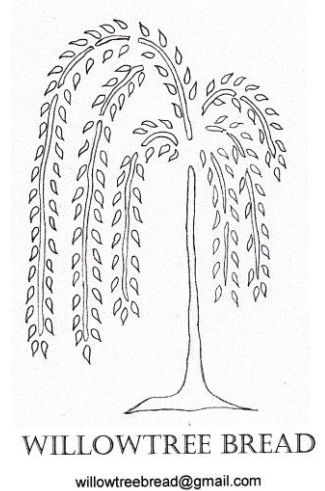


The Science Behind the Bread Making Process

If you think about it the process of making bread results in an exceptional transformation.

The ingredients – flour, water, salt and yeast start off as unappetizing gluey mix that tastes like wallpaper paste but ends up as a delicious loaf. In this note I try to explain what is happening when we make leavened bread.



A grain of wheat contains carbohydrate (starch), protein and fibre. After milling into flour these constituents are mixed together in a fine powder. The addition of water, salt and yeast gives us the starting point for bread making.

The first step in the process is to knead the dough. Initially the dough is a shaggy mass that falls apart easily but as kneading proceeds the dough becomes elastic and extendable. This is because the two major proteins in the flour (gliadin and glutenin) have started to link together to form a composite protein – gluten (from the Latin for glue). The mechanical kneading encourages millions of protein molecules to link together to form long elastic strands and sheets of gluten that give the dough its new properties.

The second step is to allow the dough to rest and ferment. In this phase the yeast (single celled fungi) feed on the starch and excrete alcohol and carbon dioxide. The gas is trapped by the gluten and forms bubbles that cause the dough to expand and rise.

In the third stage we heat the risen dough and several processes occur. Most importantly, at about 150F the tiny starch granules begin to swell and absorb large amounts of water. As the temperature rises to 200F the starch gelatinizes and the cooked starchy liquid spreads over the walls of the bubbles in the dough that were caused by the carbon dioxide. This process dramatically changes the raw starch taste of dough into the characteristically pleasing taste of bread. The heat also cooks the gluten in the walls of the bubbles and this combined with the gelatinized starch forms the mechanical strength of the bread. As cooking continues the gas ruptures the bubble walls and the crumb of the bread become porous, allowing the steam to pass through the loaf and escape through the crust. At this point the rising process stops. Towards the end of cooking the high temperatures cause the crust to brown. This is due to caremalization of sugars and by the Maillard reaction in which amino acids and sugars combine to form many complex molecules. The Maillard reaction is responsible for the delicious aromas that we associate with baked bread.

The final stage is the cooling of the bread. It is important not to cut a loaf that has come straight out of the oven because the gelatinization of the starch is still proceeding at the centre of the loaf and until this is complete the centre will be “doughy”. Leave the loaf for at least one hour.

Charles