TEMUGIRING (*Curcuma* heyneana) : AN ANTIOXIDANT IN *PUPUR DINGIN* AS A TRADITIONAL SUNSCREEN FROM BORNEO

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Abstract

Cosmetic product are currently dominated from the processed chemicals product, whereas Indonesia very rich with natural resources to efficacious with medicinal plants as raw material for cosmetics. One alternative to maximize the utilization of natural materials as a maximizing the main ingredient of cosmetics manufacturing to its use. One of it is pupur dingin, a traditional sunscreen of Borneo. This research is specifically to discuss about the antioxidant activity of rhizomes temugiring, used everyday as one of the nutritious ingredients in pupur dingin. Based on the methods that have been conducted to determine the antioxidant activity of curcumin in rhizome, temugiring can be used with FTC method and DPPH methods. The results of comparative studies of curcumin activity with ascorbic acid using FTC and DPPH have differences. The results of the FTC method, antioxidant effect of curcumin is greater than ascorbic acid or citric acid, but by using the DPPH, antioxidant activity of ascorbic is greater than temugiring rhizomes. Difference in results is by using DPPH method, curcumin from temugiring be socletated first and then took into the crystal. The FTC method used for measuring the absorbance of the extract. If compared between the extract snd crystal curcumin, the effectiveness of crystal is larger because only contain curcumin without other compounds, where the compared compound is ascorbic acid. The results showed that the antioxidant activity of curcumin in rhizome temugiring is greater than ascorbic acid. Absorbance values ??at a concentration of 400 ppm are 0.008 for ascorbic acid and 0.005 for the curcumin temugiring indicating that the antioxidant activity temugiring is greater than ascorbic acid. So temugiring as one of the active ingredient found in cold powder can be used as a sunscreen with its curcumin.

Keywords : *pupur dingin, temugiring rhizome, curcumine, FTC method, DPPH Method*

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INTRODUCTION

Cosmetic products are currently dominated from the processed chemicals, whereas Indonesia very rich with natural resources to efficacious medicinal plants as raw material for cosmetics. Megabiodiversity Indonesia as a country rich in medicinal plants are potential to be developed, but has not been managed to its full potential although it is wellknown that the natural wealth of plants in Indonesia covering 30,000 species of plants from a total of 40,000 of the world's plant species and 940 species of which are medicinal plants. This amount represents 90% of the total medicinal plant in Asia (Department of Forestry, 2010).

As an alternative to minimize the poisoning effect of dangerous substances in cosmetic is to maximize the uses of natural materials, either by themselves or making large-scale manufacture. The recipes of traditional cosmetic Indonesia that are being abandoned due to the proliferation of modern cosmetic products on the market may be reappointed and encouraged its uses. One of them is cold powder, a traditional sunscreen of Borneo.

Cold powder is used by the women of Borneo to maintain their healthy skin from the strong sun exposure around equator. Generally, women in the Borneo use cold powder when they want to do their activity under the hot sun or at night before going bed to keep the freshness of their skin.Cold powder are made from the mixture starch and some herbs such as **ginger temugiring** (Curcumae Heyneanae Rhizoma) as an antioxidant and **"kulit pulasari"** (Alyxiae Cortex) as a sunscreen. At this time study of specifically addresses the rhizome activity temugiring as antioxidants, which are used daily as a nutritious ingredient in cold powder. The expectation from efficacy studies of temugiring rhizomes, cold powder can be used as an alternative of facial products, reduced the harmfulness of available cosmetics contained of chemical substances.

CHAPTERS EXPOSITION

Review

Temugiring Rhizome or Curcumae Heyneanae Rhizoma derived from plants belonging to family Zingiberaceae. This plant contains compounds of essential oils, tannins, and curcumine. Antioxidants are substances that neutralize the toxic material and resist or inhibit the free radicals and oxidants in the body cell, thereby reducing the occurrence of damage (Widjaja, 1997). There are two kinds of anti-oxidants, the natural antioxidants and antioxidant from synthesis. For example, á tocopherol (vitamin E) is a natural antioxidant found in fats and oils derived from plant seeds (Zapsalis, 1985). Curcumin contained in the ethanol extract of rhizome temugiring has potential as an antioxidant that can be used as a sunscreen. Curcumine is a natural antioxidant where the activity is greater than á tocopherol when tested in oil (Zapsalis, 1985).

Vitamin C or ascorbic acid is an antioxidant that is well known. Ascorbic acid has a molecular weight of 178.13 up with the formula C6H8O6, in the form of colorless crystals with melting point 190-192 ° C. Ascorbic acid contains not less than 99.0% C6H8O6. Ascorbic acid in the dry state, steady in air, rapidly oxidized in solution. (Ministry of Health, 1979).

Ascorbic acid is a reducing agent. That characteristic was caused by the easy escape of hydrogen atoms on the hydroxyl group attached to atom C2 and C3 atoms (C atoms at the double bond). Due to the influence of oxygen, oxidizing substances are weak, or by the influence of ascorbic acid oxidase enzymes, ascorbic acid is easily oxidized to dehydroascorbic acid. Reduction of dehydroascorbic acid as vitamin C will result in ascorbic acid. Reciprocally, oxidation also occurs in the body. Due to possess easily oxidized, ascorbic acid is used as an antioxidant (Sumardjo, 2006). In all the experiments is better to use a standard or a "positive control" in addition to the main sample

being studied. According to the standard that is widely used is ascorbic acid (Molyneux, 2004).

METHODS

Based on research methods in the curcumin content of rhizome temugiring, can be compared from the research conducted by Wahyudi (2010) and by Rachman (2008). Based on the method that has been done by Wahyudi (2010) to determine the activity of curcumin as an antioxidant in the rhizomes temuputih can be done by the FTC method (Ferric Thio Cyanate) which is 100 grams of fine powder temugiring wrapped in filter paper, inserted into the tool with a pumpkin base soklet round 1000 mL filled with approximately 350 mL (1/3 the volume) n - hexane and a few boiling stones. Extraction is performed at 70 ° C for 24 hours or until the color of the condensed solvent is trun into pale yellow. The residue was evaporated at low pressure, then extracted again with ethanol solvent at a temperature of -80 ° C for 24 hours. Ethanol extract was evaporated with a rotary evaporator to crystallize. Recrystalized crystals is obtained by using solvent methanol, then eluted with column chromatography with benzene eluent: chloroform (1: 4) as eluent and stationary phase silica gel 60. Curcumin fractions were analyzed by using UV, IR, GC-MS and melting point test.

Antioxidant activity of test compounds curcumin, ascorbic acid and citric acid begins by making a variation of the concentration of each of 50, 100, 200 and 400 ppm. Each solution (3.7 mL) was added 4 mL of ethanol 99.5%, 4.1 mL of 2.51% linoleic acid in 99.5% ethanol and 8 mL of phosphate buffer (pH 7). Mixture put in a dark bottle tightly closed and incubated at 40 ° C temperature. Each interval of 24 hours of footage taken of each added 0.1 mL and 9.7 mL of 75% ethanol, 0.1 mL of ammonium thiocyanate 30%, 3.9 mL H2O, and 0.1 mL of 0.02 M in HCl FeCl2 3.5%. The mixture was put into the cuvette, absorbance was measured after 3 minutes at ë = 500 nm and the results were compared with control solution (without antioxidants).the sinergism test is done by adding 3.7 mL of 200 ppm curcumin in 0.1 mL of 200 ppm of ascorbic acid. The mixture was added 4 mL of ethanol 99.5%, 4.1 mL of 2.51% linoleic acid in 99.5% ethanol and 8 mL of phosphate buffer (pH 7). The mixture was put into a dark bottle sealed and incubated at 40 ° C for 24 hours each time interval. Samples were taken and added 9.7 mL 0.1 mL 75% ethanol, 0.1 mL of ammonium thiocyanate 30%, 3.9 mL and 0.1 mL H2O FeCl2 0.002 M in HCl 3.5%. After 3 minutes the solution absorbance was measured at ë = 500 nm. The same work performed on a mixture of ascorbic acid and citric acid. Both the results of each compared with a control solution without an antioxidant.

In the study conducted by Rachman et al. (2008), using methods of DPPH (1,1-diphenyl-2-pikrilhidrazil) to test the antioxidant activity by reflucting first ginger rhizome (Curcuma xanthorrhiza), turmeric (Curcuma domestica), temuireng (Curcuma aeruginosa), and temugiring (Curcuma heyneana) aged 11-12 months. Extraction method performed by weighing 50 g each of the dried rhizome and then refluxed for a period of three hours using 500 ml of methanol, filtered and repeated three times and evaporated. The extract was then partitioned with n-hexane three times as much as 100 ml, concentrated, and then stored in a clean container, dry and tightly closed. Antioxidant testing is done by immersion method using DPPH free radical in a way according to Yen and Okawa, then made thin-layer chromatography. Four types of rhizome methanol extract was dissolved in methanol, while n-hexane extract was dissolved in n-hexane and spotted in the plates of silica gel GF then eluted using n-hexane-ethyl:acetate (9:1) and kloform:methanol (5:1) with a solution spray cerium sulfat. Yakushima Zedoary used as standard comparison to identify sesquiterpenoid while curcumin reference standard to determine the presence of curcumin.

RESULTS AND DISCUSSIONS

Wahyudi Research (2010) is a compound isolated from the rhizomes of curcumin temugiring sokletasi method with the solvent

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n-hexane and ethanol. Temugiring powder solvent extraction with n - hexane intended to take the non-polar fractions containing the most likely essential oils and lipids. The residue was extracted again with ethanol solvent to take curcuminoid. Obtained from extraction of 3 x 100 grams of powder temugiring 5 grams of pure curcuminoid extract. The results obtained by oxidation of linoleic acid in the buffer conditions that can be measured by the number peroksidanya FeCl2 and NH4SCN reagent. This reaction is characterized by the formation of red color that can be measured absorbance at $\lambda = 500$ nm. More and more peroxide / radical that is formed then the higher absorbance values.

Table I. Activity Test of Rimpang Temugiring by Using Socletation

Cuplikan1	Absorbance with ë = 500 nm The Day of Observation									
	1	2	3	4	5	6	7	8	9	10
Control Liquid (Without Anti Oxidant)	0,53	0,726	1,1	1,162	1,236	1,286	1,326	1,4	0,676	0,224
Citric Acid 50 ppm	0,412	0,442	0,46	0,484	0,542	0,633	0,7	0,832	0,528	0,166
100 ppm	0,4	0,441	0,42	0,43	0,5	0,528	0,64	0,776	0,524	0,122
200 ppm	0,35	0,4	0,405	0,41	0,46	0,492	0,54	0,58	0,346	0,076
400 ppm	0,136	0,156	0,184	0,234	0,312	0,386	0,406	0,466	0,103	0,015
Ascorbic Acid 50 ppm	0,366	0,39	0,42	0,442	0,472	0,592	0,672	0,86	0,488	0,035
100 ppm	0,332	0,36	0,39	0,41	0,436	0,49	0,546	0,635	0,486	0,026
200 ppm	0,292	0,312	0,33	0,342	0,368	0,462	0,496	0,53	0,286	0,02
400 ppm	0,126	0,206	0,24	0,264	0,284	0,306	0,332	0,36	0,078	0,008
Curcumin 50 ppm	0,3	0,34	0,4	0,44	0,502	0,564	0,62	0,726	0,42	0,027
100 ppm	0,286	0,32	0,38	0,41	0,432	0,48	0,528	0,635	0,34	0,018
200 ppm	0,24	0,28	0,336	0,4	0,42	0,456	0,48	0,506	0,28	0,012
400 ppm	0,022	0,042	0,095	0,108	0,127	0,14	0,17	0,268	0,027	0,005

column chromatography 0.25 g curcuminoid extract curcumin which has a melting point of 174oC, while curcumin has a melting point of 175oC standards. Identification by UV spectroscopy, the results showed that curcumin wavelength is 422 nm and curcumin standard is 420 nm. The results indicate there is a similarity between curcumin extracted with standard curcumin. Test is carried out on the antioxidant activity of different variations, it is intended to study the relationship between concentration and antioxidative effects provided in inhibiting the formation of compounds that are radical and reactive. Free radicals are formed due to

Antioxidant activity test was also conducted by the FTC method for citric acid and ascorbic acid at concentrations of 50, 100, 200 and 400 ppm experiments showed that the most effective concentration of curcumin is 200 ppm with a comparable number of control peroxide on day-8. It also happened the same on the measurement of ascorbic acid and citric acid. Concentration of 200 ppm was used to assess the effect of synergism. From table I. seen that on day 8 only solution that controls the highest absorbance. This is due to the absence of antioxidants in the control solution so that the formation of peroxides in linoleic acid emulsion

is increasingly characterized by the increase in absorbance of each day on a regular basis. Curcumin has antioxidant effects greater than with citric acid and ascorbic acid radical stabilizing this is due to curcumin going well. Antioxidative effect is due to the radical form bundled with non radical results (Hidaka, 1999).

In the study Rachman et al. (2008) used the yield of the plant extract of Curcuma spp simplicia. extracted with methanol and the solvent n-hexane. Of the four roots are used, the most yield is the yield of methanol extract of turmeric as seen in Table II. Temugiring at a concentration of 100 ppm yield of 45.74% activity, compared with vitamin C at concentrations of 10 ppm has had activities of 53.07%. When compared at a concentration of 10 ppm temugiring, the activity of only 4.57% temugiring. On the analysis of thin-layer chromatography (TLC) using a reference standard of curcumin with the solvent chloroform-methanol (5:1) showed that the methanol extract of temugirirng contains curcumin, but not in n-hexane extracts.

Table II. The Result activity test submerged free radical of Methanol Extract with Combination

Methanol Extract				n-hexane Extract	
Simplisia	**ppm**	**Inhibition**	**IC50**	**Inhibition**	**IC50**
Temulawak (C. xanthoriza)	10	19,14	47,03 ppm	2,68	413,41 ppm
	25	42,23		2,87	
	50	51,93		3,88	
	100	84,61		13,17	
Kunyit (C. domestica)	10	18,81	43,57 ppm	0,90	1429,4 ppm
	25	39,63		1,33	
	50	59,66		2,97	
	100	90,04		3,92	
Temu ireng (C. aeruginosa)	10	3,86	87,27 ppm	0,45	3250,7 ppm
	25	12,58		0,98	
	50	29,96		1,85	
	100	56,75		1,88	
Temu Giring (C. heyneana)	10	13,07	108,54 ppm	3,32	874,13 ppm
	25	18,09		4,23	
	50	31,40		4,31	
	100	45,74		8,33	
Vitamin C	4	11,56	10,06 ppm		
	6	13,07			
	8	33,35			
	10	53,07			
	12	64,52			
	15	85,37			

The results of comparative research activity of curcumin with vitamin C / ascorbic acid on the research Wahyudi (2010) by Rachman (2008), there is a difference. In the study Wahyudi (2010) concluded that the

antioxidant effect of curcumin is greater than with ascorbic acid or citric acid, but the research Rachman, et al. (2008) produced the antioxidant activity of ascorbic acid greater than temugiring rhizomes. Difference in results is due to the research Wahyudi (2010), curcumin from temugiring is socletated first and then took into the crystal. The next research phase, which is used is a crystal of curcumin, so when compared with research Rachman, et al. (2008) results would be different. In the study Rachman, et al. (2008) is used to measure the absorbance of the extract, rather than pure crystals of temugiring that will give the effect of different antioxidants. If the comparison between the crystal extract curcumin, the effectiveness of larger crystals because only contains curcumin alone without other compounds, wherein the compound is a compound for comparison instead of ascorbic acid ascorbic acid extract. So when compared to the comparison with curcumin extract or crystalline ascorbic acid, is more properly applied to the crystal because ascorbic acid is used instead of extract.

CONCLUSIONS

Temugiring rhizome (Curcuma heyneana) contains curcumin as an antioxidant that can be used as a sunscreen. The results showed that the antioxidant activity of curcumin in rhizome temugiring greater than ascorbic acid. Absorbance values at a concentration of 400 ppm are 0.008 for ascorbic acid and 0.005 for the curcumin temugiring indicating that the antioxidant activity temugiring greater than ascorbic acid at the same concentration. So temugiring as one of the active ingredient found in cold powder can be used as a sunscreen.

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