SENSORY EVALUATION AND MOLD GROWTH OBSERVATION OF MILK BREAD (PAN DE LECHE) FROM JARO, ILOILO CITY

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Sensory Evaluation and Mold Growth Observation of Milk Bread (*Pan de leche*) from Jaro, Iloilo City

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ABSTRACT

Bread is recognized as a perishable commodity that can be subjected to a number of changes which lead to the loss of its freshness causing spoilage. Smell, texture, color, taste and mold growth are indicators of bread spoilage and quality. This study aimed to evaluate bread color, smell, texture, and taste, and to determine the number of days until the first appearance mold growth is visible. A glass bread box with a cover was divided into 3 sections for 3 different bread samples, each sample having 21 replicates. The breads were evaluated for sensory characteristics at 0, 24, 48, 96, 120 hour storage intervals using 9- point hedonic scale until the appearance of mold growth was observed. Results showed that Bread A was the first to grow molds while Breads B and C was observed to have mold growth on the sixth day. The texture and smell of Breads B and C deteriorated on the sixth day.

Keywords: molds, bread, spoilage, 9-point hedonic scale

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CHAPTER 1

INTRODUCTION

A. Background of the Study

Bread is the most staple food in the Western world and slowly also adopted by the Eastern world. It is recognized as a perishable commodity, which is at its best when consumed fresh right after it is taken out of the oven. Many people buy and eat bread because bread is quite popular and it does not only have a unique taste but it is also cheap and satisfying. Unfortunately, bread remains truly fresh for only a few hours after it leaves the oven. During storage, it is subjected to a number of changes which lead to the loss of its freshness (Pateras, 2007). Bread loaves fresh out of oven are free of moulds or mould spores due to their thermal inactivation during the baking process. Bread becomes contaminated after baking with the mould spores present in the atmosphere around the loaves during cooling, slicing, packaging and storage processes (Pateras, 2007). Bread spoils easily because of the deterioration of the bread's quality.

Bread texture is one of the factors that affect the staling of the bread. It indicates decreasing consumer acceptance of bread products. Changes which occur in the texture of the crumb are: the crumb becomes harder, tougher as well as more crumbly and opaque. Although a complex series of events occur during staling including changes in the crystallinity of the starch during storage. Bakery products have a very short shelf life and their quality is dependent on the period of time between baking and consumption. During storage, a decrease in bread freshness parallel to an increase in crumb hardness produces a loss of consumer acceptance of bakery products caused by changes in crumb (Arendt and others, 2004).

Color is an important characteristic of cereal-based foods. Together with texture and aroma they contribute to consumer preference. Color is another indication of the extent of the milliard reaction and caramelization. Color depends both on the physicochemical characteristics of raw dough (water content, pH, reducing sugars, and amino acid content) and on the operating conditions during processing) (Hui, Y and others, 2006).

Bread molds are the unappealing greenish-black entity that grows on the bread, making it inedible. These fungi draw nutrients from the bread for their survival and then destroy the bread. Molds produce toxin that affect animals and humans through their toxicological actions. These include inhibition of protein synthesis, mutation of DNA, cancer, severe activation of the immune system and increased production of various cytokines (WellSphere, 2001). When ingested, these would lead to food poisoning and other worst cases like allergies, hypersensitivity, respiratory problems (asthma, wheezing, coughing) and more severe like those of memory loss, depression, anxiety and reproductive problems among others

(Intelligent Life on the Web, 2000).

Molds are relatively slow to develop, so that in dry climates the surface of a sliced-bread may dry before mold growth is sufficient to be visible. In a humid atmosphere, breads wrapped hot from the oven forms droplets of water on the inside surface of the wrapper. When bread is divided into pieces, more susceptible surfaces are exposed to mold infection. Sliced, wrapped bread is more at risk, because the moist, cut surfaces are an ideal substrate for molds to grow on and the packaging prevents moisture loss (Pateras, 2007).

The environment inside a bakery is not sterile because dry ingredients, especially flour, contain mould spores, and flour dust spreads easily through the air. It has been estimated that 1 g of flour contains as many as 8000 mould spores. In some bakeries a similar number of spores settle $1m^2$ of surface every hour. Production operations such as weighing and mixing of ingredients increase the mould count in the air. In larger bakeries where segregation is possible, the flour handling areas are separated from the cooling and packaging area of the finished bread (Pateras, 2007).

People tend to buy breads without checking its freshness and quality. Since commercial breads from small local stores have no expiration date labels, sensory evaluation is necessary. Sensory evaluation had been used to evaluate the quality of different products. In this study the bread samples will be evaluated of its color, texture, smell and taste using a sensory evaluation.

B. Statement of the Problem

This study aimed to evaluate the sensory characteristics of bread in terms of color, texture, smell and taste and determined the number of days until mold growth is visible.

C. Objectives

This study aimed to:

1. Evaluate the bread color from day 0 to day 7.
2. Assess the smell of the bread from day 0 to day 7.
3. Evaluate the texture of bread from day 0 to day 7.
4. Evaluate the taste of the bread from day 0 to day 7.
5. Determine the number of days until the first appearance of mold growth is visible.

D. Significance of the Study

This study is for the community to inform them not all breads bought are freshly baked and are still edible especially those that are bought from "tiangge" which does not have expiry dates. The quality of the bread may be deteriorated but cannot be seen by the consumer's naked eyes and if these were eaten these would lead to food poisoning or other worst cases like allergies, hypersensitivity, respiratory problems (asthma, wheezing, coughing) and more severe like those of memory loss, depression, anxiety and reproductive problems among others (Intelligent Life on the Web, 2000)

E. Scope and Delimitation

In this study, milk bread (pan de leche) was used for evaluation since it is on the top 3 list of mostly bought bread. Milk breads (pan de leche) were bought from the top three stores in Jaro, Iloilo. Sensory evaluation was used because it was used to examine the sensory attributes (color, smell, texture and taste) of the correspondents which were selected randomly. The evaluation was conducted in the function room of the Philippine Science High School Western Visayas Campus.

F. Definition of Terms

Best Before Date–foods are still safe to eat or sell after this date but may have lost some quality but they must not be deteriorated (Zoller, undated)

Crystallinity– made of or like crystal (Free Dictionary... [updated 2011])

Deterioration– to diminish or impair in quality, character, or value (Free Dictionary... [updated 2011])

Hedonic Scale–used in food science, marketing research and tasting panels where the respondents or judges indicate the extent to which they either like or dislike food (Merriam Webster Dictionary)

In this study, hedonic scale was used for the evaluation of the sensory characteristics of bread.

Molds– an often woolly surface growth of fungus especially on damp or decaying organic matter (Encarta dictionary)

In this study molds were observed at the surface of the bread.

Mold Growth– process by which mold grows and multiplies (newsnet5, 2003)

In this study mold growth was observed.

Sensory evaluation– physical examination using all senses (Encarta Dictionary, 2009)

In this study, sensory evaluation was done by the panellist.

Smell– the sense by which odors are perceived; the olfactory sense (Free Dictionary, 2009)

In this study, smell was evaluated by the panellist using the hedonic scale.

Staling– chemical and physical process in bread and other foods that reduces their palatability (Harold, 2004)

Taste–to distinguish the flavor by taking into the mouth (Free Dictionary, 2009)

In this study, taste was evaluated by the panellist using the hedonic scale.

Texture–the appearance and feel of a surface (Webopedia, 2011)

In this study, texture was evaluated by the panellist using the hedonic scale.

Thermal Inactivation– a convenient method for stopping a restriction endonuclease reaction (New Englands Biolabs Inc., 2000)

CHAPTER 2

REVIEW OF RELATED LITERATURE

A. Bread

Bread is called the staff of life. It is one of the most important parts of human diet. A Government survey was conducted to provide the ideas of bread benefits. The results showed that flour and bread provides the consumers more energy value, more protein, more iron, more nicotinic acid and more vitamin B1 compared with any other basic food like cereals. (Botham's Educational Pages)

Bread is rich in carbohydrates. With balanced diet, these carbohydrates can provide 50-55% of the whole calories. Although bread is a staple food, it does not provide all the nutrients needed by a human body. It is rich in fibers especially the integral one (Martima Mineghetti, 2009).

Bread is sometimes defined as any form of baked flour, but as the word is commonly understood it means only those forms of baked flour which contain some leavening substance that produces fermentation. The making of bread has come down through the ages from the simplest methods practiced by the most primitive peoples to the more elaborate processes of the present day (Classic-cooking school, 2002).

A.1 Steps in Baking Bread

Combine 4 cups of unbleached flour, one teaspoon of yeast, and two teaspoons of salt. Pour in one and a half cups of warm water. Water must be warm to enough to activate the yeast. Mash the combination together in the bowl. The contents of the bowl will begin to form rough dough balls. Cover the dough ball with a piece of foil or plastic. The cover must be placed directly on the surface of the ball to prevent the crust from forming on the outside of the exposed dough. Let the dough sit to rest for the next three hours. This will allow the yeast to create the gas bubbles that give bread an airy, light texture. Dust hands with flour before performing the next step, as risen dough can be sticky. Once the dough ball has doubled in size, knead it gently into the form of a smooth-surfaced round ball. Place the ball on an ungreased baking pan. A few thin slits must be sliced in the top of the ball to allow steam to

escape while baking. Preheat the oven to 450 degrees. Place an oven-safe container with about an inch of hot water in the back of the oven. This will give the bread a nice crunchy crust and moist center. Put the dough into the preheated oven for 20 minutes. Then lower the temperature to 350 degrees and bake for another 30 minutes. The bread is done it has a golden-brown appearance all over the top. Tap on the loaf to further test the doneness. It is finished cooking if it has a hollow sound. Remove the bread and place it on the counter to cool. Wait to slice the bread until it has fully cooled because the inside continues to cook after the bread is removed from the oven. (Airman, 2011)

A.2 Bread Fermentation

Fermentation is one of the critical and essential steps in bread baking. It is a process where yeast converts the complex carbohydrates in the bread recipe's flour into simple sugars that it feeds on. With an almost instant action it starts to release carbon dioxide and alcohol, all very important by-products in bread-making (Phillips, 2008).

B. Spoilage

Food spoilage means that the original nutritional value, texture and flavor of the food are damaged, the food becomes harmful to people and unsuitable to eat. Food spoilage means that the original nutritional value, texture and flavor of the food are damaged, the food becomes harmful to people and unsuitable to eat. It can also be defined as " any sensory change" (tactile, visual,olfactory or flavor) which the consumers consider to be unacceptable. There are three types of microorganisms that cause food spoilage---yeasts, bacteria and molds. Yeasts cause fermentation which is the result of yeast metabolism. There are two types of yeasts true and false yeast. True yeast metabolizes sugar producing alcohol and carbon dioxide while false yeast grows as a dry film of food surfaces and occurs on food having high sugar content and high acidity. Bacteria that grows on different variety of conditions.spore-forming and nonspore-forming bacteria causes food spoilage. Bacteria prefer foods having low acid content such as vegetables and meat. And lastly molds grow in filaments forming a tough mass which is visible as mold growth (123foodscience.com). Spoilage of food can be manifested with visible mold growth, gas production, slime, diffusible pigment and enzymes, off- odors and off-flavors (Microbial Food Spoilage).

Mold spoilage of bakery products is a major problem for bakeries thus the use of preservatives has become a well-known mean to prevent spoilage and ensure safety.

C. Molds

Fungi that grow in the form of multicellular filaments called hyphae.[1] In contrast, microscopic fungi that grow as single cells are called yeasts. A connected network of these tubular branching hyphae has multiple, genetically identical nuclei and is considered a single organism, referred to as a colony or in more technical terms a mycelium. Molds do not form a specific taxonomic or phylogenetic grouping, but can be found in the divisions *Zygomycota*, *Deuteromycota* and *Ascomycota*. Some molds cause disease orfood spoilage, others play an important role in biodegradation or in the production of various foods, beverages, antibiotics and enzymes. There are thousands of known species of molds which include opportunistic pathogens, saprotrophs, aquatic species, and thermophiles.[2] Like all fungi, molds derive energy not through photosynthesis but from the organic matter in which they live. Typically, molds secrete hydrolytic enzymes, mainly from the hyphal tips. These enzymes degrade complexbiopolymers such as starch, cellulose and lignin into simpler substances which can be absorbed by the hyphae. In this way, molds play a major role in causing decomposition of organic material, enabling the recycling of nutrients throughout ecosystems. Many molds also secrete mycotoxins which, together with hydrolytic enzymes, inhibit the growth of competing microorganisms. Many molds can begin growing at 4 °C (39 °F), the temperature within a typical refrigerator, or less. When conditions do not enable growth, molds may remain alive in a dormant state depending on the species, within a large range of temperatures before they die. The many different mold species vary enormously in their tolerance to temperature and humidity extremes (EPA, 2010).

Mold growing on the bread can be microscopic fungi belonging to different species like Penicillium, Rhizopus, Aspergillus, Monascus and Fusarum. They are of different shapes and colors depending on the species. *Rhizopus stolonifer* is the most common and fast growing bread mold. It is also known as black mold as it appears dark green or black in color. It causes rotting of some fruits and some infections in humans (Deshpande, 2010)

Bread mold growth rate depends on several factors, temperature being the most important one. It is observed that most molds thrive in temperatures above 70°, and the low temperatures in

the refrigerator are unfavorable for bread mold growth. Putting the bread slice in the freezer will stop the growth of mold completely as the temperatures in the freezer are way below the favorable bread mold growth temperature. As bread mold is a living organism, it requires moisture and oxygen to grow. The moisture trapped in the bag is absorbed by the fungus and it grows at a faster rate. However, as mold is a type of fungi and not a plant, bread mold does not require light for its growth (Deshpande, 2010).

Most fungi like molds are destroyed by baking or boiling, but re-infection occurs readily after the cooked food becomes cool (Spoilage of Bread by Fungi and Bacteria, 2010)

D. Hedonic Scale

The scale has nine points, and these points are given word descriptions raging from "dislike extremely" to "like extremely". Further, the instructions are designed to direct the test subject's attention to his feeling about the food rather than to the food itself. This scale is being used constantly for consumer preference tests in the laboratory and has also been employed in field testing.

The most common hedonic scale is the 9-point hedonic scale. This is also known as the degree of liking scale. This scale has achieved wide popularity since it was first invented in the 1940s at the Food Research Division of Quartermaster Food and Container Institute in Chicago, Illinois. David Peryam coined the name hedonic scale for the 9-point scale used to determine degree of liking for food products. The hedonic scale assumes that consumer preferences exist in a continuum and that preference can be categorized by responses based on likes and dislikes.

E. Shelf Life Based on Mold Growth

Shelf life of selected level of breads was studied by Frazier. The breads were analysed for apparent spoilage by visual observation of mold growth under ambient temperature (room temperature) and refrigerated temperature 4°C conditions. The results showed that under refrigerated conditions, no spoilage was recorded up to the seventh day of storage. Whereas, at room temperature on the fifth day of storage, oat bread and psyllium bread, showed fungal growth. On the sixth day of storage control bread also showed mold growth along with these breads. It was also reported that the loaves made without preservatives spoiled by the fifth day of storage.

F. Sensory Evaluation

Sensory evaluation was defined by the Institute of Food Technologists as "the scientific discipline used to evoke, measure, analyze, and interpret those reactions to characteristics of food and materials as they are perceived through the sense of sight, smell, taste, touch, and hearing." Sensory attributes are the terms or words used to describe sensory perceptions. The major sensory attributes include appearance, odor, taste, flavor, texture and noise. Descriptive sensory attribute information can be obtained from trained panelists while preference information can be obtained from specially recruited and qualified consumers (Park, 1997).

G. Flour

Straight flour contains the darker parts of the grain as well as the white interior. Patent flour made from hard wheat is a strong flour of excellent quality and light, creamy color. Clear flour is darker in color and higher in protein. Cake flour is made from soft wheat. It has a very soft, smooth texture and a pure white color. Pastry flour has creamy white color (Gisslen, 2000). Pastry flour has a more off-white color (Alfaro, 2008)

A good bread flour contains a large percentage of gluten, is creamy in color and granular in touch (Characteristics of Good Flour, 2010)

H. Related Studies

Studies of Pateras showed that bread becomes contaminated after baking with the mould spores present in the atmosphere around the loaves during cooling, slicing, packaging and storage processes. During storage, bread is subjected to a number of changes which lead to the loss of its freshness.

CHAPTER 3

METHODOLOGY

A. Overview of the Study

This study was conducted to evaluate the sensory characteristics (color, texture, smell and taste) and to determine the number of days until mold growth is visible in the surface of the bread. The samples were purchased from the 3 bakeries in Jaro, Iloilo City. The bread samples were evaluated from the day of purchased until the first appearance of mold growth.

B. Materials and Equipment

Ziploc bag	Wax Paper
Cloth	Box of tissue
Table	Bread Box
Lysol	Bread Knife
Food gloves	

C. Survey of Sampling

The top three stores in the Jaro Big Market were surveyed on what kind of bread is the 3rd fastest selling bread.

D. Bread preparation

D.1 Bread Collection

Two of the bread samples were purchased from the main manufacturer of the bread sold in Jaro Big Market and the other sample was purchased from the store that supplies most of the Philippine Science High School dormers.

D.2 Transport

The bread samples in its original plastic package were transported to Philippine Science High School-Western Visayas Campus. A conscious effort was made to make sure that no

external moisture would enter the packages and the bread samples would not be exposed to direct heat.

D.3 Bread Storage

The glass bread box with a cover was divided into three sections for three different samples. Each sample had twenty one replicates. The bread samples were placed in a Ziploc bag, 6 1/2in x 5 7/8in / 16.5cm x 14.9cm in dimension. The Ziploc bags were stored in the storage box measuring 40 inches in length, 16 inches in width and 16 inches in height. The storage box was kept in a clean environment, away from stray animals and people and was placed on a disinfected table disinfected with Lysol, in room temperature and without direct sunlight. There were 3 replicates for each trial of different brands of bread per day.

E. Selection of Panellists

Twenty volunteers were chosen from the following categories: faculty members, coop personnel and scholars from each batch. A pre-screening test was done by giving out questionnaires wherein ten panelists were chosen for sensory evaluation. Ten qualified volunteers were chosen and have evaluated the bread samples. The group of evaluators was composed of Seniors of Batch 2011 and Philippine Science High School Cooperative staff.

F. Questionnaire Used to Choose Panellists

Name: _____ Date:_____

Address:_____

Phone #/Cell phone #: _____

Please read each of the following items and indicate your response by circling an answer or filling in a blank. Your response will be confidential and will not be used in any manner that could identify you.

1. Gender
   A. Male B. Female

2. Age: _____
3. Occupation
   A. Undergraduate Student
   B. Graduate student
   C. Faculty
   D. Staff
   E. Other (Please specify)
4. Interest in sensory evaluation of food is essential for learning and good performance. Are you interested in participating in this sensory evaluation of food project?
   A. Yes B. No
5. Availability is essential throughout a sensory evaluation project. Will you participate in all the sessions scheduled for the project?
   A. Yes B. No
6. Promptness at each session is essential to maintain integrity of food samples and experimental design. Will you arrive on time for each session?
   A. Yes B. No
7. Panelists should be in generally good health, with no condition, such as allergies to test materials, which would impair their ability to make reliable judgments. Are you in generally good health?
   A. Yes B. No
8. Do you have an allergy to specific food product?
   A. Yes B. No
9. Are you taking medication which might influence your sensitivity to taste or smell?
   B. Yes B. No
10. Are you color-blind?
11. Yes B. No
12. How many cigarettes do you usually smoke each day?

13. Attitude about the food product class in the sensory study should be such that panelists are willing to taste all test products as part of their learning experience. Are you willing to taste bread samples?
    Yes B. No
14. Can you be objective about evaluating bread samples?
    A. Yes B. No
15. Do you like bread?
    B. Yes B. No
16. Sensitivity to taste and smell is affected by food and beverage consumption; therefore will you please not eat or drink anything except water for one hour before each test session?
    A. Yes B. No
17. Have you served as a sensory panelist before?
    A. No B. Yes (Please specify.)_____

G. Mold Growth Observation

A daily observation of any mold growth was done every twenty four hours. Observations of the types of mold present noting the color and appearance of the molds were made.

H. Sensory Evaluation

The texture and odor analysis were evaluated by the panelist using the 9- point hedonic scale and each was given a score sheet. The color and taste were evaluated by the panelists using a table which contains range of colors and tastes. The breads were evaluated for sensory characteristics at 0, 24, 48, 96, 120 hour storage intervals until the appearance of mold growth was observed.

Scores were defined as follows:

Table 1. Sensory Evaluation Scores from 9-1.

9-like extremely	6-like slightly	3-dislike moderately
8-like very much	5-neither like nor dislike	2-dislike very much
7-like moderately	4-dislike slightly	1-dislike extremely

Table 2. List of Colors of Bread

___White	___Light Brown
___Off-white	___Medium Brown
___Grayish White	___Brown
___Grayish Cream	___Golden Brown
___Light Yellow	___Deep Brown
___Golden	___Dark Brown

Table 3. List of Tastes of Bread

___Milky	___Sour	___Sharp
___Creamy	___Buttery	___Wheaty
___Sweet	___Salty	___Bland

The evaluation of the bread color was only from the bread's crust and the inner portion of the bread. The bread evaluation for taste lasted until mold growth was visible.

CHAPTER 4

RESULTS AND DISCUSSION

This study aimed to evaluate the smell, color, texture and taste of milk bread (pan de leche) and determined the number of days until mold growth is visible in the surface of the bread. The bread samples were bought from three different stores in Jaro, Iloilo City. The bread's smell, taste, texture and color were assessed by ten panellist from the day zero until mold growth is noticeable.

There were 3 samples of milk bread (pan de leche) having 21 replicates per sample. The bread samples were randomly assigned as samples A, B and C. In every evaluation session 3 replicates per sample were evaluated by the panellist.

A. **Results**

Table 4. Mold Growth and Sensory evaluation of bread from day 0 to day 7

Bread Samples	Mold Growth Number of Days	Color	Smell	Texture	Taste
A	2 days	White to Off-white	Slightly Liked	Like slightly	Bland Sweet
B	6 days	Off-white	Slightly Liked	Like slightly	Milky Creamy
C	6 days	Light yellow	Moderately Liked	Dislike slightly	Milky Wheaty

The table above shows the data that were gathered for 7 days. Mold growth was observed on bread A after 2 days. Bread A was the nearest to white color. Bread C smelled like butter and had the most preferred smell by the panel. Bread C had a granular texture unlike the soft texture of Breads A and B. Bread B had the nearest taste to milk. On the sixth day Breads B and C became tough and the smell became unpleasant.

B. Discussion

This study described the sensory evaluation and mold growth determination of milk bread (pan de leche).

Based on the results, bread A was observed with mold growth after 2 days of evaluation. This is influenced by temperature, package protection, processing conditions and ingredient quality (Sewald and Devries, 2002). Samples B and C were observed of mold growth after 6 days which is in the range of 7 days which is the maximum shelf life of bread products. Mold growth is the most important indicator of bread spoilage.

The result of the study showed that the color of the Breads A and B were mostly off-white and white which indicates that the flour used for baking has a high gluten content which indicates that the flour used has an excellent quality. The color of bread crumb depends on a number of factors, the most important of which are the color of flour from which the bread has been produced (Pomeranz, 1960). Color depends on the grade of flour used, over-extended fermentation period and badly over-ripe dough. Flour color had a direct effect on crumb color and combines with crumb structure to influence crumb "brightness" (Lallemand Baking Update Vol. 1, Number 17). Sugar adds flavour and rich brown color to bread's crust. Eggs add food value, color and flavour to breads. They also help make the crumb fine and crust tender (Bread Baking 101, 2000). Among the flours that give white color bread are straight, pastry, clear, cake and patent flour (Gisslen, 2000).

Bread C smelled like butter and was most preferred by the panel. Some aromas are created by alcohol production, others are obtained from organic acids, and still others are created by the secondary reactions that take place during fermentation. Ingredients added to improve taste such as egg, butter, salt and sugar can affect the smell of the bread.

The texture of Breads A and B were slightly liked by the panellists. They had soft texture. In the study of Salehifar and Shahedi, breads baked with more oat flour had a longer shelf life, softer texture and bitter taste. The amount of flour affects the texture and the crumb the most (Wikipedia). The bread can easily be chewed if the bread has undergone the process of leavening (rising of dough) and exposure to increased temperature can make the dough bigger (Aboaba and Obakpolor, 2009). Strong flours which have high gluten content result on superior dough handling properties, but result in unsatisfactory crumb texture and separation quality. The softer the wheat the harder and less flexible the final product (Mueen-

Ud-Ud, 2009). High gluten flours are strong because of high protein content (The prepared pantry 2011). Fats affect texture by forming structures of crystalline networks and by disruption of structure by interfering with non-fat networks (Texture in food, Brian McKenna 2003). It is referred to as a shortening because it shortens the gluten strands. It does so by lubricating the fibers so they cannot stick together. The more shortening in the dough, the more tender and less chewy the product will be (The prepared pantry 2011). The texture of the crumb becomes firmer and drier, while the texture of the crust becomes soft and leathery (Lallemand Baking Update, Volume 2/ Number 6). When the flour has high gluten content, the bread becomes elastic hence, making it harder to chew.

Breads B and C had a milky taste. Milk contributes to the texture, flavour and nutritional value, keeping quality and crust color of goods (Gisslen, 2000). During storage the flavour of bread diminishes and changes as some of the flavour components are lost faster than others. Sweet and salty tastes decrease with time, and the remaining sourness starts to become unpleasant. (Lallemand Baking Update, Volume 2/ Number 6). Other ingredients such as sugar, egg, salt and butter may affect the taste of the bread.

Bread A had mold growth after 2 days from the day of purchase. Spoilage by these causes is most likely to occur in hot and humid weather. The spoilage may happen in two days. Bakers, and all other people who handle food for sale distribution, should understand how fungi and bacteria are transferred and spread (Spoilage of Bread by Fungi and Bacteria, 2010). But bread is bests stored at room temperature for 2-3 days and not in refrigerator because it hastens staling and the bread dries out (Baking 911…[updated 2008]). Mold grows on bread within two to seven days, depending on the environmental conditions and ingredients of the bread. Bread is best used immediately or frozen (eHow…[updated 2011]). It was stated by the store that the breads were fresh but the date that they were baked was not stated.

CHAPTER 5

SUMMARY, CONCLUSION, RECOMMENDATION

This study evaluated the sensory characteristics of bread. The characteristics evaluated were smell, color, texture and taste of milk bread (pan de leche). The number of days until mold growth is visible in the surface of the bread was also determined.

A. Summary of Findings

After a week of study we have obtain this data:

The initial characteristics of bread differed as time went by.

1. The color of the bread remained the same before the growth of molds.
2. The smell of the bread remained the same before the growth of molds.
3. The texture of the bread remained the same before the growth of molds.
4. The taste of the bread remained the same before the growth of molds.
5. Deterioration of bread A was the fastest among three bread samples from the day of purchased as it showed mold growth on the second day. Bread samples B and C showed mold growth on the sixth day. This result agrees with the usual bread storage period of two to three days. The bread samples with molds were not further evaluated due to the health conditions they may bring about.

B. Conclusion

Bread A can be eaten up to two days while Breads B and C can be consumed up to sixth day although the bread has already deteriorated in texture and smell. The three bread samples A, B and C's sensory characteristics like color, smell, texture and taste remained the same before mold growth.

C .Recommendations

1. The samples should be ensured fresh.

2. The bread samples to be baked by the researchers.
3. Bread samples to be gathered from other places.

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APPENDIX A

RAW DATA

Color

	Sample A	Sample B	Sample C
Panellist 1	Off-white		Light Yellow
Panellist 2	White	Off-white	Golden
Panellist 3	White	Off-white	Light Yellow
Panellist 4	Off-white,golden brown	Off-white, deep brown	Light yellow, light brown
Panellist 5	White	Off-white	Light Yellow
Panellist 6	Off-white	Off=white	Light Yellow
Panellist 7	Off-white	Off-white	Light Yellow
Panellist 8	White	Golden	Golden Brown
Panellist 9	Light brown	Medium brown	Light Yellow
Panellists 10	Off-White	Off-White	

Smell

	Sample A	Sample B	Sample C
Panellist 1	Like moderately	Like slightly	Like slightly
Panellist 2	Like moderately	Like moderately	Like slightly
Panellist 3	Like slightly	Like moderately	Neither like nor dislike
Panellist 4	Like slightly	Like slightly	Dislike slightly
Panellist 5	Like moderately	Like slightly	Like slightly
Panellist 6	Like moderately	Like moderately	Like slightly
Panellist 7	Like moderately	Like moderately	Like slightly
Panellist 8	Dislike slightly	Like moderately	Dislike very much
Panellist 9	Like sligthly	Neither like nor dislike	Like sligthly
Panellist 10	Like moderately	Like sligthly	Like sligthly

Texture

	Sample A	Sample B	Sample C
Panelist 1	Like slightly	Like moderately	Dislike slightly
Panelist 2	Like slightly	Like very much	Dislike slightly
Panelist 3	Like slightly	Like moderately	Dislike slightly
Panelist 4	Dislike slightly	Dislike Slightly	Dislike moderately
Panelist 5	Like moderately	Like slightly	Like moderately
Panelist 6	Like slightly	Dislike slightly	Dislike slightly
Panelist 7	Like moderately	Like moderately	Dislike slightly
Panelist 8	Like slightly	Dislike moderately	Like very much
Panelist 9	Like slightly	Like slightly	Like slightly
Panelist 10	Like moderately	Like slightly	Dislike slightly

Taste

	Sample A	Sample B	Sample C
Panelist 1	Wheaty	Wheaty	sweet
Panelist 2	Sweet	Wheaty	Wheaty
Panelist 3	Creamy	Milky	Wheaty
Panelist 4	Bland	Milky	Bland
Panelist 5	Milky	Creamy	Wheaty
Panelist 6	Bland	Bland	Sweet
Panelist 7	Bland	Creamy	Milky
Panelist 8	Creamy	Sweet	Milky
Panelist 9	Salty	Buttery	Salty
Panelist 10	Bland	Milky	Milky

APPENDIX B

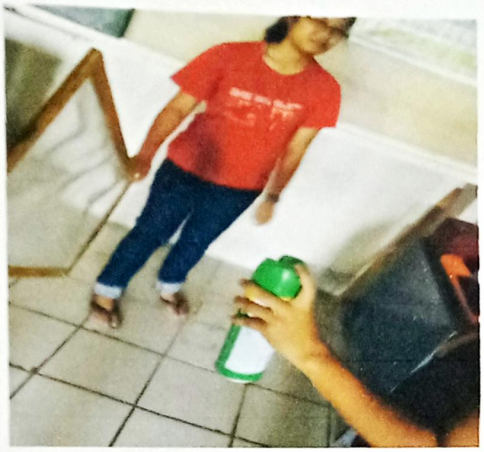

Plate 1. Disinfecting the cover of the storage box with Lysol.

Plate 2. The bread storage box used in the conduct of the study.

Plate 3. Bread transferred from the store package to individual Ziploc bags.

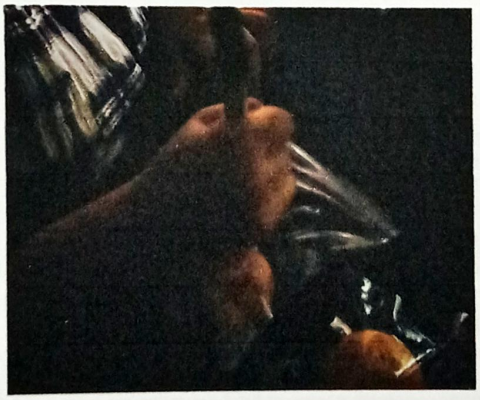

Plate 4. Bread labelled with sample codes.

Plate 5. Coded bread placed inside the breadbox for storage.

Plate 7. Sample Bread C in bad condition with moulds on the 7th day.

Plate 8. Sample Bread B in bad condition with moulds on the 7th day

\Plate 9. Sample Bread A on the second day.

APPENDIX C

Questionnaire

Name: _____ Date: _____

Address: _____

Phone #/Cell phone #: _____

Please read each of the following items and indicate your response by circling an answer or filling in a blank. Your response will be confidential and will not be used in any manner that could identify you.

1. Gender
   A. Male B. Female

2. Age: _____
3. Occupation
   A. Undergraduate Student
   B. Graduate student
   C. Faculty
   D. Staff
   E. Other (Please specify)
4. Interest in sensory evaluation of food is essential for learning and good performance. Are you interested in participating in this sensory evaluation of food project?
   A. Yes B. No
5. Availability is essential throughout a sensory evaluation project. Will you participate in all the sessions scheduled for the project?
   A. Yes B. No
6. Promptness at each session is essential to maintain integrity of food samples and experimental design. Will you arrive on time for each session?
   A. Yes B. No
7. Panelists should be in generally good health, with no condition, such as allergies to test materials, which would impair their ability to make reliable judgments. Are you in generally good health?
   A. Yes B. No
8. Do you have an allergy to specific food product?
   A. Yes B. No
9. Are you taking medication which might influence your sensitivity to taste or smell?
   A. Yes B. No
10. Are you color-blind?
    A. Yes B. No
11. How many cigarettes do you usually smoke each day?

12. Attitude about the food product class in the sensory study should be such that panelists are willing to taste all test products as part of their learning experience. Are you willing to taste bread samples?
    A. Yes B. No
13. Can you be objective about evaluating bread samples?
    A. Yes B. No
14. Do you like bread?
    A. Yes B. No
16. Sensitivity to taste and smell is affected by food and beverage consumption; therefore will you please not eat or drink anything except water for one hour before each test session?
    A. Yes B. No
17. Have you served as a sensory panelist before?
    A. No B. Yes (Please specify.)_____