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Chemical Characterization of Instant Powder Based on Dutch Eggplant Peel and Seed Waste Using the Foam Drying Method

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Abstract - *Chemical content of Dutch eggplant shell waste and seeds Each 500 mL extract contains sugar (0.46), crude fiber (1.98), vitamin C (0.0716), anthocyanin (122.57) and pH (5.9). Where with some of the ingredients contained in the skin and seeds of Dutch eggplant skin waste and seeds, it can be processed into an instant powder drink that is beneficial to the health of the human body, one of which is preventing free radicals and treating hypertension. This study aims to determine the formulation and specifications of instant drink powder made from waste skins and seeds from waste Dutch eggplant shells and seeds using the foam drying method and the addition of sucrose as a sweetener. In this study the experiments used RAL with 2 times in a row and variable sucrose concentration (10%; 15%; 20%), stirring time (30 minutes; 45 minutes; 1 hour) and a comparison of air and eggplant. (1:1; 1:2; 1:3) In this study the vitamin C test, organoleptic test and fiber test were analyzed. So the result is that the best vitamin test is obtained by adding 10% sucrose with an absorbance value of 0.303. the level of preference of the organoleptic panelists on the variable addition of 20% sucrose and for the highest fiber content was around 30% on the variable addition of 20% sucrose.*

Keywords *– Free radicals, foam drying, dutch eggplant, sucrose, organoleptic*
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1. Introduction

Dutch eggplant skin and seeds waste (Cyphomandra betacea) or often called tamarillo is one type of plant that belongs to the familySolanaceae. The content of 500 mL of Dutch eggplant shell and seed waste extract contains sugar (0.46), vitamin C (0.0716), crude fiber (1.98), anthocyanin (122.57) and pH (5.9). In addition, Dutch eggplant shell and seed waste has a high fiber content and is useful in preventing cancer and the antioxidant content in Dutch eggplant shell and seed waste can be useful as an antidote to free radicals and help reduce hypertension. In addition, its antioxidant content can help prevent premature aging (Suzanna et al., 2019).

With a variety of chemical compounds contained in the waste fruit skin and Dutch eggplant seeds, it can be processed into an instant powder drink that can maintain the health of the human body and maintain stamina. Instant drinks can be used as healthy drinks. Using foam drying method, foam drying. The foam drying method uses an oven that can be temperature regulated. The foam drying method is used to dry the previously prepared liquid in the form of foam by shaking it and adding a small amount of developer or foaming agent to the foaming liquid. Formation of foam from the liquid results in a wider surface area, resulting in faster water absorption, as well as a much lower drying temperature usage (Zakiah et al., 2016).

The advantage of using this method in the foam phase is that water absorption is faster, the drying temperature is not too high, around 50 - 80oC, the product has quite good color and taste quality. , because it uses a low drying temperature so that the color of the product is not damaged, the smell and taste are not lost, the cost of the drying process is more efficient because the energy required is less, the product is stable during the storage process so that the product life is quite long and the product has density and water content which is quite low between 2 - 4% (Senjawati et al., 2021).

In addition, the Dutch eggplant shell and seed waste uses a variation of the addition of sucrose with the aim of enhancing the taste of this instant drink to attract public interest and 2 help the crystallization process. It can be concluded that the purpose of this study was to determine the formulation in the manufacture of instant beverage products made from Dutch eggplant shell and seed waste and to determine the chemical content contained in Dutch eggplant shell and seed waste before and after being processed into instant drinks.

2. Materials and Methods

2.1. Raw Material

All chemicals in this study were obtained from the Diponegoro University Vocational School Laboratory. This research started from a preliminary study to determine the best ratio between fruit juice and water and the right heating temperature for the drying process. The ratio of water to fruit juice is 1:3, that is, 500 ml of fruit juice and 1500 ml of water. The raw materials used were Dutch eggplant shell and seed waste, sucrose, iodine solution, distilled water, boiled water, 96% KOH purity from Merck, Germany, 0.01N iodine solution, 2% starch indicator and 3M HCl technical solution.

2.2. Equipment

While the equipment used is burette, frying pan, stirrer, stove and gas, measuring cup, beaker, JASCO UV-Vis Spectrophotometer and oven.

2.3. Procedure

Instant drink Dutch eggplant skin and seeds waste

Separate the Dutch eggplant skin and seeds waste from the skin, then cut into small pieces and then puree. Prepare the granulated sugar and put it in the pan that has been prepared then add the finely ground granulated sugar and eggplant according to the variable into the frying pan, dry over low heat while stirring until the ingredients turn caramel and change form to powder(Yuliawaty & Susanto, 2015).

Analysis Stage

- **Crude fiber test**

Crude fiber testing using the gravimetric method. By weighing 3 g of sample (W) and putting it into a 500 ml Erlenmeyer, and adding 50 ml of H2SO4 solution with heating in 30 minutes. Furthermore, 50 ml of NaOH was heated for 30 minutes using an upright cooler. In hot conditions, filter with filter paper that has been previously baked and the weight is known to be placed in a Buchner funnel. The precipitate was washed successively with hot H2SO4 solution, hot water and 96% ethanol. Put the filter paper and its contents into the oven at 105oC then cool and then weigh until the weight remains (W1). Then the ashes of the filter paper and its contents were weighed to a constant weight (W2) and then the gauze fiber content was calculated.

- **Vitamin C test**

Vitamin C is determined by titration with iodine solution. Then do the titration by looking at the color change that occurs to blue. To calculate the result, the level of vitamin C is equated to 1 ml of 0.01 N iodine equivalent to 0.88 mg of ascorbic acid.

- **Organoleptic Test**

Organoleptic test with 20 panelists from the community around the village, including village officials. Where the qualitative organoleptic test was carried out by testing the color, taste and smell.

- **Sub Procedure**

The experimental design used RAL (Completely Randomized Design) with response surface graphics with the help of the SPSS application. The analysis that will be carried out for testing the instant powder drink waste from Dutch eggplant shells and seeds is the vitamin C test, fiber test and organoleptic test.

3. Results and Discussion

- **Fiber Test Analysis Results**

Crude fiber is a non-nutritional substance contained in fruits and vegetables, so that fruits and vegetables are the main source of crude fiber (Anova & Kamsina, 2019). The main function of dietary fiber is the ability to bind water, cellulose and pectin. The amount of fiber contained in 500 mL of Dutch eggplant shell and seed waste was 1.98% and after being processed into instant drinks, there was a change in the amount of fiber in each sample which was getting lower, this was because each sample experienced an increase in the fiber content contained in soft drinks.

The control treatment with a fiber content of 0.14% with a sugar concentration of 10% then increased fiber content until the highest point was located at a sugar concentration of 30% which had a fiber content of 0.21%. Heat treatment causes fiber in foodstuffs to increase along with the addition of sucrose, due to the heating process Mailard reactions and caramelization occur which cause sugar to change into other compounds which then become crude fiber.

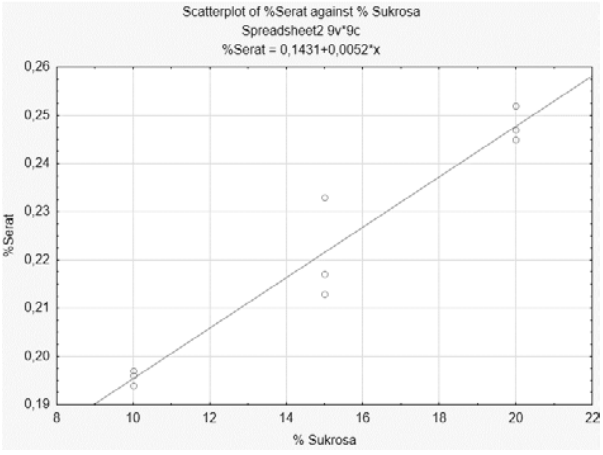

Figure 1a. Graph of %Crude Fiber Vs % Sucrose

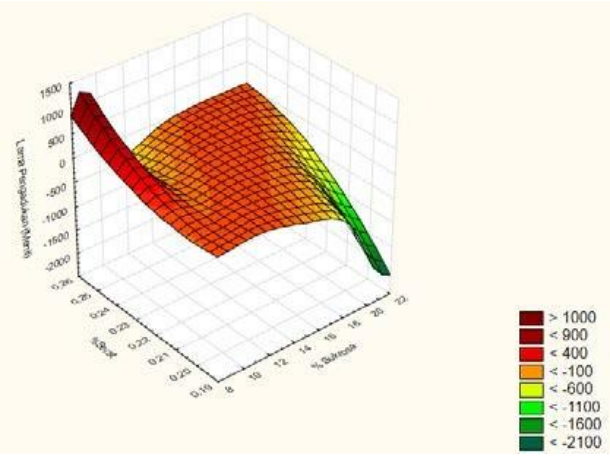

Figure 1b. Graph of Response Surface of % Crude Fiber Vs % Sucrose

- **Vitamin C Test Analysis Results**

Vitamin C is a nutrient needed by the body and plays a role in boosting the immune system. Vitamin C plays a role in the process of hydroxylation of proline and lysine to become hydroxyproline and hydroxylysine in the formation of collagen.

From the research results obtained 0.6404% after being processed into instant drinks, the lowest change was in the sugar concentration of 20% with an average value of 0.721333333% then the sugar concentration was 10%, the control formulation was in sugar 15% and the lowest was in the sugar control formulation 10% obtained a sugar content of 10% vitamin C of 0.702%. After being processed into soft drinks, changes in the vitamin C content in soft drinks vary, due to the addition of sugar to these drinks (Pudjihastutia & Wisnu Broto, Edy Supriyo, 2018).

According to (Yuliawaty & Susanto, 2015) Vitamin C is a vitamin that dissolves easily in water, while sugar is a substance that can bind free water so that the more sugar, the vitamin C content will increase. The main factor of changes in vitamin C content due to washing and heating in the process of making instant powder drinks. It can be seen in the scatter graph in Figure 2.

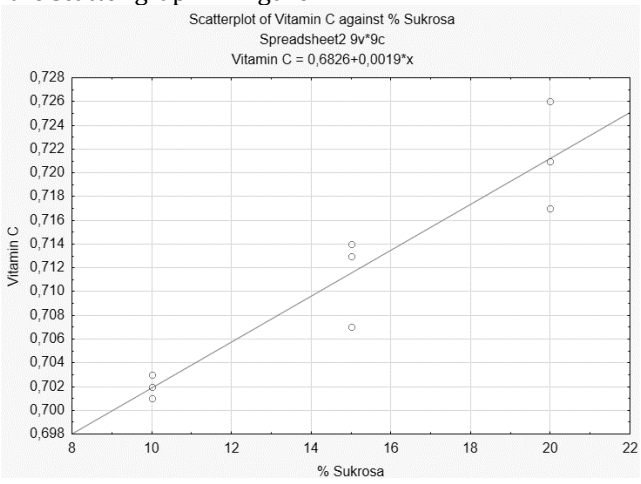

Figure 2. Vitamin C Scatter Graph With % Sucrose

Organoleptic Test

- **Color**

Food coloring can be categorized as natural colors and artificial (synthetic) colors. Natural color, namely the color of food ingredients as a result of the growth process or chemical changes of the substances contained in these ingredients. Artificial coloring is the color given to food by adding chemical compounds to the material. These chemical compounds come from natural or chemical substances (Suzanna et al., 2019). The results of the panelists' assessment of the color of the Dutch eggplant shell and seed soft drink were in the range of 7-8 (Figure 3).

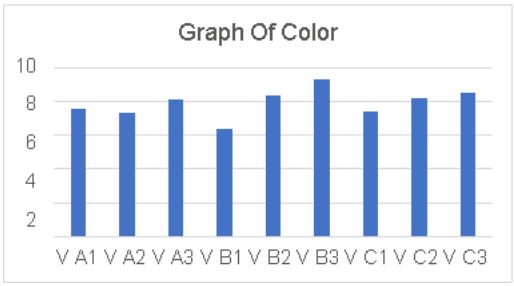

Figure 3. Graph of Average Panelist Acceptance Score for Instant Drink Powder Color Waste Dutch eggplant skins and seeds

The resulting instant drink of Dutch eggplant skin and seed waste is red in color. The value of this instant drink with the addition of sugar concentration has a lower value compared to the control treatment by the panelists. The instant drink color that had the lowest value was in the 20% sugar concentration treatment, namely 3.7 (rather disliked), while the highest instant drink color value was in the control treatment with a value of 7.5. This value indicates that the control treatment is favored by the panelists.

The color of the instant drink product corresponds to the raw material, namely Dutch eggplant skin and seed waste extract, sugar and other additives. Dutch eggplant skin and seed waste extract has a reddish-purple color while the color of the sugar is brownish white, making the caramelized instant drink turn pink. Instant drinks with added ingredients have a darker color than natural ingredients (Edy & Ajo, 2020).

- **Flavor**

The taste of food is the second factor that influences the taste of food after the appearance of food. In addition, according (Wirantika, 2019) Taste is one of the important sensory properties in food acceptance. Evaluation of odor and taste is highly dependent on the taste panel and the taste of the food during processing.

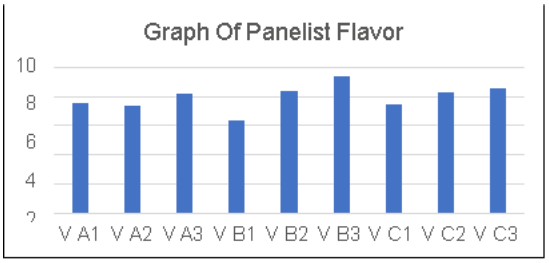

Figure 4. Graph of Average Panelist Acceptance Score for Powder Flavored Instant Drinks Waste Dutch eggplant skins and seeds

The panelists liked the taste of skin waste and Dutch eggplant seeds. It has a high acceptance rate according to the organoleptic test results. The taste of the chips comes from volatile substances from the waste extract of Dutch eggplant skins and seeds and sugar. Where the higher the concentration of Dutch eggplant skin and seed waste extract and sugar, the stronger the resulting taste.

- **Smell**

Smell is the sense of smell to assess the smell or smell of food products. Although humans are capable of detecting it, each individual has different preferences (Lamusu, 2018). In the food industry, the smell test is very important because it can quickly provide the results of an assessment of consumer acceptance of the product produced (Arifan et al., 2018).

The results of the organoleptic test on the smell of the instant drink of waste Dutch eggplant shells and seeds can be reviewed in Figure 5. The smell of the instant drink waste of Dutch eggplant shells and seeds ranges from 6-9.3. The smell of the instant drink of waste shells and Dutch eggplant seeds in the control treatment obtained the lowest value from the panelists, namely 6.3, this value belonged to the very dislike category, while the treatment of adding 20% sugar produced the highest smell value, namely 9.3 (liked).

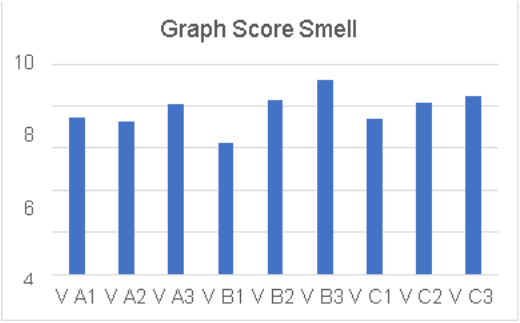

Figure 5. Graph of Average Panelist Acceptance Score for Instant Drink Powder Smell Waste Dutch eggplant skins and seeds

4. Conclusion

Based on research we conducted in Sikunang Village, Wonosobo Regency regarding the analysis of changes in the chemical content of waste Dutch eggplant shells and seeds before and after being processed into instant powder drinks, that the addition of sucrose and stirring greatly affected changes in the chemical content of waste Dutch eggplant shells and seeds. Dutch eggplant skin and seeds waste instant drink powder. And based on the results of chemical content tests and organoleptic tests, the 20% sugar concentration treatment was the best treatment from the results of this study.

References

Anova, IT, & Kamsina, K. (2019). The effect of adding agar powder to the chemical composition of agar powder from fro. Journal of Industrial Research and Development, 9(2), 119. https://doi.org/10.24960/jli.v9i2.5631.119-126

Arifan, F., Winarni, S., Handoyo, G., Nurdiana, A., Rahma, ANH, & Risdiyanti, S. (2018). An analysis of antioxidants, organoleptics and hedonics with variations of boiling time in Jasmine tea and Jasmine root tea a study in Kaliprau, Pemalang. Journal of Physics: Conference Series, 1025(1), 8–12. https://doi.org/10.1088/1742-6596/1025/1/012066

Edy, S., & Ajo, A. (2020). Processing of instant ginger as an herbal drink during the COVID- 19 pandemic. Journal of Economics, Social, and Humanities, 2(3), 177–183.

Lamusu, D. (2018). ORGANOLEPTIC TEST OF JALANGKOTE PURPLE SWEET POTATO (Ipomoea batatas L) AS A FOOD DIVERSIFICATION EFFORT. 3(1), 9–15.

Pudjihastutia, I., & , Wisnu Broto, Edy Supriyo, FA (2018). Collaborative National Seminar on Improving the Process of Making Traditional Instant Drinks in the City of Semarang. 1, 531–533.

Senjawati, MI, Maryam, M., & Afriyuni, F. (2021). Instant Spice Beverage Processing Technology as a Business Opportunity and Increase the Body's Resistance Against Covid 19. Journal of Approriate Technology for Community Services, 2(2), 103–110. https://doi.org/10.20885/jattec.vol2.iss2.art7

Suzanna, A., Wijaya, M., & Fadilah, R. (2019). ANALYSIS OF THE CHEMICAL CONTENT OF FRUIT WASTE SKINS AND SEEDS OF DUTCH EGGPLANT (Cyphomandra betacea) AFTER PROCESSING INTO SOFT BEVERAGES. Journal of Agricultural Technology Education. https://doi.org/10.26858/jptp.v5i0.8555

Wirantika, L. (2019). Physical, chemical and organoleptic characteristics of kenitu fruit leather (Chrysophyllum cainito L.) with various concentrations of CMC and carrageenan as binders.

Yuliawaty, ST, & Susanto, WH (2015). The Effect of Drying Time and Maltodextrin Concentration on the Physical-Chemical and Organoleptic Characteristics of Noni Leaf Instant Drink (Morinda citrifolia L). Journal of Food and Agroindustry, 3(1), 41–51.

Zakiah, I., Cahya, G., Darma, E., Priani, SE, Pharmacy, P., Mathematics, F., Science, D., & Nature, P. (2016). Formulation of Toothpaste Containing Citronella Oil (Cymbopogon winterianus jowitt) as Anti-Plaque and Dental Caries and Activity Test against Streptococcus mutans. Proceedings of Pharmacy, 2(2), 400–406.