Textbook of Baking & Pastry Fundamentals

Sarah R. Labensky, Priscilla A. Martel,
Eddy Van Damme

Third Edition

PEARSON NEW INTERNATIONAL EDITION

ALWAYS LEARNING

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TABLE 5 WASHES FOR YEAST PRODUCTS

WASH	USE
Whole egg and water	Shine and color
Whole egg and milk	Shine and color with soft crust
Egg white and water	Shine with firm crust
Egg yolk and cream or milk	Shine and color with soft crust
Milk or cream	Color with soft crust
Water	Crisp crust
Flour	Texture and contrast
Starch wash	Shine and color

to deflate the product. Avoid using too much wash, as it can burn or cause the product to stick to the pan. Puddles or streaks of egg wash on the dough will cause uneven browning.

Occasionally, a formula will specify that melted butter or oil be brushed on the product after baking. Do not, however, apply egg washes to already baked products, as the egg will remain raw and the desired effect will not be achieved.

SCORING AND DOCKING

The shape and appearance of some breads can be improved by cutting their tops with a sharp knife or razor (lame) just before baking. This is referred to as **scoring** or slashing. Hard-crusted breads are usually scored to allow for continued rising and the escape of gases after the crust has formed. Breads that are not properly scored will burst or break along the sides. Scoring can also be used to make an attractive design on the product's surface. Some flatbreads such as pizza and crackers may be docked, or pricked with small holes to prevent the formation of irregular air bubbles in the finished product. A tool called a **docker** is used for this purpose. By contrast, pita bread is not docked so that its distinctive pocket will form. Even a hard-crusted loaf of bread can be gently docked after proofing to create an attractive design on the crust.

docker a hand tool designed to pierce holes in the surface of bread, cracker, pastry and pizza dough before baking to release air bubbles so the product bakes evenly

Dipping bread in seeds and coatings before baking.

Scoring a round loaf with a lame.

Docking a risen loaf of raisin bread with a docker before baking.

Unmolding a loaf from a brotform onto a sheet pan (in the foreground) and a scored loaf (at the top).

OVEN STEAM

The crisp crust desired for certain breads and rolls is achieved by introducing moisture into the oven during baking. Steam revitalizes the yeast in the dough and keeps the surface of the dough soft so that it can rise fully in the oven. The steam also contributes to the

Loading bread into a deck oven.

chemical changes of the starch and sugar on the surface of the dough, producing a thin crust and brown color. Steam is introduced into the oven in the early baking stages only. Excessive steam will produce a crust that is pale and thick. Professional bakers' ovens have built-in steam injection jets to provide moisture as needed. Steam must not be present during the final stages of baking so the bread can brown.

To create steam, spray the bread with water several times during baking, or place a pan on the oven's lowest rack to receive water. Then pour ½ to ¾ cup (120 to 180 milliliters) of water into the pan just before placing the bread in the oven. This creates a burst of steam during the first few minutes of baking. (Slightly open the oven door or the vent in a deck oven during the last few minutes of baking to let condensed steam escape.) Rich doughs, which do not form crisp crusts, may be baked without steam.

Many artisan bakeries bake their breads directly on the flat heated surface of a deck oven. Usually made from masonry material, the hearth or deck traps heat and conducts it directly to the bread dough. Bakers slide the bread onto the hearth using a flat wooden or metal peel.

DETERMINING DONENESS

Baking time is determined by many factors: the product's size, the oven thermostat's accuracy and the desired crust color. Larger items require a longer baking time than smaller ones. Lean dough products bake faster and at higher temperatures than enriched dough products.

Fully baked lean bread dough should reach an internal temperature of 190°F to 210°F (88°C to 99°C). Rich bread dough is fully baked when it reaches an internal temperature of 180°F to 190°F (82°C to 88°C). The internal temperature can be gauged with great accuracy using an instant-read thermometer. However, bread loaves are commonly tested for doneness by tapping them on the bottom and listening for a hollow sound. This indicates that air, not moisture, is present inside the loaf. If the bottom is damp or heavy, the loaf probably needs more baking time. The texture and color of the crust are also a good indication of doneness, particularly with individual rolls. Browning (caramelization) on the outside of bread flavors the entire loaf. A pale loaf will have less flavor than a well-browned one. The baking times indicated in formulas are estimates only and may vary depending on the equipment used. Experience will teach how to determine doneness without strict adherence to elapsed time.

GUIDELINES FOR DETERMINING BREAD DONENESS

- Uniform, rich, burnished gold to brown crust color
- Hollow sound when bottom of loaf is tapped
- Lean dough—Internal temperature 190°F to 210°F (88°C to 99°C)
- Rich dough—Internal temperature 180°F to 190°F (82°C to 88°C)

Stage 10: Cooling and Storing the Finished Products

The quality of even the finest yeast products suffers if they are cooled or stored improperly. Yeast products should be cooled on racks at room temperature and away from drafts. Yeast breads and rolls should be removed from their pans for cooling unless indicated otherwise. Cool completely before slicing. This allows the internal structure to settle and evaporates any excess moisture remaining. Once cool, yeast products should be stored at room temperature or frozen for longer storage. Do not refrigerate yeast breads, as refrigeration promotes staling. Do not wrap crisp-crusted breads such as Italian or French loaves, as this causes the crust to soften.

ARTISAN BREAD

An artisan is a person who works with his or her hands, a skilled craftsperson in a trade, whether it be cheese making, ceramics or butchery. When it comes to yeast breads, the term *artisan* refers to many things: a style of bread making as well as specific production techniques. Since the 1970s, there has been an interest in traditional techniques employed in European bakeries. The spread of automated baking machinery led to deterioration in the quality of bread, especially in France, where bread is an important symbol of pride and national identity. Combined with the deprivations surrounding World War II, the quality of bread in France suffered greatly during the mid-twentieth century, leading bakers such as Lionel Poilâne to search out and reemploy neglected ingredients and techniques. Now in the United States and globally, "artisan baking" is part of a larger food movement away from large scale commercial production back to small-scale, hands-on production techniques.

ARTISAN YEAST BREAD

The term *artisan bread* is not easily defined because it has been adopted by small-scale independent bakers as well as industrial producers. Some generally-recognized characteristics of artisan bread are hand-crafted products made with high-quality, traditional ingredients without additives or preservatives. Unbleached, unbromated and organic flours are preferred, and doughs generally contain natural starters mixed using pre-fermentation methods. Mixers may be used to prepare the dough, but rounding and forming is usually done by hand. And artisan breads are often baked without pans, directly on the heated stone deck of a hearth oven. Some specific ingredients and techniques used to make artisan bread are discussed here, although they may apply to any type of bread being made.

Priscilla Martel

Breads baked at an artisan bread competition.

Ingredients for Artisan Bread

The selection of ingredients for artisan breads is significant. Artisan bakers look for high-quality, all-natural unbleached, unbromated flours. Seeking to emulate traditional bread from Europe, bakers choose lower-protein flours with a high ash content such as those used abroad. Ash content indicates the bran contained in the flour; higher-ash-content flour tends to be slightly darker with distinctive flavors. Minerals in the bran are nutritious and enhance yeast activity during fermentation. But a high bran content can also weaken the gluten bond in doughs. Artisan-style bread flour may absorb less water than conventional bread flour. This means that water quantities may have to be adjusted when using artisan-style flour as when changing any type of flour used in a formula.

The type of flour used impacts dough-handling techniques employed by artisan bakers. Organic flour from a small producer may behave somewhat differently from its conventional counterpart. There may be less consistency from bag to bag requiring the need to test-bake a batch of bread with each delivery of flour. Stone-ground flours, which are coarse, tend to absorb less water than flours milled on steel rollers. Flours milled from whole grains, which are often an important component in artisan breads, tend to absorb more water. Bread dough may need longer fermentation or different make-up techniques when made with lower-protein flours. Bakers need to understand and pay close attention to the impact of each ingredient when preparing an artisan dough.

NATURAL YEAST STARTERS, SOURS AND PREFERMENTS

Artisan bakers prefer to limit or eliminate the use of commercial yeast in order to bring out the best qualities of their flour. They accomplish this by using natural starters and preferments for leavening.

Natural starters contribute a distinctive flavor, from mild and buttery to sharp and tangy, to the finished product. A natural yeast starter, known as a natural starter, sour, mother or a *chef* in French, is made when wild yeasts such as *Candida milleri* and bacteria are captured in a dough. During the fermentation process bacteria, such as lactobacilli, convert sugars into acids that lend distinctive flavors to bread. Two types of acid are produced during fermentation, lactic and acetic acid. **Lactic acid** is mild and **acetic acid** is strong with the tang of vinegar. Generally a cool fermentation favors the development of lactic acid, whereas a shorter, warmer fermentation will favor the development of acetic acids.

Wild yeasts, unlike their commercial counterparts, can tolerate a higher level of acidity. Natural starters are essential to make sourdough and many types of artisan bread. Because thousands of strains of wild yeast and bacteria thrive in the various geographic regions, starters vary widely. Over time and in different regions, bakers developed numerous strategies for using natural yeast starters to create regionally desirable flavors and textures in bread. Although the term *sourdough* implies that the bread will have a distinctive sharpness, European breads made with natural starters do not usually have a strongly sour flavor because of the way in which the dough is handled, balancing fermentation temperature and time.

Making a Natural Starter

To make a natural starter, begin by combining equal parts flour and water into a wet mixture. Using organic flour will increase yeast activity, as will using equal parts by weight of rye flour, which ferments quickly, and white flour in the initial starter mixture. A small

Starter activity at three stages: just mixed (lower right), 3 hours after mixing (left) and 12 hours later (upper right).

AN HONEST LOAF

It is astonishing that the word *artisan* as it applies to bread baking remains so challenging to define. "I know it when I see it," "Bread made all by hand," "Bread made by hand except for mechanical mixing and an oven," and "Bread made from the soul of the baker" all have been presented by various spokespeople. I once heard someone call artisan bread "an honest loaf" and it made me think of all the implications of our craft—not the inference of the word but the impact of a lifelong quest for the bread they call "honest."

To today's artisanal baker, the creation of an honest loaf goes beyond man versus machine. It's about respect. Respect for everything that occurs before the baker creates the loaf and respect for everything that the loaf means after it leaves the bakery. Today's baker knows the source of the wheat, sometimes the name of the farmer who planted it, and has respect for the methodology used to sustain the wheat field. Today's artisanal baker knows where the wheat was milled and has a good understanding of complicated scientific tests that predict the quality of the grain. To bake an honest loaf the baker maintains the integrity of the bread-baking process, facing day-to-day challenges without taking shortcuts. The baker realizes that his or her art is on display not in a museum but in a home, around the family dinner table sharing all the joy and pain of reality. Finally, being a prideful sort, today's artisanal baker realizes that unselfishly teaching others, sharing information, and setting an example of professional discipline are the cornerstones of sustaining the honest loaf.

A famous singer once compared herself to Rembrandt. "It's not easy to be a performing artist. Rembrandt only had to paint *Return of the Prodigal Son* once. I have to paint it every time I perform." The same could be said about the artisanal baker. The quest for the honest loaf is eternal.

—GREG MISTELL, owner, Delphina's Bakery and Pearl Bakery, Portland, OR; past chairman, Bread Bakers Guild of America

CHARACTERISTICS OF ARTISAN BREAD

- made from all natural ingredients
- made using natural yeast starters and preferments rather than commercial yeast
- produced in small batches
- fermented slowly, perhaps under retardation to develop flavor
- formed by hand and baked in a deck oven

amount of grapes, apple peels or orange rinds may be added to introduce natural yeasts to the mixture. Some bakers also add a small amount of prepared yeast to initiate fermentation. After several hours covered at room temperatures (60°F–80°F/15°C–26°C), bubbles will appear on the surface, indicating that yeast activity has begun. Within 12 to 24 hours, yeast activity should be noticeable and the mixture will double or triple in volume. Over time, the starter will develop a mellow flavor with some noticeable acidity. A quantity of starter is then used as an ingredient in various bread dough formulas. Starters can be kept and used for literally years if properly maintained. To maintain a natural starter, frequently **refresh** or feed it with more flour and water. Yeast is more active in a wet starter than a dry one; add more flour when the starter will not be used for an extended period of time. A drier starter—more like a dough than a batter—will ferment more slowly and develop more sour flavors under refrigeration. When preparing to make sourdough bread for production, feed the starter as often as every 8 hours to keep the yeast active. A starter is ready to use when it doubles in volume in 8 to 12 hours after feeding. (Another test some bakers use is to place a small piece of dry starter in warm water. If it floats, the starter has the strength to leaven bread dough.) The amount of flour and water necessary to feed a starter varies, but never add more flour and water than would double the mixture at one time. More water can be added to speed fermentation in the starter on the day when it will be used. Learning to build and maintain a starter is an essential baking skill that takes time and experience to master.

Using a Natural Starter

When using a natural starter to leaven bread, certain procedures must be followed to ensure a viable rise. The true sourdough starter method of mixing bread has three stages. First a sourdough culture or mother (Fr. *chef*) is prepared. Because natural yeasts may be less concentrated in the starter, a second-stage mixture called a **levain** is prepared to add more yeast food and encourage yeast activity. In the third stage, the final dough is mixed. The three-stage sourdough mixing method is illustrated by Pain au Levain (Traditional French Sourdough Bread) (recipe shown later in this chapter).

Authentic sourdough bread contains no commercially prepared yeast. Today, however, many bread doughs made with starters are often fortified with commercial yeast to provide consistency and reliability. The starter provides flavor and other qualities to the dough, while the yeast ensures timely bread production. A sourdough bread made with starter and some commercial yeast is illustrated by Italian Country Sourdough Loaves (recipe later in chapter). Bread dough with a high percentage of rye flour benefits from the inclusion of a starter.

levain the French term for leavening; it refers to a dough made from a sourdough culture that forms the basis for French-style sourdough bread

The acidity in the starter inactivates enzymes in rye flour allowing starches in the dough to gelatinize and give the bread its structure.

PREFERMENTS

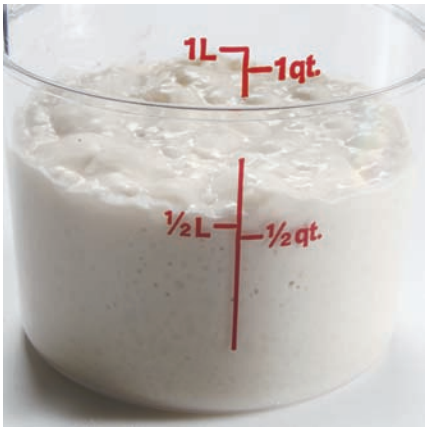
A **preferment** is a batter or dough mixed as a first step in making artisan bread. Preferments are mixed from a portion of the water and flour in the bread formula. Commercial yeast and, sometimes, salt are included. This dough or batter is allowed to ferment for a time before it is incorporated into the remaining ingredients of the formula. The use of preferments offers several benefits. The bread's flavor and aroma is enhanced, and the acids created in the preferment help strengthen gluten proteins and extend the bread's shelf life. Production time is also shortened because bulk fermentation time decreases.

Many types of these pre-fermented mixtures are used by artisan bakers, although the terms are not standardized. Among the most basic is **old dough** (Fr. *pâte fermentée*). Old dough is nothing more than a piece of dough saved from a previous batch of bread and added to a new batch to improve the aroma and flavor of the bread. Because the old dough has already fermented, a bakery may use this method to add flavor without compromising a production schedule. Up to an equal amount of old dough can be added to a new batch of dough. Because old dough contains salt, which retards fermentation, additional yeast may be needed. Because the old dough is fully developed, it is added near the end of the mixing and kneading period.

Old Dough

An all-purpose bread dough formula is provided to use as old dough in formulas listing it as an ingredient. But any similar dough may be used for this purpose. Old dough may be omitted in any formula that calls for it. Yield on the finished dough will be that much less, however. Old dough keeps for at least 3 days under refrigeration. The old dough method is illustrated by Traditional French Baguettes with Old Dough (recipe later in chapter).

Poolish is the French term for a type of sponge. Its invention is attributed to Polish bakers of the 19th century. Breads made with poolish have a lighter texture and a less sour flavor than traditional sourdough. Poolish is made from equal parts water and flour by weight plus a small quantity of commercial yeast. This mixture will be very liquid and should ferment at room temperature until it doubles in volume. The goal is to have a long slow fermentation of at least 2 to 3 hours at cool temperatures. This helps the bread develop complex aromas and flavors. The poolish is mature and ready to use when it just begins to crest and sink back slightly.



Active Poolish Sponge

The quantity of yeast used in a poolish depends on the ferementation time in the baking schedule and on the temperature of the room in which it is maturing. For longer fermentation, decrease the quantity of yeast so that the preferment isn't at its optimum fermentation point too soon. Likewise, when the temperature is warmer decrease the amount of yeast; a cooler temperature may require more yeast. It is important to use the poolish while it is still active and bubbling. Once it collapses, harsh acetic acids will dominate. Bread dough that calls for poolish is mixed using the sponge method illustrated with the recipe for Light Rye Bread (recipe later in chapter).

Biga is the Italian term for a yeasted starter, one that is generally a dry mixture made with only 30 to 35 percent water by weight. A biga and bread dough made from it require a long fermentation.

Production Stages for Artisan Breads

Artisan breads are prepared following the same procedures as all yeast bread dough. Special attention is paid at certain steps, however. Most artisan breads are mixed using the sponge, old dough or sourdough starter methods. Artisan bakers select machinery and mixing methods designed to minimize the friction and oxidation of the dough during mixing. When hand kneading is not feasible, artisan bakers select their mixers carefully. Spiral mixers are popular with artisan bakers because of the gentle way they knead bread dough.

AUTOLYSE

Many artisan bakers use a resting technique during kneading that improves the dough's baking and handling qualities. Created by French artisan baker Raymond Calvel, this simple technique, called *autolyse*, requires kneading only the flour and water briefly before resting the dough for 20 minutes. After resting, the yeast or starter and salt are added and the dough is kneaded until it is fully developed. The resting period allows the flour to

absorb all of the water in the formula, enhancing starch and gluten expansion. Yeast and salt are held back so that nothing inhibits gluten development and enzyme activity in the dough. The total kneading time is shortened, and the dough becomes easier to handle. Dough that has rested before the final kneading will be stretchy and rise more fully when baked. The autolyse technique can be used for any yeast bread dough.

PROCEDURE FOR KNEADING DOUGH USING AUTOLYSE TECHNIQUE

1. Scale the ingredients. Adjust the water temperature.
2. Knead the flour and water until the dough just comes together, approximately 2 to 3 minutes.
3. Cover and let the dough rest for 20 minutes.
4. Hydrate the yeast if necessary.
5. Add the yeast and salt to the dough. Knead the dough on medium speed until it is fully developed, approximately 2 to 5 minutes.

Adding the yeast and salt to bread dough that has rested.

Dough that has rested after the second kneading.

FORMULAS FOR ARTISAN BREADS

As Greg Mistell writes, artisan bread is "an honest loaf," not a separate category of products. Consumers often think of artisan bread as bread made with organic ingredients, whole grains, fruit and nuts, or other specialty ingredients, however. In actual practice, many of the formulas in this text will produce artisan bread when made with time and care by those attentive to the craft of bread making.

FERMENTATION, MAKE-UP AND BAKING ARTISAN BREADS

The use of starters and preferments impacts the techniques artisan bakers use when fermenting bread dough. Preferments add flavor to bread dough, as does a long, cool fermentation. Artisan breads may be left to ferment at temperatures from approximately 65°F to 75°F (18°C to 23°C). But as dough ferments, more acids will develop, giving the bread a strong flavor profile, which may or may not be desirable. Experienced artisan bakers pay attention to fermentation conditions, which will vary depending on the equipment and ingredients used as well as the season, to ensure a desirable flavor profile in their starter and doughs. Artisan breads are usually hand molded and baked in a hearth or deck oven, which promotes the development of a thick, dark blistered crust.

PROCEDURES FOR PREPARING YEAST BREADS

The following formulas illustrate each of the basic mixing methods used to produce contemporary and artisan yeast breads discussed in this chapter. Additional formulas appear at the end of this chapter.

PROCEDURE FOR YEAST BREAD: STRAIGHT DOUGH METHOD

1. Scale the ingredients. Adjust water temperature and rehydrate yeast if necessary.
2. Combine all ingredients in the bowl of a mixer fitted with a dough hook on low speed to moisten; this is the pickup stage.
3. Adjust mixture with water or flour if needed to correct dough consistency.
4. Knead the dough on medium speed to properly develop the dough, approximately 5 to 10 minutes.