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(54) Title: RICE-BASED SNACK CHIP AND METHOD OF MAKING SAME

(57) Abstract: A rice-based snack chip made from a dough including the dry ingredients of bumped rice kernels, long-grain rice pregelatinized flour, medium-grain course white rice flour and in which the bumped rice kernels are partially hydrated, bumped, partially dehydrated and fried as the chip is made.

## RICE-BASED SNACK CHIP AND METHOD OF MAKING SAME

The present invention relates to snack food chips and, in particular, to a dry mix, a dough, and a processed brown rice product for use in making rice-based snack chips and to methods for making same.

5 BACKGROUND OF THE INVENTION

The world of snack chips includes a wide variety of base materials, including, for example, potatoes, corn, taro, sweet potatoes and cheese, to name a few. Prior to the present invention, however, the use of rice as the primary base material for a snack chip has eluded the snack food industry.

10 In order for a snack chip to be commercially successful, it must taste good, look good, feel good when eaten and be capable of large scale production. The look good and feel good features usually translate into the chip having a structure that keeps the chip from crumbling during processing, packaging, transport or use (prior to reaching a mouth). Further, the structure of the  
15 chip wants to give it a fresh "crunchability" when eaten. The look good feature translates into the chip having a toasted appearance that is usually associated with crunchiness.

Some of the difficulties in using rice as a base material for a snack chip are that it does not naturally acquire a toasted appearance, it tends to crumble  
20 easily and is sticky when cooked and made into a dough, making it unusable with existing machinery commonly used to make chips from other base materials.

By the use of different forms of rice, the present invention overcomes these problems and produces a tasty snack chip that has desirable  
25 characteristics and necessary structural integrity.

BRIEF DESCRIPTION OF THE INVENTION

The present invention combines in water at least two different rice materials, together with other ingredients, to make a dough that can be sheeted, cut, parbaked and fried using presently existing equipment. The  
30 resulting chips are tasty, look appetizing, have the "crunch factor" that characterizes a good snack chip, and are structurally strong enough to remain whole until eaten.

It is the combination of different forms of rice that give the present invention the ability to make a dough that can be formed into a commercial  
35 snack chip using existing equipment commonly used to make a tasty snack chip from other base materials.

One of the forms of rice used in the present invention is bumped rice

that has been cooked and then oven-toasted.

Bumped rice is typically a transient state of rice between a parcooked rice grain and crisp rice. Crisp rice is a well known and frequently used product in the manufacture of crisp candy bars, cookies, granola bars and 5 other snacks and confections, in addition to its well known use as a breakfast food.

A typical crisp rice process is an oven-puffing process which begins with whole kernels of rice. The rice kernels are first cooked in a retort for several hours, together with sugar, salt and malt. The cooked kernels are then dried 10 to a moisture content of 25% to 30%, tempered for about 15 hours to equilibrate moisture, and dried again to a moisture content of 18-20%. The dried kernels are then radiantly heated to plasticize the outside layers of the kernel, "bumped" on widely spaced flaking rolls, and tempered for 24 hours. At this point, the rice is in the form of hard, generally disk-shaped kernels not 15 suitable as a constituent in a food product without further processing. For purposes of the present invention, rice at this stage of processing—bumped and tempered rice formed into hard, disk-shaped kernels—is referred to as "bumped rice kernels". In the prior art, the bumped rice kernels are puffed and toasted in a toasting oven for 30-45 seconds, resulting in a highly expanded cereal 20 product with a tender, crisp structure. Rice in this form is commonly referred to as "rice crisp".

In the bumping step, the rice kernels are flattened, but not beyond the point wherein they lose their integrity as a grain per se; the bumped rice will thus assume a thickness dimension generally 50%-75% of the cooked tempered 25 rice dimension just prior to bumping.

In the present invention, bumped rice kernels are used as one of the rice constituents in the dough from which chips of the invention are made. The bumped rice kernels, however, are further processed in a way that makes them suitable as a food constituent, but does not permit them to expand fully into 30 rice crisp, as is done in the prior art.

Bumped rice kernels, as used in the present invention, is a commercially available product (for example, Item #CB04200 from California Cereal Products, Inc., in Oakland, California) used exclusively to make crisp rice.

In the present invention, bumped rice is made a desirable snack chip 35 ingredient by unique processing that transforms the bumped rice kernels from dense, hard-to-chew kernels to crunchy, but not airy, nuggets of nutty rice

flavor. Bumped rice kernels processed according to the present invention are referred to herein as "rice nuggets".

In the present invention, bumped rice kernels, rice flour, as well as other ingredients, are mixed with water to form a dough. In forming the dough, the 5 bumped rice kernels are partially hydrated along with the other ingredients. When the dough is formed into sheets by the rollers of a mechanical sheeter, the partially hydrated bumped rice kernels are bumped again. When the sheeted dough is baked to partially dehydrate the dough before frying, the partially hydrated and bumped rice kernels are also partially dehydrated. 10 When the dough is cut into chip-size pieces and fried in oil along with the other constituents of the chip of the present invention, the processed bumped rice kernels do not puff up as they would had they not been further processed as described above. Instead, the bumped rice kernels enlarge only slightly, but enough to make them crisp and crunchy (but without being airy). In this 15 state, the bumped rice kernels have been transformed into what are referred to herein as "rice nuggets". The rice nuggets provide the chip with a distinct flavor (whether made from plain or malted bumped rice kernels), an interesting texture and an attractive, contrasting toasted color (when the bumped rice kernels are made from brown rice). Rice nuggets are significant in making the 20 chip look good, taste good and feel good when eaten.

Thus, it is an object of the present invention to provide a snack food chip having rice as its base ingredient which tastes good, looks good and feels good when eaten.

It is a further object of the present invention to provide a snack food 25 chip having rice as its base ingredient which can be made on existing machinery.

It is another object of the present invention to use rice nuggets as a significant component of a snack food chip.

Yet another object of the present invention is to provide a dry mix 30 including bumped rice kernels and rice flour from which a snack chip can be made.

Still another object of the invention is to provide a dough including bumped rice kernels and rice flour from which a snack chip can be made.

Another object of the invention is to provide a dough including bumped 35 rice kernels and pregelatinized long-grain rice flour from which a snack chip can be made.

An additional object of the invention is to provide rice nuggets.

A further object of the invention is to provide methods for making the dough, rice nuggets and chips of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

5 The present invention relates to a snack chip having rice as its primary ingredient. The chip is made from a dough that is sheeted, cut, parbaked, then fried before being packaged.

In one embodiment of the invention, the dough is made by combining water with a dry mix of bumped rice kernels, pregelatinized long-grain rice 10 flour, coarse medium-grain white rice flour, tortilla chip flour, Crisp Film®, Textaid® A and sesame seeds. Other embodiments using ingredients other than tortilla chip flour, Crisp Film®, Textaid® A and sesame seeds are within the scope of the invention and at least one other will be described.

Bumped rice kernels is a well known product and is commercially 15 available from a number of sources, including California Cereal Products, Inc., of Oakland, California, which describes its product as first grade, clean, whole brown rice that has been cooked and flavored with malt and salt and then oven-toasted. In the preferred embodiment, the bumped rice kernels are made from medium-grain brown rice.

20 Pregelatinized long-grain rice flour is a commercially available product, such as RF-G2080 offered by Sage V Foods, which describes its product as a finely ground, fully gelatinized rice flour which has excellent water holding capacity and thickens in cold water, releases water when baked and causes some expansion to the product, and provides a binding property and gives 25 texture to dough to aid in machinability. Pregelatinized rice flour is well known to those skilled in the art.

Coarse medium-grain white rice flour is a commercially available 30 product, such as Rice Flour #4511 from ACH Foods Corporation, Inc., of Cordova, Tennessee. Coarse white rice flour is well known to those skilled in the art.

The combination of the water holding capability of the pregelatinized long-grain rice flour and the water absorbing capability of the bumped rice kernels forms a dough that can be sheeted using existing machinery known to those skilled in the art.

35 Tortilla chip flour is flour made from whole-grain yellow corn and is well known to those skilled in the art. The addition of the corn flour adds a

desirable flavor and further adds to the ability of the predominately rice dough to be processed by available machinery.

Crisp Film® is a modified high amylose corn starch available from National Starch and Chemical Company, of Bridgewater, New Jersey, and is 5 well known to those skilled in the art as an ingredient that adds crispiness to a fried product.

Textaid® A is a modified food starch refined from corn and available from National Starch and Chemical Company, of Bridgewater, New Jersey, and is well known to those skilled in the art as a product that gives texture and 10 strength to a fried snack chip product.

Sesame seeds, such as those from Sesaco Corporation, of Paris, Texas, or their equivalent, are well known to those skilled in the art as a flavor enhancing ingredient.

In one embodiment of the invention, the following ingredients are 15 combined in the following proportions to form a dry mix: bumped rice kernels (35%); pregelatinized long-grain rice flour (30%); coarse medium-grain white rice flour (8.75%); tortilla flour (8.75%); Crisp Film® (8.75%); Textaid® A (5.25%); and sesame seeds (3.5%). From these dry ingredients, a dough of the invention can be made by adding water. From the dough of the invention, the 20 chips of the invention are formed.

In one embodiment of the invention, a dough is made by combining the following ingredients in the following proportions: water (45.5%); bumped rice kernels (20%); pregelatinized long-grain rice flour (17%); coarse medium-grain white rice flour (5%); tortilla flour (5%); Modified Food Starch - Sago 77-1869 25 (National Starch) (2.5%); Modified food starch - Textaid® A (National Starch) (3.0%); and sesame seeds (2.0%).

With the ingredients specified above, chips of the invention are made as follows:

- (a) mix all dry ingredients for about one minute;
- 30 (b) add water and mix until dough forms with consistency suitable for passing through sheeter without sticking (e.g., between 30 seconds and 3 minutes);
- (c) pass dough through roller head to form sheets which are between 1/16 and 1/8 inch thick;
- 35 (d) cut the sheets into chip-size pieces;
- (e) expose chip-size pieces to oven temperature of approximately 690 degrees

F until moisture content is 2% or less (e.g., approximately 36 seconds);

(f) equilibrate by allowing to stand at room temperature (e.g., about 8 minutes);

(g) fry in 360-380 degree F safflower oil until crisp (e.g., approximately 22 seconds);

(h) salt at a 0.5 to 0.8% salt (and/or add topical spices and flavorings).

The forgoing example is but one embodiment of the present invention. Temperatures and times, for example, can change with altitude and other conditions, amounts of ingredients and ingredients themselves may be varied or eliminated within the scope of the invention.

An alternative embodiment, where all the rice components are from brown rice, includes: water 37.5%; Organic Brown Rice Parboil (Lundberg Family Farms) 19%; Brown Rice Flour (Lundberg Family Farms) 15%; Brown Rice Kernels (CA Cereal Products, Inc.) 15%; Brown Rice Syrup Flour (Lundberg Family Farms) 8%; Instant Tapioca (National Starch - Novation 3300) 2.5%; Sesame Seeds 2%; Nu-Bake (Ribus, Inc) 1%. The procedure for processing this formulation into chips is the same as set forth above.

Nu-Bake, from Ribus, Inc., is an extract from rice bran that is derived through patented, proprietary technology.

As seen from the two examples, the relative proportions of the rice components can be varied so long as the resulting dough can be sheeted, cut, parbaked and fried to produce a desirable tasting and structurally useful chip. Likewise, the minor ingredients can be varied in amounts or eliminated altogether and other ingredients added, as long as they are present in amounts sufficient to lend the characteristics highlighted above to the resulting chip. It will be understood by those skilled in the art that in modifying, eliminating and/or adding ingredients, it will likely be necessary to vary the amounts of the other ingredients to produce a balanced blend that meets all the requirements for a useful and tasty chip. Thus, the invention is not limited to any particular set of relative percentages of ingredients, but is rather found in the combinations of key ingredients in amounts and relative proportions that produce the desired results.

When used, the bumped rice kernels are processed (partially hydrated, bumped by being passed through the sheeter, partially dehydrated and fried) so that they do not fully expand (become crisp rice) from the heat of either the partial dehydration or the frying process, but rather are transformed into

crunchy rice nuggets. Also, the combination of the long-grain rice flour and the medium-grain rice flour forms a blend from which a dough can be made that can be processed on existing machinery to produce a chip having the desirable characteristics specified above.

5        Rice nuggets are useful in foods other than chips and, in particular, in just about any food that now uses crisp rice. The fried rice nuggets add a crunchy texture and flavorful boost to a food without all the air of traditional puffed rice.

10      Of course, various changes, modifications and alterations in the teachings of the present invention may be contemplated by those skilled in the art without departing from the intended spirit and scope thereof. As such, it is intended that the present invention only be limited by the terms of the appended claims.

What is claimed is:

1. A snack chip including bumped rice kernels that have been partially hydrated, bumped, partially dehydrated and fried.
2. The snack chip of claim 1 further including rice flour.
- 5 3. The snack chip of claim 1 wherein the amount of said bumped rice kernels is less than the amount of said rice flour by dry weight.
4. The snack chip of claim 1 in which, for every 7 parts of said bumped rice kernels, there are approximately 8 parts of said rice flour by dry weight.
- 10 5. The snack chip of claim 2 wherein said rice flour includes pregelatinized long-grain rice flour.
6. The snack chip of claim 5 further including medium-grain coarse white rice flour wherein, for every 3 parts of pregelatinized long-grain rice flour, there is approximately 1 part medium-grain coarse white rice flour by dry weight.
7. The snack chip of claim 2 further including tortilla chip flour.
- 15 8. The snack chip of claim 7 wherein the amount of said tortilla chip flour is approximately one-fourth the amount of said rice flour by dry weight.
9. The snack chip of claim 8 wherein said rice flour includes pregelatinized long-grain rice flour and medium-grain coarse white rice flour.
10. The snack chip of claim 9 wherein, for every 3 parts of pregelatinized long-grain rice flour, there is approximately 1 part medium-grain coarse white rice flour by dry weight.
- 20 11. The snack chip of claim 1 wherein the bumped rice kernels are made from brown rice.
12. The snack chip of claim 1 wherein the bumped rice kernels are made from medium-grain brown rice.
- 25 13. The snack chip of claim 12 wherein the bumped rice kernels have been malt flavored.
14. A parbaked sheeted dough for making snack chips including bumped rice kernels that have been partially hydrated, bumped and partially dehydrated.
- 30 15. A sheeted dough for making snack chips including bumped rice kernels that have been partially hydrated and bumped.
16. The sheeted dough for making snack chips of claim 15 wherein the bumped rice kernels are made from brown rice.
17. A snack chip made from a mixture of ingredients including in
- 35 combination: bumped rice kernels, pregelatinized long-grain rice flour and medium-grain coarse white rice flour .

18. The snack chip of claim 17 further including corn flour.
19. The snack chip of claim 18 further including Sago 77 - 1869 and Textaid A.
20. The snack chip of claim 18 further including sesame seeds.
- 5 21. The snack chip of claim 17 wherein the bumped rice kernels are made from brown rice.
22. The snack chip of claim 17 wherein the bumped rice kernels are made from brown rice and have been malt flavored.
23. A method of making rice-based snack chips comprising the steps of:
- 10 forming a dough by combining dry ingredients including bumped rice kernels, and pregelatinized long-grain rice flour;
- sheeting the dough to between 1/16 and 1/8 inch thick;
- cutting the sheeted dough into chip-size pieces;
- parbaking the chip-size pieces to remove some of the moisture from the
- 15 dough; and
- frying the baked chip-size pieces until crisp.
24. The method of claim 23 where the parbaking reduces the moisture content of the chip-size pieces to 2% or less.
25. The method of claim 23 wherein the dry ingredients further include corn
- 20 flour.
26. The method of claim 23 wherein the step of frying uses saffola oil.
27. The method of claim 23 where the bumped rice kernels are made from brown rice.
28. The method of claim 23 where the bumped rice kernels are made from
- 25 brown rice and have been malt flavored.
29. A method of making rice-based snack chips on machinery having a sheeter with a roller head from a combination of dry ingredients including bumped rice kernels, pregelatinized long-grain rice flour and coarse white medium-grain rice flour comprising the steps of:
- 30 (a) mixing all dry ingredients for about one minute;
- (b) adding water and mix for 30 seconds to 3 minutes until dough forms with consistency suitable for passing through a sheeter;
- (c) passing dough through the roller head to form sheets which are between 1/16 and 1/8 inch thick;
- 35 (d) cutting the sheets into chip-size pieces;
- (e) exposing chip-size pieces to an oven temperature of approximately

690 degrees F for about 36 seconds;

(f) allowing the chip-size pieces to stand at room temperature for about eight minutes;

(g) frying the chip-size pieces in 360-380 degree F safflower oil for

5 approximately 22 seconds until crisp.

30. The method of claim 24 further comprising the step of flavoring the fried chips by applying a topical flavoring.

31. The method of claim 24 wherein the bumped rice kernels are made from brown rice.

10 32. The method of claim 24 wherein the bumped rice kernels are made from brown rice and have been malt flavored.

33. A snack chip including rice nuggets.

34. The snack chip of claim 33 further including pregelatinized long-grain rice flour.

15 35. The snack chip of claim 34 further including coarse white medium-grain rice flour.

36. The snack chip of claim 33 wherein said rice nuggets are made from brown rice.

20 37. The snack chip of claim 33 wherein said rice nuggets are made from brown rice and have been malt flavored.

38. A dry mix for making a snack chip including bumped rice kernels.

39. The dry mix of claim 38 further including pregelatinized long-grain rice flour.

25 40. The dry mix of claim 39 further including coarse white medium-grain rice flour.

41. The dry mix of claim 40 further including corn flour.

42. A dough for making a snack chip including bumped rice kernels.

43. The dough of claim 42 further including pregelatinized long-grain rice flour.

30 44. The dough of claim 43 further including coarse white medium-grain rice flour.

45. The dough of claim 44 further including corn flour.

46. The dough of claim 42 wherein the bumped rice kernels are made from brown rice.

35 47. The dough of claim 42 wherein the bumped rice kernels are made from brown rice and have been malt flavored.

48. A method of making snack chips with rice as the major component comprising the steps of:

(a) mixing as dry ingredients bumped rice kernels, pregelatinized long-grain rice flour and coarse white medium-grain rice flour;

5 (b) add water and mix to form dough;

(c) form dough into sheets from 1/16 to 1/8 inch thick;

(d) cut the sheets into chip-size pieces;

(e) expose chip-size pieces to oven temperature to partially dehydrate;

(f) fry partially dehydrated chip-size pieces in oil until crisp.

10 49. The method of claim 48 wherein, for approximately each four parts of bumped rice kernels and four parts of pregelatinized long-grain rice flour, there is approximately one part coarse white medium-grain rice flour.

50. Rice nuggets.

51. The rice nuggets of claim 50 made from brown rice.

15 52. The rice nuggets of claim 50 made from brown rice and malt flavored.

53. A method of making rice nuggets comprising the steps of:

hydrating bumped rice kernels,  
bumping the hydrated bumped rice kernels;  
dehydrating the bumped rice kernels; and

20 heating the dehydrated bumped rice kernels.

52. The method of claim 40 wherein the step of heating the bumped rice kernels is frying in oil.

53. The method of claim 53 wherein the bumped rice kernels are made from brown rice.

25 54. The method of claim 53 wherein the bumped rice kernels are made from brown rice and have been malt flavored.

55. A rice-based snack chip made from a dough including long-grain rice flour and medium-grain rice flour.

56. The snack chip of claim 55 where the long-grain rice flour is 30 pregelatinized.

57. The snack chip of claim 56 where the amount of long-grain pregelatinized rice flour is approximately three times the amount of medium-grain rice flour.

58. The snack chip of claim 55 where all of the rice ingredients are from 35 brown rice.

59. A rice-based snack chip that has structural integrity made from the

following ingredients where the percentages stated are only approximate:

water 37.5%;  
Organic Brown Rice Parboil 19%;  
Brown Rice Flour 15%;  
5 Brown Rice Kernels 15%;  
Brown Rice Syrup Flour 8%; and  
Instant Tapioca 2.5%.  
Sesame Seeds 2%;  
Nu-Bake 1%.

10 60. A rice-based snack chip that has structural integrity made from the following ingredients where the percentages stated are only approximate:

water (45.5%);  
bumped rice kernels (20%);  
pregelatinized long-grain rice flour (17%);  
15 coarse medium-grain white rice flour (5%);  
tortilla flour (5%);  
Modified Food Starch - Sago 77-1869 (2.5%);  
Modified food starch - Textaid® A (3.0%); and  
sesame seeds (2.0%).

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/09334

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A23L 1/217  
US CL : 426/549

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 426/549, 438, 439, 506, 507, 618, 621, 808

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y ✓	US 4,861,609 A ( WILLARD et al ) 29 August 1989 ( 29.08.1989), columns 3-4.	1-60
Y ✓	US 5,110,613 A ( BROWN et al ) 05 May 1992 ( 05.05.1992), column 8, lines 4-11.	14, 23-26, 29, 48

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

PCT/US03/09334

**Continuation of B. FIELDS SEARCHED Item 3:**

WEST

search terms: rice kernel, rice flake, bumped rice, fried, bake, snack, chip, rice