Gluten free food product

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ABSTRACT

The present invention relates to a gluten-free composition for preparation of gluten-free food product. The composition comprises of brewer's rice and hydroxylpropyl methylcellulose. The present invention also relates to a method for preparing a gluten-free food product comprises of providing a mixture; stirring the mixture to form a dough; resting the dough; extruding the dough to form extrudate; coating the extrudate with alkaline solution; and baking the extrudate to form the gluten-free food product characterized in that, adding brewer's rice flour and hydroxypropyl methylcellulose to the mixture.

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DESCRIPTION

GLUTEN FREE FOOD PRODUCT

The present invention relates to a gluten-free food product and method of producing thereof.

Gluten-free industry is currently one of the important issues in food technology. This is due to the fact that at least 0.5% of the whole world population suffers from a genetic disorder called celiac disease. Therefore, it is necessary to develop more choices of gluten-free food products.

Pretzel is one of the most common snacks especially in the Europe and USA. Original pretzel which contains wheat flour, is a low fat snack with the potential of being functional food product, has been consumed for several centuries. There are two types of pretzel, soft pretzel and hard pretzel. Pretzel formulation also can be as simple as basic bread formulation; but it can be very complicated too. There are three major methods for preparing pretzel such as cutting and sheeting, rotary molding and extruding.

Preparing common foods for people with specific conditions is one of the food technologists' duties. For celiac people, the ingredient used in the formulations must not contain gluten (which is usually found in wheat, rye, barley and their derivatives). Rice is the most common substitute of wheat in gluten-free product. Moreover, to achieve the required gluten network property of gluten-free product, suitable hydrocolloids in the presence of emulsifiers can be used.

The amount of brewer's rice or also known as 'temukut' in Malay language produced in Malaysia is estimated to be around 27,500 metric tons annually. Brewer's rice consists of a mixture of very small broken rice, rice bran, and rice germ. Presently, brewer's rice is sold off exclusively as animal feed orused for making alcoholic beverages. Since, there are not much uses of this product; it is therefore regarded as a very cheap material. However, application of brewer's rice as a substitute of wheat flour in baked product, increase the value of this material. In addition, the phytonutrients found in brewer's rice were proven to be beneficial for health. Recently, Tan et al. (2013) had reported that the phytochemicals (such as total phenolic compounds, vitamin E, oryzanol and phytic acid) in brewer's rice has a potential to inhibit the proliferation of colon cancer (HT-29), ovary cancer (Caov-3), and liver cancer (HepG2) cells without causing any cytotoxicity on normal cells (BalBlc3T3).

There are many publications on gluten-free food products. In a granted US patent, US 7901725 disclosed novel methods of using *Phleum* spp. seeds, especially Timothy grass (*P. pratense L.*) seeds, for making gluten-free food products and the food products produced using such methods. In another granted US patent, US 7264841 disclosed organic, gluten-free savory food products, including gluten-free pre-mixes, gluten-free broths, and gluten-free snack foods, as well as the methods for making them. The present invention

CLAIMS (14)

1. A gluten-free composition for preparation of gluten-free food product comprising of brewer's rice flour and hydroxylpropyl methylcellulose.

2. A gluten-free composition according to Claim 1, wherein the amount of the brewer's rice flour ranges from 90 parts to 110 parts.

3. A gluten-free composition according to Claim 1, wherein the amount of the hydroxyl propyl methylcellulose ranges from 0.86 parts to 0.99 parts.

4. A gluten-free composition according to Claim 1, further comprising corn starch, shortening, ammonium bicarbonate, bicarbonate of soda, salt, yeast, sugar, soy lecithin and water.

5. A gluten-free composition according to Claim 1, wherein the food product is an extruded food product.

6. A gluten-free food product according to Claim 5, wherein the extruded food product is pretzel.

7. A method for preparing a gluten-free food product as in Claim 1 comprising of:providing a mixture; stirring the mixture to form a dough; resting the dough; extruding the dough to form extrudate; coating the extrudate with alkaline solution; and baking the extrudate to form the gluten-free food product; characterized in that, adding brewer's rice flour and hydroxypropyl methylcellulose to the mixture.

8. A method according to Claim 7, wherein the mixture are corn starch, shortening, ammonium bicarbonate, bicarbonate of soda, salt, yeast, sugar, soy lecithin and water.

9. A method according to Claim 7, wherein resting time of the dough ranges from 10 minutes to 15 minutes.

10. A method according to Claim 7, wherein extruding the dough to form extrudate is conducted at temperature ranging from 60°C to 160°C.

11. A method according to Claim 7, wherein feeder speed of extruding the dough to form extrudate is ranging from 20 rpm to 30 rpm.

12. A method according to Claim 7, wherein screw speed of extruding the dough to form extrudate is ranging from 50 rpm to 70 rpm.

provides tasteful alternatives for people sensitive to commercially available foods prepared with gluten-containing wheat flour.

Despite the numerous ingredients used as wheat flour substitute in producing gluten-free food product, there is still a need to provide a gluten-free food product that is having almost similar characteristic to wheat flour containing food products. Particularly, the wheat flour substitute is brewer's rice, a by-product of rice milling industry.

13. A method according to Claim 7, wherein the alkaline solution are sodium hydroxide or baking soda in 80-85 ºC.

14. A method according to Claim 7, wherein the extrudate is partially cooked.

According to a first aspect of the present invention, there is provided a gluten-free composition for preparation of gluten-free food product comprising of brewer's rice flour and hydroxylpropyl methylcellulose. The provision of the brewer's rice flour is advantageous as it results in providing a gluten-free food product.

According to a second aspect of the present invention, there is provided a method for preparing a gluten-free food product comprises of providing a mixture; stirring the mixture to form a dough; resting the dough; extruding the dough to form extrudate; coating the extrudate with alkaline solution; and baking the extrudate to form the gluten-free food product characterized in that, adding brewers rice flour and hydroxypropyl methylcellulose to the mixture.

As used herein, according to the Codex Alimentarius Standard, the term 'gluten-free food product' refers to the products that contained not more than 20 ppm gluten.

As used herein, the term 'extrusion' refers to a continuous process in which a preformed food product is cooked, shaped, and puffed by a combination of mechanical and thermal energy inputs.

The present invention relates to a gluten-free composition for preparation of gluten-free food product. In one embodiment, there is provided a gluten-free composition for preparation of gluten-free food product comprises of brewer's rice flour and hydroxylpropyl methylcellulose.

The brewer's rice flour does not contain gluten protein and therefore functions as wheat flour substitute in preparing the gluten-free food product. Amount of the brewer's rice flour is ranging from 90 parts to 110 parts. Brewer's rice is a by-product of rice milling industry and could be found in abundant at cheap price. Therefore, the cost for preparing the gluten-free food product could be minimized.

The hydroxylpropyl methylcellulose (HPMC) is a water soluble modified fiber. HPMC functions as thickener, emulsifier and stabilizer. HPMC also allows dough of the food product to retain its uniformity as well as to protect and maintain emulsion stability. Amount of the HPMC is ranging from 0.86 parts to 0.99 parts.

The gluten-free composition further comprises of other ingredients such as corn starch, shortening, ammonium bicarbonate, bicarbonate of soda, salt, yeast, sugar, emulsifier and water. Preferably, the shortening is palm shortening while the emulsifier is soy lecithin. However, this is not a comprehensive list of all ingredients that could be used to make the gluten-free food product.

Surprisingly, the gluten-free food product prepared from the gluten-free composition having organoleptic, texture, physical and physicochemical similar to gluten containing food product.

The gluten-free composition is used to prepare gluten-free food product. Preferably, the gluten-free food product is an extruded food product such as pretzel, including hard pretzel and soft pretzel. The extruded food product is prepared by extrusion process. Other example of the extruded food product are, but not limited to spaghetti, cracker and puffed snack.

Advantageously, the gluten-free food product is edible and digestible for celiac people as well as normal diet people.

Advantageously, the gluten-free composition could be used to prepare healthy functional gluten-free food product that is high fiber, high mineral or high protein by adding various types of functional ingredients. Furthermore, antioxidant agent, anticancer agent or antimicrobial agent could also be coated on the gluten-free food product.

In another embodiment, there is provided a gluten-free food product comprises of brewer's rice flour and hydroxylpropyl methylcellulose.

In further embodiment, there is provided a gluten-free pretzel comprises of brewer's rice flour and hydroxylpropyl methylcellulose.

The present invention also relates to a method for preparing a gluten-free food product. The method comprises of providing a mixture; stirring the mixture to form a dough; resting the dough; extruding the dough to form extrudate; coating the extrudate with alkaline solution; and baking the extrudate to form the gluten-free food product characterized in that, adding brewer's rice flour and hydroxypropyl methylcellulose to the mixture.

The mixture comprises of corn starch, shortening, ammonium bicarbonate, bicarbonate of soda, salt, yeast, sugar, emulsifier and water. Preferably, the shortening is palm shortening while the emulsifier is soy lecithin. However, this is not a comprehensive list of all ingredients that could be used to make the gluten-free food product.

Resting time of the dough is ranging from 10 minutes to 15 minutes.

In one example, there is provided a method for preparing a gluten-free pretzel comprises of providing a mixture; stirring the mixture to form a dough; resting the dough; extruding the dough to form extrudate; coating the extrudate with alkaline solution; and baking the extrudate to form the gluten-free food product characterized in that, adding brewer's rice flour and hydroxypropyl methylcellulose to the mixture.

The mixture comprises of corn starch, shortening, ammonium bicarbonate, bicarbonate of soda, salt, yeast, sugar, emulsifier and water. Preferably, the shortening is palm shortening while the emulsifier is soy lecithin. Preferably, amount of yeast is ranging from 1.50 part to 1.70 part, amount of bicarbonate of soda is ranging from 0.42 part to 0.55 part, amount of ammonium bicarbonate is ranging from 0.03 part to 0.05 part, amount of brewer's rice flour is ranging from 90 part to 110 part and amount of hydroxypropyl methylcellulose is ranging from 0.86 part to 0.99 part. However, this is not a comprehensive list of all ingredients that could be used to make the gluten-free food product.

In general, the gluten-free food product is prepared by extrusion process. The dough is extruded by using single screw extruder. The dough is extruded to form partially cooked extrudate. Extruding the dough to form the partially cooked extrudate is conducted at temperature ranging from 60 ^{o}C to 160 ^{o}C. Feeder speed of extruding the dough to form the partially cooked extrudate is ranging from 20 rpm to 30 rpm. Screw speed of extruding the dough to form the partially cooked extrudate is ranging from 50 rpm to 70 rpm.

The partially cooked extrudate could be coated by spraying with alkaline solution or dipping into alkaline solution. Preferably the alkaline solution is sodium hydroxide or baking soda.

Various flavoring agent could be added as coating. Solid flavoring agents such as sugar, salt, cinnamon, powdered herbs are added to the extrudates before baking, where the extrudates are in wet condition. Whereas, liquid flavoring agents such as caramel, chocolate and cream are added after the extrudates are baked. Solid additives like nuts, candies, herbs and spices could be sprinkled on top of the liquid flavoring agents as well.

The present invention will be explained in more detail through the examples below. The examples are presented only to illustrate the preferred embodiments of the present invention and not intended in any way to limit the scope of the present invention.

The Composition

Ingredients	**Amount Part**
Brewer's rice flour	90.00-110.00
Corn starch	4.50-5.55
Palm shortening	4.80-5.00
Ammonium bicarbonate	0.03-0.05
Bicarbonate of soda	0.42-0.55
NaCl	0.70-1.05
Yeast	1.50-1.70
Sugar	3.00-3.40
Soy lecithin	0.07-0.10
HPMC	0.86-0.99

Preparation of Gluten-Free Food Product

HPMC gum was dissolved in 20g of water at 50°C and was allowed to rest for 24hr at 4°C to be hydrated. Soy lecithin was dissolved in 1-2g of water and was mixed until homogenized. Yeast and sugar were mixed with 50g of water and the mixture was allowed to rest at room temperature for about 10-15 min. All dried ingredients and shortening were mixed in a pastry mixer for 3-6 min. Soy lecithin was added to the mixer and was mixed for 1-2 min. Hydrocolloid was added to the mixer and was mixed for 2-3 min. The rest of water and yeast mixture were added; mixing was continued for about 5-7 min until a uniform mixture was formed. The dough was covered and was allowed to rest for 10-15 min. The dough was placed into the hopper of a single screw extruder with the following processing parameters: Temperature zones: 60-70°C, 80-100° C, 110-130°C, 140-160°C; Screw type: 1:3; Screw speed: 50-70rpm; Feeder speed: 20-30rpm. The extrudates were collected and arranged in a tray (preferably in a non-metal tray) or a non-metal conveyer belt. The extrudates were sprayed with 80-85°C 1% NaOH solution. The extrudates were placed in the oven at 150°C for 1min and then at 125°C for about 15min or until the total moisture content reaches less than 3.5% wet basis.

Determination of Properties

1. Determination of cutting strength and fracturability

Cutting strength and fracturability of pretzel was measured using the guillotine blade of texture analyzer (TA.HD. Plus Texture Analyser, UK). The individual samples of pretzel were placed on the platform and the blade was attached to the crosshead of the instrument. The TA setting was kept at: pre-test speed of 5 mm/s, test speed of 3 mm/s; post-test speed of 10 mm/s. The absolute peak force of the resulting curve was considered as cutting strength of the pretzel. The first peak of compression was considered as fracturability (Singh et al., 1993; Tyagi et al., 2007). The measurements were replicated for at least 20 times.

2. Determination of breaking strength

Breaking strength of pretzel was measured using the 3-point blade of texture analyzer (TA.HD. Plus Texture Analyser, UK). A stick of pretzel was placed on the platform and the blade was attached to the crosshead of the instrument. The TA setting was kept at: pre-test speed of 5mm/s, test speed of 3mm/s; post-test speed of 10mm/s. The absolute peak force of

the resulting curve was considered as breaking strength of the pretzel (Gormley, 1987; Tyagi et al., 2007). Measurements were repeated for 20 times.

3. Determination of crunchiness

Crunchiness of pretzel was measured using the 5-blade Kramer of texture analyzer (TA.HD. Plus Texture Analyser, UK). Fifty grams of broken pretzel were placed in the probe container and the blades were attached to the crosshead of the instrument. The equipment was set as follows: pre-test speed of 5mm/s, test speed of 3mm/s; post-test speed of 10mm/s. The number of peak on the curve is considered as crunchiness of the pretzel (Johanningsmeier et al., 2007).

4. Determination of lateral expansion (LE) and expansion ratio (ER)

These are obtained by measuring the diameter of the pretzels using the Vernier caliper with a resolution of 0.01mm in triplicate using the following formulas (Ibanoglu et al., 2006; Stojceska et al., 2008; Stojceska et al., 2010):

Figure PCTXMLIB-appb-M000001

Figure PCTXMLIB-appb-M000002

5. Determination of bulk density (BD)

Bulk density of particulate solids was measured by placing the sample into a cylindrical container with known dimensions (Carr et al., 2006; Gambaro et al., 2004;McCarthy et al., 2005). The following equation is used to calculate the bulk density of pretzel.

Figure PCTXMLIB-appb-M000003

6. Determination of particle density (PD)

The particle density was calculated using the following formula (Carr et al., 2006; Fik & Surówka, 2002; Haros et al., 2002; Stojceska et al., 2008;Stojceska et al., 2010). The measurement was done in triplicate.

Figure PCTXMLIB-appb-M000004

7. Determination of material (substance) density (MD)

The material (substance) density of pretzel was measured by liquid displacement method and applying the following formula (Carr et al., 2006). All measurements were done in triplicate.

Figure PCTXMLIB-appb-M000005

8. Determination of open porosity, close porosity, and total porosity of rice hard pretzel

Porosity is an important physical property that characterizes the texture and the quality of dry and intermediate moisture foods. Different porosities were calculated by using different densities and the following formulas (Carr et al., 2006):

Figure PCTXMLIB-appb-M000006

Figure PCTXMLIB-appb-M000007

Figure PCTXMLIB-appb-M000008

9.Determination of specific length

The specific length of the extrudate is defined as the length (cm) of the extrudate per unit mass (g) (Singkhornart et al., 2014; Stojceska et al., 2010) as follows:

Figure PCTXMLIB-appb-M000009

10. Determination of water absorption index (WAI), water solubility index (WSI) and water holding capacity (WHC)

Pretzel pieces (2.500g) were ground and placed in a pre-weighted centrifuge tube with 30ml distilled water. The mixture was shaken and allowed to stand for 30min before it was centrifuged (Sigma 3-18, Sartorius, Germany) at 1000×g for 15min. After centrifugation, the weight of wet and dried sediment and supernatant was taken and the parameters were calculated using the following formulas (Haros et al., 2002; Stojceska et al., 2008):


Figure PCTXMLIB-appb-M000010


Figure PCTXMLIB-appb-M000011


Figure PCTXMLIB-appb-M000012

11. Determination of oil absorption index and oil holding capacity

Ten milliliters of refined corn oil was added to 1.0000g of powdered sample in a preweighted graduated 15ml glass centrifuge tube. The tube was agitated on a Vortex mixer (VX100, Labnet International Inc., USA) for 2min, allowed to stand for 30min and centrifuged (Sigma 3-18, Sartorius, Germany) for 20min at 700g. The volume of free oil and the weight of sediment were measured by applying the following formulas (Kebede et al., 2010; Stojceska et al., 2008).


Figure PCTXMLIB-appb-M000013


Figure PCTXMLIB-appb-M000014

Properties	Wheat Pretzel	Gluten-Free Pretzel
Cutting strength (N)	10.32-15.44	11.62-13.62
Fracturability (mm)	2.13-3.88	3.40-3.59
Breaking strength (N)	0.36-0.58	0.36-0.56
Crunchiness	6-18	13-18
Lateral expansion (%)	27.01-63.96	43.87-53.21
Expansion ratio	1.37-1.84	1.52-1.58
Specific length	7.56-9.64	7.73-8.31
Bulk density (g/ml)	0.39-0.48	0.44-0.46
Particle density (g/ml)	0.66-1.12	1.02-1.07
Material density (g/ml)	1.36-1.45	1.42-1.44
Open porosity (%)	33.05-59.29	56.90-58.03
Close porosity (%)	24.95-56.45	25.35-29.44
Total porosity (%)	66.42-80.33	67.69-69.63
WAI (g/g)	5.84-6.8	6.36-6.61
WHC (g/g)	4.05-5.12	4.61-4.87
WSI (%)	6.68-7.87	7.55-7.86
OAI (ml/g)	4.17-5.85	4.79-4.94
OHC (%)	0.82-1.21	0.82-0.87

Table 2 illustrates the properties of wheat pretzel and gluten-free pretzel prepared from the gluten-free composition. As seen in Table 2, properties of the gluten-free pretzel are comparable with the commercial wheat pretzel. Therefore, the gluten-free composition comprises of brewer's rice flour and hydroxylpropyl methylcellulose could be used as substitute to wheat flour in producing gluten-free food product.

The invention being thus described, it will be apparent that the same may be varied in many ways. Such variations are to be regarded as within the scope of the invention, and all such modifications as would be apparent to one skilled in the art are intended to be within the scope of the following claim.

PATENT CITATIONS

Cited Patent	Filing date	Publication date	Applicant	Title
WO2000004784A1 *	Jul 22, 1999	Feb 3, 2000	The Procter & Gamble Company	A dough composition for producing low-fat and fat-free snacks
WO2013043659A1 *	Sep 19, 2012	Mar 28, 2013	Lucca Foods, Llc	Gluten-free dry mix composition
US3876815 *	Sep 16, 1974	Apr 8, 1975	Kurzius Karl A	Process for making pretzels
US20050031756 *	May 21, 2004	Feb 10, 2005	Maningat Clodualdo C.	High-protein, reduced-carbohydrate bread and other food products

Cited Patent	Filing date	Publication date	Applicant	Title
US20100021610 *		Jan 28, 2010	Shin-Etsu Chemical Co., Ltd.	Gluten-free dough composition
US20120076909 *	Apr 29, 2011	Mar 29, 2012	Mary Waldner	Gluten-free vegan emulsification and texturization process
US20130323355 *	Feb 8, 2012	Dec 5, 2013	Dow Global Technologies Llc	Composition comprising gluten-free cereal flour

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NON-PATENT CITATIONS

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* Cited by examiner

CLASSIFICATIONS

International Classification	A21D13/00, A21D13/04
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LEGAL EVENTS

Date	Code	Event	Description
Apr 13, 2016	121	Ep: the epo has been informed by wipo that ep was designated in this application	**Ref document number:** 15833788 **Country of ref document:** EP **Kind code of ref document:** A1