USE OF ENCAPSULATED OIL IN DOUGH PREPARATION

FIELD OF THE INVENTION

The invention concerns the use of encapsulated oils and bakery dough low in saturated fatty acids prepared with the encapsulated oils as fat replacement systems. The dough can be used for the preparation of bakery products such as cookies, pies, croissants, puff pastry, wafers, loaves, biscuits, bread, sandwich doughs, and pizza doughs etc.

The dough products related to the invention comprise encapsulated oils, optionally fat, water, flour, optionally eggs, and optionally a leavening agent, as main ingredients.

BACKGROUND

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

A common characteristic of different dough types is that the type of fat strongly governs the texture and organoleptic properties of the unbaked dough as well as the baked product. Bakery doughs are usually prepared with solid-type fats such as lard, butter, margarine, palm-based fats, hydrogenated vegetable oils, or high melting stearin fractions of vegetable oils.

The hardness of a fat is linked to its degree of saturation. Highly saturated fats are usually solid at ambient conditions. Low levels of saturation yield a liquid product at ambient conditions, e.g. sunflower oil.

Solid fats containing high amounts of saturated fatty acids (SFA) are known to have negative health effects and are linked to an enhanced risk of cardiovascular diseases. In the recent years, this has led to an increasingly negative consumer perception of saturated fats.

Hydrogenation of oil is a commonly used technique to obtain solid-type fats from liquid oils. Besides the resulting high SFA content, the presence of trans fatty acids in partially hydrogenated fats has become a major health issue. Trans fatty acids are associated with cardiovascular diseases as well as with an increased risk of diabetes and some types of cancer, such as breast cancer.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

~~Hence, it would~~It may be desirable to replace high SFA solid-type fats or hydrogenated fats containing significant levels of trans fatty acids with low SFA liquid oils. However, persons skilled in the art understand that in most cases of dough preparation it is not possible to use a liquid oil instead of a solid fat. Besides other technological drawbacks, liquid oil doughs usually have a poor dough texture. The doughs are much softer and stickier

resulting in unworkable and unprocessable doughs. Oil release during manufacturing and dough storage also occurs.

T~~hus, t~~here is a ~~high~~general demand in the art for low SFA fats that can replace high SFA solid fats while still providing sufficient dough texture and workability.

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WO 1994/019953 describes bakery doughs or batters comprising conventional ingredients where the fat used has a SFA content of less than 40 wt. %. The fats that can be used are obtained from chemical or emzymatic interesterification, optionally followed by fractionation of a hardened fat and/or a liquid oil.

WO 2008/150169 describes a method of preparing biscuits or crackers using a fat blend which is characterized by a solid fat content of less than 10 wt. % at 25 °C. The inventors found that despite the high level of unsaturated fatty acids in the fat blend it can be used to prepare a biscuit dough or a cracker dough that does not suffer from stickiness.

In these documents SFA reduction is achieved using a low SFA fat blend usually containing a crystallizing or structuring agent such as a hydrogenated fat or a highly saturated fat fraction.

~~An object of the present invention is therefore to provide~~The invention relates very generally to a dough for baking that goes at least part way to overcoming one or more of the above disadvantages of existing doughs, or at least provides a useful alternative.

Unless the context clearly requires otherwise, throughout the description and the claims, the words “comprise”, “comprising”, and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of “including, but not limited to”.

Although the invention will be described with reference to specific examples it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a process for the preparation of an oil cream comprising at least 60 % oil by weight, a maximum content of water of 40 %, and cross-linked protein, wherein the oil is encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein, the process comprising the steps:

a) preparing an emulsion by homogenization of oil in an aqueous protein solution;
b) heating the emulsion at 70 to 90 “C for 5 to 15 minutes;
c) concentrating the emulsion by microfiltration or centrifugation or evaporation to reduce the water content of the oil cream to less than 35 % by weight.

According to a second aspect of the present invention there is provided an oil cream obtained by a process as defined according to the first aspect of the present invention.

According to a third aspect of the present invention there is provided a baked product which has been prepared using a dough as defined according to the second aspect of the present invention.

In ~~a first aspect~~one form, the invention provides the use of encapsulated oil for the preparation of a dough, the encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein, wherein the encapsulated oil comprises at least 80 % by weight oil, and wherein the dough is formed by mixing 0.5 to 40 % by weight of the encapsulated oil with other ingredients.

Preferably, the encapsulated oil is selected from the group consisting of oil powder, oil flakes, and oil cream.

In some preferred embodiments of the invention, the other ingredients comprise fat, water, and flour. The other ingredients may further comprise egg, a leavening agent, salt and sugar.

Preferably, the oil is a food grade oil obtained from plants or animals. Preferred oils include, but are not limited to, olive oil, safflower oil, sunflower oil, fish oil, soy bean oil, soy oil, palm kernel oil, palm oil, coconut oil, hazelnut oil, flaxseed oil, rapeseed oil, primrose oil, linseed oil, corn oil, algae oil, cottonseed oil, essential oils, and any combination thereof. The oil may also contain at least one liposoluble compound selected from the group consisting of plant polyphenols, plant sterols, carotenoids, fatty acids, vitamins, aromas, antioxidants, and active ingredients.

The protein is preferably selected from the group consisting of whey protein, caseinate, egg albumen, lyzozyme, soy proteins, gluten, rice proteins, corn proteins, potato proteins, pea proteins, any kind of globular or random coil proteins, and any combination thereof. The protein may also comprises a food-grade salt selected from the group

CLAIMS

~~1. The use of encapsulated oil for the preparation of a dough, the encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein, wherein the encapsulated oil comprises at least 80 % by weight oil, and wherein the dough is formed by mixing 0.5 to 40 % by weight of the encapsulated oil with other ingredients.~~

~~2. The use according to claim 1, wherein the encapsulated oil is selected from the group consisting of oil powder, oil flakes, and oil cream.~~

~~3. The use according to claim 1 or claim 2, wherein the other ingredients comprise fat, water, and flour.~~

~~4. The use according to claim 3, wherein the other ingredients further comprise egg, a leavening agent, and sugar.~~

~~5. The use according to any one of claims 1 to 4, wherein the oil is a food grade oil obtained from plants or animals.~~

~~6. The use according to claim 5, wherein the oil is selected from the group consisting of olive oil, safflower oil, sunflower oil, fish oil, soy bean oil, soy oil, palm kernel oil, palm oil, coconut oil, hazelnut oil, flaxseed oil, rapeseed oil, primrose oil, linseed oil, corn oil, algae oil, cottonseed oil, essential oils, and any combination thereof.~~

~~7. The use according to any one of claims 1 to 6, wherein the protein is selected from the group consisting of whey protein, caseinate, egg albumen, lyzozyme, soy proteins, gluten, rice proteins, corn proteins, potato proteins, pea proteins, any kind of globular or random coil proteins, and any combination thereof.~~

~~8. The use according to any one of claims 1 to 7, wherein the protein comprises a food-grade salt selected from the group comprising sodium citrate, magnesium citrate, potassium citrate, calcium, phosphate, and any combination thereof.~~

~~9. The use according to any one of claims 1 to 8, wherein the oil contains at least one liposoluble compound selected from the group consisting of plant polyphenols, plant sterols, carotenoids, fatty acids, vitamins, aromas, antioxidants, and active ingredients.~~

1. A process for the preparation of an oil cream comprising at least 60 % oil by weight, a maximum content of water of 40 %, and cross-linked protein, wherein the oil is encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein, the process comprising the steps:

a) preparing an emulsion by homogenization of oil in an aqueous protein solution;

b) heating the emulsion at 70 to 90 °C for 5 to 15 minutes;

c) concentrating the emulsion by microfiltration or centrifugation or evaporation to reduce the water content of the oil cream to less than 35 % by weight.

2. A process according to claim 1, wherein the oil cream comprises at least 80 % by weight oil.

3. A process according to claim 1 or claim 2, wherein the oil is a food grade oil obtained from plants or animals.

4. A process according to claim 3, wherein the oil is selected from the group consisting of olive oil, safflower oil, sunflower oil, fish oil, soy bean oil, soy oil, palm kernel oil, palm oil, coconut oil, hazelnut oil, flaxseed oil, rapeseed oil, primrose oil, linseed oil, corn oil, algae oil, cottonseed oil, essential oils, and any combination thereof.

5. A process according to any one of the preceding claims, wherein the protein is selected from the group consisting of whey protein, caseinate, egg albumen, lyzozyme, soy proteins, gluten, rice proteins, corn proteins, potato proteins, pea proteins, any kind of globular or random coil proteins, and any combination thereof.

6. A process according to any one of the preceding claims, wherein the oil contains at least one liposoluble compound selected from the group consisting of plant polyphenols, plant sterols, carotenoids, fatty acids, vitamins, aromas, antioxidants, and active ingredients.

7. An oil cream obtained by a process as defined according to any one of claims 1 to 6.

~~10. The use according to any one of claims 1 to 9, wherein the encapsulated oil capsules have an average size in the range of about 0.1-100 µm.~~

~~11. A dough comprising:~~

~~a) 0.5 to 40 % of an encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein, wherein the encapsulated oil comprises at least 80 % by weight oil;~~

~~b) 0.5 and 40 % fat;~~

~~c) 4.5 and 35 % water; and~~

~~d) 30 and 65 % flour.~~

~~12. A dough according to claim 11, wherein the encapsulated oil is in the form of oil powder, oil flakes, or oil cream.~~

8. A dough comprising: between 0.5 to 40 % oil cream according to claim 7, between 0.5 and 40 % fat, between 4.5 and 35 % water, and between 30 and 65 % flour.

9. A dough according to claim 8, further comprising between 0.1 and 2 % of a leavening agent, between 0.1 and 10 % egg and between 0.1 and 40 % sugar.

10. A dough according to claim 8 or claim 9, comprising from 10 to 20 % oil cream from 5 to 15 fat, from 32 to 37 % flour and from 8 to 12 % water.

~~13.~~11. A dough according to ~~claim 11 or claim 12~~any one of claims 8 to 10, which is selected from the group consisting of cookie dough, pie dough, croissant dough, puff pastry dough, wafer dough, loaf dough, biscuit dough, and pizza dough.

~~14.~~12. A baked product which has been prepared using ~~the dough of any one of claims 11 to 13~~a dough as defined according to any one of claims 8 to 11.

~~15.~~13. A baked product ~~as claimed in claim 14~~ according to claim 12, which is selected from the group comprising pizza, cookie, pie, croissant, pastry, wafer, loaf, and biscuit.

~~16. An oil cream comprising at least 60 % oil by weight, a maximum content of water of 40 %, and cross-linked protein, wherein the oil is encapsulated oil comprising an inner core of oil encapsulated in an outer shell of cross-linked protein.~~

~~17. A process for the preparation of an oil cream according to claim 16, comprising the steps:~~

~~a) preparing an emulsion by homogenization of oil in an aqueous protein solution;~~

~~b) heating the emulsion at 70 to 90 °C for 5 to 15 minutes;~~

~~c) concentrating the emulsion by microfiltration or centrifugation or evaporation to reduce the water content of the oil cream to less than 35 % by weight.~~