SOME PRACTICAL ASPECTS ON CHOOSING A SHORTENING FOR BISCUIT AND CRACKER MANUFACTURE

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Abstract

Stability, or resistance to the development of rancidity is an important factor in determining the suitability of a shortening for biscuit and cracker use. The keeping properties of the fat alone may not be a measure of its stability in a cracker. The Technical Institute accelerated keeping test of shortening in a laboratory cracker is described. Examples are cited showing the effect of light on different shortenings in cookies and crackers.

TO help the biscuit and cracker manufacturer select fats, we make a number of tests, primarily with the idea of determining stability. In general, his selection is made on two factors; keeping property, and price. Of course the individual biscuit and cracker baker may make his selection on some other basis, but the majority no doubt choose on the two points mentioned. Price we cannot control, and shall not discuss. Our only way of helping the baker in this problem is to tell him with what degree of safety he can use the various fats interchangeably.

We make two practical tests to check keeping property. Cookies and crackers are often consumed several weeks after they are baked, and they may undergo unfavorable conditions from the time they leave the oven until they are eaten, so that a stable shortening and one that will resist rancidity is of paramount importance.

Some time ago only the fat itself was tested, using 50 grams and testing it in a cabinet held at 145° F. For several years, however, we have also included a test on a laboratory cracker containing the fat. We had reason to feel that some shortenings were being stabilized with anti-oxidants that would not carry through into the baked product. The anti-oxidant was either rendered inactive or denatured during baking. Also, the spread of fat over a great surface, as in a cooky or cracker, might cause increased oxidation. So we developed a test on the baked piece itself. Using commercial crackers we could not control conditions, and consequently found it necessary to bake our crackers for the test in the laboratory. It has so far been impossible to make a laboratory cracker that closely resembles the commercial product in appearance, but it contains the same ingredients and goes through the same processes. First a sponge is made up, using

60	grams	flour
.5	grams	yeast
25	cc	water

This is mixed in a glass bowl, by hand, and fermented for 19 hours in a cabinet held at 86°, care being taken that no metal touches the sponge. After 19 hours, to the sponge is added

40	grams	flour
11	grams	shortening
.5	grams	soda
1	gram	salt
8	cc	water

This is also mixed by hand, fermented for 5 hours at 86° F., rolled on a glass sheet without dusting flour, folded 3 times and rolled 3 times to 3/32 inch. Metal guides are used to get the desired thickness, but they never touch the dough. A porcelain rolling pin is used, the crackers are cut out with a glass tumbler, dockered with a glass pin, and baked on glass sheets at 480° F. for 9 minutes. They are then allowed to stand overnight. The next morning they are given the regular crisping test, again on the glass plate for 7 minutes at 300° F. and then are allowed to cool thoroughly for 3 hours. After that they are put in a pint glass jar with a metal top, the porcelain having been removed from the top, sealed, and kept in a cabinet held at 145° F. until rancidity develops. They are tested daily for development of a rancid odor.

We have found tests on laboratory crackers to correlate in practically all cases with the keeping time on the fat itself, but results are more rapid, and we believe more closely simulate conditions that the fats must undergo when used by the biscuit and cracker baker. We have come to base our conclusions on the keeping properties of a shortening much more on the resistance of the cracker in the accelerated test than on the shortening itself.

About two years ago we became interested in the effect of light on the keeping properties of shortenings in cookies and crackers. No doubt all of you have seen cookies displayed in glass showcases, in glass windows, in cellophane bags, or piled directly on a store counter with no protection from the light. We decided to start a series of practical tests to find out, if possible, whether light might not develop an off-odor in such products. Here again we baked our own crackers in order that we might use various types of shortening on which we were also running the keeping tests just described to you. We packed our crackers in cellophane bags, using three types for each cracker (or shortening) to be tested, a clear cellophane, a light amber one, and a medium amber.

Let us emphasize that our test was only a practical one, but one from which we thought could be offered to biscuit manufacturers some suggestions as to what precautions he could well take in marketing his products. Having no lamp, we used an outside west window for our tests. Here we have daylight all day long, and when the sun shines we have sunshine. The cellophane bags packed with laboratory crackers were strung on wires, clipped on much as one would hang clothes on a clothesline. They were taken down daily and tested for the development of an off odor.

To our surprise, the odor that developed was not a rancid one, but was, nevertheless, strongly objectionable and distasteful. Many are no doubt familiar with the odor and have some classification for it. We thought it most nearly resembled the off-odor that develops in oleo oils before true rancidity comes, and so we came to describe it as a "tallowy" odor. In most cases true

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rancidity eventually developed, but long before that, the tallowy odor and taste had made the crackers inedible. As we watched the test, the first indication that something was wrong was the lack of any good cracker odor at all, then came an off-taste even before the odor could be detected, then an off-odor or tallowiness strengthening until true rancidity developed. We did a little work on cookies also, although the bulk of our work was carried out on crackers. The amazing thing to us about our work on cookies was that the sugar in the cookies apparently gave no protection against tallowiness as it does against rancidity.

As before mentioned, our test was only a practical one, but from it we felt able to draw two conclusions that we thought would assist the cooky and cracker manufacturer in his packaging problems. The first conclusion is that if he is going to display his products in unprotected glass showcases, or in cellophane bags, he would do well to choose types of shortening most resistant to light. We tested all-hydrogenated cottonseed oils, hydrogenated soybean oil compounds, oleo oils (both No. 1 and No. 2), lard, and a mixture of lard and oleo oil. A good all-hydrogenated cottonseed oil we have found to be the most resistant to rancidity. This also held true for light. The hydrogenated soybean oil compounds, which are fairly resistant to heat, we found very susceptible to light. They were probably the worst of all types examined in both odor and flavor. Good oleo oils, which we ordinarily find will resist heat for as long as 16 to 25 days, were very poor in resistance to light, running as low as 1 to 5 days. Here, too, the odor is strong and disagreeable. Lard, much to our surprise, failed to develop tallowiness at all in light, although it is quite poor in resistance to rancidity coming from heat and age. The first off-odor from lard in light was that of true rancidity. Then in an effort to improve the resistance of oleo oil to light, we tried a 50-50 mixture of oleo and lard, and our results were about the average keeping time of the two, perhaps slightly less.

Now as to the protection afforded by different colored cellophane bags; as might be expected, the clearer bags permitted tallowy odors to develop considerably earlier than did the amber shades. Where the type of shortening used was very susceptible to light, however, darker colors seemed to help but slightly.

The effect of light was found to be most rapid. For example, late one afternoon we received two boxes of crackers from a biscuit plant. Both were made with the same oleo oil, packed from the same run. One was packed in the usual type of cardboard box, the other in a new cardboard box that the baker had just purchased. The crackers in the new type box were decidedly tallowy, and the manufacturer was interested in knowing whether this was caused by inferior cardboard, whether the box was causing the off-odor in the crackers. To make a test on the cardboard, the lid was torn from each box and the cardboard put in the cabinet at 145° F. Of course that allowed each box of crackers to stand unprotected where they had been placed, on the west end of a laboratory table, exposed to the afternoon sunlight. The next morning on coming into the laboratory the new type box was picked up and the crackers smelled to see if the off-odor had dissipated, as this sometimes occurs. No, it was just as bad as ever. Then the old type box of crackers was smelled, the one that had been all right upon arrival 17 or 18 hours earlier. And these were just as bad as the first box, where they had been perfectly sweet and fresh the night before. Exposure to what daylight those crackers would receive from 3 or 4 o'clock in the afternoon until 8:30 the next morning had given them a disagreeable, strong off-odor. It should be added that the ink of the cardboard in the new box was found to be rancid, and this flavor had carried through into the crackers, thus causing the complaint of the biscuit manufacturer when the crackers were sent to us.

So, from our work on the effect of light, which has only been started, we have so far drawn only the two conclusions—first, to pick carefully the type of shortening to be used in baked products that will be exposed to light, and second, if a cellophane bag is to be used, the amber shades give greater protection than the colorless.

The biscuit and cracker baker uses fats for other purposes than as shortenings; fats for coatings and for sandwich work. These are usually cocoanut oils, such as the spray for the type of cracker which you may recognize as the "Ritz" cracker. For sandwich fillings a plastic cocoanut butter is used, and for imitation chocolate coated cookies, or for white or colored hard butter coatings, a hard cocoanut butter is employed. Some difficulty is experienced with these fats becoming soapy, but if so, the introduction of moisture is usually the cause, and it is brought into the coating by some other ingredient.

Some bakers may base their choice on mixing and creaming properties, on shortening value, on plasticity, or on texture of the fat, but we believe the characteristic of most interest to the manufacturer of biscuits and crackers is that of keeping property.

Correction for "Some Notes on the Determination of Glycerol in Fats" Published in the January Issue of "Oil and Soap"

Page 14, Column 1, Line 12—

The fat containing the stearic acid is heated to 110-120° C. for tallow and coconut oil and to 140-150° C. for hydrogenated cottonseed oil and cottonseed oil by immersing in an oil bath at 160-150° C. for one and three minutes, respectively.

Addition—

Acknowledgment—

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