

Ancient and Modern Artisan bread

Come to think about it, modern refined flour artisan bread is very deliberately made only with flour, water, baker's yeast and salt. However, the producers of refined flour for artisan bakers usually make sure that there is an adequate supply of starch degrading alpha-amylase in the refined flour by adding malt, or purified enzyme from microbial sources. Sugars from the enzyme-degraded starch are needed as food for the yeast.

Malt is grain that has been sprouted for several days such that roots and shoot, are very evident. Enzyme activity is very high at this point. As well as enzymes, malt is also richer than the original sound grain in several vitamins. Starch-degrading alpha-amylase is present only as a result of the sprouting. The total mix of starch-degrading enzymes is known as diastase. Hence the measurement of diastatic power for malt, in degrees Lintner. The freshly sprouted grain can be dried at a low temperature to preserve the diastatic power to become "diastatic malt" or it can be roasted to caramelize the malt for use as flavoring and coloring for beer or bread. Roasting eliminates the diastatic power.

Modern 100% whole wheat artisan bread involves a sourdough leavening, 100% whole wheat flour from sound grain, salt, and water, but no added enzyme source. So how can bread be made? This is a conundrum that needs discussing, because all indications are that ancient breads were leavened with a sourdough that involved the use of malt. After all aren't beermaking and breadmaking inextricably connected in our history? The common ingredient is the malt. Sweetening crushed grains in warm water with a portion of ground up well-sprouted grains, would have created a base for the first attractively sweet porridge. On standing a sweet liquor would have separated, which on standing even longer would ferment and produce the heady beverage known as beer. If the sweet ground up cereal in water, instead stood around to ferment and was then flung on a fire-hot rock until set, bread would have been created.

With such history, how do modern whole wheat artisan bakers manage without those enzymes from malt? Well, it seems that one class of starch degrading enzymes (beta-amylase) is trapped in the endosperm and becomes available only provided enough time is given to the breadmaking process. Time allows beta-amylase and other enzymes to favorably modify dough; the phenomenon of dough improvement on standing is very evidently also used in making non-fermented products such as pasta, pastry and wheat tortillas.

Importantly, beta-amylase will only release sugars from starch granules that have been ruptured. Luckily the hard-red wheat so frequently used for bread is hard enough that the milling process actually does rupture a small amount of starch granules. Thus, we have an explanation for how modern artisan bread can be made without using added alpha-amylase.

As an aside, an alternative way to ensure the presence of enough ruptured starch granules in softer wheat flour, is to make a porridge with 5 to 10% of the flour and then cool it enough to add to the dough mix. Cooking or gelatinizing the starch essentially ruptures the starch granules so that they can rapidly absorb water, and they are easily attacked by amylases.

Ancient style artisan 100% whole wheat bread makes use of sprouted wheat alpha-amylase, from diastatic malt, that can immediately produce sugars from ruptured starch. Alpha-amylase has the added advantage that the degraded starch products, include dextrin which enhances bread texture. This amylase is rightly called "alpha" because it also has the specialized power to act on starch granules even when they have not been ruptured. Other enzymes in malt include proteases and phytase, which modify

dough and release valuable nutrients. In sourdough systems, alpha-amylase never goes too far with its breakdown of starch. When the sourdough acidifies the dough enough, then the alpha-amylase conveniently stops working. This is not the case with beta-amylase, which will carry on degrading ruptured starch right up until it is deactivated by the heat of the oven, so providing an explanation for sweet sourdough breads made from extra hard wheat such as Akmolinka (*Triticum turgidum* ssp. *turgidum*) that may contain a significant amount of ruptured starch granules (damaged starch) in their stone milled flours.