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Thesis

Problems of Bread Making

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Bea Alexander

Thesis : - Problems of Bread Making

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3. Mode of reproduction
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II. Bread

1. Good
 - a. Conditions necessary

b. Good flour
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(b) Constituents
Gliadin
Glutenin

(2) Good yeast
(a) Strength
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(3) Good manipulation
(a) Cleanliness of utensils
(b) Proper handling
(c) Length of fermentation
(d) Temperature

(4) Good baking
(a) Size of loaf
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(c) Time

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2. Faults of Bread
a. Caused by flour
- (1) Heated in stack or bin

- (2) Moulded in stack or bin.
- (3) Stored in mouldy places.
- (4) Wheat disease spores
- (5) Constituents

b. Caused by yeast

- (1) Weak yeast
- (2) Foreign bacteria

c. Faults of manipulation

- (1) Uncleanliness

- (2) Kneading

(a) Manner

(b) Quantity

- (3) Temperature

- (4) Fermentation

d. Faulty baking

- (1) Size of loaf

- (2) Temperature

- (3) Time

e. Faulty care

- (1) In cooling

- (2) In storing

3. Ideal bread

a. Baking

(1) Thoroughness

(2) Color

(3) Shape of loaf

b. Taste

(1) Sweetness

(2) Flavor

c. Appearance of crumb

(1) Color

(2) Texture

(a) Quality

(b) Fineness

(c) Evenness

Bread.

This the most universally used of all foods that is made. All men, in all conditions, in all countries, use bread in some form. Wheat bread is the commonest form, limiting the word bread to that which is leavened by yeast. For years, wheat and other cereals, were crushed between rollers or stones. The flavor of bread, made by the use of yeast, is very pleasant and complex, and hence, never produces satiety. This is one of the important reasons why bread can be and is used universally.

There are no specific rules that can be laid down for making bread. So much depends upon quality of yeast and flour, temperature, atmospheric changes, and other conditions which bring about variations in regard to fermentation of the bread. Close observation and practice will supply the lack of unvarying rules in bread making.

Bread is an article of diet which con-

tains all the foods necessary for human subsistence. The most active principle in bread is yeast. Yeast plants are the natural agents that produce fermentation. Fermentation is the process by which alcoholic liquors are produced from sugary solutions. The raising of bread is as truly fermentation as the making of alcoholic beverages.

The growth of the yeast plant produces this fermentation.

The yeast plant is a microscopic, transparent body. These bodies really bear no resemblance to plants, but they are classed as colorless plants, and hence fungi. Yeast exists in three stages:

1. Resting.
2. Growing
3. Spore bearing

When yeast, in the resting stage, is placed under suitable conditions, it immediately begins to grow by budding. The cell wall is elastic, and the small body grows until a bud appears on the side of the parent.

plant. This bud breaks off and produces a plant similar to the original plant.

If the plant lacks any one of the essential conditions, as for example, moisture, food being supplied in sufficient quantity, spore bearing is the result. These spore bodies are able to resist drying, heating and other unfavorable conditions, without being injured, and when placed under suitable conditions will continue their growth. Methods of reproduction are then: budding, and, under adverse conditions, spores.

Conditions necessary for growth are: warmth, 27°C . (the most favorable temperature). A high temperature will kill the plant, while a low temperature only retards or stops the growth. The temperature may vary from 24°C . or even lower to 30° to 35°C . without serious injury. If heat is quickly reduced when found very high. Fermentation, for any length of time, at a high temperature, causes the bread to become sour.

Moisture is another essential for growth

Sugar, having a great affinity for water, if present in more than 35% solution, deprives the yeast of the requisite amount of water, essential to rapid growth. Moreover, if the medium is too dense, air is excluded, and the best growth of the yeast plant is retarded.

The essential foods are:

1. Sugar.

Sugar is the chief food of the yeast. In ordinary bread dough, chemical change takes place, converting a part of the starch into sugar, thus making fermentation possible.

2. Nitrogenous substances

These are needed in small quantities. To supply the protein of the cell itself is its chief work. Soluble proteins are those commonly present. Egg albumen cannot be used. neither can vegetable albumen.

3. Mineral matter

Mineral matter is another required food. Potassium phosphate is the most important one used. For this reason, potatoes are

extensively used in bread making, they being rich in this mineral. Magnesium phosphate, and calcium phosphate may, also, be used to some extent, but they are not essential.

Darkness is another condition of growth. It is possible for yeast plants to grow in the light, but better results are obtained in the absence of light. Direct sunlight is harmful to yeast, as to all micro-organisms.

Conditions affecting yeast growth.

1. Salt.

This retards the growth of the yeast to but a slight extent, while the growth and multiplication of bacteria is very materially affected by the presence of salt.

2. Sugar.

This is required to an appreciable extent, but if present in too great a quantity growth, as stated before, is either hindered or entirely stopped.

3. Tannin

Tannin is present in hops in a considerable quantity, and if hop yeast

is used too extensively, a bitter taste results. Tannin prevents the growth of bacteria very much more than it does the growth of yeast.

Chemical effects of yeast:

Changes take place during the process of fermentation, converting the starch into sugar into CO_2 and H_2O . Alcohol is also produced. The alcohol is set free during the process of baking. Some large bakeries have tried the plan of catching the alcohol thus released, making a liquor in this way. The expenses connected with this plan are, however, too great for the profits. The plan followed requires pipes leading from the oven to vats where the alcohol is condensed.

Foreign bacteria

These are hindrances to the growth of the yeast plant by their using the food necessary to the growth of the yeast, and, also from the fact that they give to the bread objectionable waste products. These products, when present in sufficient quantity may kill the yeast plant.

Bread.

Conditions necessary for good bread.

1. Flour

Flour of a creamy color is usually indicative of the best. The flour must not be harsh and dry in quality, neither should it be weak, indicating superfluous gluten. Flour deficient in gluten, produces bread with large holes, which are caused by the small air holes breaking into each other because the cell walls are weak.

2. Yeast

Yeast is of equal importance with flour in the matter of making good bread. Yeast produces a finer and sweeter quality of bread than other ferments do. A hardy, strong yeast in suitable media, grows rapidly and prevents the formation of bacteria and other foreign elements. Pure yeast produces the sweetest bread. It may be used in smaller quantity for this reason.

3. Good manipulation.

This is indispensable to the

production of good bread. If the use of the best of flours and yeasts is productive of good bread, yet, improperly used, the bread is sure to be spoiled, by either carelessness or ignorance. Utensils must be clean, and the liquid scalded to kill all foreign elements. If the bread is not kneaded sufficiently, or if the flour is not worked in gradually, either a coarse texture is produced or streaks are found in the resulting loaf.

4. Period of fermentation.

The length of this period depends to a greater or less extent upon how stiff the dough is made. If conditions are such that a long fermentation is necessary, or if the temperature is very high, the bread must be mixed stiff. The stiffer the mixture, the harder for the yeast to grow. A soft loaf will rise more quickly and is more apt to sour if not attended to at the right time.

The most favorable temperature, as has been stated before is from 24°C to 35°C .

Good baking

This is second in importance

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to good flour and good yeast. The loaves should be uniform in size, and of an even, rich brown, both top and bottom, when taken from the oven. The oven should be 400°C . when the bread is put in. In fifteen minutes, the loaf should be a delicate brown. For a single loaf of bread, with the oven at the correct temperature, 45 to fifty minutes is sufficient time for baking thoroughly. For small rolls, twenty minutes is enough time.

After baking

The bread must be exposed to the air as much as possible upon being taken from the oven. When cooled it should be stored in a closed tin box, which is perfectly clean. Bread frequently sours in a few hours, if it is not well baked. Bread, which when new had no disagreeable taste was experimented with, and found after the second day to be wholly unpalatable. "The experiments show that ordinary bread turns mouldy, owing to the growth of *A. glaucus*. Musty

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bread, on the other hand, yields both A. glaucus Mucor mucedo, and finally undergoes putrefactive changes, becoming the home of vibriones and bacteria." These organisms, of course, do not show the mustiness. They merely flourish because there is suitable nidus for their growth. Sweet bread does not decay under similar conditions. It is thought that starch is not so suitable a nidus as dextrine.

Faults of Bread

Caused by flour.

"Smith says of musty bread and flour sent to him, the following is the cause; Flour was stored in a damp place, causing fungoid growth. To avoid decomposition, the flour was then baked. When bread was baked from it, the assimilation of moisture regenerated the fungus, thus causing the bread to become musty, for which result, it is unnecessary for the plant to arrive at maturity; the disagreeable taste being developed as soon as flocci are visible under the microscope.

Diseases of wheat.

Wheat is subject to mildew and also to smut. Mildew will appear on the wheat in May or June making the plant look as though the lower leaves are rusty, at the same time making the plant appear sickly. As the disease develops the rusty leaves increase, The rust itself consists of the spores of the fungus called Corn Mildew. These spores, called uredo spores, from their rusty red appearance, produce a mycelium which penetrates the leaves and stalks of the wheat. This mycelium, under good conditions for its development, will finally destroy the wheat plant. A resting spore, called the telento spore grows in this mycelium. It rests in the wheat stubble during the winter, only to grow again in the spring on barberry bushes, which produce the red telento spores again. Smut is another disease that attacks wheat, When the grain is almost ripe, there will be noticed shriveled looking heads which are blackened in appearance. This disease is due to a fungus which develops

in the seeds, destroying the seeds contents ^{and} replacing them by masses of spores, which look like powder.

When working with low grade flours great care must be taken if a loaf of bread which is eatable is produced. These flours have a low percentage of gluten, and that badly matured, while the percentage of soluble proteins is high and in an active condition. If a wheat is harvested damp, it should immediately be kiln-dried to prevent the production of these low grade flours. When one of these unsound flours is used, it should be used in a dough which is put in the oven as quickly as possible.

Crumbliness of Bread

This condition is due to a harsh, dry flour, not sufficiently fermented. Sometimes it is caused by a deficiency of dextrine ^{and} soluble starch

a deficiency of gluten in the flour, pro-

ducing a soft flour lacking in tenacity, often makes bread with large holes in it. These holes are caused by the small air holes breaking down and forming one large one.

Another fault in bread caused by flour is red spots in the loaf. They are most distinctly seen after the bread is baked. These spots are found to be due to the highest class flours. They do not increase as the bread grows older, nor do they seem to be caused by any living, growing organism. Only on one occasion were spots found in unbaked bread. While the starch remains uncolored, the glutens have a red dye. In the larger spots may be seen a nucleus. No signs of spores were visible, but these might easily have been broken down by water. On examining this nucleus with water under the microscope, there were invariably found, fragments of the outer tegument of the grain, and not infrequently, also the outer layers of bran, and hairs of the beard of wheat, all of which were intensely colored. It is suggested as a possible source of these spots, either some insect of the cochineal species, or an intensely colored vegetable growth

as a mould. These minute particles of bran are sufficiently fine to pass through the dressing silk and thus, get into the flour. On being wet the color spreads and colors the surrounding gluten. It is seen most distinctly in freshly baked bread.

Faults caused by Yeast

Weak Yeast and Foreign Bacteria

Weak yeast, just as a weak garden plant, naturally permits of weeds or foreign bacteria. When the yeast is strong^{and} grows rapidly, the bacterial growth is retarded and to a greater or less extent prevented. When sterile materials and utensils are used, the yeast will have a better chance to grow. These foreign bacteria cause acid fermentation, lactic in large quantities and acetic and butyric acids in smaller quantities. The activity of these bacteria is dependent on that of the yeast. While the yeast plant remains active, the bacteria are comparatively dormant. With the cessation of active fermentation, a stage is reached

in bread fermentation when bacteria are very active and sourness rapidly develops.

Faults in Manipulation

To begin with, utensils must be clean, as those well sown with bacteria, invariably cause acid fermentation. First, acetic fermentation develops, and if conditions are very favorable, also butyric acid results.

The manner of kneading in successful bread-making, is very important. Bread should not be kneaded, using much pressure. An easy motion of the wrist is the best way. Flour should be worked gradually, as attempting to work it in gradually produces streaks in the loaf, that are very difficult to eliminate.

Bread should be kneaded until perfectly smooth and velvety, and should respond to the touch and bound back immediately. If it is not kneaded sufficiently a coarse texture in the loaf is the consequence.

The most favorable temperature for yeast is 27°C . This temperature may vary either lower or higher, to the extent of four or five degrees.

Fermentation depends upon the dough. Oftentimes a stiff dough is not sufficiently fermented; so a sad or soggy loaf is produced. A frequent cause of sour bread is a too soft dough, which ferments too rapidly, and is not caught in the nick of time. Acid fermentation sets in, checking and finally stopping yeast fermentation.

Faulty Baking.

If a loaf is "over proved", it becomes too large for the amount of gluten and breaks up into large holes. On the other hand, if a loaf is not allowed to get light enough, the bread, after baking is not elastic and spongy, but, instead, rather hard and soggy.

Too high a temperature, when the bread is put into the oven, produces a poorly baked loaf. The heat forms a hard crust so quickly. This crust prevents the heat from penetrating as quickly as it should. Thus the center of the loaf is not well baked. Frequently bread is put into the oven before it is hot enough, and the loaf, if it gets thoroughly baked, is baked by such a slow

process, that the bread is dry and crumbly. Sometimes bread remains in the oven the required time and is taken out apparently done but is found to sour inside of twenty four hours, because the loaf has not been made sterile to the very center, leaving an opportunity for bacteria to begin their work.

Faulty Care after Baking.

Bread that is well wrapped, or not exposed to the air will sweat. For example, if the air is placed on a surface that prevents the circulation of air underneath, the bottom will become soft because of sweating.

If the box where the bread is stored is mouldy or musty, the mould spores grow on the surface of the bread. If it is stored in a damp place, moulds are induced to grow. This growth spreads quickly, and soon spoils all the bread. If the bread is not cool when stored it will sweat.

Ideal Bread.

Baking of ideal bread in the single loaf requires fifty minutes, requires a temperature of 400°C , when the loaf is put in

Within fifteen or twenty minutes after the bread is put in, the surface should be an even delicate brown. At the end of the baking period, the loaf ought to be a rich brown of uniform shape. If the bread is frequently turned, during the first quarter of an hour of baking, a uniform shape will be obtained.

Ideal taste of bread is sweet, not like that of cane sugar, but of sugar which is produced from the starch during the process of fermentation. The flavor is slightly of nuts, but never a highly pronounced flavor. This ideal flavor is brought out by baking.

Appearance of crumb is a creamy white in color, fine and even in texture. This last quality can be obtained only by proper kneading in proper quantity. By pressing the inside of the loaf, it responds readily to the touch.