Sourdough Bread: 101

The history of sourdough breadmaking dates back thousands of years ago. All sourdough bread was once naturally leavened with just wild microbes in the environment, but with the industrialization of bread production, natural fermentation in bread-baking became less common. Large-scale commercial sourdough bread is leavened with commercial yeast, processing aids, and additives that help the bread rise and have that distinctive sour taste. But more and more people want to return to artisan ways.

Like kimchi, yogurt, fermented sauerkraut, and fermented pickles, sourdough is characterized as a lactic-acid fermentation. This means that lactic acid bacteria, which are naturally present in our food, including flour, and in our environment, feed on the sugars (carbohydrates) in flour and produce lactic acid, giving the bread a sour taste.

Sourdough Starter

Sourdough bread begins with a starter. You can obtain a starter from a friend, purchase a commercial dried starter, or make your starter with flour and water.

Supplies for Making a Sourdough Starter

- **Non-reactive containers.** Include wide-mouth mason jars, plastic containers, glass bowls, or crocks. Do not use copper, iron, or galvanized metal. A funnel may be excellent to have when using mason jars.
- **Digital kitchen scale.** It's optional, but many recipes are written in grams because it's a more accurate unit of measurement than measuring in cups and will produce more consistent results.
- **Indoor thermometer or hygrometer.** It is optional, but knowing the room temperature is helpful.
- **Spatula.** Useful to stir the flour and water together.
- **Water.** Spring water or filtered water. Tap water is usually fine, but if the water is very hard or heavily chlorinated, the starter may not ferment well.
- **Flour.** Use unbleached flour, preferably rye flour or whole-grain flour. You may use a combination of flours.

Sourdough Science

A sourdough starter is made of flour and water. During fermentation, bacteria, primarily lactic acid bacteria and wild yeast, colonize and grow. Yeasts and lactic acid bacteria digest the flour's carbohydrates (sugar and starch).

Yeasts produce by-products, including carbon dioxide, the primary leavening agent. It also produces alcohol and converts it to acetic acid. Yeasts will contribute to that wonderful yeast bread aroma.

Lactic acid bacteria (mainly lactobacillus) will produce the by-product, lactic acid, which gives the bread a sour flavor. This production lowers the pH of the starter, making it more acidic, thus eliminating the survival of any "bad" microbes that can get us sick.

Start with a clean kitchen

Wash and sanitize countertops and equipment. Wash hands with warm soap and water before handling food and clean equipment. Cover the starter loosely to limit airborne contaminants.

Feeding the Starter

The fermenting microorganisms in the starter need to be routinely fed flour and water to survive and grow. Feed a minimum 1:1:1 ratio, equal parts by weight of starter, flour, and water. While it may seem wasteful, it's necessary to regularly discard some of the starter when feeding to minimize the volume. The keys to making a sourdough starter are time, temperature, and patience:

Time

It can take 14 days to a month to establish a starter. It must be fed daily and twice daily starting on day 4.

Temperature

Warm temperatures are needed to help the yeast stay active. Generally, temperatures in the 70-82 F range work best.

Patience

Don't give up! Continue to feed the starter regularly. If it's sluggish and not rising, consider putting it in a warmer environment and/or switching the flour, such as all-purpose or bread flour to rye flour.

Signs that the Starter is Ready

- It's been at least 14 days (while a starter can be used to make bread on day 7, it can take longer for the good bacteria to establish itself as the dominant force. You'll be rewarded with a more active, more robust starter and better bread).
- It consistently falls and rises; the starter at least doubles within 4-6 hours after feeding.
- It smells yeasty and pleasant.
- It has bubbles on the top and some large bubbles on the sides.
- It has a stretchy, aerated, mousse-like consistency that is pourable but not watery.

Using the Starter

You may have heard before that you want to use your starter at its peak; it's best to use it when it has at least doubled in size, usually about 4-6 hours after you've fed it, before falling back down.

Feeding a higher ratio of flour and water will slow the starter down. If planning on making bread in the morning so there is plenty of time to bulk ferment, consider feeding a high ratio of 1:10:10 the night before so that it peaks in the morning (10 g starter, 100 g flour, 100 g water); this is sometimes referred to as a levain.

Maintaining the Starter

Maintaining your starter depends on your schedule and how often you plan to bake. If baking:

- **Every day or 3-4 times per week:** Feed it daily and leave it on the counter or in a warm place.
- **Weekly**: Keep the starter in the refrigerator and get it out the day before you start making the bread. You do not need to bring it to room temperature before feeding it.
- **Monthly**: Keep the starter in the refrigerator and get it out the day before you plan to make bread. May need to feed it a couple of times 12 hours apart to get it going.

Hooch forming on top of the starter.

Besides carbon dioxide, yeasts also produce alcohol, which forms as a dark liquid at the top of the starter when it hasn't been fed in a while. This liquid is known as "hooch." Pour it off or stir it in; it's up to you!

Preserving the Starter

Can the Starter Die?

Starters are highly resilient and more than likely can be revived. However, the longer a starter goes without food, the higher the acidity; too much acid and beneficial bacteria can't survive. Discard the starter if mold appears. If taking an extended break from baking, consider preserving the starter by dehydrating it.

Drying. Feed the starter and allow it to double in size. Lay parchment paper onto a baking sheet. Spread the starter very thinly and dry it at room temperature until it is brittle. Break into pieces and store in a labeled airtight container from direct sunlight and heat.

Reviving the starter. There are several steps to returning the starter to its former glory days. Visit King Arthur Baking Company at www.kingarthurbaking.com/visit for directions.

Can I Freeze Starter?

Yes, but it can damage the cell structure, causing poor performance when thawed. It is better to dehydrate it for long-term storage.

Sourdough Benefits

Longer shelf-life. The low pH of the bread inhibits mold growth and helps it stay fresh for longer.

Easier to digest. The long fermentation time breaks down some carbohydrates and proteins into smaller units, decreasing bowel irritation (gas/bloating) in some people.

It may reduce gluten sensitivity symptoms. Lactic acid bacteria release enzymes that break down gluten over time and may minimize gluten intolerance symptoms, but research is ongoing. It's important to note that gluten is still present and cannot be consumed by those with celiac disease.

Potentially lower glycemic index. Some studies show that sourdough fermentation stops the enzymes that metabolize starches, slowing down digestion and reducing a rise in blood glucose, though more research is needed.

It makes nutrients more bioavailable. Magnesium, iron, and zinc are especially found in whole-grain flours. Lactic acid breaks down phytates that try to inhibit absorption.

Supplies for Making Sourdough Bread

Non-reactive container: This can be a plastic, stainless steel, or glass container. Do not use copper, iron, or galvanized metal.

Digital kitchen scale: Most recipes are written in grams because it is a more accurate unit of measurement than measuring in cups.

Bowl scraper: This is not necessary but helps scrape the batter off the sides of the bowl. Clean hands may also be used.

Dough scraper/banquette: Optional but helpful in dividing, lifting, and shaping the dough.

Proofing basket: This is not necessary, but it is used to maintain the shape of the dough during cold proofing.

Bread lame or razor blade: Used to score the bread and create a weak point in the dough through which gas can escape when the bread rises in the oven.

Dutch oven: It traps steam inside the pan, allowing the dough to rise before taking off the lid to create an outer crust.

10 Steps to Making Sourdough Bread

1. Refresh (feed) the starter or make levain.
2. Autolyse, cover, and rest for at least 60 minutes.
3. Add starter and salt. Cover and rest for 30 minutes.
4. Do 3-4 stretches and folds over 2 hours.
5. Cover and bulk ferment.
6. Divide (if desired) and pre-shape.
7. Final shape.
8. Cold ferment or countertop final proof.
9. Score dough.
10. Bake in a hot oven.

Autolyse or Fermentolyse?

Autolyse: Mix flour and water. Cover and let rest for at least 60 minutes before adding starter and salt.

- Good for higher hydration doughs.
- Good for whole grain doughs.
- Creates a smoother, more elastic dough.

Fermentolyse: Mix flour, water, and starter. Cover and let rest for 30-40 minutes before adding salt.

- Works well when using flours that are not whole grain.

Hydration

It can be very beneficial to know and understand the hydration of your dough, which is simply the percentage of water to flour in your recipe.

% **hydration** = (Weight of Water divided by Weight of Flour) x 100

350g of water/500g of flour x 100 = 70%

Most sourdough bread is around 70-90% hydration. Higher hydration may give a thinner, crispier crust and a light, airy crumb. However, it also depends on the type of flour used. A 70% hydration using whole grain flour will be too low, and the bread will turn out too dense.

Higher hydration doughs may be harder to work with and shape as they may have a stretchy, stickier dough. Higher hydration doughs generally work best with strong, high-protein flour (bread flour). Understanding hydration and the effects of different flours makes it easier to modify recipes or even create your own.

Stretch and Folds

Wet hands with water to prevent sticking. Do 4 stretch and folds around the dough: pull the dough from top to bottom, quarter-turn the bowl, and repeat until you've done 4 stretch and folds. Repeat the process 2-3 more times, letting the dough rest in between for 20-30 minutes.

Bulk Ferment

After developing the gluten with stretch and folds, it's time to let the dough rise, which is the bulk ferment process. Some recipes say to bulk ferment for a period of time, some will say until doubled, but it depends on the dough temperature. It should only double if fermenting in cooler temperatures, around 65 F. Go by dough temperature and percent rise, not by time.

- 30% rise when dough temp is 80 F
- 50% rise when dough temp is 75 F
- 75% rise when dough temp is 70 F
- 100% -double-when dough temp is 65 F

Signs of readiness:

- A slightly domed surface is coming away from the edges of the container.
- Smooth surface with some air bubbles forming at the top.
- Bubbles look like sponges on the sides of the container.

50% rise: based on average dough temperature of 74 F.

Shaping the Dough

Shaping is essential to build structure. It's done by layering the dough onto itself and then tightening it to create surface tension, allowing for adequate oven spring rise.

Turn the dough onto the counter, and using a bench scraper, divide the dough into two if desired. Then, pre-shape the dough.

Lightly dust bannetons with rice flour. Depending on the banneton's shape, the dough's final shape becomes a boule (round) or a batard (oval).

Watch a video on how to shape dough: YouTube: Foodgeek, SHAPING high hydration DOUGH.

Cold Ferment or Countertop Final Proof

Cold ferment. The cold ferment or sometimes referred to as "cold retard" or "proofing" is done after the final shaping. Cover the dough in the floured banneton (elastic food covers work well) and leave in the refrigerator for 8-16 hours or longer. The longer the dough is left in the fridge, the sourer it will taste, but generally, it shouldn't be cold fermented past three days. The cold temperature makes the yeast "sleepy," so it won't rise much, if at all, but the lactic acid bacteria are still working and producing that sour flavor. There are other advantages to cold fermenting: A cold dough makes it easier to score the dough, and the cold ferment allows you to bake bread whenever you are ready.

Countertop final proof. Rather than cold-fermenting, cover the dough in the floured banneton and leave it at room temperature for 1-4 hours, depending on the dough and room temperature. The warmer the temperature and dough, the less time it will take. Use the poke test to determine when to bake: Flour your finger and press the dough. If it springs back, it's not ready; if it slowly springs halfway back, it's ready; if it stays, it's over-proofed and should be baked immediately.

Scoring the Dough

A sourdough loaf may increase to about three times its original size while baking. Scoring the dough before baking is necessary to create a weak point in the dough where gas can escape as the bread rises in the oven. You need at least one long essential (or primary) cut ½-inch deep; this is a confident, single stroke with one continuous motion. You may use decorative scoring, too, if desired.

To score:

- Turn the dough out of the banneton onto parchment paper.
- Brush away any flour that has been caked on.
- Dust the surface with rice flour and smooth over the top of the dough with your hand.
- Using a bread lame or razor blade, score the dough.

Boule Scoring

Batard Scoring

Resources

The Sourdough Journey: https://thesourdoughjourney.com.

Colorado State University Extension: https://extension.colostate.edu/topic-areas/nutrition-food-safety-health/9-392-understanding-and-selecting-sourdough-for-health-benefits/

Foodgeek: https://foodgeek.dk/en/

Tartine Bread, book by Chad Robertson.

Illinois Extension educators Jenna Smith and Nick Frillman took all the pictures in this handout.

Baking in the Oven

A Dutch oven traps steam inside the pot, which creates a thick crust. Sourdough bread is baked in a hot oven, usually around 450 F. Be sure your Dutch oven can handle this hot temperature. You don't need to bring the dough to room temperature before baking. Preheat the oven with the Dutch oven in it to get it nice and hot. Then, lift the parchment paper with the dough and set it inside. Bake it for 30 minutes with the lid on. Then, remove the lid and bake for another 15-30 minutes; this will brown the crust. Let the loaf cool for at least an hour before slicing.

What if I don't have a Dutch oven?

There are other ways to create steam in an oven. For example, place dough in a loaf pan and place a second loaf pan on top.

Storing Sourdough Bread

Store baked bread at room temperature for 3-5 days for best quality; refrigeration temperatures will dry the bread. Store in a linen bread bag to allow it to breathe or in a bread bin, paper bag, cooled Dutch oven, or cake carrier. The bread will start to lose its crispy crust. Refresh in toaster or spritz with water and warm in oven.

Can I freeze baked bread?

Yes. To freeze:

1. Ensure the sourdough bread has completely cooled, usually at least one hour.
2. Freeze the whole loaf by wrapping it in aluminum foil and placing it in a plastic bag or slice.
3. Freeze slices on a baking sheet so they don't stick together, and then stack them back into a loaf in a plastic bag or freezer container.
4. Freeze for up to two months for best quality.

Example Schedule #1

Day 1

Time	Instruction
9:00 p.m.	Create levain (10 g starter, 100 g flour, 100 g water)

Day 2

Time	Instruction
7:00 a.m.	Prepare autolyze
8:00 a.m.	Add starter; cover and let rest
8:30 a.m.	4 stretch and folds, about 30 minutes apart
10:30 a.m.	Cover and bulk ferment
approximately 3:30 p.m.	Divide and pre-shape
4:00 p.m.	Final shape
4:15 p.m.	Cold retard overnight

Day 3

Time	Instruction
7:00 a.m.	Score and bake bread

Example Schedule #2

Day 1

Time	Instruction
6:00 a.m.	Refresher feed starter 1:1:1 (60 g starter, 60 g flour, 60 g water)
10:00 a.m.	Prepare autolyze
11:00 a.m.	Add starter; cover and let rest
11:30 a.m.	3 stretch and folds, about 20 minutes apart
12:30 p.m.	Cover and bulk ferment
approximately 6:00 p.m.	Pre-shape
6:20 p.m.	Final shape
6:35 p.m.	Cold retard overnight

Day 2

Time	Instruction
8:00 a.m.	Score and bake bread

Sourdough Glossary

Autolyse: Mix flour and water and let it rest for at least 60 minutes.

Banneton: Also called “proofing basket.” Used to ensure the dough stays in the correct shape after the final shaping.

Batard: French word for elongated or oval-shaped loaf of bread.

Boule: French word for a round-shaped loaf of bread.

Bulk Ferment: The step when the dough is fermenting and rising in a large, single mass.

Coil Folds: A method of strengthening the gluten network in the dough. Gently lift the dough straight from the middle and allow it to fold underneath.

Cold Ferment: Also called “cold retard” or “proofing.” After the final shaping, the dough is put in the banneton in the refrigerator to rest. It helps to develop the sourness of the bread.

Crumb: Refers to the inside texture of the bread. An open crumb is light and airy, with large but even holes. A closed crumb has much smaller holes and may be gummy or chewy.

Fermentolyse: Mix flour, water, and sourdough starter and rest for 30-40 minutes.

Hooch: Liquid alcohol on top of the starter formed when the starter hasn’t been fed in a while.

Levain: An offshoot of the sourdough starter.

Stretch and Folds: A method of strengthening the gluten network in the dough.

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