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METHOD AND COMPOSITION FOR IMPROVING MILLING PRODUCTS

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My invention relates to the improvement of wheat flour and other milling products, including the baking and keeping qualities thereof, and more particularly has reference to a method and composition for the simultaneous bleaching and ageing or maturing of flour and the like.

According to present commercial practice, flour is bleached and aged in separate stages of treatment. The initial treatment is accomplished with gaseous nitrogen trichloride, which matures the flour. Nitrogen trichloride, in addition to being a maturing agent, also possesses bleaching properties but, when used in sufficient amount to obtain a complete commercial bleach, injures the quality of the flour. Therefore, for this reason nitrogen trichloride is used in an amount not substantially in excess of that required to mature or age the flour, and the necessary additional bleaching is obtained by a subsequent treatment with benzoyl peroxide, which has no maturing properties. While the last-mentioned step is relatively simple, the gas treatment is quite cumbersome, requiring special contacting apparatus and corrosion-resistant equipment and accurate control over the gas, which presents many hazards and difficulties in use.

It is an object of this invention to bleach and age flour and the like in a single operation and to provide a finely divided or powdered composition which, when intimately mixed with the flour, functions to effect a simultaneous bleaching and maturing of the milling product. The flour is thus improved in the two respects mentioned by the simple expedient of mixing the solid composition therewith and allowing sufficient time for the desired effects to take place.

In my prior Patents Nos. 2,158,588 and 2,158,589 I have shown that simultaneous bleaching and ageing of flour and the like can be obtained by means of a powdered mixture of a bromate or iodate with an active organic peroxide, the latter seemingly functioning as an activator or accelerator for the solid bromates and iodates in their maturing of the dry milling product. I have now found that alkali and alkaline earth metal salts of fatty acids, in powdered form, similarly function with the active organic peroxides to bring about a simultaneous bleaching and ageing of flour and other milling products.

Accordingly, the solid bleaching and maturing composition of the present invention comprises a pre-formed mixture of an alkali or alkaline earth metal salt of a fatty acid and an active organic peroxide, that is, an organic peroxide which is

sufficiently active in powdered form to effect at least a 90% flour bleach.

Potassium propionate in powdered form is the preferred reagent for use with the active organic peroxide; sodium and potassium laurate and caproate are illustrative of other alkali metal salts of fatty acids suitable for use in powdered form with the active organic peroxide.

As in my prior patents referred to, only certain organic peroxides are sufficiently active to cooperate with the fatty acid salt to effect the simultaneous bleaching and maturing, these being the aromatic and fatty acid peroxides which have sufficient activity in powdered form to accomplish at least a 90% flour bleach. Benzoyl peroxide is the preferred aromatic peroxide while cinnamyl peroxide and phenyl acetyl peroxide are other aromatic peroxides which I have found to be of sufficient activity and flour bleaching power for use with potassium propionate and the like in accordance with the invention. Suitable active fatty acid peroxides of sufficient bleaching power for my purpose are stearyl peroxide, lauryl peroxide and palmitic acid peroxide. These aromatic and fatty acid peroxides function with the finely divided or powdered potassium propionate to bring about a commercially satisfactory maturing and bleaching of dry flour. I believe that I am the first to discover that the active aromatic and fatty acid peroxides possess the property of increasing the maturing action of powdered potassium propionate and the like upon dry milling products.

In practicing the method of this invention, the bleaching and maturing composition is fed directly into the flour at any convenient point during the milling operation and intimately mixed therewith, by means of powder feeding machines now used in the mills, in the proportion of about one-half ounce to 196 pounds of flour. For thorough distribution of such small amounts of the composition in the flour, the composition should be in the form of a dry free-flowing finely divided powder. A satisfactory bleaching and ageing is obtained by exposure of the flour to the action of the composition for about twenty-four hours.

As illustrative of the preparation of a preferred composition, dry powdered commercial grade dicalcium phosphate or other suitable carrier is added to an equal weight of dry commercial grade granular benzoyl peroxide and the mixture ground to the desired fineness. With the powder thus obtained there is now mixed dry powdered potassium propionate in the proportion of six parts potassium propionate to ninety parts of the

peroxide-phosphate mixture. The resultant mixture is then ready for use as a flour bleaching and ageing composition in the manner already described.

- 5 Since there are many grades of flour, the proportion of peroxide, potassium propionate and carrier, as well as the amount of the composition required for effective bleaching and maturing, should be determined by tests in particular cases.
- 10 In some instances, for certain kinds of flour, the proportion of potassium propionate may be increased to as much as eight parts potassium propionate to ninety parts of the peroxide-phosphate mixture. The proportions here stated are
- 15 by weight.

- The compositions of this invention improve the color and baking qualities of the flour. Loaf volume is one of the most important, if not the most important, indication for determining the value of the baking qualities of flour. The volume of the baked loaf of bread is measured in cubic centimeters and denotes the exact size of the loaf produced. Small volume, as obtained with untreated or unmaturing flour, indicates low baking
- 20 strength, while large volume indicates high baking strength, which is apparently brought about by the maturing of the flour.

- The following tabulations show, by comparison, the advantages and effectiveness of my composition. Table I deals with hard wheat bakers' flour and Table II with a blend of hard and soft wheat flour. The tables show the amounts of benzoyl peroxide and potassium propionate used in the tests. In each case where benzoyl peroxide was employed, it was mixed with an equal weight of dicalcium phosphate as a carrier. This is not indicated in the tables for sake of simplification. The laboratory tests were performed on amounts of fresh milled flour such that the treatments
- 30 corresponded to the use of about one-half ounce of the composition per 196 pound barrel of flour.

TABLE I

Hard wheat bakers' flour

	Loaf volume, c. c.	Color removal	Texture
Untreated.....	710	None	92
Laboratory treated benzoyl peroxide 45 gm., potassium propionate 3 gm.....	763	99	98
Laboratory treated benzoyl peroxide 45 gm.....	668	98	95
Laboratory treated potassium propionate 3 gm.....	745	None	97

TABLE II

Blend hard and soft wheat flour

	Loaf volume, c. c.	Color removal	Texture
Untreated.....	620	None	90
Laboratory treated benzoyl peroxide 45 gm., potassium propionate 3 gm.....	665	99	98
Laboratory treated benzoyl peroxide 45 gm.....	583	98	95
Laboratory treated potassium propionate 3 gm.....	645	None	97

- Illustrative of the valuations of the tests: The loaf volume obtained with untreated hard wheat bakers' flour, which is fresh milled flour without any kind of treatment, is 710 c. c. The same untreated fresh milled hard wheat bakers' flour laboratory treated with the benzoyl peroxide-potassium propionate composition yields a loaf volume of 763 c. c., an increase of 53 c. c. more than is obtained with untreated flour. Un-

treated hard wheat flour laboratory treated with benzoyl peroxide alone and in an amount to effect a complete commercial bleach of the flour yields a loaf volume of 668 c. c., a reduction of 42 c. c. in volume less than is obtained with untreated flour. Laboratory potassium propionate treated hard wheat flour yields a loaf volume of 745 c. c., an increase in volume of 35 c. c. above the volume obtained with untreated hard wheat flour.

According to the tests, benzoyl peroxide when used alone and in sufficient quantity for a complete bleach of the flour, reduces the loaf volume. Potassium propionate when used alone matures the flour somewhat but not to as great an extent as when mixed with the peroxide and it does not have any bleaching effect. When benzoyl peroxide and potassium propionate in combination are incorporated into the dry flour during the milling process a complete bleach and color removal is obtained with an increase in loaf volume which is in excess of the volume obtained when either potassium propionate or benzoyl peroxide is used alone.

In the appended claims I have characterized the peroxides as active and as having substantial flour bleaching properties in order to distinguish from those organic peroxides which are of insufficient activity and bleaching power to effect a commercial bleach. By "substantial flour bleaching properties" is meant the ability to bleach flour satisfactorily for commercial purposes, that is, to effect at least a 90% bleach. The term "alkali metal" is used in the appended claims in its generic sense, that is, as inclusive of the alkaline earth metals.

Having described my invention, I claim:

1. A method for improving wheat flour and other milling products which comprises intimately mixing with the dry milling product a powdered alkali metal salt of a fatty acid and a powdered active organic peroxide having substantial flour bleaching properties, the peroxide being in sufficient amount to bleach the milling product and said salt being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the milling product in dry form to the simultaneous action of said salt and peroxide for a sufficient time to bleach and mature the product.

2. A method for improving wheat flour and other milling products which comprises intimately mixing with the dry milling product a powdered alkali metal salt of a fatty acid and a powdered active aromatic peroxide having substantial flour bleaching properties, the peroxide being in sufficient amount to bleach the milling product and said salt being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the milling product in dry form to the simultaneous action of said salt and peroxide for a sufficient time to bleach and mature the product.

3. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and a powdered alkali metal salt of a fatty acid with the dry milling product, the peroxide being in sufficient amount to bleach the milling product and said salt being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the latter in dry form to the simultaneous action of the peroxide and said salt for a sufficient time to bleach and mature the milling product.

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4. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and potassium propionate with the dry milling product, the peroxide being in sufficient amount to bleach the milling product and said propionate being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the latter in dry form to the simultaneous action of the peroxide and potassium propionate for a sufficient time to bleach and mature the milling product.
5. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and potassium laurate with the dry milling product, the peroxide being in sufficient amount to bleach the milling product and said laurate being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the latter in dry form to the simultaneous action of the peroxide and potassium laurate for a sufficient time to bleach and mature the milling product.
6. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and potassium caproate with the dry milling product, the peroxide being in sufficient amount to bleach the milling product and said caproate being in sufficient amount to increase the loaf volume factor of the milling product, and subjecting the latter in dry form to the simultaneous action of the peroxide and potassium caproate for a sufficient time to bleach and mature the milling product.
7. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of an active organic peroxide having substantial flour bleaching properties and a sufficient quantity of an alkali metal salt of a fatty acid to overcome the loaf volume reducing factor of the peroxide.
8. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of an active aromatic peroxide having substantial flour bleaching properties and a sufficient quantity of an alkali metal salt of a fatty acid to overcome the loaf volume reducing factor of the peroxide.
9. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of benzoyl peroxide and a sufficient quantity of an alkali metal salt of a fatty acid to overcome the loaf volume reducing factor of the peroxide.
10. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of benzoyl peroxide and a sufficient quantity of potassium propionate to overcome the loaf volume reducing factor of the benzoyl peroxide.
11. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of benzoyl peroxide and a sufficient quantity of potassium laurate to overcome the loaf volume reducing factor of the benzoyl peroxide.
12. A flour bleaching and maturing composition comprising a dry free-flowing powdered mixture of benzoyl peroxide and a sufficient quantity of potassium caproate to overcome the loaf volume reducing factor of the benzoyl peroxide.

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