Antioxidant Activity From Water Extract Of Kecombrang Flower (*Etlingera elatior*) Leading To Jelly Candy Formulation

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Abstract

A research on antioxidant activity of kecombrang flower (*Etlingera Elatior*) water extract leading to jelly candy formulation was conducted. This experiment aims to elucidate the potential usage of kecombrang flower as a functional food ingredient. Antioxidant activity of the kecombrang flower water extract was determined using *Diphenyl Picryl Hidrazyl* (DPPH) method. In order to elucidate the responsible compound for antioxidant activity, GCMS analysis was undertaken. Water extract of kecombrang flower have antioxidant activity (IC_{50}=61,6497 ppm) and based on GCMS analysis it contained 1-dodekanol (tR=11,60, area=11,73, similarity at 95 %), 3-metil-1-oxo-2-buten 1-(21,41, 51-trihidroxyl phenil) (tR=13,02, area=3,17, similarity at 57 %) and 1-tetradecene (tR= 13,26, area=6,03, similarity at 98 %). Formulation of jelly candy using kecombrang flower was designed and based on organoleptic test, C formula (pink, sample code 763) was the optimum jelly pepermint formula with average score of 3,52.

Keyword: kecombrang (*Etlingera elatior*), functional food, antioxidant and jelly candy

1. INTRODUCTION

Indonesian natural resources as a state of megabiodiversity in the world is reflected immeasurablely it the animal species (fauna), microbe and crop (flora). One of among properties crop of the Indonesia is Zingiberacea family consisted of ginger, curcuma, alpinea galanga, koempheria galanga etcetera.

One of Zingiberacea family original of Indonesia is flower kecombrang (*Etlingera Elatior*). This Crop is recognized with various names for example " kencong" or " kincung" in Sumatra North, " kecombrang" in Java, " honje" in Sunda, " bongkot" in Bali, " sambuang" in West Sumatra " flower kantan" in Malaysia. This crop is also known as torch ginger or torch lily due to the colour and shape of this particular flower (Figure 1). Some people also know it as philippine waxflower or porcelein rose relating to the beauty of its flower. This crop is an indigenous crop of Indonesia proven by an etnobotanical study in Kalimantan island, where 70% from existing species have other local names in the island and more than 60% existing species have at least one benefit used by the Kalimantan people.

Gambar 1. Kecombrang flower (*Etlingera elatior*).

The use of kecombrang flower in the culinary have been practiced since long time ago. This flower have a typicall flavour and aroma that will give delicious sensation to neutralize seafood and coconut based food.

Traditionally, the leaf is used as medicine and cosmetic useage such as eliminating body odour. Based on some ancient literature, the kecombrang flower was also used to prevent early aging an eliminating phlegm.

Kecombrang flower has some excellence traits for example as an edible flower, owning antioxidant activity which can eliminate free radical inhibition and antimicrobial activity. So that this crop can be developed as the functional food, that is substance of food that not only has nutrition value but also owns certain medical purposes. The medical purposes is different from drugs which are more curative. Functional food works as an agent of preventing infectious diseases (Winarti And Nurdjanah, 2005).

Product development of food base on kecombrang will be able to give an example to the society of about application of kecombrang flower as a functional food. Therefore, research on kecombrang crop characteristics as a functional food including the formulation is needed.

2. MATERIAL AND METHODS

General. Extraction conducted by macerated the flower for 3 days. Examination of antioxidant activity of kecombrang flower water extract was conducted using *Diphenyl Picryl Hidrazyl* (DPPH) method and linear regression (Cahyana, 2002), chemical component analysis using Gas Chromatography-Mass Spectroscopy (GCMS) was done and determination of an optimum formula of jelly candy was done by organoleptic test (SNI No-01-3547-1994).

Material. Chemicals used in this experiment are DPPH solution, table sugar (24%), liquid glucose syrup (49%), sodium citrate (0.3%), citrate (0.3%), jelly candy powder (1.5%), essence (sufficiently), colouring agents (sufficiently), water, liquid milk (24,9%) and 2 forms of the kecombrang flower (sweetened and extract).

Extraction

500 gram of dry kecombtang flower sample was macerated in 1 litre of aqquades solven for 3 days. Result of extraction filtered, condensed by rotary evaporator and is used for examination of antioxidant activity, chemical component analysis and organoleptic test.

Antioxidant analysis

25 mg of crude extract dissolved in methanol (stock solution of 1000 ppm). 0,1 ml; 0,2 ml; 0,3 ml; and 0,4 ml of stock solution was pippeted to get concentration of test solution 4 ppm, 8 ppm, 12 ppm and 16 ppm. Into each flask, 5 of ml of 0,5 mM DPPH solution was added. Blank or control was made by solution of DPPH 0,5 mM without extract. Absorbance of DPPH was measured with spectrometer of visible ray at wavelength 515 nm and the value of IC_{50} was determined (Cahyana, 2002).

GCMS analysis

The chemical content of kecombrang flower water extract was identified using GCMS Agilent 19091S-436. using column of polar HP-5MS 0.25 x 60 x 0.25 mm, oven temperature (70^0C - 325^0C), interface (290 ^{0}C), mode control (split), pressure (16.30 psi), total [of] flow (40.0 ml/min), split ratio (50 : 1), split flow (49,3 ml/min), gas (He), gas saver (On), and detector (MSD).

Jelly candy formulation

Jelly candy using kecombrang flower formulation was designed as follows :

1) A (yellow) : extract (150 ml) + sugar concentration I (20% table sugar and 40% liquid glucose syrup)
2) B (orange) : swetened (50 ml) + sugar concentration I (20% table sugar and 40% liquid glucose syrup)
3) C (pink) : swetened (50 ml) + sugar concentration II (24% table sugar and 43% liquid glucose syrup)

4) D (purple) : extract (150 ml) + sugar concentration II (24% table sugar and 43% liquid glucose syrup)

Table sugar mixed with jelly candy powder and catalyzed by cool water addition then swirled to fully dissolved; then heated at temperature 80^0C until all of table sugar dissolved. Afterwards liquid glucose syrup was added and the heating was discontinued when temperature reached 107^oC. Afterwards kecombrang flower, sodium citrate and citric acid were added. Mixture was then poured into moulding tray and will be formed jelly candy texture at temperature 50^oC-60^oC. Jelly candy was then dried for during 24 hours and wrapped. Organoleptic test was done according to SNI No-01-3547-1994.

Data Analysis. All treatment repeated three times from different samples and will be tested with statistical analysis (ANOVA).

3. RESULT AND DISCUSSION

Result examination of antioxidant activity of water extract kecombrang flower can be seen at table 1 below.

Tables of 1. Antioxidant activity of water extract kecombrang flower

Concentration (ppm)	Absorbance	% Inhibition	IC_{50} (ppm)
0	0,8907	0	61.6497
18	0,6518	26,8216	
36	0,4281	51,9367	
54	0,4125	53,6881	

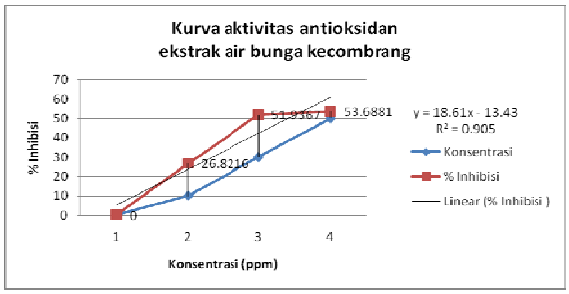


Figure 2. Antioxidant activity curve of water extract kecombrang flower

According figure above, antioxidant activity result using DPPH method of water extract kecombrang flower at concentration 0, 18, 36 and 54 ppm yielded IC_{50} of 61.6497 ppm. This value indicated that the extract have strong antioxidant activity, because having IC_{50} less than 100 ppm. According to Blois (1958), antioxidant activity from plant extract can be grouped according to IC_{50} value, for example < 50 ppm is categorized as very strong, 50-100 ppm strong, 100-150 ppm medium and 151-200 ppm weak antioxidant.

Result of GCMS analysis of water extract kecombrang flower can be seen at the following picture (Fig. 3).

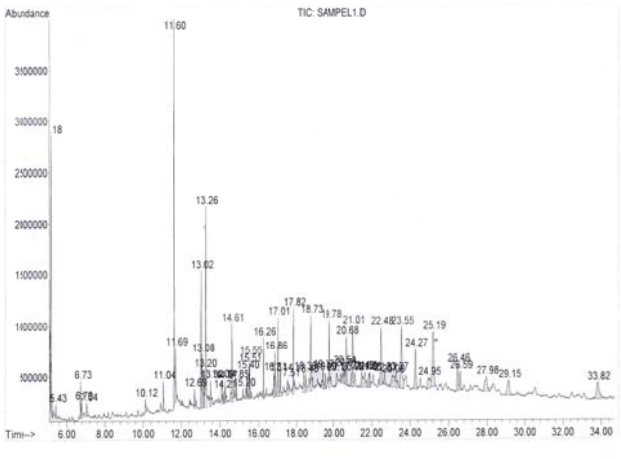
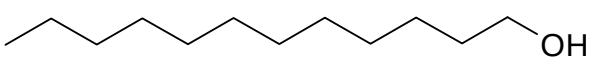


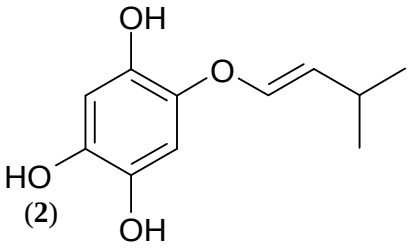
Figure 3. Result of GCMS analysis

Result GCMS analysis of water extract kecombrang flower on figure 3 showed that there were at least 6 fractions of special compounds which contained in the water extract of kecombrang flower, those are alkane, alkene, alcohol, fatty acid, ester, and fenol. Three of them are majority which are 1-dodecanol (**1**) at retention time 11,60, wide culminate 11,73 and similarity 95 %, 3-metil-1-oxo-2-buten 1-(21,41, 51-trihidroxy phenyl) (**2**) at retention time 13,02, wide culminate 3,17 and similarity 57 % and also 1-tetradecene (**3**) at retention time 13,26, wide culminate 6,03 and similarity 98 %. Chemical structures of those compounds are presented in figure 4.



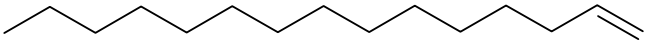
1-dodecanol

(**1**)



(**2**)

3-metil-1-oxo-2-buten-1-(2^1,4^1,5^1-trihidroxy phenyl)



(**3**)

1-tetradecene

Figure 4. Major compounds of water extract kecombrang flower

Results of organoleptic test on kecombrang flower based jelly candy can be seen at table 2.

Table 2. Result of organoleptic test

Indicators	Samples				
	893	**763**	**487**	**307**	**855**
Preference	3.20	3.60	3.33	3.53	4.00
Fragrant	2.86	3.46	3.33	3.73	3.93
Colour	3.33	3.53	3.26	3.26	3.40
Taste	3.13	3.40	2.93	3.53	4.06
Texture	3.46	3.53	3.20	3.46	3.26
Elasticity	3.40	3.60	3.33	3.60	3.20
Total Indicator	19.38	21.12	19.38	21.11	21.85
Mean Score	3.23	3.52	3.23	3.51	3.64

Result organoleptic test with indicator of preference, panelists were spread to all level; level 1 extremely like until level 5 extremely dislike. Statistical analysis showed there is no significant difference at all of formulation (A to D) that is tried by panelist including commercial product. It is then concluded that kecombrang based jelly candy can be accepted by consumers.

While organoleptic test with indicator of fragrant, panelists were spreadto level 3 and 4; level 3 (rather like) and 4 (like). Statistical analysis show there is significant difference in the case of fragrant where fragrant of kecombrang flower in the form of extract (code 893) preferred by the consumers. In general, fragrant of kecombrang flower based jelly candy is equally preferred by consumers compared to commercial jelly candy (code 855). Fragrant of food determining delicacy of food (Winarno, 1992)

Colour represent parameter which determine the quality of food (deMan, 1989). Result of organoleptic test with indicator colour did not show any statistically differences. This indicated that consumers have accustomed to different colours of jelly candy so that this indicator becomes less important.

Taste is feeling brought by food substance entered into mouth and felt by

sensuous receptors in the mouth (deMan, 1989). Taste of the food determines quality of food substances. Result of organoleptic test with indicator taste range from level 3 to level 4; level 3 (rather like) and 4 (like). This result indicated that most panelists can accept the taste of kecombrang flower. Furthermore, panelists prefer to dominant flower kecombrang flavour in jelly candy. This was shown by the result that formula with extract kecombrang flower (307) that has stronger flavour was statistically preferred over swetened kecombrang flower.

In the case of texture and elasticity, the were no statistically difference between tried formulation of jelly candy. This result is rather suprising because sugar concentration was also considered besides kecombrang flower forms. Theoretically the different sugar concentration will give different texture and elasticity of jelly candy. According to Desrosier and Norman (1988), elasticity and texture of gel was influenced by sugar concentration. Sugar causes to high water binding capacity where at high concentration, sugar can pull water to go out from three gel dimension network so that both gel consistency and gelatine stability becoming imperfect (gel formed progressively weak and watery). But this factor is not seen in this research. Perhaps the size of samples should be enlarged so that differences in the case of texture and elasticity can be felt.

According to the average result of the organoleptic test in table 2 the formulation tested are ranked. First of jelly candy sample code 855 (old purple) with value 3,64 representing sampel control (commercial product), secondly jelly candy kecombrang flower sample code 763 (pink) with score mean 3,52, third jelly candy kecombrang flower sample code 307 (purple) with score mean 3,51 and fourth jelly candy kecombrang flower 893 and 487 with equal score mean, that is 3,23. It can be concluded that formulation jelly candy kecombrang flower with sample code 763 (Formula C, pink) posessed the highest score among 4 tested formula.

4. CONCLUSION AND SUGGESTION

Conclusion

Water extract of kecombrang flower have been antioxidant activity (IC_{50}=61,6497 ppm)

1. Water extract of kecombrang flower composed of 1-dodecanol (tR= 11,60, area=11,73, similaruty 95 %), 3-metil-1-oxo-2-buten 1-(2^1,4^1, 5^1-trihidroxy phenyl) (tR=13,02, area=3,17 similarity 57 %) dan 1-tetradecene (tR= 13,26, area=6,03, similarity 98 %).
2. Formulation of jelly candy kecombrang flower with sample code 763 (Formula C, pink) had the highest score among four tested formula at 3,52.

Suggestion

First, further research on structure of active compounds that has antioxidant, antibacterial and toxicity properties using spectroscopy UV-VIS, IR, and NMR. Second, further research on nature of physical and chemical traits of jelly candy formula C. Third, further research of antibacterial properties of kecombrang flower toward mouth bacteria for tooth paste formulation.

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