YEAST

Yeast is a living plant, and as such requires suitable conditions to thrive. These conditions include moisture, oxygen, food, and appropriate temperatures. Under suitable conditions, the yeast will reproduce, and it will generate fermentation. Fermentation is the conversion of sugars into alcohol and carbon dioxide, by yeast and bacteria. When food, water, oxygen, and a proper temperature occur, the life cycle of yeast will become activated.

In Nature, there are dozens of Genus of yeast, hundreds of species, and thousands of subspecies or strains. Saccharomyces cerivisiae is the strain that has been chosen for commercial yeast, because it has characteristics that favor rapid gas production. Commercial yeast is available in a number of forms, from cream yeast (a liquid form of compressed yeast, it is usually delivered in tank trucks to storage bins, and is used in very large operations), to compressed yeast (also called cake yeast or fresh yeast), and finally dry yeast.

As we have noted, yeast requires moisture, oxygen, a suitable temperature, and food in order to multiply and generate fermentation. Generally speaking, bread dough is an ideal environment for the yeast, providing all the necessary conditions for its needs.

- Water is needed by the yeast in order for it to absorb nutrients. It is well known by bakers that salt retards the activity of yeast fermentation. This is due to osmotic pressure exerted on the yeast cells by the salt. Salt, being hygroscopic (attracting moisture), draws water out of the yeast cell, reducing the amount available to the yeast, and this is why there is a decrease in fermentation from the presence of salt. Sugar acts the same way. It too is hygroscopic, and once a dough contains more than 9% sugar, a decrease is noted in the rate of fermentation.
- Oxygen, obtained mostly by the mixing of the dough, enables the yeast to metabolize nutrients and to multiply. Although yeast requires oxygen for its reproduction, in reality there is almost no reproduction occurring in bread dough, and the rise we see is almost entirely due to gas production during fermentation. Available oxygen is used up within a matter of minutes after dough mixing, and fermentation occurs in an anaerobic environment.
- Dough temperature is crucial for yeast activity. For commercial yeast, the optimum temperature for fermentation is 90°F or even higher. It is important to note, however, that a dough temperature in this range is inappropriate; although fermentation would be favored, it would occur at the expense of flavor development, which requires lower temperatures. Wild yeasts prefer a narrower temperature zone than commercial yeast, and in general perform better at slightly lower temperatures than commercial yeast.
- During fermentation, food is provided to the yeast by the conversion of starches (by amylase enzymes) into sugar. The yeast ferments the sugar, and as a result of this fermentation, carbon dioxide gas and alcohol are produced. The CO2 is trapped by the gluten network in the dough, and provides volume to the baked loaf. The alcohol is largely evaporated during the baking of the bread. Another by-product of fermentation is heat.

The forms of yeast most commonly used by the baker are fresh yeast (also known as cake yeast or compressed yeast), active dry yeast, and instant dry yeast. When converting from fresh to dry, it is important to adjust the weight of the yeast. Although it is best to follow the conversion ratio provided by the manufacturer, there are general conversion guidelines that may prove helpful.

- To convert from fresh yeast to active dry yeast, multiply the fresh quantity by .4. Active dry yeast must be hydrated in warm water before being incorporated into a dough.
- To convert from fresh yeast to instant dry yeast, multiply the fresh quantity by .33. Instant yeast can be incorporated into the dough without first rehydrating it; however, it is sensitive to ice or ice-cold temperatures, and if the water temperature of the dough is cold, it is best to mix the dough for a minute or two before adding the yeast. In order to maintain dough yield, most manufacturers suggest making up the weight difference between dry yeast and fresh with additional water.

AN INTERESTING RELATIONSHIP

There is an interesting relationship in what we call San Francisco Sourdough between the wild yeast, Candida milleri, and the dominant lactobacillus strain, Lactobacillus sanfranciscensis. C. milleri cannot utilize maltose during fermentation, while L. sanfranciscensis is happy to use it. And once it does, it excretes glucose. This is fortunate for C. milleri, because it is fond of glucose, and ferments this simple sugar readily. At the same time, competing bacterial species are inhibited by the presence of so much glucose, and this is to the benefit of L. sanfranciscensis, whose development is therefore favored. A last factor in this relationship pertains to acidity. L. sanfranciscensis produces a lot of acetic acid, which contributes significantly to the flavor we associate with sourdough bread. C. milleri is more tolerant of an acidic environment than many yeast varieties. The high level of acidity prevents competing yeasts from dominating the culture, much to the benefit of C. Milleri.