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# TRAINING ASSISTANCE IN MAKING NATA DE CITRULLUS LANATUS AS A HEALTHY DRINK FOR DIABETES MELLITUS

**Shobirin[1], Megawati[2], Fiorenza An Nafisah[3], Jinani Firdausiah[4], Wilni Wahda Ulwiyati[5]**

[1]Universitas Islam Zainul Hasan Genggong, birinsho489@gmail.com

[2]MA Model Zainul Hasan Genggong, memegha20@gmail.com

[3]MA Model Zainul Hasan Genggong, fiorenza21nafisah@gmail.com

[4]MA Model Zainul Hasan Genggong, jinanifirdausiah2003@gmail.com

[5]MA Model Zainul Hasan Genggong, wilniwahda2416@gmail.com

## ABSTRAK

*Sebagian besar minuman kemasan menggunakan bahan kimia dan pemanis buatan yang dikonsumsi dalam jangka waktu lama. Oleh karena itu, solusi untuk mengatasi hal tersebut adalah dengan menciptakan minuman sehat baru yang disebut nata de citrulus yang mengandung banyak vitamin dan mineral, rendah kalori, tinggi serat, dan tinggi air. Produk ini menggunakan daun stevia sebagai pemanis alami yang rendah gula. Tujuan dari penelitian ini adalah untuk mengetahui proporsi gizi antara nata decoco dan nata de citrulus, pengaruh nata de citrulus terhadap rasio gula sampel, dan prospek minuman nata de citrulus. Penelitian ini dianalisis dengan statistik deskriptif dan regresi linier, menunjukkan nata de citrulus lanatus lebih baik dikonsumsi untuk pasien diabetes militus. Hasil tes tekanan darah, sebelum dan sesudah mengkonsumsi nata de citrulus lanatus, mengalami perubahan. Sampel laki-laki (usia 32 tahun), sebelum mengkonsumsi nata de citrulus, memiliki tekanan darah 165/90 mmHg, dan setelah mengkonsumsi nata de citrulus lanatus selama seminggu, terjadi perubahan tekanan darah menjadi 130/80 mmHg. Uji analisis varians regresi linier (paired T-test), T hitung sebesar 2,64, T tabel satu arah sebesar 1,73 dan T tabel dua arah sebesar 2,09. Hasil uji hipotesis membuktikan bahwa setelah pemberian nata de Citrullus lannatus pada pasien diabetes melitus dapat menurunkan atau menstabilkan kadar gula sampel. Selain itu, produk nata de Citrullus memiliki harga jual yang lebih murah yaitu Rp6.000,00 per botol. Sehingga dapat meringankan konsumen dalam melakukan pembelian. Kesimpulannya, Nata de Citrullus lanatus mampu menurunkan dan menstabilkan kadar gula. Selain itu, nata ini memiliki kandungan serat, protein, dan kadar air yang tinggi dibandingkan dengan nata lainnya. Tidak hanya menstabilkan kadar gula tetapi juga menurunkan kadar gula.*

***Kata Kunci: Pendampingan Pelatihan, Diabetes Millitus, nata de Citrullus lanatus, nata decoco***

## ABSTRACT

*Most bevarages use chemical ingredients and much sythetic sweeteners that are consumed for a long period. To handle this situation, people have to start healthy lifestyle such as consuming nutritious food and drink. Therefore, a solution for this is to create a new healthy drink which is called nata de citrulus which has plenty of vitamins and minerals obtaining low calories, high fibers and high-water contents. This product consists of stevia leaves as natural sweeteners which has low sugar. The purpose of this research is to know the proportion of nutrition between nata decoco and nata de Citrullus lanatus, the effect of nata de Citrullus lanatus towards sugar ratio samples, and the prospect of nata de Citrullus lanatus drink. This research is analyzed by descriptive and linier regration statistics, showing nata de citrulus lanatus is better to consume for diabetes militus patients. The outcome of blood pressure tests, before and after consuming nata de citrulus lanatus, has changed. Male sample (aged 32 years), before consuming nata de citrulus, has blood pressure of 165/90 mmHg, and after consuming nata de citrulus lanatus throughout a week, there is changed in blood pressure at 130/80 mmHg. The linear regression analysis of variance test (paired T-test), the T count was at 2.64, the one-way T-table was at 1.73 and the two-way T-table was at 2.09. The results of hypothesis test proved that after giving nata de Citrullus lannatus to diabetes mellitus patients, it could reduce or stabilized the sugar levels of the samples. Moreover, the nata de Citrullus product has a cheaper selling price at 6000 IDR per bottle. So that, it can alleviate consumers in purchasing. In conclusion, Nata de Citrullus lanatus is able to reduce and stabilize the sugar level. In addition, it has the high amount in fibers, protein, and water level compared to others. Not only stabilizes the sugar level but it also declines the sugar level.*

***Keyword: Diabetes Millitus, Nata De Citrullus Lanatus, Nata Decoco***

## INTRODUCTION

Indonesia as a tropical country has great potential in farming one of them by cultivating watermelon fruit, but many of the Indonesian people only use watermelon flesh for consumption. In fact, watermelon peels also contain many benefits for health. Fermentation is the way to create the peels into a healthy drink. Nata is the result of fermentation done by bacteria. To produce a product nata then conducted practicum making nata in which acetobacter xylinum bacteria grown in the media with high sugar content such as fruit juice.

In some studies, it is proven that watermelon skin is rich in nutrients. The high nutritional content of watermelon skin also has some good benefits for health among them health in the heart, preventing various types of cancer, neutralizing high blood pressure. make a good night's sleep, facilitate blood circulation, lose weight, keep skin healthy and decrease sugar levels (Ahmad, 2016). Stevia leaves (Stevia rebaudiana) are low-sugar and calorie sweeteners.

The sweetness of stevia leaves comes from the content of glycosides consisting of 2 main components namely stevioside (3-10% of the dry weight of the leaves) and rebaudiosides (1-3% of the dry weight of the leaves). Stevia leaf powder has a sweetness level of 2.5 times that of sucrose (cane sugar). Therefore, the author has a breakthrough, namely the use of watermelon skin waste as a basic ingredient nata with the use of stevia leaf sugar.

## THEORY

Nata comes from Spanish which when translated into Latin becomes "natare" which means floating (Susanti, 2006). Nata is the result of fermentation of acetobacter xylinum bacteria grown in glucose-containing media. The largest content in nata is water 98% (Susanti, 2006). Nata is very well consumed especially by those who diet low in calories or diet high in fiber, high water content serves to facilitate the metabolic processes of the body. Nata can be classified as a health food or diet food because it contains cellulose (dietary fiber) which is beneficial in the digestive process of the human small intestine and the process of absorption of water in the colon (Elisabeth, 2006 and Hayati, 2003).

Acetobacter xylinum bacteria is one of the bacteria which exists in nata. It requires a liquid substrate containing nutrients to produce a nata (Elfina, 2009). In the

manufacture of nata, starter is an absolute requirement that must be had to produce a good nata. Starter is a pure breed of Acetobacter xylinum seeds. The growth of Acetobacter xylinum bacteria must achieve optimal density for the manufacturing process of nata, which is 1 x 109 cells / ml. Usually this density will be achieved in the growth of the culture in susbtrat for 48 hours (2 days) (Poni, 2008).

Watermelon waste peels has many benefits that can be processed into useful food products, one of which is the manufacture of watermelon peels nata. This fruit peel can be used as raw material for making nata as one of the option of healthy drink which is affordable.

Watermelon fruit peel is also rich in vitamins, minerals, enzymes, and chlorophyll. Vitamins found in watermelon peels include vitamin A, vitamin B2, vitamin B6, vitamin E, vitamin C. Vitamin E content, vitamin C, and protein in watermelon peels can be used to smooth the peels, hair, and make hair look shiny. While betakaroten and lycopene found on the peels of watermelon fruit can be used as antioxidants to tighten the face and prevent loss of the face. Watermelon peels contains amino acid citrulline as much as 2-20 mg / gr dry weight. Watermelon peels contains more fiber and potassium but contains less (Perkins and Collins, 2004).

**Table 1. Nutritional Content of Watermelon peels.**

| Substance Content | Sum |
|---|---|
| Water (g) | 94,00 |
| Protein (cal) | 1,60 |
| Fat (g) | 0,10 |
| Carbohydrates (g) | 3,20 |
| Calcium (mg) | 31,00 |
| Phosphorus (mg) | 11,00 |
| Potassium (mg) | 82,00 |
| Magnesium (mg) | 10 |
| Iron (g) | 0,50 |

*Source:* (Leung, dkk, 1972)

Making a healthy drink using watermelon peels is not as simple as some people think. It has to have a good taste so that people who try to have a better lifestyle can feel comfortable drinking this kind of drink. One of the ingredients which has to be included

is sweetener to add some taste. *Stevia* is the best choice because it is safe for diabetes and high blood pressure.

Stevia leaves *(Stevia rebaudiana)* are low-sugar and calorie sweeteners. The sweetness of stevia leaves comes from the content of glycosides consisting of 2 main components namely stevioside (3-10% of the dry weight of the leaves) and rebaudiosides (1-3% of the dry weight of the leaves). Stevia leaf powder has a sweetness level of 2.5 times that of sucrose (cane sugar) (Buchori, 2007). Stevia sugar has a sweetness level of 200-300 times that of sugar cane sweetener, low-calorie, relatively harmless because it does not contain carcinogenic substances and has been marketed in Japan, Taiwan and Korea (Inglet, G.E., 1981).

## METHOD

The form of assistance carried out is by empowering the community through training using the facilities that have been prepared. The method used is the ABCD (Asset Based Community Development) method, which is a community service empowerment approach aimed at understanding assets, potential and maximizing their utilization so that this potential can be used as a community empowerment strategy. This method is an approach model that emphasizes the inventory of existing assets in the village in the form of both natural and human resources that are considered to support community empowerment activities, especially community economic improvement.

This training assistance based on the research lasted for 4 months, starting from January to May 2021. The research was conducted in Mathematics and Science Laboratory MA MODEL ZAINUL HASAN GENGGONG and Nutrition Laboratory of Muhammadiyah University Malang. Based on the research that used descriptive analysis data processing and simple linear regression statitistic analysis. The data obtained from the test of nata content from watermelon peels which will be compared to kadungan nata from coconut water. The data obtained from the blood pressure measurement results and sugar levels of the trial samples were analyzed using a simple linear regression analysis or T Test to determine the effect of watermelon peels on blood pressure and blood sugar levels of test samples.

**Devinisi Concept :**

- Bound Variables: Sugar content results from diabetics
- Free Variables: Giving nata to diabetics

- Control Variable: Giving nata with the same volume and the same time

**Variable Operations:**

This research is to obtain data in a way; first make a supply of nata from watermelon peels. Watermelon peels cleaned the outer peels then the white peels is cut into small pieces and blended with a ratio of 500 gr of watermelon peels mixed with 500 ml of mineral water. Mix both ingredients then in a blender until smooth. The blender result of the main ingredients is then filtered using a filter cloth so that the pulp is not included when heated. The result of the filter of the main ingredient is watermelon peels juice heated on the stove until boiling. While waiting for the watermelon peels juice to boil, the researcher prepares a sterilized tray using 70% alcohol then covered with a sterile newspaper. Watermelon peels juice boiling poured with 100 gr of granulated sugar, 1 gr ZA Food Grade and 1 spoonful of glacial acetic acid 99%. The solution is simmered for 5 minutes, after boiling the solution is poured on a sterile tray that has been prepared and immediately covered with a newspaper. Watermelon peels juice solution in wait cold then pour 10 ml stater bacteria Acetobacter xylinum in 1000 ml. The result of mixing stater with watermelon peels juice solution waited 1 week to form Nata. Nata results soaked for 3 days to eliminate the smell of acid due to fermentation. The finished Nata is cut into pieces and boiled 3 times. Nata that has been boiled then boiled again and mixed with stevia leaf powder as a substitute for sugar. The stew in the bottle is 250 ml and labeled with a packaging sticker with the name "NATA de Citrulus MA MODEL ZAHA". Nata de citrulus was then tested for gynecology at the Nutrition Laboratory of Muhammadiyah University of Malang. Both finished natas are tested kesample trials by means; there are 20 test samples namely ustad / ustadzah MA MODEL ZAINUL HASAN GENGGONG aged 30 years and above. The reason for the sample was taken by trials over the age of 30 years is the age of susceptible to diabetes millitus disease. The test sample measured sugar and blood pressure levels before consuming Nata de Citrullus products, then the test samples were directed to consume Nata De Citrullus products for 7 consecutive days. On the 7th day, the test samples were conducted again measuring sugar levels and blood pressure. Results are recorded and analyzed.

**ANALYSIS & FINDING**

The results of the nata de citrullus content test showed that the water content contained was 91.46% with DM (Dry Matter) LAB 8.54%. The ash content in this product is 0.47%, then the content of protium in 100 gr Nata de Ctrillus lanatus is 22.88%. Coarse fat contained in this product is 0.23% and Coarse fiber in 100 grams Nata de Citrullus lanatus is 24.56%.

**Table 2. Nutritional Content Test Results Nata De Citrullus lanatus**

| Sample name | Water Level (105°C) | DM (Dry Matter) LAB | Ash Level | protein | Lipid | Fiber |
|---|---|---|---|---|---|---|
| Nata De *Citrullus lanatus* | 91,4% | 8,54% | 0,47% | 22,88 % | 0,23% | 24,56% |

*Source: Primary Data (2021)*

**Table 3. Blood Pressure Test Samples**

| No. | Sample trial | Age | Blood Pressure (mmHg) | |
|---|---|---|---|---|
| | | | Before consuming | After consuming |
| 1 | L | 32 | 121/80 | 120/80 |
| 2 | L | 39 | 120/70 | 121/80 |
| 3 | L | 48 | 125/90 | 120/80 |
| 4 | L | 45 | 120/80 | 120/80 |
| 5 | L | 45 | 123/80 | 121/80 |
| 6 | L | 44 | 125/90 | 120/80 |
| 7 | L | 51 | 135/85 | 120/80 |
| 8 | L | 33 | 120/80 | 123/80 |
| 9 | L | 37 | 120/75 | 118/80 |
| 10 | L | 32 | 165/90 | 130/80 |
| 11 | P | 33 | 125/85 | 121/80 |

| | | | | |
|---|---|---|---|---|
| 12 | P | 34 | 120/80 | 120/80 |
| 13 | P | 44 | 120/75 | 123/85 |
| 14 | P | 36 | 122/80 | 118/80 |
| 15 | P | 37 | 120/80 | 121/80 |
| 16 | P | 37 | 124/80 | 118/90 |
| 17 | P | 31 | 118/80 | 121/80 |
| 18 | P | 29 | 120/80 | 120/70 |
| 19 | P | 28 | 120/80 | 118/75 |
| 20 | P | 30 | 121/80 | 120/80 |

**Table 4. Sugar test samples**

| No. | Sample trial | Age | Sugar Content (mg/dl) | |
|---|---|---|---|---|
| | | | Before consuming | After consuming |
| 1 | L | 32 | 150 | 125 |
| 2 | L | 39 | 130 | 120 |
| 3 | L | 48 | 135 | 129 |
| 4 | L | 45 | 130 | 125 |
| 5 | L | 45 | 145 | 118 |
| 6 | L | 44 | 155 | 128 |
| 7 | L | 51 | 135 | 129 |
| 8 | L | 33 | 118 | 118 |
| 9 | L | 37 | 140 | 100 |
| 10 | L | 32 | 120 | 121 |
| 11 | P | 33 | 145 | 118 |
| 12 | P | 34 | 175 | 139 |
| 13 | P | 44 | 80 | 111 |
| 14 | P | 36 | 121 | 119 |
| 15 | P | 37 | 150 | 130 |
| 16 | P | 37 | 140 | 125 |
| 17 | P | 31 | 155 | 120 |

| | | | | |
|---|---|---|---|---|
| 18 | P | 29 | 70 | 98 |
| 19 | P | 28 | 98 | 105 |
| 20 | P | 30 | 140 | 120 |

*Source: Primary Data (2021)*

**Effect of Nata de *Citrullus lanatus* on Sugar Content**

Nata de *Ctrillus lanatus* adherence to sugar levels is measured using a simple linear regression analysis (T Test). The following are the results of the T Test analysis:

**Table 5. T test results**

| **-Test: Paired Two Sample for Means** | **SUGAR CONTENT** | |
|---|---|---|
| | **Before Consume** | **After Consume** |
| Mean | 131.6 | 119.9 |
| Variance | 645.9368421 | 103.4631579 |
| Observations | 20 | 20 |
| Pearson Correlation | 0.714848605 | |
| Hypothesized Mean Difference | 0.2 | |
| Df | 19 | |
| t Stat | 2.638975498 | |
| P(T<=t) one-tail | 0.00808945 | |
| t Critical one-tail | 1.729132812 | |
| P(T<=t) two-tail | 0.016178901 | |
| t Critical two-tail | 2.093024054 | |

*Sumber: Data primer (2021)*

The results of the linear regression variant analysis test (T-test paired) i.e. T count obtained is 2.64, one-way table T 1.73 and two-way table T 2.09. Therefore, it can be concluded that the initial hypothesis (H0) was rejected either tested both ways or in the direction. While Hypothetical Alternative (H1) is accepted, then there is a significant difference in sugar levels of people with diabetes mellitus before and after taking nata de Citrullus lanatus. From the hypothesis test it was proven that after giving nata de Citrullus lannatus to people with diabetes mellitus can lower or stabilize the sugar levels of the test sample. Here is an explanation of the hypothetical results;

a. The initial hypothesis (Ho) there was no significant difference in sugar levels of diabetic mellitus before and after taking nata de citrullus lanatus.
*b.* Alternative hypothesis (H1) there is a significant difference in sugar levels of people with diabetes mellitus before and after taking nata de *Citrullus lanatus.*

The results of this study are known that the content of nata de Citrullus lanatus is better. The advantage of nata de Citrillus lanatus is that it has a higher content of water, protein and coarse fiber makes nata de Citrillus lanatus has an advantage. Nata is a health eat that is rich in fiber, but low in calories. The results of fiber content test on nata de citrullus showed 24.56%, this indicates that the fiber needs in the body can be met. Daily adult fiber needs of 25 - 35 grams or 10 - 13 grams of fiber per consumption of 1,000 kcal of energy daily. In today's modern diet it is very difficult to meet the ideal amount of fiber needs every day. Even according to research Puslitbang Ministry of Health RI in 2001 found that the average consumption of indonesians only about 10 grams, or lack of fiber consumption 15-25 grams every day. Fiber deficiency can lead to some degenerative diseases, such as heart disease, stroke, high cholesterol, colon cancer, diabetes mellitus, hemorrhoids, indigestion, and even obesity (obesity).

The results of the measurement of sugar content of test samples showed that from 20 samples 80% sugar content after consuming nata de Citrulus lanatus for 7 consecutive days experienced stabilization, this is due to the influence of the secondary metabolite content of watermelon peels that is cytotrulin. Cytotrulin is required by the body to control blood sugar. People with diabetes mellitus basically occur disorders of tissue sensitivity to insulin, but this citrulline substance will react with the body's enzymes when consumed and trigger tissue sensitivity to insulin. (Prahasta, 2009). The results of blood pressure measurement after and before consumption showed a decrease in the sample. This is because the content of watermelon that can be an antihypertensive drug there are several namely potassium, beta carotene and potassium. In watermelon is very rich in water content, amino acids, L-arginine can maintain healthy blood pressure. The amino acid content of watermelon is able to improve arterial function and lower blood pressure in the aorta. Watermelon can lower high blood pressure because it contains potassium, vitamin C, carbohydrates, lycopene that serves to improve the work of the heart and citrulline that is able to encourage blood flow throughout the body (Rengga et al., 2020).

## CONCLUSION

This research shows that the content of *nata de citrullus lanatus* is better than *nata de coco* in the market, because nata de citrullus lanatus has higher in fiber, protein and water content by adding natural sweeteners which is stevia leaves. Creating drink from using these ingredients has shown significant changes. It is lowering the patients' blood pressure and blood sugar number. Therefore, this healthy drink is one of the best option for diabetes sufferer to treat the disease naturally.

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