

T H E S I S

ON

BREAD AND BREAD MAKING

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BREAD AND BREAD MAKING

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BREAD AND BREAD MAKING

~~Intro-~~ The art of bread making has been handed down from one generation to another for centuries, with gradual improvement until at the present time we have mastered what we consider a perfect method. The aboriginal savages did not use a leavening agent by which bread can be made light. They were content to simply mix flour with water, and when the dough was of sufficient stiffness, to bake it in a crude oven made of clay. The flour was not prepared in the elaborate manner it is today, but was prepared by simply crushing the grain between stones.

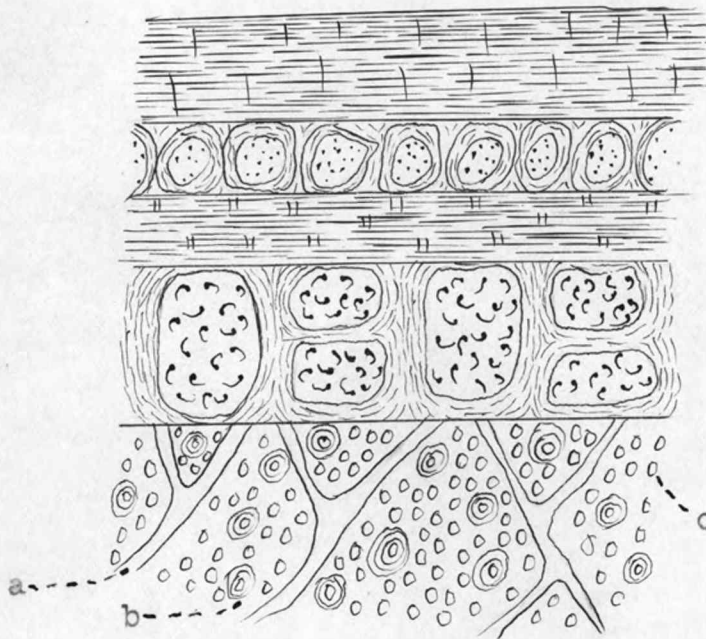
From the days of the savages the methods of bread making gradually developed with the advance of civilization until today it has reached its important place in domestic art. However the old-fashioned method of baking bread in a brick oven is still used on a large scale in England. Another antiquated baking process still used in remote localities is by the Dutch oven which consists of an iron pot with a cover and it is kept hot above and below by hot coals.

The method of making and baking bread has so improved that at the present time it is thought necessary to know how to make and use a proper leavening agents; how to carefully prepare the dough; the proper temperature to be used for rising and baking; the physical and chemical changes which take place; and most of all the food value of the various kinds of bread.

Grains Best All grains used for bread making be-
Adapted to long to the order of Glumiflorae and to
Bread Making the great family of grasses Graminae.

Wheat occupies the most important place among them by virtue of its gluten content which especially adapts it for the purpose. Rye, corn and oats are also used but in smaller quantities, and all except rye are mixed with wheat flour to secure a dough of the proper consistency.

Wheat Grain



(a) honeycomb (b) starch grains (c) particles
Of gluten



Bran

Endosperm

Germ

Structure of Wheat Kernel The wheat kernel is a small oval seed. Its six outer layers are known as bran. Of these, the three outermost form what is known as the skin of the grain and constitutes the three percent of the weight of the entire seed. The three remaining layers of the bran form the envelope of the seed proper. The outer one is known as the testa, and contains the greater part of the coloring matter of the bran. Inside it lies a thin layer of membrane. These two form two percent of the entire weight of the grain. The inner layer of the bran, called the cereal layer, is made up of rectangular cells filled with a nitrogenous substance known as cerealine. Its weight is about eight percent of whole weight of the grain, making the entire weight of the bran about thirteen percent. In milling it is very difficult to separate these three layers of the bran.

Within the cerealine lies the endosperm, as the portion of the grain adjacent to the embryo is called, which constitutes the larger portion of the grain and consists of irregular shaped cells containing starch granules, while at the lower end of the grain, almost surrounded by the endosperm, lies the germ or embryo. A portion of the embryo is called the scutellum. This serves a special purpose in germination. When the grain has thoroughly ripened and has been placed in favorable conditions, this embryo will develop into a new plant; as it begins to grow it will feed upon the starch and other substances in the endosperm.

Composition The five outer layers of the grain contain very little except cellulose, a woody, fibrous substance forming the cell walls. When burned the ash of bran is found to contain a fairly large proportion of phosphoric acid, potash, and small amounts of other mineral matter. The cereal is richest in nitrogenous substances, the chief of which is cerealine, from which it takes its name. The endosperm contains, besides the cellulose of the cell walls, a large quantity of starch, a little sugar, and a nitrogenous matter known as gluten. The germ contains cellulose, nitrogenous substances, sugar, and a very large percent of fat.

Kinds of Wheat There are two general classes of wheat, Spring Wheat and Winter Wheat, although wheats Most Used are characterized only as hard or soft, depending upon the physical properties. The and winter wheats are, as a rule, more soft and Their Advantages starchy than spring wheats, which are usually flinty to different degrees. However, there is a tendency for wheats to become either starchy or glutinous owing to inherited individuality of the seed and

to environment. Wheats of low protein content do not make high grade flour; neither do wheats of the maximum protein content necessarily make the best flour.

Composition of Wheat Flour

Water	12.00%
Potash	
Soda	
Lime	
Magnesia	
Ash	2.25
Phosphoric Anhydrid	
Sulphuric Anhydrid	
Other Substances	

Albumin . . 4%	
Globulin . . .9	
Gliadin . . 6.	Protein13.
Glutenin . 5.3	
Other proteids 4	

Other nitrogenous bodies, as amids,lecethin,	.25
Crude fat, ether extract	2.25
Cellulose	2.25
Starch	66.
Sucrose, dextrose, soluble carbo-hydrates .	2.

Manufacture of Flour Flours vary in composition, food value, and bread-making qualities with the character of the wheat and the process of milling employed. Prior to 1870, practically all flour was prepared by grinding the wheat between mill stones, but with the introduction of the roller process, steel rolls have been substituted for mill stones. By the former process a smaller amount of flour was secured from the wheat, but with the present improved system about seventy five percent of the weight of the grain is recovered as flour and twenty five percent as wheat offals, bran and shorts.

The wheat is first screened and cleaned, then passed on to the corrugated rolls, or the first break, where it is partially flattened and slightly crushed, and a small amount of flour, known as break flour, is separated by means of sieves, while the main portion is conveyed through elevators to the second break, where the kernels are more completely flattened and the granular flour particles are partially separated from the bran. The material passes over several rolls or breaks, each succeeding pair being set a little closer together. This

is called the gradual reduction process, because the wheat is not made into flour in one operation. A more complete removal of the bran and other impurities from the middlings is effected by means of sieves, aspirators, and other devices, and the purified middlings are then passed on into smooth rolls, where the granulation is completed.

The flour finally passes through silk bolting cloths containing many meshes per square inch, where dust and fine particles of debris are removed. The granulation of the middlings is done after the impurities are removed, the object being first to separate as perfectly as possible the middlings from the branny portions of the kernel.

Flour milling is a mechanical process; The flour stock passes from roll to roll by means of elevators. According to the number of reductions which the middlings and stock undergo, the process is designated as a long or short reduction system. The term 4, 6, 8, or 10 break process indicates that the stock has been subjected to that number of reductions. With an 8-break system of milling, the process is more gradual than with an a 4-break system, and greater opportunity is afforded for complete removal of bran.

Liquids The next step for consideration is the kinds Used in of liquids used in bread making. These are Bread water, milk, or a mixture of the two. However Making if milk is used, we have in addition to the food products contained in the flour those also contained in the milk. Another point to be considered in connection with the liquids is that they should be sterile, the water being heated to the boiling point and then cooled to luke warm. However, if milk is used, it should not be boiled, as this renders the materials hard to digest, impairing the flavor as well.

Leavening There are various methods by which bread is Materials raised and thereby made light; among these the chief ones are by the use of yeast, Sodium Bicarbonate and molasses, and Baking Powder.

Yeast The yeast most commonly used in bread making and its is compressed yeast, a product of distilleries. Preparation The yeast floating on the surface of the wort tion is skimmed off and that remaining allowed to settle to the bottom, and is obtained by running the wort into shallow tanks. It is then washed in cold water, and the impurities are removed, either by sieving through silk or wine sieves, or by precipitation

The yeast is then pressed and cut into cakes, and wrapped in tinfoil.

Dry yeast is made by mixing starch or meal with fresh yeast until a stiff dough is formed. This is then dried, either at a moderate temperature or in the sun, and cut into cakes. By drying, many of the yeast cells are rendered inactive, and so it is slower acting leaven than the compressed yeast.

The Preparation and Baking of Bread	The process of making raised bread consists of mixing the flour and water in proper proportions for a stiff dough, together with some salt and seasoning, and yeast or leavening agent. The moistened gluten of the flour forms a viscid, elastic, tenacious mass, which is thoroughly kneaded to distribute the yeast. The dough is then set in a warm place and the yeast begins to grow or work causing alcoholic fermentation with the production of carbon dioxide gas, which expands the dough, thus rendering it porous. After the yeast has grown sufficiently the dough is baked in a hot oven where further fermentation is stopped, because of the destruction of the yeast, by heat, which also causes the gas to expand the loaf and in addition generates steam. The gas and steam escape into the oven. At the same time the gluten of the dough is hardened by the heat, and the mass remains porous and light. While the outer surface is darkened and formed into a crust.
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Chemical and Physical Changes Which Occur During Bread Baking	In Bread baking complex chemical, physical, and biological changes occur. Each chemical compound of the flour undergoes some change during the process. The most important changes are as follows: 1. Production of carbon dioxide gas, alcohol and soluble carbohydrates as the result of fermentation. 2. Partial rupturing of the starch grains and fermentation of a small amount of soluble carbohydrates due to the action of heat. 3. Production of lactic and other organic acids. 4. Formation of volatile carbon compounds, other than alcohol and carbon dioxide. 5. Change in the solubility of the proteins, due to the action of the heat, as coagulation of the albumin and globulin. 6. Changes in the solubility of the gluten proteins due to the action of the organic acids and fermentation. 7. Formation and liberation of a small amount of volatile, nitrogenous compounds, as ammonia and amides.
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8. Partial oxidation of the fats.

The Action of Wheat Proteids in Bread Making Gluten is an ingredient of the flour on which its bread making properties largely depend. The important thing, however, is not entirely the quantity of the gluten, but more particularly its character; as two flours may contain the same amount of carbohydrates and protein compounds, when converted into bread by the same process, may produce bread of entirely different physical characteristics because of differences in the nature of the gluten of the flour.

Gluten is composed of two bodies called gliadin and glutenin, a sort of plant gelatin is the material which binds the flour particles together to form the dough, thus giving it tenacity and adhesiveness; and the gluten is the material to which the gliadin adheres. If there is an excess of gliadin, the dough is soft and sticky, while if there is a deficiency, it lacks expansive power. Many flours containing a large amount of gluten and total proteid material and possessing a high nutritive value, do not yield bread of the best quality, because of an imperfect blending of the gliadin and glutenin. A large amount of gluten does not yield a correspondingly large loaf.

Composition of Material

of Flour and	Flour	. . . . .	I.	. . . . .	I.
Different	Flour and water bread	. . . . .	II.	. . . . .	II.
Flour Breads	Bread from flour, water, and lard	. . . . .	III.	. . . . .	III.
	Bread from flour and skim milk	. . . . .	IV.	. . . . .	IV.
Material	Water	Protein	Fat	Carbohydrate	Ash
I.	10.11%	12.47%	.86%	76.09%	.47%
II.	36.12	9.46	.40	53.70	.32
III.	37.70	9.27	1.02	51.70	.31
IV.	36.02	10.57	.48	52.63	.30

Comparative

Digestibility of New and Old Bread With healthy persons there is no difference in the completeness of the digestibility of new and old bread; one appears to be as thoroughly absorbed as the other. In the case of some individuals with impaired digestion there may be a difference in the ease with the two kinds of bread are digested, but this is due mainly to individuality and does not apply generally. The changes which occur when it is kept for several days are largely a loss of moisture and development of a small amount of acid and other substances

Causes of Poor Bread Bread may not only be poor on account of the improper combination of the gliadin and glutenin contained in the flour, but

the flour may become musty from being stored in damp or the grain may have been kept in damp storehouses, and thus have become musty.

Another thing to be considered is that the materials and utensils must be sterile, for if they are not, harmful bacteria may grow, especially if the bread is allowed to rise too long, the yeast at a certain stage becoming inactive and giving the bacteria a better chance to develop.

Methods of	Recognizing the fact that sour bread is
Avoiding	due to the growth of bacteria, it is not
the	difficult to suggest the proper means of
Growth of	avoiding it. Fresh yeast only should be
Bacteria	used, and the dough should be mixed in
	clean utensils. The dough should not be
	allowed to ferment too long

EXPERIMENTS

Nut Brown Bread

Materials

4 cups flour	$\frac{1}{2}$ t salt
4 t baking powder	1 egg
1 cup nuts	1 cup milk

Method

Sift the flour and add the salt; the egg is then beaten and the nuts chopped fine. Add the beaten egg, milk, and nuts to the flour, and mix well. After this has been done add the baking powder, which has been sifted with a small amount of flour. Let the mixture, which has been poured into a greased pan, stand twenty minutes, then bake in a moderately heated oven for twenty minutes.

Time

Preparation - 10 minutes.

Rising - 20 "

Baking - 20 "

Cost of material - 15 cents.

Number served - four, two meals.

White Bread

Materials

2 cups boiling water	$1\frac{1}{2}$ teaspoons salt
1 tablespoon butter	$\frac{1}{2}$ yeast cake dissolved
1 tablespoon lard	in $\frac{1}{2}$ cup luke warm water
1 tablespoon sugar	6 cups sifted flour

Method

Put butter, lard, sugar, and salt into a large bowl and pour on them the boiling water. When luke warm add dissolved yeast cake and five cups of flour, then stir until thoroughly mixed and knead until the mixture is smooth and elastic to the touch. Let rise over night in temperature of 65° F. In the morning knead and place in greased pans. Cover and let rise to about double its original bulk and bake in a hot oven from thirty to fortyfive minutes, depending on the size of the loaf.

Time

Preparation - 30 minutes.

Rising - 10 hours, then 1 hour.

Baking - 40 minutes.

Cost of materials - 7 cents.

Number served - four., two meals.

Boston Brown Bread

Materials

1 cup rye meal	3/4 cup molasses
1 cup granulated corn meal	1 teaspoon salt
2 cups sour milk	3/4 teaspoon soda

Method

The dry ingredients are first mixed, and to this is added the molasses and milk. The mixture is stirred well and then turned into a well buttered pan and steamed for three and a half hours. The paper should be greased and tied over the top of the mold with a string, to keep the steam from affecting the surface of the bread and making it soggy. The mold should not be filled more than two thirds full. Allow the boiling water to come half way up around the mold. Cover closely and steam, adding water as needed.

Time

Preparation - 30 minutes.

Steaming - 3 1/2 hours.

Cost of materials - 8 cents.

Number served - 4 persons three meals.

Rye Bread.

Materials

1 cup scalded milk	1 1/2 teaspoon salt
1 cup boiling water	1/2 yeast cake dissolved in
3 cups flour & rye meal	1 cup luke warm water
1/3 cup brown sugar	1 tablespoon lard

Method

To milk and water add lard, sugar, salt; when luke warm add dissolved yeast cake and flour; beat this mixture thoroughly and cover. Let rise till light. Add rye meal untill the dough is stiff enough to knead; knead thoroughly, let rise, shape into the loaves, let rise again and bake. This made one loaf.

Time

Preparation - 30 minutes

Rising - 9 1/2 hours

Baking - 1 hour

Cost of material - 7 1/2 cents.

Number served - 4 persons two meals.

Parker House Rolls

Materials

2 cups scalded milk	1 teaspoon salt
3 tablespoons butter	1 yeast cake dissolved in
2 tablespoons sugar	$\frac{1}{4}$ cup luke warm water
2 cups flour	

Method

Add butter, sugar, and salt to milk; when cooled to luke warm add dissolved yeast cake and three cups of flour. Beat thoroughly, cover and let rise till light; cut down, add enough flour to knead, about $1\frac{1}{2}$ cups. Let rise again, and knead. Roll out to $\frac{1}{3}$ inch in thickness. Dip a biscuit cutter in flour and cut into shape. Dip the handle of a case knife in flour and with it make a crease through the middle of each circle of dough; brush over one half of each piece with melted butter, and fold, pressing edges lightly together in the middle. Place in a greased pan and let rise. Bake in a hot oven from twelve to fifteen minutes.

Time

Preparation - 30 minutes
Rising - 11 hours
Baking - 15 minutes

Cost of materials - 13 cents

Number served - 4 persons two meals.

Swedish Rolls

Materials

1 cup scalded milk	$1\frac{1}{2}$ tablespoons sugar
$\frac{1}{4}$ cup butter	$\frac{1}{2}$ teaspoon salt
$3\frac{3}{4}$ cups flour	1 egg white
1 yeast cake dissolved in a little luke warm water	

Method

Add butter, sugar, and salt to milk while hot. When luke warm, add dissolved yeast cake, white of egg well beaten, and flour. Knead, let rise, roll to $\frac{1}{4}$ inch thick, spread with butter and sprinkle with 2 tablespoons sugar mixed with $\frac{1}{3}$ teaspoon cinnamon and $\frac{1}{3}$ cup raisins finely chopped, and 2 tablespoons chopped citron; roll like a jelly roll and cut in $\frac{3}{4}$ inch pieces. Place in pan, let rise, and bake in a hot oven.

Time

Preparation - 30 minutes
Rising - 11 hours
Baking - 15 minutes

Cost of materials - $13\frac{1}{2}$ cents

Number served - 4 persons two meals

Sweet French Rolls

Materials

1 cup milk	$\frac{1}{4}$ cup melted butter
$\frac{1}{4}$ cup sugar	$\frac{1}{8}$ teaspoon mace
1 teaspoon salt	1 egg yolk
Flour	
1 yeast cake dissolved in $\frac{1}{4}$ cup luke warm water	

Method

Scald milk; when luke warm, add dissolved yeast cake and $1\frac{1}{2}$ cups flour; beat well, cover, and let rise untill light; add sugar, salt, egg well beaten, mace, butter, and enough more flour to knead; knead and let rise, shape and bake the same as salad rolls.

Time

Preparation - 30 minutes
Rising - 11 hours
Baking - 15 minutes
Cost of materials - 14 cents
Number served - 4 persons two meals

Baking Powder Biscuits

Materials

2 cups flour	1 tablespoon lard
4 teaspoons baking powder	$\frac{3}{4}$ cup milk
1 teaspoon salt	1 tablespoon butter

Method

Mix dry ingredients and sift twice; work in butter and lard; add gradually the liquid; toss on board and roll lightly to $\frac{1}{2}$ inch thick; shape with biscuit cutter; place on buttered pan, and bake in a hot oven from twelve to fifteen minutes.

Time

Preparation - 10 minutes
Baking - 15 minutes
Cost of materials - $7\frac{1}{2}$ cents
Number served - 4

Conclusion In summing up the points to be emphasized in the art of bread making, the principal ones are found to be as follows:-

Careful selection of the grain from which the flour is to be made, a flour well milled, and of good quality.

Careful preparation of the dough, with correct temperature applied to both the yeast and the rising dough.

Fresh yeast in good growing condition.

Other materials of good quality.

Accuracy of measurement of the materials used.

Careful attention to the rising, not to allow the process to go on too long.

Proper heat in baking.

Thus, in order to secure uniformly good bread, one must have a thorough knowledge of the subject as well as practice.

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