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USING BELIMBING WULUH (AVERHOABLIMBI L.) AS A FUNCTIONAL FOOD PROCESSING PRODUCT

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ABSTRACT

The rapid development of science, technology and lifestyle patterns today make consumer desire for processed food products not only limited as a source of nutrients but also must be able to provide benefits to the health of the body. This creates a term called functional food. Functional food is a food that contains active components and is used for the prevention or cure of disease in order to achieve optimal health. BelimbingWuluh contains active components / pharmaceutic compounds that are buffer, antibacterial and antioxidant in the root, stems, leaves, and fruits are very useful for health. Phytochemical and functional food is known to be associated with the prevention and treatment of various kinds. Functional food made from raw BelimbingWuluh based on several studies have produced some products both in the form of food and beverages as; candied dried, jam, syrup, jelly drink, candy, dates, and Sunti lime. The purpose of this paper is to know what processed food products that can be used as food or drink from BelibingWuluh without reducing the distinctive taste of BelibingWuluh. Besides it also provides information thatBelibingWuluh not only used as food seasoning but also able to serve as a more commercially processed food products with high selling value.

KEYWORDS: *Belimbingwuluh**,** Functional food, phytochemicals, processed products.*

1. INTRODUCTION

At this time people are increasingly aware of the importance of healthy living. This resulted in consumer demand for food also shifted. According to Winarti and Nurdjanah (2005) food that is now a lot of consumer demand not only have the delights but also has an influence on the health of the body. This situation gave birth to the concept of functional food.

According to Suter (2013), the functional food is a food whose active component content can provide health benefits, beyond the benefits provided by the nutrients contained therein. Functional foods should be sensitive, physiological, and nutritive. Sensory properties of functional foods can be color, texture, and tastes that consumers can accept, and do not provide contradictions and side effects to other nutrient metabolisms if used in the recommended amount. The physiological properties of functional foods are also determined by the bioactive components contained therein, such as flavonoids, saponins, and polyphenols, inulin, antioxidants, prebiotics, and probiotics (Marsono, 2008).

Functional food that will grow rapidly in the future closely related to food that can inhibit the aging process, increase immunity, improve fitness, facial beauty and appearance (Suter, 2013). Food industry accuracy to see the opportunities are needed and cooperation with researchers and government support. Based on the above one of the food ingredients that could potentially be used as functional food products is starfruitbelimbingwuluh (*Averrhoabilimbi L.)*

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BelimbingWuluh (Averabilimbi L.) is a plant that is not included in the seasonal plants. The fruit of this plant is often found around the yard of the house with a stem that is not too large. This fruit is oval-shaped with a length of 4-6 cm, the characteristics of this fruit have a skin which is shiny and green to yellow (Aflinda and Armi, 2015). BelimbingWuluh grows fertile in Indonesia, Philippines, Sri Lanka, Myanmar, and Malaysia which can be found in place of direct sunlight but moist enough. The number of fruit production per year can reach 1500 fruits. Besides that, this plant also has a pharmaceutics component that is compound - buffer, antibacterial and antioxidant compounds (Yuliansyah, et al, 2015). This resulted in plants potentially being used as functional food products.

Based on the utilization of fruit from BelimbingWuluh often used by the community as a flavoring food to give a sour taste. The sour fruit makes star fruit is often used as a mixture in various traditional dishes. BelimbingWuluh fruit also has efficacy to serve as a medicine in overcoming various diseases such as cholesterol, gout, diabetes mellitus, cough, acne, and canker sores (Harjana, 2011; Kurniawati&Lastri, 2016; Saputra&Angraini, 2016; Winarto, 2004).

In addition to fruit, leaves, flowers, and bark of Belimbing Wuluh also very potential to be developed as food products. Leaf starfruit leaves contain active ingredients such as flavonoids that play a role in pharmacological activities that function as antioxidants and antidiabetes (Kurniawati & Lastri, 2016). Belimbing Wuluh has the potential to serve as a medicine for typhoid fever (one of the diseases of the digestive tract) because it has antimicrobial compounds against Salmonella typhi bacteria causing flavonoid disease (Ardanurdin et al, 2004). Extracts of ethanol bark of Belimbing Wuluh have antibacterial activity against bacteria Klebsiella pneumoniae and Staphylococcusepidermidis which is a cause of respiratory infectious disease. This is because the bark contains antibacterial compounds such as phenolic, steroidal saponin, and triterpene saponin (Muhtadiet al, 2012).

BelimbingWuluh can be used as medicinal plants (Fahrudina&Pratiwi 2015). Medicinal plants have long been known to contain phytochemical components that play an important role in prevention and treatment. The need for medicinal plants continues to increase in line with the emergence of the tendency to return to nature and the assumption that side effects are not as much as synthetic drugs. This is also enhanced by Winarti&Nurjanah (2005) that the production of biopharmaceutical plants in Indonesia over the last few years has increased considerably. BelimbingWuluh utilization based on research in recent years has produced more commercial products. This resulted in the utilization of this plant is now not only used as a spice community traditional cuisine but now it has become a product of food with the product processed a diverse range.

The use of BelimbingWuluh into food products like this will make BelimbingWuluh not neglected in vain, given the high vitamin C content and compounds contained therein that can as anti-bacteria in preventing various diseases. Besides, the utilization of BelimbingWuluh is also expected to have economic value for the community to increase income in fulfilling daily life. In this paper will be discussed some processed products that use BelimbingWuluh as functional food processing products and research results that support it.

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2. RESULS AND DISCUSSION

2.1 Definition ofBelimbingwuluh(*Averhoablimbi L*.)

Belimbing Wuluh is a small tree plant with a field that is not so large and has a diameter of 30 cm. This plant is easy to grow and multiply through graft or seedbed. If the planting is done by seed, at the age of 3-4 years has begun to bear fruit. The amount of fruit production per year can reach 1500 fruit. Belimbing Wuluh also called starfruit acid which is a kind of tree that comes from the Maluku islands. Belimbing Wuluh is one of the many plants that grow in the yard of the house or grow wild in the fields and forests at an altitude of 5-500 m above sea level (Yuniarti, 2008). In this case, star fruit also has pharmaceutic components that are the buffer, antibacterial and antioxidant compounds (Yuliansyahet al., 2015). The parts of the Belimbing Wuluh plant used are leaves, flowers, and fruit. These three parts of a plant contain different nutrients and benefits for health.

Source: http://bibitbunga.com

Figure 1.Starfruit Plant Wuluh

2.1.1 Leaves

Leaves of belimbing wuluh elongated and small. According Aryantini, (2017) leaves of Belimbing wuluh has great potential as traditional medicine such as anti-inflammatory, anti-cough, anthypertension, treat stomach and antiinfectives. This leaf contains flavonoids, saponins, tannins, sulfur, furmat acid, calcium oxalate and calcium citrate. In addition, from the pharmacological experiments showed leaf belimbing wuluh extract gave the effect of fever (antipyretic) and decreased blood sugar (hypoglycic).

2.1.2 Flowers

Belimbing wuluh can basically be used as a traditional medicine as an alternative to typhoid fever. Based on research Ardananurdin (2004), flower of belimbing wuluh effective as an anti-microbial against salmonella invitro bacteria which is the cause of the occurrence of typhoid fever. The results of this study resulted that the higher concentration of starfruit flower dekok wuluhmaka the lower the growth of salmonella invitro bacteria.

2.1.3 Fruit

BelimbingWuluh basically made the community as natural food. Fruit star fruit has many benefits as a traditional medicine to cure various diseases such as sore rheumatism, mumps, rheumatism, thrush, acne, skin fungus, high blood and toothache (Fahrunnida,

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2015). The fruit is easily damaged and has a relatively short shelf life. Therefore, based on some research produced many researchers who focus more on the fruit of this plant than other parts plus this fruit also contains high vitamin C.

2.2 The content of BelimbingWuluh

The chemical content of star fruit in the leaves contains tannin, sulfur, formic acid, potassium citrate, and calcium oxalate. Its stalk leaves contain alkaloids and polyphenols. In addition, these plants contain saponins, tannins, glycosides, calcium oxalate, vitamin C, and peroxidase. That fruit contains flavonoid and triterpenoid compounds (Maryani and Lusi, 2004). According to Lathifa (2008) content of compounds in the fruit starfruit like flavonoid and phenol function as inflammatory anti-bacteria.Secara overall chemical content of this plant consists of amino acids, citrate, cyanidin 3-OHD-glucoside, potassium ions, sugars and vitamin A. It is very potential to make starfruit as a source of processed functional foods. For more details here is the nutrient content ofBelimbingWuluh with DKBM / 100 gr (Table 1).

Tabel 1.Nutritional content of BelimbingWuluhBased on Food Composition List (DKBM) / 100 gram

utrient content	Total
Energy	36 cal
Protein	0.4 mg
Fat	0.4 gr
Carbohydrate	8.8 gr
Calcium	4 mg
Phosphor	12 mg
Iron	1.1 mg
Vitamin A	170 sl
Vitamin B1	0.03 mg
Vitamin C	35 mg
Potassium	39 mg

Source: List of Foodstuff Composition (DKBM) / 100 gram

2.3 Benefits of Wuluh Belimbing Plant

This plant is commonly utilized by the community as an additional ingredient of natural acid flavoring. Namuntanaman is also widely used as a traditional medicine to treat various diseases such as a cough, diabetes, rheumatism, mumps, sprue, toothache, bleeding gums, acne, diarrhea to high blood pressure (Hayati et. al. 2010). Besides fruit, leave of BelimbingWuluh also contains tannin compounds that are useful for inhibiting tumor growth. According to Saputra and Anggraini (2016), tannin compounds are secondary metabolite compounds derived from plants that are separate from proteins and cytoplasmic enzymes. Tannin activity as an antimicrobial can occur because through several mechanisms that inhibit antimicrobial enzymes and inhibit growth. Therefore, the leaves of this plant also have the potential as one of the drugs to inhibit tumor growth.

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2.4 Processed Results BelimbingWuluh

2.4.1 Candied Dried

Candied products are generally well known and popular by the public. This is because it tastes good and the process of making is also relatively easy. Dry sweets do not need to use high technology and require only simple equipment. Candied dried from Belimbing Wuluh is one of the products of processing that can be done by drying so that it can be directly consumed

A process of Belimbing Wuluh to be candied dried consisting of: washing, weighing and immersion with lime water (Ca (OH) 2), after that the thickening process with sugar solution as much as 2 times in order to get sweets that good Belimbing Wuluh. Belimbing Wuluh process is a candied dry very attention to temperature and drying time to produce quality organic dry candied organoleptic and chemical. According to Van Buren (1979), the use of too low drying temperature results in long drying times, whereas if the temperature is too high the texture of the material will be unfavorable.

Source : www.https://cookpad.com

Figure 2.Candied Swallow Belimbing Wuluh

Based on research Fitriani (2008), the use of the right temperature in the manufacture of candied dried BelimbingWuluh ranged from 750C-900C with a duration of drying 11-15 hours. From the results of the research turned out to produce BelimbingWuluh that has a hard texture. In the next study according to Windyastari (2015), an increase in lime water concentration in the soaking process of 1.8% and drying for 11 hours, resulting in candied dried BelimbingWuluh with good quality, because it has a much longer shelf life and sugar solution is mixed in the drying process makes the acid tasteless.

2.4.2 Syrup

The syrup is a thick solution made from raw fruit juice with a mixture of sugar solution. Food ingredients in the form of BelimbingWuluh can actually be used as raw material for making syrup. According to Sularjo (2010), The process of BelimbingWuluh

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into syrup is by way of BelimbingWuluh cleaned first, then blender BelimbingWuluh to get the liquid/extract by filtering. After filtering the BelimbingWuluh cooked with the addition of sugar solution until boiling. Sugar, in this case, has a role as a builder of texture and flavor formers through browning reaction. Besides the star fruit juice also has a role as a giver characteristic in terms of taste, color, and aroma of syrup.

Source: www.masakenaksehari.blogspot.com

Figure 3. Belimbing Wuluh Syrup

This is added by Fitri et. al., (2017) that in order to obtain the concentration of sugar and juice in the preparation of syrup from Belimbing Wuluh must have good quality and quality by chemical analysis and sensory syrup test appropriate SNI. In studies performed produce syrup that has a lower acidity (pH) (acid) 4.05. However, the overall assessment is hedonic between 3.79 - 3.82 (like). Overall obtained at the best treatment of GB3 (70% sugar and 30% juice) with a balanced taste, resulting in a fresh and delicious syrup.

2.4.3 Selai

Jam is a type of food preserved in the form of juice that has been destroyed by the addition of sugar in the process of manufacture. Peanut butter is much preferred by various community groups, so that the manufacture of this jam has a good prospect to be developed. Good jam making conditions are asam.Asam useful to thicken jam. Thus, the more acidic content contained by the fruit used in the manufacture of the jam the better the jam is produced.

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Source : http://nova.grid.id

Figure 4. Belimbing Wuluh Jam

The acid that is a requirement in the manufacture of jam is contained in the fruit of one of the BelimbingWuluh. Hal this is based on the results of research conducted Etsaet. al. (2015) BelimbingWuluh turns out to contain carbohydrates, saccharin sweetening ingredients and preservatives of Na benzoate. Besides, also from testing the total plate numbers on the BelimbingWuluh fruit is declared eligible for direct consumption because no more than 5 x 102 colonies that have been established SNI. Based on the processing technique of BelimbingWuluh that used not too ripe and not too young.BelimbingWuluhboil in temperature 82o - 93o C for 5 minutes to reduce the sour taste in star fruit.

Saccharin is a chemical compound found in star fruit which is often added and used for food, industrial, beverage, and food products. Saccharin serves to improve taste, improve chemical properties, control the maintenance program and lose weight, reduce damage teeth and as a substitute material of main sweetener (Cahyadi, 2009) Saccharin filling is allowed in Indonesia. Its use refers to the Food and Drug Administration (FDA) decision that the use of saccharin for beverages should not exceed 12 mg/oz of liquid and processed foods should not exceed 30 mg/oz.

Sodium benzoate as an organic preservative serves to prevent the occurrence of damage by microbial activity. Use of this preservative is allowed to be used in certain amounts. Sodium benzoate is effectively used at pH 2.5 to 4. In food products benzoate compounds should only be used with a concentration range of 400-1000 mg/kg of material (Hambali et al., 2006). Therefore, there is a potential to make BelimbingWuluh functional food.

2.4.4 Jelly Drink

Jelly drink is a semi-solid beverage product made from fruit juice that is cooked in sugar. The jelly drink is not just a regular drink, but can also be consumed as a hunger delay drink. The desired texture on a jelly beverage is easily destroyed moment consumed using the help of a straw, but the gel form is still felt in the mouth. Making jelly drinks require gel-making materials such as Karagenan. From Jelly drink research results can be made from BelimbingWuluh.

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In making the jelly drink using BelimbingWuluh showed that Jelly drink BelimbingWuluh best according to physical and chemical parameters is BelimbingWuluh jelly drink with proportion BelimbingWuluh: water 1: 1 with the addition of carrageenan concentration of 1.20%. The best treatment values according to physical and chemical parameters were as follows: pH (2.63), total acid (1.23%), vitamin C (9.62 mg / 100g), viscosity (0.82 cps), syneresis (2.26 mg/min). While jelly drink BelimbingWuluh best according to the organoleptic parameter is BelimbingWuluh jelly drink with propane BelimbingWuluh water 1: 3 with the addition of carrageenan concentration of 1.0%. (Agustin and Putri, 2014) .This result indicates the potential for improving the quality of star fruit to be better in terms of quality.

2.4.5 Hard Candy

Hard candy is one of the non crystalline candies that has a hard texture cooked with high temperature (140o C - 150o C) that is shiny and clear. The materials used in the manufacture of hard candies are fresh BelimbingWuluh, sugar (sucrose), glucose syrup, citric acid, water and aqua and aluminum foil analysis materials. From the results of the research, the right concentration of sucrose and glucose syrup for hard candy star fruit candy is 85% sucrose and 15% glucose syrup containing 0.40% moisture content, 0.01% ash content, 1.06% total acid, degree of difficulty of color (neutral), taste (likes), aroma (neutral), and texture (like). (Engka, 2016).

2.4.6 Kurma

Source: http:// buatresep.blogspot.com

Figure 5. Belimbing Wuluh Kurma

Dates that have the Latin name Phoenix dactyliferamerukan palm plant (arecaceae) in the genus of Phoenix. Most date palms grow in Arab countries. The fruit dates are known to contain many useful chemicals in the health field. Generally dates contain the following substances, sugar (a mixture of glucose, sucrose, and fructose), protein, fat, fiber, vitamin A, B1, B2, B3, C, potassium, calcium, iron, chlorine, copper, magnesium, sulfur, phosphorus, and some enzymes. Based on current research, it turns out dates are also able to be made from star fruit wuluh. Based on the result of this research, the best treatment is S3 treatment, because it has the best

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value compared to S1 and S2, that is organoleptic color 3,75, aroma 3,55, taste 3,65 and chemical properties of sugar content 22,23% 8.87%, moisture content 31.91%, ash content 3.39%. (Arisanti, 2015). This indicates that belimbingwuluh also able to be processed into dates with a good quality level berdasrkan data above

3. CONCLUSION

Functional food has good prospects in the future so that new product development opportunities to be widely accepted by consumers are wide open. The development of the concept of healthy lifestyle thinking and return to nature will enhance the development of this type of product. Various functional food will facilitate consumers in obtaining the type of food that is beneficial to the health of the body.

BelimbingWuluh is one type of food that is very potential to be developed. At this time there are some processed food products that use BelimbingWuluh for food and beverages such as; sweets, jelly drinks, syrups, jams, candies, and dates. In the processing of BelimbingWuluh need to regulate the temperature, time, and concentration of sugar to produce food products made from raw BelimbingWuluh. Utilization of star fruit into a more commercial product aims to increase the welfare of the community.

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