Antioxidant of Effervescent Tablet Formulated from Combination of Secang Wood and Red Ginger Extracts

Titik Mardiyanti Sofyah, Tukiran[*)], Suyatno Sutoyo
Chemistry Department, Faculty of Mathematics and Natural Sciences,
Universitas Negeri Surabaya
[*]E-mail: tukiran@unesa.ac.id

ABSTRACT

Secang wood has strong antioxidant properties because it contains phenolic compounds such as flavonoids and brazilin. Also, red ginger has antioxidant derived from nonvolatile phenolic compounds. Until now, there has been no use of a combination of secang wood extract and red ginger specifically for the manufacture of effervescent tablets. The purpose of this study was to formulate an effervescent tablet by doing combination of secang wood and red ginger extracts with using various concentrations of citric and tartaric acids. The formulations conducted were three acid sources of 20%, 25%, 30%, using wet granulation. The evaluation subjected to the formulas included the physical properties of the granules, such as the water content and flow properties of the granules. Meanwhile, the evaluation performed to the tablet included the hardness test, tablet friability, weight uniformity, dissolution time, and acidity (pH). The analysis was carried out in accordance with the requirements of the Indonesian Pharmacopoeia Edition III and BPOM. The results obtained are effervescent tablet with an acid variation of 20% with physical quality values of water content of 2.91% and granule flow properties of 6.03 s. Meanwhile, the physical quality requirements of effervescent tablets were tablet hardness of 4.02 kp; tablet friability 0.46%; weight uniformity 0.132%; 71 s dissolution time; and 6.4 degrees of acidity.

Keywords: Secang wood extracts, red ginger extracts, effervescent tablets.

INTRODUCTION

Antioxidants are compounds that donate electrons so that they can prevent the formation of free radicals in the human body by binding to free radical molecules (Salamah & Widyasari, 2015). Antioxidants also compounds that protect cell damage which works by stabilizing free radicals. Free radicals are compounds with highly reactive properties due to the presence of an unpaired outer shell (Warner, *et al*., 2004). One of the plants that can be used as traditional medicine is secang wood *(Caesalpinia sappan)* and red ginger (*Zingiber officinale*). People usually use as traditional medicine, cooking spices, spices, and herbs.

Secang wood has medicinal properties because it contains many chemical compounds such as alkaloids, flavonoids, saponins, tannins, steroids, and terpenoids (Youstina & Suhartono, 2016). Secang also have antioxidant activity that can block free radicals because it contains phenolic compounds, such as flavonoids and brazilin (Rahmawati, 2011). In addition, the high antioxidant content is suspected because it contains terpenoid compounds, such as monoterpenes and diterpenes (Widayanti , *et al*., 2012). The use of secang wood is not only used as an antioxidant but can also be used to treat diarrhea, malaria, tumors, bone loss, antibacterial antidote, ulcers (Rahmawati, 2011), (Arisandi, 2008), (Mufidah & Yusnita, 2012). Brazilin in secang is not only used as an antioxidant but can be used to inhibit the apoptosis inhibitor protein survivin and is involved in the activation of caspase 3 and caspase 9 so that it can treat cancer *(Zhong, et al*., 2009).

Red ginger rhizome has antioxidant, antibacterial, antimutagenic, anti-inflammatory, anticarcinogenic, and antitumor activity. In addition, fresh ginger rhizomes contain several components that can inhibit microbial growth, namely -pinene, kamfena, caryophyllene, pinene, -farnesene cineol, dl-camphor, isokaryophyllene, caryophyllene-oxide, and germacron. Red ginger also contains gingerol and shogaol which can be used as primary antioxidant activity on lipid radicals, because there is a benzene ring and hydroxyl group (Zakaria, 2000). Red ginger extract with n-hexane fraction was toxic to the mortality of Artemia salina larvae (Tim Lentera, 2002).

The use of a combination of secang wood and red ginger is rarely encountered in the community. In general, the use of secang wood or red ginger is consumed in the packaging of herbal powder, tea, wedang uwuh, pletok beer, or boiled which results in the less public interest.

One of the efforts made to use a combination of secang wood and red ginger is that it is formulated in the form of a joint effervescent tablet.

Effervescent tablets can be interpreted as a liquid mixture that in its reaction or dissolution produces gas bubbles (CO_2) (Ansel, 1989). The use of this effervescent tablet preparation has the advantage that it can cover the taste and smell of the combination of red ginger and secang wood as well as ease of storage, easy consumption, and the use of the right dose every consumption. Based on the explanation above, the purpose of this study was to formulate an antioxidant effervescent tablet with a combination of secang wood and red ginger towards concentrations of citric acid and tartaric acid.

METHODS

Equipment anda Materials

The equipment used in this experiment are stopwatch, flow funnel, digital balance, oven, mortar and pestle, a set of extraction equipment with maceration method, a set of Buchner filter, rotary vacuum evaporator, Hardness tester, friability tester, beaker glass, spatula, print tablet. The ingredients used are ethanol 96%, secang wood, red ginger, lactose, citric acid, tartaric acid, sodium bicarbonate, PVP, magnesium stearate, dried stevia leaves, sodium benzoate.

Extraction of Secang Wood

500 g of dry secang wood powder was macerated using 96 % food-grade ethanol solvent for 24 hours. The results obtained after maceration were filtered using a Buchner funnel and obtained ethanol extract and residue from secang wood. The residue from the secang wood was macerated again using the same procedure as above 2 times. The resulting extracts were combined and evaporated using a rotary evaporator so that a thick extract of secang wood was obtained. Then dried using freeze-dry to produce a dry extract of secang wood.

Extraction of Red Gingger

400 g of dry red ginger powder was macerated using 96 % food-grade ethanol as a solvent for 24 hours. The results obtained after maceration were filtered using a Buchner funnel and obtained ethanol extract and residue from red ginger. The residue from red ginger was macerated again using the same procedure as above 2 times. The resulting extracts were combined and evaporated using a rotary evaporator so that a thick red ginger extract was obtained. Then dried using freeze-dry to produce the dry red ginger extract.

Extraction Granule Manufacture

The dry extracts of secang wood and red ginger were mixed in a ratio of 2:1. The results of combining the two extracts were then made into granules by adding lactose with a ratio of 1:3 extract and lactose. Furthermore, the mixture is stirred until homogeneous, sieved using a sieve no. 20, and dried using an oven at a temperature of 60°C for 1 hour. After the dry mixture was sieved again with sieve no. 20 until granules were formed.

Physical Properties Test of Effervescent Granule

1. Water Level Test

The water content test was carried out by weighing 3500 mg granules, then in the oven for 10-15 minutes at a temperature of 60°C. Then it was weighed again and the water content was calculated. Granules are said to be good if they have a moisture content of 10 % (BPOM RI , 2014).

2. Flow Rate

The flow rate test was carried out by weighing 100 g of effervescent granules inserted into the funnel in the closed position. Calculation of flow rate using a stopwatch when the funnel cover is opened and the granules flow to completion after that time is recorded. The repetition at the flow rate was carried out 3 times, the granules were said to be good when the resulting time was less than 10 seconds (Voight , 1994).

Manufacturing of Effervescent Tablets

The method that will be used in the manufacture of these tablets is wet granulation, using various compositions of citric and tartaric acids with concentrations of 20 %, 25 %, and 30 % of the weight of the effervescent tablet, which is 3500 mg. The effervescent tablet formulations are as Table 1:

Table 1. Formulation of effervescent tablets with secang wood and red ginger extracts

Materials	Formulation (mg)		
	F-1	F-2	F3
Granule mixture of secang wood extract and red ginger	1200	1200	1200
Citric acid	70	63	56
Tartric acid	630	812	994
Sodium bicarbonate	1050	1050	1050
PVP	30	30	30
Magnesium stearate	10	10	10
Stevia	30	30	30
Sodium benzoate	3	3	3
Laktose ad	477	302	177
Total	3500	3500	3500

The manufacture of effervescent tablets was divided into two mixtures, in the first mixture, namely granule extract, dry stevia leaves, citric acid, and

tartaric acid were homogenized in a mortar and pestle. While the second mixture contains lactose, sodium bicarbonate, PVP, magnesium stearate which is then homogenized in a mortar and pestle then sieved with sieve no.16, and dried in an oven at 60°C for 15 minutes. Furthermore, mixture one and mixture 2 were mixed until homogeneous which was then sieved with sieve no.16 to have the same size. Next, sodium benzoate is added. The resulting mixture was then printed using a tablet mold and tested for the physical properties of the tablet.

Physical Properties Test of Effervescent Tablets

1. Tablet Hardness Test

The tablet hardness test was carried out using a Hardness tester (Zakaria, 2000). The test is carried out as many as 10 tablets are inserted into the tool and run the tool, the hardness value of the tablet will be listed. Tablets are said to be good if they have a hardness value of at least 4-10 kp (Sulaiman, 2007).

2. Tablet Friability Test

The tablet friability test was carried out using a tether friabilator. The test was carried out as many as 10 tablets free of dust which were then weighed, after which they were inserted into the apparatus set at a speed of 25 rpm for 4 minutes. The tablets were then cleaned of powder and reweighed. A good tablet has a friability value of less than 1 % (Siregar & Wikarsa, 2010).

3. Weight Uniformity Test

The test was carried out by weighing 10 tablets one by one using an analytical balance. Tablets are said to be good if none of the tablets deviate by 20 % from the average weight, and no more than 2 tablets deviate from the 10 % average tablet (Anonim, 1979).

4. Dissolve Time Test

This test is carried out by inserting 1 effervescent tablet into a beaker glass that has been filled with 200 mL of distilled water. The stopwatch is turned on when the tablet is immersed in water and is stopped when it is completely dissolved. (Lachman & Lieberman, 2010). The dissolving time of a good effervescent tablet is less than 5 minutes (BPOM RI , 2014).

5. Test The Degree of Acidity (pH)

This test was carried out by dissolving 1 effervescent tablet using 200 mL of water, then measuring the pH using a pH meter. Effervescent tablets are said to have a good pH if they are close to neutral (Rahmah , 2006).

RESULTS AND DISCUSSION

Result of Making Secang Wood Extract

Secang wood extract was made by the maceration method using 96% food-grade ethanol as solvent. As much as 500 g of dry secang wood powder was macerated, which was then filtered using a vacuum pump and the filtered extract was evaporated using a rotary evaporator which was then dried using freeze dry. Obtained dry extract of secang wood with reddish brown color with a weight of 60.401 g with an extract yield of 12.08%.

Result of Making Red Ginger Extract

Red ginger extract was made by the maceration method using food grade 96% ethanol as solvent. As much as 400 g of dried red ginger powder was macerated, which was then filtered using a vacuum pump and the filtered extract was evaporated using a rotary evaporator which was then dried using freeze dry. Obtained dry extract of red ginger extract with a brown color was obtained with a weight of 34.674 g with an extract yield of 8.66%.

Result of Making Granules and Effervescent Tablets Extracts of Secang Wood and Red Ginger

Granules are made by mixing dry extract of secang wood which is reddish-brown and red ginger which is brown in a ratio of 2:1. After that, it is mixed with lactose with a ratio of extract to lactose, which is 1:3. Then stirred until homogeneous, sieved, and dried using an oven to obtain brownish-orange granules.

Secang wood extract granules and red ginger were mixed with other ingredients, namely citric acid, tartaric acid, dry stevia leaves, stirred until homogeneous. Another mixture containing sodium bicarbonate, lactose, PVP, mg stearate was stirred until homogeneous and sieved. Followed by mixing the extract mixture, stirred until homogeneous, then sodium benzoate was added to produce a granule mixture which was then printed using a tablet mold and an effervescent tablet was formed.

Physical Properties Test of Effervescent Granule

1. Water Level Test

Table 2. The results of the water content test of the effervescent tablets of secang wood and red ginger extracts

Tablet formulation	Water content (%)
F-1	2.91
F-2	3.35
F-3	3.73

Based on table 2, the three formulations meet the BPOM standard, namely 10% (BPOM RI, 2014). The results of the ANOVA test showed that the addition of citric acid and tartaric acid had a significant effect on the water content of the effervescent tablets of secang

wood and red ginger extracts. The water content in effervescent tablets is influenced by the addition of citric acid and tartaric acid, where the higher the acid concentration, the lower the water content (Widayanti *et al*., 2012). In addition, room humidity can also affect the water content, it is advisable to make effervescent tablets at a maximum relative humidity of 25% and a temperature of 25°C (Anam, *et al*., 2013).

2. Flow Rate

Table 3. The results of the water content test of the effervescent tablets of secang wood and red ginger extracts

Tablet formulation	Water content (%)
F-1	6.01
F-2	5.56
F-3	5.19

Based on Table 3, it meets the standard flow rate, which is less than 10 seconds (Rahmawati, 2011). The results of the ANOVA test which showed the difference in the addition of citric acid and tartaric acid had no significant effect on the water content of the effervescent tablets of secang wood and red ginger extracts. Things that affect the flow rate of the shape of the particles, the cohesion between particles and, also the size of the particles. The flow rate is good because it is influenced by the concentration of the binder where the smaller the concentration of the binder, the viscosity, size and, cohesive force of the granules will increase (Anshory, 2007).

Physical Properties Test of Effervescent Tablets

1. Tablet Hardness Test

Table 4. Hardness test results of effervescent tablets extracts of secang wood and red ginger.

Tablet formulation	Water content (%)
F-1	4.02
F-2	12.92
F-3	26.26

Based on Table 4, the first formulation meets the standard of 4-10 kp. But the tablet hardness of 4-10 kp is not absolute, if the tablet hardness is more than 10 it can be accepted if the dissolving time requirements are in accordance with the requirements (Sulaiman, 2007). The results of the ANOVA test showed that the addition of citric acid and tartaric acid had a significant effect on the hardness of the effervescent tablets of secang wood and red ginger extracts. The hardness of effervescent tablets is influenced by citric acid and tartaric acid, where citric acid and tartaric acid themselves are hygroscopic, the more acid added to the effervescent tablet, the smaller the tablet hardness value. This is because citric acid absorbs water so that when the concentration of acid added in a sample is large, the tablet will become soft (Anam, *et al*., 2013).

2. Tablet Friability Test

Table 5. The results of the water content test of the effervescent tablets of secang wood and red ginger extracts.

Tablet formulation	Water content (%)
F-1	0.46
F-2	0.39
F-3	0.26

Based on Table 5, the three formulations met the standard for friability of effervescent tablets, which was less than 1% (Siregar & Wikarsa, 2010). The results of the ANOVA test showed that the addition of citric acid and tartaric acid had no significant effect on the friability of the effervescent tablets of secang wood and red ginger extracts. The fragility of the tablet describes the physical strength of the outer part of the tablet which functions to resist mechanical shocks (Fonner *et al*., 1981).

3. Weight Uniformity Test

Table 6. The results of the weight uniformity test for the effervescent tablets of secang wood and red ginger extracts.

Tablet formulation	Average weight (g)	Percentage of weight deviation average (%)
F-1	3.431	0.132
F-2	3.425	0.048
F-3	3.392	0.11

Based on Table 6, the three formulations are in accordance with the requirements for uniformity of weight, which is stated in the third edition of the Indonesian Pharmacopoeia that there should be no more than two tablets, each of which weights deviate by 5% from the average weight and there should be no 1 tablet whose weight deviates by 10% of the average (Anonim, 1979).

4. Dissolve Time Test

Table 7. The results of the dissolution time of the effervescent tablets of secang wood and red ginger extracts.

Tablet formulation	Dissolving time value (s)
F-1	71
F-2	129
F-3	166

Based on Table 7, the three formulations met the standard effervescent tablet dissolving time, which was less than 5 minutes (BPOM RI, 2014). The results of the ANOVA test showed that the difference in the addition of citric acid and tartaric acid had a significant effect on the dissolution time of effervescent tablets of secang wood and red ginger extracts. This is due to the addition of citric acid and tartaric acid which are hygroscopic so that it facilitates the dissolution process in water.

5. Test The Degree of Acidity (pH)

Table 8. Test results for the degree of acidity (pH) of effervescent tablets of secang wood extract and red ginger.

Tablet formulation	Dissolving time value (s)
F-1	71
F-2	129
F-3	166

Based on Table 8, the three formulations meet the standard pH of the effervescent tablet, which is close to neutral pH (Patel *et al*., 2012). In that formulation the pH value that is close to the standard is F-1, which is 6.4. ANOVA test results show differences in the addition of citric acid and Tartaric acid has a significant effect on the acidity of the effervescent tablets extracts of secang wood and red ginger. The addition of the concentration of the amount of acid will affect the pH value, the more acid concentration used, the smaller the resulting pH value because more H^+ ions are released

CONCLUSION

The effervescent tablets of secang wood extract and red ginger with an acid concentration of 20% met all the requirements for the physical quality of the granules, namely water content and flow rate, and met all the physical quality requirements of effervescent tablets, both tablet hardness, tablet friability, weight uniformity, time soluble and pH. Differences in the concentration of citric acid and tartrate affect some of the physical qualities of effervescent tablets.

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