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The Effect of Cherry Juice Addition to the Chemical and Organoleptic Properties of Yoghurt

E. Basuki*, S. Hawa and D. Handito
Faculty of Food Technology and Agroindustry University of Mataram, Indonesia. 83125

Abstract:- The purpose of this research is to identify the effect of the addition of cherry juice to organoleptic properties of yoghurt drink. Experimental method using Completely Randomized Design (CRD) with the treatment of addition of cherry juice (0%, 5%, 10%, 15%, 20% and 25%) with 4 replications. The parameters to be observed were Ascorbic Acid, Protein, pH, total lactic acid and organoleptics (flavor, aroma and color). Data were analyzed using Analysis of Variance (ANOVA) at 5% significant level and continued using orthogonal polynomial test (5%) for Ascorbic Acid, protein, pH, total lactic acid and Honestly Significant Different (HSD) for organoleptics properties. The results indicated that the addition of cherry juice gave significant effect on Ascorbic Acid, pH and total lactic acid of yoghurt drink, but gave a non significant effect on the level of yogurt drink. However, the addition of cherry juice gave significant effect on color (Hedonic), Scoring (color) and scent of yoghurt drink, but gave a non-significant effect on taste (Hedonic), taste (Scoring) and aroma (Hedonic) yoghurt drink. Yoghurt drink with 25% addition of cherry juice is the best treatment because it contains Ascorbic Acid level 19,8 mg/100 g, protein content 1,19% and pH value 4.5. The pH value and total lactic acid produced have fulfilled the standard of SNI 01.2981.2009.

Keywords:- *Cherry, goat milk, Ascorbic Acid, yoghurt drink.*

I. INTRODUCTION

Milk is one of the livestock products known as high nutritional foodstuffs that contain are various types of nutrients. The nutrient content of milk is considered complete and in a balanced proportion that beneficial for the growth and health of the body, both for children, adolescents and adults. Milk is a fluid from the mammary gland obtained by milking during lactation without any addition or reduction of any component of the liquid. Milk contains many macro and micro nutrients, such as carbohydrates, fats, proteins, vitamins and minerals [12]. Goat milk has protein content higher than cow's milk, which is 3.4% while the milk protein content of cows is 3.2%. High protein content in goat's milk is very good for growth and the formation of body tissues. Goat milk also contains short-chain fatty acids more than cow's milk, which makes the fat in goat's milk more easily digested by the body to generate energy [13] Application of goat milk is currently less optimized, this is caused by the assumption that pungent-scented goat milk so most people do not like it. Therefore, diversification processed from goat milk, one of which is to process it into yoghurt. Yogurt is one of the products of fermented milk by lactic acid bacteria that has acidic flavor. It is this yogurt sour taste that causes this product to receive additional treatment in the manufacturing process. Currently there are many innovations that can be done to improve the flavor of yoghurt is by the addition of fruit flavor. The type of fruit that is suitable to add to yogurt is a sweet fruit to offset the acidity of yogurt [22] . One of the fruits that can be added to the yoghurt product is Cherry (*Muntingia calabura* L.). The addition of cherry juice in yoghurt has not been done, now the fruit are consumed only in fresh condition and processed into juice and jam. Utilization of cherry fruit (Muntingia calabura L.) less than the maximum however cherries are a source of antioxidants, because they contain flavonoids, phenols, niacin and beta-carotene, which act as antioxidant agents [21], in addition to the kersen also contain high of Ascorbic Acid that is about 80.5 mg compared to mango fruit only 30 mg [5] and citrus fruit of 18.90 mg [8]. Caffeine juice added to the process of making yoghurt drink is expected other than as a flavor enhancer can also be used to help the growth of lactic acid bacteria. It is based on the high nutritional content of cherries such as carbohydrates, proteins, calcium, vitamins and energy [5] that cause this fruit has the potential growth of microbes. Several studies have shown that the addition of juice can improve the quality of yoghurt. The results of Adhilah study, the addition of yellow passion fruit extract at different doses (40 mL and 80 mL), resulted in the highest Ascorbic Acid level of 6.219 mg at 80 mL[1]. Based on the results, which gives the best influence on yogurt is the addition of juice sours 10% and fermentation time 12 hours [11],. At the best treatment resulted pH 4,413, total acid 0,82%, antioxidant activity 61,503%. The addition of star fruit extract with different concentration (1%, 2% and 3%) resulted in the best quality yogurt drink on the addition of star fruit extract with 2% concentration [10]. Other studies have shown that the addition of bit extracts can mask goaty-flavor and goaty-odor in goat milk yoghurt. At 4% concentrations preferably panelists versus 6% and 8% concentrations, addition of beetroot juice also did not alter the pH and acidity of goat milk yoghurt produced [4].

II. MATERIAL AND METHODS

Fruits are sorted to get cherries with good quality then washed with running water. The clean cherry fruit is weighed and extracted by to obtain cherry juice (Ristek, 2000). Goat's milk is diluted by adding warm water (2: 1) then it stirred until homogenized. Pasteurization of goat's milk cooked on 75˚C for 15 minutes. Then 5% sugar and 0.2% carrageenan is added.

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Pasteurized milk is filtered into the container, which is intended to separate the remaining impurities present in the milk. Temperatures decrease is done to lower the temperature of post-pasteurization to 40˚C. The inoculation was aimed at planting a bacterial starter in pre-temperature dairy goat, after the milk temperature was lowered to 40 °C, starter culture was added to the milk at a predetermined dose, ie the amount of bacteria added by 3% of starter culture mixture (*Lactobacillus bulgaricus* and *Streptococcus thermophillus*). Milk that has been planted with starter culture then incubated for 15 hours at 37 ° C. The incubation conditions especially the temperature and time for the desired microbe to grow well, resulting in a coagulum (softening) which is soft and sufficiently thick and the preferred of yogurt flavor. Harvesting is done after the incubation process complete for 15 hours, while the screening aims to reduce the clots in yoghurt, so that the resulting drink yoghurt ready to drink [16]. The mixing process of yogurt drink (300 mL) with cherry juice has concentrations of 5%, 10%, 15%, 20% and 25%. The samples were packed with glass cups equipped with cover, then stored in the refrigerator at 5˚C for further analysis of Ascorbic Acid levels, protein content, pH, total lactic acid and organoleptic (flavor, color, flavor). Parameters to be observed were Ascorbic Acid and protein content, pH, total lactic acid and organoleptic test. Organoleptic tests include colors, flavors and aromas observed by Hedonic methods and Scoring methods [14].. Ascorbic Acid levels were determined by iodine titration method [18]. Protein levels is determined by the method of Gunning [18]. PH test is done by using pH meter. Total Lactic Acid was determined by 0.1 N NaOH titration method (SNI 2981: 2009). And . Organoleptic properties include color, flavors and sensory fragrances were performed using hedonic test and scoring methods. The test was conducted using a rather trained panelist of 25 people [4] from Food Science and Technology students. Panelists are required to provide an assessment based on the preferred level for the hedonic method, whereas for panelist scoring methods are requested to provide an assessment based on the nature of the foodstuff. Scores of hedonic and scoring tests include colors, flavors and flavors expressed in numbers 1-7, as follows: value scales for hedonic test: 1 = very unlikely, 2 = strong dislike, 3 = dislike, 4 = neutral, 5 = Likes, 6 = very like, 7 = very, very like. Scale value for scoring test, flavor: 1 = very sour, 2 = very acid, 3 = acid, 4 = neutral, 5 = sweet, 6 = very sweet and 7 = very very sweet. Aroma, 1 = very scented typical goats, 2 = very typical flavored goats, 3 = typical flavor of goats, 4 = neutral, 5 = typical cherry scent, 6 = very typical scented cherry and 7 = very very typical scented cherry. Color, 1 = very not brown, 2 = very brown, 3 = not brown, 4 = neutral, 5 = brown, 6 = very brown and 7 = very brown.

➢ *Statistic analysis*

The experimental design used was Completely Randomized Design (RAL) for the parameters of Ascorbic Acid, protein, pH, total lactic acid and Randomized Block Design (RAK) for organoleptic parameters (number of panelists as blocks). The single factor in this experiment was the addition of cherry juice to the yogurt drink consisting of 6 treatments, namely: K0 = without addition of cherry juice (control), K1 = cherry juice addition of 5% (15 mL), K2 = Cherry fruit as much as 10% (30 mL), K3 = cherry juice addition of 15% (45 mL), K4 = cherry juice addition of 20% (60 mL) and K5 = cherry juice added 25% (75 mL).

The observed data were analyzed using Analysis of Variance (ANOVA) at 5% level using Co-Stat software. The existence of significant differences between treatments, will be further tested with Orthogonal Polynomials at 5% level for the parameters of Ascorbic Acid, protein, pH, total lactic acid and advanced test of Honestly Significant Differences (HSD) for organoleptic parameters [6].

III. RESULTS AND DISCUSSION

A. Effect of Addition of Cherry Juice to Ascorbic Acid of Yoghurt Drink

The observation analysis of variance (ANOVA) showed that the addition of cherry extract resulted significantly different on Ascorbic Acid of yoghurt drink. Further orthogonal polynomial test show the interaction with the linear pattern. The polynomial graph can be seen in Figure 1.

Figure 1 shows an increase in Ascorbic Acid levels of yoghurt drink with the equation y = 0.0118x2 + 3,7028x-2,9084 with the coefficient of determination (R2) = 0.9939. A value of 0.0118x2 determines the direction of the quadratic regression and the 3.7028x value determines the linear regression direction because the value is positive, it indicates a positive relationship. This positive relationship can be interpreted that the higher concentration of cherry juice given cause increased levels of Ascorbic Acid amounted to 3.7028x. Correlation coefficient value obtained by rooting the coefficient of determination to get the value of correlation coefficient of 0.9969, including in very strong category. So the correlation between Ascorbic Acid levels and concentrations of cherry juice is very strong. Determination coefficient value (R2 = 0,9939) showed that 99,39% increase of vitamin C content influenced by treatment of cherry juice concentration, while the rest (100% - 99,39%) 0,61% influenced by other factor.

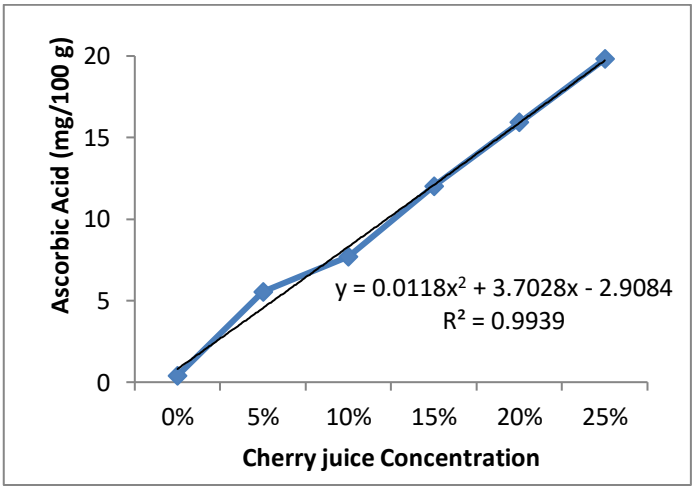

Fig 1:- Effect of Addition of Cherry Juice to Ascorbic Acid of *Yoghurt Drink*

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Ascorbic Acid levels of yoghurt drink increased as the concentration of cherry juice grew. The highest levels of Ascorbic Acid were found in the treatment with cherry juice concentration of 25%, ie 19.8 mg / 100g of the ingredients. This is because the cherries contain Ascorbic Acid as much as 80.5 mg / 100 g of ingredients [5]. Vitamin C is stable in acidic or low pH ([2]. Several studies have also shown that the addition of juice can increase vitamin C levels of yoghurt. Hayati [7] states that the addition of 15% juice of srikaya fruit produces Ascorbic Acid levels of 3.08 mg / 100 g of ingredients and 0 mg without the addition of srikaya fruit juice. The addition of 15% of guava fruit extract from Bangkok yield Ascorbic Acid levels of 3.22 mg / 100 g of ingredients [19].

B. The Effect of Cherry juice addition to Protein Level of Yoghurt Drink

Based on data of observation and analysis of diversity showed that the addition of cherry juice to produce the effect that is not significantly different to the level of yoghurt drink protein. Further orthogonal polynomial test results can be used to determine the trend pattern of treatment of protein content can be seen in Figure 2.

Figure 2 shows an increase in yoghurt drink protein content with the equation y = -0,0069x2 + 0.0886x + 0.8926 with the coefficient of determination (R2) = 0.8958. The value -0.0069x2 determines the direction of the quadratic regression, since the value is negative, it indicates a negative relationship. Negative relationship can be interpreted that if the concentration of juice squared will not affect the levels of yoghurt drink protein. The value of 0.0886x determines the direction of linear regression because the value is positive, it indicates a positive relationship. This positive relationship can be interpreted that the higher concentrations of cherry juice given cause increased protein content of 0.0886x. Correlation coefficient value obtained by rooting the coefficient of determination so that the correlation coefficient obtained value of 0.9464, including in very strong category. So the correlation between protein content and concentration of cherry juice is very strong. Determination coefficient value (R2 = 0,8958) showed that 89,58% increase of protein content influenced by treatment of cherry juice concentration, while the rest (100% - 89,58%) 10,42% influenced by other factor.

Yoghurt drink protein levels increased as the concentration of cherry juice grew. The highest protein content was found in the treatment with the concentration of cherry juice 25% that is equal to 1,19%. This is because kersen contains protein of 0.38 g / 100 g of ingredients [5]. The quality of yoghurt depends on the ingredients added, if the added ingredients have a high protein content, the higher the yoghurt protein content [9]. Levels of yoghurt drink protein produced in this study ranged from 0.95 to 1.19%. This protein content has not met the SNI 01-2981-2009 standard for less than 2.7%.

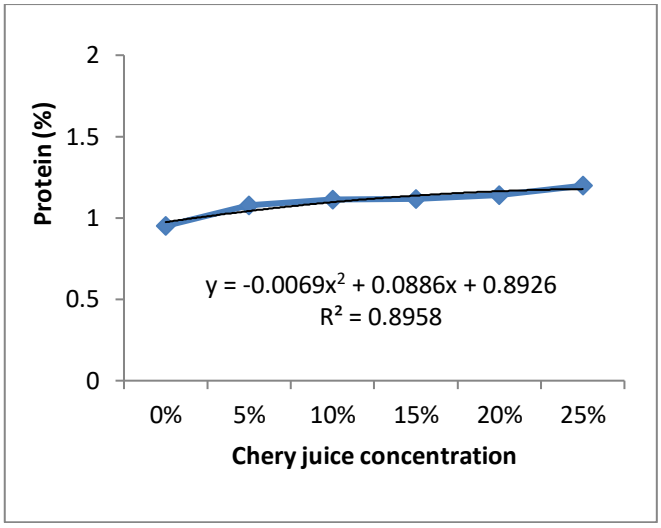

Fig 2:- Effect of Addition of Cherry Juice to Protein of Y*oghurt Drink*

C. The Effect of Cherry juice addition to the pH Value of Yogurt Drink Based on the observed data and the diversity analysis in Table 1 shows that the addition of cherry juice resulted in significantly different effect on the pH value of yoghurt drink. Further orthogonal polynomial test results can be used to determine the trend pattern of treatment to pH value.

Figure 3 shows an increase in pH value of yoghurt drink with the equation y = -0.0019x2 + 0.0407x + 4.3273 with the coefficient of determination (R2) = 0.9947. The value -0.0019x2 determines the direction of the quadratic regression, since the value is negative, it indicates a negative relationship. Negative relationship can be interpreted that if the concentration of juice squared will not affect the pH value of yoghurt drink. The value of 0.0407x determines the direction of linear regression because the value is positive, it indicates a positive relationship. This positive relationship can be interpreted that the higher concentration of cherry juice given causes an increase in pH value of 0.0407x. Correlation coefficient value obtained by rooting the coefficient of determination so that the correlation coefficient obtained value of 0.9973, including in very strong category. So the correlation between the pH value and the concentration of cherry juice is very strong. The coefficient of determination (R2 = 0,9947) shows that 99.47% increase of pH value is influenced by the addition of cherry juice, while the remaining (100% -99,47%) 0,53% is influenced by other factors.

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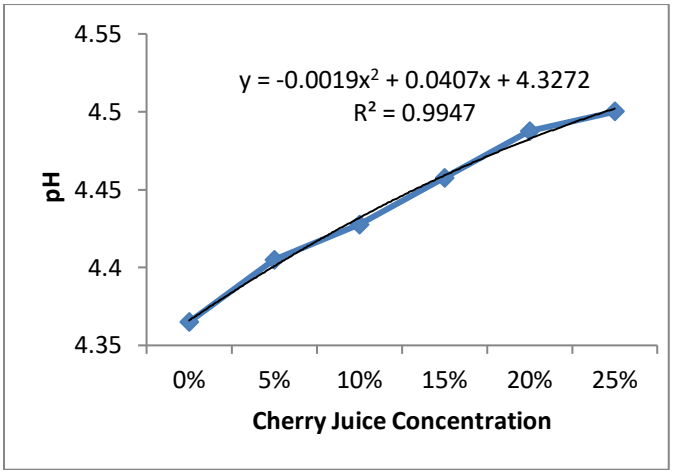

Fig 3:- Effect of Addition of Cherry Juice to pH of *Yoghurt Drink*

The pH value of yoghurt drink increased with the concentration of cherry juice given. The higher concentration of cherry juice added, the higher the pH value of yoghurt drink. This increase in pH value is due to the addition of cherry juice to the yoghurt drink, because the pH value of cherries is higher than the pH value of the yoghurt drink produced. Based on the results of research known pH value on cherry fruit is 6.40. The pH value of yogurt drink produced in this study ranged from 4.36 to 4.50. This pH value still meets the SNI 01-2981-1992 standard that is 4.0-4.5.

D. The Effect of Cider Drug Addition to Total Lactic Acid Yoghurt Drink

Result of observation and analysis of diversity (ANOVA) showed that treatment of addition of cherry juice resulted significantly different effect on total lactic acid yoghurt drink. Further orthogonal polynomial test results show the interaction with the linear pattern.

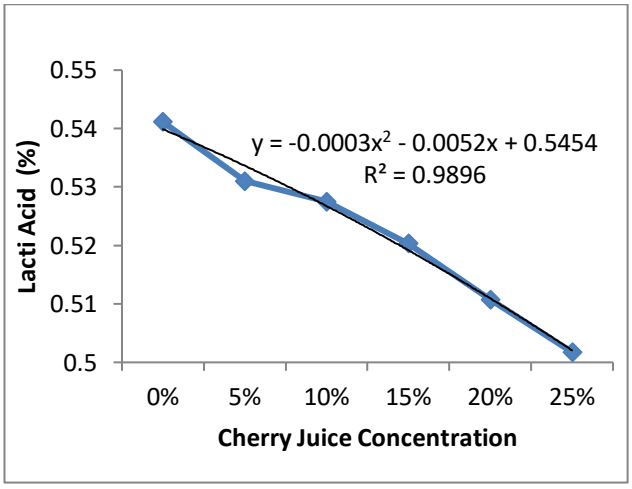

Fig 4:- Effect of Addition of Cherry Juice to Lactic Acid of*Yoghurt Drink*

Figure 4 shows a decrease in total lactic acid value of yoghurt drink with the equation y = -0.0003x2 - 0.0052x + 0,5454 with coefficient of determination (R2) = 0,9896. The value -0.0003x2 determines the direction of the quadratic regression and the value -0.0052x determines the direction of linear regression because of its negative value, it indicates a negative relationship. This negative relationship can be interpreted that the higher concentrations of cherry juice given cause a decrease in total lactic acid value of 0.0052x. Correlation coefficient value obtained by rooting the coefficient of determination to get the value of correlation coefficient of 0.9947, including in very strong category. So the correlation between the total value of lactic acid and the concentration of cherry juice is very strong. Determination coefficient value (R2 = 0,9896) showed that 98,96% increase of lactic acid total value influenced by treatment of cherry juice concentration, while the rest (100% - 98,96%) 1,04% influenced by other factor.

The total value of lactic acid yoghurt drink decreased with increasing concentration of cherry juice. The total value of the lowest lactic acid was found in the treatment with the concentration of cherry juice 25% that is 0.50. The decrease in the total value of lactic acid is due to the lack of maximum utilization of sugar in coveted by lactic acid bacteria, which causes the resulting lactic acid is not maximal. The decrease in the total value of lactic acid is also caused by the presence of antibacterial compounds in cherries, which can inhibit the growth of lactic acid bacteria. Based on Sartika [17], states that cherries contain antibacterial compounds ie, flavonoids 32.82 g / kg, saponin 5.0.0 g / kg, tannins 14.64 g / kg and polyphenols 69.78 g / kg. The delayed growth of lactic acid bacteria can affect the production of lactic acid in the yoghurt drink. The higher the antibacterial compound, the lower the lactic acid is formed. The total value of lactic acid is closely related to the pH value, the lower the total value of lactic acid the higher the pH value [20]. The total lactic acid value of yogurt drink produced in this study ranged from 0.50-0.54. The total value of lactic acid is still meet the standards of SNI 01-2981-2009 of 0.5-2.0.

E. The Effect of Cider Dried Fruit Extract on Yoghurt Drink Flavor

Results of the diversity analysis at 5% level showed that the addition of cherry juice gave no significant effect on the taste of yoghurt drink. Based on the results of organoleptic test of taste with hedonic test obtained values ranged from 3.48 to 4.04 and for scoring test obtained values ranged from 3.36 to 3.68, for further can be seen in Figure 5. Purpose of taste test organoleptic test The highest hedonic acid was obtained in addition of 5% cassava extract of 4.04 with neutral criterion and lowest score 3,48 with criterion did not like to be obtained at addition of 15% of cherry juice. This can happen because the higher concentration of cherry juice added will make the yoghurt drink taste sweet. Excessive sweetness can cause nausea.

The flavor of taste organoleptic test with the highest scoring test was obtained on the addition of 20% cassava juice of 3.68 with the slightly acidic criterion and the lowest value of 3.36 with the acid criterion was obtained at the addition of 0% cherry juice. This can happen because the higher concentration of cherry juice added will make the yoghurt drink taste sweet, so the taste of yoghurt drink is reduced.

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F. The Effect of Cider Dye Addition to Yoghurt Drink Color

The results of the diversity analysis at 5% level showed that the addition of cherry juice gave a significant effect on the taste of yoghurt drink, so that further test was done with honestly significant difference test (HSD). Based on organoleptic test Color with hedonic test obtained values ranging from 3.56-4.32 and for scoring test obtained values ranging from 3.00 to 4.52.

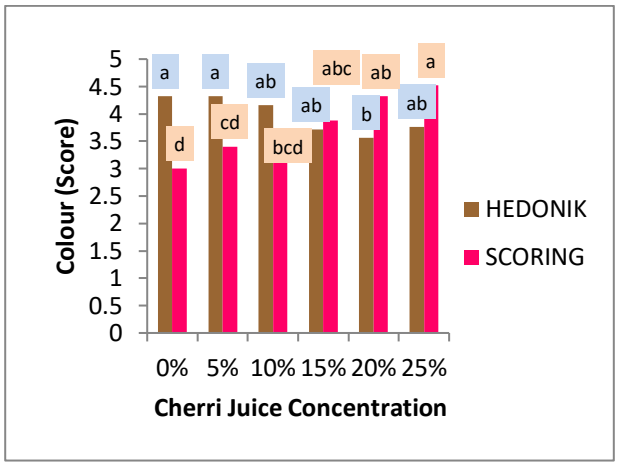

Fig 5:- Colour of *Yoghurt Drink*

The color of the organoleptic test of color with the highest hedonic test was obtained at the addition of 5% cassava juice of 4.32 with the neutral criterion and the lowest value of 3.56 with the criterion of dislike, was obtained on the addition of 20% cherry juice. Purpose of organoleptic test with the highest scoring test was obtained in addition of 25% cassava extract of 4.52 with neutral criterion and lowest value 3,00 with no brown criterion was obtained at 0% addition of cherry juice. This can happen because the more concentration of cherry juice added, the more yoghurt drink color chocolate produced

G. The Effect of Cider Dried Fruit Extract on Yogurt Drink

Based on the results of organoleptic test of aroma with hedonic test obtained values ranged between 3.68-4.24 and for scoring test obtained values ranged from 2.96-4.44.

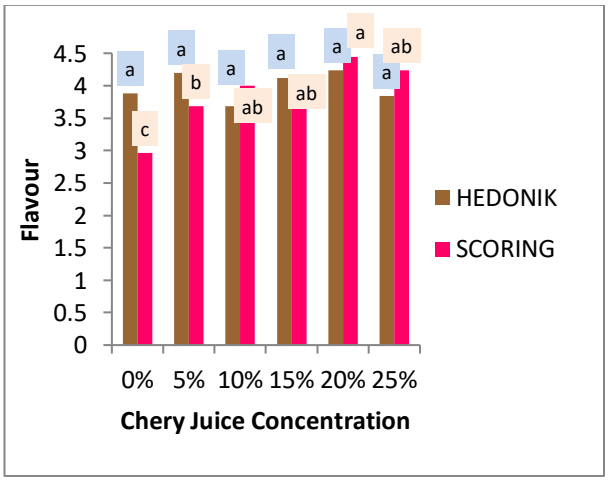

Fig 6:- Flavour of *Yoghurt Drink*

Purpose of organoleptic test with the highest hedonic test was obtained in addition of 20% cherry juice of 4.24 with neutral criterion and lowest value 3,68 with criterion did not like to be obtained at 10% addition of cherry juice. The highest scoring of organoleptic tests were obtained at the addition of 20% cherry juice of 4.44 with neutral criterion and the lowest value of 2.96 with the criterion very goats typical of goats obtained at the addition of 0% cherry juice. This can happen because the more concentration of cherry juice is added then the distinctive aroma of goat can be covered or lost by the distinctive aroma of cherry.

IV. CONCLUSION

The addition of cherry juice can increase levels of Ascorbic Acid, protein content and pH value of yoghurt drink but not the total value of lactic acid because the higher the pH value the lower the total value of lactic acid. In addition, cherries also contain high ascorbic acid. The addition of cherry juice can increase consumer acceptability test of flavor and aroma but not for color test, because the higher concentration of cherry juice added will cause brown color in yoghurt drink. The pH and total acid values of the yoghurt drink with the addition of cherry juice at various concentrations resulted in pH values of 4.3-4.5 and total lactic acid of 0.50-0.54 which complied with the standard of SNI 01.2981.1992 (pH 4.0- 4.5) and SNI 01.2981.2009 (total lactic acid 0.5-2.0). Based on the parameters of Ascorbic Acid, protein, pH, total lactic acid and organoleptic yoghurt drink goat milk with the addition of 5% cherry juice concentration is the best treatment.

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