# FORMULATION, ORGANOLEPTIC TESTS AND ANTIOXIDANT ACTIVITIES CANDY OF JAMICU FROM GINGER (*ZINGIBER OFFICINAL*), MIANA (*COLEUS ATROPURPUREUS* L. BENTH.) AND CALAMANSI (*CITROFORTUNELLA MICROCARPA*)

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## ABSTRACT

*Ginger* (*Zingiber officinal*), *miana* (*Coleus atropurpureus benth*) *and calamansi* (*Citrofortunella microcarpa*) *are plants that have high antioxidant activity. This activity is due to the content of flavonoids, anthocyanins, essential oils and minerals. However, it is unfortunate in Gorontalo that these three ingredients are only used as spices. Based on the content and lack of utilization of these three plants, reseacher to make a formula that is popular with the community, namely ginger-based jelly candy, miana and Calamansi which are rich in antioxidants and can increase endurance.*

*The research method is true experiment. Organoletic test results show that Formula B is the most preferred formula. Microscopic tests and heavy metal tests show that Jamicu jelly candy fulfills the requirements of SNI 3547-02-2008 concerning Jelly Soft Confectionery. Antioxidant activity test results using the DPPH method show that Jamicu jelly candy has a very strong antioxidant activity ($IC_{50}$ 3.39 ppm).*

***Keywords:*** *Candy, Ginger, Miana, Calamansi, Organoleptic Test.*

## INTRODUCTION

In everyday life, people certainly cannot be separated from consuming food to meet their nutritional needs. When consuming food, people should choose foods that have added value in addition to satiating, and can also increase endurance. many locales around us. One of the favorite products from various groups is jelly candy (Koswara, 2009 Afriananda, 2012; Ahmad et al., 2015; Atmaka, Nurhartadi, & Karim, 2013; Candy, Surti, & RatnaIbrahim, 2010; Fajriani, 2013; Fitrina, Akhyar, & Shanti, 2014; Isnanda, Novita, & Rohaya, 2016; Jumri, Yusmarini, & Herawati, 2015; Kumalasari, 2011; Muawanah, Djajanegara, Sa'duddin, Sukandar, & Radiastuti, 2012; Nelwan, Langi, Koapaha, & Th.Tuju, 2014; Octaviani, 2010; Purba, 2011; putri Octaviana, Ekamawati, 2003; Putri, Ninsix, & Sari, 2015; Riawati et al., 2014; Riyawan, Mustofa, & Kurniawati, 2016; Silvi Leila Rahmi, Fitry Tafzi, 2012; Wijana, Mulyadi, Dyan, & Septivirta, 2008; Yuniarti, 2011; Zalizar, Sapitri, Putri, & Winda, 2016). Previous research has been done to make candy from some natural ingredients, such as pineapple (*Ananas comosus* L.Merr) (Isnanda et al., 2016), Seaweed (*Eucheuma cottonii*) (Putri et al., 2015), Sappan wood (*Cesalpinia sappang*) (Riyawan et al., 2016), Red dragon fruit (*Hylocereus polyrhizus*) (Jumri et al., 2015)(Fajriani, 2013), Aloe vera (Aloe vera) (Fitrina et al., 2014), Kecombrang flower (*Etlingera elatior*) (Muawanah et al., 2012), Papaya leaf (*Carica papaya*) (Purba, 2011), Pomelo fruit skin (*Citrus grandis* L. Osbeck) and Roselle (Hibiscus sabdariffa L.) (putri Octaviana,Ekamawati, 2003), kefir (Riawati et al., 2014), Curcuma (Curcuma xanthorrhiza Roxb.) (Atmaka et al., 2013), Nutmeg juice (*Myristica fragrans* Houtt) (Afriananda, 2012), Black Murbey (*Morus nigra* L.) (Kumalasari, 2011).

Zingiber rhizome (*Zingiber officinale*), miana leaves (*Coleus* benth) and Calamansi (*Citrofortunella microcarpa*) are found in Gorontalo and are known to have high antioxidant content. Based on the description above, made an innovative product in the form of jelly candy containing herbal ingredients, namely ginger, miana leaves and Calamansi (JAMICU). The purpose of this study was to make JAMICU jelly candies based on ginger, miana leaves, Calamansi, organoleptic and microbiological tests, and measure antioxidant levels using the DPPH method.

## LITERATURE REVIEW

The immune system is the body's ability to fight infection, eliminate the action of toxins and other virulent factors that are antigenic and immunogenic [36].

Antioxidants are compounds that can counteract the effects of free radicals. Free radicals are atoms or molecules whose nature is very unstable. Free radicals are produced due to several factors, such as smoke, dust, pollution, the habit of consuming fast food that is not balanced between carbohydrates, proteins and fats. Antioxidant compounds will donate one electron to the unstable free radicals so that these free radicals can be neutralized and no longer interfere with the body's metabolism [27].

Miana (*Coleus atropurpureus* L. Benth.) Is a plant native to India and Thailand.Miana plants are very easy to flourish and easily found in various places. Miana plants contain phytochemical compounds including essential oils, tannins, flavonoids, eugenols, steroids, saponins, alkaloids, rosmarinic acid, streptozocin and quersetin. Miana also has pharmacological activities including antimicrobial, anthelmintic, antifungal, antibacterial, anti-inflammatory, antioxidant, antidiabetic, antihistamine and immunostimulant [20], [31], [33]. Plants of the genus Coleus from the Lamiaceae or Labiatae family are widely used in traditional medicine as antimicrobials, antioxidants, antiseptics, and other pharmacological activities. Folius atropurpureus L. Benth decoction leaves are indicated for traditional treatment of bronchitis, hemorrhoids, antioxidants, and tuberculosis [2]. The variety of styles, shapes and colors of miana, but the medicinal properties are da un yang be) brownish red color. The extract contains flavonoids with high antioxidant activity where IC50 which is found in the ethanol extract is 48.04 ppm and in the ethyl acetate fraction 22.98 ppm [3]. Research conducted by Wahidah (2008) [38] states that miana leaves are rich in essential oils, tannins, flavonoids, eugenols, steroids, tannins, saponins, phytols, rosmanic acids, streptozocins, anthocyanins and quercetin. In addition, one Calamansi was stated to have a composition of vitamin C 7.3 mg, vitamin A 54.4 mg, calcium 8.4 mg and water 15.5%, [23].

Calamansi (*Citrus microcarpa*) originates from China. Indonesian people are more familiar with the name orange/lime Calamansi, while in Gorontalo Province, better known as Lemon Cui. Calamansi has active compounds that are important for health such as vitamin C, flavonoids, carotenoids, limonoids and minerals. Flavonoid compounds in citrus fruits have antioxidant activity that has antihypertensive and antihypercholesterolemia properties. In addition, the vitamin C content of oranges can protect endothelial cells and LDL from intra or extracellular oxidants and can reduce the risk of atherosclerosis. The study results show Calamansi has hepatoprotective activity when compared with silymarin [10]. In the test using DPPH, Calamansi leaf has an inhibitory power of 48.67%, and has a phenolic value of 309.38 mg AAE / g [6].

Ginger rhizome contains 2 main components, namely the volatile and non-volatile components. The volatile

component consists of oleoresin (4.0-7.5%), which is responsible for the aroma of ginger (essential oils) with the most components being zingiberen, zingiberol and essential oils or also known as etheric oil (aetheric oil). Non-volatile components in ginger are responsible for the spicy taste, one of which is gingerol. Gingerol functions as a medicinal compound which is anti-inflammatory, antipyretic, gastroprotective, cardiotonic, antihepatotoxic, antioxidant, anticancer, anti-inflammatory, antiangiogenesis and anti -herosclerosis [34]. Studies in mice show that ginger can change the balance between antioxidant / pro-oxidant systems and affect antioxidant enzymes (GPx) (Ghasemzadeh, Jaafar, & Rahmat, 2010). Ginger and gingerol extracts had IC50 of 92.68 ± 5.47 and 74.19 ± 5.36 (Harliansyah, Murad, Ngah, & Yusof, 2007). As for ginger, it has the potential to reduce oxidative stress and protect immune cells from oxidative stress. Ginger also has the ability to stimulate the immune system [28].

Candy is made from the main ingredients in the form of sugar and water and auxiliary materials include dyes, flavor ingredients and other additives. Candies can be divided into two classes or classes; they are crystalline or non-crystalline or clear candies. One type of non-crystal candy is jelly candy. Jelly is made with sugar and gel-forming ingredients (gelatin, agar, pectin and carrageenan) and then added flavor and color and finally printed.) Jelly jelly is generally cooked to produce 75 percent solids [17].

## RESEARCH METHODS

This study used a true experimental method conducted in April-August 2019. The research sites were the Food Laboratory, Chemistry Laboratory and Microbiology Laboratory of Polytechnic of the Ministry of Health Gorontalo, and Pharmacy Laboratory of Sam Ratulangi University, Manado.

The research stages are as follows:

1. Making "JAMICU" Jelly Candy Tools: Frying pan, juicer, stove, filter, basin Formula:

| No | Ingredients | Percentage | | |
|---|---|---|---|---|
| | | FA | FB | FC |
| 1 | Miana Leaves | 10 | 10 | 10 |
| 2 | Zingiber | 7 | 7 | 7 |
| 3 | Calamansi | 26 | 26 | 26 |
| 4 | Jelly | 0,5 | 1 | 2 |
| 5 | Gel | 1,5 | 1 | - |
| 6 | Sugar | 34 | 34 | 34 |
| 7 | Water | 20 | 20 | 20 |

**Processing Method**

a. Prepared tools and materials used. b. 50 grams of miana leaves mixed with 130 mL of Calamansi juice, blended and then filtered and taken as much as 130 mL of filtrate.
b. Mixed 35 grams of ginger with 100 mL of water, then blended and filtered and taken as much as 100 mL of filtrate.
c. Put sugar, jelly and gelatin into the pan, then add 100 mL of ginger rhizome juice, cooked until the sugar dissolves on medium heat.
d. Added Calamansi-miana juice extract into the pan, cooked until thickened.
e. Pour into molds, cooled and cut into pieces.
f. Candy is dried by indirectly drying in the sun for 3 days, packaged and labeled.

2. Testing
   a. Organoleptic Test Organoleptic tests include color, taste, texture and aroma. Organoleptic tests have been carried out on 30 trained panelists with a range of values 1-5 (very dislike to very like). Qualitative Test of Heavy Metal Contamination (Pb, Cu and Hg). Pb test was carried out with HCl, $NH_3$, hot $H_2O$ reagents, Cu test with NaOH reagents, and Hg tests using NaOH and KI. Testing is done at the Chemistry Laboratory of Health Polytechnic of Gorontalo.

b. Microbiology Test
Microbiology test by calculating the Total Plate Number (ALT) using Sodium Agar (NA) media at the Microbiology Laboratory of Health Polytechnic of Gorontalo. The sample was incubated for 24 hours and compared with the requirements of the SNI SNI 3547-02-2008 concerning Jelly Soft Sugar Flower, which is under 50,000 colonies / gram.

c. Antioxidant Test Content
The test was carried out at the Pharmacy Laboratory Sam Ratulangi University, Manado. The effectiveness of a sample to ward off free radicals was tested by determining the $IC_{50}$ value (concentration that can reduce 50% of DPPH free radicals) using the DPPH test method (1,1-diphenyl-2-picrylhydrazil) based on the color changes in the sample after incubation with DPPH, starting from dark purple to bright yellow. The absorbance value of the sample was measured at several concentrations and vitamin C as a positive control was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm (Filbert, 2014; Tristantini, 2016; Koleangan, Runtuwene, & Kamu, 2014; Huliselan, Runtuwene, & Wewengkang, 2015; Septiani, Marianne, & Nainggolan, 2018; Tristantini, Ismawati, Pradana, & Gabriel, 2016; Widyasanti, 2016).

## RESULTS AND DISCUSSIONS

1. Organoleptic Test

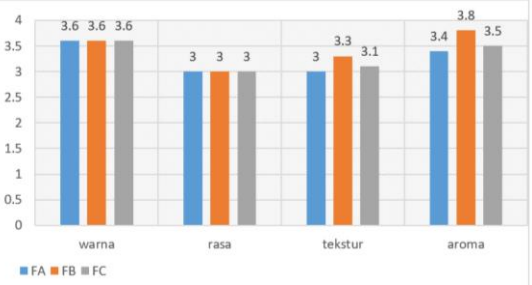


Figure 1. Organoleptic Test of Jelly candy JAMICU

Based on the product organoleptic test, it was found that Formula B had the highest acceptance, namely 3.6 for color, 3 for taste, 3.3 for texture, and 3.8 for flavor.

2. Heavy Metal Test

Qualitative heavy metal test was carried out to ensure compliance with SNI SNI 3547-02-2008 concerning Jelly Soft Sugar Confectionery.

Table 1. Heavy Metal Test Results

| No | Test | Reactor | Results | | |
|---|---|---|---|---|---|
| | | | FA | FB | FC |
| 1 | Pb | HCl<br>NH3<br>H2O heat | Negatif<br>Negatif<br>Vegative | Vegative<br>Vegative<br>Vegative | Vegative<br>Vegative<br>Vegative |
| 2 | Cu | NaOH | Vegative | Vegative | Vegative |
| 3 | Hg | NaOH<br>KI | Vegative<br>Vegative | Vegative<br>Vegative | Vegative<br>Vegative |

The results of quantitative tests of heavy metals showed that all formulas were free of Pb, Cu, and Hg metal contents (fulfilling SNI requirements).

3. Microbiological Test (Angka Lempeng Total/ALT)

The ALT result of the colony was 17,000 colonies / gram for formula A, 16,900 colonies / gram for Formula B, and 16,500 for Formula C (fulfilling SNI requirements of 50,000 colonies / gram).

4. Antioxidant activity test

Table 2. Antioxidant Activity Test Results with the DPPH method

| Conc. | Repetition | | average absorbance | % Inhibition | $IC_{50}$ |
|---|---|---|---|---|---|
| | U1 | U2 | | | |
| 150 ppm | 0.671 | 0.672 | 0.6715 | 19.5326 | 3.39092 |
| 200 ppm | 0.477 | 0.456 | 0.4665 | 44.0982 | |
| 250 ppm | 0.256 | 0.266 | 0.261 | 68.7237 | |
| 300 ppm | 0.142 | 0.145 | 0.1435 | 82.8040 | |
| 350 ppm | 0.091 | 0.095 | 0.093 | 88.8556 | |
| Control DPPH | 0.822 | 0.847 | 0.8345 | | |

This study shows that the product has antioxidant activity with an $IC_{50}$ value of 3.39 ppm. A compound is said to have very

strong antioxidant activity if the $IC_{50}$ value is less than 50 ppm, the strong group $IC_{50}$ is between 50-100 ppm, the moderate group is if the $IC_{50}$ value is 101-150 ppm, and the group is weak if the $IC_{50}$ value is between 150-200 ppm (Molyneux)[39]. This value indicates that the product has very strong antioxidant activity. The high antioxidant activity is suspected because the polyphenol compounds in sweets produce very strong activity derived from the 3 (three) plants referred to in capturing free radicals. Polyphenols or flavonoids contribute directly to the effects of antioxidants, also have a role in preventing oxidation of Suzuki et. al., 2003 states that polyphenols are chemical components that have antioxidant activity because they have hydrogen atoms which will be donated to free radicals. The hydroxyl group on polyphenols has electrons which the polyphenols will donate to free radicals. Giving electrons is intended to stabilize free radicals that are reactive. Free radicals are reactive because they have unpaired electrons. The more polyphenol content in sweets the more electrons that are donated to free radicals and the higher the extract activity as an antioxidant.

Because jelly candy antioxidant activity is very strong, then this candy is recommended for daily consumption to ward off free radicals that are around us.

## CONCLUSION

Jamicu candies (Ginger, Miana, and Calamansi) have been made with the most preferred organoleptic test results in Formula B. Jamicu jelly candies meet SNI 3547-02-2008 standards on the criteria of microbiological restrictions and are free of heavy metals. Jamicu jelly candy has antioxidant activity which is very strong with an IC50 value of 3.39 ppm.

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