

The Complexities of Bread Staling

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Most of us tend to think that bread stales simply because it begins to dry out, but this is far from what is actually happening. Unfortunately, the situation is more complicated than it appears, and our misunderstanding of the causes of bread staling can lead us to take inappropriate actions that actually aggravate the problem.

Since one of the main ingredients in bread is flour, we really need to take a look at some starch chemistry to shed some light on how staling occurs.

If you have ever bitten into a raw kernel of grain such as wheat or rice, you know that in their uncooked state they are so hard you could possibly chip a tooth on them. This is because the starch molecules are aligned in a highly organized glass-like crystalline structure. This orientation is retained in the wheat flour as it goes into the bread dough.

After the flour is mixed with water and the other desired ingredients, the dough is allowed to rise before being placed in an oven to bake. Once the starch reaches a certain temperature (usually about 60 to 65 degrees Celsius), it begins to undergo a change from its ordered crystalline form to a soft elastic consistency. During this gelatinization process, the starch molecules relax and start to absorb water. As they swell, the starch molecules become “amorphous”. This is just a twenty-five cent word meaning that they have no real or defined structural arrangement, so they become rubbery.

While it is warm, the bread tends to be soft and squishy – the perfect time for us to go a bit crazy with some butter and homemade strawberry jam!

However, as the bread cools, the starch molecules gradually begin to realign themselves into the organized crystalline structure that they originally had. With time, the degree of recrystallization increases and the bread becomes firmer, or stale. In scientific terms, the recrystallization process is called “retrogradation” (if “amorphous” is a twenty-five cent word, this one’s got to be worth at least a dollar). To the rest of us, it’s just plain, old, ordinary staling.

Now for the mistake that a lot of people make. When it comes to keeping foods fresh longer, we have been conditioned to put them in the refrigerator where the temperature is usually about 4 degrees Celsius. For perishables, this is ideal since it slows the spoilage process. But bread is different – remember “retrogradation”? When placed in the refrigerator, the rate at which the starch crystals re-form is increased as heat is withdrawn and the molecules realign faster than bread at room temperature. As a

result, bread kept in the refrigerator actually stales more quickly than bread that is not refrigerated.

If you need to store bread for a prolonged period of time, you should freeze it rather than just refrigerating it. The temperature in a typical household freezer should be set to about minus twenty degrees Celsius, or slightly lower. These very low temperatures are sufficient to almost halt the recrystallization process by freezing the water in the bread and substantially reducing the movement of the starch crystals. The thawed bread will not be as soft as fresh bread, but it tends to be better in quality than if it had been refrigerated.

You also need to remember that moisture must be prevented from escaping from the bread by keeping it in a sealed container. If not, the bread will simply dry out, which can have a similar undesirable effect to staling.

You can use your knowledge about the staling process in reverse if you have some stale bread and want to freshen it up a bit. By heating the bread, either by toasting it or warming it in an oven, you will add enough energy to start the starch crystals moving away from their rigid crystalline structure, which will soften the bread until it begins to cool again.

The next time you see someone putting bread in the refrigerator, you might want to explain to them that this isn't really the best idea. If you can work the word "retrogradation" into your conversation, so much the better. It will either impress them beyond belief, or they'll stare at you like you're from another planet, which is usually the response I get.



Staling of fresh bread is a problem that frustrates us all.