2, P5, P6 treatment with a score of 13 compared to the P3, P5, P6 treatment in the like category. Drying can affect the level of panelists' liking for the taste of tea. The taste of food is one of the important parameters that affect consumer acceptance of a food product. Overall acceptance or overall liking of rose flower tea is influenced by several factors such as color, aroma, and taste so that this overall acceptance is the result of several assessments that aim to see the panelists' overall liking for rose flower tea brewing. Based on table 3, it shows that the overall level of liking with the category of liking is found in the P4 and P5 treatments with a value of 14, while those that are slightly liked are in the P2, P3, P5, P6 treatments. So that from the overall treatment has a color, aroma, taste that can still be accepted by all panelists, namely in the P2 treatment with a temperature and drying time of 60oC for 5 hours.

Shelf Life

Table 4 Estimation of shelf life of rose flower tea

Sampel	Suhu	Ko	Umur simpan
P1	14ºC	1,0005	17,63067
	30ºC		17,63064
P2	14ºC	1,0005	17,63066
	30ºC		17,63063
P3	14ºC	1,001501	17,63065
	30ºC		17,63063
P4	14ºC	1,00002	17,63066
	30ºC		17,63062
P5	14ºC	1,00002	17,63066
	30ºC		17,63062
P6	14ºC	1,00004	17,63067
	30ºC		17,63064

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The results of the analysis of the estimated shelf life of rose flower tea in table 4 show that all treatments have the same shelf life of 17 days. Arrhenius method where the use of extreme temperatures is intended to accelerate the reaction of damage to the product so that the shelf life of the product can be simulated. A factor that greatly affects the decline in the quality of food products is the change in water content in the product. Water activity is closely related to water content which is generally depicted as an isothermic curve, as well as the growth of bacteria, fungi and other microbes.

CONCLUSION

Based on the results of research on the manufacture of rose flower tea on the effect of temperature and drying time, it can be concluded that temperature and drying time affect the total value of water content, anthocyanins, vitamin C, flavonoids, and greatly affect the total value of antioxidant activity content and polyphenols. The highest average value of total water content in rose flower tea is found in the P3 treatment which is 0.929%, the highest anthocyanin content value is found in the P1 treatment which is 4.713%, the average value of total vitamin C is high in the P1 treatment which is 1.546 mg/100g. The high flavonoid content value was found in the P1 treatment at 42.521 mg QE/g. The highest antioxidant activity value was found in the P6 treatment, which was 39.181%. The highest polyphenol content value was found in the P1 treatment, which was 32.312 mg GAE/g. The results of organoleptic tests on each attribute of taste, aroma, color, and liking showed that the panelists gave scores to the P2 treatment, namely with a temperature and drying time of 60oC for 5 hours. The shelf life of rose flower tea using the ASLT Arhenius method at 14oC and 30oC is estimated to have a shelf life of 17 days.

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