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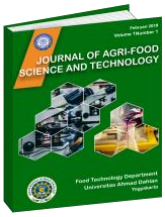

Physico-Chemical Characteristics and Organoleptics of Herbal Syrup Made From Temulawak (Curcuma xanthorrihza) and Temu Giring Extract (Curcuma heyneana)

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ABSTRACT

Herbal syrups are concentrated preparations in water from sugar or sugar substitutes with herbal plant additives. Some herbal plants that are rich in antioxidants such as temulawak and temu giring, besides being found in the market, temulawak and temu giring have several benefits, such as increasing appetite and having anticancer properties. The purpose of this study was to determine the physico-chemical and organoleptic characteristics of temulawak and temu giring syrups.

This study used a completely randomized design (CRD) with various formulations of temu giring and temulawak extract; F0 (100%:0%), F1 (80%:20%), F2 (50%:50%), F3 (20%:80%), and F4 (0%:100%). For 3 (three)

repetitions each, the physico-chemical parameters tested were viscosity, density, water content, total dissolved solids, total phenols, antioxidant activity, pH, total sugars, and total reducing sugars, the organoleptic parameters tested are taste, aroma, color, and preferences. Then the data were analyzed using the one-way Analysis of Variance (ANOVA) test.

Physico-chemical test results for syrup based on temulawak and temu giring extracts had a viscosity value of 3.10cPs-4.33cPs, total dissolved solids 55.97°Brix- 57.37°Brix, total phenol 0.00%-0.01%, total sugar 60 .06%-78.32%, reducing
sugar, 0.25%-0.77%, acidity pH 6.05-6.39, antioxidants 1.94%-17.34%, moisture content 40.37%- 44.18%, density 1.26g/ml-1.27g/ml. Organoleptic sensory reception produced significant differences except for bitter taste, aftertaste and texture, whereas for preferences that were not significantly different were color, aroma, texture, and only taste was significantly different.

1. INTRODUCTION

Syrup is a concentrated preparation in water made from sugar or its substitutes with or without additional ingredients, fragrances and active substances. Meanwhile, herbal syrup is a herbal product in the form of syrup made from natural herbal ingredients. Indonesia is a country rich in herbal plants, spices or fruit plants which are useful and can treat various diseases. Several types of herbal plants that can be used as ingredients for making herbal syrup include ginger, lemongrass, cloves, cinnamon, betel leaves, temu lawak, temu giring and others. Among these herbal ingredients, ginger and temu giring are interesting herbal plants to research because they contain antioxidants and essential oils which are beneficial for health. Some of the benefits of these two plants are increasing appetite, anticancer, preventing kidney disease, and others. Apart from its many benefits, temu lawak and temu giring are herbal plants that are easy to obtain, affordable and easy to process.

So far there has been no use of the basic ingredients of ginger and temu giring used together to make herbal syrup. Based on the benefits contained in ginger and temu giring, it has the potential to be used as a way to make herbal syrup drinks. Curcuma rhizomes and ginger rhizomes contain natural antioxidant compounds (Darsono & Kuntorini, 2012).

Temulawak rhizomes contain essential oils, the yellow substance curcumin, protein, cellulose, fat and minerals. The most useful components are curcuminoids, starch and essential oils (Afifah, 2003). Some of the benefits of the rhizomes of this plant include increasing appetite, curing chicken pox, treating asthma and back pain, curing colds and others (Suparni et al., 2012). According to research findings, ginger can increase appetite and stimulate more bile secretion. (Puspitojati & Santoso, 2020).

Temu giring rhizomes contain the compound curcumin which can give a yellow color, 0.8-3% essential oil, starch, resin, fat, tannin, saponin and flavonoids (Santoso.B, 2008). In other references it was also found that ginger ginger contains essential oils, curcumin, tannin, saponin, flavonoids and starch (Wijayakusuma, 2002). In previous research, it was shown that temu giring has anti-inflammatory potential, in this research a type of sesquiterpene was also found where the activity of this compound showed anti-inflammatory, anti-cancer and blocked Ca2+ channels (Eid et al., 2010). Then based on other literature, which has isolated a sesquiterpene compound, namely zedoarondiol, from temu giring which has an anti-inflammatory effect by inhibiting iNOS, COX-2 and pro-inflammatory cytokines (Abraham & Cho, 2009).

Based on the description above, researchers are interested in developing a high-antioxidant syrup product made from ginger and ginger, which contains antioxidants that the body needs, namely, it can increase appetite, be an anti-cancer drink, improve digestion, lower blood pressure, stabilize blood sugar in the body, and also can maintain the body's immune system so that it is not easily infected with disease, this benefit is also one of the attractions itself for researchers, because there are a multitude of benefits that can be obtained if you use

ginger ginger and ginger. from young people to the elderly can enjoy and obtain the benefits contained in it, researchers also hope that this research can be used as a reference for useful food innovation, for example as a reference for industrial and SME food innovation. This research is entitled Physico-Chemical Characteristics of Herbal Syrup Made from Temulawak (Curcuma xanthorrihza) and Temu Giring (Curcuma heyneana) juice. This research was conducted to determine the physico-chemical properties and organoleptic sensory acceptance of syrup. It is hoped that this research will be useful for society, especially in the field of functional food entrepreneurship.

2. MATERIALS AND METHODS

2.1. Materials

Equipment for making temu giring and temu lawak syrup is a knife, handsome, basin, stove, pan, rag, lighter, filter paper, 250 ml measuring cup, glass, spoon, spatula, thermometer, Ohaus Pioneer analytical scale, blender, stopwatch, label, pen, 100 ml bottle, funnel and tweezers.

The tools used for the analytical tests were a Brookfield viscometer, 100 ml Iwaki beaker, 250 ml Iwaki beaker, ATC Brix meter, spectrophotometer, Ohaus ST-20 pH meter, pycnometer, Memmert UN-55/UN-30 analytical oven, Erlenmeyer 100ml, measuring flask, vortex, test tube

2.2. Research Methods

The object of this research is syrup with high antioxidant content, as well as natural coloring from ginger juice and temu giring, the basic ingredients used come from Wonosari, Gunung Kidul, Yogyakarta. The sample population used in this research included ginger juice and temu giring. Temulawak and temu giring are tropical plants that usually grow wild in the forests of Indonesia, especially Java, Maluku, Kalimantan and Sumatra. The research sample was syrup made from the basic ingredients of ginger and temu giring juice.

3. RESULT AND DISCUSSION

Density

Viscosity is a parameter of a liquid's resistance to flowing. The thicker the liquid, the higher the viscosity value. The viscosity of a liquid is a sign of the strength of intermolecular forces. This force attracts each other and allows molecules to move easily. The following are the results of the viscosity tests that have been carried out, which can be seen in Table 1.

Table 1 Density Results of Temulawak and Temu Giring Syrup

Sample	Density (g/ml)
F0	$1,27 \pm 0,005^{c}$
F1	$1,27 \pm 0,003^{c}$
F2	$1,26 \pm 0,007^{a}$
F3	$1,27 \pm 0,006^{bc}$
F4	$1,26 \pm 0,003^{ab}$

Information:
F0: temu giring 100%: temulawak 0%
FI: temu giring 80%: temulawak 20%
F2: temu giring 50%: temulawak 50%
F3: temu giring 20%: temulawak 80%
F4: temu giring 0%: temulawak 100%

The density of Temulawak and Temu Giring Syrup which has the smallest value is sample F4 with a value of 1.26 ± 0.003g/ml. According to the literature, the specific gravity of a good syrup is 1.3 g/mL. It can be concluded that all samples are close to the specific gravity of a good syrup and the closest is the F3 sample with a value of 1.27 ± 0.006 g/mL. The density of ginger and ginger syrup have significantly different values, this is thought to be due to a number of factors that can influence the density of the syrup such as temperature, volume, pressure and viscosity, the density values which are not much different are most likely due to the density of ginger and ginger juice. sleighs are not much different.

Water content

Samples with good concentration have high water content. The syrup water content in sample F2 has a high syrup water content, where the sample contains 25% ginger and 25% ginger each. Then, if we look at the empon water content samples, it is found that curcuma has a higher content than empon temu giring. Table 4.4 shows a significant difference in syrup water content, allegedly due to different heating times or temperatures. In accordance with SNI 01-2891-1992 quality standards, the maximum water content is 20%. This happens because the heating takes a long time so that evaporation occurs so that the water content value becomes greater, the viscosity value of ginger and temu giring syrup tends to be thicker, possibly due to the lack of water content, thus making the syrup too thick. The water content of empon temulawak and temu giring can be seen in Table 2.

Table 2 Results of Water Content of Temulawak and Temu Giring Syrup

Sample	Syrup Water Content (%)
F0	41,18 ± 0,302[a]
F1	40,44 ± 0,534[a]
F2	44,18 ± 1,480[b]
F3	40,37 ± 0,389[a]
F4	41,92 ± 1,092[a]

Total dissolved solids

Tabel 3 Result total dissolved solids

Sample	TPT (^{o}brix)
F0	57,03 ± 0,252[a]
F1	57,37 ± 0,379[a]
F2	56,77 ± 1,701[a]
F3	56,03 ± 1,050[a]
F4	55,97 ± 0,058[a]

High total dissolved solids are due to the content of pigments, vitamins, sugars, proteins, or organic acids. In research by Koge & Chung (2003), ginger juice and sugar cane stems contain high levels of antioxidants, namely Kakutou which can suppress hyperlipidemia and octacosanol which can increase active work, brighten the skin, fight changes in quality, and is used for various therapies. Buckle et al (1987) stated that the TPT content of a material includes reducing and non-reducing sugars, organic acids, petkin and protein. Therefore, the higher the addition of sucrose, the higher the total dissolved solids will be. The TPT results in this study were not significantly different. with the conclusion that ginger and ginger juice do not affect the total dissolved solids in the syrup.

Total phenols

Table 4 Result total phenols

Sample	Total phenols (%)
F0	0,00 ± 0,000[a]
F1	0,00 ± 0,000[b]
F2	0,01 ± 0,000[c]
F3	0,01 ± 0,000[d]
F4	0,01 ± 0,000[e]

Based on this data, it can be concluded that ginger ginger extract can lower phenol levels. Thus, the greater the concentration of ginger will show an increase in total phenol levels. This is in line with the DPPH capture activity because the greater the concentration of curcuma causes more water-soluble phenolic compounds from curcuma. The results show that ginger syrup and temu giring have an increase with the composition of ginger juice. The total phenols of temulawak and temu giring syrup are small, allegedly because the antioxidant activity content is very low, which makes the total phenol value also low.

Antioxidant Activity

Tabel 5 Result Antioxidant Activity RSA-DPPH

Sample	Antioxidant Activity (%)
F0	$1,94 \pm 0,526^{a}$
F1	$6,19 \pm 1,860^{b}$
F2	$11,36 \pm 1,010^{c}$
F3	$15,40 \pm 0,668^{d}$
F4	$17,34 \pm 0,635^{e}$

The results of research on antioxidant activity in herbal syrups show that the highest RSA-DPPH value is F4, followed by F3 and the lowest is F0. However, low antioxidant activity was shown in the F0 sample with a value of 1.94 ± 0.526%. If we refer to Molyneux (2004), reduced DPPH is a free radical compound that can react with hydrogen atoms to form a stable purple compound.

If the percentage of DPPH radical reduction exceeds 90%, it shows very high antioxidant activity (Wulansari & Chairul, 2011). From the results of the analysis above, it can be concluded that the greater the composition of ginger juice, the greater the value of antioxidant activity. Temulawak syrup and temu giring are low in antioxidants, which affects the stability of antioxidant activity, presumably because the antioxidant content of ginger is higher compared to temu giring.

Total sugar

Table 5 Result Total sugar

Sampel	Gula Total (%)
F0	$60,06 \pm 0,816^{b}$
F1	$66,75 \pm 1,858^{b}$
F2	$60,58 \pm 4,508^{a}$
F3	$74,23 \pm 0,356^{c}$
F4	$78,32 \pm 2,930^{c}$

Based on Table 5, the treatment of F0 ginger yields a sugar content of 60%, in F1 it produces 66.75% sugar, in F2 the sugar content is 60.58%, in F3 the sugar content is 74.23%, and in F4 the sugar content is 78.32% . This shows that the greater the added ginger extract, the lower the sugar content in the herbal syrup. This is because the dissolved solids in the mixture of extract and water are lower. According to Table 4.4, the results of the analysis of the sugar content in ginger extract without the addition of temu giring were 78.40 0brix, while according to research by Gustianova H. (2012) the total sugar content in ginger extract was 75.88%. This difference is caused by the location of ginger planting. According to SNI 01-3544: 2013 concerning syrup, the minimum sugar content of syrup is 65%, so only syrup with codes F1, F3 and F4 meet the standard, while F0 and F2 are only close to the standard. This can be influenced by the water content of ginger and ginger juice. It can be seen that as ginger juice is added, the total sugar value will be greater, except for F2, possibly due to less water content.

Total Reducing Sugars

Tabel 6 Result Total Reducing Sugars

Sample	Total reducing sugars (%)
F0	$0,59 \pm 0,324^{ab}$
F1	$0,53 \pm 0,326^{ab}$
F2	$0,25 \pm 0,135^{a}$
F3	$0,70 \pm 0,051^{ab}$
F4	$0,77 \pm 0,226^{b}$

Based on the results above, it can be compared with the SNI 01-2891-1992 quality standard which states a minimum standard of 30%, this value is very different, this is thought to be due to heating, where as a result of heating it will change the chemical structure and composition of the syrup, especially for reducing sugar.

Acid level

Tabel 7 Result Acid Level

Sample	pH
F0	$6,05 \pm 0,268^{a}$
F1	$6,16 \pm 0,275^{a}$
F2	$6,24 \pm 0,210^{a}$
F3	$6,39 \pm 0,050^{a}$
F4	$6,23 \pm 0,199^{a}$

Table 7 above shows that the pH of herbal syrups with variations in the basic ingredients

of ginger juice (curcuma xanthorrihza) and temu giring (curcuma heyneana) in each sample is not much different. Each increase is caused by an increase in organic acids as a result of acid fluctuations, then the decrease in pH is thought to be due to microbial activities that produce acid. Based on Ermawati's 2021 research, the pH value of this research meets good requirements because the pH value of good syrup ranges from 4 to 7.

Organoleptic

Tabel 8 Organoleptic

Organoleptic parameters	**Sample**				
	F0	**F1**	**F2**	**F3**	**F4**
flavor					
sweet	4,03±0,183^{a}	4,23±0,430^{ab}	4,27±0,521^{ab}	4,27±0,571^{bc}	4,670,479^{c}
bitter	2,73±1,048^{a}	2,77±0,935^{a}	2,43±0,898^{a}	2,40±0,814^{a}	2,30±0,952^{a}
after taste	2,33±0,844^{a}	2,37±0,928^{a}	2,53±0,860^{a}	2,50±1,106^{a}	2,73±1,172^{a}
Color	3,97±1,326^{c}	3,63±1,033^{bc}	3,10±0,712^{b}	2,50±1,009^{a}	2,20±1,297^{a}
Smell					
Temu giring	4,20±0,551^{e}	3,70±0,915^{d}	2,73±1,112^{c}	2,03±0,999^{b}	1,53±0,819^{a}
Temu lawak	1,83±1,117^{a}	2,43±1,073^{b}	3,47±0,776^{c}	3,87±0,819^{cd}	4,23±0,774^{d}
Texture	2,07±0,828^{a}	1,87±0,57^{a}	1,87±0,730^{a}	2,07±0,828^{a}	2,07±0,907^{a}

Based on the organoleptic test results in Table 8, and analysis using SPSS, it shows that ginger (curcuma xanthorrihza) and ginger (curcuma heyneana) have a sweet and not bitter taste, and there is no aftertaste left behind. However, ginger should have a distinctive smell and a sharp and bitter taste as well as a yellow-orange to brown color. So the herbal syrup is influenced by the concentration of ginger and ginger ginger used.

According to the results of the analysis, the use of various concentrations of ginger and temu giring had a real influence on the color of the telawak drink so the color was influenced by the concentration of ginger and temu giring. So the brightness of the color will be darker if the formulation of ginger juice is greater than that of temu giring, and vice versa, the more ginger juice there is, the brighter the color of the syrup will be.

The texture is not sticky, and the typical aroma of temu giring and the typical aroma of ginger have different aromas, the more dominant the ginger juice, the stronger the typical ginger aroma, and if the ginger juice is dominant, the stronger the typical ginger aroma will be. As the results of the analysis using SPSS show that the use of various concentrations of ginger and temu giring does not have an effect on the aroma of ginger drinks. The resulting aroma is not influenced by the concentration of ginger ginger used.

Organoleptic Level of Favorability

Tabel 9 Organoleptic Level of Favorability

Sampel	F0	F1	F2	F3	F4
Flavor	3,70±0,535[a]	3,80±0,664[ab]	4,10±0,607[ab]	4,10±0,712[b]	3,90±0,885[b]
Color	3,63±0,718[a]	3,77±0,817[a]	3,67±0,711[a]	3,73±0,740[a]	3,63±0,765[a]
Smell	3,70±0,750[a]	3,80±0,551[a]	3,77±0,626[a]	3,87±0,776[a]	3,80±0,961[a]
Texture	3,93±0,691[a]	4,13±0,730[a]	4,03±0,765[a]	3,93±0,785[a]	4,03±0,718[a]

Based on the experimental results, it was discovered that all panelists showed liking for the taste, aroma, color and texture of herbal syrup with variations of the basic ingredients of ginger juice (curcuma xanthorrihza) and temu giring (curcuma heyneana), with the formulation of temu giring 50%: curcuma 50% the taste and texture were more acceptable to the panelists.

CONCLUSIONS

From the results of the physico-chemical research, it can be concluded that the viscosity results slightly exceed the syrup viscosity standard, for syrup density many of the same numbers are likely to occur because the density of ginger and temugiring is almost the same, for the water content in this study exceeding the syrup water content standard is likely to occur because of the long heating and evaporation that occurs so the water content value becomes greater, for the total dissolved solids test according to the research literature this has met a good TPT value, for total phenol it has a very small value which is clearly very less compared to the existing literature, as well as the activity the antioxidants, then the total sugars F3 and F4 exceed the standard limit for sugar syrup, and reducing sugar is also very low compared to the standard syrup, for acidity according to the literature it is very suitable for a good pH value.

From the results of the organoleptic research, it can be concluded that this research is dominated by a sweet, slightly bitter taste and a slight aftertaste. For color, as ginger is added, the color of the syrup will become darker. For the typical aroma of temu giring, the greater the formulation of temu giring, the aroma of temu giring. The dribble will get stronger, and vice versa, for texture the panelists feel it is a little sticky, then for the average liking test for taste, color, aroma, texture, they choose likes/indicator 4. It can be concluded that the average panelists like the syrup.

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