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**DEVELOPMENT OF RICE FLOUR BREAD INCORPORATING
HYDROCOLLOIDS AND ASSESMENT OF PROXIMATE AS WELL AS
SENSORIAL QUALITY**

BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment
of B.Sc. in Nutrition and Food Engineering

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APPROVAL

This Project titled “**Development of Rice Flour Bread Incorporating Hydrocolloids and Assessment of Proximate As Well As Sensorial Quality**”, submitted by Shahmir Ullah to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the Partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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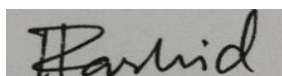
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Md.Harun-Ar-Rashid, Assistant Professor, Department of NFE**, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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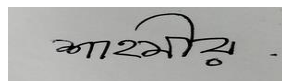
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ABSTRACT

Rice is cultivated in Bangladesh throughout the year. Bangladesh is self-sufficient in term of growing rice. The growing number of celiac disease patients increases the demand of gluten-free goods. As there is no gluten present in rice flour, hydrocolloids such as Carboxymethyl cellulose (CMC), Xanthan gum, Psyllium Husk etc. are used to substitute the gluten. Bangladesh grown sufficient amount of rice every year, therefor the aim of this study was to develop rice flour bread using a combination of different hydrocolloids and analysis of its proximate and sensory quality. Two rice flour bread were developed incorporating different hydrocolloids and named as Sample 1 (CMC + xanthan gum) and Sample 2 (CMC + Psyllium husk). Then analyzed the breads both chemically for proximate composition and hedonic scale for sensorial acceptance. The protein content was 10.7% and 10.1% respectively in sample 1 and sample 2. There was no significant difference in terms of carbohydrate, fat, ash and crude fiber content for both of the samples. Sample 1 contained 1% less moisture compared to sample 2. Participants mostly accepted all the sensory parameter such as color, flavor, taste and texture of sample 1. In terms of overall sensory quality, 63% participants like the sample 1 extremely where only 43% of them extremely liked the sample 2. There was no one who dislikes the bread made with rice flour incorporating different hydrocolloids.

Keywords: Rice flour, Rice flour bread, CMC, Xanthan gum, Sensory analysi

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CHAPTER 1

1. Introduction

Rice is the major food of the people of Bangladesh. About all of the 13 million agricultural households in the nation grow rice. Approximately 10.5 million hectares rice is harvested. Rice meets the nutritional demand of most of the families. As Bangladesh is self-sufficient in term of growing rice it is easy to reduce the dependency from wheat flour if rice grain utilize properly. Wheat is not cultivated in the country so, Bangladesh is depended on other countries. As flour comes from wheat and flour is an essential raw materials of cake biscuits and other bakery item, the proper uses of rice grain as an alternative of wheat flour to produce rice flour and it will be helpful for the country. Wheat flour contains gluten which can cause celiac disease. Celiac disease was a digestive disorder which damages the villi, tiny hair like projections in the small intestine that absorb nutrients [1].

Throughout the world, people regularly eat bread, which is one of the main staple meals [2]. Bread is the most widely used breakfast items in urban and sub-urban areas in Bangladesh. Bread is the main source of food widely consumed and provides more nutrients compared to any other single food source [3] [4].

People with celiac disease cannot tolerate the gliadin fraction in wheat and the prolamins in rye, barley and oats, so they should find alternative ingredients such as rice flour instead of wheat flour [2]. As rice are free from gluten so there is no chance of occurring celiac disease that is a huge benefit. Moreover, rice flour bread provides a good source of minerals, which gives a lot of benefit for human health.

Gluten-free baked goods come in different forms, including pasta, bread, cakes, and cookies. As a result, making high-quality gluten-free bread with rice flour increases rice intake while also enhancing the variety of rice items available to those following a gluten-free diet.

The quality of gluten-free baked goods is also impacted by the usage of a single hydrocolloid type and by the mixture of various hydrocolloids. When beginning the process of creating a gluten-free bakery, the synergy between hydrocolloid becomes a crucial component to take into account [5].

So, rice flour bread will be a great opportunity to use the local resource of country and make bread without using wheat flour. It also reduces the dependency on wheat flour. For implementing a new product like rice flour bread in the market People need to be motivated by proper advertisement about the importance of rice and the variety use of it. The impact of rice flour bread will be huge in near future and the baking industries will be benefited.

1.1 Objective

Bangladesh is self-sufficient in rice production also bread is a popular food in Bangladesh. Therefore the aims of this study are-

- i. To develop rice flour bread incorporating different hydrocolloids as an alternative of wheat gluten.
- ii. To analysis the proximate composition of rice flour bread.
- iii. To evaluate the sensory perception of rice flour bread.

CHAPTER 2

2. Literature Review

Rice is one of the main foods in Bangladesh. People produce a lot of rice every year. People consume it by making cooked rice and also some local food known as pitha in Bangladesh. Rice flour is not used large scale yet to make bakery product like cake, bread, biscuits, bun etc. So using rice flour to make baking item will provide a lot of opportunities in baking industries [5] [6].

Bangladesh has an agricultural economy in which rice is the main crop. Rice is a staple food, reflected in the country's high per capita rice consumption. Rice meets the nutritional needs of the majority of people [8].

The rice production of Bangladesh has increased significantly over the last 40 years, its success has been strong in relation to high-yielding varieties caused by the liberalization of important input markets such as irrigation and fertilizer [7].

Bangladesh has a long history of rice cultivation. Rice is grown all over the country, except in the hilly areas of the southeast. The country's agro climatic conditions are suitable for year-round rice cultivation. Rice is the staple food of about 156 million people Country. Population growth rate is 2 million people per person year. If the population increases at this rate, total Population to reach 238 million by 2050. All rice production is needed to feed this growing crowd population [6] [7].

Rice is not only the main food it's also vital for Bengali's culture, politics, and economic lives. Although a lot has changed in Bengali life over the years, rice hasn't lost any of its elegance. A few significant statistics support this assertion. Half of the nation's protein consumption comes from rice, which accounts for two three - fifths of the nation's overall calorie requirements [9] [6].

Food processing researchers is trying to develop high-quality gluten-free bread. Rice is gluten free so a person who does not tolerate gluten can consume gluten free bread. Celiac disease is a severe genetic autoimmune disorder, caused by a dietary intolerance to gluten proteins found in all wheat types and closely related cereals such as barley and rye [6] [8].

Bread products made from wheat flour are consumed worldwide, but some people are intolerant to prolamins from wheat and related grains oat, rye, and barley. Disease can greatly affect intestinal absorption and lead to severe malnutrition [8].

Rice bread is bread made with rice flour instead of wheat flour. Gluten-free, so no side effects for those with gluten intolerance. Gluten-free bread is very popular with celiac patients who don't like wheat bread. This allowed creating a new image for processing baked goods. The advantage of rice bread is that rice is full of vitamins and minerals. It is an excellent source of manganese, zinc and iron, all of which are essential to a balanced and healthy diet. [6] [9] To fulfill dietary needs, white rice flour is enriched with vitamins and minerals. As rice flour is

gluten-free, those with celiac disease can safely eat it. Because it is simpler to digest and higher in fiber than wheat flour, it is frequently used as a healthier substitute. Rice is included in infant meals and puddings because it has special nutritional, hypoallergenic, colorless, and bland taste qualities. Its importance in creating meals, particularly for people with gluten intolerance, has grown [7].

Bread is considered the most commonly eaten food. Thus producing high quality gluten-free bread made with rice flour is not just a selection of ingredients. It can enrich a variety of rice products as well as for gluten-free nutrition expand rice consumption [1].

Many researchers have tried to develop gluten-free yeast bread. However, many people are highly sensitive to the gliadin fraction of gluten. Wheat-free grain products can also be used in bread. Rice flour is convenient because it does not contain gluten. Low sodium levels and high digestible amounts carbohydrates, make them desirable in the celiac diet [10] [8].

Several studies have examined how these damage starch affect the quality of bread. When rice flour with minimal starch damage (less than 5 g/100 g) was utilized as an ingredient, bread with a high specific volume and good performance on gas retention were achieved. The moderately milled brown rice flour that had been available, according to several researchers, was better suited for making gluten-free bread. [12]Several studies shown that the use of xanthan gum reduced the crumb hardness of freshly baked and stored loaves made with rice flour [12].

Rice is considered as a suitable alternative for wheat anyway in worldwide and hypoallergenic. Therefore, some efforts have been made to make gluten-free rice bread by adding gum or hydroxypropyl methylcellulose (HPMC), which creates a gluten-like polymer network that, improves the rheological properties of rice dough and increases bread volume [11].

Emulsifiers are frequently used for wheat-based bakery goods in addition to hydrocolloids to help in blending and emulsifying ingredients, to improve the characteristics of the shortening, and also to engage with the elements of the flour and other ingredients in the mix for a softer crumb. Emulsifiers can interact and create complexes with starch, protein, shortening, and water depending on their chemical makeup. The protein's strength can be increased and CO₂ retention can be enhanced by an emulsifier's interaction with the protein [14].

Bangladesh has a huge land area to cultivate rice and almost every villagers cultivate rice throughout the season .So utilizing of rice flour to make rice bread is easy in this country as the country has enough resource of raw material [6].

CHAPTER 3

3. Material and Methods

3.1 Material

All of the materials collected from local market and departmental stores to make gluten free rice flour bread. In this study the rice of BRRI dhan-29 have been used. BRRI dhan -29 purchased from the local market of Khagan bazar, Ashulia, Savar.

3.1.1 Ingredients

1. Rice flour (white and brown rice).
2. Sugar.
3. Oil.
4. Egg.
5. Yeast.
6. Potassium Sorbate.
7. CMC.
8. Xanthan gum.
9. Psyllium husk powder.
10. Milk powder.
11. Water.

3.1.2 Equipment's

1. 0.15mm Sieve.
2. Oven.
3. Bowl.
4. Spoon.
5. Bread molder.
6. Measuring balance.
7. Mixer.

3.2 Methods

3.2.1 Preparation of Rice Flour

Rice flour made by mixing of dried grain and wet grain [12]. Short grain rice firstly soaked in water for 1 hour. After soaking the extra water of rice removed and grind it by a hammer mill machine. Rice powders were then dried at 70 degree Celsius for 6 hours [12] and cooled at room temperature. Rice flour were passed through a 0.15 mm sieve, packed in plastic bags and stored at room temperature.

The dry rice grain grind by a hammer mill machine. Then it is also passed by a 150 microns (0.15mm) sieve, packed in plastic bag and store for further uses.

3.2.2 Measurement of Hydrocolloids

In this study every batch of flour sample weight is 200 gram. According to this weight 2% hydrocolloids are used to make rice flour bread with varied amount of CMC and xanthan gum 2:1 also CMC and psyllium husk 2:1 ratios [9].

3.2.3 Production Flowchart of Rice Flour Bread

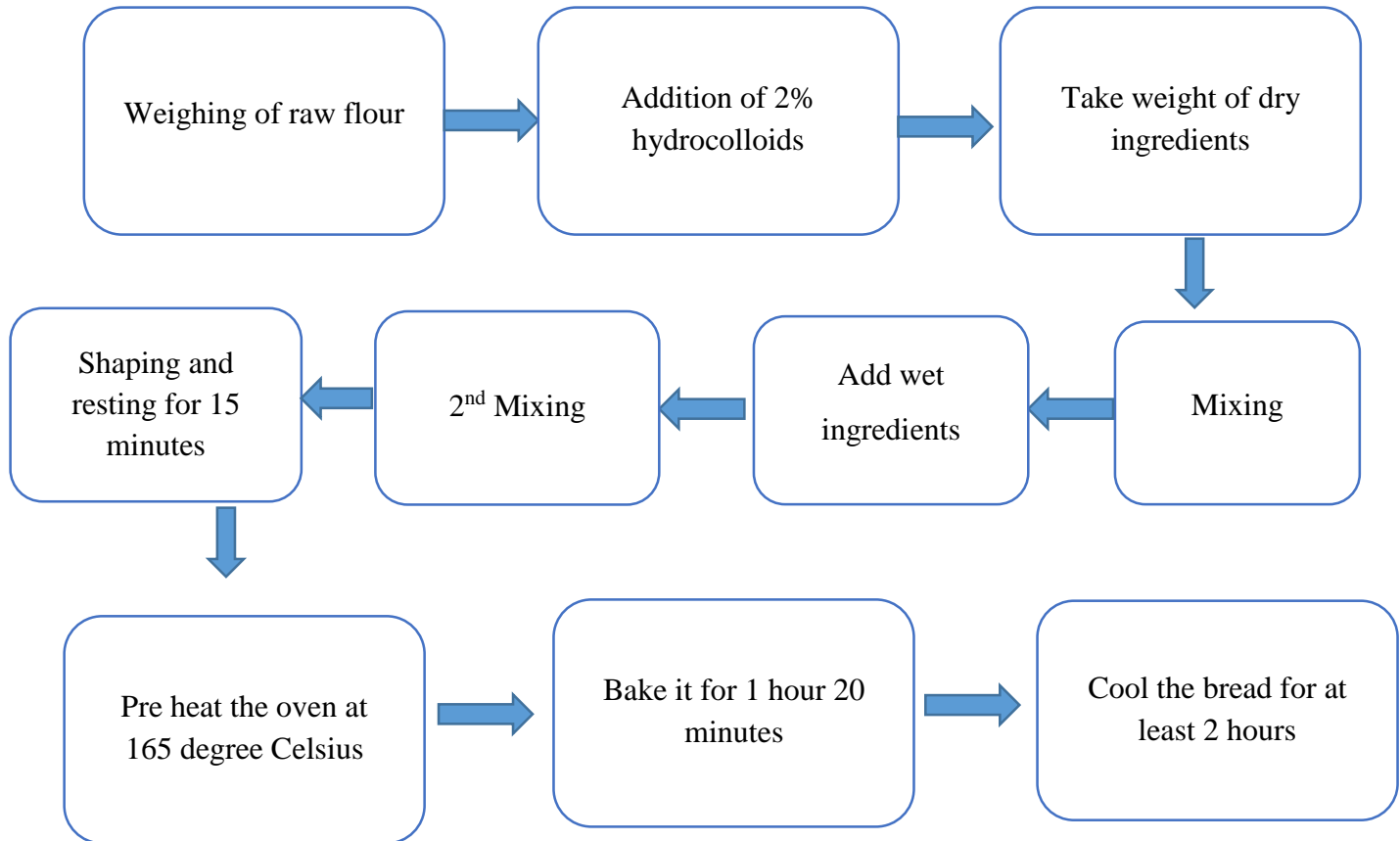


Figure-1: Flow Diagram of Rice Flour Bread Production

3.2.4 Final Product



Figure-2: Bread without Hydrocolloids



Figure-3: Bread with Hydrocolloids

3.2.5 Different Formulation of Rice Bread

Two sample of rice flour bread have been prepared and ingredients ration were as in the Table 1.

Table 1: Different formulation of rice bread

Ingredient	Sample 1(g/ml)	Sample 2(g/ml)
White rice Flour	130 Gram	130 Gram
Parboiled rice flour	40 Gram	40 Gram
Yeast	3.5 Gram	3.5 Gram
Potato starch	25 Gram	25 Gram
sugar	22 Gram	22 Gram
salt	2 Gram	2 Gram
CMC: XANTHAN GUM 2:1	-	(4 gram)
CMC:ISABGUL 2:1	(4 gram)	-
Milk powder	8 Gram	8 Gram
Egg	2 Eggs	2 Eggs
Oil	15 ml	15 ml

3.3 Proximate Analysis of Rice Flour Bread

3.3.1 Determination of Moisture

Sample Weight: 1.2 gram

Apparatus:

1. Moisture Analyzer.
2. Balance.

Procedure

1. Take Weight of the bread Sample.
2. Turn on the Moisture Analyzer And make it reading o
3. Place the sample on Moisture Analyzer.
4. Measure the % of moisture on rice bread at 120 degree Celsius.



Figure-4: Moisture Analyzer

3.3.2 Determination of Fat

Sample Weight: 2.02 gram

Solvent: N-Hexane

Solvent Volume: 250 ml

Apparatus: Soxhlet Apparatus, Filter Paper, Balance Machine, Desiccator, Twister

Procedure:

- Take the weight of empty round bottom flask
- Weight 2.02 gram of sample
- Place 2.02 g of sample and grind by mortar and pestle .place sample in the thimble.
- Place samples in a Soxhlet extractor. Put 250 ml N-hexane in the flask, add several glass boiling beads, and extract for 6 hr.
- After 6 hours take the RBF flask and dry it at 110 degree Celsius and cool in in the desiccator for 20 minute.
- Take the weight of RBF flask after it is properly cooled.



Figure-5: Soxhlet Apparatus

3.3.3 Determination of Ash

Ash defines as the total mineral content of a food product. Minerals are responsible for conducting a lot of function in human body.

Sample Weight: 1.56 gram

Apparatus and equipment

1. Crucible
2. Balance Machine
3. Spatula.
4. Desiccator.
5. Drying oven.
6. Muffle Furnace.



Figure-6: Muffle Furnace

3.3.4 Determination of Protein

Kjeldahl method is an analytical method to estimate protein on food sample.

Apparatus & Chemicals:

1. Digestion mixture (2g $\text{CuSO}_4 + 98\text{g K}_2\text{SO}_4$)
2. H_2SO_4
3. 0.1 N HCL
4. 0.1 N NAOH
5. 40% NAOH
6. Distill water
7. Methyl red indicator.

Procedure (Digestion)

- ✓ Take 0.4 gram sample, 10 ml sulfuric acid and digestion mixture 2 gm.
- ✓ Put it in the digestion flask.
- ✓ Use two digestion flask to take average.
- ✓ Heat slowly and then heat up for 3-4 times.
- ✓ End point will be no white smoke and crystal clear solution.

Distillation

- ✓ Pour the solution in the conical flask & make it volume 100 ml by distill water.
- ✓ Take 10 ml sample from conical flask to distillation flask.
- ✓ Take distill water 150 ml and 40% 10 ml Sodium hydroxide in the distillation flask.
- ✓ Take 50 ml distill water 10 ml 0.1N HCL and 2 drops of methyl red.
- ✓ Use 3 distillation flask for this procedure where one will be blank.

Titration:

- ✓ Fill the burette with 0.1N NAOH.
- ✓ Do the titration 3 times with 3 tapping solution.
- ✓ The endpoint will be pink to light yellow.

Calculation:

Formula for calculating protein % on a sample = $(b-s) \times 1.4 \times 10 \times 5.95 \times .1 / .4$

B = titration reading for blank

S = titration reading for sample.

3.3.5 Determination of Crude Fiber

Crude fiber is a measure of primarily cellulosic material left over from chemical analysis of plant matter in foods.

Apparatus & Equipment's

- Measuring Cylinder.
- Hot plate.
- Hot air oven.
- Conical flask.
- Funnel.
- Crucible.
- Cloth.
- Spatula.

Chemical solution

0.128 M H₂SO₄: 3.49 gram sulfuric acid in 500 ml distill water (Acid solution)

0.313 M NaOH: 6.25 g Sodium Hydroxide (NaOH) pellet in 500 ml distill water (base solution)

Preparation of Sulfuric Acid Solution:

- Take 3.49 ml of sulfuric acid (H₂SO₄), 500 ml distil water and mix well.

Preparation of Sodium Hydroxide Solution:

- Take 6.25 gram of sodium hydroxide (NaOH), 500 ml of distil water and mix well.

Procedure---

1. First, measure 200 ml of sulfuric acid and transfer it to 500 ml conical flask.
2. Take 3 gram of bread sample and mix it to sulfuric acid and boil it for 30 minute
3. After 30 minute filter the sample
4. Wash with hot water to remove acid residue.
5. Take .313m NaOH to wash the filtrate.
6. Now do the same procedure 1,2,3,4 by using NaOH.
7. Collect the filtrate in dry and clean crucible.
8. Dry the crucible in 230 degree Celsius for 2 hours
9. Take out and cool it in desiccator.
10. Take weight of the crucible.
11. Place the crucible inside muffle furnace and burn it at 550 degree Celsius for 2 hours.
12. Take out the crucible from furnace and cool it in the desiccator for 20 minute.
13. Take crucible with ash.

Calculation: % crude fiber in
Ground sample= Loss in weight on ignition

$(W1 - W2) \times 100 / W_s$
 W_s = weight of sample
 $W1$ = weight of crucible with fiber
 $W2$ = weight of crucible with ash

3.3.6 Determination of Total Carbohydrate

The total carbohydrate was calculated by using a subtract Formula

% of total carbohydrate = $100 - (\text{Protein} + \text{Fat} + \text{Ash} + \text{Moisture})$

3.4 Sensory Evaluation of Rice Bread

The method of this test is 9 point hedonic test. 30-assessor selected to conduct sensory analysis of rice flour bread. Two sample of bread provided to each assessor. They taste the sample and give their feedback on texture, taste, color, and flavor. The bread was evaluated by 30 panelists including students.

Procedure

- Thirty panelists were chosen to conduct sensory analysis of the product.
- Both of the samples given to them.
- A data collection sheet provided to them.
- They taste the product and give their feedback by mark up how much they like or dislike the product.

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 Dept. Of Nutrition & Food Engineering
 Sensory Evaluation of XXXXXXXXXX Rice Flour Bread

Name: Md. Reaz Mahamud
 ID : 210002933
 Date: 22.01.23

> Taste this samples and checking how much you like or dislike.
 > Use the appropriate scale to show your attitude by checking at the point that best describe your feelings about the sample.

Preference	Colour	Texture	Flavour	Taste
Like extremely				
like very much	✓	✓	✓	✓
like moderately				
like slightly				
like or dislike				
Dislike slightly				
Dislike very much				

Figure 6: Sensory Evaluation Form

CHAPTER 4

4. Result and Discussion

Two sample bread of rice flour has been developed using different hydrocolloids such as CMC, Gum and Psyllium husk powder. Sample 1 is made using CMC and xanthan gum & sample 2 is made using CMC and psyllium husk powder.

4.1 Proximate Compositions of Rice Flour Bread

The proximate compositions of rice flour breads were analyzed at the food analytical laboratory of NFE. The total protein, carbohydrate, fat, ash, crude fiber and moisture content of two samples are given below in table 2.

Table 2: Proximate compositions of both of the sample of rice flour bread (per 100 g)

Components	SAMPLE 1	SAMPLE 2
Protein	10.67 gm.	10.17gm
Carbohydrate	48.76 gm.	48.18 gm.
Fat	3.53 gm.	3.51 gm.
Ash	1.38 gm.	1.42 gm.
Crude Fiber	1.12 gm.	1.15 gm.
Moisture	35.66 gm.	36.72 gm.

This table shows the overall nutrient content of rice flour bread made by using different hydrocolloids. The protein content was higher in the sample 1 compare to the sample 2 and it was 10.7% and 10.1% respectively. The both sample contained same percentage of fat and it is 3.5%. There was no significant difference in terms of carbohydrate, ash and crude fiber content for both of the samples. Sample 1 contained 1% lees moisture compared to sample 2.

4.2 Sensory Evaluation of Rice Flour Bread

Sensory qualities were evaluated based on color, texture, flavor and taste for both samples and data are presented in the table 3 and 4. To conduct sensory analysis 9 scale hedonic method are choosed. A number of 30 assessors had been participated in the sensory evaluation.

Table 3: Sensory evaluation data for rice flour bread sample 1

Preference	Color	Texture	Flavor	Taste
Like Extremely	17	17	18	14
Like Very Much	7	7	5	8
Like Moderately	4	4	6	6
Like Slightly	2	2	1	2
Like or dislike	0	0	0	0
Dislike Slightly	0	0	0	0
Dislike Moderately	0	0	0	0
Dislike Very Much	0	0	0	0
Dislike Extremely	0	0	0	0

The sensory evaluation data given in table 3 basically represent the preferences of consumers about rice flour bread. Among 30 assessors, 17 people like the color and texture extremely, on the other hand 18 people like the flavor extremely and 14 people extremely like the taste. Similarly 7 people like the color and texture very much whereas more people like the taste of the bread, which is 8 in number. The 3rd Row of the column indicates that same number of people like the color and texture of this bread and 6 people like flavor and taste moderately of the bread, which is slightly high in number. A few number of people like the bread slightly.

Table 4: Sensory evaluation data for rice bread sample 2

Preference	Color	Texture	Flavor	Taste
Like Extremely	13	13	14	8
Like Very Much	7	8	6	9
Like Moderately	6	7	8	11
Like Slightly	4	2	2	2
Like Or Dislike	0	0	0	0
Dislike Slightly	0	0	0	0
Dislike Moderately	0	0	0	0
Dislike Very Much	0	0	0	0
Dislike Extremely	0	0	0	0

The sensory evaluation data displayed in table 4 basically represents the preferences of consumers about rice flour bread. Among 30 assessors, 13 people like the color and texture extremely, on the other hand 14 people like the flavor extremely and 8 people extremely like

the taste. Similarly 7 people like the color, 8 people like the texture, 6 people like the flavor and 9 people like the taste very much. The 3rd Row of the table indicates that only 6 people like the color, 7 people like the texture, 8 people loved the flavor and the highest number of consumer loved the taste of this bread which is 11 in number. Lastly 2 people like the texture and taste of the bread slightly whereas 4 people like the color and a single person love the flavor of this bread.

4.3 Color Comparison of Rice Flour Bread

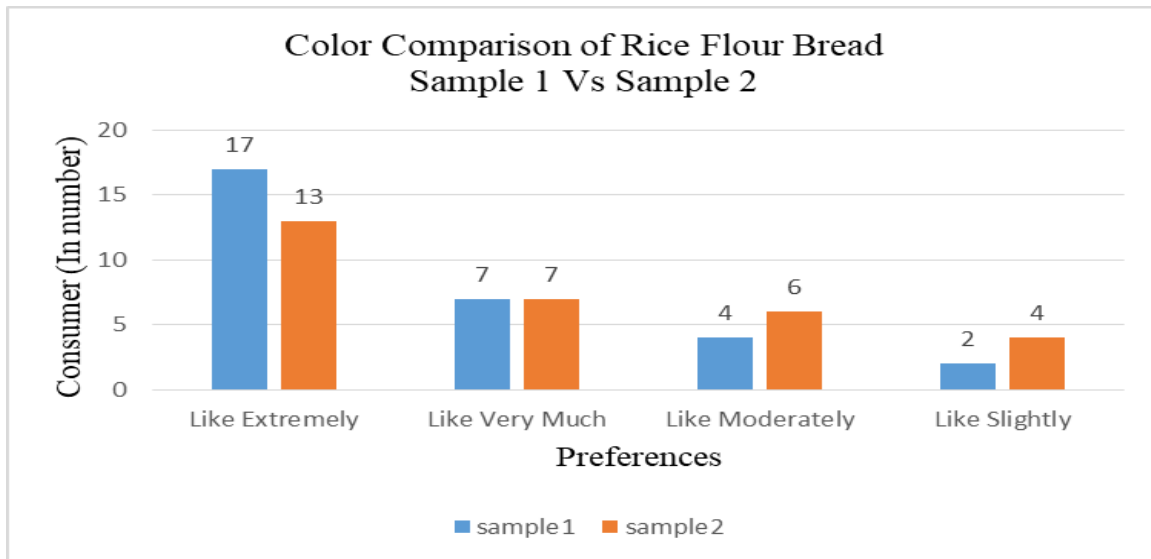


Figure 7: Color Comparison of Rice Flour Bread

Figure 7 showed the color attribute of sample1 vs sample2 of rice flour bread displayed on 9 point hedonic scale. More people love sample 1 compare to sample 2 as the graph shows that 17 people like extremely. 23% participants like both samples color very much. 4 people like the sample 1 and 6 people like the sample 2 moderately. Only 2 people like the first sample slightly which is lower than sample 2.

4.4 Texture Comparison of Rice Flour Bread

Figure 8 shows the texture attribute of sample1 vs sample2 of rice flour bread displayed on 9 point hedonic scale. More people love sample 1 as the graph shows that 17 people like extremely compare to sample 2. A number of 8 people like sample 2 very much which is slightly higher than sample 1. More people like the bread moderately and only 2 people like both of the sample slightly.

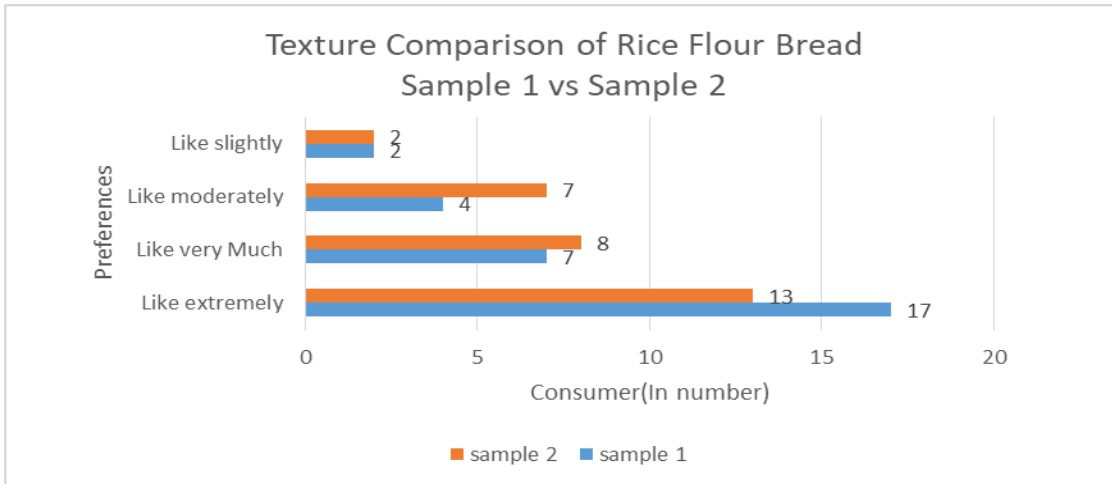


Figure 8: Texture Comparison of Rice Bread

4.5 Flavor Comparison of Rice Flour Bread

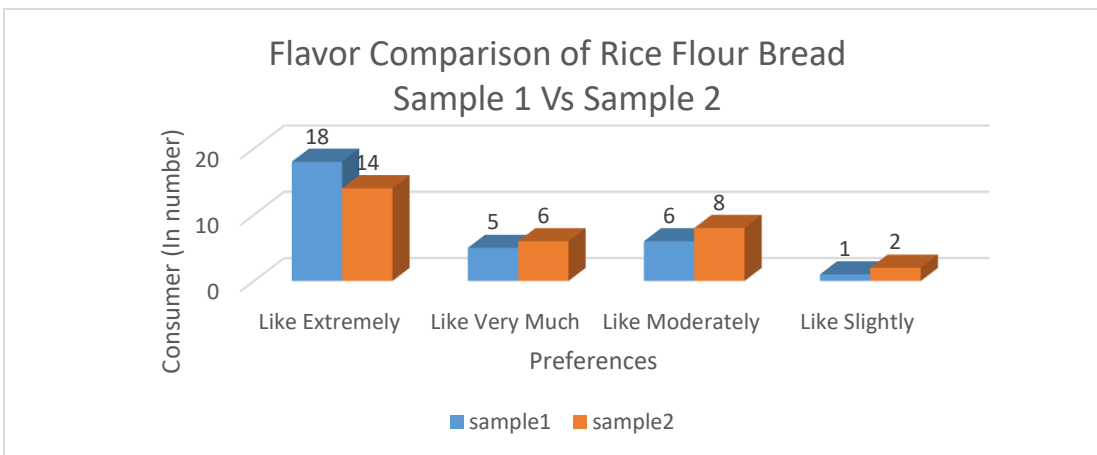


Figure 9: Flavor Comparison of Rice Flour Bread

Figure 9 shows the flavor attribute of sample1 vs sample 2 of rice flour bread displayed on 9 point hedonic scale. Among 30 assessor more people love sample 1 as the graph shows that 18 people like extremely compare to sample 2 .7 people like sample 1 rice flour bread very much which is slightly higher than sample 2. More people like sample 2 moderately compared to sample 1. only 1 people like sample 1 slightly which is lower than sam ple 2.

4.6 Taste Comparison of Rice Flour Bread

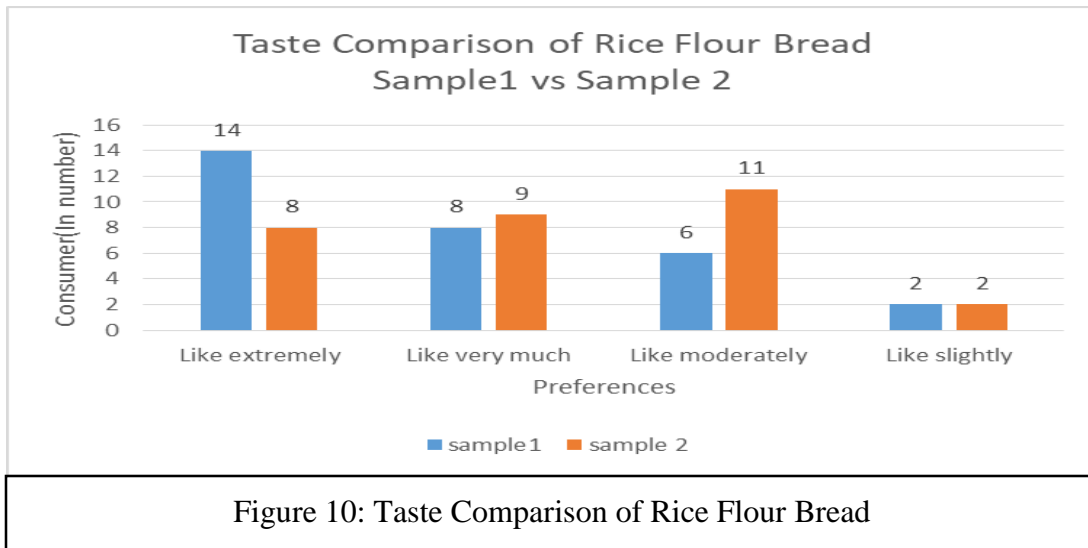


Figure 10: Taste Comparison of Rice Flour Bread

Figure 10 displayed the taste comparison of sample1 vs sample2 of rice flour bread displayed on 9 point hedonic scale. Among 30 assessor more people love sample 1 as the graph shows that 14 people like extremely compare to sample 2 .8 people like sample 1 rice flour bread very much which is slightly lower than sample 2. Most of the people like sample 2 moderately which is 11 in number than sample 1. only 2 people like both of the bread slightly.

4.7 Overall Acceptability of Rice Flour Bread

The overall acceptability of rice flour bread is showed in the figure 11. Form the study it is found that sensory qualities of sample 1 were mostly accepted by the participants. 63% participant like the sample 1 extremely where only 43% of them extremely liked the sample 2. There was no one who dislikes the bread made with rice flour incorporating different hydrocolloids.

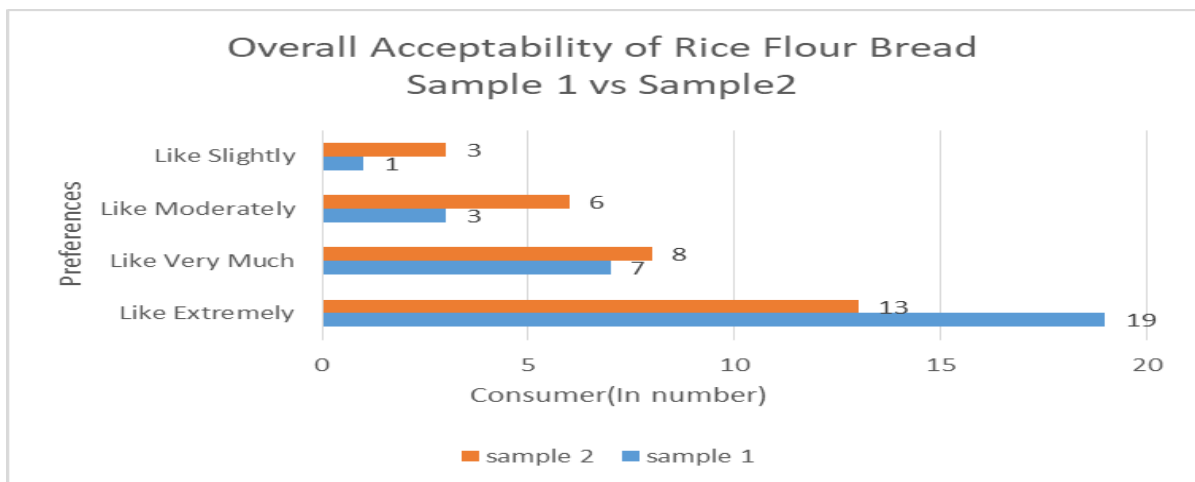


Figure 11: Overall Acceptability of Rice Flour Bread

CHAPTER 5

5. Conclusion

Rice flour bread made of incorporating different hydrocolloids and analyzed both chemically for proximate composition and hedonic scale for sensorial acceptance. There was little difference in protein content as 10.7% and 10.1% respectively. There was no significant difference in terms of carbohydrate, fat, ash and crude fiber content for both of the samples. Sample 1 contained 1% less moisture compared to sample 2. Participants mostly accepted all the sensory parameter such as color, flavor, taste and texture of sample 1. In terms of overall sensory quality, 63% participants like the sample 1 extremely where only 43% of them extremely liked the sample 2. There was no one who dislikes the bread made with rice flour incorporating different hydrocolloids. More study is needed using instrument like colorimeter, texture analyzer etc. for the accurate analysis of sensory quality of rice flour bread.

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