

THE QUALITY OF CRACKER FROM PURPLE SWEET POTATO FLOUR SUBSTITUTED FOR WHEAT FLOUR

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ABSTRACT

The research objective of this study is quality of cracker from purple sweet potato flour substituted for wheat flour to acceptance of consumer and make choice for consumer whom think of health. The results of the sensory quality evaluation of the 3 types of cracker. This study found that the most appropriate recipe was the 1st recipe, which consisted wheat flour 400 g, sugar 14 g, salt 3 g, yeast 3 g, salted butter 80 g, shortening 80 g, water 180 g. Then standard recipe is brought to substituted of purple sweet potato flour in the ratio of 25, 50, 75 percent (weight of total wheat flour) respectively.; the researcher found that substituted of purple sweet potato flour of 50 percent had satisfaction score between minimum in terms of taste and score to median score in terms of color. The chemical composition of purple sweet potato flour to substitute for wheat flour in cracker found that anthocyanin was equal to 1.82 mg /100g.

Keywords: cracker, anthocyanin, purple sweet potato flour, wheat flour

1. INTRODUCTION

Nowadays, popularity in eating crisp breads or crackers as snacks much more increases as they are convenient for eating and bringing around. Crackers are a kind of crisp breads different from biscuits and cookies considered from ingredients, how to cook, shape and sizes (Thailand Industrial Standards, 1995). Crackers are considered products gaining popularity from people of all genders and ages, both domestic and international levels which can be seen from the export data of crisp breads with high exportation. During 1996 – 2000 crisp breads could be exported each year averagely 20,690 tons worth 1,435 million baht causing export volume and export value increased by 13 and 15 percent respectively [1]. Crackers are crisp breads having ingredients combined together thoroughly. Their main ingredients are comprise wheat flour, margarine, egg, and etc. The flavor is filling or coating with other visible ingredients [2]. Therefore, crackers should be produced by adding more nutritional values or left over ingredients to increase more values to the product.

Purple sweet potatoes are fast growing vines that grow and cover the ground. Their large root tubers store water and energy and known as their heads. Their roots or heads have high benefits for being good food for humans. They are rich in nutritional values. Their flesh has biological functions to help protect cells from the damage caused by free radicals (scavenging free radicals). They have an anti-mutation property, inhibit the activation of carcinogens and blood pressure [3]. They are contain anthocyanin with a class of compounds and also antioxidant effects [4]. Anthocyanins can be found naturally. They are non-toxic and water-soluble vacuolar pigments that may appear red, purple, or blue. Sweet potatoes in many different colors are continually developed by the government sector and promoted to cultivate widely. Purple sweet potatoes are used medicinally in Japan for treating diabetes and other diseases. Besides, purples sweet potatoes are rich in fiber at the same amount as brown rice and higher than other leafy vegetables.

Therefore, this research aims to use purple sweet potato flour to be an ingredient in crackers so as to add more nutritional values to cracker, a type of snacks, by mixing purple sweet potato flour substituted for wheat flour for being another choice of cracker consumption.

2. METHODOLOGY

1. Studying a standard recipe for producing crackers

Studied the standard recipe of 3 recipes for producing crackers and how to make as seen in the Table 1. Plan an experiment to obtain appropriate data through randomized complete block design (RCBD) [5]. when the 3 recipes were taken to test the sensory quality using the acceptance test method of the 9-Hedonic Scale, then used to evaluate the characteristics such as color, odor, taste, texture (crispy and crumbly), and the overall preference. There were 50 unpracticed testers being students from Suan Sunandha Rajabhat University. Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DMRT) were used to analyze the obtained results with 95% reliability [6].

Table 1
Standard recipe of 3 crackers.

Ingredients	Quantity (g)		
	Recipe 1	Recipe 2	Recipe 3
Purpose wheat flour	400	270	250
Dry yeast powder	3	2	2
White sugar	14	10	10
Salt	3	2	5
Salted butter	80	40	60
White butter	80	40	20
Water	180	120	120
Unsweetened condensed milk	50	55	50

Resource: Recipe 1[6, 7, 8]

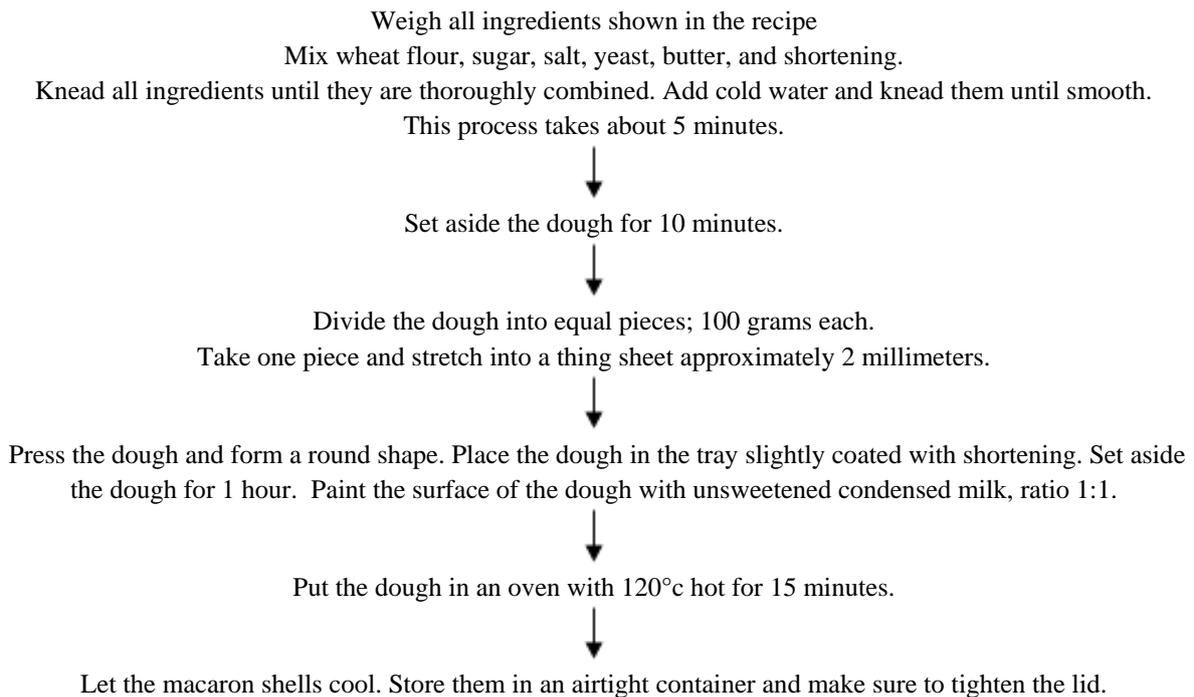


Figure 1
Production Steps of cracker [9]

2. Studying appropriate ratio of purple sweet potato flour substituted for wheat flour in crackers

Study the most acceptable standard recipe by using purple sweet potato flour substituted for wheat flour to make 3 levels crackers; 25%, 50%, 75% of the whole weight of the wheat. Sensory quality assessment by Acceptance test method used 9 – Point Hedonic scale to assess the appearance, color, odor, taste, texture (crispy and crumbly), and the overall. The experimental study used testers who were not trained 50 people, the

experimental design is Randomized Complete Block Design: RCBD, analysis of variance, and compare the difference between the average by Duncan's New Multiple Range Test method at the 95% confidence level.

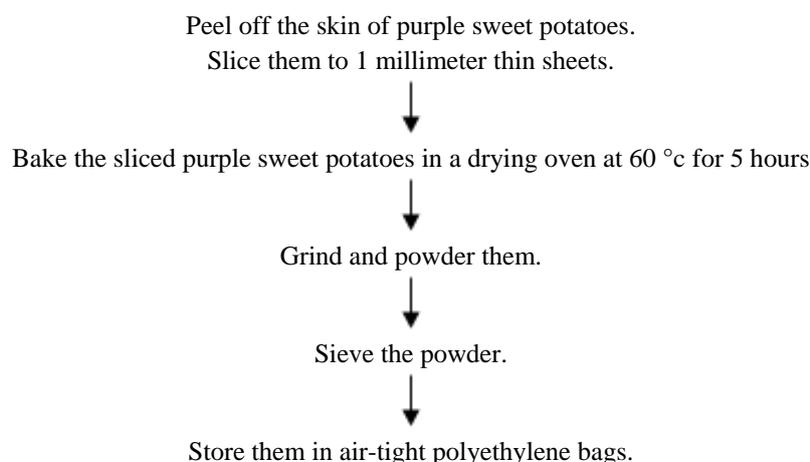


Figure 2

Procedures to prepare purple sweet potato flour [10].

3. Studying the amount of anthocyanins in crackers made of purple sweet potato flour substituted for wheat flour.

Acceptable crackers made from purple sweet potato substituted for wheat flour were analyzed to find the amount of anthocyanin with AOAC method (2012). Plan an experiment to obtain appropriate data through completely randomized design (CRD). Analysis of variance and Duncan's New Multiple Range Test, a multiple comparison procedure, were used to analyze the obtained results with 95% reliability.

3. RESULTS

1. Study results of cracker standard recipes

The test results of sensory evaluation of 3 cracker recipes to be selected for being a cracker standard recipe are shown in the Table 2

Table 2

Sensory characteristics of standard recipe of crackers.

Sensory Characteristics	Standard Recipe		
	1	2	3
Appearance ^{ns}	6.88±1.29	6.52±1.36	6.48±1.20
Colour ^{ns}	6.64±1.37	6.40±1.39	6.52±1.37
Odor ^{ns}	6.96±1.48	6.28±1.71	6.42±1.70
Taste ^{ns}	6.30±1.62	6.06±1.57	5.88±1.59
Texture (crispy and crumbly)	6.26±1.93 ^a	5.74±1.93 ^{ab}	5.30±2.01 ^b
Overall ^{ns}	6.76±1.81	6.36±1.71	6.10±1.62

Notes; letters that are different in the horizontal indicate the distinct average were statistically significant at 95% confidence level.

Mean ± standard deviation

^{a,b,c...} Means with the different letters are significantly different ($p \leq 0.05$). ^{ns} Means are not significantly different ($p > 0.05$).

The Table 2 found that crackers from the recipe 1 were acceptable for their texture the most with the mean score at 6.26. Consequently, the recipe 1 was selected to be a cracker standard recipe to study an appropriate substitution of purple sweet potato flour in the following experiments.

2. Study results of appropriate ratio of purple sweet potato flour in crackers

The test results of sensory evaluation to study ratio of purple sweet potato flour substituted for wheat flour in making crackers are shown in the Table 3.

Table 3

Sensory characteristics of the appropriate quantity of purple sweet potato flour for making crackers products at 25, 50 and 75 percent.

Sensory Characteristics	Purple sweet potato quantity per wheat flour (percent)		
	25	50	75
Appearance ^{ns}	6.52±1.64	7.04±1.52	7.00±1.65
Colour	6.52±1.47 ^b	7.34±1.21 ^a	7.00±1.74 ^{ab}
Odor ^{ns}	6.70±1.47	6.92±1.44	6.36±1.83
Taste	6.60±1.47 ^a	6.76±1.49 ^a	5.88±1.91 ^b
Texture ^{ns} (crispy and crumbly)	6.72±1.37	6.56±1.40	6.68±1.53
Overall ^{ns}	6.70±1.22	7.00±1.34	6.46±1.74

Notes; letters that are different in the horizontal indicate the distinct average were statistically significant at 95% confidence level.

Mean ± standard deviation

^{a,b,c...} Means with the different letters are significantly different ($p \leq 0.05$).

^{ns} Means are not significantly different ($p > 0.05$).

**Figure 3**

Characteristic of purple sweet potato flour

**Figure 4**

Characteristic of crackers made of purple sweet potato flour which has ratio of purple sweet potato flour to wheat flour at 25:75, 50:50, 75:25

The Table 3 found that the crackers made with purple sweet potato flour conducted sensory evaluation on intrinsic characteristics such as color, odor, taste, texture (crispy and crumbly), and the overall liking using the method with the traditional 9-point hedonic scale had different overall liking scores for taste and color of the product with a statistical significance level ($p \leq 0.05$) when the amount of purple sweet potato flour substituted for wheat flour was different. The crackers made from purple sweet potato flour substituted for wheat flour at 50% level gained the most liking scores for taste and color averagely 6.76 and 7.34, followed by the crackers made from purple sweet potato flour substituted for wheat flour at 25% that gained the liking scores for taste and color averagely 6.60 and 6.52. The crackers made from purple sweet potato flour substituted for wheat flour

at 75% gained the least liking scores for taste and color averagely 5.88 and 7.00 respectively. The results from the sensory evaluation conclude that the substitution of purple sweet potato flour at 50% level for wheat flour in crackers gains the most liking scores for taste, color and acceptance.

3. Study results of the amount of anthocyanin in crackers made from purple sweet potato substituted for wheat flour.

From the experiment that crackers made from purple sweet potato flour at 50% level substituted for wheat flour were used to make a cracker standard recipe, the cost was calculated according to the calculation formula seen in the Table 4.

Table 4

The analysis results of anthocyanin of purple sweet potato flour substituted for wheat flour in crackers.

Nutritional value	Quantity	Unit
Cyanidin	1.05	Mg
Peonidin	0.77	Mg
Total Anthocyanin	1.82	Mg

The analysis of the amount of anthocyanins in crackers made from purple sweet potato flour at 50% level found that the amount of anthocyanins was 1.82 milligrams/100 grams.

4. CONCLUSION

The study conducted on 3 basic cracker recipes and tested with sensory evaluation can be concluded that crackers from the recipe 1 were the most acceptable for their texture with a statistical significance level ($p \leq 0.05$).

The sensory evaluation of purple sweet potato flour substituted for wheat flour in all 3 recipes found that testers gave the liking scores to the recipe with purple sweet potato flour at 50% level substituted for wheat flour the most as the liking scores for taste and color were averagely 6.76 and 7.34 respectively because the substitution of too much purple sweet potato flour amount can make darker color and give bitter taste and testers liked them less. The amount of anthocyanin was 1.82 milligrams/100 grams.

Suggestions

1. A study should be conducted on shelf life of crackers made from purple sweet potato flour.
2. A study should be conducted on nutritional values of crackers made from purple sweet potato flour for future research.
3. A study should be conducted on making use of purple sweet potato in other products.

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