



Characteristics of Instant Chocolate Drink with the Addition of Natural Sweeteners Sugar Stevia Leaf Extract (*Stevia Rebaudiana Botani*)

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Abstract

Instant chocolate drink is a type of processed chocolate product that has many devotees, the use of sucrose as a sweetener for flavour in the process of making instant chocolate drinks can have side effects on health, namely it can cause heart attacks, allergies, diarrhoea, increase the risk of bladder cancer, hypertension and migraines. Stevia leaves contain glycosides which have a sweetness level of 250 higher than sucrose. The purpose of this study was to determine the effect of stevia sugar as a natural sweetener in the manufacture of instant chocolate drinks. The method used is a laboratory study using a single factor at 3 levels of treatment, namely the concentration of instant chocolate and stevia sugar used as much as 11g and 7g; 9g and 9g; as well as 7g and 11g. Data analysis used two methods, namely the Chi-square method for organoleptic data and the One Way ANOVA method with a 95% confidence level followed by Duncan's New Multiple Test (DMRT). The results of this study are samples with concentrations of cocoa powder and stevia sugar as much as 11g and 7g are the best treatment by having a colour parameter value of 4.13 (like), taste parameter of 3.80 (somewhat like), aroma parameter of 4.13 (like), the viscosity parameter is 4.33 (like), the water content parameter is 4.14%, the solubility parameter is 90.15%, the pH parameter is 6.4 and the total dissolved solids parameter is 9.03.

Introduction

Instant chocolate drink is one type of processed chocolate product that has many devotees in the community. According to Rosniati (2016) consuming 100 grams of chocolate containing 500 mg of polyphenols per day can improve insulin sensitivity performance, decrease insulin resistance performance and can reduce systolic blood pressure. In the process of processing instant chocolate drinks there is the addition of sweetener as a taste enhancer in the form of sucrose.

Artificial or natural sweeteners aim to maintain quality, prevent food spoilage, and to improve or improve the appearance so that the food is preferred by consumers, but the use of artificial sweeteners in the process of making instant chocolate drinks can have side effects on health such as increasing the risk of bladder cancer, heart attack, allergies, diarrhoea, hypertension and migraine (Jamil et al., 2017). Therefore, natural sweeteners are needed as a substitute for the process of making instant chocolate drinks.

Stevia leaf is an alternative method that can be used as an ingredient for making natural sweeteners that are safer than the artificial sweeteners currently available. The sweet taste of stevia leaves is due to the glycoside content consisting of two components, namely stevioside (3-10% dry weight of leaves) and rebaudioside (1-3% dry weight of leaves) where the two components have a higher sweetness level of 250 compared to sucrose. In addition, stevia

leaves have a low calorific value so they are useful for regulating blood sugar levels in the human body (Buchori, 2007). The advantage of using stevia leaves as a natural sweetener is that stevia leaves can be stable at a temperature of 100°C and a pH range of 3-9 besides that it does not cause a dark color when cooking stevia leaves (Nurhayati, 2011).

The food, beverage and supplement industry often uses sweeteners, both natural sweeteners and synthetic sweeteners as a flavour enhancer. The natural sweetener commonly used is sucrose or cane sugar. According to Harismah et al. (2014) said that sucrose has a relatively large caloric content of 346.0 calories/100g of material where the content can cause various problems, namely obesity, tooth decay and is very dangerous for diabetics.

These problems can be overcome by using a natural sweetener in the form of stevia leaves as a substitute for sugar, this is in accordance with the statement of Harismah et al. (2014) which states that stevia sugar can replace artificial sweeteners or synthetic sweeteners that have low calorific value with a sweetness level of 100-300 times the sweetness of sucrose and have no carcinogenic effect. This study aims to determine the effect of stevia sugar as a natural sweetener in the manufacture of instant chocolate drinks. The characteristics observed in this study were organoleptic, water content, solubility, pH and total dissolved solids.

Methods

The materials used in this research were stevia leaf powder, milk powder, creamer, dark chocolate powder and water. The tools used in the analysis and production process are pans, gas stoves, spoons, ovens, baking sheets, beaker glass, filter cloth, digital balances, plastic cups, mortars, tissue, label paper, baking paper, analytical balances, pipettes, funnels, paper filter Whatman no. 41, stopwatch pH meter, petri dish, Labtech LDO-080N oven, LG/400 watt microwave, refractometer and others. While the tools used in the analysis of the data results are stationary, laptops, questionnaires, Microsoft Office and SPSS 22.0 applications. The manufacture of instant chocolate drink products is carried out in the laboratory of the Indonesian Coffee and Cocoa Research Centre. Analysis of the characteristics of instant chocolate drink was conducted at the Laboratory of Agroindustrial Management, Agricultural Industrial Technology study program, Faculty of Agricultural Technology, University of Jember. The treatment formulations used in this study are presented in Table 1.

Table 1. Treatment Variations on Instant Chocolate Drink

Samples	Cocoa Powder Samples (g)	Stevia Sugar (g)	Powdered Milk (g)	Creamer (g)
A1	11	7	5	5
A2	9	9	5	5
A3	7	11	5	5

The process of making stevia sugar begins by weighing 100 g of stevia leaf powder using an analytical balance after which it is refined with the aim that the extraction results are more perfect and do not produce a lot of waste that is thrown away. Then the boiling process is carried out by adding 300 mL of water for 10 minutes at a temperature of 100°C and stirring occasionally during the boiling process. Furthermore, the results of boiling are filtered using a filter cloth with a size of 200 mesh which aims to separate the stevia leaf extract from the pulp. The filtered stevia leaf extract was boiled again at 100°C for 40 minutes to become stevia sugar paste and stirred at an average speed of 12 rpm. The resulting stevia paste is then spread on a baking sheet that has been lined with parchment paper and oven for 5 minutes using an electric oven with a temperature of 100°C. Then the results of the pasta that have been baked are mashed until they become stevia sugar crystals.

The ingredients used in making instant chocolate drinks are stevia sugar, black cocoa powder, creamer, and powdered milk. Then the material is weighed according to the dose listed in Table 1. The weighted material is then stirred until homogeneous. After that, a hedonic test was carried out to determine the level of consumer preference for instant chocolate drinks with the addition of stevia leaf extract sugar. This test was carried out using a scoring on 30 panellists of students from the Faculty of Agricultural Technology. The hedonic scale used is from 1 to 5 (1 = strongly dislike, 2 = dislike, 3 = neutral, 4 = like, 5 = very much like).

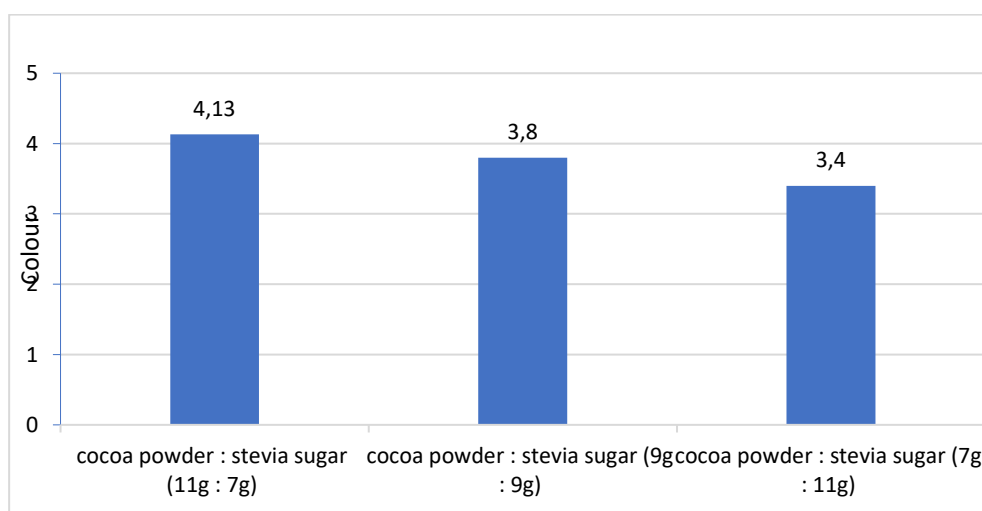
Physical characteristics testing includes analysis of water content (gravimetric method), solubility (gravimetric method), pH and total dissolved solids. This study used a single factor with 7 replications. Statistical analysis of organoleptic test results using Chi-square and static analysis of physical characteristics test using One Way ANOVA using 95% confidence level and followed by a significant difference test using Duncan's New Multiple Test (DMRT).

Results and Discussion

Colour

The results of the consumer hedonic test on the colour of instant chocolate drinks with variations in the sugar concentration of stevia leaf extract can be seen in Figure 1.1 Based on the results of the chi-square with a 95% confidence level (α 0.05) shows that the addition of stevia leaf extract sugar has a significant effect on colour preference in instant chocolate drinks. Figure 1. shows that the colour parameter values in samples with concentrations of cocoa powder and stevia sugar as much as 11g and 7g got the highest results, namely 4.13 (likes). The colour difference in each sample is influenced by the amount of cocoa powder and stevia sugar used, the more cocoa powder, the darker the colour of the instant chocolate drink.

The colour of chocolate in instant chocolate drinks is also influenced by the concentration of cocoa powder contained, the less cocoa powder and the more stevia sugar used, the colour of instant chocolate drinks will fade. Stevia sugar does not cause a dark colour when cooking or heating (Nurhayati, 2011), so stevia sugar does not significantly affect the colour indicators in instant chocolate drinks. The higher the amount of stevia sugar and the lower the amount of cocoa powder in instant chocolate drinks affect the level of consumer preference which is decreasing.



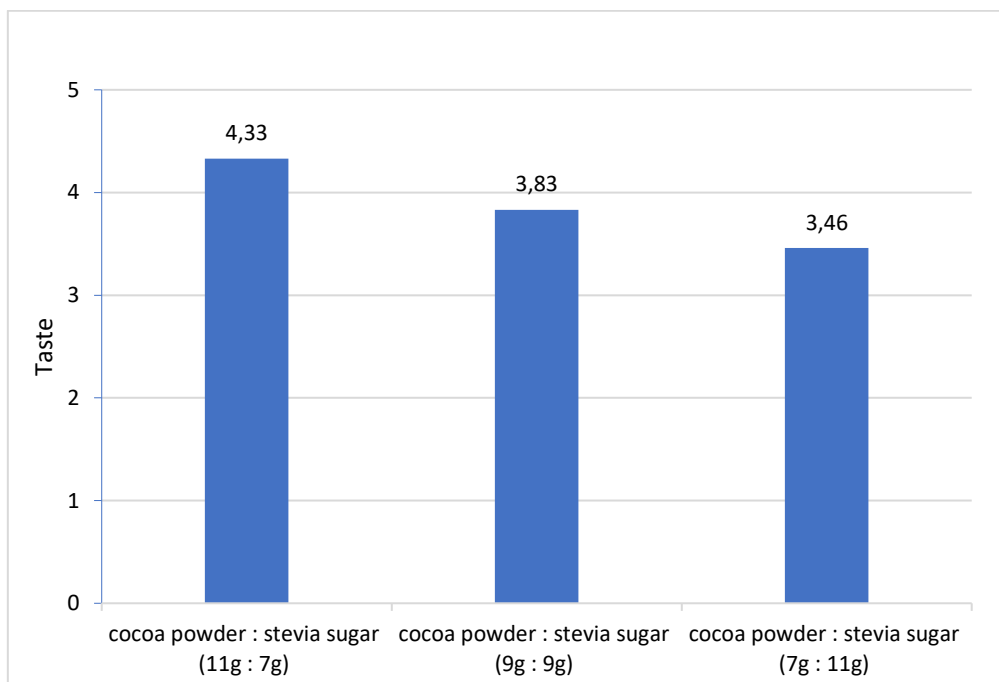
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1 = Strongly Dislike, 2 = Dislike, 3 = Neutral, 4 = Like, 5 = Very Much Like

Figure 1. Organoleptic Value of Colour Parameters in Instant Chocolate Drink Samples

Taste

Results of the consumer hedonic test on the taste of instant chocolate drinks with variations in the concentration of stevia sugar can be seen in Figure 2. Based on the results of the chi-square with a 95% confidence level (α 0.05) shows that the addition of stevia sugar has a significant effect on taste preferences. on instant chocolate drink. Figure 1.2 shows that the value of the taste parameters in the sample with concentrations of cocoa powder and stevia sugar as much as 11g and 7g obtained the highest result of 4.33 (likes). The more addition of stevia sugar to instant chocolate drinks causes a decrease in the level of consumer preference. According to Bawane (2012), astringent and unpleasant tastes resembling bitterness are influenced by stevisoda compounds present in stevia leaves. Therefore, the more the amount of stevisoda extracted, the more tannin compounds in the extracted stevia leaves so that the resulting taste will be more bitter.



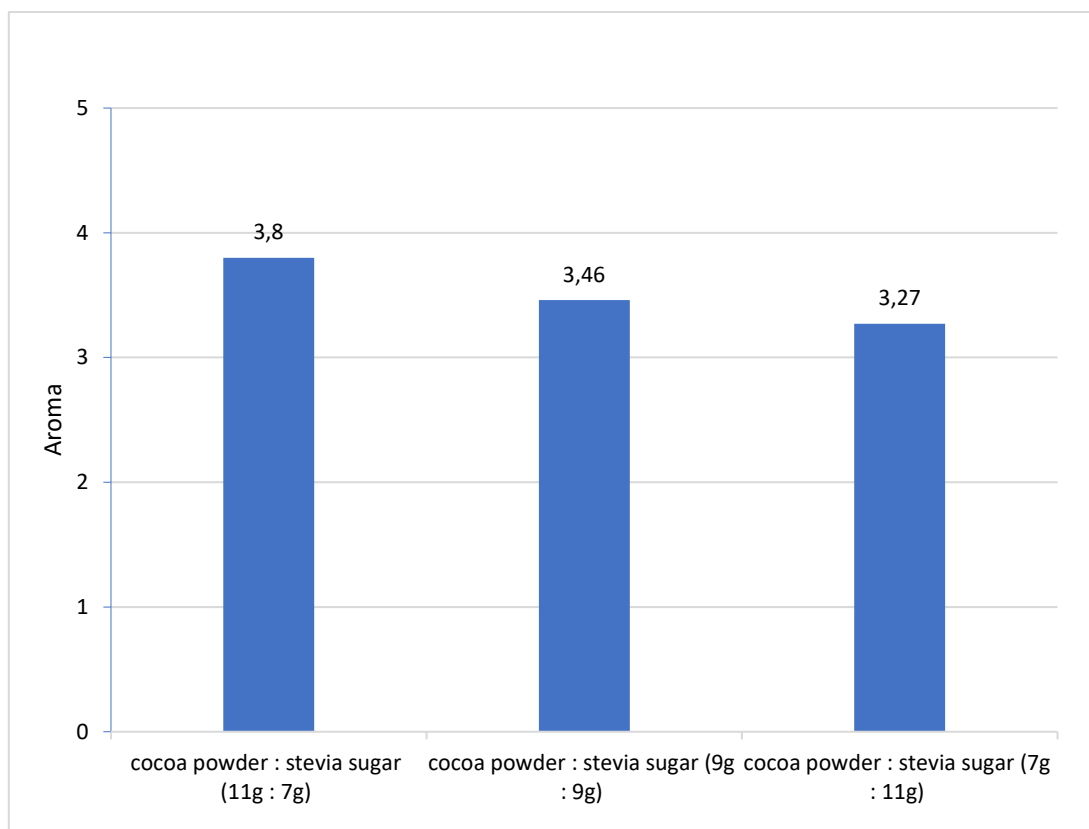
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Figure 2. Organoleptic Value of Taste Parameters in Instant Chocolate Drink Samples

Aroma

The results of the consumer hedonic test on the aroma of instant chocolate drinks with variations in the concentration of stevia sugar can be seen in Figure 3. Based on the results of the chi-square with a 95% confidence level (α 0.05) shows that the addition of stevia leaf extract sugar has a significant effect on preference. aroma in instant chocolate drink. Based on Figure 1.3 it is known that the more addition of stevia sugar causes the level of consumer preference for the aroma of instant chocolate drinks to decrease. The more stevia sugar used, the more herbal or unpleasant aromas appear in instant chocolate drinks. This is in accordance with the opinion of Lawless et al. (2013) which stated that the unpleasant aroma in stevia leaf extract was in the form of an unpleasant aroma derived from the volatile compound 3-Methylbutanal. Based on the results of the aroma preference test for instant chocolate drinks, samples with variations of cocoa powder and stevia sugar as much as 11g and 7g got the highest value of 3.80 (somewhat like).



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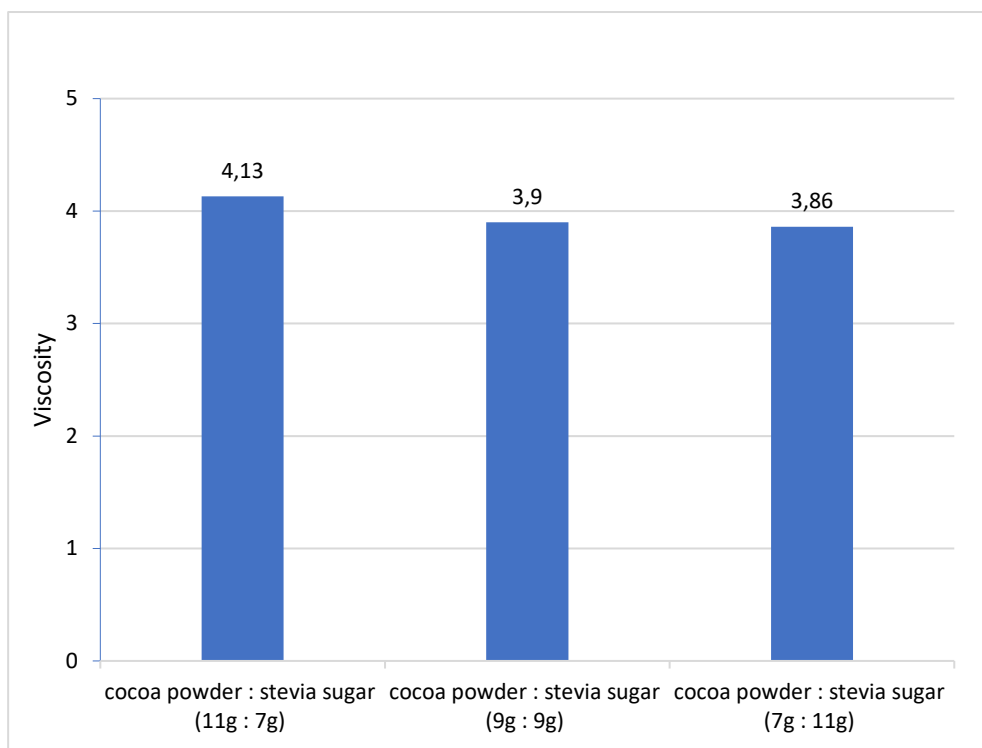
1 = Strongly Dislike, 2 = Dislike, 3 = Neutral, 4 = Like, 5 = Very Much Like

Figure 3. Parameter Organoleptic Value of Aroma in Instant Chocolate Drink Samples

Viscosity

The results of the consumer hedonic test on the viscosity of instant chocolate drinks with variations in the concentration of stevia sugar can be seen in Figure 4 the results of the chi-square with a 95% confidence level (α 0.05) showed that the addition of stevia sugar had no significant effect on taste preference. on instant chocolate drink. Panellists stated that the texture of the instant chocolate drink sample with the addition of stevia sugar had the same overall texture, namely liquid or not thick.

Panellists prefer the texture of the sample with variations of cocoa powder and stevia sugar of 11g and 7g because the concentration of cocoa powder is more than stevia sugar, causing the texture of the sample to be slightly thicker than other samples, because cocoa powder has a fat content that can affect the viscosity or viscosity of the sample. food products. This is in accordance with research conducted by Meilina (2019) that the addition of stevia sugar did not show a significant effect on the texture of instant drinks. Overall, the viscosity of instant chocolate drink with the addition of stevia sugar did not show much difference in the values in each treatment.



Information:

1 = Strongly Dislike, 2 = Dislike, 3 = Neutral, 4 = Like, 5 = Very Much Like

Figure 4. Organoleptic Value of Viscosity Parameters in Instant Chocolate Drink Samples

Moisture Content the water

The moisture content test was carried out using the gravimetric method with seven repetitions. The results of testing water content in instant chocolate drink samples can be seen in Figure 1.5 the results of the analysis using ANOVA with a 95% confidence level (α 0.05) showed that the addition of stevia sugar concentration had a significant effect on the water content of instant chocolate drinks and continued with Duncan's New Multiple Test (DMRT). Based on Figure 1.5 shows that the sample with variations of cocoa powder and stevia sugar as much as 11g and 7g has the highest water content value of 4.14%, while the lowest water content value is owned by the sample with variations in the addition of cocoa powder and stevia sugar as much as 7g and 11g. which is 3.08%.

The addition of stevia sugar did not show a significant effect on the texture of instant drinks (Ibrahim et al., 2019). According to SNI-2015, the water content of cocoa powder drinks is a maximum of 5% and the three samples of instant chocolate drinks that have been carried out have met the requirements for the water content of cocoa powder drinks because they each have a water content below 5%. The results of the water content test show that the more stevia sugar is added, the lower the water content of instant chocolate drinks. The higher concentration of stevia sugar substitution results in less water content because sugar is hygroscopic and will bind to the water contained in the material (Ibrahim et al., 2019).

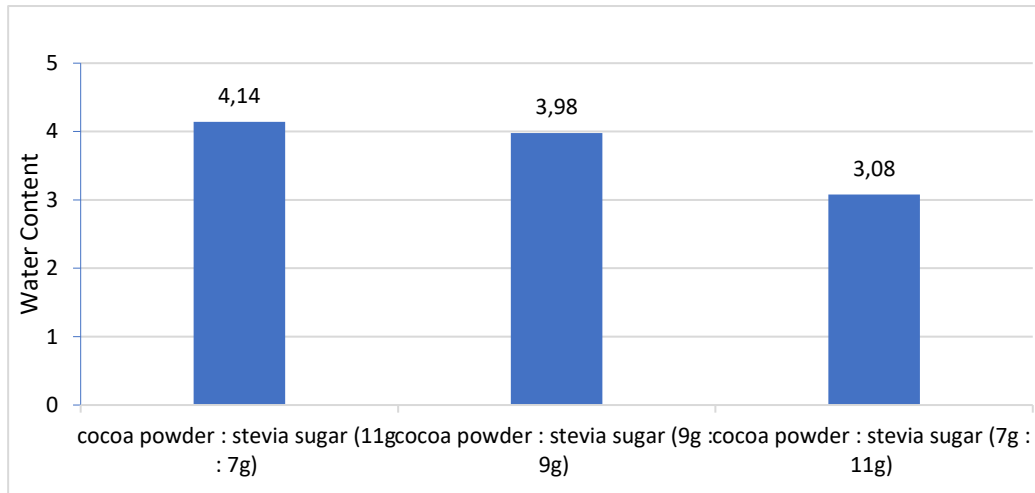


Figure 5. Test Value of Water Content in Instant Chocolate Drink Samples

Solubility

Solubility tests were carried out using the oven method (gravimetric). The results of the instant chocolate drink solubility test with the addition of stevia sugar can be seen in Figure 1.6 the results of the analysis were carried out using ANOVA with a 95% confidence level (α 0.05) which showed that the addition of stevia sugar concentration had a significant effect on the solubility of instant chocolate drinks and continued with Duncan's New Multiple Test (DMRT). Based on Figure 1.6 shows that the highest solubility value is owned by the sample with variations of cocoa powder and stevia sugar as much as 7g and 11g. The less concentration of cocoa powder and the greater the amount of stevia sugar, the higher the solubility of instant chocolate drinks. This is because stevia sugar is easily soluble in water because it is hygroscopic (Bambang, 2016). Solubility is also influenced by the ability of the material to absorb water, besides the cocoa powder used may still contain fat content, this is because the roasting process on cocoa powder is not optimal so that it has an impact on the remaining fat content. According to Sudarmadji (2007) that the fat content in chocolate can inhibit water from being absorbed with cocoa powder due to the nature of fat that is not easily soluble in water so that the more cocoa powder is added, the lower the solubility level of the instant chocolate drink.

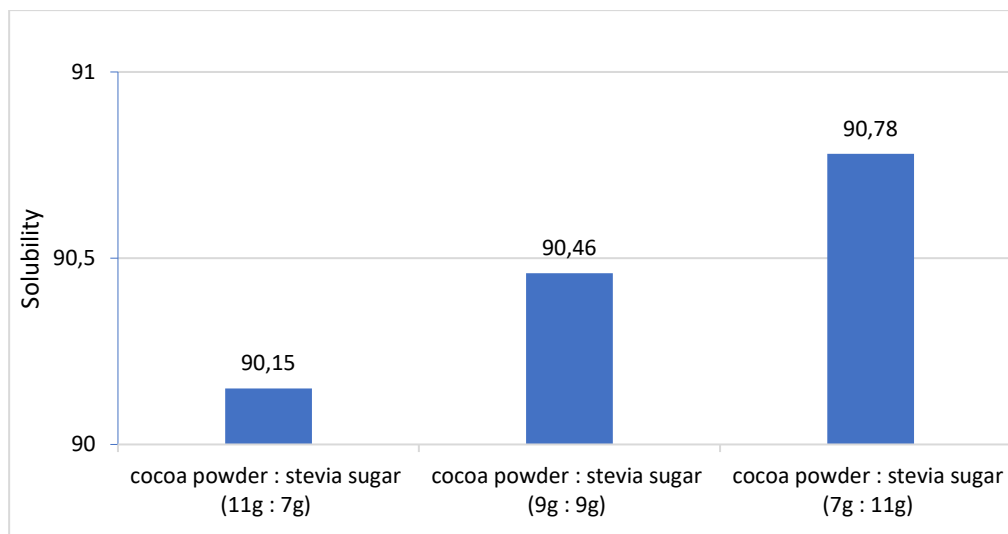


Figure 6. Solubility Test Values on Instant Chocolate Drink Samples

pH

pH is the degree of acidity used to express the level of acid or base possessed by a solution. The more acidic a solution, the smaller the pH degree it has and vice versa (Lumentut et al., 2020). The results of the pH test can be seen in Figure 7 the results of the analysis using ANOVA with a 95% confidence level (α 0.05) showed that the addition of stevia sugar concentration had no significant effect on the pH of instant chocolate drinks. The average pH of instant chocolate drink samples is 6. Based on Figure 1.7 shows that the highest pH value is owned by the sample with variations in the addition of cocoa powder and stevia sugar of 11g and 7g. Product quality in foodstuffs can also be influenced by the pH value. Low pH test results (acidic) can affect the quality of instant powder flavour (Afifah, 2011).

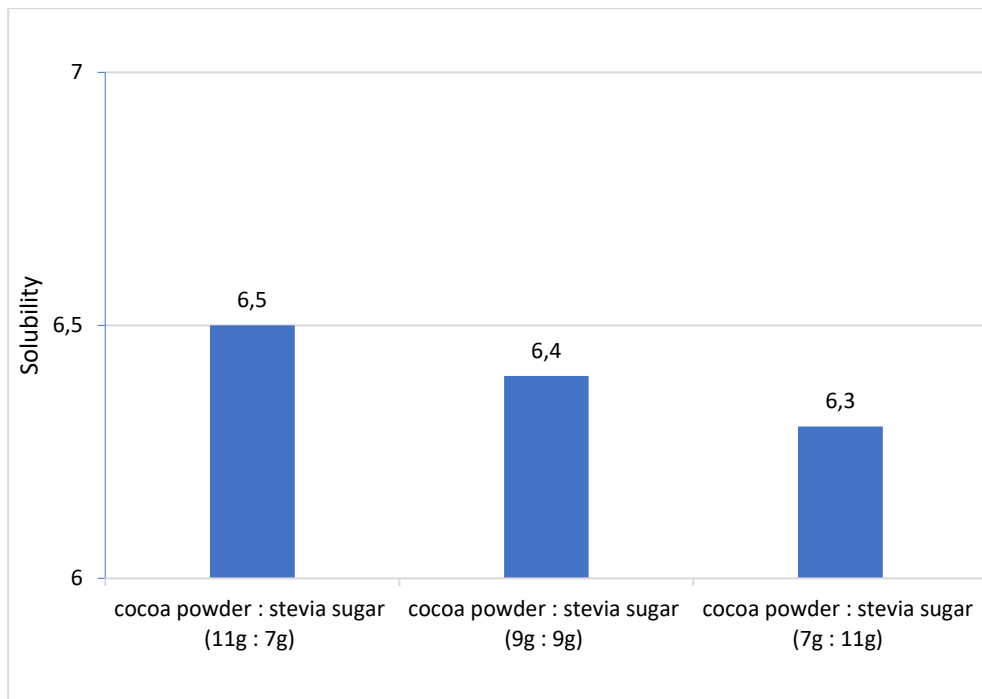


Figure 7. pH Test Value on Instant Chocolate Drink Samples

Total Dissolved Solids

Total solids are all solid components of instant drinks which include solid ingredients including carbohydrates, fats, proteins, vitamins, and minerals (Achmad et al., 2012). The results of the total dissolved solids test of instant chocolate drink can be seen in Figure 8 the results of the analysis using ANOVA with a 95% confidence level (α 0.05) showed that the addition of stevia sugar concentration had a significant effect on the solubility of instant chocolate drinks and continued with the Duncan's New Multiple Test (DMRT). Based on Figure 1.8 shows that the highest TPT value is owned by the sample with variations of cocoa powder and stevia sugar as much as 7g and 11g. The addition of more stevia sugar can increase the total amount of soluble solids this is due to the increase in soluble components consisting of glucose, fructose, sucrose and protein (Farikha et al., 2013). The increasing total dissolved solids can also reduce the precipitate formed so that the quality of instant drinks is getting better (Ariska & Utomo, 2019).

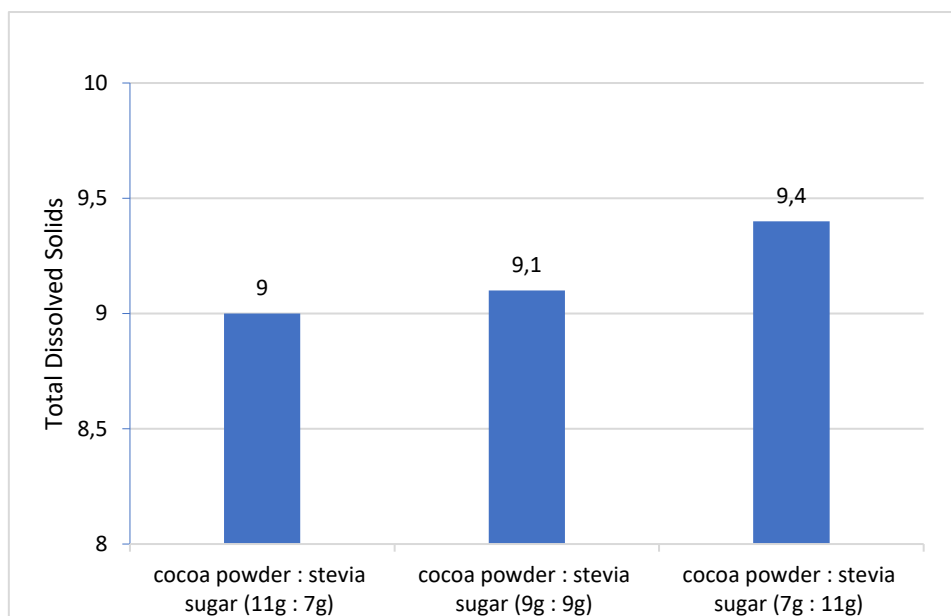


Figure 8. Test Value of Total Dissolved Solids in Instant Chocolate Drink Samples

Effectiveness

The effectiveness test is used to determine the best treatment or formula by assigning a weighted value to each test parameter with numbers 0-1. In this study, the effectiveness value was calculated using the De Garmo. The effectiveness value of instant chocolate drink with the addition of stevia sugar ranges from 0.00 to 0.65 as shown in Table 2.

Table 2. Effectiveness Value of Instant Chocolate Drink

Treatment	Effectiveness Value
Cocoa powder: Stevia sugar (11g: 7g)	0.65
Cocoa powder: Stevia sugar (9g: 9g)	0.43
Cocoa powder: Stevia sugar (7g: 11g)	0.44

The parameters used in calculating the effectiveness value include hedonic test (colour, aroma, taste and viscosity), water content, solubility, pH, and total dissolved solids. Based on Table 1.2 it can be seen that the highest effectiveness value is owned by the sample with variations in the concentration of cocoa powder and stevia sugar as much as 11g and 7g, while the lowest effectiveness value is owned by the sample with varying concentrations of cocoa powder and stevia sugar as much as 7g and 11g. Samples with varying concentrations of cocoa powder and stevia sugar as much as 11g and 7g produced instant chocolate drinks with a colour hedonic test value of 4.13 (like), a taste hedonic test of 3.80 (somewhat like), a hedonic aroma test of 4.13 (likes), the hedonic viscosity test is 4.33 (likes), the water content test is 4.14%, the solubility test is 90.15%, the pH test is 6.4, and the total dissolved solids test is 9.03.

Conclusion

The conclusion of this research is that the addition of stevia sugar has a significant effect on the colour, taste, and aroma of the sample but has no significant effect on the viscosity of the sample. The addition of stevia sugar had a significant effect on water content, solubility and total dissolved solids but had no significant effect on the pH of the sample. The best sample in this study was sample A1 with a concentration of 11g of cocoa powder and a concentration of 7g of stevia sugar. Sample A1 has a colour parameter value of 4.13 (likes), a taste parameter of 3.80 (somewhat like), an aroma parameter of 4.13 (likes), a viscosity parameter of 4.33

(likes), a moisture content parameter of 4.14%, the solubility parameter is 90.15%, the pH parameter is 6.4 and the total dissolved solids parameter is 9.03.

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