Introducing *Barm* Bread 2010

What is *barm*? There are two words in the English language that were originally used for a sourdough bread starter: *yeast* and *barm*. However, in the 1800s when it was discovered that a living microorganism was responsible for the gassing in a sourdough starter; the microorganism was given the name *yeast*. Purified bakers' *yeast* has been commercially available for making bread, since the late 1800s. Since then it has been the normal leavening for bread from refined flour, which was brought into almost universal production at the same time. Whole wheat *barm* sourdough starters were steadily lost from the bakers' range of skills. Now the word *barm* is known only to those interested in bread history, and sourdough bread making.

Historically, *barm* starter production was similar to making beer. A sweet *mash* was prepared from *malt,* milled grain and warm water, and allowed to cool. A small amount of the previous ferment was then added, and the *mash* supplied all the nutrients needed for a vigorous fermentation to continue (Jago & Jago, 1911).

Malt is sprouted grain, usually barley, wheat or rye that has been gently dried or roasted. Sprouting is just long enough for the main shoot to equal the length of the grain, although the roots grow much longer in the same time. To be suitable for making a *mash*, the drying process for the malt must be very gentle, so that the enzymes generated in the sprouts remain active. During the warm water *mash* process, some enzymes from the *malt* act on the milled grain and release sugars from the starch and other carbohydrates, which are built from chains of sugar molecules. Other enzymes act on the grain phytates and so release minerals. The addition of some common salt (sodium chloride) and the presence of calcium and magnesium salts in the water supply, enhance the effectiveness of the enzymatic processes. All the enzymes, minerals and vitamins normally used in the sprouting grain to start a new plant are brought into action in the *mash*. This *mash* is a perfect food for the *barm* sourdough microorganisms, which are a naturally symbiotic mixture of yeasts and lactic bacteria. The symbiosis is based on the fact that the sourdough yeasts ferment only some types of sugar and in particular leave maltose to be fermented by the lactic bacteria. This allows a vigorous lactic ferment in the presence of *barm* yeasts. The natural acidity produced limits the kind of microorganism that can grow there, and usually this means that disease-causing microorganisms are excluded. When salt (sodium chloride) is included, this further limits microbial contamination of the *barm*.

In the 1980s the predominant yeast in both wheat and rye *barm*, was identified by Herman J. Phaff at the University of California, in Davis, as *Saccharomyces dairensis*. The major lactic bacteria were identified as *Lactobacillus brevis, atypical*, at the American Type Culture Collection in Maryland (US Patent 4,666,719 now expired). For comparison, the San Francisco sourdough contains predominantly *Saccharomyces exiguus* and *Lactobacillus sanfrancisco,* which were recognized by Kline & Sugihara in the 1970s. Panetonne sourdough contains mainly *Saccharomyces exiguus* and *Lactobacillus brevis* (Galli & Ottogalli, 1973). Modern bakers yeast, *Saccharomyces cerevisiae,* generally ferments a wide range of sugar types, including maltose. This can limit lactic fermentation in the presence of bakers' yeast.

Some advantages of whole wheat barm bread making

Some important advantages of *barm* in making whole wheat bread are due to the *mash* process using *malt*. The enzyme actions on the whole wheat flour include the breakdown of pentosan fiber and at the same time the release of previously bound gluten. This and other enzyme effects, contribute to the production of cohesive and supple dough. *Mashing* is especially valuable for soft wheat, durum wheat and rye, with otherwise un-extractable pentosan fiber that binds a significant part of the gluten. The effect is important in all whole wheat bread making, including bread from hard wheat, because the pentosans are concentrated in the bran layers that are part of whole wheat flour. Refined endosperm flour is relatively low in pentosan fiber content, and therefore the detrimental effect of pentosan bound gluten is usually insignificant in making refined flour bread. The acidity produced by the lactic fermentation of the *mash*, halts the enzyme activity that would otherwise continue, and eventually cause a breakdown of the bread texture during baking.

There is also some residual sweetness in the dough due to the mash, provided the fermentation is not too long, and the flavor profile can be that of a sweet-sourdough.

The yeasts and lactic bacteria in *barm* produce an interesting complexity of aroma and flavor, with fruity and buttery notes evident in whole wheat bread from *Sonora* wheat, for example. A distinction in flavor can be experienced between the red bran wheat types such as *Turkey Red*, and the golden bran wheat types such as *Sonora*, when they are made into whole wheat *barm* breads. With *Turkey Red* whole wheat *barm* bread, nut-like and honey flavors can be detected. This possibility arises similarly to flavors in wines that are due to the release of phenolic compounds from grape skin and seed during fermentation. In wheat the phenolics are released from the bran during the *barm* fermentation.

The mixed culture fermentation in *barm* breads supplies *probiotic* yeast and lactic bacteria, assuming that not quite all of the culture is killed during the baking process. Several other nutritional advantages have been recognized for whole grain sourdough breads, including the enhanced availability of minerals from the whole grain, and the presence of short chain fatty acids produced by the lactic bacteria. These short chain fatty acids immediately improve the insulin response to a meal, and over the long term they can improve the blood cholesterol profile. Whole wheat flour is 10% lower in calories than refined flour. In a simple whole wheat *barm* bread, making a *mash* as a source of sugars for the *barm* ferment, means that the calories are reduced still further. This is in comparison with breads that are made by adding sugar for the yeast to ferment, as well as texturizing oils, which add more calories. With all these attributes, simple whole wheat *barm* bread can be regarded as anti-diabetic, and especially healthful.

The acidity of the dough also gives whole wheat *barm* breads a prolonged shelf life, provided the breads are kept in a closed bag or container, so that they do not dry out. Under these circumstances the crust becomes soft, and offers a range of whole wheat breads that are particularly appealing to children.

The *Barm* bread method 2010

Before starting a barm bread project you will need a source of **stock barm,** see below.

Otherwise, only the **gel** and **mash** stages are unusual to modern bakers. The span of time, approximately 24 hours, needed to produce whole wheat *barm* bread may look daunting, but at each stage the hands on time is short. The mash requires a rest (up to 3 hours), but most of the time span is due to the **sponge** fermentation (up to16 hours) that takes place overnight with little intervention. The final **bread** making has a familiar schedule lasting about 4 hours. For whole **soft wheat** flour, the four main stages for making *barm* bread are:

• **Gel**: Gelatinize the starch in a portion of the flour, without causing heat damage to the gluten, using hot salty water (155ºF), for 10 minutes.
• **Mash**: Make a mash with the warm gel, added malt and more of the flour. Wait 3 hours while the warmth promotes enzyme activity.
• **Sponge**: Ferment the cooled mash with added stock *barm*, to make a *barm* sponge. Allow 8-16 hours for the fermentation to cause the pH to fall to 3.5 – 4.
• **Bread**: Make a dough with the sponge, the rest of the flour, vital wheat gluten if needed, and salty water. Mix and knead to develop dough, rest 30-60 minutes, divide, rest 15 minutes, shape the dough, allow 1-2 hours final rise, and bake.

For whole **hard wheat** flour a portion of the starch granules are ruptured during the milling process. This is known as starch damage, and is actually beneficial. The damaged starch granules behave like gelatinized starch in the mash, and are easily attacked by the enzymes from malt. Therefore in making whole **hard wheat** barm bread there are just three main stages: **mash, sponge** and **bread**.

Sources for stock *barm*

Before starting a *barm* bread project you will need a source of **stock *barm***. The easiest method is from dried *barm,* available from www.sustainablegrains.org ; dried *barm* can be hydrated with water and is ready to use in bread making after 24-48 hours when the pH is 3.5 - 4, it is very well gassed and it has a pleasing aroma. You can make your own *barm* from organic wheat grain, but the process usually requires two weeks, to increase the concentration of yeasts and lactic bacteria sufficiently to make bread, see www.sustainablegrains.org . Alternatively you could try using a natural sourdough starter, that you already have on hand and that you have been refreshing with whole wheat flour. Repeated refreshment with mash, may lead to a good *barm*.

Refreshing and maintaining stock *barm*

Stock *barm* = *barm* sponge; stock *barm* has the same formulation as the sponge for making *barm* bread, 1 part stock *barm* to 5.25 parts mash by weight, and is made in exactly the same way. On a small scale it is convenient when making *barm* bread, to prepare enough *barm* sponge for both bread making and to set aside as stock *barm*. **Stock *barm*** should be allowed to ferment twice as long as the sponge, 24 – 48 hours according to ambient temperature, and then refrigerated at 40ºF, ready for the next bread making session. In any case, it is especially important to wait until the pH drops to 3.5 before refreshing *barm* for stock; this minimizes microbial contamination.

Tips for *barm* breadmaking

• Fermentation is very slow in winter at cool ambient temperatures (below 68ºF), and very fast in summer (86ºF). With an 18ºF temperature difference, the time taken for fermentation in summer will be 2-3 times shorter than in winter. It is easy to over-ferment the bread in summer and yet in winter, to think the bread may never rise! *Barm* bread flavor is usually milder when made within the temperature range, 65-75ºF. Harsh flavor notes can appear when the *barm* bread is produced at higher temperatures, or the sponge is fermented beyond the time taken to reach pH 3.5-4.

• *Barm* sponge is best stirred at 4-8 hour intervals, to incorporate air and so encourage yeast growth. The lactic bacteria multiply fastest in the absence of air, whereas the yeast multiplies fastest in the presence of oxygen from the air.

• Containers and materials that contact the dough should be acid resistant, such as stainless steel and wood. Keeping mash, *barm* sponge and dough covered, prevents drying out.

• For soft-crusted loaves, especially from whole soft wheat flour, bake just enough to properly cook the bread through, and then cool the loaves on a rack. As soon as they have cooled, place them in a closed plastic bag or other closed container. After 12 hours approximately, the crust becomes soft. For a soft crust on pocket bread and English muffin buns, allow them to cool on a cloth covered rack and cover them with a cloth. When cool these soft buns can be stored in a closed container or bag. *Barm* bread can be stored this way at ambient temperature for several days without molding, or drying out. In order to revive the fresh crustiness, slices and buns can be lightly toasted, or loaf pieces crisped in the oven at 350ºF for 15 minutes, just before serving.

• Stock *barm* is at its most active if it can be refreshed 2-4 times per week, and used within two days of maturing. However, stock *barm* that has been stored for a month, refrigerated at 40ºF, can still give a useful loaf of bread, or be used to prepare more stock *barm*. It is normal for a dark colored liquid to eventually separate out from stock *barm,* especially when made with red wheat. Before using stock *barm* that has separated, stir well to homogenize it.

• Colored acidity test paper is the most convenient way to test pH in the stock *barm,* and sponge *barm*. Take care to remove some *barm* from the container, for testing, and discard afterwards. The reason for this procedure is that the dyes in the test paper are not compatible with food, and may even be toxic.

• The ideal protein in whole wheat flour for bread is 15%, which corresponds to 12% gluten protein in the endosperm of the wheat and 3% non-gluten protein distributed in the germ, aleurone and bran. When whole wheat flour contains less than 15 % protein it is the endosperm gluten protein that is reduced. To compensate for this, *vital wheat gluten* can be substituted for a similar, small portion of the flour. This substitution is made at the dough stage, since this is when the gluten is brought into full use in producing the spongy structure of the bread. *Vital wheat gluten* is obtained commercially, by washing gluten from wheat and then drying it to a flour-like powder (75% protein). Therefore in 100 grams whole wheat flour, 1.3 grams of whole wheat flour can be replaced by *vital wheat gluten*, for every percentage point that the whole wheat flour is below 15% protein.

• Whole wheat flour that is aged 4 weeks or more, gives a better textured dough and bread than freshly ground whole wheat flour and there is no known significant change in nutritional value.