Formulation And Evaluation Of The Preparation Of Hard Candy Source Of Sweet Orange (Citrus Sinensis (L.) Osbeck) As A Nutracetical

Syarifah Mauliza[1], Gabena Indrayani Dalimunthe[2*]

[1,2] Department of Pharmacy, Universitas Muslim Nusantara Al Washliyah,
Medan Amplas 20147, North Sumatera, Indonesia
*Corresponding Author:
Email: gabenaindrayani03@gmail.com

Abstract.
Candy is used as a source of high calories, so it is often eaten during activities such as work, studying, and exercise. In general, the candy that is widely circulated in the community is hard candy, which has a hard texture and a shiny appearance. The benefits of candy for the human body are that it adds nutrients, minerals, and other vitamin content because this candy is made from real fruit juice. The purpose of this study was to formulate hard candy with the main ingredient of sweet orange juice with a variety of sucrose in order to get a delicious formula in the form of taste that is expected to meet the nutritional requirements of both children and adults. formulated candy. Hard candy is made using the open pan method. The research is experimental and includes the processing of sweet orange ingredients, making sweet orange juice, making hard candy and hard candy test parameters including organoleptic tests, pH tests, weight uniformity tests, water content tests, ash content tests and tests of preference level (hedonic test) by the respondent. Based on the results of the study, sweet orange juice can be formulated into hard candy preparations with sucrose 1,5; 2 and 3 g. The obtained results with candy shape, taste, and hardness are quite good; they have a pH of 5, and they meet weight uniformity requirements with a coefficient of variation of 1.08, 1.30, and 1.11%, moisture content 2.4, 2.3 and 1.7%, ash content 1.0, 0.13 and 0%. The results of the organoleptic preference level test in terms of liking, taste, and texture showed that F3 was the most preferred formula. The sucrose levels have an effect on the level of liking.

Keywords: *Hard Candy, sweet orange juice, nutraceutical*

I. INTRODUCTION

Candy is very popular with the public and is only used as a snack because it tastes sweet and refreshing. It is practical to carry anywhere because of its small size. Besides that, a simple manufacturing method can be carried out by the home industry. Hard candy has become a product that is favored by various groups, both children and adults. In the market, there are still many synthetic-based sweets that use excessive amounts of dyes and flavorings and can have a negative impact on the body. Therefore, candy with original fruit flavor that is refreshing and provides nutritional value and is not just a snack has not been found, so these preparations are called nutrient-based preparations.With the development of the world of health after the era of supplements, there are now nutraceuticals, which come from the words nutra, which means nutrition, and ceuticals, which means nutrition to regulate the body's biological functions. (Lockwood, 2007) says that a nutraceutical is a medicinal or nutritional component found in food, plants, or natural materials that has been purified or concentrated and is used to promote health and prevent and treat disease. The purpose of this study was to formulate hard candy with the main ingredient of sweet orange juice by varying the amount of sucrose in order to get a good formula that is liked by both children and adults.

Several studies using vegetables or fruits in candy preparations include broccoli juice (Fonna and Gabena, 2022), gotu kola (Hutabarat et al., 2022), mustard greens (Zuliani and Gabena, 2022) and so on.In this study, sweet orange juice is used, which is a source of vitamins, minerals, and protein that are needed by the community for balanced nutritional needs. In addition, sweet oranges are fruits that are liked by the public as fresh or processed fruit and can be consumed by low-income people to high-income people (Waoni, 2019). Research (Fahruroji, 2020) states that sweet oranges contain metabolite compounds, namely flavonoids, saponins, phenolics, and vitamin C. The most abundant vitamin in sweet oranges is vitamin C, which can be useful as an antioxidant and is very good for increasing endurance.Based on the description above, the researcher is interested in conducting a study with the title "Formulation and Evaluation of Hard Candy Preparations." Citrus sinensis (L.) Osbeck) as a nutraceutical preparation with the main ingredient of sweet jeuk juice and an evaluation of the preparation.

II. METHODS

1. Sampling

The sample collection was carried out purposively, that is, without comparing with other regions. The samples used were fresh sweet oranges obtained from Kaban Jahe, Karo, North Sumatra

2. Materials

The materials used are fresh sweet oranges which will be made into sweet orange juice, sucrose, glucose syrup, citric acid, and aquadest.

3. Making Sweet Orange Juice

Making sweet orange juice begins with washing the sweet orange fruit with running water then splitting it into two parts, then squeezed using a juicer that is able to separate the pulp from the sweet orange juice, filtered using a sieve. Sweet orange juice is a liquid that has been separated from the pulp and then filtered to get clear sweet orange juice (Pujiastuti, 2017).

4. Formulation and Procedure for Making Hard Candy

Hard Candy Formula

Table 1. Formula for Hard Candy Sweet Orange Juice with Variations in Sucrose Levels

Ingredient	Amount of Ingredients (grams)		
	Formula I	Formula II	Formula III
Juice	5 g	5 g	5g
Sucrose	1,5 g	2 g	3 g
Glucose Syrup	3 g	3 g	3 g
Citric Acid	0,015 g	0,015 g	0,015 g
Aquadest	0,5 g	0,5 g	0,5 g
Total	10,015 g	10,515 g	11,515 g

Information:

F1 : Hard Candy Formula with a sucrose concentration of 1.5 g

F2 : Hard Candy Formula with sucrose concentration 2 g

F3 : Hard Candy Formula with a sucrose concentration of 3 g

Making Sweet Orange Juice Hard Candy

Hard candy is made using the open pan method. The process of making hard candy begins by preparing the ingredients, such as water, sucrose, and glucose syrup, with a ratio of 1.5, 2 and 3 g of sucrose. The preparation begins by dissolving sucrose with water up to 110 °C until the sucrose is dissolved, then adding glucose syrup and continuing with heating. At a temperature of 60-70°C, sweet orange juice is added to the solution, stirred until thickened, and then citric acid is added. After cooking, the ingredients are removed and then put into the mold and allowed to harden for 13-15 minutes. Then it was removed from the mold (Naibaho, 2021).

5. Evaluation of Hard Candy

1. Organoleptic Test

Organoleptic test of hard candy preparations of sweet orange juice was observed visually with color, shape, texture and aroma (Pujiastuti, 2017)

2. pH Test

The pH measurement is carried out by diluting 1 gram of hard candy with 10 ml of distilled water and then dipping it in a pH stick (Rahmayanti, 2019).

3. Weight Uniformity Test

The hard candy from each formula weighed 10 candies. Calculate the average weight of each candy. If weighed individually, there may not be more than two hard candies, each of which the weight deviates from the average weight by more than the price set in column A, and not one fruit whose weight deviates from the average weight by more than the stated price. assigned to column B (Depkes RI, 1979).

4. Moisture Test

The water content was measured by weighing 1-2 grams of hard candy sweet orange juice, putting it in a porcelain exchange rate that was already tame, putting it in an oven at a temperature of 100-105°C for 3-5

hours, and then weighing the sample weight (Rahkmayanti, 2019). Calculation of water content is done by the formula:

$$\text{Water content} = \frac{b-c}{b-a} X\ 100\ \%$$

a = Weight of the cup (gr)
b = Weight of the cup and initial sample (gr)
c = Weight of cup and dry sample (gr)

5. Ash Test

Ash content is done by weighing as much as 3-5 grams of hard candy sweet orange juice put into a porcelain exchange that has been tared. Then burned at a temperature of 500°C for 4-5 hours until white ash is formed, put in a desiccator for 1 hour (Rahkmayanti, 2019), then weigh the sample and then calculate the ash content with the formula:

$$\text{Ash content} = \frac{W2-W0}{W1-W2}\ x\ 100\ \%$$

W_0 = Weight of the cup (gr)
W_1 = Weight of the cup and initial sample(gr)
W_2 = Weight of the cup and Ashing sample (gr)

6. Hedonic Test

Twenty-one respondents were asked to provide taste responses about sweet orange juice hard candy by filling out a questionnaire. Equal opportunity to feel the sample. The level of liking test is grouped into three levels, namely very like, like, and dislike (Pujiastuti, 2017).

III. RESULT

Evaluation of Hard Candy

1. Organoleptic

Organoleptic tests are important to be able to make preparations that are easily accepted by the public, namely hard candy preparations, as well as to support consumer acceptance of the preparations that have been made. In all formulas, hard candy preparations were produced with a shape according to the mold used, namely a small oval. The small oval shape was chosen because this preparation is intended for both children and adults, so that the preparation is made attractive to be liked by both children and adults. The organoleptic test of color and aroma of the preparations produced in formulas 1-3 has a brownish yellow color and a distinctive citrus aroma according to the fruit used. Organoleptic tests for the preparation of Hard Candy sweet orange juice are presented in Tables 2, 3 and 4 below:

Table 2. Organoleptic test results Hard Candy formula 1 with 1.5 g sucrose

No.	Organoleptic Examination	Observation result
1.	Form	Small oval
2.	Color	Yellow (brown)
3.	Scent	Sweet orange special
4.	Flavor	Pretty Sweet
5.	Texture	Not hard

Table 3. Organoleptic test results for Hard Candy formula 2 with 2 g sucrose

No.	Organoleptic Examination	Observation result
1.	Form	Small oval
2.	Color	Yellow
3.	Scent	Sweet orange special
4.	Flavor	Pretty Sweet
5.	Texture	Not hard

Table 4. Organoleptic test results for Hard Candy formula 3 with 3 g sucrose

No.	Organoleptic Examination	Observation result
1.	Form	Small oval
2.	Color	Yellow
3.	Scent	Sweet orange special
4.	Flavor	Pretty Sweet
5.	Texture	Hard

3.2.2 pH Test

The pH test was carried out to determine the pH value of the preparations made. In this study, pH measurements were carried out using universal pH paper. pH measurement with universal pH is based on color observations. Any change in stable pH must be calibrated before use. This method was chosen because universal pH is easy to use, economical, and easy to obtain. The pH test results obtained show that the pH of the entire Hard Candy formula is 5. This is categorized as acidic because the pH is 7. An acidic pH inhibits the growth of spoilage microbes, giving hard candy a long shelf life. pH changes may be caused by citric acid. In addition to giving a sour taste, citric acid can also function as a preventer of sugar crystallization (Dhina et al., 2019). According to Lees and Jackson (1999), the pH value of good jelly candy ranges from 4 to 6. So the three formulas of Hard Candy sweet orange juice are according to Lees and Jackson's requirements because all three have a pH of 5 (Rakhmayanti, 2017). The results of the pH test can be seen in Table 5.

Table 5. pH Test Results

Formula	pH Observation Results	pH requirements
Formula 1	5	
Formula 2	5	4 – 6
Formula 3	5	

3.2.3 Weight Uniformity

The weight uniformity test is carried out to determine the uniformity of the preparation and ensure that each preparation is in the right and evenly distributed dosage. We weighed 10 hard candies and sweet orange juice and calculated the average weight. The uniformity test of dosage weights is carried out to determine the uniform weight of the preparations and this test is used as a production parameter, which is a routine measurement to obtain the desired dosage weight. The weight uniformity test is important to know the average weight of the preparation and its deviation from The results of the observation of the uniformity of the weight of hard candy with sucrose concentrations of 1.5 g, 2 g, and 3 g showed that all formulations met the requirements for weight uniformity, i.e., there was no single weight of sweet orange juice hard candy that exceeded the deviation weight of 5% and 10%. The sweet orange juice hard candy meets the requirements. The results of the hard candy weight uniformity test are presented in table 6.

Table 6. Hard Candy Weight Uniformity Test Results

Formula	Average Weight	Coefficient of Variation	Boundary Uniform Weight of Preparation (mg)	
	(mg) ± SD	(%)	Colom A	Colom B
F1	1947± 21,10	1,08%	2044 - 1850	2141–1753
F2	1943± 25,40	1,30%	2040 – 1846	2137- 1749
F3	1947 ± 21,70	1,11%	2042 - 1848	2139- 1751

3.2.4 Water Content

Based on the water content test carried out using an oven with a temperature of 100-105°C for 3-5 hours. Where the results obtained with three repetitions of F1 = 2.4%, FII results = 2.3% and FIII results = 1.7% have met the requirements of no more than 3.5% in accordance with the requirements of SNI 3547.1.2008). The results of the water content test can be seen in table 7.

Table 7. Test Results Moisture Content

Formula	Average %	Conditions	Information (SNI 3547.1.2008).
Formula 1	2,4 %		Qualify
Formula 2	2,3 %	Maks. 3,5 %	Qualify
Formula 3	1,7 %		Qualify

3.2.5 Ash Content

Based on the results obtained that the ash content obtained from the preparation of sweet orange juice hard candy with each formula three times repeated using a furnace at a temperature of 500°C is FI = 1.0%, F2 = 0.13% and F3 = 0, 8% compared to the quality requirements of the ash content, which is not

more than 2.0%, the ash content of hard candy has met the requirements according to SNI 2008. The results of the ash content test can be seen in table 8.

Table 8. Ash Content Test Results

Formula	Average %	Conditions	Description
Formula 1	1,0%		Qualify
Formula 2	0,13 %	Maks. 2.0 %	Qualify
Formula 3	0,8 %		Qualify

3.2.6 Hedonic Test

The hedonic test is the most widely used test to measure the level of preference for a product. In this test, respondents were asked for their personal responses about their likes or dislikes of the product presented using a hedonic scale. The results of the hedonic test carried out on respondents can be seen in table 9, 10 and 11.

Table 9. Test results of the Hedonic test

Formula	Like Respons			Flavor			Hard Textur		
	1	2	3	1	2	3	1	2	3
Formula 1	3	18	-	3	18	-	4	17	-
Formula 2	1	20	-	1	20		1	20	-
Formula 3	-	3	18	-	1	20	-	2	19

Information :

Like : 1 = Dislike

2 = Like

3 = Very Like

Taste : 1 = Not Sweet

2 = Sweet

3 = Very Sweet

Violence: 1 = Dislike

2 = Like

3 = Really like

Based on the table results from testing the taste preferences of Hard Candy with an average value (F1 = 1.83) (F2 = 1.94) and (F3 = 2.83). It can be seen that most of the respondents prefer the F3 preparation, because F3 has a sweeter and harder taste than other formulas

Table 10. Preferred Value Interval like Hard Candy

Formula	Preferred Value Interval	Least Value	Conclusion
F1	1,83 ± 1,86	1,83	TS
F2	1,94 ± 1,95	1,94	TS
F3	2,83 ± 2,86	2,83	S

Based on the table the results of the taste preference test with an average value (F1 = 1.6) (F2 = 1.73) and (F3 = 2.65). It can be seen that respondents prefer the texture of the F3 preparation, because this formula has a pretty good sweet

Table 11. Hard Candy Flavor Preferred Value Interval

Formula	Preferred Value Interval	Least Value	Conclusion
F1	1,6 ± 2,2	1,6	TM
F2	1,73 ± 2,17	1,73	TM
F3	2,65 ± 3,25	2,65	M

Based on the results of the test of liking responses with an average value (F1 = 1.64) (F2 = 1.58) and (F3 = 2.05). It can be seen that respondents prefer F3, because this formula has a sweeter taste than F1 and F2, hard texture and attractive shape (Table 12).Based on the results of the Hedonic test on hard candy, it shows that of the three formulas that have the highest value for the respondent's liking response is formula 3. The highest value for the assessment of the taste of hard candy is formula 3. In addition to its sweet and hard taste, the most preferred formula is the most preferred because it

Table 12. Interval of Hard Candy Texture/Hardness Response Values

Formula	Preferred Value Interval	Least value	Conclusion
F1	1,64 ± 1,96	1,64	TK
F2	1,58± 2,32	1,58	TK
F3	2,05 ± 3,75	2,05	K

IV. CONCLUSION

From the results of the study, it can be concluded that the formulation of hard candy preparations using sweet orange juice (Citrus sinensis (L.) Osbeck) can be formulated into hard candy preparations. The highest value for the assessment of the taste of hard candy is formula 3. In the results of the taste response test, formula 3, with a sucrose concentration of 3 g, is the most preferred formula of the three because, in addition to its sweet and hard taste.

REFERENCES

[1] Anggia, M., and Ruri, W. (2018). *Study of Physico-Chemical Properties of Hard Candy Made from Kahwa Leaves*. University Andalas

[2] Fonna, N., & Dalimunthe, G. I. (2022). Preparation of Gummy Candies Sari Broccoli (Brassica Oleracea L.) Formulation with Variations of Sucrose as Sweetener. ***Journal of Health and Medical Science***. 1(April):28-36.

[3] Depkes RI. (1979) I*ndonesian Pharmacopoeia. Edition I II.* Jakarta : Indonesian Ministry of Health.

[4] Fahrurroji., A., & Riza., H., (2020). C*haracteristics of Citrus Amblycarpa., Citrus Aurantifolia., and Citrus Sinensis (L.) Osbeck Fruit Ethanol Extracts.* Pontianak: University Tanjungpura. Pages 101- 104.

[5] Hutabarat, M. R., Rafita, Y., Gabena, I. D., & Minda, S. L., (2022). Formulation and Physical Quality Test for Hard Candy Sari Herba Pegagan (Centella asiatica (L.) Urban). ***Journal FARMASAINKES***. 2:59-66.

[6] Lockwood B.(2007). *Nutraceuticals. 2nd edition.* Chicago:Pharmaceutical Press

[7] Naibaho, B., and Mutiara F. (2021). *The Influence of Comparison of Sucrose and Glucose Syrup and Concentration of Sentosa (Cidema hirta L) on the Quality of Hard Candy*. Medan : HKBP University Nomensen. pp. 32-33.

[8] Pujiastuti, A., and Monica K. (2017). Hard Candy Tomato Juice (Licopersicon Esculentum Mill.) As Antioxidant Experience. Semarang : Academy Thersiana Pharmacy: pp. 9-11.

[9] Rakhmayanti, R. D., and Rini Tri H. (2017). *Hard Candy Formulation Secang Wood Extract*. Surakarta: Ministry of Health Poltekkes

[10] Zulaini, L., & Dalimunthe, G. I. (2022). Preparation of Gummy Candies Preparations Sari Sawi Pakcoy (Brassica Rapa L) With Variations of Sucrose as Sweetener. ***Journal of Health and Medical Science.*** 1(April):69-77.

[11] Waoni, B., and Rosmawati. (2019). Agribusiness System Study of Sweet Orange (Citrus sinensis) in order to improve Village Farmer Income Konda One District Konda South Konawe Regency. Pg 117-118