Good Bread From Illinois Soft-Wheat Flours

By Ruth A. Wardall
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University of Illinois
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FOREWORD

The University of Illinois, thru its Departments of Agronomy and Home Economics, has been for some time investigating Illinois wheats and the flours manufactured from them. The Department of Home Economics is conducting a study of the soft-wheat flours and their baking qualities. This circular is a preliminary report and deals with the use of these flours in the home baking of bread. It is hoped that the information in the circular will be of interest not only to the homemaker and the teacher, but to the farmer and miller. The possibility of a better utilization of the Illinois soft-wheat flours may involve more careful choice of varieties of wheat to be grown and modifications in milling practice, as well as changes in the bread-making process.

H. M. Munro ford
Dean and Director
GOOD BREAD FROM ILLINOIS
SOFT-WHEAT FLOURS

BY RUTH A. WARDALL AND NATALIE K. FITCH

Fully half the wheat grown in Illinois is classed as soft. This fact suggests the desirability of a good understanding of the use of flour made from such wheat, in order that this important Illinois product may be more fully utilized within the state. A more extended use of soft-wheat flour in the making of bread would be an advantage to Illinois and probably to the country as a whole.

In general practice the soft-wheat flours have long been used for pastry and quick breads, but their bread-making qualities have not been so clearly recognized. A study of the baking qualities of Illinois soft-wheat flours by the Department of Home Economics of the University of Illinois has demonstrated that superior bread can be made from them. Many loaves have been secured showing excellent appearance, texture, and flavor. Since satisfactory results have been obtained from the Illinois soft-wheat flours, it seems desirable to bring their value to general attention.

The making of bread in the home is still quite a common practice altho the commercial baker has to a great extent supplanted the home baker. The increasing demand for commercially baked bread is resulting in a product of high quality and improvements are constantly being made in appearance, flavor, and nutritive value. There are times and circumstances, however, when it seems desirable or necessary to the housewife to make bread. When the bread is made at home, it is possible to control the ingredients and the conditions under which it is made. There are certain characteristics of a good loaf of homemade bread which make a universal appeal and the satisfaction in the product will often lead to home baking. There seems to be a place for both the commercial and the homemade bread, and convenience, time, and individual preference will determine the procedure for any given household.

1Ruth A. Wardall, Professor of Home Economics and Head of Department; Natalie K. Fitch, Associate in Foods. Various members of the Department of Home Economics have taken part in this work during a period of years. Anna Marie Schreiber and Katherine B. Gunn have done much of the experimental work. Special acknowledgment is due Miss Schreiber.

2Dr. Carl L. Alsberg says, "We have not enough hard wheat, wheat of high gluten content. In other words, we have a relative wheat deficiency. The fact that despite an import duty of thirty cents a bushel, there has been a not inconsiderable importation of hard Canadian wheat is very good evidence that such is the case."
PROCEDURE FOR SOFT-WHEAT BREAD

The bread-making procedure involves a consideration of ingredients, of fermentation, manipulation, and baking. In this experimental study, some changes in the usual procedure with hard-wheat flours have tended to improve the quality of the bread made with the soft-wheat flours. Modifications appear in the proportion of ingredients, in the length of the fermentation period, and in the character and manipulation of the dough.

Ingredients

Flour, a liquid, and a leavening agent are the necessary ingredients for all bread. Other materials may be added in order to improve flavor, texture, and food value. The most common additions are sugar, salt, and fat.

The amount of yeast, sugar, fat, and salt suggested for bread from soft-wheat flour is greater than that used in common practice. For 1 quart of liquid, 6 to 7 level tablespoonfuls of sugar, from 4 to 5 level tablespoonfuls of fat, and 2 to \(2\frac{1}{2}\) level tablespoonfuls of salt may be used. The amount of flour used for 1 quart of liquid varies with the quality of the gluten. The softer the flour, the greater is the quantity to a given measure of liquid. Experiments clearly show the superior quality of bread made with milk rather than water.

Flour. Flour is usually classed as hard or soft, depending upon the class of wheat used in its manufacture. A very hard wheat yields a very hard or strong flour, a very soft wheat yields a very soft or weak flour. Between these extremes are many gradations and there is no sharp line of demarcation between some of the so-called soft-wheat flours and the hard-wheat flours. Although flour is composed largely of starch, the protein content is of very great interest to the bread maker. Two of the flour proteins, in the presence of the liquid used in bread making, combine physically or chemically, resulting in a product known as gluten. The gluten plays an important role in the bread-making process because it entraps the gases, stretches as these expand, and so causes the dough to rise. The gluten from different flours varies in its elasticity and cohesiveness, thereby influencing the bread-making qualities of the flour. A desirable gluten has the elasticity and cohesiveness to stretch to a very considerable extent before it breaks, thus making possible the manipulation required for a fine grain and texture and the framework for a well-shaped loaf of bread. As stated above, for a given weight of flour used in making bread dough, the amount of liquid varies according to the nature of the gluten. The greater proportion of liquid to flour means a greater weight of bread from a given weight of flour. This is a matter which may be of interest to the commercial baker but is of little concern to the housewife.
From the chemical and physical viewpoints the important difference between the hard and soft wheats is the amount and nature of the gluten which they yield. In general, the gluten from the soft-wheat flours has less elasticity and cohesiveness than that from the hard-wheat flours and therefore calls for a somewhat different procedure in bread making.

Liquid. Water is the liquid most commonly used, altho milk, either whole or skimmed, has the advantage of furnishing other nutrients along with the water. Milk also improves the flavor and possibly the grain and texture of the bread. The proteins of the milk are a valuable supplement to the wheat proteins; the milk increases the calcium and phosphorus content; skimmed milk increases the vitamin B value, and whole milk has the advantage of contributing some fat and vitamin A in addition to the foregoing. The greater superiority of the milk bread justifies its use. Skimmed milk has all of the advantages of the whole milk except the butterfat and the vitamin A, which may
be easily supplied by butter eaten with the bread. Dried milk, either skimmed or whole, may be very satisfactorily used in place of fresh milk.

Leavening Agents. Yeast is the leavening agent most commonly used in bread making. Yeasts are microscopic plants which by virtue of their life activities produce among other products carbon dioxide gas. This and other gases in the dough are entrapped in the gluten and upon expansion with heat stretch the gluten so that the bread is said to rise. The yeast plants find the necessary food, air, and moisture for their activity in the bread dough. By maintaining the dough at a temperature of 80 to 95 degrees Fahrenheit a favorable condition of warmth is provided for the yeast. Forms of Yeast: The ordinary commercial forms are known as dried and compressed yeast. Liquid, jug, or starter forms are sometimes found in household use. Dried yeast has the advantage of superior keeping qualities and so may be conveniently kept on hand. Compressed yeast, which is moist and which deteriorates much more quickly, has the decided advantage of more rapid action in the bread-making process. The liquid, jug, or starter yeast which is kept from week to week in the household furnishes an excellent medium for the growth of other microorganisms as well as the yeasts and the use of these forms sometimes results in a bread which is sour and of inferior flavor.

Sugar. Since bread may be made without the addition of sugar, it may be considered as playing a minor part in the bread-making process. Sugar, however, improves the color of the crust of bread, imparting to it a rich brown color. It also adds flavor to the bread and serves as a valuable food for the yeast plants.

Salt. Salt is necessary for flavor. It is quite probable that it also serves other purposes.

Fat. Fat is used for the improvement of flavor, texture, and the keeping qualities of the bread. Any good fat of mild flavor may be used.

Rapid Fermentation Desired

In making bread with soft-wheat flours, experiments clearly indicate the desirability of completing the process in as short a time as possible. The amount and condition of the yeast largely determine the length of the fermentation period. Reduction of time is accomplished by using a greater amount of yeast than frequently is used and by providing conditions, such as a pre-fermentation period, which increase the activity of the yeast.

Careful Manipulation

In making bread from soft-wheat flour, the dough should be kept as soft as possible in order to secure the best results. When the pro-
portion of flour to liquid is right, there is a tendency for the dough to be soft and slightly sticky so that careful and rapid handling is necessary to prevent it from sticking to the board and to the hands. At intervals during the fermentation period, the dough is kneaded down on the board to distribute the gas and insure good grain and texture in the bread.

**Baking**

The baking of bread from soft-wheat flours is the same as the baking of any bread.

**EITHER LONG OR SHORT PROCESS MAY BE USED**

According to the method of making, bread is classed as long or short process. The period of fermentation determines the length of the process and the yeast and temperature are the most important factors in the fermentation.

**Long-Process Bread.** A relatively small amount of yeast is used in long-process bread and the yeast may be in the dried, compressed, or liquid form. It is usually cultured over night in a sponge. A sponge is a thin batter of flour and liquid to which sugar is added and sometimes salt and fat. When the yeast is active and the sponge full of bubbles, a dough is made. Fermentation proceeds until the dough is leavened, when it is moulded into a loaf, and when this is sufficiently light, it is baked. In ordinary household practice the sponge is started at the time of the noon or evening meal, the dough is mixed in the early morning, and the bread baked about noon of the second day. A long fermentation period introduces the difficulty of over-night temperature control and offers the opportunity for other and undesirable microorganisms to develop along with the yeast, resulting in a damaging effect upon the flavor of the bread. The long-process bread is usually made with dried yeast, which has the advantage of low cost and good keeping qualities so that it may always be kept on hand.

**Short-Process Bread.** Compressed yeast is used in this process because it acts much more rapidly than yeast which has been dried and usually more rapidly than the starter yeasts.

Since the yeast is in an active form, it is not necessary to culture it in a sponge and all of the ingredients may be mixed at once into a dough. When this is made the procedure is the same as in the long-process bread. Experiments show that the time required for the whole bread-making process is shortened by using a short pre-fermentation period. It is especially advantageous to use this pre-fermentation when making bread from soft-wheat flours.

The amount of yeast has a marked influence on the time involved in the process. Within ordinary limits, the amount of compressed yeast may be doubled if it seems desirable to hasten the process to
that extent. Within the limits of temperature favorable to yeast activity, the higher the temperature during the fermentation, the more rapid is the action of the yeast and the shorter is the bread-making process.

A practical household method of maintaining an even temperature of the dough is that of placing the bread bowl in a large pan of warm water, covering carefully, and renewing the warm water as needed.

**RECIPIES FOR SOFT-WHEAT BREAD**

Every home baker realizes that each new sack of flour may present a new problem. Wheats show some variation from year to year; flours are not altogether uniform and other factors introduce some uncertainty into the bread-making process. Depending upon the degree of strength of the wheat, there is a variation in the proportion of flour to liquid necessary to secure a dough of the right consistency. Keen observation leads the interested home baker to the experimental viewpoint, which adapts the procedure to the particular flour on hand.

**Short-Process Bread**

(Four loaves)

1 quart liquid  5 tablespoons fat
2½ tablespoons salt  3 to 4 cakes compressed yeast
6½ tablespoons sugar  3 quarts flour

The liquid may be water, whole or skimmed milk, or water and dried milk. For 1 quart of liquid, 1 cup of dried milk is used and is mixed with the flour and added with it. Milk should be scalded before using. To 1 measure of liquid, approximately 3 measures of flour are used, the actual amount varying with the flour.

**Pre-fermentation.** Dissolve salt and sugar in one-half of the liquid and mix the compressed yeast with the other half. Combine the two mixtures and allow to stand at about 80° F. for one-half hour.

**Mixing and Kneading.** To the mixture add melted fat and flour to make a dough which is as soft as possible but still can be kneaded on the board. Knead until the ingredients are thoroughly mixed, until the dough is smooth, elastic to the touch, and bubbles may be seen under the surface. (The mixing and kneading should require about 10 minutes.)

**Fermentation.** Allow the dough to rise in a covered bowl at about 80° F. for 30 minutes; place on board and knead slightly, return to bowl, allow to rise for a second 30-minute period; knead slightly, return to bowl, allow to rise for 30 minutes; knead again, allow to rise for 15 minutes longer and then shape into loaves. Place in greased bread pans, grease the surface lightly to prevent the formation of a
hard crust, allow to rise in the pan at about 95° F. until it doubles in bulk—about one hour. Kneading during the fermentation period is for the purpose of distributing the gas thru the dough but because of the nature of the soft-wheat glutens the least possible handling should be done. Ten to twenty times is all that should be required in each of the above kneadings.

**Baking.** Start the baking in a hot oven (410° F.) and reduce the temperature (375° F.) during the last 10 minutes. The baking period for loaves of this size is about 45 minutes.

**Care After Baking.** Remove from pan, and place so that air has access to the entire loaf. The loaves may be placed across the tops of the pans or on a wire rack.

### Long-Process Bread

*(Four loaves)*

<table>
<thead>
<tr>
<th>1 quart liquid</th>
<th>5 tablespoons fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1/2 tablespoons salt</td>
<td>2 cakes dried yeast softened</td>
</tr>
<tr>
<td>6 1/2 tablespoons sugar</td>
<td>in 1/4 cup lukewarm water</td>
</tr>
<tr>
<td>3 quarts flour</td>
<td></td>
</tr>
</tbody>
</table>

One pint of the liquid to be used in the sponge should be water, the remainder may be water, whole or skimmed milk, or water and dried milk. For 1 quart of liquid, 1 cup of dried milk is used and is mixed with the flour and added with it. Milk should be scalded before using. To 1 measure of liquid approximately 3 measures of flour are used, the actual amount varying with the flour.

**Sponge.** Mix the pint of water and the softened yeast with one-third of the flour and allow to stand in a covered bowl over night at about 68° F. to 70° F.

**Mixing and Kneading.** In the morning add to the sponge, which should be light and full of bubbles, the melted fat and the sugar and salt dissolved in the remaining liquid. Beat until smooth and then add flour to make a dough as in the short-process bread.

**Fermentation.** Allow the dough to rise in a covered bowl at about 80° F. until doubled in bulk, about two and one-half hours; place on board and knead slightly, return to bowl, allow to rise for about 45 minutes; knead again, allow to stand for about 15 minutes and then shape into loaves. Place in greased bread pans, grease the surface lightly to prevent the formation of a hard crust, allow to rise in the pans at about 95° F. until it doubles in bulk—about two hours.

**Baking.** The same as for the short-process bread.

**Care After Baking.** The same as for the short-process bread.
Parkerhouse Rolls

1 cup milk 2 tablespoons fat
2 teaspoons salt 3/4 to 1 cake compressed yeast
2 tablespoons sugar 3 to 4 cups flour

Method. Same as the dough for short-process bread. Shape the finished dough into rolls, allow to rise until doubled in bulk (about 30 minutes), and bake in a hot oven (410°F.) for 20 minutes.

Luncheon Rolls

1 cup milk 3/4 to 1 cake compressed yeast
2 teaspoons salt 1 egg
2 tablespoons sugar Grated rind of 1 lemon
2 tablespoons fat 3 to 4 cups flour

Method. Same as the dough for short-process bread, adding the slightly beaten egg and lemon rind with the melted fat. Roll to 1/2 inch thickness, cut with small biscuit cutter, place on greased baking pan, allow to rise until doubled in bulk (about 30 minutes) and bake in a hot oven (410°F.) for 20 minutes.

Coffee Bread

1 cup milk 3/4 to 1 cake compressed yeast
2 teaspoons salt 2 eggs
61/2 tablespoons sugar 21/2 cups flour
5 tablespoons fat

Pre-fermentation. Same as for short-process bread.

Mixing. To this mixture add the melted fat, eggs slightly beaten, and the flour. This makes a stiff batter. Allow to rise in covered bowl for 30 minutes at about 80°F., beat thoroughly in the bowl, pour into greased cake tins, sprinkle with nut mixture, allow to rise until doubled in bulk (about 45 minutes at 80°F.). Bake in a hot oven (410°F.) for 40 minutes.

Nut Mixture. Mix together 1 cup soft stale bread crumbs, 3 tablespoons sugar, 1 teaspoon cinnamon, 3 tablespoons chopped almonds, and 3 tablespoons melted butter.

CHARACTERISTICS OF GOOD BREAD

In order that bread may assume its proper place in the well-balanced diet it is desirable that the characteristics of good bread be appreciated and that high standards should prevail. There is a wide variation in the quality of the commercial and home-made loaf of bread, and there is also a wide variation in the standard of quality
which the individual requires in bread. Flavor and nutritive value, as well as good appearance, should be the goal of the bread maker whether in the bakery or in the home.

A fairly small or medium-sized loaf of bread is more desirable than a large loaf because a more thorough baking is assured and there is a greater proportion of crust to crumb. Bread pans ranging from 4 to 4½ inches by 9 to 10 inches are satisfactory. The baking of each loaf of bread in an individual pan adds to the appearance and quality of the loaf.

The following score card, which is a slight modification of the one devised by the American Institute of Baking, is useful in judging the various characteristics of bread.

**Bread Score Card**

<table>
<thead>
<tr>
<th>External Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>10</td>
</tr>
<tr>
<td>Color of crust</td>
<td>8</td>
</tr>
<tr>
<td>Symmetry of form</td>
<td>4</td>
</tr>
<tr>
<td>Character of crust</td>
<td>5</td>
</tr>
<tr>
<td>Break and shred</td>
<td>3 30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Color of crumb</td>
<td>10</td>
</tr>
<tr>
<td>Grain</td>
<td>10</td>
</tr>
<tr>
<td>Texture</td>
<td>15</td>
</tr>
<tr>
<td>Flavor</td>
<td>35</td>
</tr>
<tr>
<td>Aroma</td>
<td>15</td>
</tr>
<tr>
<td>Taste</td>
<td>20 70</td>
</tr>
<tr>
<td>Total score</td>
<td>100</td>
</tr>
</tbody>
</table>

**Volume.** Weight of loaf in relation to size is expressed as volume. This ratio is approximately one to four (1 gram to 4 cubic centimeters).

**Color of Crust.** The crust should be a uniform golden brown on top and a lighter brown on sides and bottom.

**Symmetry of Form.** A loaf of bread is well-formed when the sides are straight and the top is evenly rounded.

**Character of Crust.** The crust should be tender and have a uniform depth of about \( \frac{1}{8} \) of an inch.

**Break and Shred.** This occurs at the line where the sides meet the top of the loaf. There should not be a sharp break in this area, but a strip \( \frac{1}{2} \) to 1 inch in width showing a finely shredded surface.

**Color of Crumb.** The crumb should be creamy rather than chalky white. A freshly cut surface should be uniform in color.
Grain. Grain refers to the size and distribution of the cells. These should be small, thin-walled, uniform in size, and elongated vertically rather than horizontally.

Texture. The crumb should be soft and velvety, not soggy, dry, or crumbly. Bread of good texture tends to rebound, or spring back, when pressed between the fingers, rather than to remain compressed.

Flavor. Flavor is determined by odor and taste and it is the most important characteristic of bread. The best bread has a nutty or grain-like flavor and is entirely free from any suggestion of sourness.