Preparation and Processing Method for a Type of Gastroesophageal Reflux Preventive Healthy Beverage

Field of Invention

Functional beverage, specifically a healthy beverage for preventing acid reflux and its processing and preparation method.

Background

Gastroesophageal reflux disease (GERD) is a disease in which gastroduodenal contents flow back into the esophagus causing heartburn, chest pain, acid reflux and other symptoms. It can lead to complications such as esophagitis and extraesophageal tissue damage. GERD is a common disease worldwide, its prevalence in Western countries is 10%-20%. Singapore has the highest prevalence of GERB in Asia with 10.5%, Japan has 6.6% and Korea has 3.5%. Meta-analysis indicates that the prevalence of GERB in China is at about 6.5% and has an increasing trend. The risk factors for the development of GERb includes: age, gender, smoking, increase in body mass index (BMI), excessive alcohol consumption, drug use, etc. Overweight is an important risk factor for GERB and weight loss can reduce reflux symptoms in GERB patients.

Sodium alginate is an edible and non-digestible macromolecular polysaccharide extracted from brown algae seaweed, which is widely used in dairy products and beverages. Sodium alginate has water and material absorption, exchange of cations and gel filtration functions in the stomach and intestines, which has a unique regulating effect on human metabolism. Sodium alginate combined with calcium ions to form calcium alginate gel, which can protect the gastric mucosa and form a gastroesophageal "valve" to prevent gastroesophageal reflux; in addition, sodium alginate also has the ability to lower blood pressure, lower blood lipids, lower cholesterol in the body and prevent fatty liver; increase satiety, promote healthy weight loss; accelerate gastrointestinal motility and prevent constipation.

Aloe vera contains polysaccharides, anthraquinones, amino acids, enzymes, peptides, vitamins and minerals, which have a variety of health functions. Aloe polysaccharide has a good repair effect on the damage of gastric mucosa caused by alcohol. Additionally, calcium malate in aloe vera is very effective in suppressing gastric acid reflux.

Papain is an enzyme found in papaya that helps break down proteins and carbohydrates. Pineapple protease is a protein hydrolase found in pineapple, and like papain, it also promotes protein digestion. Pineapple protease also has anti-inflammatory activity that aids in digestion and has an effect of aiding in the treatment of gastroenteritis and indigestion.

Brief Description of Drawings

Embodiments of the present invention are hereafter described, by way of non-limiting example only, with reference to the accompanying drawings in which:

Figure 1a) and b). Illustration of the principle of the product to prevent gastroesophageal reflux.

Figure 2. Process flow diagram

Detailed Description

A. Purpose

The product of this invention is a kind of healthy beverage that exhibits an effect of preventing gastroesophageal reflux by using the principle of forming suspension gel comprises of sodium alginate, calcium carbonate and baking soda under the condition of stomach acidity combined with raw materials such as aloe vera juice, papaya juice and milk, etc. The product is pleasant in flavor, healthy and nutritious and easy to drink.

B. Technology

The purpose of the present invention is to provide a formula of healthy beverage for preventing gastroesophageal reflux and a preparation method. The beverage consists of white sugar, sodium alginate, calcium carbonate, baking soda, sucralose, raw cow's milk, coconut milk, matcha powder, fruit juice, carrageenan, microcrystalline cellulose, monoglycerides, and food flavouring. A scientific processing method is used to produce this healthy beverage with pleasant flavour, good nutrition, easy to drink and with gastroesophageal reflux preventive effect.

Ingredients	**Percentage/ %**
White sugar	2.0-4.0
Sodium alginate	2.0-4.0
Calcium carbonate	1.0-2.0
Baking soda	1.0-2.0
Sucralose	0.05-0.07
Raw cow's milk	35.0-50.0
Coconut milk	10.0-20.0
Concentrated aloe vera juice	0.5-1.5
Concentrated papaya juice	3.0-5.0
Carrageenan	0.02-0.04
Microcrystalline cellulose	0.15-0.25
Food flavoring	0.005-0.010
Monoglycerides	0.07-0.10
Water	11.030-45.205

Disclosed herein is a gastroesophageal reflux prevention healthy drink characterized by the composition of the raw material formula by weight and percentage as follows:

Ingredients	**Percentage/ %**
White sugar	2.0-4.0
Sodium alginate	2.0-4.0
Calcium carbonate	1.0-2.0
Baking soda	1.0-2.0

Sucralose	0.05-0.07
Raw cow's milk	35.0-50.0
Coconut milk	10.0-20.0
Concentrated aloe vera juice	0.5-1.5
Concentrated papaya juice	3.0-5.0
Carrageenan	0.02-0.04
Microcrystalline cellulose	0.15-0.25
Food flavoring	0.005-0.010
Monoglycerides	0.07-0.10
Water	11.030-45.205

In one embodiment, the gastroesophageal reflux prevention healthy drink is characterized by a neutral pH of 6.0-7.0

In one embodiment, the gastroesophageal reflux prevention healthy drink is preventative against gastroesophageal reflux. Due to the acidic environment in gastric, upon consumption of the neutral pH beverage, calcium carbonate broke down and released calcium ions. Sodium alginate reacted with calcium ions and formed calcium alginate gel which is not digested and absorbed by the human body. The baking soda that is enclosed by calcium alginate gel released carbon dioxide due to the acidic environment, causing calcium alginate gel to float to the upper part of the stomach content, forming a "valve" in the gastroesophageal area to prevent stomach content from refluxing into the esophageal tube.

This invention also includes the processing and preparation method as following:

1. Weigh each ingredients according to the formulation.
2. Dissolve hydrocolloids: Dry mix the weighed ingredients (white sugar, sodium alginate, carrageenan, microcrystalline cellulose and monoglyceride) and add into 60℃ hot water while stirring at a ratio of (w/v) 1:30-40. Mix for 20 minutes or until hydrocolloids is fully hydrated and ready for use.
3. Mix calcium carbonate, baking soda, sucralose, raw cow's milk, coconut milk, matcha powder, papaya juice into the hydrocolloids solution prepared in step 2.

Mix for 15 minutes or until all ingredients are fully dissolved, add water to fix volume to 100% and add in food flavourings.

4. Homogenization: Place the solution prepared in step 3 into water bath of 60℃-70℃. In second homogenization process, condition is 40bar/200bar and temperature is 60℃-70℃.
5. Filling: Pour homogenized liquid into 50mL glass bottle and seal.
6. Sterilization: Sealed glass bottles are sterilized using water bath, with condition of 85℃-95℃ for 30 minutes.
7. Cool: Cool sterilized products to 15℃-20℃.

C. Invention Results

1. This invention makes use of the interactions of sodium alginate, calcium carbonate and baking soda in gastric acidity condition, which forms a suspension gel and exhibits an effect of preventing gastroesophageal reflux. This healthy beverage has pleasant flavour, good nutrition and easy to drink. There are no literature reports nor such products found in China.

2. This invention makes use of white sugar, sodium alginate, calcium carbonate, baking soda, sucralose, raw cow's milk, coconut milk, matcha powder, fruit juices, carrageenan, microcrystalline cellulose, monoglycerides and food flavors. It involves key process of gel hydration, blending, fixing, homogenization, filling, sterilization, and other processing to prepare the product.

3. This invention has the advantage of pleasant flavor, good nutrition, and prevents heartburn, acid reflux and other uncomfortable symptoms caused by gastroesophageal reflux.

4. Product is rich in dietary fiber and has reduced white sugar content to be in line with current demand of low sugar and high dietary fiber healthy lifestyle.

D. Process flow and illustration

The process flow and illustration are shown in Figures 1 and 2.

E. Implementation

Formulation 1

Dairy based:

Ingredients	**Percentage/ %**
White sugar	3.0
Sodium alginate	3.0
Calcium carbonate	1.5
Baking soda	1.0
Sucralose	0.05
Raw cow's milk	40.0
Concentrated aloe vera juice	3.0
Concentrated papaya juice	3.0
Carrageenan	0.02
Microcrystalline cellulose	0.20
Papaya flavoring	0.06
Monoglycerides	0.07
Water	45.1

Process:

1. Weigh each ingredients according to the formulation.
2. Dissolve hydrocolloids: Dry mix the weighed ingredients (white sugar, sodium alginate, carrageenan, microcrystalline cellulose and monoglyceride) and add into 60℃ hot water while stirring at a ratio of (w/v) 1:30. Mix for 20 minutes or until hydrocolloids is fully hydrated and ready for use.
3. Mix calcium carbonate, baking soda, sucralose, raw cow's milk, aloe vera juice, papaya juice into the hydrocolloids solution prepared in step 2. Mix for 15 minutes or until all ingredients are fully dissolved, add water to fix volume to 100% and add papaya flavourings.

4. Homogenization: Place the solution prepared in step 3 into water bath of 70℃. In second homogenization process, condition is 40bar/200bar and temperature is 65℃.
5. Filling: Pour homogenized liquid into 50mL glass bottle and seal.
6. Sterilization: Sealed glass bottles are sterilized using water bath, with condition of 85℃ for 30 minutes.
7. Cool: Cool sterilized products to 20℃.

Formulation 2

Plant-based protein based:

Ingredients	**Percentage/ %**
White sugar	3.0
Sodium alginate	3.0
Calcium carbonate	1.5
Baking soda	1.0
Sucralose	0.05
Coconut milk	10.0
Concentrated aloe vera juice	3.0
Concentrated papaya juice	3.0
Carrageenan	0.03
Microcrystalline cellulose	0.25
Coconut flavoring	0.01
Papaya flavoring	0.01
Monoglycerides	0.10
Water	75.05

Process:

1. Weigh each ingredients according to the formulation.
2. Dissolve hydrocolloids: Dry mix the weighed ingredients (white sugar, sodium alginate, carrageenan, microcrystalline cellulose and monoglyceride) and add into 60℃ hot water while stirring at a ratio of (w/v) 1:30. Mix for 20 minutes or until hydrocolloids is fully hydrated and ready for use.

3. Mix calcium carbonate, baking soda, sucralose, coconut milk, aloe vera juice, papaya juice into the hydrocolloids solution prepared in step 2. Mix for 15 minutes or until all ingredients are fully dissolved, add water to fix volume to 100% and add in papaya and coconut flavourings.
4. Homogenization: Place the solution prepared in step 3 into water bath of 70℃. In second homogenization process, condition is 40bar/200bar and temperature is 65℃.
5. Filling: Pour homogenized liquid into 50mL glass bottle and seal.
6. Sterilization: Sealed glass bottles are sterilized using water bath, with condition of 85℃ for 30 minutes.
7. Cool: Cool sterilized products to 20℃.

Formulation 3

Plant-based:

Ingredients	**Percentage/ %**
White sugar	3.0
Sodium alginate	3.0
Calcium carbonate	1.5
Baking soda	1.0
Sucralose	0.05
Concentrated aloe vera juice	3.0
Concentrated papaya juice	3.0
Carrageenan	0.02
Microcrystalline cellulose	0.20
Coconut flavoring	0.06
Papaya flavoring	0.06
Water	85.11

Process:

1. Weigh each ingredients according to the formulation.
2. Dissolve hydrocolloids: Dry mix the weighed ingredients (white sugar, sodium alginate, carrageenan and microcrystalline cellulose) and add into 60℃ hot

water while stirring at a ratio of (w/v) 1:30. Mix for 20 minutes or until hydrocolloids is fully hydrated and ready for use.

3. Mix calcium carbonate, baking soda, sucralose, aloe vera juice, papaya juice into the hydrocolloids solution prepared in step 2. Mix for 15 minutes or until all ingredients are fully dissolved, add water to fix volume to 100% and add in papaya and coconut flavourings.
4. Homogenization: Place the solution prepared in step 3 into water bath of 70℃. In second homogenization process, condition is 40bar/200bar and temperature is 65℃.
5. Filling: Pour homogenized liquid into 50mL glass bottle and seal.
6. Sterilization: Sealed glass bottles are sterilized using water bath, with condition of 85℃ for 30 minutes.
7. Cool: Cool sterilized products to 20℃.

The specific embodiments described above only express several embodiments of the present invention, and their descriptions are more specific and detailed, but they should not be understood as a limitation of the patent scope of the present invention for this reason. It should be noted that for a technologist in this field, a number of deformations and improvements can be made without departing from the conception of the present invention, which all belong to the scope of protection of the present invention. Therefore, the scope of protection of the patent of the present invention shall be subject to the claims attached.

Validation of present invention of the efficacy of healthy beverage to prevent gastroesophageal reflux.

1. Research method

1.1. Volunteer recruitment

The inventor recruited a total of 50 volunteers with self-reported gastroesophageal reflux disease between December 2021 and February 2022 in Minhang District, Shanghai, China, aged 25-45 years, of any gender, with a disease duration of 1-3 years.

1.2. Volunteer's condition diagnosis and documentation

1. Patients have typical clinical symptoms, including regurgitation, acid reflux, belching, and heartburn.

2. The Western medical diagnosis and condition classification of GERB are mainly based on 《Chinese expert consensus on endoscopic treatment of gastroesophageal reflux disease in 2020》

3. Chinese medical diagnosis is based on 《Consensus on Integrated Traditional Chinese and Western Medicine endoscopic treatment of gastroesophageal reflux disease》

4. Relevant tests to monitor pH of esophageal, esophageal bile acid, etc.

5. Informed consent was obtained from all volunteers in this study.

1.3. Exclusion criteria

1. Patient with combined severe heart, liver and kidney disease
2. Patients with combined stomach and esophageal tumors and symptoms of drug-induced esophagitis.
3. Patients who need to restrict calcium and sodium intake in their diet, as there are high sodium and calcium ion content in this product.
4. Patients with hypercalcemia, renal calcinosis, and recurrent calcium-containing renal calculi.
5. Patients with severe allergic reactions to the drugs treated in this study.

2. Test method

2.1. Participants

Participants are randomly allocated into 2 groups: 20 participants in the treatment group and 20 participants in the blank group. The age, disease, and other information of participants in both groups are not significant different, hence comparable.

2.2. Consumption

2.2.1. Participants in the treatment group consume product of this invention. 50ml of product is consumed in the morning, afternoon, and night after meal for 7 days.

2.2.2. Participants in the blank group consume placebo drink. 50ml of product is consumed in the morning, afternoon, and night after meal for 7 days.

2.3. Efficacy standard

Recovered: All clinical symptoms not detected.

Improved: Clinical symptoms are reduced, and the disease is under control.

Not effective: No significant improvement or worsening of clinical symptoms.

2.4. Study results

Group	Recovered	Improved	Not effective	Total efficacy (%)
Treatment	3	14	2	90
Blank	2	1	17	15

Total efficacy = Recovered + Improved

3. Study conclusion

The healthy beverage made by present invention can safely and effectively improve the discomfort symptoms such as acid reflux and heartburn caused by gastroesophageal reflux and has no toxic side effects.

CLAIMS

1. A gastroesophageal reflux prevention healthy drink characterized by the composition of the raw material formula by weight and percentage as follows:

Ingredients	**Percentage/ %**
White sugar	2.0-4.0
Sodium alginate	2.0-4.0
Calcium carbonate	1.0-2.0
Baking soda	1.0-2.0
Sucralose	0.05-0.07
Raw cow's milk	35.0-50.0
Coconut milk	10.0-20.0
Concentrated aloe vera juice	0.5-1.5
Concentrated papaya juice	3.0-5.0
Carrageenan	0.02-0.04
Microcrystalline cellulose	0.15-0.25
Food flavoring	0.005-0.010
Monoglycerides	0.07-0.10
Water	11.030-45.205

2. The gastroesophageal reflux prevention healthy drink according to Claim 1, wherein the gastroesophageal reflux prevention healthy drink is characterized by a neutral pH of 6.0-7.0

3. The gastroesophageal reflux prevention healthy drink according to Claim 1, wherein the gastroesophageal reflux prevention healthy drink is preventative against gastroesophageal reflux.

4. The gastroesophageal reflux prevention healthy drink according to Claim 1, wherein the processing and preparation of the gastroesophageal reflux prevention healthy drink comprises the following steps:

    1. weigh each ingredients according to the formulation;
    2. dissolve hydrocolloids: Dry mix the weighed ingredients (white sugar, sodium alginate, carrageenan, microcrystalline cellulose and monoglyceride) and add into 60℃ hot water while stirring at a ratio of (w/v) 1:30-40. Mix for 20 minutes or until hydrocolloids is fully hydrated and ready for use;
    3. mix calcium carbonate, baking soda, sucralose, raw cow's milk, coconut milk, matcha powder, papaya juice into the hydrocolloids solution prepared in step 2. Mix for 15 minutes or until all ingredients are fully dissolved, add water to fix volume to 100% and add in food flavourings;
    4. homogenization: Place the solution prepared in step 3 into water bath of 60℃-70℃. In second homogenization process, condition is 40bar/200bar and temperature is 60℃-70℃;
    5. filling: Pour homogenized liquid into 50mL glass bottle and seal;
    6. sterilization: Sealed glass bottles are sterilized using water bath, with condition of 85℃-95℃ for 30 minutes; and
    7. cool: Cool sterilized products to 15℃-20℃.