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Research Article

Cookies Formula for Oat (*Avena sativa* L.) and Plainnates (*Musa Paradisiaca* L.) as Alternative Food Ingredients

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ABSTRACT

Cookies in circulation have a high amount of vegetable or animal fat (20-30% based on flour weight) and fiber content low Because material main *cookies* Which There is in market that is flour flour, necessary innovation for develop product *cookies that are low in calories and have high fiber content*, Wrong the only one with use material main *oats* (*Avena sativa* L.*)*. The aim of this research is to analyze whether OAT (*Avena sativa* L. *)* and Raja banana *(Musa Paradisiaca* L.) can be formulated as cookies that have low calorie content and sensory evaluation of cookies using color, taste, aroma and texture parameters. This research is true experimental research carried out in the laboratory. Cookies made with the composition of oats and plantain are F1 (120gr: 80gr), F2 (150gr: 50gr), F3 (180gr: 20gr). Based on the research results obtained, it is stated that the ash content, water content, carbohydrate content, protein content, fat content and total energy (calories) are respectively as follows: In the control (0.74%; 3.38%; 92 .2%; 2.62%; 4.8% and 422kcal), F1 (3.50%; 4.70%; 78.97%; 5.25%; 12.20% and 446 kcal), F2 (3.42%; 4.24%; 70.99; 8.75%; 18.00; .96% and 481%). The results of the sensory test stated the p value: 0.000, which means there is a difference. Oats (*Avena sativa* L. *)* and plantains *(Musa Paradisiaca* L.) can be formulated into low-calorie cookies. Based on the sensory evaluation, it was stated that there were differences in the panelists' preferences for the color, taste, aroma and texture of oat and plantain cookies. In order to carry out further analysis for the application of cookies to mice as a low-calorie diet food.

Keywords: Cookies, Oats, King Banana, Alternative Food.

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INTRODUCTION

High fat intake has a negative effect on human health and leads to the development of several chronic diseases-obesity, diabetes, high cholesterol, high blood pressure, heart disease and cancer. A dietary alternative to reduce the fat content in food products is the use of fat substitutes [1,2] . According to *the World Health Organization* (WHO) a healthy diet is regulated pattern Eat so that spared from malnutrition And Also disease No infectious including obesity, diabetes, strokes And cancer. However Now in operate diet Healthy always fail because Lots temptation food in around We what is visible delicious, but less Healthy Which make it on a diet No controlled [3] . Nutritious and low calorie food high in fiber, one of which is *oats* which can be used as an internal food program diet Healthy Which can lower heavy body. Higher consumption of dietary fiber or proportional inclusion of fiber in the diet is associated with the prevention of diseases such as obesity, diabetes, inflammatory bowel disease, colorectal and breast cancer [4,5] .

Low calorie foods are foods that have a low fat content, which are usually used when carrying out a healthy diet program, because foods with a low calorie content can carry out the process of a healthy diet program in losing weight. Eating low-calorie foods is not only for diet planning, but also for a healthy lifestyle [6] . The rise of the functional food market has driven the development of oat-based foods over the last 30 years [7] . Increasing consumer demand for healthy foods and value-added drinks, as well as scientific discoveries about the nutritional composition of oats are driving the promotion of oat-based foods. Ancient food and cereal-based concepts can be applied to develop new nutrient-enriched oat-based fermented foods and beverages as healthy, quick, and convenient beverages and meal replacements [8] .

Oats (Avena sativa) are well known for their nutritional value and health benefits [8] . Oats or wheat belong to the Poaceae family and the Avena genus which consists of 70 species, but only a few are cultivated. The most widely cultivated oats (Avena Sativa) or wheat are (A Orientalis, A sativa, A byzantina, A dif fusa and others) [9] . Oats are considered one of the most important crops in the world. Oats have the highest protein content compared to other cereal grains. Oats are an excellent food because of their ability to provide sufficient amounts of essential amino acids in the body. Apart from containing balanced protein, oats also contain vitamins B and E, high levels of dietary fiber, unsaturated fatty acids such as polyphenols, sterols, beta glucans and phenolics [10,11] . Therefore, oats can be used as a functional food/cereal [12] which has very important bioactive compounds and mineral properties [13] .

Cookies are an example of a bakery product that is popular with most people, regardless of social conditions [14] . Cookies are a popular product among various consumer groups. Cookies in circulation have a high amount of vegetable or animal fat (20-30% based on flour weight) and fiber content low Because material main *cookies* Which There is in market that is flour flour [15] . So from That need

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innovation For develop product *cookies are low in calories and have high fiber content* , Wrong the only one with use material main *oats* (*Avena sativa* L. *)* which have high fiber content and low calories and additional ingredients plantains [6] .

Previous research conducted by [10] showed that the addition of oats and cinnamon to cookies improved sensory evaluation because they were liked by many panelists and reduced microbial growth. Research [13] . The addition of wheat husks to cookies increases the fiber and ash content, and decreases the available carbohydrates in the cookies. The color of enriched cookies changed significantly and the total color difference between control and enriched cookies ranged from 4.76 to 11.00. Micronized oat hulls at a level of 20% had little effect on the sensory acceptability of cookies. Plantain is a traditionally known dessert banana that grows widely in Indonesia, scientifically known as *Musa Paradisiaca L* and the *Musa paradisiaca species* is the main staple food for millions of people in most parts of Indonesia. This banana content is known to improve consumer health because of its dietary fiber content (14.5%) and resistant starch (17.5%), vitamin C, vitamin A and minerals such as potassium, calcium, phosphorus, magnesium and sodium [16] . The aim of this research is to analyze whether OAT and Raja bananas can be formulated as cookies that have low calorie content and sensory evaluation of cookies with parameters namely color, taste, aroma and texture.

MATERIALS AND METHODS

Tools and materials

Material for manufacturing *cookies* that is *oat* flour , milk powder low calories (*meal replacement*), palm sugar, olive oil, egg white, *baking powder* , vanilla powder, salt were all bought at the local mini market , banana The king was bought from the local market . The materials used for chemical analysis are hexane a solution , K 2 SO 4 solution , CuSO 4 solution , solution H 2 SO 4, Solution H 2 SO 4 1.25%, distilled water, solution NaOH 50%, Zn, Solution HCl 0.1 N, alcohol 36%, Indicator methyl red, solution NaOH 3.25% were all purchased from chemical stores.

Procedure for creating Cookies

Weigh the ingredients according to table 2.1 in each formula, namely oats (Avena sativa L), plantain (Musa Paradisiaca L), olive oil, *meal replacement, ant palm sugar, baking powder* , vanilla powder, white egg, And salt. First, mix the egg whites for 5 minutes until fluffy, then mix in the meal replacement, palm sugar, vanilla powder and plantain, then mix for 1 minute until the bananas become smooth. Then add oat flour and baking powder and stir until evenly mixed. Take 13 grams of donut, then shape the dough into a round shape by pressing the surface with a fork. Then the dough that has been painted is put into the oven at a temperature of 150 ^{0}C for $\pm$ 20 minutes. After finishing in the oven, the cookies are stored in a jar and ready for analysis. [3,17,18] .

Physical Evaluation of Cookies (Sensory Evaluation)

The organoleptic properties of cookies were carried out on 14 panelists who were students at the Faculty of Health, Aufa Royhan University in Padangsidimpuan City. Before conducting tests on 14 panelists, the researchers first explained the description of the composition of low-calorie cookies so that the 14 panelists were able to choose cookie products correctly [3] .

Inspection test organoleptic Which done is use method test hedonic . This hedonic test aims to obtain scores from the panelists regarding their liking for Oat Cookies *(Avena sativa* L.) and Plantain *(Musa paradisiaca* L.). The parameters that will be tested are color, aroma, taste and texture with the following scale of values (1=dislike very much), (2=dislike very much), (3=like), (4=very much), (5=very much really like it) [19,20] .

Table 1. Formulation of Oat (Avena Sativa) and Plantain (Musa Paradisiaca L) Cookies.

Material	Heavy (grams)			
	Control	F1	F2	F3
Flour flour (gr)	200	0	0	0
Oats (gr)	0	120	150	180
Plantain (gr)	0	80	50	20
Oil Olives (gr)	20	20	20	20
Meal Replacement (gr)	50	50	50	50
Ant Palm Sugar (gr)	50	50	50	50
Vanilla Powder (gr)	5	5	5	5
White egg (gr)	30	30	30	30
Baking Powder (gr)	2	2	2	2
Salt	3	3	3	3

Type: F1 = Oats: Plantain (120gr: 80gr), F2 = Oats: Plantain (150gr: 50gr), F3= Oats: Plantain (180gr: 20gr)

Physico-Chemical Analysis

Physico-chemical analysis includes ash content test, water content test, carbohydrate content test, fat content test, and protein content test in accordance with [20]

1. Ash Content Test

The porcelain cup was dried in a kiln for 15 minutes at 600°C, then cooled in a desiccator, and weighed (W grams). Next, 5 grams of the sample is weighed in the cup (W1 gram), then the cup is placed in an ashing furnace, burned to produce ash at a temperature of 550°C for 4 hours. Once finished, cool in a desiccator, then weigh (W2 grams). Calculate the weight of ash using the formula:

$$\text{Rate Ash (\%)} = \frac{w1-w2}{w} x100\%$$

Where; w (sample weight (gr)), w $_1$ (sample weight + cup after drying (gr)) and w $_2$ (weight of empty cup (gr))

2. Water Content Test

Water content analysis was carried out using the drying method. The porcelain cup and lid were dried in the oven for 15 minutes at 105°C then cooled in a desiccator for 10 minutes then weighed (W1 gram). Next, weigh 5 grams of the sample with the porcelain cup (W2 grams). The porcelain cup containing the sample was placed in the oven for 3 hours at 105°C. Once finished, the porcelain cup containing the sample was removed from the oven and cooled in a desiccator then weighed (W3 grams). Water content can be calculated using the formula:

$$\text{Rate Water (\%)} = \frac{(w1+w2)-w3}{w2} x100\%$$

Where; w $_1$ (weight of empty cup (gr)), w $_2$ (sample weight (gr)) and w $_3$ (weight of sample + cup after oven (gr))

3. Test Protein Levels Using the Kedjal Method

The cookie sample was ground and weighed 1 gram of cookie sample, 3 grams of $CuSO_4$, 7 grams of K_2SO_4, then put into a Kjedahl flask. Add 14-25 mL H_2SO_4 (as a destroyer) to the sample solution and shake until homogeneous. Then enter the digestion stage where the mixture of cookie samples, $CuSO_4$, K_2SO_4, and $H_2SO_{4\ solution}$ is burned over a Bunsen lamp in a fume cupboard. Digestion was carried out until the color of the solution turned turquoise blue and did not smoke. After the digestion process is complete, then it goes to the distillation stage where the solution is put into a distillation flask and 25 ml of 50% NaOH solution (as a neutralizer) is added, Zn powder is added (so that the distillation process does not cause liquid splashes) as much as ½ of a spatula and Add distilled water to reach ½ of the distillation flask then close the hole in the distillation tube. Then put 25 ml of 0.1 N HCl (as an analyte) into the distillate container and add a few drops of methyl

red indicator (as an indicator). Then start distilling until it reaches 100 ml. After obtaining the distillate, then titrate it with 0.1 N NaOH, then carry out the titration until the distillate is orange. Titration was also carried out on blanks without cookie samples l with the same steps from the digestion process to titration, recording the titration volume. The percentage of protein content can be calculated using the following formula:

$$\text{Kadar protein (\%)} = \frac{(\text{vol HCl} - \text{vol blanko}) \times 0{,}014 \times \text{fk} \times 100\%}{\text{w sampel}}$$

Where; fk (conversion factor i.e. 6.25) and w (sample weight)

4. Test Fat Content Using the Soxhlet Method

Weigh the empty round bottom flask which has been heated in the oven at 100-110°C for 1 hour and cooled in a desiccator. The sample that has been ground is wrapped in filter paper then put into a soxhlet, n-hexane solvent (as a fat solvent) is added until the soxhlet column is full and flows into the flask, then n-hexane is added again until the sample is submerged. The soxhletation process is carried out for 3-4 hours. Once complete, the sample is removed from the Soxhlet column when the Soxhlet column is empty of n-hexane. After that, carry out indirect distillation, by pipetting the solvent that rises into the Soxhlet column, do this until there is no n-hexane filling the Soxhlet column. Next, oven the pumpkin containing fat for ± 1 hour to evaporate the remaining n-hexane. After 1 hour, put the pumpkin in the desiccator and wait until it cools. Then the pumpkin filled with fat was balanced and the results were recorded. The percentage of fat content can be calculated using the formula below:

$$\text{Kadar Lemak (\%)} = \frac{(C - B) \times 100\%}{A}$$

Where; A (sample weight (gr), B (weight of empty fat flask (gr), C (weight of flask and fat (gr))

5. Carbohydrate Content Test (By Difference)

Determining carbohydrate content is done using the By Difference method. Addition This No through analysis will but based on summation as following:

Carbohydrate content/100 grams = 100% - (Ash + Protein + Fat)

6. Calorie (Energy) Test

Total energy can be determined by converting the chemical content (carbohydrate content, protein content, fat content) with a conversion factor for all these contents. Carbohydrates and protein have a conversion factor of 4kkl/gram, while fat has a conversion factor of 9kkl/gram. Total energy can be determined using the following formula: (21)

Total Energy/100 grams = (4 x A) + (4 x B) + (9 x C)

Where; A (carbohydrate content), B (protein content) and C (fat content) [22]

Statistical Data Analysis

Statistical data analysis was carried out for sensory analysis of color, taste, texture and aroma. The initial stage of the data is tested for normality, if the data is normally distributed then it is continued with one way ANOVA analysis, the results are declared significant if $p<0.05$.

RESULTS AND DISCUSSION

The formulation of oat (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) cookies in the respective control treatments, F1, F2, F3 has a round shape and is brown in color and has a distinctive smell of banana and chocolate due to the addition of meal supplement which is chocolate. powder that is low in calories.

Based on table 2, it can be seen that the cookies produced are predominantly brown in color, have the aroma/smell of chocolate and banana, have a round texture with serrations, are slightly hard and crunchy when eaten, and have a sweet taste.

Sensory Evaluation

Sensory evaluation was carried out by organoleptic examination using the hedonic test method. The hedonic test is a test carried out to obtain scores from the panelists regarding their level of liking for a product. This hedonic test aims to obtain scores from the panelists on their level of liking for Oat Cookies (*Avena sativa* L.) and Plantain (*Musa paradisiaca* L.). The parameters that will be tested are color, aroma, taste and texture with the following scale of values (1= really don't like), (2= don't like), (3= like), (4= really like), (5= very much love it). The hedonic test was carried out on 21 panelists [19,23] .

Average value ± standard deviation for each hedonic test parameter for all formulations.

Based on table 3, if you look at the color parameters of cookies, color has a function in food, one of which is to steal attention from consumers. Therefore, it is necessary to test the color of oat (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) cookie products using a predetermined

Table 2. Description of Organoleptic Test Results.

Physical Category	Description	Results			
		Control	F1	F2	F3
Color	The color intensity of the cake	Light brown	Light brown	Dark brown	Dark chocolate
Aroma	Smell associated with chocolate and banana	Chocolate smell	The smell of chocolate and banana	The smell of chocolate and banana	Smells of chocolate and a hint of banana
Texture	Shape, Hardness, roughness and crunchiness	Round rather hard and crunchy	Round rather hard and crunchy	Round rather hard and crunchy	Round rather hard and crunchy
Flavor	The taste is similar to sugar	sweet	sweet	sweet	sweet

Type: F1 = Oats: Plantain (120gr: 80gr), F2 = Oats: Plantain (150gr: 50gr), F3= Oats: Plantain (180gr: 20gr)

Table 3. Organoleptic Evaluation Results Using the Hedonic Test.

Parameter	Formulation				P Value
	Control	F1	F2	F3	
Warna	3±0.95	3.4±0.92	3.2±0.46	3.1±1.01	0,000
Rasa	2.5±1.07	3.5±1.07	3.4±1.07	3.2±1.30	0,000
Textur	2±0.95	3.2±1.19	3.4±0.75	3.4±0.92	0,000
Aroma	2.7±0.90	3.5±0.75	3.2±0.72	2.8±0.85	0,000

Type: F1 = Oats: Plantain (120gr: 80gr), F2 = Oats: Plantain (150gr: 50gr), F3= Oats: Plantain (180gr: 20gr)

value scale. In table 3, the organoleptic test of the color of oat cookies (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) obtained the highest average color value in the F1 treatment, namely with a value of 3.4 in the category like, The color of the cookies depends a lot on the ingredients used. Incorporation of different food additives into cookies will significantly change the color and usually more of them will lead to a darker product color [24] .

Based on this research, the F1 treatment is the treatment that uses the most bananas. Apart from bananas, adding olive oil can make the cookies shinier. [25] also stated that adding bananas to food will make the color of the cookies more attractive and many people like it. Apart from that, the change in cake color is mainly caused by the Maillard reaction involving reducing sugars and amino acids as well as caramelization of sugar at high temperatures during baking [26] . Based on the results of variance analysis (Anova) on the color preferences of oat and plantain cookies, it is known that the value of p = 0.00 then ho is rejected, meaning there is a difference in the panelists' preferences for the colors of oat and plantain cookies. In table 3, the overall formulation of the cookies above has a distinctive aroma of banana and chocolate because the cookies above are made from banana and the addition of chocolate meal replacement, except for the control formulation. In table 3, the cookie treatment that has a distinctive aroma is in the F1 treatment: 3.5 (like), this is because the F1 treatment is the treatment that has the highest use of bananas compared to other treatments, this is supported by research [25] states that adding bananas to food will make the food have a fragrant and sharper aroma. The more bananas you add, the stronger the aroma of the cookies will be. Based on the results of variance analysis (Anova) regarding the preferences for the aroma of oat cookies and plantain, it is known that the value of p = 0.00, so ho is rejected, meaning that there is a difference in the panelists' preferences for the aroma of oat cookies and plantain.

In the graphic image above, the organoleptic test for the texture of oat cookies (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) shows that the average value of cookies that have the highest texture value is in the F3 treatment: 3.5 (like), p. This is because the F3 treatment is the treatment that uses the most oats. Research [19] states that increasing oats in cookies can reduce the hardness of the cookies, which makes the cookies crunchier and easier to break. The cookie texture preferred by the panelists is one that has a brittle texture and is easy to break. Research [19] states that the more oats added can make cookies become brittle and easy to break, temperature and baking time are also one of the influences that make cookies become brittle and easy to break because the higher the baking temperature, the more water content can be lost in the cookies [27] . Based on the results of the ANOVA analysis of the preferences for the texture of oat and plantain cookies, it is known that the value of p = 0.00, so ho is rejected, meaning there is a difference in the panelists' preferences for the taste of oat and plantain cookies.

In table 3, the organoleptic test of the taste of oat (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) cookies shows that the average value of the cookies which have the highest taste value is in the F1 treatment: 3.5 (like), p. This is because the F1 treatment is the treatment that uses the most bananas, the same as the aroma value. Manurung [25] also stated that adding bananas to food will increase the taste of the food because bananas have a sweet taste. The more bananas you add, the stronger it will be. also the taste [27] . The addition of oats can also affect the taste of cookies because oats have a balance of amino acids which will make the cookies taste savory [19]. This is not in accordance with research conducted by [28] which concluded that taste is directly proportional to the level of oats because increasing the level of oats makes the taste stronger. Based on the results of the ANOVA analysis of the taste preferences of oat and plantain cookies, it is known that the value of p = 0.00, so ho is rejected, meaning there is a difference in the panelists' preferences for the taste of oat and plantain cookies.

Table 4. Results of Basic Composition of Oat and Plantain Cookies.

Nutrition	Formulation			
	Control	F1	F2	F3
Ash content (%)	0.74	3.50	3.42	3.38
Water content (%)	3.38	4.70	4.24	3.94
Carbohydrates (%)	92.2	78.97	70.99	63.7
RDA of carbohydrates (%)	8.51	7.28	6.55	5.88
Protein (%)	2.62	5.25	8.75	14.00
AKG protein (%)	1.30	2.61	4.36	7.00
Fat (%)	4,8	12,20	16,48	18.96
AKG Fat (%)	2,1	5.49	7.37	8.47
Energy/100 gr (kcal)	422	446	470	481

Ket: F1 = Oats: King Banana (120 : 80), F2 = Oats : King Banana (150 : 50), F3 = Oats : King Banana (180 : 20)

Table 4 shows that the ash content of oat cookies *(Avena sativa* L.) and plantain (*Musa paradisiaca* L.) obtained the highest ash content of cookies, namely the F1 treatment of 3.5%. According to researchers, this is because the F1 treatment formula contains Banana content is more than other formulas, according to research results [29] that Ambon bananas contain very large mineral content such as potassium 435mg, magnesium 27mg, phosphorus 32mg, zinc 0.2mg, iron 0.50mg and calcium 8mg. This is what causes the ash content to be higher than other formulas [29] .

According to [19] , stated that the increase in ash content in cookies is caused by the main ingredient oats which has an ash content of 3.5%. Apart from that, during ashing, incomplete oxidation of organic substances may occur during ashing. Meanwhile, the lowest ash content was found in the F0 treatment at 0.74% because the control treatment only had wheat flour as the main ingredient, there was no addition of oats and Ambon bananas, the ash content of wheat flour itself was 0.58%. Table 3 shows that the water content of oat (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) cookies states that the water content of cookies does not exceed the limits determined by SNI 01-2973-2011, namely the maximum cookie water content is 5%. According to researchers, the highest water content was obtained in the F1 treatment, 4.70%, this was because the F1 treatment formula contained more bananas than other formulas. In research [29], plantains had a water content of 72.9 mg. Oats can also affect water content because oats contain fiber which can bind water, pectin and cellulose. According to research [30] , the water content test is an index of the storage stability of a material. Products with high humidity usually have a shorter shelf life than products with low humidity. Meanwhile, the lowest water content in the control cookies was 3.38%, this was because the control treatment only used wheat flour as the main ingredient, there was no addition of oats and Ambon bananas, the water content of the wheat flour itself was 11.80% in 100 grams. Therefore, a low water content of 3.38% can cause a small possibility of microbial growth [16] .

The highest fat content in the cookie formula is the F3 treatment: 18.96% according to researchers, this is because the F3 treatment formula contains more oats than other formulas. It is known that the fat content of oats itself is 4.5%, the more oats added to each treatment, the higher the fat content will be [19] . Meanwhile, the addition of the main ingredient plantain has a fat content of 0.20gr/100gr [29] . The protein content of oat cookies (*Avena sativa* L.) and plantain (*Musa paradisiaca* L) which states that the protein content of cookies is not less than what has been determined by SNI 01-2973-2011, namely the minimum cookie protein content is 5%, the highest protein content found in the F3 treatment: 14%, according to the researchers this was due to the addition of more oats to the F3 compared to other treatment formulas. The protein content of cookies increases due to additional ingredients for making cookies, namely meal replacement which has a protein content of 18g/50gr [31] .

Foods that have a high protein value usually have high fat, as evidenced by the fat content above, the more the cookies are treated, the fat content will also increase as well as the protein content. The Ministry of Health of the Republic of Indonesia states that consuming foods high in protein is very good when following a healthy diet which can make your stomach feel full longer . The carbohydrate content of oat cookies (*Avena sativa* L.) and plantain (*Musa paradisiaca* L) in each treatment was F1: 78.97%; F2: 70.99%; F3: 63.7% in 100 grams, for consumption per serving (30 grams) each treatment has a carbohydrate content of F1: 23.69 grams RDA 6.72%; F2: 21.29 grams RDA 5.98%; F3: 19.11 grams RDA 5.55%, according to researchers this is due to the increased carbohydrate content in F1 cookies, namely by adding more plantains compared to other treatment formulas, in Mastuti's research [29] plantains had a carbohydrate content of 25 .8 grams/100 grams. This is not in line with research results which state that oats have a higher carbohydrate content than nuts and vegetables. In determining energy in food, it can be calculated by converting the chemical content (fat content, carbohydrate content and protein content). Proteins and carbohydrates have a conversion factor of 4 kkl and fats of 9 kkl [21] .

In table 4, the total energy content of oat (*Avena sativa* L.) and plantain (*Musa paradisiaca* L.) cookies shows that the energy content of cookies can be categorized as a low-energy food, where according to nutritional value, the energy in cookies is stated to have high energy, namely 1407 kkl in one serving, namely 60 grams, and one of the cookie products that has low energy, namely quaker oat cookies, has an energy nutritional value of 27 grams or per serving, namely 119 kkl and the slimfit cookie product has energy of 90 kkl in 22 grams. For consumption per serving (30 grams) each treatment has an F1 energy content: 134 kkl AKG 6.23%; F2: 140 kkl RDA 6.51%; F3: 144 kkl RDA 6.69%, food calories come from three nutrients, namely fat, protein and carbohydrates, 1 gram of fat contains 9 calories and 1 gram of carbohydrate contains 4 calories. The higher the fat content of a food, the higher the energy level. increases, in this cookie treatment, each treatment will have an increased energy level which is caused by the cookies having an increased fat content with each treatment. The calories in these cookies have been categorized as low calorie cookies which have the lowest calorie value, namely in the control treatment: 422 kkl/100 grams and the highest in the F3 treatment: 481 kkl/100 grams, because it is known that the calories in cookies are in line with the low calories in oat cookies and plantains, there will be no accumulation of calories in the body which can become fat in the human body which results in obesity and blockage of blood vessels.

CONCLUSION

The findings of this research are that OAT (*Avena sativa* L. *)* and Raja banana *(Musa Paradisiaca* L.) can be formulated into low-calorie cookies with the calorific value of each control treatment, F1, F2 and F3 respectively being 422kcal, 446 kcal, 470kcal and 481 kcal. Based on the sensory evaluation of the four parameters which include color, taste, aroma and texture, it was stated that there were differences in the panelists' preferences for the color, taste, aroma and texture of oat and plantain cookies. The suggestion from this research is to carry out further analysis for the application of cookies to mice as a low-calorie diet food.

REFERENCE

1. Tapola N, Karvonen H, Niskanen L, Mikola M, Sarkkinen E. Glycemic responses of oat bran products in type 2 diabetic patients. Nutr Metab Cardiovasc Dis. 2005;15(4):255–61.
2. Baumgartner B, Özkaya B, Saka I, Özkaya H. Functional and physical properties of cookies enriched with dephytinized oat bran. J Cereal Sci [Internet]. 2018 Mar;80:24–30. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0733521017307397
3. Lois-correa JA, Torres-huerta AM, Domínguez-crespo MA, Urdapilleta-inchaurregui V, Rodríguez-salazar AE, Brachetti-sibaja SB. Production of dietary cookies based on wheat-sugarcane bagasse : Determination of textural , proximal , sensory , physical and microbial parameters. LWT [Internet]. 2023;184(July):115061. Available from: https://doi.org/10.1016/j.lwt.2023.115061
4. Chen H, Xiong M, Bai T, Chen D, Zhang Q, Lin D, et al. Comparative study on the structure, physicochemical, and functional properties of dietary fiber extracts from quinoa and wheat. Lwt [Internet]. 2021;149(May):111816. Available from: https://doi.org/10.1016/j.lwt.2021.111816
5. Dahl WJ, Stewart ML. Position of the Academy of Nutrition and Dietetics: Health Implications of Dietary Fiber. J Acad Nutr Diet. 2015;115(11):1861–70.
6. Utami ND, Hamidah S, Lastariwati B. Oatmeal Cookies Sebagai Pengganti Makanan Selingan. HEJ (Home Econ Journal). 2020;4(2):44–8.
7. Angelov A, Yaneva-Marinova T, Gotcheva V. Oats as a matrix of choice for developing fermented functional beverages. J Food Sci Technol [Internet]. 2018;55(7):2351–60. Available from: https://doi.org/10.1007/s13197-018-3186-y
8. Alemayehu GF, Forsido SF, Tola YB, Amare E. Optimization of nutritional and sensory properties of fermented oat-based composite beverage. Heliyon [Internet]. 2022;8(10):e10771. Available from: https://doi.org/10.1016/j.heliyon.2022.e10771
9. Ferranti P, Velotto S. Oats for Sustainable Production of Foods. In: Sustainable Food Science - A Comprehensive Approach [Internet]. Elsevier; 2023. p. 54–65. Available from: https://linkinghub.elsevier.com/retrieve/pii/B9780128239605000287
10. Aly AA, Zaky EA, Mahmoud HA, Alrefaei AF, Hameed AM, Alessa H, et al. The Impact of Addition Oats (Avena sativa) and Cinnamon on Cookies and their Biological Effects on Rats Treated with Cirrhosis by CCL4. Saudi J Biol Sci [Internet]. 2021;28(12):7142–51. Available from: https://doi.org/10.1016/j.sjbs.2021.08.010
11. Gangopadhyay N, Hossain MB, Rai DK, Brunton NP. A review of extraction and analysis of bioactives in oat and barley and scope for use of novel food processing technologies. Molecules. 2015;20(6):10884–909.
12. Colla K, Costanzo A, Gamlath S. Fat replacers in baked food products. Foods. 2018;7(12).
13. Dziki D, Lisiecka K, Gawlik-Dziki U, Różyło R, Krajewska A, Cacak-Pietrzak G. Shortbread Cookies Enriched with Micronized Oat Husk: Physicochemical and Sensory Properties. Appl Sci. 2022;12(24).
14. Marcinkowska-Lesiak M, Onopiuk A, Zalewska M, Ciepłoch A, Barotti L. The effect of different level of Spirulina powder on the chosen quality parameters of shortbread biscuits. J Food Process Preserv. 2018;42(3).
15. Laguna L, Primo-Martín C, Varela P, Salvador A, Sanz T. HPMC and inulin as fat replacers in biscuits: Sensory and instrumental evaluation. Lwt [Internet]. 2014;56(2):494–501. Available from: http://dx.doi.org/10.1016/j.lwt.2013.12.025
16. Njapndounke B, Foko Kouam ME, Boungo GT, Klang JM, Ngoufack FZ. Optimization of production conditions of biscuit from Musa sapientum flour ('banane cochon'): Nutritional composition and glycaemic index of the optimized biscuit. J Agric Food Res [Internet]. 2021;6:100229. Available from: https://doi.org/10.1016/j.jafr.2021.100229
17. Nugraha F, Kurniawan H, Yastiara I. Penetapan Kadar Paracetamol dalam Jamu di Kota Pontianak Menggunakan Instrumen Spektrofotometri. Indones J Pharm Educ. 2023;3(1):77–87.
18. Sykes GB, Davidson I. Cookies. In: Biscuit, Cookie and Cracker Process and Recipes [Internet]. Elsevier; 2020. p. 127–49. Available from: https://linkinghub.elsevier.com/retrieve/pii/B9780128205983000056

19. Wati H. Analysis of antioxidant activity, organoleptic tests, nutritional content of cookies with the addition of purple sweet potato paste (Ipomoea batatas) and oat flour (Avena sativa). thesis. 2022;18(02):9–21.
20. AOAC DGWL. Official methods of analysis of AOAC International. In: official methods of analysis of AOAC International. 2023. p. xi–xvi.
21. Please AO. Physical Quality and Chemical Quality of Red Bean Flour Cookies (Phaseolus Vulgaris) and Beet Flour as Functional Food. Thesis. 2019;1–77.
22. Barreira JCM, Nunes MA, da Silva BV, Pimentel FB, Costa ASG, Alvarez-Ortí M, et al. Almond cold-pressed oil by-product as ingredient for cookies with potential health benefits: Chemical and sensory evaluation. Food Sci Hum Wellness. 2019;8(3):292–8.
23. Tan D, Lin JWX, Zhou Y, Yao Y, Chan RX, Lê KA, et al. Enzymatic hydrolysis preserves nutritional properties of oat bran and improves sensory and physiochemical properties for powdered beverage application. Lwt [Internet]. 2023;181(March):114729. Available from: https://doi.org/10.1016/j.lwt.2023.114729
24. Najjar Z, Alkaabi M, Alketbi K, Stathopoulos C, Ranasinghe M. Physical Chemical and Textural Characteristics and Sensory Evaluation of Cookies Formulated with Date Seed Powder. Foods. 2022;11(3):1–13.
25. Manurung MP, Seveline, Taufik M. Formulation of Cookies Made from Yellow Pumpkin Flour (Cucurbita moschata Duch) and Wheat Flour with the Addition of Ambon Banana (Musa paradisiaca). J Halal Agroindustry. 2021;7(2):156–64.
26. Hadiyanto, Asselman A, Straten G van, Boom RM, Esveld DC, Boxtel AJB va. Quality prediction of bakery products in the initial phase of process design. Innov Food Sci Emerg Technol. 2007;8(2):285–98.
27. Alemu T. Effects of Blending Ratio and Processing of Lupine Bean On Nutritional Quality and Sensory Evaluation of Wheat-Lupine Bread. 2021;1–18.
28. LCD. Ana Paola Echavarría Vélez P, Lcda. Carmen Hernández Dominguez P. Centro de Recursos para el Aprendizaje y la Investigación (CRAI) / 3Arquitectura. Cienc Unemi [Internet]. 2019;3(4):1–141. Available from: https://www.plataformaarquitectura.cl/cl/781333/centro-de-recursos-para-el-aprendizaje-y-la-investigacion-crai-3arquitectura
29. Mastuti N. The Effect of Giving Yellow Ambon Bananas (Musa Paradisiaca Sapientum L.) on Body Weight and Nutritional Status of Over-Nutrified Adolescents in the Undergraduate Nutrition Study Program at the PKU Muhammadiyah Surakarta College of Health Sciences (Stikes). 2018;
30. Adegunwa MO, Adebowale AA, Olisa ZG, Bakare H. Chemical and microbiological qualities of smoked herring (sardinella eba, valenciennes 1847) in Odeda, Ogun state, Nigeria. Int J Microbiol Res Rev [Internet]. 2013;1(5):85–087. Available from: www.internationalscholarsjournals.org
31. Meilina. Extra virgin olive oil reduces mda (malondialdehyde) levels in male Wistar rats (Rattus norvegicus) exposed to cigarette smoke. Medical Science Digest. 2017;8(2):97–101.

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