

Beginning Whole Wheat Sourdough Bread Making

What equipment do I need to make one basket-raised loaf of bread?



- Wide measuring jug / mixing bowl (2 quart size)
- Measuring jug (0.5 quart size)
- Electronic kitchen scale, reading in grams to 1 decimal place up to 5 Kg (or ounces to 2 decimal place up to 10 pounds), and with taring capability (Ability to set the scale to zero with the container on the scale.)
- Spurtle (shaped wooden stick) or wooden spoon for mixing small amounts of dough
- Hardwood pastry board
- Plastic or metal dough scraper / dough cutter
- Pizza stone 12 inch or larger that fits in your oven
- Round reed or willow basket (8 inches in diameter at the top and approximately 4 inches deep)
- Oven peel
- Wooden rack to cool bread
- Warm place to raise the bread (above 68°F, or 20°C). In winter if your kitchen is cold, a constant temperature dough raising cabinet is invaluable.

- An oven, and miscellaneous spoons, knife, clean cloths, etc., that you probably already have in your home or kitchen

How can I make a sourdough starter?

There is a recipe for a “Simple whole wheat sourdough starter” in the recipe section of www.wholegrainconnection.org. The only ingredients needed are a supply of freshly ground organic whole wheat flour and good drinking water.

How do I knead the dough?

Kneading dough is working the dough so that it takes on a smooth cohesive and stretchy form. Just how strongly elastic or smooth depends on the wheat quality. The working involves some method of forming the dough into a thin sheet and then folding it in half and then pressing the halves together. This is repeated many times over. It is necessary to use water-moistened hands to prevent the dough sticking to your hands, and sometimes it is necessary to also moisten the wooden board with water. Alternatively you can lightly oil your hands with olive oil. *If you watch videos of the process please remember that whole wheat dough is kneaded with the help of water or oil on your hands and on the board, whereas white refined flour dough is kneaded with floury hands and board. Watch videos to discover only the motions of kneading. Whole wheat flour takes longer to hydrate than white flour and if added to the dough late in the process, after the first mixing, it makes the bread dense.*

Note that some kinds of wheat produce more elastic dough than others. The main goal is to thoroughly mix, fold and pummel the dough until it is relatively smooth. This happens readily if you wait until the dough has become fully hydrated and fermented by the end of the first rise to double. *This is an important difference for whole wheat breads compared with refined flour white breads, which can be kneaded soon after mixing.*

Method 1: To knead the dough in a rectangular plastic box: Pull and press the dough piece until it forms a rectangle, fold it in half then press it all over with your fist until it becomes the size it was originally. Repeat this process until the dough is smoother than it was originally and it can be stretched between your hands, without immediately breaking.

Method 2: To knead the dough on a wooden board: Pull and press the dough until it is a rough rectangle. Roll the dough into a tight cylinder with one hand while stretching the dough by pulling on the end of the dough with your other hand, turn it through 90 degrees and repeat the rolling up of the dough, into a tight cylinder. Eventually the dough becomes smooth and stretchy, so that it will not break easily if stretched between your hands.

Method 3: To Knead the dough in a wide mixing bowl: Grasp the dough at the edge of the bowl and pull it up, over and towards the bowl center and then use your fist to press it down in the center. Partially rotate the bowl and repeat the

process. Continue repeating the folding, fisting and rotation of the bowl until the dough becomes smooth and stretchy, and a dough piece can be stretched between your hands, without immediately breaking.

Method 4: Use a food processor or electric dough mixer, following the manufacturers instructions. *Do not add any flour during this process.*

How do I shape dough for a round basket loaf?

After kneading, the dough is generally formed into a ball, and left to rest under a cloth or in a plate covered bowl.

To form a ball of dough on a wooden board: Stretch and press the dough into a rectangle approximately a half inch thick. Starting from the short side, fold the dough into three layers, by flapping one end towards the middle and then flapping the other end over the first. Fist it gently into an approximate rectangle. Turn through 90° and repeat the folding into three layers. Because the dough is by now quite elastic the result should be an approximate cube. Pull the edges of the cube over the sides to make the cube into an approximate ball. Turn the dough ball over so that all the ends are underneath and then spin the ball of dough on the work surface, between your hands until it is round and as close to spherical as you can manage. *If you watch videos for this process please observe the motions, but do not add any more flour to your dough at this stage. Whole wheat flour added into the dough at any time after the first mixing may make the bread heavy.*

After resting the ball of dough, the final shaping is a repetition of the process for making a ball of dough as just described.

To ready the basket and dough ball: First lay a clean linen or cotton cloth inside the basket to line it, leaving the ends hanging over the edge ready to later cover the dough. The dough ball has an uneven underside from the shaping, so it is first gently coated with flour and then is placed upside down into the basket. The ball is gently pressed into the basket with the fist and then is covered with the ends of the cloth, so that the crust does not dry out while it is resting and rising. *In this case the whole wheat flour is simply coating the dough, it is not at all worked into the dough, and serves to prevent the dough from sticking to the cloth. To keep the dough moist in dry conditions, wrap the filled basket in a large plastic bag while the dough rises.*

How can I put steam into my oven?

A bread pan containing a half-inch depth of water can be placed to one side in the oven, approximately 30 minutes, before baking time. This pan is left in the oven for the entire bake time and keeps the air in the oven steamy. The steam provides moisture on the bread surface at the beginning of the bake, and prevents your bread from drying out too quickly as it bakes. The effect of the steam is to produce a more or less shiny crust on your bread.

Remember to open the oven slowly and stand back somewhat when you open the oven door of a steamy oven, so that the steam vents upwards and away from your face.

How do I transfer a basket loaf into the oven?

How do I take it out of the oven?

When the dough has risen to be level with the rim of the basket, uncover it and sprinkle a small amount of whole wheat flour on the loaf. Invert the basket onto the oven peel to release the loaf, and then remove the basket and cloth. *The loaf will be upright, and there will a layer of flour underneath it.* With a sharp knife cut a cross a quarter inch deep on the surface to allow for expansion in the oven.

A pizza stone should have been heating in the oven for an hour or more before you are ready to bake. With a gentle shove, or rapid push-pull motion of the peel you will be able to slide the loaf onto the hot pizza stone. *You can practice this motion when the oven and pizza stone are cold using a slice of already cooked bread!*

At the end of the baking time, you can probably best take the bread from your oven with your hands protected by a pair of oven mitts. Or you can insert the oven peel under the loaf, and with a reverse shove, pull-push movement, slide the loaf onto the peel and bring it out of the oven and onto a cooling rack.

Which recipe should I begin with?

The “Simple Whole Wheat Sourdough – Pavanne” or the “Universal Whole Wheat Sourdough Bread”, in the recipe section of www.wholegrainconnection.org might be the best recipes to begin with. After that you could try any of the recipes that are for making a basket loaf.

What is Baker’s Per Cent?

How is it different from a normal percentage?

Bakers base their recipes on the amount of flour that they use. For example a normal sized loaf is made with 500 grams of whole wheat flour, a baguette is made with 250 grams and a bread bun or roll is made with 125 or 63 grams of whole wheat flour, etc. e.g. A baker who wants to make 10 small buns would start with $10 \times 63 = 630$ grams of whole wheat flour.

For convenience the baker then calculates and measures out all the other ingredients as a percentage of the starting amount of flour. When designing a recipe, to make it even easier to do the arithmetic we can imagine basing our recipe on 100 grams of whole wheat flour. By experimentation, or because we already know, this 100 grams flour may need 60 grams of water to make satisfactory bread dough. The baker’s percentage of water is therefore 60%. Similarly the baker’s per cent of salt generally used in bread is 2%. If oil is used the baker’s percentage may be 4%. Enzyme active malt at the baker’s percentage of 1% may be used. Sourdough starter may be used at the rate of 10%, bakers percent. Note that recipes are generally written so that the ingredients are in the order used.

Here is a chart showing our typical bread recipe with ingredients in bakers percent, compared with the real percentage in a whole loaf based on 500 grams of whole wheat flour:

Ingredient	Bakers Percent	Calculating ingredient amounts based on baker's percent, in grams, for one loaf based on 500 grams whole wheat flour	Real percentage of ingredients present
Whole wheat flour	100	$(100/100) \times 500 = 500$ grams	$(500/885) \times 100 = 56.497$
Enzyme active malt	1	$(1/100) \times 500 = 5$ grams	$(5/885) \times 100 = 0.565$
Olive oil	4	$(4/100) \times 500 = 20$ grams	$(20/885) \times 100 = 2.260$
Salt	2	$(2/100) \times 500 = 10$ grams	$(10/885) \times 100 = 1.130$
Water	60	$(60/100) \times 500 = 300$ grams	$(300/885) \times 100 = 33.898$
Sourdough starter	10	$(10/100) \times 500 = 50$ grams	$(50/885) \times 100 = 5.650$
Totals	177	885 grams	100

How can I know how much water to use in whole wheat bread dough?

The big centralized millers have been blending refined white flour from just the endosperm of wheat for over 100 years; the result has been that we did not need to think very hard about how much water to use, when making white bread; we could simply use the amount given in a recipe. Nor did we need to worry about how long the flour might take to actually absorb the water, since it could absorb the water practically instantly.

However now, the new local millers are producing freshly ground 100% whole wheat flour from a wide range of wheat types, grown under a wide range of conditions. Whole wheat flour contains bran and germ, as well as the endosperm material. In particular, the bran absorbs much more water for a given weight, than endosperm white flour can absorb. The tendency therefore, is to add too much water to whole grain bread dough, only to find that the dough cannot hold the water in the same way as refined endosperm flour. The most evident proof that too much water has been added, is if the cloth liner in the bread basket, used to raise the dough after final shaping, becomes soaking wet.

In reality, the amount of water that whole wheat flour can absorb when making a bread dough is as wide ranging as the wheat varieties are. In addition for a given variety, there is also variability due to the conditions under which the wheat was grown. As a result, water needed to make a dough suitable for a basket raised loaf can range from as little as 55% up to 80% and more, bakers percent.

To find out how much water to add for each whole wheat flour that you encounter, start your mixture with 55% water, or 60% or more, with respect to

the whole wheat flour amount, if you are sure the flour can absorb it. Note the amount used. The dough is initially mixed just until the ingredients are incorporated. No attempt is made at this first mixing stage, to knead the dough i.e. to develop smoothness and elasticity into the dough. Punch the dough down into a container and allow it to rise until double. Next, knead the dough by hand or in a good dough mixer and if you would like to make a softer dough, add 5% (bakers percent) water at a time and mix it in, until the dough texture is just still firm enough to be self supporting as a basket loaf. Make a note of the amount of water needed to reach this dough consistency, and add it to the amount used to make the initial mixture. The total will be the amount of water that you can use when first mixing your dough, when next you use the same whole wheat flour to make a basket loaf of bread.

Note: This range of amounts of water to make up the dough is for whole wheat flour that is very dry at 10% moisture. Some commercial whole wheat flour has a moisture content of 14%, so that it may be necessary to start your recipe with just 50% water.

What temperature do I need to make my bread rise?

Bread dough rises as a result of the reproduction of billions of microorganisms producing carbon dioxide. When they are in a winter cold kitchen the rate of reproduction slows dramatically, and conversely on a hot summer day the growth is astronomically faster. To generalize, the time taken for bread dough to double is cut by at half or even a third for every 18°F (10°C) rise in temperature.

This means that provided you are able to control and choose the temperature you can set the temperature so that the dough takes the time to rise that you would like. For example you could mix the dough early in the morning and leave it at a cool temperature so that it rises to double by the time you come home from work. To be exact with your timing, you would need to be consistent with the temperature of your materials: the mixing bowl, water and flour. Generally this is easy since all of these are stored or come from the same place each time. Some bakers like to use warm water to begin with, at a particular temperature, and this will give you a shorter time to rise to double.

Another consideration is that the mix of microorganisms contains some that reproduce faster than others at the various temperatures, and this can influence the flavor. If you discover that your favorite flavor is produced at 75°F (24°C), then you may be content to wait much longer for the dough to rise to double, than it would take at 90°F (32°C).

In my kitchen using cold water and flour at room temperature, the dough kept at 90°F (32°C) rises to double after the first mixing within 5-6 hours, whereas at 72°F (22°C) it takes 11-12 hours. Below about 68°F (20°C) the dough takes rather too long to rise to double, and if refrigerated at 40°F (4°C) it is even slower.

What kind of whole wheat flour is best for bread making?

Since the whole grain is used to make whole wheat flour it is best to choose organic grain, or at least grain that has not been treated with any pesticides. This reduces the possibility that you would ingest any of these chemicals, but it is also a way to maximize the possibility that you will be able to

make your own sourdough starter from this flour and to maintain a sourdough starter.

Practically all kinds of wheat can be made into a basket loaf, using a sourdough starter. The method for producing whole grain flour from the grain is *the* important step, and the best method still is stone grinding. Even then the stones need to be well cared for to produce very fine flour. Actually, I mean a mixture of bran and germ flakes and fine flour from the endosperm. Stone ground whole wheat flour for bread can have large bran flakes in it, but the endosperm of the grain should be very fine. Coarser ground flour, or flour with chunks of grain can still be used to make bread, but the texture will be correspondingly coarser.

The best flavored whole wheat flour is ground just before using it to make a dough for bread. However, stone ground whole wheat flour generally still has a good flavor even two to four weeks later. Once you experience freshly ground flour it is difficult to be satisfied with any flour that has been stored. The grain however, can be stored for 10 years or more without deteriorating provided it is protected from heat, moisture, insects and rodents, which is easy enough if the clean grain is in a closed container and kept cool.

What kind of water is best for bread making?

Tap water is likely to contain disinfecting chemicals added at the local water treatment plant. Since these chemicals are likely to be bacteriostatic and damaging to yeasts, or simply may cause a chemical taste, the best treatment for your tap water if you suspect the presence of any of these substances, is to filter the water through a carbon filter. Most water purifier systems are of this type; an active carbon filter capable of removing organic compounds. *Organic compounds* here are referring to those complex carbon compounds used as disinfectants, and described by chemists as organic compounds.

Hard water contains significant amounts of the ions of salts such as calcium, magnesium, chloride and sulphate. The presence of these salts is good for bread making; the various enzyme systems of the microorganisms and wheat use these ions as cofactors, so making their presence valuable. However these salts may be removed by a filter system, if the carbon filter is in combination with some ion exchange beads. Also any system of reverse osmosis or distillation will remove these salts from the water. It is possible to add these salts to the water if it looks as though the fermentation might be less vigorous than expected. The natural water in Burton-on-Trent, in England is famous for its high content of calcium and magnesium together with the associated ions. This natural water makes famously good beer; so that beer makers elsewhere add these salts to their water in order to simulate the beers from Burton-on-Trent. It is also here that the Benedictine Monks produced famous English whole grain bread similar to the modern Granary loaf containing roasted malt grains.

What is malted wheat?

Sprouted grains have been gaining in popularity as a novelty, but in fact sprouted grains have been in use since ancient times. The historic word for sprouted grains is *malt*.

A simple and convenient recipe for making sprouted wheat at home can be found at www.wholegrainconnection.org in the recipe section.

Malt or sprouted grains are useful in baking. If gently dried then the sprouting grain enzymes will still be active. These enzymes will aid the release of sugars from the starch as a source of energy for the sourdough microorganisms, and the release of minerals from the bran and germ as well as other useful activities for bread-making. If instead the malt is roasted, then the malt becomes richly flavored and can be added to bread to intensify flavor.

Barley malt is generally made with barley that is still enclosed in the husk, in which case it is ideal for brewing beer, but entirely unsuited to bread making. For bread-making, roasted barley malts are steeped in water to dissolve out all the soluble materials. This solution is then evaporated down to a syrup known as barley malt extract, which generally has no natural enzyme activity left, but is a source of soluble carbohydrates, proteins, vitamins and minerals that are used by fermenting microorganisms, as well as by people eating bread flavored with barley malt extract.