Avocado seed waste utilization into biscuits as diabetes mellitus patients' alternative foods

Ervianingsih1, Hurria1, C astari1, M Mursyid1 and A R Kadir2
1Departement of pharmacy, Faculty of Health Agriculture and Marine Science, Universitas Muhammadiyah Palopo, South Sulawesi, Indonesia
2Faculty of Economics and Business, Hasanuddin University, Makassar

Email: ervianingsih@umpalopo.ac.id

Abstract. Avocado seeds contain flavonoid compounds that can regulate blood sugar in people with diabetes by reducing glucose absorption and increasing insulin secretion. The purpose of this study is to use avocado seed waste into biscuits as an alternative food for people with diabetes. This research used an experimental method by using avocado seed flour active ingredients 0.98 g Kg / BW that met SNI standards. From the test results, the test is 3.93, the ash content test is 0.97, the fat content test is 21.3, the protein content test is 3.81, the carbohydrate content test is 70.16, and the calorie test is 485.49. these biscuits are made based on SNI standards.

1. Introduction
Diabetes mellitus or diabetes is a health disorder in the form of a collection of symptoms that arise in a person caused by an increase in blood sugar levels due to a shortage of insulin or insulin resistance and metabolic disorders in general [1].

Treatment of diabetes mellitus can be done medically with modern medicines and injections. However, due to the high cost of treating this medical method is sometimes difficult to do, and treatment using synthetic drugs continuously can have dangerous side effects for the body. Diabetes mellitus can also be overcome with natural medicine by using medicinal plants [2].

The principle of managing diabetes is to eat wisely. All patients should always start a diet with calorie restriction, especially in patients who are overweight. Food needs to be chosen carefully concerning the limits of total fat, trans fat, and saturated fat, achieving normalization of blood glucose and lipid levels [3].

In general, people with diabetes should avoid foods containing sugar, one type of food that should be avoided by people with diabetes mellitus, namely snacks such as biscuits. Nevertheless, the biscuits circulating in the market contain high sugar levels, so we need safe alternative biscuits. The development of alternative biscuits can utilize traditional medicinal plants. One of them is avocado seeds. The content of flavonoids, which are natural compounds of plants and found in avocado seeds, functions as an antidiabetic. Flavonoids are substances that can reduce blood glucose levels in people with diabetes by reducing glucose absorption or increasing insulin secretion, besides that flavonoids
can stimulate glucose absorption in peripheral tissues and regulate the work of enzymes involved in carbohydrate metabolic pathways [4].

Previous research stated that avocado seed extract at a dose of 1200 mg/kg body weight could reduce blood glucose levels in white male rats with an average reduction of 134.8 mg/dL [5]. 70% ethanol extract of avocado seeds also has an antioxidant effect with an IC50 value of 31.5 ppm. Phenolic compounds in avocado seeds are more significant than in avocado fruit or leaves [6]. Avocado seeds are proven to reduce blood glucose levels by 40% in mice at a dose of 0.98 g/kg BW. Avocado seed ethanol extract (Persea Americana Mill.) Can reduce blood glucose levels in white male rats (Rattus Novergicus) hypercholesterolemia-diabetes model. Based on the explanation above, the researchers intend to develop biscuit products from avocado seeds as an alternative food for people with diabetes.

2. Research Methods

2.1 Creation

Prepare tools and ingredients. Mixed with all ingredients (eggs, low-calorie sugar, avocado seed flour, eggs, and flour) until homogeneous. Then put in print and bake in the oven to a temperature of 40-60°C until cooked.

2.2 Testing

2.2.1 Water level

Two mashed samples were dried in an oven at 105°C for 3 hours. Then cooled in a desiccator and weighed. This treatment is repeated until a constant weight is achieved. Weight reduction is the amount of water in the material.

\[
\% \text{water level} = \frac{\text{initial weight} - \text{final weight}}{\text{initial weight}} \times 100\%
\]

2.2.2 Ash Levels

The sample was mashed 2 g in a porcelain cup and heated on a hot plate. Porcelain and charcoal that have been charcoal are put into the furnace for 3 hours at 600°C until the ash is white, then weighed.

\[
\% \text{ash level} = \frac{\text{container weight without sample} - \text{container weight with sample}}{\text{sample weight}} + 100\%
\]

2.2.3 Fat level

Samples mashed and weighed 3 g and put in a thimble. Install the extraction tube in the distillation apparatus using petroleum ether as a fat solvent for 4 hours using Soxhlet. The residue in the test tube stirred then the extraction is continued again for 2 hours using the same solvent. The solvent containing fat extract was evaporated on a water bath until it was slightly concentrated. It dried in an oven at 105°C until the residual weight was constant and cooled in a desiccator for 15 minutes. The residual weight is fat.

2.2.4 Protein levels

Weighed as much as 0.5 g of a refined sample and put it in a Kjeldahl flask, add 2 g of selenium and 25 ml of concentrated H2SO4. Put the Kjeldahl flask into the nitrogen digestion apparatus, allow it to boil,
and the solution becomes clear greenish (about 45 minutes). Allow cooling, then dilute and put in a 100 ml measuring flask. Pipette 5 ml of Kjedahl flask sample solution for long, add 30 ml of 30% NaOH and a few drops of phenolphthalein. For about 5 minutes, flute as a container using 10 ml of 2% boric acid, which has been mixed with the indicator. Rinse the cooling and end it with distilled water. Titrate with a 0.01 HCL solution. Perform the blank according to the example.

\[
\text{Protein(\%)} = \frac{(v_1 - v_2) \times N \times 0.014 \times f_k \times f_p}{W} \times 100
\]

note:
W = Trailer weight (g)
V1 = 0.01 N HCL volume used for sample titration
V2 = 0.01 N HCL volume used for blank titration
N = HCL normality
Fk = conversion factor for protein from food in general 96.25); milk and processed products (6.37); wheat flour (5.70); and peanut butter (5.46).

2.2.5. Carbohydrate Levels
Determination of carbohydrate content is done by rough calculation or carbohydrate by difference, which is the determination of carbohydrate levels by using calculations instead of analysis.
Carbohydrate content (\%) = 100\% \cdot \% (\text{water + ash + fat + protein})
Calorie Value
Calorie value per 100 g. Example = (9 \times \% \text{ fat} + 4 \times \% \text{ protein} + 4 \times \text{carbohydrates}) \text{ Cal}

3. Results and Research
To find out the biscuit formula fulfilling the biscuit preparation requirements following SNI standards as diabetics' foods. Tests were conducted, which included tests of water content, ash content, fat content, protein content, determination of carbohydrate value, and calorific value.

| No | Testing (Content/Level) | Result (%) |
|----|-------------------------|------------|
| 1  | Water                   | 3.93       |
| 2  | Ash                     | 0.97       |
| 3  | Fat                     | 21.3       |
| 4  | Protein                 | 3.81       |
| 5  | Carbohydrate            | 70.16      |
| 6  | Calories                | 485.49     |

3.1. Water content
Water content is one of the most important characteristics of food because water can affect the appearance, texture, and taste of food, which determines the freshness and durability of the food. Based on the three results of water content testing that has been done, only formula three that meets the SNI requirements is equal to a maximum of 5\%. Water content tends to decrease with increasing sugar concentration. It is related to the water activity of the material, which is also reduced due to adding sugar in high concentrations.
3.2. Ash content
The determination of ash content is closely related to mineral content contained in food, purity, and cleanliness of a material produced. Food is burned at a high temperature and turned to ash. From the test results obtained by ash content obtained in biscuits meets the SNI requirements which are a maximum of 1.5

3.3. Fat content
Fat is an essential component in making biscuits because it functions as an ingredient to taste savory, add flavor, and produce a crispy product texture. Fat content was tested using the Soxhlet method. According to SNI, the fat content contained in biscuits is at least 9%. From the testing conducted, avocado seed flour biscuits showed results under SNI quality standards.

3.4. Protein content
Protein is an essential component in making biscuits because it serves as an ingredient to cause savory flavors, add aroma, and produce a crispy product texture. According to SNI, the fat content contained in biscuits is at least 6.5%. The results are following SNI standards from the tests that have been carried out on all samples of avocado seed flour biscuits.

3.5. Carbohydrate Content
Carbohydrates are the fundamental source of calories for humans. Carbohydrates are useful for preventing excessive body protein breakdown, mineral loss, and helps metabolize fats and proteins. Determination of carbohydrate content is done by carbohydrate by differences, i.e., determination of carbohydrate content using calculations, not analysis. From the calculation of the value of carbohydrates is 70.16%, and according to SNI, the value of carbohydrates contained in biscuits is at least 70%, so it can be said that the carbohydrate value meets SNI quality standards.

3.6. Calories
Humans need the energy to sustain life, support growth, and carry out physical activity. In testing, the calorie value obtained was 485.49 calories. According to SNI, the caloric value in biscuits is at least 400 calories, so that it meets SNI standards.

The test result showed that the avocado seed flour biscuit formula meets SNI standards. Besides this biscuit formula can be used for people with diabetes because according to yuheldi cendra, (2012) in the medical selective book capita Edition III Volume 1 that the dietary needs of diabetics in adult humans with the normal body weight of 1700 calories for a mild activity to protein need a maximum of 65 grams, a maximum of 69 grams of fat, and a maximum of 260 grams of carbohydrates. As for thin patients, adolescents, and complications with a maximum need of 2100 calories for mild to moderate activity with a maximum protein requirement of 80 grams, a maximum of 55 grams of fat, and a maximum of 355 grams of carbohydrates. This energy source can be obtained from daily food intake, provided it does not contain pure sugar. At the same time, the results of testing on avocado seed flour biscuits have a calorie value of 485.49 calories with 21.03 grams of fat, 3.81 grams of protein, and 7.36 grams of carbohydrates.

4. Conclusion
In the form of flour, avocado seeds can be formulated into biscuits as an alternative food for people with diabetes mellitus.
References

[1] Isniati I 2007 Hubungan Tingkat Pengetahuan Penderita Diabetes Miltus dengan Keterkendalian Gula Darah di Poliklinik RS Perjan Dr. M. Djamil Padang Tahun 2003 J. Kesehat. Masy. Andalas 1 73–7

[2] Wijayakusuma H 2004 Bebas Diabetes Mellitus ala Hembing (Jakarta: Puspa Swara)

[3] Tjay T H and Rahardja K 2007 Obat-obat penting: khasiat, penggunaan dan efek-efek sampingnya (Elex Media Komputindo)

[4] Brahmachari G 2011 Bio-flavonoids with promising antidiabetic potentials: A critical survey Res. signpost 661 187–212

[5] Oktaria Y E 2013 Uji Aktivitas Antidiabetes Ekstrak Etanol Biji Alpukat (Persea americana Mill.) Terhadap Tikus Galur Wistar Yang Diinduksi Aloksan

[6] Oktaria Y E, Azizah T and Sutrisna E M 2015 The hypoglicemic effect of avocado seed (persea Americana mill) and histopathologic profile J. pharm Bio Sci 6 136–41