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DETERMINATION OF PHENOL CONTENT AND PHYSICAL TEST OF COMBINED JAMU POWDERRED GINGER (Zingiber officinale Rosc. var. rubrum), KENCUR (Kaempferia galanga L.) AND TURMERIC (Curcuma domestica Val.)

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Abstract: Powdered herbs are in the form of fine grains ground from sifted simplicia, blended with different compositions adjusted to the function and benefits of the herb, powdered herbs are consumed by brewing with warm water. This study was to determine the organoleptic physique, pH, moisture content, weight uniformity, and phenol content of herbal medicine powder in combination with red ginger (Zingiber officinale Rosc. var. rubrum), kencur (Kaempferia galanga L.) and turmeric (Curcuma domestica Val.). The method used to measure pH was using a pH meter, the moisture content using the gravimetric method, the phenol level using the foline ciocalteau method with the standard standard of gallic acid. The organoleptic results of herbal powder are in the form of powder, the taste in composition 1 is a bit bitter, in composition 2 the typical bitterness of turmeric is a little spicy, and in composition 3 it is a bit bitter. The pH results of composition 1, 2 and 3 were 5.954, 6.088 and 6.105. The results of the moisture content of composition 1, 2 and 3 were 8.1639, 6.8732 and 8.1042 respectively. The result of the uniformity of the weight of the second composition is 15% red ginger, 40% kencur, 45% turmeric.

Keywords: Herbal Powder, Physical Test, Phenol Content

INTRODUCTION

The Indonesian people are required to be able to coexist with Covid-19. The community is expected to be able to carry out their daily routines by implementing new adaptations through health protocols that have been set by the government. The public is also encouraged to consume vitamins and herbal supplements, such as empon-empon (Sulistyaningrum, 2021). Empon-empon does not only function to treat diseases. However, empon-empon also functions to maintain health and increase immunity (Hamid et al., 2020). Empon-empon are types of plants that can be used as traditional herbal medicine. The easiest empons to find include red ginger, kencur and turmeric (Sulistyaningrum, 2021).

Red ginger (Zingiber officinale var. rubrum) is one of the superior types of ginger rhizome plants in Indonesia. This type of red ginger is widely used as a raw material for traditional medicines. Secondary metabolite compounds contained in red ginger are a class of bioactive compounds, namely antimicrobials, phenols, flavonoids, terpenoids, and essential oils that can inhibit microbial growth (Ulum et al., 2020). Red ginger has several other pharmacological activities such as; lowering hepatoprotectors, lowering cholesterol levels, aprodication, cardiovascular prevention and diabetes in the elderly (Putra, 2020).

Kencur (Kaempferia galanga L.) is one of the Indonesian plants that has medicinal properties. Herbal ingredients that have medicinal properties are considered safer, more effective, and have fewer side effects compared to chemicals. There are compounds contained in the isolated clamp including Ethyl Cinnamate 65.98%, Ethyl p-methoxycinnamate 23.65%, (+)-3-Carene 2.42%, Beta-Pinene 2.09%, Camphene 1.67%, Hexadecane 1.61%m, Alpha-Pinene 0.71 %, Myrcene 0.50%, I-Limonene 0.37%. Some studies have shown that activities such as antifungal, anti-inflammatory, and antibacterial. This proves that herbal plants such as kencur have various benefits (Soleh and Megantara, 2019).

The turmeric plant has traditionally been widely used as a medicinal plant for a long time. India and China use the turmeric plant to treat biliary diseases, colds, coughs, diabetes, rheumatism, sinusitis, skin diseases, parasitic infections, inflammation, and biliary disorders. The results of the study showed that there were 49 active compounds found in turmeric rhizome powder, curcumin was the highest concentration compared to other compounds, which was 7.798%. Meanwhile, compounds that have the potential to be antioxidants based on in silico analysis were obtained 11 compounds, namely Ascorbic acid, Quercetin, β Carotene, Arabinose, Bis Demethoxycurcumin, Demethoxycurcumin, Caffeic acid, Cinnamic acid, Letestuianin A and Calebin A (Suprihatin et al. al., 2020).

The development of the times causes society to demand everything that is fast-paced and practical. People in terms of food, tend to prefer food products in instant form. Instant food products are a type of food product that is easy to serve or consume in a relatively short time, such as instant powder drinks. The raw material for powdered drinks can come from plant parts such as fruits, skins, leaves or stems. The use of herbal plants as raw materials in the manufacture of instant powder drinks aims to have benefits for body health in addition to the convenience of presentation (Permata and Sayuti, 2016).

Powdered herbal medicine is in the form of fine grains from sifted and blended simplicia whose composition is different according to the function and benefits of the herb, which is consumed by brewing with warm water (Shofiah, 2011). Ginger, turmeric and kencur rhizomes contain functional components, especially phenols (Dwiyanti et al., 2019). Phenolic compounds are the largest group of compounds that act as natural antioxidants in plants. Phenolic compounds have one or more (phenol) (polyphenol) phenol rings, which are hydroxy groups that are bound to aromatic rings so that they are easily oxidized by donating hydrogen atoms to free radicals. The ability to form stable phenoxy radicals in oxidation reactions makes phenolic compounds very potential as antioxidants. Natural phenolic compounds are generally in the form of polyphenols that form ether, ester, or glycoside compounds, including flavonoids, tannins, tocopherols, coumarins, lignin, cinnamic acid derivatives, and polyfunctional organic acids (Dhurhania and Novianto, 2018). Phenolic compounds have one or more (phenol) (polyphenol) phenol rings, which are hydroxy groups that are bound to aromatic rings so that they are easily oxidized by donating hydrogen atoms to free radicals. The ability to form stable phenoxy radicals in oxidation reactions makes phenolic compounds very potential as antioxidants. Natural phenolic compounds are generally in the form of polyphenols that form ether, ester, or glycoside compounds, including flavonoids, tannins, tocopherols, coumarins, lignin, cinnamic acid derivatives, and polyfunctional organic acids (Dhurhania and Novianto, 2018).

Physical stability tests are carried out to ensure that the preparation has the same properties after the preparation is made and still meets the criteria parameters during storage (Sayuti, 2015). According to the Regulation of the Food and Drug Supervisory Agency (2019) the moisture content of simplicia powder is < 10% and the results of several studies show that the optimum pH that can produce a good product is around 6.7-6.8 (Afifah et al ., 2011). According to BPOM (2019), out of 10 primary packages, there are no more than 2 packages, each of which deviates from the table and not a single package whose content weight deviates twice. So, it is necessary to have organoleptic, pH, weight uniformity and moisture content tests to determine the physical nature of herbal powder.

The background of this study is the many health benefits of ginger, kencur and turmeric that can be used for the body. Based on the above background, the researcher is interested in combining red ginger, kencur and turmeric to make herbal powder drinks, then the determination of phenol levels and physical tests of the combination of red ginger (Zingiber officinale Rosc. var. rubrum), kencur (Kaempferia galanga L.) and turmeric (Curcuma domestica Val.) were carried out. The method used to determine the phenol level is the Uv-Vis spectrophotometry method. The measurement of total phenol was used by the Folin-Ciocalteu method which is based on the reducing power of the hydroxy phenol group using the gallic acid standard. Galic acid was chosen because it is a pure and stable substance. All phenols including simple phenols can react with Folin-Ciocalteu reagents even though they are not effective radical scavengers. The presence of an aromatic nucleus in phenolic compounds can reduce phosphotungstate phospholipids to molybdenum tungsten (Senet et al., 2018). In previous studies with variations in rhizome extract concentrations of 10%, 15% and 20% (ginger, kencur and turmeric), turmeric had a higher total phenol level than ginger and kencur drinks (Dwiyanti et al., 2019). The advantages of the Uv-Vis single-beam spectrophotometer instrument are simple, cheap, and reduce the existing costs are real advantages (Suhartati, 2017).

METHODS

The variables used in the study are single variables. This study used a single variable, namely to determine the phenol and physical levels of herbal powder in combination with red ginger (Zingiber officinale Rosc. var. rubrum), kencur (Kaempferia galanga L.) and turmeric (Curcuma domestica Val.).

1. Research materials

   The materials used in this study are: fresh red ginger, fresh kencur, fresh turmeric, distilled water, methanol pa, gallic acid, folin-ciocalteu reagent, Na2CO3 7%, ethanol 96%, pH buffer solution

2. Research tools

The tools used in this study are: drying oven (CAPP), knife, stele, analytical scale (Labex), porcelain cup, watch glass, weighing paper, Erlenmeyer, measuring cup (Herma), measuring flask (Pyrex), filter paper, glass funnel, clamping rod, UV-Vis spectrophotometer (Raptor), dropper, micropipette, glass beaker (Herma), pH meter (CAPP), grinding machine (Fomax), mesh sieve 40, clip packaging.

This research stage is:

A. Preparation of raw materials

a) Wet sorting
   It is done to separate dirt or other foreign substances from plants before washing by removing unnecessary parts before drying, so that herbs that are suitable for use are obtained. This method can be done manually (Wahyuni et al., 2014).
b) Washing
   It is done to remove soil and other impurities attached to plants. Washing is carried out with clean water, for example water from springs, well water or PAM water. Washing is carried out as briefly as possible so as not to remove the effective substances from the plant (Wahyuni et al., 2014).
c) Size reduction
   A good chopping thickness for simplicia is 3 mm (Widyanti et al., 2021).
d) Drying
   The manufacture of simplicia with drying techniques uses an oven at a temperature of 50o C for 24 hours. Simplicia of red ginger, kencur and turmeric is made by thinly slicing and drying in the oven at a temperature of 50o C (Wirasti et al., 2021).

B. Herbal medicine processing

a) Milling
   The results obtained from drying are ground using a grinding machine until they form powder.
b) Shifting
   The powder obtained was sieve using a 40 mesh sieve (Wirasti et al., 2021).
c) Mixing
   Dry materials (simplisia) are equivalent to 40%-60% of fresh materials (Moeloek, 2017). Each ingredient is mixed with their

respective formulations as follows: Table 3.2 Powder Composition Jamu

Material	Composition 1	Composition 2	Composition 3
Red ginger	15%	15%	15%
Aromatic ginger	45%	40%	42.5%
Turmeric	40%	45%	42.5%

C. Physical testing of herbal powder

a) Organoleptic Test
Observations of herbal medicine powder were carried out regarding shape, taste, smell and color (BPOM, 2019).

b) Test pH
Measurement of pH using a pH meter. Carefully weigh approximately 7 g of herbal powder dissolved in 100 ml of water. The pH meter is calibrated by dipping it in a pH 7 buffer solution, then rinsing with distilled water. The pH meter is dipped in the sample, left for a few moments and the results can be seen from the numbers displayed on the screen (Sayuti, 2014).

c) Water content
Carefully weigh approximately 7 g of herbal powder, put it in a container that has been placed. Dry at 105o C for 5 hours, and weigh. Continue drying and weighing at 1 hour intervals until the difference between two consecutive weighings is no more than 0.25% (Modification of the Indonesian Ministry of Health, 2017).

d) Weight uniformity
Carefully weigh the contents of 20 randomly selected packages, determine the average weight of the contents of each package compared to the average weight of the contents of each package, not one more than 10% and no more than 2 packages more than 5% (BPOM, 2012).

D. Determination of Phenol Levels (Modification of Pratama et al., 2018)

1) Preparation of Reagents
Na2CO3 7% Weighed 3.5 g of Na2CO3 then dissolved in sterile distilled water to make 50 ml.

2) Making Sample Solutions
Weigh 10 mg of the sample then dissolve it in 10 ml of warm water.

3) Preparation of Gallic Acid Standard Solution
A standard solution of 1000 ppm gallic acid was prepared by weighing 10 mg of gallic acid dissolved in methanol to a volume of 10 ml. From the stock solution, 1 ml was pipetted and diluted with methanol pa to a volume of 10 ml to produce a concentration of 100 ppm, then from the standard solution of 100 ppm gallic acid, 0.8;1.2; 1.6; 2; 2.4 ml is dissolved in methanol pa up to 10 ml, then concentrations of 8, 12, 16, 20 and 24 ppm are obtained.

4) Measurement of Gallic Acid Standard Solution
Standard solutions of each concentration of 8, 12, 16, 20 and 24 ppm are put into a test tube, added with 0.4 ml of Folin-Ciocalteau reagent, shaken and left for 4-8 minutes, add 4.0 ml of 7% Na2CO3 solution, shake until homogeneous . Add sterile distilled water up to 10 ml and let sit for 2 hours at room temperature.

5) Determination of Maximum Wavelength
Put the 16 ppm standard solution into a test tube, add 0.4 ml of Folin-Ciocalteau reagent, shake and leave for 4-8 minutes, add 4.0 ml of 7% Na2CO3 solution, shake until homogeneous. Add sterile distilled water up to 10 ml and leave for 2 hours at room temperature, then measure the absorbance at a wavelength of 600-800 nm.

6) Measurement of Gallic Acid

Standard Solution

For eachconcentrations of 8, 12, 16, 20 and 24 ppm were added with 0.4 ml of Folin-Ciocalteau reagent, shaken and left for 4-8 minutes, add 4.0 ml of 7% Na2CO3 solution, shake until homogeneous. Add sterile distilled water up to 10 ml and let sit for 2 hours at room temperature.

7) Determination of Total Phenolic Content of Herbal Powder

Pipette 0.5 ml of the herbal powder solution. Add 0.4 ml of Folin-Ciocalteau reagent, shake and leave for 4-8 minutes, add 4.0 ml of 7% Na2CO3 solution, shake until homogeneous. Add distilled water up to 10 ml and leave for 2 hours at room temperature. Repeat 3 times so that the phenol levels obtained are expressed as mg gallic acid equivalent/g extract.

RESULTS AND DISCUSSION

1) Herbal Powder Results

The wet weight of the research materials is red ginger 735 grams, galangal 530 grams, and turmeric 580 grams. The dry weight after oven was red ginger 161.1566 grams, galangal 71.3739 grams and turmeric 69.446 grams.

The powder is made by preparing the raw materials in the stages of wet sorting, washing, reducing the size by 3 mm, and drying using an oven at a temperature of 50o C for 24 hours. A drying temperature of 50o C is the best treatment (Khatulistiwa, et al., 2020). Processing of herbal medicine powder is done by grinding the dried red ginger, turmeric and galangal, then sifting using a 40 mesh sieve.

2) Organoleptic Test Results

Organoleptic tests are carried out to determine the shape, taste, smell and color of the composition that has been made. The following are the organoleptic results of herbal powder combined with red ginger, galangal and turmeric with compositions 1,2 and 3:

Table 4.2 Organoleptic Test Results

Information	K1	K2	K3
Form	Powder	Powder	Powder
Flavor	A bit bitter	The typical bitterness of turmeric is slightly spicy	A bit bitter
Smell	The distinctive smell of kencur is more prominent	The distinctive smell of turmeric is more prominent	The distinctive smell of turmeric and kencur is more prominent
Color	Yellow	Orange	Yellowish Orange

Information :
K1 = Composition 1
K2 = Composition 2
K3 = Composition 3

The results obtained from research on the herbal powder test parameters, namely shape, color, smell and taste in Table 4.2, were normal and typical according to the ingredients used (BSN, 1996).

3) pH Test Results

The pH test of herbal medicine powder is carried out to determine the acid or alkaline pH of the herbal medicine powder. From the pH test results obtained from compositions 1, 2 and 3 are:

Table 4.3 pH Test Results

Composition	Results	SD
1	5,954	0.016
2	6,088	0.010
3	6,105	0.008

The pH test results on the combined herbal medicine powder are acidic. According to Afifah, et al. (2011), the pH test obtained must be acidic (pH 6 - 6.8) because it affects the taste quality of the powder, this proves that the pH of herbal medicine powder meets the standard (acid). The more acidic a solution is, the lower the degree of acidity or pH. Apart from that, pH is related to the survival of microbes. In general, the lower the pH, the longer the food will last because spoilage microbes cannot grow (Yohana, 2019).

4) Water Content Test Results

Water content tests are carried out to determine the quality and resistance of food to damage that may occur (Daud et al., 2019). The following are the results of the water content test for herbal medicine powder from a combination of red ginger, galangal and turmeric, compositions 1,2 and 3:

Table 4.4 Water Content Test Results

Composition	Water content (%)	SD	Standard < 10 BPOM
1	8.1639	0.660	Fulfil
2	6.8732	0.224	Fulfil
3	8.1042	0.445	Fulfil

The water content test results meet BPOM (2019) requirements, namely < 10. The drying temperature used is 105o C for 5 hours. At a temperature of 105o C water will evaporate and compounds that have a lower boiling point than water will also evaporate (BPOM, 2000). The results of drying for 5 hours are weighed and continued drying for 1 hour until the difference between two consecutive weighings is no more than 0.25% with the aim of obtaining constant results. Low water content can extend shelf life, because low water content can limit microbial growth and chemical reactions (Amanto, et al., 2015).

5) Weight Uniformity Test Results

The weight uniformity test is carried out to ensure that the weight of the powder is uniform. The following are the results of the weight uniformity test obtained:

Table 4.5 Weight Uniformity Test Results

Comp.	Weight (g)	Test results (%)	BPOM standards ±5% (2019)
1	7,002	0,000	
2	7,003	0,000	Fulfil
3	7,002	0,000	

According to BPOM 2019, the weight uniformity of herbal medicine powder is +5%. The weight uniformity in this study is in accordance with the standard, namely +5%. The weight uniformity test results prove that herbal medicine powder is a powder that is easy to divide

Because owngood weight uniformity, because the powder has a very high level of fineness, has a low water content so it is not damp and makes the powder easy to divide (Dewi and Lestari, 2016).

6) Results of Phenol Content of Herbal Powder

Measurement Long The maximum

wave is carried out in the wavelength range 716-730 nm. The results of measuring the maximum wavelength of gallic acid were obtained at a wavelength of 722 nm with an absorbance of 0.342. Calibration curve measurements were made with various concentrations of gallic acid, namely 8, 16, 20, 24, and 26 ppm. The linear regression results obtained for gallic acid are y = 0.026x + 0.2612 and the value
$R^2 = 0.9925$.

Table 4.6 Phenol Content Results Combination Herbal Powder

Composition	Rate	SD
1	0.2326	0.0096
2	0.2889	0.0054
3	0.1815	0.0028

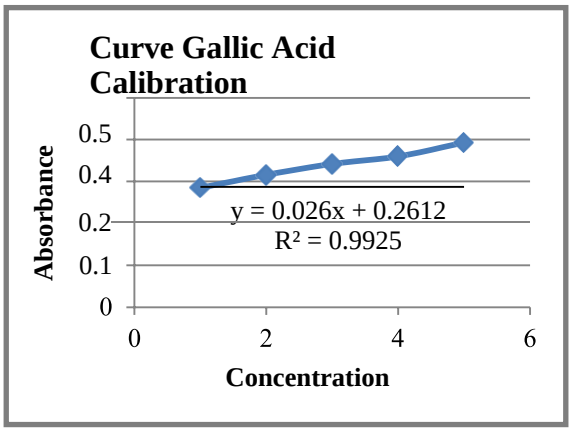

Figure 4.1 Gallic Acid Calibration Curve

The reaction results of the sample and the Folin Ciocalteau reagent produced a blue color indicating that it contained phenol, after that it was added with a 7% Na2CO3 solution to provide an alkaline atmosphere, because Folin Ciocalteau only reacts in an alkaline atmosphere (in an alkaline atmosphere Folin Ciocalteau experiences bathochrome or a shift in wavelength to a different wavelength maximum) so that 7% Na2CO3 is added to create an alkaline atmosphere (Folin Ciocalteau is acidic when added to the sample/extract) (Sam, et al., 2016), then dilution is carried out by adding sterile distilled water to the mark. According to Dwiyanti, et al. (2019) turmeric extract drinks have higher total phenol levels than ginger and galangal drinks, so the research results obtained show the same results as the research of Dwiyanti, et al. (2019).

CONCLUSION

1. The organoleptic results of the herbal powder combined with red ginger, galangal and turmeric are that composition 1 has organoleptic properties, namely a slightly bitter taste, the distinctive smell of kencur is more prominent and the color is yellow, composition 2 has organoleptic properties, namely the characteristic bitterness of turmeric is more prominent and the color is orange, composition 3 has the properties organoleptic, namely the taste is slightly bitter, the distinctive smell of turmeric and galangal is more prominent and the color is yellowish orange.
2. The pH test results for herbal medicine powder from a combination of red ginger, galangal and turmeric, namely Composition 1 5.954, Composition 2 = 6.088, and Composition 3 = 6.105, meet the requirements.
3. The results of the water content of herbal medicine powder from a combination of red ginger, galangal and turmeric are Composition 1 = 8.1639, Composition 2 = 6.8732, and Composition 3 = 8.1042 meets the requirements.
4. The results of the uniformity of the weight of herbal powder from a combination of red ginger, galangal and

turmeric, namely compositions 1, 2 and 3, namely 0.000%, meet the requirements.

5. The phenol content of herbal medicine powder from a combination of red ginger, galangal and turmeric is K1 = 0.2326, K2 = 0.2889, and K3 = 0.1815.

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