

## 2.8: Flour in Baking

Flour forms the foundation for bread, cakes, and pastries. It may be described as the skeleton, which supports the other ingredients in a baked product. This applies to both yeast and chemically leavened products.

The strength of flour is represented in protein (gluten) quality and quantity. This varies greatly from flour to flour. The quality of the protein indicates the strength and stability of the flour, and the result in bread making depends on the method used to develop the gluten by proper handling during the fermentation. Gluten is a rubber-like substance that is formed by mixing flour with water. Before it is mixed it contains two proteins. In wheat, these two proteins are **gliadin** and **glutenin**. Although we use the terms protein and gluten interchangeably, gluten only develops once the flour is moistened and mixed. The protein in the flour becomes gluten.

Hard spring wheat flours are considered the best for bread making as they have a larger percentage of good quality gluten than soft wheat flours. It is not an uncommon practice for mills to blend hard spring wheat with hard winter wheat for the purpose of producing flour that combines the qualities of both. Good bread flour should have about 13% gluten.

### Storing Flour

Flour should be kept in a dry, well-ventilated storeroom at a fairly uniform temperature. A temperature of about 21°C (70°F) with a relative humidity of 60% is considered ideal. Flour should never be stored in a damp place. Moist storerooms with temperatures greater than 23°C (74°F) are conducive to mould growth, bacterial development, and rapid deterioration of the flour. A well-ventilated storage room is necessary because flour absorbs and retains odors. For this reason, flour should not be stored in the same place as onions, garlic, coffee, or cheese, all of which give off strong odors.

### Flour Tests

Wheat that is milled and blended with modern milling methods produce flours that have a fairly uniform quality all year round and, if purchased from a reliable mill, they should not require any testing for quality. The teacher, student, and professional baker, however, should be familiar with qualitative differences in flours and should know the most common testing methods.

Flours are mainly tested for:

- Color
- Absorption
- Gluten strength
- Baking quality

Other tests, done in a laboratory, are done for:

- Albumen
- Starch
- Sugar
- Dextrin
- Mineral and fat content

### Color

The color of the flour has a direct bearing on baked bread, providing that fermentation has been carried out properly. The addition of other ingredients to the dough, such as **brown sugar**, malt, molasses, salt, and colored margarine, also affects the color of bread.

To test the color of the flour, place a small quantity on a smooth glass, and with a spatula, work until a firm smooth mass about 5 cm (2 in.) square is formed. The thickness should be about 2 cm (4/5 in.) at the back of the plate to a thin film at the front. The test should be made in comparison with a flour of known grade and quality, both flours being worked side by side on the same glass. A creamy white color indicates a hard flour of good gluten quality. A dark or greyish color indicates a poor grade of flour or the presence of dirt. Bran specks indicate a low grade of flour.

After making a color comparison of the dry samples, dip the glass on an angle into clean water and allow to partially dry. Variations in color and the presence of bran specks are more easily identified in the damp samples.

## Absorption

Flours are tested for absorption because different flours absorb different amounts of water and therefore make doughs of different consistencies. The absorption ability of a flour is usually between 55% and 65%. To determine the absorption factor, place a small quantity of flour (100 g/4 oz.) in a bowl. Add water gradually from a beaker containing a known amount of water. As the water is added, mix with a spoon until the dough reaches the desired consistency. You can knead the dough by hand for final mixing and determination of consistency. Weigh the unused water. Divide the weight of the water used by the weight of the flour used. The result is the absorption ability in percentage. For example:

- Weight of flour used 100 g (4 oz.)
- Weight of water used 60 g (2.7 oz.)
- therefore absorption =  $6/10$  or 60%

Prolonged storage in a dry place results in a natural moisture loss in flour and has a noticeable effect on the dough. For example, a sack of flour that originally weighed 40 kg (88 lb.) with a moisture content of 14% may be reduced to 39 kg (86 lb.) during storage. This means that 1 kg (2 lb.) of water is lost and must be made up when mixing. The moisture content of the wheat used to make the flour is also important from an economic standpoint.

Hard wheat flour absorbs more liquid than soft flour. Good hard wheat flour should feel somewhat granular when rubbed between the thumb and fingers. A soft, smooth feeling indicates a soft wheat flour or a blend of soft and hard wheat flour. Another indicator is that hard wheat flour retains its form when pressed in the hollow of the hand and falls apart readily when touched. Soft wheat flour tends to remain lumped together after pressure.

## Gluten Strength

The gluten test is done to find the variation of gluten quality and quantity in different kinds of flour. Hard flour has more gluten of better quality than soft flour. The gluten strength and quality of two different kinds of hard flour may also vary with the weather conditions and the place where the wheat is grown. The difference may be measured exactly by laboratory tests, or roughly assessed by the variation of gluten balls made from different kinds of hard flours.

For example, to test the gluten in hard flour and all-purpose flour, mix 250 g (9 oz.) of each in separate mixing bowls with enough water to make each dough stiff. Mix and develop each dough until smooth. Let the dough rest for about 10 minutes. Wash each dough separately while kneading it under a stream of cold water until the water runs clean and all the starch is washed out. (Keep a flour sieve in the sink to prevent dough pieces from being washed down the drain.) What remains will be crude gluten. Shape the crude gluten into round balls, then place them on a paper-lined baking pan and bake at 215°C (420°F) for about one hour. The gluten ball made from the hard flour will be larger than the one made from all-purpose flour. This illustrates the ability of hard flour to produce a greater volume because of its higher gluten content.

## Ash Content

Ash or mineral content of flour is used as another measurement of quality. Earlier in the chapter, we talked about extraction rates as an indicator of how much of the grain has been refined. Ash content refers to the amount of ash that would be left over if you were to burn 100 g of flour. A higher ash content indicates that the flour contains more of the germ, bran, and outer endosperm. Lower ash content means that the flour is more highly refined (i.e., a lower extraction rate).

## Baking Quality

The final and conclusive test of any flour is the kind of bread that can be made from it. The baking test enables the baker to check on the completed loaf that can be expected from any given flour. Good volume is related to good quality gluten; poor volume to young or green flour. Flour that lacks stability or power to hold during the entire fermentation may result in small, flat bread. Flour of this type may sometimes respond to an increase in the amount of yeast. More yeast shortens the fermentation time and keeps the dough in better condition during the pan fermentation period.

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