

NON-ALUMINIUM LEAVENING AGENT FOR FRIED DOUGH STICK

Technical field

The present invention relates to a food additive, and specifically, relates to an additive for making pastry.

Background Art

The fried dough stick is a traditional food in China and one of breakfasts that ordinary people eat daily. Alum and sodium bicarbonate are used in the traditional method for making fried dough stick, which is called "alum method" for frying fried dough stick. Several diseases are produced by frequent consumptions of aluminium. The "alum method" has been abandoned and disused gradually and taken place of the method for making non-aluminium fried dough stick.

There have been a lot of methods for making non-aluminium fried dough stick in the market at present. One of methods is adding an additive to dough, wherein the additive comprises bicarbonate, carbonate and acidic substance that can supply hydrogen ion. CN101044866 discloses a kind of flour for making fried dough stick, wherein said additive agent comprises sodium bicarbonate, calcium bicarbonate, tartaric acid and yeast. The composition is prepared by mixing additive and flour directly and used as special flour for fried dough stick. The disadvantage of product prepared by the method is that use is single. As for most of food manufacture enterprises, especially for most of families, they would like to buy flour with multiuse and they can flexibly adjust according to their needs and interests. Besides, in order to add a little leavening reagent, the main substance of flour has to been

together transported with the leavening reagent. It results in higher transport cost and increasing extra economic burden to customers.

Therefore, more ways are providing non-aluminium leavening agent for fried stick alone. However, because leavening agent should comprise alkaline substances such as sodium carbonate, sodium dicarbonate and acidic substances such as tartaric acid, hydrophosphate etc, they will carry out neutralization reaction and lose their effectiveness if they are stored together for a long time, which is called the phenomena of "swelling bag". In order to avoid losing effectiveness of leaven agent, the currently available method is that acidic substance and alkaline substance are packaged separately. For example, CN1792175A discloses a non-aluminium agent for fried dough stick which adopts compound package i.e., acidic components composed of calcium biphosphate and citric acid starch and alkaline components composed of sodium carbonate, sodium dicarbonate and ammonium hydrogen carbonate are packaged separately. The disadvantage of the package form is that users need to calculate and measure additive amount of two packaged components when they use, and the additive amount is hard to be mastered for nonprofessional pastery makers and usually needed to grope firstly when product is changed. Besides, the separate package form increases production cost for manufactures.

Summary of the invention

The present invention aims to provide a non-aluminium leavening agent for fried dough stick which can avoid the disadvantages of separate package and also could not result in losing effectiveness of leavening agent.

A non-aluminium leavening agent for fried dough stick according to present invention comprises 32-38wt% sodium bicarbonate, 5-8wt% citric acid, 8-12wt% sodium dihydrogen phosphate, 8-12wt% tartaric acid, 5-10wt% calcium carbonate and residual low-moisture starch.

Preferably, the non-aluminium leavening agent for fried dough stick according to present invention further comprises 10-20wt% diacetyltartaric acid ester of mono- and di-glycerides.

Above non-aluminium leavening agent for fried dough stick can avoid the phenomena of swelling bag which is caused by mixing package of acidic components and alkaline components.

The other aspect of present invention relates to a non-aluminium leavening agent for fried dough stick which comprises 32-38wt% sodium bicarbonate, 5-8wt% citric acid, 8-12wt% sodium dihydrogen phosphate, 8-12wt% tartaric acid, 5-10wt% calcium carbonate, 10-20wt% diacetyltartaric acid ester of mono- and di-glycerides and residual low-moisture starch. Preferably, acidic components and alkaline components are packaged separately. The leavening agent is fit for making fried dough stick after dough is frozen.

Embodiments

In present invention, the percent of components content is all described in wt% (weight%).

In present invention, the base material of leavening reagent is low-moisture starch, wherein low-moisture means water content of below 5%, preferably below 4%, more preferably below 3%, further more preferably below 2%, most preferably below 1% of starch. Because water content of the used starch as base material is low, acidic components and alkaline components of the composition could not or seldom carry out neutralization reaction in starch as base material, which thus increases (prolongs) storage life of leavening agent composition to a great extent. Low-moisture starch could also be replaced by low-moisture wheat flour.

Generally, the non-aluminium leavening agent for fried dough stick according to present invention comprises 32-38wt% sodium bicarbonate, 5-8wt% citric acid, 8-12wt% sodium dihydrogen phosphate, 8-12wt% tartaric acid, 15-22wt% calcium carbonate and residual low-moisture starch.

The citric acid and tartaric acid in above formula could be replaced by acidic salt thereof or other edible di- or tri-carboxylic acid containing below 6 (including 6) carbons, so examples which could be used include but not limited to potassium bitartrate, malic acid, fumaric acid and etc.

In a preferable aspect of present invention, the composition further comprises 10-20% diacetyltartaric acid ester of mono- and di-glycerides. Inventors discovered accidentally that because of addition (presence) of diacetyltartaric acid ester of mono- and di-glycerides, the composition obtained could be well used in the method for making fried dough stick through frozen dough process. The so-called frozen dough process means putting leavening agent into dough, storing dough at low temperature (0°C — -10°C , even 0°C — -20°C) after mixing dough and kneading dough, and then forming fried dough stick at a proper time. The frozen dough process is usually useful in large food enterprises. These enterprises usually possess one or more centers for preliminary food processing and semi-finished food producing in which flour is made into dough then distributed and delivered to each shop, which will lead to decrease operating space for the shops. For this reason, dough needs to be stored at low temperature during the process of waiting or transporting after the flour is made into dough.

However, the leavening agent for fried dough available at present is not fit for above frozen process. Particularly, leavening agent is a system comprising of acidic and alkaline raw material. The speed of producing gas and retaining gas ability of dough both affect greatly the volume of final fried dough stick as finished product. With regard to fried dough stick, it is important to swell instantly when heated, so an acid-base equilibrium system which can produce gas rapidly is necessary. However, with regard to frozen dough, because frozen time is long, the dough gluten would be destroyed to an extent during frozen process, which would cause gas leakage and thus affect the final volume of fried dough stick. The leavening agent for fried dough available at present is designed only in consideration of the effect of swelling instantly, and not in consideration of taking extra measures to strengthen retaining gas property of dough, so the situation of outleakage of gas in dough exists in frozen-unfrozen process, and thus the degree of

volume swelling of final fried dough stick is not enough. Therefore, the technology of leavening agent for fried dough available at present is not fit for making frozen dough.

While making non-aluminium fried dough stick with the product of the present invention, the flour, water, leavening agent, salt and optional sugar could be mixed according to routine operating method. For example, 100 weight parts flour, 2-3 weight parts leavening agent for fried dough stick, 1 weight parts sugar, 1.3-1.6 weight parts salt, 3-5 weight parts oil and 57-65 weight parts water could be mixed together.

In an embodiment, after mixing all the materials as desired, dough is mixed slowly in dough mixer for 5 minutes and then dough is rapidly mixed for 2 minutes so that dough forms gluten slightly. Next, the obtained gluten dough is placed in circumstance of 36~40°C (placed at normal temperature in summer) for 1.5-2.5h and then dough could be cut into bars and fried.

Example 1-4

All the materials are mixed according to the composition in table 1 and form leavening agent for fried dough stick according to the present invention, wherein all additive agents used are in food-grade and low-moisture starch is self-made product in which water content is 4.3%.

Table 1 Composition of leavening agent of examples 1-4

Components	Example 1	Example2	Example 3	Example 4
Sodium bicarbonate	35.5%	32%	38%	35.5%
Citric acid	7%	5%	8%	7%
Sodium dihydrogen phosphate	10%	12%	8%	10%
DL- tartaric acid	8%	12%	10%	8%
Diacetyltartaric acid aster of mono- and di-glycerides	10%	15%	20%	—
Calcium carbonate	8%	5%	10%	8%
Low-moisture starch	21.5%	19%	6%	31.5%

Example 5

Fried dough stick is made according to the following steps:

- (1) 1000g wheat flour is put into a dough mixing cylinder, then 25g leavening agent which is made in example 2, 15g salt, 10g sugar, 30g oil and 570g water are also put into the dough mixing cylinder. The mixture is mixed at a low speed for 4 minutes and then at a high speed for 2 minutes to form dough in dough mixer;
- (2) the dough is taken out and divided into long strips;
- (3) the divided and formed dough is proofed at 35°C for 120 minutes;
- (4) The proofed dough is taken out, then divided into pieces and made into about 70g per piece of dough stick;
- (5) the dough stick is fried at the oil temperature of 200°C for 3 minutes to form product 1.

Example 6

Repeating the operations of example 5, the difference is that leavening agent from example 3 is used and the product 2 is formed.

Example 7

Fried dough stick is made according to the following steps:

- (1) 1000g wheat flour is put into a dough mixing cylinder, then 25g leavening agent which is made in examples 1 and 4, 15g salt, 10g sugar, 30g oil and 570g water are also put into the dough mixing cylinder. The mixture is mixed at a low speed for 4 minutes, and then mixed at a high speed for 2 minutes to form dough in dough mixer;
- (2) dough is stored at -20°C for 12h, then taken out, unfrozen and divided into long strips;
- (3) the divided and formed dough is proofed at 35°C for 120 minutes;
- (4) the proofed dough is taken out, then divided into pieces and made into about 70g per piece of dough stick;
- (5) the dough stick is fried at the oil temperature of 200°C for 3 minutes to form products 3 and 4.

Example 8

Repeating the operations of example 7, the difference is that leavening agent from example 4 is used and the product 5 is formed.

Control example 1

According to the disclosure of CN101044866A, 1.6g refined flour, 1.6g sodium bicarbonate, 9.4g calcium dihydrogen phosphate, 6.2g tartaric acid are mixed homogeneously and made into leavening agent. The leavening agent is mixed homogeneously with 940g wheat flour and 37.4g yeast and made into flour for making fried dough stick. The obtained flour for making fried dough stick and 550g water are mixed at a low speed for 4 minutes, and then mixed at a high speed for 2 minutes to form dough. The dough is stored at -20°C for 12h, then taken out, unfrozen and divided into long strips; the divided and formed dough is proofed at 35°C for 120 minutes. The proofed dough is taken out, then divided into pieces and made into about 70g per piece of dough stick. The dough stick is fried at the oil temperature of 200°C for 3 minutes to form control product 1.

Control example 2

According to the disclosure of CN1792175, 1.2g refined flour, 1.9g calcium dihydrogen phosphate, 1.9g citric acid, 1.5g sodium bicarbonate, 1.5g sodium carbonate, 1.4g ammonium hydrogen carbonate, 0.6g magnesium carbonate are mixed homogeneously and made into leavening agent. The leavening agent is mixed homogeneously with 500g wheat flour and made into flour for making fried dough stick. The obtained flour for making fried dough stick and 250g water are mixed at a low speed for 4 minutes, and then mixed at a high speed for 2 minutes to form dough. The dough is stored at -20°C for 12h, then taken out, unfrozen and divided into long strips; the divided and formed dough is proofed at 35°C for 120 minutes. The proofed dough is taken out, then divided into pieces and made into about 70g per piece of dough stick. The dough stick is fried at the oil temperature of 200°C for 3 minutes to form control product 2.

Comprehensive assessment are taken on the products from above examples and control examples, and marks thereof are given according to score strategy in table 3. The assessment results are shown in table 2.

Table 2 Comprehensive assessment results of the products of the present invention and control products

Items	Product 1	Product 2	Product 3	Product 4	Product 5	Control product 1	Control product 2
Appearance and color	9	9	8	8	7	5	6
Specific volume	20	20	18	19	17	16	15
Flexibility	9	8	7	8	7	7	7
Brittleness	15	14	14	14	13	12	12
Sticking to teeth	15	14	14	14	13	11	12
Smell	15	15	15	15	15	15	10
Structure and tissue	15	14	12	13	13	12	13
Sum score	98	96	91	93	88	79	75

Table 3: Assessment method for fried dough stick

Items	Total score	Assessment standard on score
Appearance and color	10	glossy, smooth and soft surface, golden color, symmetrical, chubby: 8.1~10; medium:5.1~8; poor: 1~5
Specific volume	20	score being 20 when specific volume amount is above 5.7; score being 19 when specific volume amount is 5.5~5.7; the decrease of score being 1 per 0.1 decrease of specific volume amount when specific volume amount is below 5.5.
Flexibility	10	flexibility being good when it is pressed with fingers, possessing biting force, 10; rebounding after a long time, but possessing chewiness, 7~9; rebounding after a long time, but possessing no chewiness, 6-8; not rebounding and not possessing chewiness, below 6;
Brittleness	15	brittleness being better, chewing with intense noise:13.1~15; brittleness being good, chewing with noise:10.1~13; brittleness being average, chewing without noise: 5.1~10; very soft, brittleness being poor: 1~5
Sticking to teeth	15	refreshing, not sticking to teeth:12.1~15; medium :9.1~12; not refreshing, sticking to teeth: 1~9
Smell	15	fragrance of fried oil and wheat, no peculiar smell: 12.1~15; no fragrance of wheat, no peculiar smell: 9.1~12; peculiar smell: 5.1~9; strong peculiar smell: below 5
Structure and tissue	15	gas hole being big and homogenous in longitudinal section, crispy outside and soft inside:13.1~15; medium:10.1~13; gas hole being small and inhomogeneous: 1~10

It can be seen from table 2 that the fried dough stick which is made using the product of the present invention in a common process possesses better bulkiness and the product of the present invention is also fit for a freezing process for making fried dough stick, and obviously better than the prior art in the aspect of a freezing process.

Besides, the products from examples 1-4 are mixed and packaged in a package bag. The package bag is kept at room temperature for 6 months after sealing and no phenomena of swelling bag happens. The phenomena of obvious swelling bag happens and even the phenomena of swelling and bursting bag happens after the leavening agent which is made according to leavening composition of control examples is mixed and stored for 6 months. Moreover, the ability of producing gas reduced obviously.

CLAIMS

1. A non-aluminium leavening agent for fried dough stick, comprises 32-38wt% sodium bicarbonate, 5-8wt% citric acid, 8-12wt% sodium dihydrogen phosphate, 8-12wt% tartaric acid , 5-10wt% calcium carbonate and residual low-moisture starch.
2. A non-aluminium leavening agent for fried dough stick according to claim 1, further comprises 10-20wt% diacetyltartaric acid ester of mono- and di-glycerides.
3. A non-aluminium leavening agent for fried dough stick, comprises 32-38wt% sodium bicarbonate, 5-8wt% citric acid, 8-12wt% sodium dihydrogen phosphate, 8-12wt% tartaric acid , 5-10wt% calcium carbonate, 10-20wt% diacetyltartaric acid ester of mono- and di-glycerides and residual starch.
4. A non-aluminium leavening agent for fried dough stick according to claim 3, acidic components and alkaline components are packaged separately.