

# **GRANULAR COMPOSITION COMPRISING DIETARY FIBERS DERIVED FROM GREEN TEA AND METHOD FOR PREPARING THE SAME**

## **CROSS-REFERENCE TO RELATED APPLICATION**

5   **[0001]**     This application claims priority to and the benefit of Korean Patent Application No. 2018-0132205, filed October 31, 2018, the disclosure of which is incorporated herein by reference in its entirety.

## **BACKGROUND**

### **10   1. Field of the Invention**

**[0002]**     The present invention relates to a granular composition comprising dietary fibers derived from green tea and a method for preparing the same.

### **2. Discussion of Related Art**

15   **[0003]**     Dietary fibers are components rich in foods, for example, vegetables, fruits, algae, and the like, and are high-molecular carbohydrates that are excreted from the human body without being digested by human digestive enzymes. Owing to such characteristics of the dietary fibers, the dietary fibers are recently known to have excellent functions as prebiotics that affect the enterobacteria to inhibit the  
20   growth of pathogens and promote the growth of beneficial bacteria. In addition, when one eats a sufficient amount of the dietary fibers, the dietary fibers give a feeling of fullness while inhibiting digestion and absorption of other nutrients. Therefore, the dietary fibers are known to have a number of very beneficial functions to the human body by controlling overeating, promoting defecation, and excreting  
25   toxic substances such as cholesterol and heavy metals, and the like.

**[0004]** However, when the dietary fibers are ingested in the form of powder, they have poor preference and convenience in eating, for examples, staleness, food jamming between teeth, dust scattering, and the like due to the characteristics of tough and coarse particles. Also, the powders which are not in the form of particles  
5 have a drawback in that it is difficult to package and fill products due to poor flowability.

**[0005]** Accordingly, there is a need for development of a granular food composition, which has excellent preference as well as the convenience in eating and holding, using a raw material that may be prepared into shapes easy to eat high-  
10 content dietary fibers.

**[0006]** [Prior-art Documents]

**[0007]** [Patent Document]

**[0008]** Patent Document 1: Korean Patent Publication No. 2006-0133050

**[0009]** Patent Document 2; Korean Patent Publication No. 2018-0016818  
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## SUMMARY OF THE INVENTION

**[0010]** To solve the above problems, the present inventors have prepared a granular composition using processed green tea having an insoluble dietary fiber content of 70% by weight or more; and a sugar alcohol, and found that the granular  
20 composition has little scattered dust due to good flowability, is not stuck to teeth during the food intake, has an improved throat choking phenomenon, and is also favorable for manufacturing articles due to the good filling properties.

**[0011]** Therefore, an object of the present invention is to provide a granular composition comprising insoluble dietary fibers derived from green tea, which has  
25 good flowability, and a method for preparing the same.

**[0012]** To achieve the objects, according to one aspect of the present invention, there is provided a granular composition including processed green tea having an insoluble dietary fiber content of 70% by weight or more; and a sugar alcohol.

**[0013]** The content of insoluble dietary fibers included in the processed green tea may be greater than or equal to 90% by weight.

**[0014]** The granular composition may include 50 to 85% by weight of the processed green tea and 15 to 85% by weight of the sugar alcohol.

**[0015]** The sugar alcohol may include one or more selected from the group consisting of xylitol, erythritol, isomalt, maltitol, sorbitol, mannitol, lactitol, and mannitol.

**[0016]** The granular composition may have a particle size of 0.5 to 2  $\Phi$ .

**[0017]** Another object of the present invention is to provide a method for preparing a granular composition, which includes: (a) sequentially extracting green tea with spirits and purified water to prepare processed green tea having a dietary fiber content of 70% by weight or more; and (b) mixing the processed green tea and a sugar alcohol and then extrusion-molding the resulting mixture.

**[0018]** In the method for preparing a granular composition, the step (a) may include the following steps (a1) to (a5):

**[0019]** (a1) primarily extracting the green tea with spirits and secondarily extracting the green tea with purified water;

**[0020]** (a2) extracting a green tea residue remaining after the primary and secondary extractions in the step (a1) with an alkali;

**[0021]** (a3) subjecting the alkali extract obtained in the step (a2) to solid-liquid separation to remove an alkali extract solution and adding an acid to the remaining solid alkali extract to neutralize the solid alkali extract; and

**[0022]** (a4) subjecting the acid extract neutralized in the step (a3) to solid-liquid separation to remove an acid extract solution and washing the remaining solid acid extract; and

**[0023]** (a5) drying and pulverizing the solid extract obtained after the step (a4)  
5 to prepare processed green tea.

**[0024]** In the method for preparing a granular composition, the step (b) may include the following steps (b1) to (b3):

**[0025]** (b1) pulverizing the processed green tea and the sugar alcohol to form a powder raw material having a size of 80 meshes or less;

10 **[0026]** (b2) adding a binding solution to the powder raw material so that the binding solution is mixed with the powder raw material; and

**[0027]** (b3) subjecting the mixture obtained in the step (b2) to extrusion molding to form granules.

**[0028]** The binding solution may include one or more selected from the group  
15 consisting of purified water, spirits, and hydrocolloids.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0029]** The above and other objects, features and advantages of the present invention will become more apparent to those of ordinary skill in the art by  
20 describing in detail exemplary embodiments thereof with reference to the attached drawings, in which:

**[0030]** FIG. 1 shows an image (left panel) of a granular composition of Example 2 during extrusion molding and an image (right panel) of the extrusion-molded granular composition; and

**[0031]** FIG. 2 shows an image (left panel) of a granular composition of Comparative Example 2 during extrusion molding and an image (right panel) of the extrusion-molded granular composition.

## 5 DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

**[0001]** Hereinafter, the present invention will be described in further detail so that a person having ordinary skill in the art to which the present invention belongs can easily put the invention into practice. However, it should be understood that the present invention may be embodied in various forms and is not limited to the  
10 Examples described herein.

**[0002] Granular composition including dietary fibers derived from green tea**

**[0003]** The present invention relates to a granular composition including dietary fibers derived from green tea, and more particularly, to a granular composition  
15 including processed green tea having an insoluble dietary fiber content of 70% by weight or more; and a sugar alcohol.

**[0004]** In the present invention, the processed green tea is green tea in which a content of insoluble dietary fibers increases by removing catechin, water-soluble dietary fibers, proteins, caffeine, and other impurities, all of which are included in the  
20 green tea, by means of an extraction process using the green tea as a raw material.

**[0005]** The content of the insoluble dietary fibers included in the processed green tea may be greater than or equal to 70% by weight, and preferably 90% by weight. When the content of the insoluble dietary fibers is less than this content range, it is difficult to form granules having a higher content of the dietary fibers in  
25 the granular composition, and the green tea may have a poor affective quality due to

its innate bitter and astringent tastes. Also, the content of the insoluble dietary fibers included in the processed green tea may be less than or equal to 95% by weight in consideration of the content of moisture.

**[0006]** Also, the processed green tea may be included at a content of 50 to 85%  
5 by weight, preferably 55 to 85% by weight, and more preferably 60 to 85% by weight, based on the total weight of the granular composition. When the content of the processed green tea is less than this content range, the content of the insoluble dietary fibers may be reduced with respect to the total weight of the granular composition, which makes it possible to deteriorate positive functional effects of the  
10 dietary fibers upon the intake. On the other hand, when the content of the processed green tea is greater than this content range, a composition having a granular shape may not be easily formed.

**[0007]** In the present invention, the sugar alcohol may be mixed with the processed green tea as described above to become a raw material for the composition  
15 having a granular shape.

**[0008]** The sugar alcohol may include one or more selected from the group consisting of xylitol, erythritol, isomalt, maltitol, sorbitol, mannitol, lactitol, and mannitol. Preferably, the sugar alcohol may include xylitol, erythritol, and a mixture thereof.

**[0009]** Also, the sugar alcohol may be included at a content of 15 to 50% by  
20 weight, preferably 15 to 45% by weight, and more preferably 15 to 40% by weight, based on the total weight of the granular composition. When the content of the sugar alcohol is less than this content range, it is impossible to easily form granules, which makes it difficult to prepare a granular composition. On the other hand,  
25 when the content of the sugar alcohol is greater than this content range, a health

functional effect of the dietary fibers may be degraded due to a decrease in content of the dietary fibers in the granular composition.

**[0010]** In the present invention, the granular composition may have a particle size of 0.5 to 2 $\Phi$ , preferably 0.8 to 1.8  $\Phi$ , and more preferably 1 to 1.5  $\Phi$ . When the  
5 particle size of the granular composition is less than this size range, dust scattering may occur. On the other hand, when the particle size of the granular composition is greater than this size range, an increase in particle size may be caused, thereby giving a residual feeling in the mouth, food jamming between teeth, and the like after the food intake.

10 **[0011]** In the present invention, a natural carbohydrate and/or a sweetening agent may be used as an additive(s) that may be further included in the granular composition.

**[0012]** Examples of the aforementioned natural carbohydrate include monosaccharides, for example, glucose, fructose, and the like; disaccharides, for  
15 example maltose, sucrose, and the like; and polysaccharides, for example, conventional sugars such as dextrin, cyclodextrin, and the like, and sugar alcohols such as xylitol, sorbitol, erythritol, and the like. Natural sweetening agents (thaumatin, a stevia extract (for example, rebaudioside A, glycyrrhizin, and the like)), and synthetic sweetening agents (saccharin, aspartame, and the like) may be  
20 favorably used as the sweetening agent.

**[0013]** In addition to the aforementioned components, the granular composition of the present invention may contain various nutrients, vitamins, minerals (electrolytes), a flavoring agent (such as synthetic and natural flavoring agents), a coloring agent and a filler (cheese, chocolate, and the like), pectic acid and salts  
25 thereof, alginic acid and salts thereof, organic acid, a protective colloidal thickening

agent, a pH control agent, a stabilizing agent, a preservative, glycerin, an alcohol, a carbonizing agent used for carbonated drinks, and the like.

**[0014]** Specific examples of the carrier, the excipient, the diluent and the additive are not limited, but one or more selected from the group consisting of  
5 lactose, dextrose, sucrose, sorbitol, mannitol, erythritol, starch, acacia gum, calcium phosphate, alginate, gelatin, calcium phosphate, calcium silicate, microcrystalline cellulose, polyvinyl pyrrolidone, cellulose, polyvinyl pyrrolidone, methyl cellulose, water, sugar syrup, methyl cellulose, methyl hydroxybenzoate, propyl hydroxybenzoate, talc, magnesium stearate, and mineral oil are preferably used.

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**[0015] Method for preparing granular composition including dietary fibers derived from green tea**

**[0016]** Also, the present invention relates to a method for preparing a granular composition including dietary fibers derived from green tea. Here, the method for  
15 preparing a granular composition may include (a) sequentially extracting green tea with spirits and purified water to prepare processed green tea having an insoluble dietary fiber content of 70% by weight or more; and (b) mixing the processed green tea with a sugar alcohol and extrusion molding the resulting mixture.

**[0017]** Hereinafter, the present invention will be described in further detail with  
20 reference to the respective steps.

**[0018]** In the present invention, the step (a) includes preparing processed green tea having an insoluble dietary fiber content of 70% by weight or more. Specifically, the step (a) includes a process further divided into the following steps (a1) to (a5):

**[0019]** (a1) primarily extracting green tea with spirits and secondarily extracting the remaining residue with purified water;

**[0020]** (a2) extracting a green tea residue remaining after the primary and secondary extractions in the step (a1) with an alkali;

5 **[0021]** (a3) subjecting the alkali extract obtained in the step (a2) to solid-liquid separation to remove an alkali extract solution and adding an acid to the remaining solid alkali extract to neutralize the solid alkali extract; and

**[0022]** (a4) subjecting the acid extract neutralized in the step (a3) to solid-liquid separation to remove an acid extract solution and washing the remaining solid acid  
10 extract; and

**[0023]** (a5) drying and pulverizing the solid extract obtained after the step (a4) to prepare processed green tea.

**[0024]** In the step (a1), after the green tea is primarily extracted with spirits, the remaining green tea residue may be secondarily extracted with purified water.

15 **[0025]** The primary extraction may be a process of removing catechin from the green tea. In this case, the green tea may be green tea leaves, and the spirits may be 70% spirits.

**[0026]** Also, the primary extraction may be performed at a temperature of 60 to 80°C for 0.5 to 2 hours, and preferably performed at a temperature of 65 to 75°C for  
20 0.5 to 1.5 hours. Upon the primary extraction, the temperature and time are the optimal temperature and time at which catechin may be removed from the green tea. When the temperature and time are less than these ranges, a desired level of catechin may not be removed. On the other hand, when the temperature and time are greater than these ranges, the active ingredients included in the green tea may be denatured.

25 Also, the catechin may be removed together with chlorophyll, caffeine, and other

impurities.

**[0027]** The secondary extraction may be a process of removing water-soluble substances from the primarily extracted green tea. In this case, the water-soluble substances may refer to water-soluble dietary fibers and sugars.

5 **[0028]** Also, the secondary extraction may be performed at 80 to 100°C for 2 to 4 hours, and preferably performed at 85 to 95°C for 2.5 to 3.5 hours. Upon the secondary extraction, the temperature and time are the optimal temperature and time at which only the water-soluble substances may be removed from the primarily extracted green tea. When the temperature and time are less than these ranges, a  
10 desired level of the water-soluble substances may not be removed. On the other hand, when the temperature and time are greater than these ranges, the active ingredients included in the green tea may be denatured.

**[0029]** As such, after the green tea is subjected to the primary and secondary extractions, the green tea residue obtained by sequentially removing catechin and the  
15 water-soluble substances from the green tea may be obtained.

**[0030]** In the step (a2), the green tea residue remaining after the primary and secondary extractions in the step (a1) may be extracted by immersing the green tea residue in an alkaline solution.

**[0031]** In this case, the alkali used during the extraction with the alkali may  
20 include one or more selected from the group consisting of sodium hydroxide, potassium hydroxide, magnesium hydroxide, magnesium oxide, calcium oxide, and sodium bicarbonate. Preferably, the alkali may be an aqueous solution of 0.5 to 5% alkali in consideration of the efficiency of selective removal of the proteins included in the green tea residue.

25 **[0032]** Also, the extraction with the alkali may be performed at a temperature of

80 to 100°C for 1 to 3 hours, and preferably performed at a temperature of 85 to 95°C for 1.5 to 2.5 hours. Upon the extraction with the alkali, the temperature and time are the optimal temperature and time at which only the proteins may be selectively removed from the green tea residue. When the temperature and time are less than these ranges, a desired level of the proteins may not be removed. On the other hand, when the temperature and time are greater than these ranges, the active ingredients included in the green tea may be denatured.

**[0033]** In the step (a3), the alkali extract obtained in the step (a2) may be subjected to solid-liquid separation to remove an alkali extract solution, and an acid may be then added to the remaining solid alkali extract to neutralize the solid alkali extract.

**[0034]** The solid alkali extract may be washed with water, and then neutralized.

**[0035]** The neutralization may be performed by adding an acid to the solid alkali extract so that the solid alkali extract can be neutralized to pH 7. The acid may include one or more selected from the group consisting of acetic acid, L-glutamic acid, lactic acid, hydrochloric acid, malic acid, succinic acid, citric acid, ethylenediamine-N,N,N',N'-tetraacetic acid (EDTA: edetic acid), EDTA<sub>2</sub>Na, EDTA<sub>3</sub>Na, and EDTA<sub>4</sub>Na. Preferably, the acid may be acetic acid. Also, the acid may be an aqueous solution of 0.1 to 1 M acid in consideration of the efficient neutralization of the solid alkali extract.

**[0036]** In the step (a4), the extract neutralized in the step (a3) may be subjected to solid-liquid separation to remove an extract solution, and the solid extract may be then washed. In this case, the solution to be removed may be an acid solution used during the neutralization, and may be washed with water.

**[0037]** In the step (a5), the solid extract obtained after the step (a4) may be

dried and pulverized to prepare processed green tea.

**[0038]** The processed green tea may be green tea from which catechin, the water-soluble substances and the proteins may be sequentially removed by means of the step (a), which includes the steps (a1) to (a5), so that the content of the insoluble dietary fibers can be adjusted to 60% by weight or more, and may be in the form of powder. Preferably, the dietary fibers may be insoluble dietary fibers. In particular, the content of the insoluble dietary fibers may be adjusted in the step (a2).

**[0039]** In the present invention, the step (b) includes mixing the processed green tea prepared in the step (a), which has an insoluble dietary fiber content of 70% by weight or more; and a sugar alcohol and subjecting the resulting mixture to extrusion molding to prepare a granular composition. Specifically, the step (b) includes a process further divided into the following steps (b1) to (b3):

**[0040]** (b1) pulverizing the processed green tea and the sugar alcohol to form a powder raw material having a size of 80 meshes or less;

**[0041]** (b2) adding a binding solution to the powder raw material so that the binding solution is mixed with the powder raw material; and

**[0042]** (b3) subjecting the mixture obtained in the step (b2) to extrusion molding to form granules.

**[0043]** In the step (b1), the processed green tea and the sugar alcohol may be pulverized to form a powder raw material having a size of 80 meshes or less.

**[0044]** The weights and types of the processed green tea and the sugar alcohol are as described above.

**[0045]** The size of the powder raw material may be less than or equal to 80 meshes, preferably 75 meshes, and more preferably 70 meshes, and may be greater than at least 0 meshes. When the size of the powder raw material is greater than

this size range, a mixing process (b2) and an extrusion molding process (b3) as will be described below may not be performed smoothly.

**[0046]** In this case, the processed green tea and the sugar alcohol may be pulverized together with the additives as described above, for example, according to the present invention, one or more selected from the group consisting of a natural carbohydrate, a sweetening agent, nutrients, vitamins, minerals (electrolytes), a flavoring agent (a synthetic flavoring agent, a natural flavoring agent, and the like), a coloring agent, a filler (cheese, chocolate, and the like), pectic acid and salts thereof, alginic acid and salts thereof, organic acid, a protective colloidal thickening agent, a pH control agent, a stabilizing agent, a preservative, an antioxidant, glycerin, an alcohol, a carbonizing agent, and a flesh in order to form a powder raw material.

**[0047]** In the step (b2), a binding solution may be added to the powder raw material so that the binding solution can be mixed with the powder raw material.

**[0048]** The binding solution may include one or more selected from the group consisting of purified water, spirits, and hydrocolloids. In this case, the binding solution may be added at a content of 0.5 to 100 parts by weight, and preferably 50 to 70 parts by weight, based on 100 parts by weight of the powder raw material, so that the binding solution can be mixed with the powder raw material. When the content of the binding solution is either less than or greater than this content range, a mixture having a level of viscosity to perform an extrusion molding process may not be prepared.

**[0049]** Also, the mixing time may be in a range of 10 to 60 minutes, preferably 10 to 45 minutes, and more preferably 10 to 30 minutes. When the mixing time is less than this range, a uniform mixture may not be formed. On the other hand, when the mixing time is greater than this range, there is no benefit arising from an

increase in the mixing time.

**[0050]** In the step (b3), the mixture obtained in the step (b2) may be subjected to extrusion molding to form granules.

**[0051]** The size of the granules formed after the extrusion molding is the same  
5 as the size of the granular composition, as described above.

**[0052]** Further, the granular composition may be dried and sized. In this case, the drying time may be in a range of 20 to 60 minutes so that the granular composition can be dried to the extent suitable for its distribution, storage, digestion, and absorption.

10 **[0053]** Hereinafter, preferred embodiments of the present invention are provided to aid in understanding the present invention. However, it should be appreciated by those skilled in the art that the detailed description disclosed herein is given by way of illustration of the present invention only, and thus various changes and modification may be made without departing from the spirit and scope of the  
15 present invention. Also, it will be apparent that such changes and modifications fall within the appended claims.

**[0054] Example 1**

**[0055]** Based on the compositions as listed in the Table 1 below, a granular  
20 composition was prepared using the following method.

**[0056]** (a) Preparation of processed green tea

**[0057]** 100 g of green tea leaves was primarily extracted with 1,500 g of 70% spirits at 70°C for an hour, and then secondarily extracted with 1,500 g of purified water at 90°C for 3 hours.

25 **[0058]** 70 g of the green tea residue remaining after the primary and secondary

extractions was immersed and extracted in 490 g of an aqueous solution of 0.2 M sodium hydroxide at 90°C for 2 hours to obtain an alkali extract.

**[0059]** The alkali extract was subjected to solid-liquid separation to remove an alkali extract solution, and the remaining solid alkali extract was then washed with  
5 drinking water to remove the residual alkali. 210 g of an aqueous solution of 0.2 M acetic acid was added to 30 g of the solid alkali extract to neutralize the solid alkali extract.

**[0060]** The neutralized extract was subjected to solid-liquid separation to remove an extract solution, and the remaining solid extract was then washed with  
10 drinking water to remove the residual acid.

**[0061]** Next, the solid extract was dried and pulverized to prepare processed green tea.

**[0062]** (b) Preparation of granules

**[0063]** The processed green tea and a sugar alcohol were mixed, and the  
15 resulting mixture was pulverized to prepare a powder raw material having a size of 70 meshes.

**[0064]** As the binding solution, purified water was added to the powder raw material, and mixed for 20 minutes using a high-shear mixer (NARA) to prepare a mixture. Specifically, the mixture was prepared by adding 4 parts by weight of the  
20 purified water to 100 parts by weight of the powder raw material.

**[0065]** The mixture was put into an extrusion molding machine (Dalton) to prepare a molded product having a granular shape with a size of 1 Φ.

**[0066]** The molded product having a granular shape was dried at room temperature for 30 minutes, and put into a sizing machine (SEOWON ENG Inc.) so  
25 as to uniformly size the molded product into the granule size, thereby preparing a

granular composition.

**[0067]**      Table 1

|                       | Processed green tea (% by weight)                                 |     | Sugar alcohol (% by weight) |          | Content of dietary fibers in granular composition (% by weight) |
|-----------------------|-------------------------------------------------------------------|-----|-----------------------------|----------|-----------------------------------------------------------------|
| Example 1             | Insoluble dietary fiber content: 95% by weight                    | 60  | Xylitol                     | 40       | 57                                                              |
| Example 2             | Insoluble dietary fiber content: 95% by weight                    | 60  | Erythritol                  | 40       | 57                                                              |
| Example 3             | Insoluble dietary fiber content: 95% by weight                    | 60  | Xylitol<br>Erythritol       | 20<br>20 | 57                                                              |
| Comparative Example 1 | Crude green tea feed (total dietary fiber content: 30% by weight) | 60  | Xylitol                     | 40       | 18                                                              |
| Comparative Example 2 | Water-soluble dietary fiber content: 95% by weight                | 60  | Xylitol                     | 40       | 57                                                              |
| Comparative Example 3 | Insoluble dietary fiber content: 95% by weight                    | 100 | -                           | -        | 95                                                              |

**[0068]      Example 2**

5      **[0069]**      A granular composition was prepared in the same manner as in Example 1, except that erythritol was used as the sugar alcohol instead of the xylitol.

**[0070]      Example 3**

**[0071]**      A granular composition was prepared in the same manner as in Example 1, except that xylitol and erythritol were used together as the sugar alcohol instead of the xylitol.

**[0072]      Comparative Example 1**

**[0073]**      A granular composition was prepared in the same manner as in Example 1, except that a crude green tea feed having a water-soluble dietary fiber content of 30% by weight was used instead of the processed green tea.

**[0074] Comparative Example 2**

**[0075]** A granular composition was prepared in the same manner as in Example 1, except that indigestible maltodextrin (Rocket Corp. Ltd.) having a water-soluble dietary fiber content of 95% by weight or more was used instead of the processed green tea having an insoluble dietary fiber content of 95% by weight.

**[0076] Comparative Example 3**

**[0077]** A granular composition was prepared in the same manner as in Example 1, except that only the processed green tea having an insoluble dietary fiber content of 95% by weight was used without using the sugar alcohol.

**[0078] Experimental Example 1**

**[0079]** It was determined whether or not the granules were formed for Examples and Comparative Examples. When the granules were formed, the contents of the dietary fibers included in the granular composition were measured, as follows. The results are listed in Table 3 below.

**[0080] (1) Formation of granules**

**[0081]** The resulting products prepared in Examples and Comparative Examples were observed with the naked eye to determine whether or not the granules were formed.

**[0082] (2) Measurement of dietary fiber content**

**[0083]** Two dry samples were prepared, and then sequentially digested with heat-resistant  $\alpha$ -amylase, protease, amyloglucosidase enzymes to remove starch and proteins. In this case, a food containing 10% or more of fats was tested after the

fats were removed prior to drying.

**[0084]** Total dietary fibers (TDFs) were quantified by treating dietary fibers dissolved in an enzymatic degradation product with ethanol to precipitate the dietary fibers, filtering the dietary fibers, washing the dietary fibers with ethanol and acetone, and drying the dietary fibers to weigh the dietary fibers.

**[0085]** Insoluble dietary fibers (IDFs) were quantified by filtering an enzymatic degradation product, washing the residue with warm water, and weighing the residue.

**[0086]** Water-soluble dietary fibers (SDFs) were quantified by combining a filtrate and a wash solution obtained during pretreatment of IDFs, precipitating the resulting mixture with ethanol, and filtering, drying and weighing the mixture. Amounts of the proteins and batches were calibrated with respect to the weight of the residue by calculating the contents of the total dietary fibers and the insoluble and water-soluble dietary fibers.

**[0087]** (3) Sensory evaluation

**[0088]** A panel of 20 well-strained volunteers participated in a sensory evaluation for a degree of sticking to teeth and a bitter taste. The volunteers ingested 1 g of each of the resulting products of Examples and Comparative Examples, and evaluated the degree of sticking to teeth and bitter taste using a 7-point scale method, as follows. In this case, the lower scores mean the lower degree of sticking to teeth and the less bitter taste.

**[0089]** (4) Flowability

**[0090]** An angle of a conical pile formed while a granular powder is falling in a vertical direction is referred to as an angle of repose. The flowability of the granular powder may be determined based on the angle of repose. The measurements were made using an angle-of-repose measuring machine. A funnel

for testing an angle of repose was installed so that the end of the funnel is positioned at a height of 7.5 cm from the bottom of a round base plate, and a shutter of the tester funnel was then closed. 100 g of a test sample was put into a tester funnel for testing an angle of repose, and the shutter was opened to allow powder to flow out of the tester funnel. When a conical pile was formed on the round base plate, a height of the conical pile was measured using a height gauge. The angle of repose was measured using Equation 1 below.

**[0091]** <Equation 1>

**[0092]**  $\tan(\text{Angle of Repose: } \theta^\circ) = h/r$

10 **[0093]**  $\text{Angle of Repose } (\theta^\circ) = \arctan(h/r)$

**[0094]** h: Height of piled powder

**[0095]** r: Radius of a base plate

**[0096]** The criteria for evaluation of flowability according to the measured angle of repose are as listed in Table 2 below.

15 **[0097]** Table 2

| Angle of repose( $\theta^\circ$ ) | Flowability   |
|-----------------------------------|---------------|
| 25 to 30                          | Very good     |
| 31 to 35                          | Good          |
| 36 to 40                          | Mean          |
| 41 to 45                          | Little bad    |
| 46 to 55                          | Bad           |
| 56 to 65                          | Very bad      |
| 66 or more                        | Very very bad |

**[0098]** Table 3

|           | Granules formed or not | Dietary fiber content in granular composition (% by weight) | Sensory evaluation          |              | Flowability |
|-----------|------------------------|-------------------------------------------------------------|-----------------------------|--------------|-------------|
|           |                        |                                                             | Degree of sticking to teeth | Bitter state |             |
| Example 1 | Formed                 | 57                                                          | 1.2                         | 1.1          | Good        |
| Example 2 | Formed                 | 57                                                          | 1.1                         | 1.0          | Good        |

|                       |            |    |     |     |               |
|-----------------------|------------|----|-----|-----|---------------|
| Example 3             | Formed     | 57 | 1.2 | 1.2 | Good          |
| Comparative Example 1 | Formed     | 18 | 4.5 | 6.1 | Good          |
| Comparative Example 2 | Not formed | 57 | 6.6 | 1.1 | Very very bad |
| Comparative Example 3 | Not formed | 95 | 3.2 | 3.4 | Very very bad |

**[0099]** FIG. 1 shows an image (left panel) of a granular composition of Example 2 during extrusion molding and an image (right panel) of the extrusion-molded granular composition; and FIG. 2 shows an image (left panel) of a granular composition of Comparative Example 2 during extrusion molding and an image (right panel) of the extrusion-molded granular composition.

**[00100]** Referring to Table 3 and FIGS. 1 and 2, it can be seen that the granules having a dietary fiber content of 50% by weight or more were not prepared using the crude green tea feed and the water-soluble dietary fibers, but the granules having a dietary fiber content of 50% by weight or more were prepared using only the processed green tea having an insoluble dietary fiber content of 90% or more.

**[00101]** Also, it was confirmed that the granular composition was subjected to extrusion molding to form the granules only when the granular composition included the sugar alcohol (such as xylitol, erythritol) as well as the processed green tea having an insoluble dietary fiber content of 90% or more.

**[00102]** When the granules were formed, the granular composition had significantly improved degree of sticking to teeth, bitter taste, and flowability, compared to when the granules were not formed, which makes it possible to expect to develop articles having superior preference and excellent convenience in eating and easy packaging.

**[00103]** The granular composition according to the present invention has little scattered dust due to the good flowability, is not stuck to teeth during the food intake, has an improved choking phenomenon, and is favorable for manufacturing articles due to the good filling properties.

5 **[00104]** Also, because the processed green tea included in the granular composition is prepared so that the content of the insoluble dietary fibers is greater than or equal to 70% by weight, the granules can be formed without lumping due to such insoluble dietary fibers.

**[00105]** Further, the processed green tea can be prepared by means of an  
10 extraction process, using green tea as the raw material, so that the content of the insoluble dietary fibers is greater than or equal to 70% by weight, thereby suggesting a new plan to make use of green tea and a new technique for processing green tea.

**[00106]** While the invention has been shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the  
15 art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A granular composition comprising processed green tea having an insoluble dietary fiber content of 70% by weight or more; and a sugar alcohol.

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2. The granular composition of claim 1, wherein the content of insoluble dietary fibers included in the processed green tea is greater than or equal to 90% by weight.

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3. The granular composition of claim 1, wherein the granular composition comprises 50 to 85% by weight of the processed green tea and 15 to 85% by weight of the sugar alcohol.

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4. The granular composition of claim 1, wherein the sugar alcohol comprises one or more selected from the group consisting of xylitol, erythritol, isomalt, maltitol, sorbitol, mannitol, lactitol, and mannitol.

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5. The granular composition of claim 1, wherein the granular composition has a particle size of 0.5 to 2  $\Phi$ .

6. A method for preparing a granular composition, the method comprising:  
(a) sequentially extracting green tea with spirits and purified water to prepare processed green tea having an insoluble dietary fiber content of 70% by weight or more; and

(b) mixing the processed green tea and a sugar alcohol and then extrusion-molding the resulting mixture.

7. The method of claim 6, wherein the step (a) comprises the following steps  
5 (a1) to (a5):

(a1) primarily extracting the green tea with spirits and secondarily extracting the green tea with purified water;

(a2) extracting a green tea residue remaining after the primary and secondary extractions in the step (a1) with an alkali;

10 (a3) subjecting the alkali extract obtained in the step (a2) to solid-liquid separation to remove an alkali extract solution and adding an acid to the remaining solid alkali extract to neutralize the solid alkali extract; and

(a4) subjecting the acid extract neutralized in the step (a3) to solid-liquid separation to remove an acid extract solution and washing the remaining solid acid  
15 extract; and

(a5) drying and pulverizing the solid extract obtained after the step (a4) to prepare processed green tea.

8. The method of claim 6, wherein the step (b) comprises the following steps  
20 (b1) to (b3):

(b1) pulverizing the processed green tea and the sugar alcohol to form a powder raw material having a size of 80 meshes or less;

(b2) adding a binding solution to the powder raw material so that the binding solution is mixed with the powder raw material; and

(b3) subjecting the mixture obtained in the step (b2) to extrusion molding to form granules.

9. The method of claim 8, wherein the binding solution comprises one or  
5 more selected from the group consisting of purified water, spirits, and hydrocolloids.