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Comparison of Acceptability Test of Alternative Diabetic Snacks Obtain from Fiber and Protein Levels Pineapple Moringa Velva with Addition of Oatmeal

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ABSTRACT Diabetes is a major public health problem. For diabetics, diet shows great potential in controlling blood glucose levels by practicing regular eating patterns, either snacking between meals. Then, it's important to consume foods with a low glycemic index, meanwhile fulfill daily protein and fiber intake. This study aims to identify organoleptic tests, along with analysis of fiber and protein levels from the best organoleptic test results. This type of research was a pre-experimental design on 3 groups velva. Organoleptic tests were performed on 25 trained panelists using purposive sampling. Analysis technique uses kruskal wallis and mann whitney test. Also, laboratory tests for fiber and protein levels. The results of this study are diabetics have a daily calorie requirement of 1,500 kcal. Moreover, 150 kcal is required for one snack, 7.5 g of protein and 2.5 g for fiber is needed. In addition, based on the results of the organoleptic test, the best velva is formulation 3 (KN 03). The average value obtained from 25 panelists is 3.38. The fiber content contained in the formulation 3 velva is 3.19 g/100 g. Meanwhile, the protein content per 100 g is 8.68 g. The conclusion of this study is that diabetics can consume velva at a rate of 1 cup (100 g) with 151.9 kcal calories per snack consumption to meet 10% of their daily fiber and protein needs. The implication of this research is to find the best velva formulation with high fiber and protein levels for diabetics.

INDEX TERMS Diabetes, Moringa, Oatmeal, Pineapple, Velva.

I. INTRODUCTION

Diabetes is a chronic disease that occurs when the pancreas is no longer able to make insulin or when the body cannot properly use the insulin it produces[1]. Lack of insulin is a hallmark of diabetes mellitus, which is brought on by the process of pancreatic cell death, also called endocrine disorders[2]. Risk factors for diabetes mellitus can be caused by age, obesity, genetics or heredity, and lifestyle[3]. According to the ADA (2020), there are 4 groups of diabetes mellitus, as type 1, type 2, type of pregnancy (gestational), and other types[4].

The world is facing an epidemic of diabetes mellitus[5]. Indonesia has the 4th highest rate of diabetes prevalence in the world after India, China, and United States. WHO estimates diabetes population in Indonesia will continue to

increase significantly until in 2030 it will reach 21.3 million people[6]. Meanwhile, according to Riskesdas (2018), the prevalence of diabetes for the age group under 15 years is slightly lower than the prevalence of diabetes for those aged 15 year, which is 1.5%[7].

Due to rising rates of obesity, inactivity, and poor diet, type 2 diabetes is a significant public health issue. Diet intervention insinuatingly affect the state of type 2 diabetics' health[8]. Diet shows great prospect for regulating blood glucose levels. A new method to control hyperglycemia is to choose foods with a little glycemic index (GI) and glycemic load (GL). Glycemic control through a modified diet is a famed scheme for handling postprandial blood glucose, while restraining hazard of hyperglycemia. In addition, practicing regular eating

patterns such as slight and regular servings, and paying attention to snack times among mealtimes, will help to control blood sugar in diabetic clients[9].

Diabetes treatment can be done by regularly monitoring blood glucose levels. Self-monitoring of blood glucose is indicated for diabetes patients to improve outcomes and quality of life[10]. To keep blood glucose stable, it's very important to regulate the intake of carbohydrates that enter, especially from foods with a low glycemic index. Type 2 diabetes risk is lowered by a low glycemic index[11]. In addition to the glycemic index, it's also important to meet daily protein and fiber consumption. In type 2 diabetes, protein is an important modulator that has an influence on the process of gluconeogenesis (production of new glucose). The outcome shows that eating vegetable protein can decrease the threat of type 2 diabetes[12]. Meanwhile, fiber functions as an appetite controller because it is full-filling and water-soluble fiber can reduce blood glucose levels[13].

Havermut (*Avena sativa*), or better known as oatmeal, is a group of grains (cereals). Oatmeal is a continuation product of cereals that have undergone a drying process[14]. Oatmeal provides good macro and micro nutrients for the body[15]. Oats have a long history of use in food, and unlike wheat, they are typically eaten as whole grains. Oats contains more protein and also high in dietary fiber[16]. Instant oats have a protein content of 12.5 g/100 g and a fiber content of 10 g/100 g[17]. Oatmeal can be collaborated with food ingredients, for example: cookies[18], milk[19], biscuits and wafer[20].

Pineapples are perpetual herbaceous plant in tropical areas like Indonesia, China, Malaysia, South Africa, Costa Rica, Nigeria, Philippines, Thailand[21]. Pineapple can be processed into syrup, jam, abon[22], and pineapple dodol[23]. Pineapple have a protein content of 0.6 g/100 g and a fiber content of 0.6 g/100 g[24].

The family *moringaceae* includes the plant *moringa oleifera*. Moringa can grow in both tropical and subtropical countries. For its numerous uses, moringa has received extensive use (food, medicine, etc). Due to its use in treating conditions like herpes, Crohn's disease, cardiovascular problems, cancer, cramps, diabetes, sexually transmitted diseases, gout, and rheumatism, this plant has drawn a lot of attention[25]. Moringa can be useful as an anti-diabetic because it is rich in minerals, such as zinc. Moringa processing can be done in various ways, one of which is making a powder product. It's known that moringa powder contains 27.1 g/100 g protein and 19.2 g/100 g fiber. This is greater when compared to fresh leaf moringa, as thought 6.7 g/100 g protein and 0.9 g/100 g fiber[26]. The moringa plant can be used as a functional food item in the food industry. For example: cookies, wheat bread, and snacks[27].

Chia is reflected a pseudo-cereal, that commonly urbane and developed in numerous countries. Chia seeds have a protein content of 17 g/100 g and a fiber content of 34 g/100 g[28]. Chia contains water-soluble dietary fiber with the main aim of maintaining a healthy digestive system in

the human body[29]. Muñoz et al. (2012) suggested that chia seeds can gel together to form a mass when immersed in liquid[30]. It cause of mucilage and gum make the seeds so hydrophilic that they are able to absorb more liquid than their weight such as water, which can captivate 12 times their weight[31]. Therefore, chia can also improve the function by extending digestion times, the digestive system is strengthened and gut health is enhanced[32]. Chia seed applications in the food industry include: bread, pasta, biscuit, and cake[33]. Chia seeds can also be used in beverages, snacks, and other products[34]. The composition of chia seeds has made it a very valuable ingredient for the food industry. Chia can be used for the general population in good health as well as for patients with obesity, heart issues, diabetes, celiac disease, and gluten intolerance[35].

Similar to ice cream, velva is a frozen food item, but velva contains less fat. Velva has high levels of crude fiber and vitamins from fruits and vegetables. To produce velva with the necessary qualities, such as a smooth texture and hard-melted consistency, a stabilizer is required[36]. Sugar (sucrose) is the most common sweetener used in making velva. Sucrose has a fairly high level of sweetness, has no aftertaste, and can help produce a soft and creamy texture. However, sucrose has a weakness, as its high glycemic index, which can cause dental caries, ischemic heart disease, hypertension, obesity, metabolic syndrome, and diabetes mellitus. The use of sucrose in processed velva can be replaced with synthetic sweeteners. Artificial sweeteners are hundreds of times sweeter than sucrose, so using them can cut back on the amount of sugar used. Artificial sweeteners are useful for dietary therapy against diabetes, the data establish that Artificial sweeteners don't affect insulin levels because they are consumed much less frequently than sugar[37].

The science of sensory evaluation, also known as organoleptic evaluation, measures the texture, appearance, aroma, and flavor of food using human senses. Sensory testing is carried out by panelists who are considered the most sensitive because the ultimate aim is client satisfaction. The hedonic test is used to express the level of preference. The hedonicity of an odor depends on its character and affects how disturbing it is. Odor hedonic assessment was carried out immediately after smelling the odor[38]. Another important component of taste comes from trigeminal sense, or free nerve endings that give rise to for mouth and nose taste. This feeling is very important for spicy food, crunchy snacks, and carbonated drinks. Trained sensory panels can easily detect and monitor odor or taste. Furthermore, sensory analysis can lead to chemical testing methods. However, in general, such testing cannot completely replace the human sensory system[39].

This study has a purpose to determine the difference (research gap) between the acceptability test of this study and previous research so that this research has added value in the development of alternative snacks for diabetics. The expected benefits, such as: Benefits for the community: as a food product that is high in fiber and protein. in addition, so that the existence of pineapple moringa velva with the

addition of oatmeal is increasingly known and in demand by the public. Benefits for researchers: as a reference material and add insight to researchers about making pineapple moringa velva with the addition of oatmeal. Benefits for nutrition department institutions: this research is expected to be a reference and input for students of the department of nutrition, health polytechnic, ministry of health, surabaya, as well as material for further development.

This research contributes to updating and varying the processing and manufacture of alternative snacks for diabetics. The update was focused on comparing the acceptability of pineapple moringa velva with the addition of oatmeal under previous similar studies. In addition, this study was also conducted to find out fiber and protein levels in velva for alternative diabetics snacks.

II. METHODOLOGY

The study took place at the Department of Nutrition, Surabaya Health Polytechnic, starting from October 2021 – June 2022. This type of research uses pre-experimental design because this study provides treatment to the sample under study and aims to determine the effects that arise as a result of the treatment or experiment. In this study there are 3 groups of subjects to observe the results, where the treatment as the independent variable and the results as the dependent variable. The formulations given include pineapple: moringa powder: oatmeal, between: KN 01 = 150: 15: 50; KN 02 = 150 : 15 : 60; and KN 03 = 150 : 15 : 40.

Tests on the velva of Moringa pineapple with the addition of oatmeal were carried out through 2 types of tests, namely, subjective tests and objective tests. testing was carried out using a purposive sampling technique. Subjective test (organoleptic test) was conducted with a target of 25 trained panelists using a hedonic scale to analyze amount of preference based on color, aroma, texture, and taste. Then the data obtained remained evaluated using Kruskal Wallis and continued with the Mann Whitney Test to determine the difference between the three formulations of pineapple moringa velva with the addition of oatmeal. As for the objective test using the Gravimetric test and the Kjeldahl test in the laboratory by looking at the fiber and protein level in the velva of pineapple moringa with the addition of oatmeal.

A panelist in conducting an organoleptic test of pineapple moringa velva with addition of oatmeal must meet several requirements, to minimize the error rate in the research results. The following are the requirements to become a panelist, for example: female or male with age > 17 years and receiving nutrition education at least semester 3, in good health and don't have any sensory disturbances (vision or ENT (Ear, Nose, Throat) and others) who interfere with the organoleptic test process, have no allergies to the food ingredients being tested, and don't eat smelly and spicy food \pm 15 minutes before the test.

The ingredients used in making moringa pineapple velva with the addition of oatmeal are: instant oatmeal,

pineapple, moringa powder, fresh cow's milk, diabetes diet sugar, skim milk powder, chia seeds, cornstarch, salt, and carboxymethyl cellulose (CMC) stabilizer. In addition, the tools used are digital scales, blenders/mixers, basins, pans, knives, plates, spoons, and measuring cups, all accompanied by a cover.

The procedure for making velva begins with peeling and cutting the whole pineapple, then soaked in salt water for 2 minutes, and after that it's washed clean. Next, make pineapple puree by mixing pineapple and milk in a blender until smooth and cooking on low heat ($\pm 70^{\circ}\text{C}$) for ± 5 minutes. Then, 3 formulations were made with the addition of moringa powder, oatmeal, and other ingredients. The formulations are blended until creamy and put in the freezer for 2-3 hours. After that, mix each formulation and put it back in the freezer for 2-3 hours.

III. RESULT

The results of the research on the velva of pineapple moringa with the addition of oatmeal include the results of organoleptic tests, fiber level tests, and protein level tests. Velva is made from pineapple and moringa powder, and in processing it's formulated with oatmeal. In the processing of velva pineapple moringa with the addition of oatmeal, other ingredients with the same weight are used in each formulation. These ingredients include: diet sugar, powdered skim milk, chia, cornstarch, salt, and CMC. The difference in formulation is the addition of oatmeal. The aim is to determine the differences in the organoleptic characteristics of each velva. This can be observed in the Table 1.

TABLE 1

Characteristics of Pineapple Moringa Velva Formulation with Addition of Oatmeal

Indicator	Velva Formulation		
	KN 01	KN 02	KN 03
Color	Young green leaf	Green leaves a little pale	Dark green leaf
Aroma	Typical pineapple and a little moringa powder	Typical pineapple	Typical pineapple
Texture	Smooth and a little thick	Smooth and thick	Smooth and a little thick
Taste	Sweet, typical of pineapple and a little powdered moringa	Sweet, typical of pineapple and a little powdered moringa	Sweet, typical of pineapple and a little powdered moringa

Note. Assesment is Carried Out in Semi-Frozen Conditions

All formulations are similar in color, aroma, texture, and taste. The formulation 1 or KN 01 has a young green leaf color, formulation 2 or KN 02 has a slightly green leaves color, and formulation 3 or KN 03 has a dark green leaf color. As for the aroma of formulation 1 or KN 01, it

smells of typical pineapple and a little moringa powder. Then, for formulation 2 and formulation 3 or KN 02 and KN 03 it smells like typical pineapple. Meanwhile, formulation 2 or KN 02 has a smooth and thick texture. Besides, formulation 1 and formulation 3 have a smooth and a little thick texture. Finally, there is no difference in the taste indicators in all formulations. all have a sweet taste, typical of pineapple and a little powdered moringa.

Next, velva was given 3 different formulations of pineapple: moringa powder: oatmeal, within KN 01 = 150: 15: 50; KN 02 = 150 : 15 : 60; and KN 03 = 150: 15: 40. Then the panelists were asked to taste and give an assessment of the Velva formulation with predetermined indicators. The results of the 25 panelists' assessments can be seen in the Table 2.

TABLE 2

Organoleptic Test of Pineapple Moringa Velva Formulation with Addition of oatmeal

Indicator	Velva Formulation		
	KN 01	KN 02	KN 03
Color	3,24	3,56	3,60
Aroma	2,80	3,16	3,24
Texture	2,92	3,28	3,40
Taste	3,32	3,16	3,28
Average	3,07	3,29	3,38

Description of Assessment Criteria:

(1) Very disliking; (2) Dislike; (3) Neutral; (4) Likes; (5) Really like

Based on the table above, the formulation of pineapple moringa velva with the addition of oatmeal, it's known the results of preference by using an organoleptic test assessment (hedonic scale). In general, based on the color, aroma, texture and taste of pineapple moringa velva with the addition of oatmeal with 3 formulations, panelists preferred velva, that is KN 03 with an average score of 3.38. Based on the color indicators on pineapple moringa velva with the addition of oatmeal, the highest average score of the 3 formulations is in formulation 3 (KN 03) with a score of 3.6, while the lowest is formulation 1 (KN 01) with a score of 3.24. Based on the aroma indicator on pineapple moringa velva with the addition of oatmeal, the highest average score among the 3 formulations was in formulation 3 (KN 03) with a score of 3.24, while the lowest was formulation 1 (KN 01) with a score of 2.80. Based on the texture indicators on pineapple moringa velva with the addition of oatmeal, the highest average score among the 3 formulations is in formulation 3 (KN 03) with a score of 3.4, while the lowest is formulation 1 (KN 01) with a score of 2.92. Based on the taste indicators on pineapple moringa velva with the addition of oatmeal, the highest average score among the 3 formulations is in formulation 1 (KN 01) with a score of 3.32, while the lowest is formulation 2 (KN 02) with a score of 3.16. Then, The results of analysis fiber and protein levels in the velva of pineapple moringa with the addition of oatmeal per 100 grams can be seen in the table below. The outcomes of the fiber content analysis displayed the highest ranks were found in the formulation of velva pineapple moringa with the addition of oatmeal formulation 1 (KN 01) with

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formulation of pineapple: moringa powder: oatmeal (150: 15: 50), with an average fiber levels of 3.49%. Followed by formulation 3 (KN 03) of 3.19% fiber levels. And the lowest is formulation 2 (KN 02) by 2.16% fiber levels.

TABLE 3

Test of Fiber and Protein Levels on Formulation of Velva Pineapple Moringa with Addition of Oatmeal

Result	Velva Formulation		
	KN 01	KN 02	KN 03
Fiber Levels Test Per 100 g (%)	3,49%	2,16%	3,19%
Protein Levels Test Per 100 g (%)	8,51%	8,39%	8,68%

While the study results of protein levels displayed the highest ranks were found in the formulation of velva pineapple moringa with the addition of oatmeal formulation 3 (KN 03) with formulation of pineapple: moringa powder: oatmeal (150: 15: 40), with an average protein levels of 8.68%. Followed by formulation 1 (KN 01) of 8.51% protein levels. And the lowest is formulation 2 (KN 02) by 8.39% protein levels. Besides organoleptic tests, fiber and protein level tests were also carried out statistical tests using SPSS. Tests were carried out with kruskal wallis non-parametric test and mann whitney advanced test. kruskal wallis non-parametric test was conducted to see whether there was a difference in each sample of pineapple moringa velva with the addition of oatmeal. The results of the kruskal wallis test can be seen in the following table.

TABLE 4

Kruskal Wallis Test for Formulation of Velva Pineapple Moringa with Addition of Oatmeal for Each Sample

Sample Code	Kruskal Wallis Test Value
KN 01	0,014
KN 02	0,013
KN 03	0,014

Based on the table above, the kruskal wallis test obtained the results that in each sample, namely: KN 01, KN 02, and KN 03 had a P value of <0.05 which indicated that there were differences between the three formulations. Meanwhile, to see whether or not there are differences in the indicators of color, aroma, texture, and taste on the velva of pineapple moringa with the addition of oatmeal, it can be seen in the following table.

TABLE 5

Kruskal Wallis Test for Formulation of Velva Pineapple Moringa with Addition of Oatmeal Based on Indicators

Indicator	Kruskal Wallis Test Value
Color	0,072
Aroma	0,037
Texture	0,037
Taste	0,076

Based on the table above, the results of the kruskal wallis test on the aroma and texture indicators have a P value of <0.05, which means that are changes in aroma and texture in 3 formulations of pineapple moringa velva with the addition of oatmeal. While the outcomes of kruskal wallis test on the color and taste indicators have a P value >0.05,

which means that there is no difference in color and taste in the 3 formulations of pineapple moringa velva with the addition of oatmeal. To find out the difference in aroma and texture indicators, further tests need to be carried out, that is mann whitney test. Mann whitney testing was conducted to see whether the hypothesis was accepted or not. Outcomes of the mann whitney test can be seen in the table below.

TABLE 6

Mann Whitney Test for Formulation of Velva Pineapple Moringa with Addition of Oatmeal

Indicator	Mann Whitney Test Value		
	KN01 : KN02	KN02 : KN03	KN01 : KN03
Aroma	0,149	0,910	0,101
Texture	0,065	0,707	0,059

Based on the table above, the mann whitney test on aroma indicators in the three formulations, such as: formulation KN 01: KN 02, formulation KN 02: KN 03, and formulation KN 01: KN 03 has a P value >0.05 , which means H_1 is unaccepted and there is no difference in aroma in the formulation. On the other hand, the texture indicators of all formulations, such as: formulation KN 01 : KN 02, formulation KN 02 : KN 03, and formulation KN 01 : KN 03 have a P value > 0.05 , which means H_1 is unaccepted and there is no difference in texture at the formulation.

Besides that, There is the product of velva formulation. The figure below is a product made of pineapple moringa velva with the addition of oatmeal formulation. There are 3 formulations of pineapple: moringa: oatmeal, which is: formulation 1 (KN 01) of 150: 15: 50, formulation 2 (KN 02) of 150: 15: 60, and formulation 3 (KN 03) of 150: 15 : 40. The final weight of the product is 450 g, which will be used in organoleptic tests and laboratory tests for fiber and protein content.

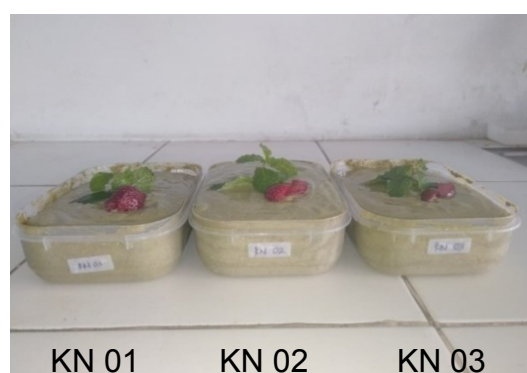


FIGURE 1. Velva Formulated Products

IV. DISCUSSION

A. CHARACTERISTICS AND ORGANOLEPTIC TESTS OF PINEAPPLE MORINGA VELVA FORMULATION WITH THE ADDITION OF OATMEAL

An organoleptic test is a hedonic test (preferred test) conducted by panelist on a total of 25 people. located in the

Laboratory of the Department of Nutrition, Surabaya Health Polytechnic. The panelists were asked to provide personal feedback about the level of preference for the pineapple moringa velva formulation product with the addition of oatmeal. The level of preference was measured by a hedonic scale (quality score according to the level of preference).

In this study, the hedonic test carried out on the sample included 4 indicators, such as texture, taste, aroma, and color of each formulation of pineapple moringa velva with the addition of oatmeal.

1. COLOR

The panelists' first sense that they can directly perceive is color. The color of food ingredients is typically used to determine their quality. The color that doesn't differ from the normal color of a assessment by the panelists. Assessment of the velva color of pineapple moringa with the addition of oatmeal is a subjective assessment based on the sense of sight. The color characteristics of the velva pineapple moringa formulation with the addition of oatmeal have slight differences, such as: the results of formulation 1 (KN 01) have a young green leaf color; formulation 2 (KN 02) has a slightly pale green leaf color; and formulation 3 (KN 03) has a dark green leaf color.

Meanwhile, The results of the organoleptic test revealed the color indicator's highest average value, such as formulation 3 (KN 03) with a value of 3.60 followed by formulation 2 (KN 02) with a value of 3.56 and the lowest value was formulation 1 (KN 01) with a value of 3.24.

Based on these results, there are color differences and slight differences in values. These results can be said to have no significant differences. According to Iskandar's research which states that the large proportion of added moringa powder to ice cream can affect the rank of preference for an ice cream's color to a lower level. The more addition of moringa powder, the darker the color, making it less attractive[40]. That research is not in line with this study, based on field data it was found that panelists tend to like dark colors so that velva with the addition of 40 grams of oatmeal (KN 03) is utmost preferred.

2. AROMA

Aroma is an odor that results from chemical stimuli that the olfactory nerves in the nasal cavity detect[41]. The characteristics of aroma in the velva pineapple moringa formulation with the addition of oatmeal have slight differences, such as formulation 1 (KN 01) have a distinctive aroma like pineapple and a little powdered moringa, formulation 2 (KN 02) and formulation 3 (KN 03) have a typical pineapple aroma.

Meanwhile, The organoleptic test's outcomes revealed that the highest average value on the aroma indicator was the result of formulation 3 (KN 03) with a value of 3.24, followed by formulation 2 (KN 02) with a value of 3.16 and the lowest value was formulation 1 (KN 01) with a value of 2.80.

Based on these results, there are differences in aroma and slight differences in values, these results can be said to have no significant differences. Sholihah's research states that the more use of pineapple pulp in the dough, the resulting velva will smell like pineapple. This is because pineapple has a substance that gives off a distinctive aroma[42]. That is in line with this study, the distinctive aroma of pineapple in the KN 03 formulation was the most preferred by the panelists. Pineapple aroma is stronger because the addition of oatmeal is only 40 grams.

3. TEXTURE

Texture is complex and related to the observable structure of the material. The texture characteristics of the velva pineapple moringa formulation with the addition of oatmeal have slight differences, such as formulation 1 (KN 01) and formulation 3 (KN 03) have a smooth and a little thick texture, and formulation 2 (KN 02) has a smooth and thick texture.

Meanwhile, The organoleptic test's outcomes revealed that the highest average value was the result of formulation 3 (KN 03) with a value of 3.40 followed by formulation 2 (KN 02) with a value of 3.28 and the lowest value was formulation 1 (KN 01) with a value of 2.92. Based on these results, there is a difference in texture and a slight difference in value, this result can be said that there is no significant difference. According to Suprayatmi's research, CMC concentration didn't significantly affect the texture quality of sweet corn velva, which means that the texture quality of the velva is soft to very soft[43]. That is in line with this study, which velva have a smooth and a little thick texture that the panelists' most preferred is formulation KN 03 with the addition of 40 grams of oatmeal.

4. TASTE

Taste is the level of preference on velva products that is noticed using the tastebuds. The taste of a food is one of the factors that determine consumer acceptance of a product. The taste characteristics of the velva pineapple moringa formulation with the addition of oatmeal didn't have any differences, such as formulation 1 (KN 01), formulation 2 (KN 02), and formulation 3 (KN 03) had a sweet taste, typical of pineapple and slightly moringa powder. Meanwhile, The organoleptic test's outcomes revealed that the highest average value was the result of formulation 1 (KN 01) with a value of 3.32 followed by formulation 3 (KN 03) with a value of 3.28 and the lowest value was formulation 2 (KN 02) with a value of 3.16.

Based on these results there is no difference in taste, there is only a slight difference in value, this result can be said that there is no significant difference. Iskandar's research stated that there was no difference in taste acceptance in ice cream formulations with the addition of moringa leaves[40]. This fits with the research, where the most preferred velva formulation of KN 01 has a sweet taste typical of pineapple and a little moringa powder, so that the taste of moringa can still be accepted by the panelists.

B. FIBER LEVEL TEST OF PINEAPPLE MORINGA VELVA WITH THE ADDITION OF OATMEAL

Velva pineapple moringa as a food product that is rich in fiber content, the addition of oatmeal to velva products is expected to increase the nutritional value of fiber in each formulation. So, that it can create new functional food products for diabetics with high-fiber advantages.

Fiber foods are needed by the body for their daily lives, one of which is to help reduce blood glucose levels. Fiber works by making food thicker or viscous (in the form of a gel) so that it inhibits the stomach digestion process and slows down stomach emptying. This slow digestion causes reduced absorption of nutrients, including glucose. As a result, blood sugar levels remain stable.

In testing the fiber level using the gravimetric method, the outcome of the fiber level analysis revealed the highest content was found in the velva with formulation 1 (KN 01) with a formulation of 150: 15: 50, which was 3.49%, followed by formulation 3 (KN 03) of 3.19 % and formulation 2 (KN 02) of 2.16%.

Considering the outcomes of the fiber level test that was performed, it shows that the formulation with the highest content of oatmeal is the KN 02, with a ratio of pineapple: moringa powder: oatmeal = 150: 15: 60, has a lower fiber level as 2.16%. Compared to the fiber level of the other formulation such as KN 01 as much as 3.49% and KN 03 as much as 3.19%. This could be due to a technical error. There are several factors that can affect the occurrence of errors in the analysis of dietary fiber. These errors can be caused by reagent and enzyme reactions, inappropriate selection of methods, damage to the equipment used, and analysis errors.

The American Dietetic Association (2020) recommends adequate fiber for diabetics, which is ± 25 g/day. The dietary requirements for people with diabetes mellitus are 3 main meals and 3 snacks. Giving snacks can be given as much as 10% of daily needs = $10\% \times 25 \text{ g} = 2.5 \text{ g}$. So the fiber requirement per snack portion ($\pm 10\%$ of the requirement) is 2.25 – 2.75 g. Consumption of 1 cup (100 g) of formulation 1 (KN 01) and Formulation 3 (KN 03) velva pineapple moringa with the addition of oatmeal can meet the needs of diabetic snack fiber because it contains 2.5 g fiber. While in formulation 2 (KN 02) it is necessary to consume 1 cup (125 g) in order to meet the needs of 10% of fiber in diabetic snacks.

According to Mas'ud's research, the fiber content in one slice of brownie with oatmeal flour shows that the highest fiber content of formulation is 1,277 grams with the addition of 60 grams of oatmeal flour with a weight of 25.7 grams/slice[44]. But, one slice of brownie is not enough fiber consumption, eating 2 slices of brownies is enough to meet the fiber requirement per snack (> 2.5 grams). On the other hand, velva has a better need for fiber in one portion, which is as much as 3.49% with an additional 60 grams of oatmeal. which the fiber content is three times more than 1 slice of brownies.

C. PROTEIN LEVEL TEST OF PINEAPPLE MORINGA VELVA WITH THE ADDITION OF OATMEAL

Pineapple moringa velva is a food product that is rich in protein content. With the addition of oatmeal to velva products, it's expected to increase the nutritional value of protein in each formulation. So, that it can create new functional food products for diabetics with high protein advantages. In type 2 diabetes, protein has an influence on the process of gluconeogenesis (production of new glucose). In controlled diabetes, protein intake doesn't increase blood glucose levels but can stimulate insulin release to maintain blood glucose levels.

In testing protein levels using the Kjeldahl technique, the AOAC 2016 method, The outcomes revealed that the velva had the highest levels is formulation 3 (KN 03) with the formulation of 150: 15: 40, which was 8.68%, followed by formulation 1 (KN 01) of 8.51% and formulation 2 (KN 02) of 8.39%. The highest protein content was found in the formulation with the addition of oatmeal, which was 40 g.

Considering the outcomes of the performed protein level test, it shows that the formulation with the most oatmeal, KN 02 with a ratio of pineapple: moringa powder: oatmeal = 150: 15: 60 has a lower protein content of 8.39% compared to other formulations with protein level, such as KN 01 of 8.51% and KN 03 of 8.68%. This could be due to a technical error. The validity of testing the protein level of the sample can be influenced by the fiber level. Samples that have a dietary fiber level less than 10% will produce ash and protein level data that have a large diversity. This is evident from the outcomes of the fiber level test, which has a value of between 2.16% and 3.49%, so the technical error could be a related factor.

The American Dietetic Association (2020) recommends adequate protein for diabetes, which is 15-20% or 1-1.5 g/BW per day. This means that if a patient with diabetes has a body weight of 50 kg, a protein adequacy of 50-75 g/day is required. The dietary requirements for people with diabetes mellitus are 3 main meals and 3 snacks. Giving snacks can be given as much as 10% of daily needs = 10% x 75 g = 7.5 g. So the protein requirement per snack portion (10% of the requirement) is 6.75-8.25 g, which corresponds to 1 cup (100 g) of formulations 1 (KN 01), 2 (KN 02), and 3 (KN 03).) With the addition of oatmeal, pineapple moringa velva can meet the needs of 10% protein in diabetic snacks.

Based on Iskandar's research, it is known that the protein content increases when the ice cream's inclusion of moringa flour. It can be seen that the highest protein contained in ice cream is conduct with 30 grams of moringa flour accumulation, which is 6.24%[40]. This is in line with this research, where the use of high-protein ingredients, such as: moringa powder, oatmeal, and chia seed can increase protein to be higher. it is known that the highest protein content of velva is 8.68% which is obtained in the formulation with 40 grams of oatmeal adding.

The limitation of this study is there are 25 trained panelists who have unequal levels of nutritional knowledge, two panelists (third semester) and other twenty-three

panelists (fifth semester). As for the research method, it isn't optimal because there is no control group in velva so that the levels of protein and fiber cannot be compared. Then, in laboratory tests for fiber and protein levels has the possibility of technical errors, because the nutritional value doesn't match the amount of ingredients added. The most addition of oatmeal (60 grams) has less nutritional value than the addition of 40 grams of oatmeal.

IV. CONCLUSION

This study purpose to identify organoleptic tests, along with analysis of fiber and protein content from the best organoleptic test results of pineapple moringa velva with addition of oatmeal. According to organoleptic test, the panelists preferred the formulation 3 (KN 03) with pineapple: moringa powder: oatmeal = 150 : 15 : 40 with a fiber content of 3.19% and a protein content of 8.68%. These results are sufficient to meet 10% of fiber and protein needs per snack consumption, with sufficient calories of 151.9 kcal. As for suggestions that can be conveyed to consumers, diabetics can eat 1 cup (100 g) of pineapple moringa velva with addition of oatmeal per snack to satisfy the requirements for daily protein and fiber. The results of this study can be used as a variety of food products that are high in fiber and protein for people with diabetes. For researchers it can be used as reference material in alternative snacks for people with diabetes as well as for the development of further research with better methods and results. Then, a suggestion for further research is that researchers can conduct experiments using oat bran formulations, so that it can be seen whether fiber and protein levels of velva can increase and better than using instant oats in this study.

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