

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO PROCESSES FOR PREPARING SNACK-FOODS FROM STARCH

(71) I, SHUNJI ABE of 1-banchi Oaza Tsuchikawa, Ojiya-shi, Niigata-ken, Japan, of Japanese Nationality do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a process for preparing snack-foods from glutinous type starch containing 20% or more of rice flour and/or other cereal material. The term "glutinous type starch" as used herein means a starch which has no or a very low content of Amylose and substantially comprises Amylopectin for example at least 88% Amylopectin.

Previously, many attempts have been made to prepare snack-foods from glutinous type starch such as waxy corn starch, glutinous millet starch and glutinous kaoliang starch. However, in spite of improvements to the steps and operations of the prior art snack-foods having the same soft texture as those obtained from glutinous rice were not obtained; the snack food products obtained in the prior art were found to have a rough texture due to hardness and insolubility of the snack food in the mouth.

In a conventional method of preparing snack-foods, a raw material is kneaded with steam, thereby producing a cake material, that is a dough cake. It is inevitable that the water content of the cake material rises due to the introduction of steam into a steam kneader and that the physical properties of the cake material deteriorate with the progress of α -starch formation. Particularly when using starch as the raw material, the starch absorbs water boundlessly in proportion to the time for kneading with steam because it has no cell membranes to inhibit it from swelling. Therefore, when starch is kneaded with steam, α -starch formation proceeds to too great a level,

thereby lowering the viscosity of the cake material produced. Further, the cake material produced is too soft to be cut into a desired shape and is difficult to solidify by cooling. Furthermore, as the cake material is easy to break during the drying step, it has been difficult to obtain commercially available snack-foods therefrom.

According to one aspect of the present invention there is provided in a process of preparing a snack-food, the steps of kneading with steam a mixture of one or more glutinous type starches (as hereinbefore defined) and 20% or more, based on the weight of the mixture, of rice flour and/or other cereal material to produce a cake material and thereafter immediately cooling the mixture to a temperature sufficient to form a solidified material.

According to a second aspect of the present invention there is provided a process of preparing a snack food, which comprises mixing by kneading with steam for a period of time sufficient to produce a homogenous cake material a glutinous type starch (as hereinbefore defined) selected from the group consisting of glutinous rice starch, waxy corn starch, glutinous millet starch and glutinous kaoliang starch with at least 20% based on the weight of the mixture of a flour selected from the group consisting of rice flour and other cereal flour, immediately thereafter rapidly cooling the mixture to a temperature sufficient to form a solidified material, shaping and forming the solidified material into the desired shape, drying the shaped and formed material and baking the dried material under conditions sufficient to form a puffed snack food product.

The present invention further relates to a snack food whenever prepared by the process of one of the two preceding paragraphs.

90

The inventor of the present invention has tried to prepare snack-foods of improved quality from glutinous type starch and has found that if glutinous type starch is mixed with 20% or more of rice flour and/or other cereal material such as cereal flour, the water content of the mixture does not change so much during steam kneading thereby enabling the production of a fine and homogeneous cake material or dough cake. That is, rice or other cereal material which is difficult to swell on account of the cell membranes thereof enters into starch particles, that is, it is mixed therewith and when the resulting mixture is disturbed or agitated to cause swelling by steam kneading a physically stable cake material or dough cake can be obtained.

The present invention enables the provision of a process for preparing snack-foods having a good taste and soft texture which could not be produced from glutinous type starch by prior art methods, wherein glutinous type starch containing 20% or more of rice flour and/or other cereal material is used as the raw material.

Glutinous type starch mixed with 20% or more of rice flour and/or other cereal material is used as the raw starch material. Examples of glutinous type starch include glutinous rice starch, waxy corn starch, glutinous millet starch and glutinous kaoliang starch. The glutinous type starch mentioned above or a mixture thereof may be mixed with rice flour such as glutinous rice flour or non-glutinous rice flour, and/or other cereal material such as corn flour, rice bran, corn grits, corn meal. The mixing ratios of rice flour and/or other cereal material to the raw starch material is 20% or more in accordance with desired products.

The above glutinous type starch material containing 20% or more of rice flour and/or other cereal material is kneaded with steam, preferably with the addition of water and for about 8 to 10 minutes to give a homogeneous dough cake. After kneading, if necessary, steam may be discharged from a steam kneader so as to remove a bad smell or the odour of the starch material and obtain snack-foods of good taste. As in the conventional preparation of snack-foods such as crackers, pellets and Kakimoto (a product shaped like persimmon seed) from rice, it is preferred to prepare a fine and homogeneous cake material by satisfactorily kneading with steam. Since an unhomogeneous cake material is easy to break in a drying step and leads to unsatisfactory swelling in the baking step, sufficiently swelled products can not be obtained from an unhomogeneous cake material. Therefore, the step of kneading with steam is preferably carried out care-

fully in order to produce a fine and homogeneous cake material.

In the next stage, the homogeneous cake material prepared above is immediately transferred to a cooling step. In the cooling step, it is essential to cool the cake material itself to a lower temperature as quickly as possible after preparation thereof. That is, the cake material is preferably cooled to about 5°C. within at least 6 hours after preparation thereof. The cooling is then further continued to give a solidified material having a hardness sufficient for the next cutting step. The more quickly the cake material is cooled, the more favourable the taste and texture of the snack-foods become. However, freezing of the cake material should be avoided because this deteriorates the quality of the product. A satisfactorily swelled product with soft texture is normally only obtained when the cooling is carried out as explained above.

The rapid cooling and solidifying of the cake material is effectively carried out in such a way that the cake material is extruded into a sheet of from 1.0 to 1.5 cm in thickness by a kneading and extruding machine and the sheet material is taken out, that is placed, on a plate spread with a flour, then immediately put into a cooling apparatus, for example, a refrigerator at a temperature of from 1 to 5°C. and allowed to stand for from 12 to 18 hours therein. When the thickness of the material is more than 1.5 cm, a special high power refrigerator should be used. In this way, by means of the rapid cooling and solidifying of the cake material prepared from the raw starch material containing 20% or more of rice flour and/or other cereal material, a satisfactorily swelled snack-food of good taste and soft texture can be obtained. Moreover, if the temperature of the cake material itself falls to less than 5°C. by the rapid cooling, the cake material becomes easier to cut. Therefore, the cake material is, preferably, further cooled and solidified by allowing it to stand in a refrigerator for a certain time as described above.

Then, the cooled and solidified material is cut to a desired shape of from 1.0 to 2.5 mm in thickness and then dried. When the thickness is more than 2.5 mm, it is difficult to dry the shaped material efficiently which effects the swelling of the material in the baking step. The temperature of the solidified material is preferably low for cutting thereof. The cutting is preferably carried out at a room temperature of from 2 to 15°C. within 2 hours. Subsequently, the cut and shaped material is effectively dried with ventilation at a low temperature, for example, by a ventil-

ating drier at from 25 to 80°C., preferably from 25 to 50°C., within 6 hours. The drying of the shaped material should be performed as rapidly as possible to prevent retrogradation of the material. A conventional drier for non-glutinous rice crackers at from 60 to 80°C. may be also used in the drying step, thereby giving a product of satisfactory quality. However, compared with the drying by a ventilating drier at a lower temperature, the shaped material is unhomogeneously dried and the quality of the product is apt to deteriorate.

After drying, the dried material is normally allowed to stand for from 8 to 24 hours (aging) for the purpose of adjusting the water content thereof to a definite or desired level and obtaining homogeneously baked products. The aging is carried out at a temperature of from 5 to 35°C., preferably at from 5 to 15°C., because a higher temperature accelerates the retrogradation of the material. In the next, that is the baking, step, the material is preferably baked a little at a time so as to produce a favourably swelled product of improved quality. Further, in the seasoning step after baking the baked material is spread with a desired liquid relish when the temperature of the material is about from 30 to 50°C., since the seasoning at a lower or higher temperature, except the specified range and in particular the range of from 35 to 50°C., can not give the satisfactorily glazed product.

As described above, snack-foods of improved quality having soft texture and good taste such as crackers, pellets, and Kakinotane can be obtained from the raw starch material containing 20% or more of rice flour and/or other cereal material according to the process of the present invention.

As machines available for the process of the present invention, there may be exemplified as follows; rice pearling equipment, a continuous automatic rice washer, an automatic cake making machine, a steam kneader, a kneading machine for a strip cake material, a kneading and extruding machine, a grain-type automatic cake making machine, a prefabricated refrigerator, a cutting machine for pellet material, a turning-type cutting machine for a pellet material, a one-stage ventilating drier, a three-stage ventilating drier, a jumbosize automatic reciprocating moving oven, a moving gas oven, a water jacket-type shaking machine, a rotating drum-type glazing machine, a seasoning machine such as an automatic seasoning machine and a moving drier for finishing.

The present invention provides a process for preparing snack-foods of improved

quality such as crackers, pellets, and Kakinotane, by using glutinous type starch containing 20% or more of rice flour and/or other cereal material as the raw material. That is, the snack-foods obtained by the process of the present invention can be efficiently puffed and spongy, and also have a good texture similar to those obtained from glutinous rice. They can have, further, the favourable taste of the starch used as the raw material. When the process of the present invention is carried out, the conventional equipment for preparing snack-foods from glutinous rice can be used for all steps thereof. Accordingly, the desired snack-foods of the present invention can be easily prepared in any factory designed for producing snack-foods from glutinous rice. Although new steps for cooling and shaping can be added in the process of the present invention, the overall time required for all steps can be drastically reduced because as compared with the prior processes of the time for drying is shorter and the operation is simpler. It follows that the yield of the products can be increased.

It can not be clearly understood why the snack-foods of the present invention, such as rice crackers, pellets and Kakinotane have qualities similar to those of the snack-foods derived from glutinous rice. However, it is presumed that the following are the main reasons:

1) The raw materials respectively comprise about 100% of amylopectin which has similar properties to those of glutinous rice starch.

2) Starch swelling is prevented by mixing 20% or more of rice flour and/or other cereal material having cell membranes therein with the above starch having no cell membranes, thus obtaining a homogeneous cake material by disturbing the swelling property.

3) According to the prior processes, prepared cake material is immediately dried at a comparatively higher temperature to prevent the material from retrogradation, thereby obtaining snack-foods. In contrast, the present invention intends to obtain snack-foods from a less retrograded cake material by quickly cooling. Such a rapid cooling effect on the cake material is also considered to be one of the reasons why the snack-food produced according to the present invention can be efficiently puffed and have soft texture similar to those made of glutinous rice.

The following Examples further illustrate the present invention.

Example 1

A mixture of 40 kg of commercially available waxy corn starch and 40 kg of glutinous rice flour of 80 to 100 mesh in average particle size prepared by milling

scraps of glutinous rice after polishing, washing with water and draining, was put into a steam kneader. (The standard of mesh is inch; for example 80 mesh means 1/80 inch). After adding 40 kg of water thereto, the mixture was kneaded with steam under the initial pressure of 2.0 kg/cm² and a steam pressure of 0.5 kg/cm² for 8 minutes to prepare a cake material. At the end of kneading the cover of the steam kneader was taken off and steam was discharged so as to remove a bad smell or odour. The cake material was supplied to a Kakinotane making machine and extruded into a stick whose section was shaped like persimmon seed. The stick material was placed on a plate spread with a flour, then immediately put into a refrigerator at a temperature of from 2 to 5°C and left for 18 hours therein to be cooled and solidified. The solidified material was cut into pieces shaped like persimmon seeds of 1.3 mm in thickness, then dried in a ventilating drier according to the conventional method until the water content was reduced to from 22 to 23%. Subsequently, the dried material was allowed to stand for 1 day at a room temperature in an air-tight container (aging). After aging the material was baked at 280°C in 5 kg portions at a time in a baking oven. Soy glazing liquid was applied to the baked material by a rotating drum-type glazing machine and the baked material was dried to obtain a snack-food like Kakinotane of improved quality. The product had a soft texture similar to those made from glutinous rice.

Example 2

80 kilograms of a mixture of commercially available waxy corn starch and non-glutinous rice flour (mixing ratio 7 : 3) was put into a steam kneader. After adding 50 kg of water thereto, the mixture was kneaded with steam under a steam pressure of 0.5 kg/cm² for 9 minutes to prepare a cake material. At the end of kneading the cover of the steam kneader was taken off and the steam was discharged so as to remove a bad smell. The thus prepared cake material was further passed through a kneader in order to make a homogeneous cake material. The homogeneous cake material was extruded into a sheet of 1.0 cm in thickness by a kneading and extruding machine and taken out on a plate spread with flour. The sheet material was at once put into a refrigerator at from 2 to 5°C and left for 14 hours so as to be cooled and solidified. The solidified material was cut into pieces (10mm × 45mm × 1.2mm) and dried in a ventilating drier at a temperature of from 30 to 35°C until the water content was reduced to about 20%. The dried mat-

erial was allowed to stand overnight at room temperature in an air-tight container, then baked at 280°C in 1.0 kg portions at a time in a baking oven. The thus baked material was spread with salad oil in the amount of 10% based on the material by a rotating drum-type glazing machine and seasoned with salt, thereby obtaining a fried snack-food of improved quality.

Example 3

A mixture of 50 kg of glutinous millet starch prepared from commercially available glutinous millet by alkaline process, 25 kg of commercially available rice bran and 5 kg of corn flour was put into a steam kneader. After addition of 50 kg of water, the mixture was kneaded with steam under a steam pressure of 0.5 kg/cm² for 7.5 minutes. Thereafter, the cover of the steam kneader was immediately taken off and steam was discharged so as to remove a bad smell. In this way, the produced cake material was further passed through a kneader, thereby making a homogeneous cake material. The homogeneous cake material was extruded into a stick of diameter of 2.5 cm by a Kakinotane making machine. The stick of material was taken out on a plate spread with a flour, then at once put into a refrigerator at 5°C and left for 18 hours therein so as to be cooled and solidified. The solidified material was cut into pieces shaped like persimmon seeds of 1.7 mm in thickness and dried in a ventilating drier at a temperature of from 30 to 35°C for 3.5 hours until the water content was reduced to about 30%. Subsequently, the dried material was allowed to stand for 20 hours at room temperature in an air-tight container, then baked in 8 kg portions at a time in an automatic baking oven. The baked material was glazed and seasoned to obtain a snack-food like Kakinotane of improved quality.

Example 4

A mixture of 50 kg of commercially available waxy corn starch, 25 kg of rice bran and 5 kg of corn flour was put into a steam kneader. After adding 45 kg of water, the mixture was kneaded with steam under a steam pressure of 0.5 kg/cm² for 8.5 minutes, thereby producing a homogeneous cake material. The cake material was treated in the same manner as described in Example 3 to obtain a snack-food like Kakinotane of improved quality.

As mentioned above, there can be obtained snack-foods with good taste and soft texture similar to those made of glutinous rice, from glutinous type starch containing 20% or more of rice flour and/or other cereal flour according to the process of the present invention.



12
13

WHAT I CLAIM IS:

1. In a process of preparing a snack-food, the steps of kneading with steam a mixture of one or more glutinous type starches (as hereinbefore defined) and 20% or more, based on the weight of the mixture, of rice flour and/or other cereal material to produce a cake material and thereafter immediately cooling the mixture to a temperature sufficient to form a solidified material.
2. A process according to Claim 1, which process further comprises shaping, drying and baking the solidified material to obtain the desired product.
3. A process according to Claim 1 or 2, which comprises kneading with steam for a period of time sufficient to produce a homogeneous cake material.
4. A process according to Claim 2 or 3, wherein the shaping is carried out by cutting to a desired shape.
5. A process according to any one of the preceding claims, wherein the glutinous type starch is one or more of glutinous rice starch, waxy corn starch, glutinous millet starch or glutinous kaoliang starch.
6. A process according to any one of the preceding claims, wherein the other cereal material is cornflour, rice bran, corn grits or corn meal.
7. A process of preparing a snack food, which comprises mixing by kneading with steam for a period of time sufficient to produce a homogeneous cake material a glutinous type starch (as hereinbefore defined) selected from the group consisting of glutinous rice starch, waxy corn starch, glutinous millet starch and glutinous kaoliang starch with at least 20% based on the weight of the mixture of a flour selected from the group consisting of rice flour and other cereal flour, immediately thereafter rapidly cooling the mixture to a temperature sufficient to form a solidified material, shaping and forming the solidified material into the desired shape, drying the shaped and formed material

and baking the dried material under conditions sufficient to form a puffed snack food product.

8. A process according to any one of the preceding claims, wherein the steam kneading is carried out for from 8 to 10 minutes.

9. A process according to any one of the preceding claims, wherein the cake material is cooled after kneading to about 5°C. within at least 6 hours of the preparation thereof.

10. A process according to any one of the preceding claims, wherein the cooled cake material is aged for 8 to 24 hours at a temperature in the range of from 5 to 35°C.

11. A process according to Claim 10, wherein the cooled cake material is aged for from 8 to 24 hours at a temperature in the range of from 5 to 15°C.

12. A process for preparing a snack-food, substantially as described in foregoing Example 1.

13. A process for preparing a snack-food, substantially as described in foregoing Example 2.

14. A process for preparing a snack-food, substantially as described in foregoing Example 3.

15. A process for preparing a snack-food, substantially as described in foregoing Example 4.

16. A snack-food whenever prepared by the process of any one of the preceding claims.

FORRESTER, KETLEY & CO.
Chartered Patent Agents,
Forrester House,
52 Bounds Green Road,
London N11 2EY.,
— and also at —
Rutland House,
Edmund Street,
Birmingham B3 2LD.,
Scottish Provident Building,
29 St. Vincent Place,
Glasgow G1 2DT
Agents for the Applicant.