Biochemical and organoleptic analysis of zicurma herbal medicine towards mass production

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Abstract. Zicurma herbal medicine has been prepared from a mixture of Zingiber officinale, Curcuma xanthorrhiza, and Curcuma domestica. One of the conditions for mass production of Zicurma herbal medicine is the consistency of the active ingredients and additives. This study aims to analyze the continuity of the chemical content and analysis of people's preference for the Zicurma herbal medicine. This type of qualitative descriptive research. Chemical analysis focused on flavonoid content, antioxidant activity and was complemented by the viscosity. The preference test is focused on the aspects of the product's physical appearance, packaging and taste. The number of respondents was 30 people. Flavonoid analysis results ranged from 125.5 -126.5 mg / 100 gr, antioxidant activity between 7.01 - 7.40%, and, viscosity between 26.09 - 26.99 cP. The number of respondents who really liked drinking Zicurma herbs with sugar concentrations of 4%, 6%, and 8%, namely 3.33%, 36.66%, and 23.33%. The number of respondents who liked to drink the herbal medicine Zicurma with a concentration of 4%, 6%, and 8%, namely, 60%, 50%, and 73.33%. The chemical content of the Zicurma herbal medicine is relatively consistent. Respondents tend to like to drink the herbal medicine Zicurma with a sugar concentration of 6% and 8%.

1. Introduction
The number of victims who died due to Covid-19 is still skyrocketing. The greatest threat to people suffering from comorbid congenital illness. Most of the patients died because of comorbid comorbidities. Data until August 2020, 91 Covid-19 patients died from a total of 142 patients [1]. Various studies have found that Corona-19 positive patients who have a comorbid have a great chance of ending up fatal and even ending in death. Data from the Center for Disease Control and Prevention (CDC), 94% of cases of death of Covid-19 patients in the United States are due to having comorbidities. Only 6% of patients actually died from pure covid-19 [2].

Governor Ganjar said that "Patient with two comorbidities hypertension and diabetes are the leading causes of death cases due to Covid-19 in Central Java," Based on data from the Provincial Health Office, the number of Covid 19 patients from 17 September to 12:00 o'clock, recorded the number of people who tested positive for corona reaching 19,210 people. A total of 14,400 recovered, which 4,041 people were still being treated and 1,769 were Covid 19 patients in Central Java who died [3].

The general chairman of the Indonesian Health Supplement Entrepreneurs Association (APSKI) explained that the Covid-19 pandemic brought changes in people's behavior. Society is paying more
attention to health products, and these changes will only continue. Then the need for health supplements and herbal medicine will be increasingly important [4]. Chief of the Chemistry Department of IPB University explained that efforts to overcome comorbidities must be made to prevent the symptoms of Covid-19 from getting worse. This effort can be done by using herbal medicine as a companion treatment. This is related to the function of herbal medicine as a promotive agent to increase immunity, prevent, curative, and rehabilitate [5].

Efforts to maintain health and maintain body immunity by consuming herbs/herbs should be carried out consistently every day to get optimal results. Medicinal plants that increase body immunity and have anti-inflammatory properties. Empirical/experiential evidence: Temu manga, Temulawak, Turmeric, Meniran, Shallot, Garlic. Scientific evidence: Temulawak, Guava Fruit, Moringa Leaves, Orange Skin, Turmeric Rhizome, Gotu Kola Herbs, Garlic, Kembang Lawing, Ginger, Taro Mouse Herbs, Soursop Leaves, Green Tea, Neem Leaves. Clinical evidence: Herba meniran (fitofarmaka), herb Echinacea (health supplement) [6]. Based on BPOM 2020 data, herbal plants such as ginger, turmeric and ginger have been able to increase endurance and treat degenerative diseases. This could support the treatment of COVID-19 [5].

The Food and Drug Supervisory Agency (BPOM) divides herbal medicines into three types, namely Jamu, Standardized Herbal Medicine and Phyto-pharmacy. Jamu is a form of traditional herbal medicine that must meet the following criteria: safe according to the stipulated requirements, proven efficacy claims based on empirical data, meets applicable quality requirements, namely: organoleptic, moisture content, microbial contamination, total aflatoxins, heavy metal contamination, added with uniformity of weight, disintegration time, volume transferred as well as alcohol/pH content depending on the dosage form. Natural sugar and salt are two ingredients that are allowed to be added to herbs. The terms of herbal medicine advertisements must not mislead consumers. Claims for the use of herbal medicine must begin with the words "Traditionally used for ...." [6]

Zicurma is a type of herbal medicine that has been seeded by the Center for Excellence in Science and Technology (PUI) for Functional Food, Universitas Negeri Semarang. Zingiber officinale, Curcuma xanthorrhiza, and Curcuma domestica are the basic ingredients of Zicurma herbal medicine. Rock sugar was a natural sugar used to sweeten it. The antioxidant content of Zicurma is the highest compared to the herbs Beras Kencur, Turmeric Acid, and Serbat Secang [7]. Antioxidants have received widespread attention because they have been shown to prevent various diseases due to oxidation reactions. Generally, natural antioxidant compounds are phenolic or polyphenolic compounds [8].

Organoleptic properties, especially the taste of a drink, including traditional herbal medicine can be improved by adding sugar [9]. The amount of sugar a person consumes per day has been regulated by the Food and Drug Administration (FDA), which is 52 grams (12 teaspoons). The rules set by the American Heart Association (AHA) and the World Health Organization (WHO) are lower than the FDA, which is 25 grams (six teaspoons) [10]. Organoleptic tests, preference tests, and nutritional content really need to be carried out by a food and beverage industry [11]. All advertisements for traditional medicines may only include uses in accordance with the intended use in the registration by BPOM [12].

Several analyzes need to be carried out to meet the safety and quality requirements of the Zicurma herbal medicines. Laboratory analysis that has been carried out is the total content of phenols, flavanoids, tannins, alkaloids, and saponins. Viscosity and Coliform Tests have also been carried out. All laboratory test results are in good category and meet the standards [7]. The test of consumer preference and the consistency of the antioxidant content and viscosity of Zicurma herbal medicine still needs to be done so that it can be mass produced. This relates to the quality of the basic ingredients and the concentration of sweeteners added. The objectives of this study are: 1) to analyze the consistency of the chemical content of the Zicurma herbal medicine. and 2) to analyze the panelist’s preference for Zicurma herbal medicine.

2. Methods
This research was conducted in three main stages, namely: making Zicurma herbal medicine, laboratory analysis, and organoleptic tests. The Zicurma production process refers to Ely's recipe. Two ounces of *Zingiber officinale* baked, peeled, washed, and hammered. Two ounces of *Curcuma xanthorrhiza* and two ounces of *Curcuma domestica* each peeled, washed, and cut into thin strips. The three ingredients are put in a stainless pan and add 2 liters and a pinch of salt. Boiled until boiling, the cooking process uses low heat so that the remaining volume of water is 1 liter. Zicurma filtered and added rock sugar according to the desired concentration. In this study, three kinds of sugar concentrations were used, namely 4%, 6% and 8%. Then Zicurma was ready to packed into sterilized bottles.

Laboratory analysis has been carried out to determine the consistency of the active ingredients of the herbal Zicurma herb. The analysis focused on total phonochnoid, antioxidant activity, and viscosity. Total flavonoids determined by UV-Vis Spectrophotometry; The antioxidant activity by the DPPH method; and viscosity with a viscometry.

Organoleptic tests have been carried out to determine the level of susceptibility of the panelists to the Zicurma herbal medicine. The instrument is in the form of a questionnaire in the form of a Likert scale (very uncomfortable scale - very much like it). The assessment is focused on aspects of physical appearance, packaging and taste. The physical aspects of the Zicurma herbal medicine include its texture, color, and aroma. The packaging aspect is assessed by the appearance of the product in labeled bottles. Aspects of taste are judged to be bitter, sweet and warm. The number of panelists involved was 30 heterogeneous people (vegetable traders, construction workers, security guards, student housewives, university students, private employees, and civil servants). which was further described categorically

3. Results and Discussion

3.1. The consistency of the active ingredients of the Zicurma herbal medicine

The Zicurma herbal medicine which has been packaged in a 125 ml volume bottle is presented in Figure 1.

![Figure 1. The physical appearance of the Zicurma herbal medicine](image)

The results of the wipe test focused on Total Flavonoid, antioxidant activity and viscosity in three Zicurma herbal medicine produced with the addition of sugar Natural at concentrations of 4%, 6% and 8% are relatively the same, as presented in Table 1. Total Flavonoid analysis results ranged from 125.5 -126.5 mg/100 gr, antioxidant activity between 7.01 - 7.40%, and viscosity between 26.09 - 26.99 cP. The consistency of the contents and the consistency of the antioxidant content of the Zicurma herbal medicine: first, always pay attention to the volume of Zicurma in each bottle. Second, sorting the raw materials for *Zingiber officinale*, *Curcuma xanthorrhiza*, and *Curcuma domestica* which will be used for Zicurma production. Sorting is done by looking at the size and color, for example turmeric, the turmeric rhizome used is an orange rhizome, the small shoots that grow around the main rhizome are removed. This is done to meet the requirements for a herbal product as stated in BPOM Regulation No. 32 of 2019. That processed product business actors must meet the safety and quality requirements of traditional medicines written in BPOM Regulation No. 32. 2019 [13].
Table 1. The flavonoids, antioxidant activity and viscosity of the Zicurma herbal medicine in various concentration of sugar

| No. | Zicurma with sufficient sugar | Flavonoid (mg/100 gram) | Antioxidant Activity (%) discoloration | Viscosity (cP) |
|-----|------------------------------|-------------------------|----------------------------------------|--------------|
| 1   | 4 %                          | 126.5                   | 7.05                                   | 26.99        |
| 2   | 6 %                          | 125.5                   | 7.01                                   | 26.09        |
| 3   | 8 %                          | 126.5                   | 7.40                                   | 26.99        |

The total Flavonoid from the results of this study showed relative consistency (Table 1) although slightly below the previous lab test results which showed a figure of 127.5 mg /100 gram. This is due to the lack of uniformity in the basic ingredients used for Zicurma herbal products. Zingiber officinale contains several main bioactive compounds that have high antioxidant activity, these compounds include gingerol, shogaol and gengeron [14]. Curcuminoids are a group of phenolic compounds contained in Curcuma domestica (turmeric) and Curcuma xanthorrhiza (curcuma) [15]. Curcuma rhizome contains active compounds of flavonoids, terpenoids, alkaloids, essential oils and others. Curcumin, demethoxycurcumin and bis-demethoxy-curcumin, are some of the most abundant compounds in the curcuma genus, the compounds contained in curcuma rhizomes can act as antioxidants, antibacterial, anti-fungal, antiviral, anti-inflammatory, and anti-cancer [16].

Safety and Quality Requirements for Traditional Medicines (Regulation of the Food and Drug Supervisory Agency No.32 of 2019 concerning Safety and Quality Requirements for Traditional Medicines) in Article 3 states that Business Actors are required to guarantee the safety and quality of Traditional Medicines made, imported, and/or circulated in the region. Indonesia before and during its circulation [13]. Therefore, at the time of producing Zicurma, the raw material was always selected carefully.

To ensure the safety and quality of Traditional Medicines as intended in paragraph (1), Business Actors are required to meet safety and quality requirements. And the safety and quality requirements as intended in paragraph (2) are requirements for Raw Materials; and Finished Products. In accordance with Ministerial Regulation No. 007 of 2012 concerning Registration of Traditional Medicines in Article 6 explains that traditional Medicines circulating in the territory of Indonesia must have a distribution license. Traditional medicines that can be granted a distribution permit must meet the following criteria: use materials that meet safety and quality requirements, are made by applying the Good Traditional Medicine Production Method (CPOTB), meet the requirements of the Indonesian Herbal Pharmacopoeia or other recognized requirements, have proven efficacy empirical, hereditary, and/or scientifically, and labelling contains objective, complete and not misleading information [17].

Based on this, the type of ginger used for Zicurma herbal medicine products is from the Emprit Zingiber officinale. It is refers to previous researchers who stated that the antioxidant activity of emprit Zingiber officinale > red Zingiber officinale. The correlation test shows a very strong and significant correlation between antioxidant activity and total phenol content in emprit ginger [18]. Curcuma xanthorrhiza which is used is the main rhizome. The parent rhizome is dark yellow, reddish brown, and the inside is brownish orange. Curcuma xanthorrhiza also contains many chemical compounds with the largest elements being starch, curcumin and essential oils. The activities contained by ginger include as antibacterial, antivitus, antioxidant, anti-inflammatory and hepatoprotective [19]. Curcuma domestica used is a large parent branch without including the small branches. Elongated, branched, orange yellow [20].

3.2. The level of preference of the panelist for Zicurma herbal medicine
One of the organoleptic test situations to determine the panelist's preference for zucurma herbal medicine is presented in Figure 2.

![Figure 2: Three panelists are conducting an organoleptic test of the Zicurma herbal medicine](image)

The results of the analysis of the panelists' preferences for Zicurma herbal medicine in each aspect were as follows: The average panelists who expressed their likes and likes towards the texture aspects of Zicurma herbal medicine were 65.56%; on the color aspect of Jamu Zicurma there were 74.44%; on the aspect of the aroma of the Zucurma herbal medicine there were 73.33%; on the aspect of product appearance there were 84.44%; on the bitter taste aspect of Zicurma herbal medicine there were 58.89%; on the aspect of the sweetness of the 60% Zicurma herb; and the aspect of the spicy taste of Zicurma herbal medicine is 80%.

Based on these results it can be interpreted that the texture, brownish yellow color seen from the combination of selected basic ingredients, the distinctive aroma of essential oils, and the combination of bitter, sweet and spicy Zicurma herbal medicine can be accepted by the panelists. The spicy taste of Zicurma herbal medicine comes from the Zingiber officinale. Zingiber officinale is commonly used in food and beverages because of its distinctive spicy and savory taste [21]. Curcuma contains curcumin which is yellow in color. Curcumin also has a bitter slightly spicy taste [20].

The respondents' preference for the Zicurma herbal medicine at various sugar concentrations is presented in Table 2.

| No | The respondents’ preference | The Number of Respondents’ Responses (%) to Zicurma with sufficient sugar |
|----|------------------------------|-------------------------------------------------|
|    |                              | 4 %   | 6 %   | 8 %   |
| 1.  | Very Dislike                 | 0.00  | 0.00  | 0.00  |
| 2.  | Dislike                      | 3.33  | 0.00  | 0.00  |
| 3.  | Neutral                      | 33.33 | 13.33 | 3.33  |
| 4.  | Like                         | 60.00 | 50.00 | 73.33 |
| 5.  | Very Like                    | 3.33  | 36.66 | 23.33 |
| 6.  | Very Like and Like           | 63.33 | 86.66 | 96.66 |

The number of respondents who really liked drinking Zicurma herbal medicine with sugar concentrations of 4%, 6%, and 8%, namely 3.33%, 36.66%, and 23.33%. This illustrates that those who really like to drink herbal medicine will choose herbs with sufficient sugar content, namely 6%. The Ministry of Health of the Republic of Indonesia has set a limit of sugar consumption per person per day, namely 50 grams of sugar or the equivalent of 5 – 9 teaspoons [22]. In the Republic of Indonesia Minister of Health Regulation No. 30 stated that with consideration of the amount of risk of incidence non-infectious diseases. Consumption of sugar more than 50 grams, sodium more than 2000 milligrams, or total fat more than 67 grams per person per day at risk of hypertension, stroke, diabetes, and heart attack. Therefore, everyone who produces Processed Food and Ready-to-Serve Food is encouraged to include information on sugar, salt and fat content, as well as Health messages [23].
The number of respondents who liked to drink the herbal medicine Zicurma herbal medicine with a concentration of 4%, 6%, and 8%, namely, 60%, 50%, and 73.33%. The number of panelists in the category of like and very fond of drinking Zicurma herbal medicine concentrations of 4%, 6%, and 8%, namely 63.33%, 86.66%, and 96.66%. This can be used as a reference in the production of the next Zicurma herbal medicine.

4. Conclusion
The chemical content and viscosity of the Zicurma herb are relatively steady. The flavonoid content reached 126.5 mg / 100gr, antioxidant activity reached 7.40%, and viscosity reached 26.99 cP. The respondents liked the herbal Zicurma. Respondents tend to like to drink Zicurma herbal medicine with a sugar concentration of 6% and 8%.

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