

Research Article

Proximate and Sensory Analysis of Homemade Kersen (*Muntingia calabura*) Jam with Stevia Extract Substitution

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Kersen jam is a healthy food alternative produced from underused crop of Indonesia. However, the calorie content of it still considerably high. The aim of this research was to analyze proximate characteristic and acceptance of new formulated Kersen jam substituted with stevia extract. Kersen Jam was made using heating and stirring method. Total sugar and reducing sugar were analysed using titrimetric method. Moisture content and total fat was analyzed using gravimetric method. Fat content was analyzed using Soxhlet method, while protein content was analyzed using Kjeldahl method. Total calories were analyzed using calculation method. Sensory analysis was conducted on 25 semi-trained panellists using level 5 Likert chart. Substitution of sugar with stevia extract significantly increased the total sugar while significantly reducing sugar content of jam. The substitution did not significantly change moisture and total ash. Total fat, total protein, carbohydrates, and calories were significantly increased by the substitution. No coliform was found during observation. The substitution significantly reduced the acceptance of Kersen Jam from 4.13 to 3.63 from 5 level Likert chart. Substitution of stevia extract to homemade Kersen Jam affected the proximate and sensory characteristic of the product.

Keywords: proximate analysis, sensory analysis, *Muntingia calabura*, jam

1. INTRODUCTION

Diabetic patient number of Indonesia is increasing in alerting number. Each year, the population if Indonesian with diabetic was increase at least 7 to 9 %. In 2020, it was predicted that 70% of children and youngster in Indonesia exposed severe from type 1 Diabetis mellitus[1]. In Indonesia, people with low education level exposed to higher risk in having diabetic (OR=1.42; 95% CI: 1.21-1.67). Unemployed also having higher risk to exposed to diabetic (OR=1.55; 95% CI:1.33-1.82). People living in Urban area found significantly higher to have diabetic compared to other areas [2]. Although Indonesia is a developing country, the treatment cost for Diabetic was considered high compared to other countries. Indonesian has spent at least \$ 2.4 Billion just to take retinopathy

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diabetic treatment. The cost predicted to increase to \$ 8.89 Billion in 2025 [3]. The Indonesian government had conducted PROLANIS (Program Pengendalian Penyakit Kronis) program in 2014. Until 2016, 70% of the population rejected the program. It was caused by different cost charged to patients in each area. It was concluded that healthy lifestyle is the preventive act compulsory taken to reduce the increase of diabetic patient in Indonesia [4].

Stevia was believed as one of alternative and solution to reduce sugar intake. Sugar intake was major reason in the increase number of people with diabetic. Stevia performed very less to none side effect for health as herb. Unfortunately, the impact of Stevia in Body Mass Index (BMI) was still insignificant. Stevia proven giving positive impact to insulin status of animals samples. However, it did not affect the cholesterol profile of sample [5]. Stevia may not affect the pathway of sugar oxidation or lipid degeneration. However, it might help to provide antioxidant in maintaining body health. The antioxidant rendered the oxidation of glucose until 18%. It also helped body to improve insulin sensitivity [6]. In vitro researches showed results that stevia leaf has an antihyperglycemic effect and reduces the blood glucose level at doses of 200, 300, and 400 mg/kg [7]. Regardless, further researches involving antidiabetic effect of stevia in human still needed [8].

Kersen (*Muntingia calabura*), commonly found in Indonesia. Spread all over Indonesia, Kersen tree found to have wide range adaptation to many environmental conditions and climates. Easily grown and tough, Kersen doesn't need special treat to cultivate and maintain [9]. Kersen had been known to perform vast pharmacological activity. 2.5 % Kersen leaves extract perform anti-inflammatory effect toward hydrocortisone. The anti-inflammatory activity improved in accordance with increase of concentration [10]. Kersen leaves perform a very high gastro-protective characteristic. Kersen leaves extract can nullify gastric mucosal injury caused by alcoholic and soft drink beverages [11]. The fruit itself have been known to be used as traditional medicine known as fruit of miracles since its ability to treat a lot of disease and injury [12]. Kersen fruit content high amount of phenolic compounds. Kersen fruit also showed high antioxidants activities. This nutrient factor was enriched with the founding that fructose was the most abundant sugar in its fruit [13]. Fructose, having less glycemic index, considered to be friendly for people with diabetes[14]. The low fermentable oligo-, di-, monosaccharides, and polyols in its fruits are beneficial for guts health and the growth of good bacteria in it. Hence, Kersen Fruit was classified as low FODMAPs berry. Major volatile compound in the fruit was terpenes β - Farnesene and dendrolasin. Gallic acid, cyanidin-3-O-glucoside, and gentisic acid, while highest flavonoids contents in it was[15]. The addition of of 3%

Kersen leave proven increase the growth of Vaname shrimp [16]. 30% Kersen juices effectively reduced fasting blood sugar by 13% in type 2 diabetic animal model [17].

Jam was very popular from long ago and will remain as most popular preserved fruit product. The market shares of jam predicted will never touch below 56.2 %. Each year, the growth of fruit jam market share will reach 8-9% internationally. Fruit jam is a very valuable and prospective food product [18]. Jam popularity started to grow in Indonesia as preserved fruit product. In Magelang, it used as economical assets for small and medium enterprise, SOGAFARM, as product diversification. It also used to minimize post-harvest loss of the farm [19]. It also being used as preservation of Crystal Guava Fruit and signature gift in Agribusiness and Technology Park, Bogor [20]. It also being used as new economic empowerment in Polongbangkep, Takalar to preserve traditional asset of them, Lontar (*Borassus flabellifer*). The jam was called as TALA BARAKKA jam and used as identity of Takalar [21].

Kersen jam has been developed in 2022. It was found that the jam had 50.52 % carbohydrate, 1.48 % fat, 0.39% protein, 35.64% total sugar, and 25.54 % reducing sugar. Although the total sugar of Kersen Jam was lower than most of fruit jam, it still had a high acceptability in consumer (4.328/5) [22]. The jam still had higher carbohydrate and total sugar content. For people with diabetic, total carbohydrate taken from jam mas ranged from 17-43% [23]. By substitute sugar of kersen jam with stevia extract, it was expected to produce better formulation with better calories profile. This research was aimed to study the effect of substitution of sugar with stevia extract to chemical characteristic of Kersen jam, especially total sugar content. Acceptance of the kersen jam substituted with stevia extract also analyzed using sensory analysis.

2. METHODOLOGY/ MATERIALS

Material that being used in this research was Kersen fruit obtained from Bigbro Herbal Central Jakarta. Kersen fruit extracted as pulp to creat Kersen jam. Leave of Kersen was obtained from local wild Kersen tree. All chemical was obtained from Mbrio lab stock. In order to produce Kersen pupl, Kersen fruit was washed through running water and grinded to pulp using Philip HR2115 series. The pulp was weighted and stored inside deep freezer.

For every 100 g of Kersen pulp, Kersen jam was made by adding 60 g of sugars, 20 g apricot gell, and 0.1 ml food colorant (brand Koepoe Koepoe). Kersen jam produced mixing all ingredients into a mixture. The mixture was cooked with constant stirring until thick consistency has been achieved. End point was judged by sheet test. The product

was packed in 150 g capacity sterilized glass jars and then stored. As treatment, 60 g sugar was substituted with Stevia extract marketly known as Tropicana.

Moisture content and total ash content was analyzed using gravimetric method. For Moisture content, 50 g sample was measured using digital ballance. The sample was placed on weighed moisture tin. Both moisture tin and sample was being weighted. The weight was being recorded. It was being ovened for 24 hours in 105°C. After that, sample was taken from the oven and being cooled for 15 minutes. Sample was being weighted again. The lost number was measured as moisture content. For total ash analysis, 5 g of sample was taken and heated in oven in 550°C for 20 hours. The remain of the charing process was measured as the ash content. Total fat analyzed using soxhlet hydrolisis method. Protein content analyzed using Kjeldahl method. Total carblohydrate analyzed by difference method. Total sugar and reducing sugar was analyzed using titrimetric method. Coliform analyzed using total plate count method, while acceptance analyzed by conducting sensory evaluation to 25 semi trained panelists using 5 level hedonic test.

3. RESULTS AND DISCUSSIONS

Based on the result of data analysis, the result was presented in Table 2,

TABLE 1: Inhibition Percentage of Vitamin C.

Parameter	Control			Treatment			Significance test (T Test 95 CI)
	First month	Second month	Third Month	First month	Second month	Third Month	
Total Sugar	35.64 g/100g	35.64 g/100g	35.66 g/100g	37.11 g/100g	37.11 g/100g	37.13 g/100g	S
Reducing Sugar	25.54 g/100g	25.59 g/100g	25.63 g/100g	5.54 g/100g	5.54 g/100g	5.56 g/100g	S
Moisture Content	45.89 g/100g	44.98 g/100g	44.02 g/100g	45.37 g/100g	45.38 g/100g	45.38 g/100g	NS
Total Ash	0.72 g/100g	0.72 g/100g	0.72 g/100g	0.67 g/100g	0.67 g/100g	0.67 g/100g	NS
Total fat	1.48 g/100g	1.45 g/100g	1.41 g/100g	1.50 g/100g	1.51 g/100g	1.54 g/100g	NS
Protein	0.39 g/100g	0.37 g/100g	0.32 g/100g	1.13 g/100g	1.13 g/100g	1.13 g/100g	S
Carbohydrate	50.52 g/100g	50.62 g/100g	50.69 g/100g	51.33 g/100g	51.36 g/100g	51.4 g/100g	NS
Coliform	0 colony/unit	0 colony/unit	0 colony/unit	0 colony/unit	0 colony/unit	0 colony/unit	NS
Acceptance	4.328	4.24	3.728	3.728	3.384	2.96	S

*S = Significant

NS = Not Significant

The total sugar of control was lower compared to kersen jam substituted by Stevia. Reducing sugar of jam with stevia was significantly lower compared to control. There's no significant difference in moisture content and total fat. Total ash of treatment was lower compared to control. Treatment showed significantly higher protein content compared to control. Carbohydrate content of treatment was not significantly higher. However, the acceptance of treatment was significantly lower compared to control. No coliform observed during the observation.

Stevia is an herb contain very rich component. The addition of it will significantly affect the chemical characteristic of food product. In this research, stevia substitution of sugar found to significantly affect total sugar, reducing sugar and protein content. Although not significant, it also increased the carbohydrate content of jam. The result was in accordance with other researches. In many substitution of sugar with stevia, it might increase protein content from 9-11% and carbohydrates content from 52-69%. Stevioside in stevia will leave bitter aftertaste. That's why most of food product substituted with stevia will have lesser acceptance point compared to those with sugar [24]. When applied in egg products, addition or substitution of stevia not just changed the carbohydrates, fat, and protein content. It also increase the carotenoid of the egg products [25]. During stevia substitution in apple-black cumin jam, addition of stevia significantly increased TSS, Carbohydrate, protein, and fat of the jam while significantly reduce the moisture content of it [26].

The addition of stevia also significantly affecting reduce sugar content. The result was in accordance with other research in stevia substitution. Substitution of sugar with stevia crude extract and stevioside lower the reducing sugar of the product. This finding affected the acceptance of the product on consumers. The recommended composition for substitution is by replacing 50% sucrose with stevia to maintain sugar level and acceptance of chocolate [27]. In muffin production, substitution of stevia affecting reducing sugar level of the muffin. The results were reduction of height of the muffin (41-28 mm); reduction of volume (63-51 ml); and increase firmness by four fold [28]. Stevia will affect reducing sugar because of the tannin content in it. The methods of drying will affect the reducing sugar of the product. Highest reducing sugar will give highest reducing sugar content. Heat treatment will significantly affect reducing sugar of product treated with stevia [29].

Substitution of sugar with stevia significantly affect the sensory characteristic of the product. This result was in accordance with previous research. In the development of low calorie jam, replacing sugar with stevia decrease the acceptance from 8.25 from 9 scale to 6.65 from 9 scale likert chart. The reducing sugar also found in this treatment.

Replacing sugar with stevia found to reduce the reducing sugar content of jam from 22.38 % to 6.95 % [30]. In the development of low calorie tomato jam, retention of taste can be preserved by adding more fiber in to the jam or else, replacement of sugar with stevia will reduce sensory performance of jam [23]. In ice cream, substitution of sugar with stevia will result in bad taste of ice cream. It must be combined with sugar. The most accepted composition of sugar and stevia for ice cream was 15% sugar + 0.45% stevia [31]. In fruit based milk shake, stevia should be mixed with sugar with ratio 25:75 stevia:sucrose to maintain high sensory acceptability [32].

4. CONCLUSION AND RECOMMENDATION

Substitution of stevia in kersen jam significantly affect the chemical characteristic of jam. The substitution significantly affected total sugar, reducing sugar, and protein content of jam. It also affected sensory characteristic of jam. Substitution significantly reduce total acceptance of jams in consumers. Based on the conclusion made above, it was recommended to conduct further studies in formulating composition of sugar and stevia to produce kersen jam with lower sugar content but higher acceptance.

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