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Substitution Effect of Wheat Flour with Moringa Leaf Toward the Nutrient Improvement and the Quality of Moringa Biscuit (Moringga Oleifera)

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Abstract : Biscuit of Moringa leaf powder has many benefits for health. For instance, to counteract free radicals, inflammation, premature anemia to infants. Besides, it protects not only the cell structure but also improves the effectiveness of vitamin B2, iron and anti-inflammatory.
The first procedure conducted to make Moringa leaf powder was leaf sorting process and 2 kg-leaf-weighing, and then, they were washed and drained. The second step was they were dried in the Cabinet Dryer in 45 ° C for 24 hours. The third step, the dried leaf were blended and then sieved using 100-mesh-sieve. They were accordingly analyzed. The following procedure was to make biscuits; mixing ingredients such as flour, Moringa leaf with a ratio of 1: 1, 1: 2, 1: 3, 1: 4, 1: 5, salt, cornstarch, baking powder butter, sugar, and milk powder according to the composition required. They were blended using a using a mixer and then add some water, egg yolks and stirred to form a dough and left for 3 minutes (fermentation stage), molded and then placed in a baking dish that had been smeared with butter, and baked in 130, 135, 140, 145, 150 ° C for 25 minutes.
Keywords : Leaf of Moringa, Moringa Leaf Flour, Moringa leaf biscuits.

Introduction

The fact that the high number of malnutrition and incidence of the infectious diseases in children is a serious problem and urgent to overcome. Data Research and Development in 2010, showed that 17.9 percent of children under five are suffering from malnutrition and 4.9% severely malnourished. While the prevalence of short toddlers are 35.7 % and 13.3 % extremely thin. In the attempt of quick responding to the malnutrition in Indonesia, things have been done as such having an innovation based food diversification, developing additional nutritional standardized food formulation which enhance toddler's immunity, as well as applying processing technology considering the excellence of local food resources. Normally, kid diet intake should contains enough calories (energy) and all the essential nutrients and should be available in sufficient quantities in regular basis.

Moringa leaf have major potential sources of some nutrients and theraupetic elements, including antibiotics, and stimulate the immune system. Moringa leaf contains protein, vitamins and minerals that have a high potential theraupetic and supplementary food for children who are malnourished. Moringa intake to the child daily diet is able to perform rapid recovery because it contains 40 essential nutrients [1].

According the research done by Zakaria, Moringa Flour contains rich nutrients such as protein which was obtained 28.25%, Vitamin A in the form of ß-Carotene 11.92 mg, calcium 2241.19 mg, and Magnesium as much as 28.03 mg[2]. Compared to the result of the analysis of Moringa leaf flourin Africa[1]. The composition of protein, calcium, iron substance of South Sulawesi moringa leaf variety is slightly higher. On the other hand, the Vitamin A (ß-Carotene) were slightly lower, but the researchers said there was not significant difference and still needed further studies about the method/procedures, tools and meticulous analyses.

Table 1 the change of children weight in sample group and controlled group after the invention wheat LeafMoringa and the egg intake case in the controlled group

Change	Case		Control	
	n	%	n	%
Up	10	76,9	9	60.0
Constant	2	15.4	-	-
Down	1	7.7	6	40.0
Total	13	100	15	100

The table showed that the children who consumed Moringa of the 13 children, 10 children (76,9 %) gained weight in 14 days, 2 children (15,4%) were in constant weight and 1 child (7,7 %) lose weight. Whereas, controlled sample who got an additional egg daily 9 of whom gained weight of (60%) and 6 of whom lose weight of (40 %).

Based on the research done by the FifiLuthfiah, et al about the nutritional of Moringa Leaf (Moringaoliera) NTB stated that the standard protein content DRIs (Dietary reference Intakes) was 10-35 gr while the white Moringa powder was 2.78 $\pm$0.74 gr, DRIs fat was 30-40 gr whereas the white Moringa was 2.78$\pm$0.5, the DRI' of Fe was 3.0 – 4.1 mg whereas the white moringa was 3.08$\pm$ 0.01. The data in question was the result of the analyses of the macro and micro nutrient of Moringa powder from NTB and its comparison with the recommended daily intakes (DRIs) of chidren aged 1-9 years[3].

According to the research done by Rudianto et all, There were 5 biscuit product formulas which were made under the following composition of flour and Moringa leaf flour; 0% : 100%, 25% : 50 %, 75% : 25%, 100% : 0%. The best result of the 5 formula organoleptic test was the composition of 75% : 25% which showed the following analyses; the biscuit contains 3.89 % of water content, 1,41% of ash content, 33,87% of fat, 16.1% of protein, 74,72% of carbohydrate and 35,79 mg of iron. In this research, Moringa leaf are washed in clean fresh water and then traced from the stem leaf, then it was stocked up on a wire mesh (laundry rack oven) and set its thickness in such a way that it was dried in an oven at a temperature of about 45 ^{o} C for approximately 24 hours (it's already enough dried). Making flour from dried Moringa leaf were by using a dry blender and a 100 mash sieve to separate small rods that could not be crushed by the blender[4].

Biscuit is widely consumed by people. This is a dry product that has low water content. Based on the research done by Nurjanah showed that the best result of making banana biscuit was in the temperature of 150^{o}C for 25 minutes[5]. According to SNI 01-2973-1992 biscuit is a product obtained by baking dough from the combination of wheat flour and other foods and with or without the permitted additive substance addition.

Experimental

The researched was conducted at the Laboratory of Food Technology ITN Malang. The steps of conducting the research were the study of literature, research preparation, conducting the research, data collection, data analyses, evaluation and the last was reporting.

The materials usedare:2 kg Moringa leaf, and for biscuit using materials like :Sugar , Butter, Salt, Egg Yolks, Water, Milk Powder, Cornstarch Flour, Baking powder. The equipments usedare as follow :100 Mesh Sieve, baking pan, mixer, cabinet dryer, Oven, cake mold, Lumber mill, knife.

The following step for Making of Moringa leaf Flour :

The process of sorting leaf (the fresh young leaf separation of impurities), Weighing 2 kg of Moringa Leaf then Rinsing the Moringa Leaf with fresh running water 1-2 times and kneading is not allowed. Having washed the leaf, let it drain. Drying the Moringa leaf firstly placed in the baking pan in 45^{o}C temperature for 24 hours. Letting the leaf in a room temperature for $\pm$ 15 minutes. And then blending the dried leaf and then sieved it with a 100 mesh sieve. Obtaining the Moringa leaf flour which then was tested its protein, fat, carbohydrate, iron, calcium, vitamin B2 and water contents.

And the following step for biscuit making of Moringa leaf:

Blending all the ingredients such as the wheat flour, and Moringa Leaf powder with ratio of :1:1, 1:2, 1:3, 1:4, 1:5, salt, cornstarch, baking powder, butter, sugar and milk powder. All were mixed in accordance to a correct composition using a mixer, Adding some water, egg yolk, and stirring it well until the dough is mixed well and smooth, Leaving the dough for 3 minutes until it is inflated and letting it in fermentation process, Molding the dough and putting them into the baking pan which was firstly buttered, Putting them into the oven with 130, 135, 145, 145, 150^{o}C in temperature for 25 minutes, Obtaining the biscuit after a series of baking process, Testing the fat, carbohydrate, protein, iron, calcium, vitamin B2, and water content.

Result and Discussions

The result analysis of Fresh Moringa Leaf and the Moringa Leaf powder

Based on the observation we made the result are as follow:

Table 2. The analysis of fresh Moringa leafand the Moringa Leaf powder (based on the observation)

Component	The total amount per 100 gr For fresh Moringa leaf	The total amount per 100 gr for Moringa Leaf powder
Fat (gr)	3.35	3,2
Carbohydrate (gr)	32.05	30,09
Protein (gr)	27.30	25,22
Iron (mg)	38.5	37,52
Calcium (mg)	1530	1429
Water content (%)	10.73	8.64
Vitamin B2 (mg)	19.51	18.62

The amount of nutrient that we got from the Moringa leaf was in conformity with the literature.

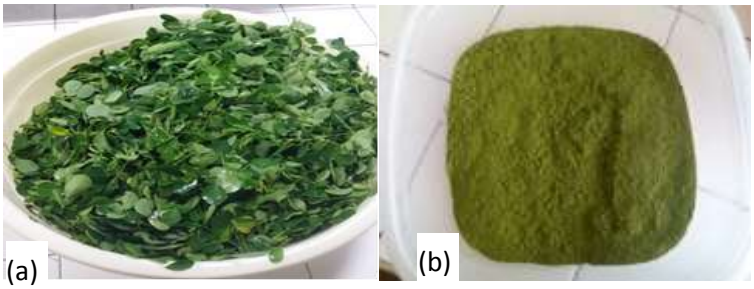

Figure 1. Figure of fresh Moringa leaf (a) and Moringa Leaf powder

There was a slight nutrient increase and decrease to the fresh Moringa leaf. It may be due to not only the difference in region where the Moringa originated but also the heating effect during the making of the Moringa leaf powder.

The following is the graphic of the effect of temperature and substitution of moringga leaf powder toward the fat content of Moringa leaf biscuits

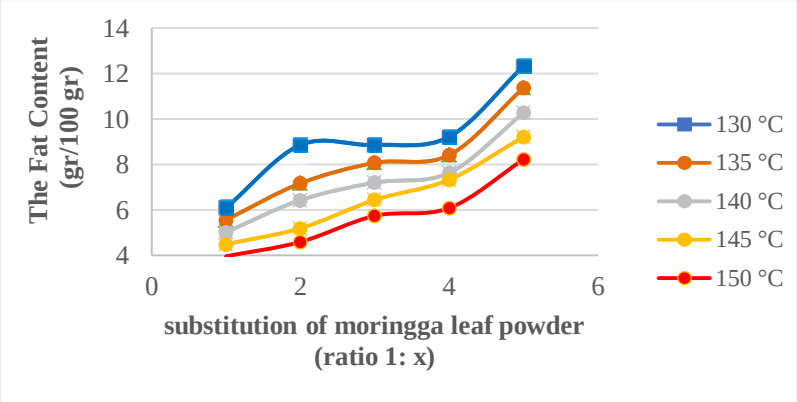

Figure 1.The relationship of the effect of temperature and substitution of moringga leaf powdertoward the fat content of Moringa leaf biscuits.

Figure 1 shows that the lower the temperature and the more amount of Moringa leaf powder, the fat content in the biscuits was higher.

The highest fat content obtained was at the temperature of 30°C with substitution of moringga leaf powderratio 1:5, 12,34 gr/100 gr and the lowest fat obtained was at the temperature of 150°C with an ingredient ratio 1:1; 3,97 gr/100 gr.

The best fat content we obtained had been in accordance with the SNI no 01-2973-92 for biscuit; 9,5%. It was due to the addition of Moringa leaf powder and margarine with fat content of 25%-30%.

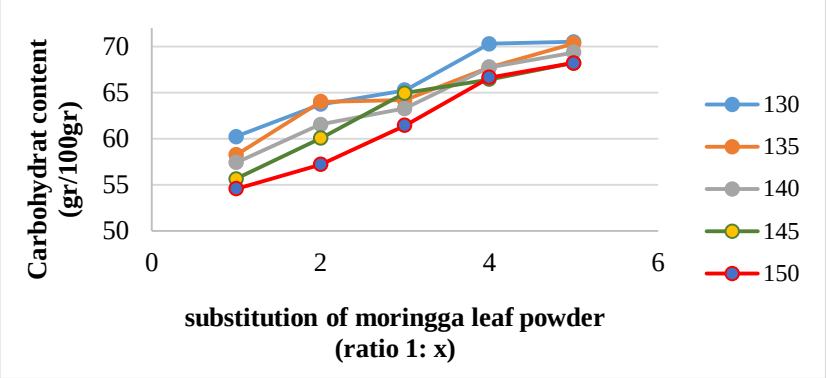

Figure 2.The relationshipof the effect of temperature and substitution of moringga leaf powdertoward the carbohydrate content of Moringa leaf biscuits.

Figure 2 it can be concluded that the lower the temperature and the more amount of Moringa leaf powder, the carbohydrate content in the biscuits was higher.

The highest carbohydrate content obtained was at the temperature of 130°C with substitution of moringga leaf powderratio 1:5, 71,51 gr/100 gr and the lowest fat obtained was at the temperature of 150°C with an ingredient ratio 1:1; 54,56 gr/100 gr.

The best carbohydrate content we obtained had been in accordance with the SNI no 01-2973-92 for biscuit; 70 %. It was due to the partly substitution wheat flour which was the main source of carbohydrate in Moringa biscuit.

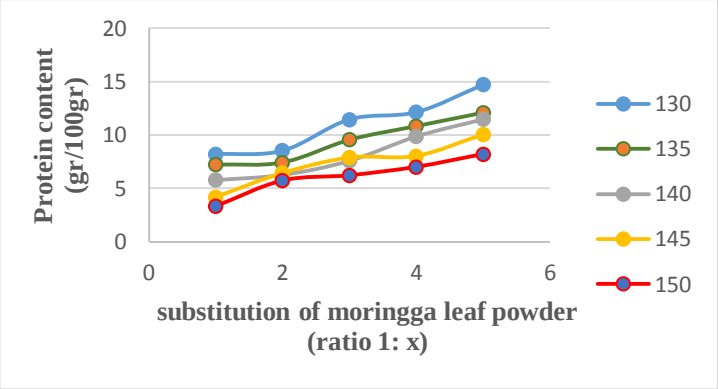

Figure 3.The relationshipof the effect of temperature and substitution of moringga leaf powder toward the protein content of Moringa leaf biscuits.

From Figure 3, shows that the lower the temperature and the more amount of Moringa leaf powder, the protein content in the biscuits was higher.

The highest protein content obtained was at the temperature of 130°C with substitution of moringga leaf powder ratio 1:5, 14.7 gr/100 gr and the lowest fat obtained was at the temperature of 150°C with an ingredient ratio 1:1 3,35 gr/100 gr.

The best carbohydrate content we obtained had been in accordance with the SNI no 01-2973-92 for biscuit; 9 %. It was due to the more Moringa leaf powder implemented or added into the biscuit the protein content in the biscuit was higher.

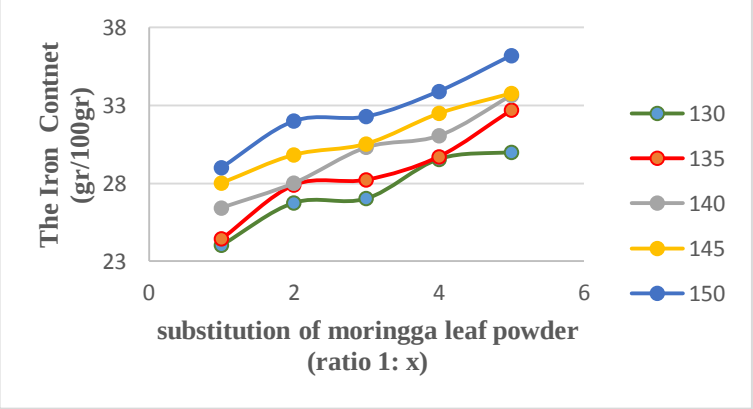

Figure 4.The relationshipof the effect of temperature and substitution of moringga leaf powdertoward the iron content of Moringa leaf biscuits.

Figure 4, shows that the higher the temperature and the more amount of Moringa leaf powder, the iron content in the biscuits was higher.

The highest iron content obtained was at the temperature of 150°C with substitution of moringga leaf powder ratio1:5, 36,22 gr/100 gr and the lowest iron obtained was at the temperature of 130°C with an ingredient ratio 1:1; 24,02 mg/100 gr.Due to no standard in SNI for iron, then it was adjusted with reference to food nutrition BPOM RI for iron 8.00 mg. The higher the temperature of biscuit heating, the higher the iron levels. This was related to the nature of the iron itself,it is biodegradable in water, so the higher the temperature, the water content decreases and the more concentrated iron levels contained in Moringaleaf biscuits.

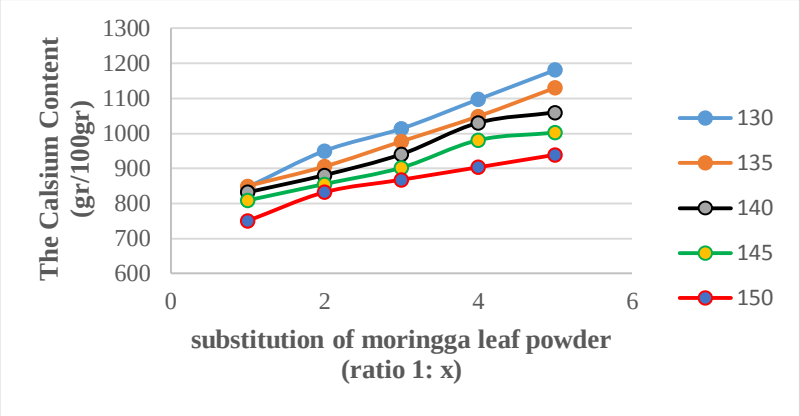

Figure 5.The relationshipof the effect of temperature and substitution of moringga leaf powdertoward the calcium content of Moringa leaf biscuits.

Figure 5, it can be concluded that the lower the temperature and the more amount of Moringa leaf powder, the calcium content in the biscuits was higher.

The highest calcium content obtained was at the temperature of 130^{o}C with the substitution of moringga leaf powder ratio 1:5,1181mg/100 gr and the lowest calcium obtained was at the temperature of 150^{o}C with an ingredient ratio 1:1; 750,420 mg/100 gr.

The content taken in this research was obtained had been in accordance with the SNI no 01-2973-92 for calcium 500 mg. The higher the temperature of biscuit heating, the lower the calcium levels.The decreasing of calcium level is supported by the results of the study[6].which states that a significant decrease in minerals, especially, phosphorus and calcium after the cooking process is at temperature above 100 ° C[7].

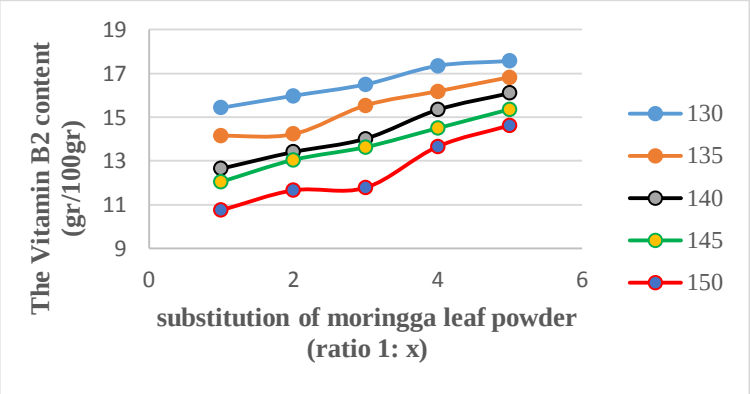

Figure 6.The relationshipof the effect of temperature and substitution of moringga leaf powdertoward the vitamin B2 content of Moringa leaf biscuits.

Figure6, shows that the lower the temperature and the more amount of Moringa leaf powder, the vitamin B2 content in the biscuits was higher.

The highest vitamin B2 content obtained was at the temperature of 130^{o}C with substitution of moringga leaf powder ratio 1:5; 17,57mg/100 gr and the lowest vitamin B2 content obtained was at the temperature of 150^{o}C with an ingredient ratio 1:1; 10,75 mg/100 gr. Levels of vitamin B2 are in accordance with the decision of BPOM RI for vitamin B2; 0.6 mg.

The content of VitaminB2 on Moringa leaf biscuit products decreased due to damage caused by high temperature of heating. An appropriate product handling could help stabilizing vitamin B2. To keep the content of vitamin B2, sugar can be added to stabilize its compound[8].

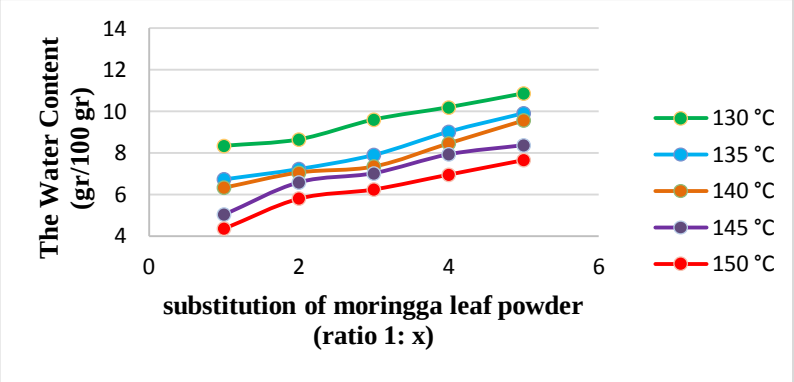

Figure 7.The relationship of the effect of temperature and substitution of moringga leaf powder toward the water content of Moringa leaf biscuits.

From figure7, shows that the higher the temperature and the more amount of Moringa leaf powder, the water content in the biscuits was higher.

The analysis result showed that the highest water content obtained was at the temperature of 130°C with the substitution of moringga leaf powder ratio 1:5; 10,87 % and the lowest water content obtained was at the temperature of 150°C with an ingredient ratio 1:1; 4.34%.

The best water content was the lowest; 4.34%. The biscuit quality requirements based on SNI 01-2973-1992 stated that maximum water content contained in biscuits was 5% (bb). The water content of biscuits produced was less than 5% or below the quality required on SNI, so it can be said that the water content of biscuits with flour substitution of Moringa leaves and wheat flour met the biscuit quality requirements of SNI.

Conclusions

Result from the research show thatthe best temperature on Moringa biscuit-making was at a temperature of 130 ºC and the best substitution of moringga leaf powder is 1: 5. The analysis showed the content of fat 12,34 gr / 100gr, carbohydrate 70,51gr / 100 gr, protein 14,7 gr / 100 gr, iron 30.01 mg / 100g,calcium1181 mg / 100g, vitamin B2 17, 57 mg / 100g, but for the water content the best temperature occured at a temperature of 150 ºC because the higher the temperature, the more moisture is lost.

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