[0030]

8. The nutritional composition having a fluidization characteristic according to any of 3 to 7, wherein the water-absorbing dietary fiber is an insoluble fiber of soybean dietary fiber and/or soybean *fusuma* bran.

[0031]

9. The nutritional composition having a fluidization characteristic according to any of 1 to 4, wherein the adjuvant that imparts a viscous property but not a shear thinning characteristic is a thickening agent that does not have a network structure in an aqueous solution.

[0032]

10. The nutritional composition having a fluidization characteristic according to 9, wherein the thickening agent that does not have a network structure in an aqueous solution is a thickening agent selected from the group consisting of ι-carrageenan, λ-carrageenan, locust bean gum, guar gum, psyllium seed gum, and tamarind seed gum.

[0033]

11. The nutritional composition having a fluidization characteristic according to any of 1 to 4, wherein the adjuvant that imparts a viscous property but not a shear thinning characteristic is a starch not having been subjected to pregelatinization treatment in advance.

[0034]

12. The nutritional composition having a fluidization characteristic according to any of 1 to 11, comprising one or more from the group consisting of protein, lipid, and sugar, wherein the specific ~~weight~~ gravity of the composition is 1.06 to 1.5.

[0035]

13. The nutritional composition having a fluidization characteristic according to any of 1 to 12, comprising one or more from the group consisting of a thickening agent and an emulsifier.

[0036]

14. The nutritional composition having a fluidization characteristic according to any of 1 to 13, wherein the viscosity of the composition is 5 to 300 mPa·s, wherein the viscosity of the composition is measured at 45 to 85°C and 12 rpm using a spindle type rotational~~B-type~~ viscometer.

[0037]

15. The nutritional composition having a fluidization characteristic according to any of 1 to 14, wherein homogenization treatment is performed by adjusting the homogenization treatment pressure to 10 to 100 MPa.

[0038]

16. The nutritional composition having a fluidization characteristic according to any of 1 to 15, wherein the viscosity of the composition reaches 300 to 3000 mPa·s by subjecting the composition to heat treatment and then storing the composition at a temperature equal to or below normal temperature for 1 to 90 days, wherein the viscosity of the composition is measured at 20°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer.

[0039]

17. A nutritional composition having a fluidization characteristic comprising an adjuvant that imparts a viscous property but not a shear thinning characteristic, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 1000/s are expressed by the following viscous property formula:

$$P = \mu D^n$$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, and

wherein the composition has been subjected to heat treatment and then stored at a temperature equal to or below normal temperature for 1 to 90 days.

[0040]

18. A nutritional composition having a fluidization characteristic comprising an adjuvant that imparts a viscous property but not a shear thinning characteristic, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, and

wherein the composition has been subjected to heat treatment and then stored at a temperature equal to or below normal temperature for 1 to 90 days.

[0041]

19. A method for producing a viscous nutritional composition, comprising the steps of:

i) preparing an adjuvant that imparts a viscous property but not a shear thinning characteristic selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer.

[0042]

20. A method for producing a viscous nutritional composition, comprising the steps of:

i) preparing an adjuvant that imparts a viscous property but not a shear thinning characteristic selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been

subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer.

[0043]

21. A method for producing a nutritional composition having a fluidization characteristic comprising an adjuvant that imparts a viscous property but not a shear thinning characteristic, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 1000/s are expressed by the following viscous property formula:

$$P = \mu D^n$$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, comprising the steps of:

i) preparing an adjuvant that imparts a viscous property but not a shear thinning characteristic selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer.

[0044]

22. A method for producing a nutritional composition having a fluidization characteristic, wherein the composition is prepared so that when results of measurement of viscosity at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$$P = \mu D^n$$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s, comprising the steps of:

i) preparing an adjuvant that imparts a viscous property but not a shear thinning characteristic selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational ~~B-type~~ viscometer.

[0045]

The present application encompasses the contents described in the specification and/or drawings of JP Patent Application No. 2011-108857, based on which the priority of the present application is claimed.

Advantageous Effects of Invention

[0046]

The use of an adjuvant that imparts a viscous property but not a shear thinning characteristic enables the provision of a nutritional composition which maintains a viscosity at which the production thereof is facilitated from the step of mixing raw materials to the step of filling a container with the resulting mixture, and which, after heat treatment, has a viscosity suitable for tube feeding by free fall. In other words, the nutritional composition of the present invention can be easily produced and administered by tube. Also, compared to a composition in which the viscosity is increased primarily by a thickening agent, the viscosity of the nutritional composition of the present invention before heat treatment can be kept low, whereby the production thereof is facilitated. Further, a water-absorbing dietary fiber and a starch not having been subjected to pregelatinization treatment in advance contained in the aforementioned adjuvant that imparts a viscous property but not a shear thinning characteristic can reduce free water in the nutritional composition by virtue of their water-absorbing action, whereby the content of a substance that imparts a shear thinning characteristic necessary for

imparting a certain degree of viscosity (such as a thickening agent) can be kept lower than that in conventional products. The thickening agent that does not have a network structure in an aqueous solution and starch not having been subjected to pregelatinization treatment in advance contained in the aforementioned adjuvant that imparts a viscous property but not a shear thinning characteristic do not have a network structure in an aqueous solution, thereby

g/100 g, and more preferably 20 to 25 g/100 g. The nutritional composition of the present invention can contain the aforementioned amounts of protein, lipid, and carbohydrate while retaining certain fluidization characteristics as described above.

[0081]

The specific gravity~~weight~~ of the nutritional composition of the present invention can be adjusted according to the usage. The specific gravity~~weight~~ of the nutritional composition of the present invention can be set at, for example, 1.06 or more, 1.07 or more, 1.08 or more, 1.09 or more, 1.1 or more, less than 1.5, less than 1.4, less than 1.3, and less than 1.2, for example, 1.06 to 1.5, 1.07 to 1.5, 1.08 to 1.4, 1.09 to 1.3, 1.1 to 1.2, 1.1 to 1.15, 1.12 to 1.15, 1.13 to 1.15, preferably 1.135 to 1.145. Those skilled in the art can determine the specific gravity~~weight~~ of the composition by appropriately adjusting each component. Although the specific gravity~~weight~~ may vary depending on the temperature, for the sake of convenience, the specific gravity~~weight~~ refers to a value obtained at 20°C in the present specification. The specific gravity~~weight~~ of the composition can be calculated from the weight and volume of each component or by a conventional method, for example by using a density and specific gravity~~weight~~ meter.

[0082]

In the present specification, a rich nutritional composition refers to a composition that appropriately contains protein, lipid, carbohydrate, and the like and has a specific gravity~~weight~~ of 1.06 or more, for example 1.06 to 1.5, for example 1.07 to 1.5, for example 1.08 to 1.4, for example 1.09 to 1.3, for example 1.1 to 1.2, for example 1.1 to 1.15, for example 1.12 to 1.15, for example 1.13 to 1.15, and 1.135 to 1.145. Such a rich nutritional composition can be prepared as an emulsion by appropriately using the aforementioned emulsifier. A rich nutritional composition can also be prepared as an emulsion by appropriately performing homogenization treatment. Although homogenization treatment can be conducted before or after the addition of the aforementioned emulsifier, it is preferably conducted after the addition of an emulsifier. Homogenization will be described in detail below. Accordingly, in the present specification, an emulsion of a rich nutritional composition refers to a composition that appropriately contains protein, lipid, carbohydrate,

and the like and has a certain specific gravity~~weight~~ as described above, and is emulsified by homogenization treatment. According to an embodiment of the present invention, a rich nutritional composition having a flow characteristic close to that of a Newtonian fluid can be obtained by using an emulsion of a rich nutritional composition in combination with an adjuvant that imparts a viscous property but not a shear thinning characteristic.

[0083]

As a substance that imparts a shear thinning characteristic to a composition, the aforementioned raw materials, gum arabic, alginic acid, casein, κ-carrageenan, xanthan gum, guar gum, gellan gum (native form, deacylated form, and the like), gelatin, tragacanth gum, bacterial cellulose, hydroxyethylcellulose, polyethylene glycol, locust bean gum, agar, fine crystalline cellulose, and the like are known. These materials can also be contained partly in the composition of the present invention.

[0084]

By using an adjuvant that imparts a viscous property but not a shear thinning characteristic in the composition of the present invention, the concentrations of a thickening agent necessary for imparting the intended viscosity, an emulsifier, or a substance that imparts a shear thinning characteristic can be kept low, whereby the shear thinning characteristic attributable to these substances can be suppressed. As a result, the composition of the present invention can attain a low shear thinning characteristic and a viscous property close to the Newtonian viscous property, while maintaining high viscosity.

[0085]

The composition of the present invention is advantageous in that the dripping rate in drip feeding can readily be adjusted due to said composition having a viscous property close to the Newtonian viscous property.

[0086]

The shear thinning characteristic as used in the present specification has the meaning as commonly used in the field of the present invention, and a shear thinning fluid refers to a fluid in which an apparent viscous rate or consistency decreases with an increase in the shear deformation rate.

[0087]

After mixing some or all of the aforementioned raw materials, homogenization is performed as needed. Homogenization refers to homogenizing the mixed components by thorough mixing and mechanically miniaturizing fat globules and coarse particles of other components to prevent floatation and aggregation of fat and the like, while making the nutritional composition into a uniform emulsion. An emulsified nutritional composition can have a flow characteristic close to a Newtonian fluid even when it is rich with a certain degree of viscosity. By increasing homogenization treatment pressure in homogenization process, viscosity after heat treatment can be reduced and generation of sediment (settling particles) can be reduced. That is, the viscosity of the nutritional composition and the generation of sediment can be controlled by adjusting the homogenization treatment pressure. Homogenization treatment is normally performed by shearing an adjusted solution using a conventional homogenizer under certain pressure. In the present invention, homogenization treatment can be preferably performed at a homogenization pressure of 10, 25, 40, 60, 100 MPa, and the like; however, treatment pressure is not limited to those exemplified above. That is, the viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of the composition after heat treatment and storage at a temperature equal to or below normal temperature for a certain period of time, for example 7 days, can also be adjusted to 300 to 3000 mPa·s, for example 400 to 3000 mPa·s by applying homogenization treatment at a homogenization treatment pressure of 10 to 100 MPa in addition to using, for example, an adjuvant that imparts a viscous property but not a shear thinning characteristic, a thickening agent, an emulsifier, or a substance that imparts a shear thinning characteristic as described above.

[0088]

Homogenization treatment after mixing the raw materials can be performed at any appropriate temperature. Homogenization treatment can be performed, for example, at room temperature of around 20°C. Homogenization treatment can also be performed at a temperature higher than this, for example at 20 to 85°C, for example at 45 to 80°C, preferably

at 45 to 70°C, more preferably at around 50°C to 60°C. Homogenization treatment is preferably performed at around 50°C to 60°C.

[0089]

In the production of the nutritional composition of the present invention, heat treatment or heat sterilization is performed. For heat sterilization conditions, sterilization conditions generally applied to food product can be used, and heat sterilization can be performed using a conventional device. For example, sterilization at 62 to 65°C for 30 minutes, 72°C or higher for 15 seconds or more, 72°C or higher for 15 minutes or more, or 120 to 150°C for 1 to 5 seconds, or disinfection at 121 to 124°C for 5 to 20 minutes, at 105 to 140°C, retort (autoclave) sterilization, high pressure steam disinfection, and the like can be used; however, heat sterilization is not limited to those exemplified above. Heat sterilization can be performed preferably under pressure. Further, by using an adjuvant that imparts a viscous property but not a shear thinning characteristic having a property such that its water absorbency is increased by heating, for example a water-absorbing dietary fiber or a starch not having been subjected to pregelatinization treatment in advance, the nutritional composition can be sterilized by heat treatment, and also the viscosity of the composition can be increased. In the present specification, disinfection and sterilization can be used synonymously. Also, retort sterilization can be used as one aspect of heat sterilization.

[0090]

The viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of the nutritional composition of the present invention gradually increases by storing the composition at a temperature equal to or below room temperature following heat treatment, and after the elapse of a certain period of time, the viscosity is almost stabilized. The storage period of the composition can be appropriately selected according to the desired viscosity, for example, several hours to half a day, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days, 10 days, 14 days, 20 days, 30 days, 40 days, 50 days, 60 days, 70 days, 80 days, and 90 days. That is, the storage period of the composition of the present invention after heat treatment can be, for example, 1 to 90 days, preferably 5 to 60 days, more preferably 7 to 30 days, and even more preferably 7 days. The viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of

a nutritional composition according to a preferable embodiment of the present invention is almost stabilized approximately 7 days after (approximately one week after) storage at a temperature equal to or below normal temperature following heat treatment. Those skilled in the art can appropriately determine the time required for stabilization of a heat-treated composition by a conventional technique.

[0091]

Also, preferably, the viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of the nutritional composition of the present invention that has been subjected to heat treatment and then stored at normal temperature (15 to 25°C) or below for a certain period of time, for example 7 days, is 300 to 6500 mPa·s, preferably 300 to 3000 mPa·s, preferably 400 to 3000 mPa·s, preferably 400 to 2000 mPa·s, and more preferably 500 to 1500 mPa·s. The heat-treated nutritional composition of the present invention is preferably stored at 0°C to normal temperature or below. By adjusting the viscosity to the aforementioned values, conventional free-fall tube feeding can be employed for feeding a liquid nutritional composition to those who consume it. As a result, gastroesophageal reflux, which is a problem associated with tube feeding of a low-viscosity nutritional composition, and cumbersome operation such as injection by syringe, which is a problem associated with feeding of a semi-solid nutritional composition with high viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm, for example 4000 to 20000 mPa·s), are solved, whereby simple feeding is made possible. Alternatively, a composition having the same degree of viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) as a semi-solid liquid food of 4000 mPa·s or more can be obtained by appropriately adjusting the types and contents of a water-absorbing dietary fiber, a thickening agent, and a non-pregelatinized starch, the contents and types of other ingredients such as an emulsifier, homogenization treatment pressure, and the like.

[0092]

In the present specification, when the viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of the nutritional composition of the present invention that has been subjected to heat treatment and then stored for a certain period of time at a temperature equal

to or below normal temperature is expressed as 300 to 3000 mPa·s, it is intended to indicate a range from not lower than the lower limit to less than the upper limit. That is, "300 to 3000 mPa·s" means 300 mPa·s or more to less than 3000 mPa·s.

[0093]

The viscosity of the nutritional composition of the present invention can be measured by a conventional method. As an example, when the measurement is made at a constant shear rate, the viscosity can be measured with a spindle type rotational ~~B-type~~ viscometer (for example, measurement is made with a spindle type rotational ~~B-type~~ viscometer at 20 to 85°C and 12 rpm). Also, when the measurement is made at varied shear rates, as an example, the measurement can also be made under the conditions of a gap of 1 mm, 25°C, a shear rate of 1 to 100/s using the rheometer Physica MCR301 (Anton Paar) with a cone plate having a diameter of 25 mm. Those skilled in the art can select an appropriate viscosity measurement device and determine measurement conditions according to the desired requirements.

[0094]

When the viscosity is measured under the conditions of a shear rate of 10/s, the viscosity of the nutritional composition of the present invention can be adjusted to 150 to 1000 m·Pas, 200 to 800 m·Pas, or 300 to 500 m·Pas. Examples of the measurement method of the aforementioned viscosity include a measurement method performed under the conditions of a gap of 1 mm and 25°C using the rheometer Physica MCR301 (Anton Paar) with a cone plate having a diameter of 25 mm.

[0095]

The measurement of the viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of the nutritional composition of the present invention can be performed in accordance with, for example, "Standard for labeling approval of foods for special dietary uses: Test method for foods for the elderly 3, Viscosity ("How to handle the labeling approval for foods for the elderly", (February 23, 1994, Notice No. 15 by the chief of the Office of Health Policy on Newly Developed Foods, Food Sanitation Division, Environmental Health Bureau, the Ministry of Health, Labour and Welfare of Japan)) ". Specifically, using a spindle type rotational ~~B-type~~ rotating viscometer, the reading is taken two minutes after rotating a rotor.

Subsequently, the value thus obtained is multiplied by a coefficient corresponding to this value, and the resulting value is expressed as mPa·s. The measurement is performed at 20 ± 2°C.

[0096]

Also, as other examples, the viscosity can be measured properly or continuously during the production step using an inline viscometer such as a torsional vibration viscometer, an ultrasonic viscometer, and a rotating viscometer.

[0097]

By virtue of the effect of an adjuvant that imparts a viscous property but not a shear thinning characteristic, the amounts of a thickening agent necessary for imparting a certain degree of viscosity to a composition, an emulsifier, a substance that imparts a shear thinning characteristic, and the like in the nutritional composition of the present invention can be reduced. Since the use of a substance that imparts a shear thinning characteristic such as a thickening agent can be reduced, the nutritional composition of the present invention achieves an increasing effect on the viscosity of the composition after heat treatment and storage at a temperature equal to or below normal temperature for a certain period of time, for example 1 to 90 days, for example 7 days. In light of the above, the viscosity of the nutritional composition of the present invention before heat treatment can be kept lower that of a composition in which the viscosity is increased primarily by a thickening agent. That is, the present invention provides a nutritional composition that can be easily produced and fed by tube. Meanwhile, as will be demonstrated in, for example, Comparative Example 1 in Example 1 to be described later, the viscosity of a nutritional composition produced by adding an emulsifier, not an adjuvant that imparts a viscous property but not a shear thinning characteristic, did not increase even after heat treatment and further storage at a temperature equal to or below normal temperature for 7 days, in comparison with the viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) before heat treatment.

[0098]

Here, the effect of an adjuvant that imparts a viscous property but not a shear thinning characteristic means that, in the production of a nutritional composition having a viscosity (spindle type rotational ~~B-type~~ viscometer, 20°C, 12 rpm) of 300 to 3000 mPa·s after heat

treatment and then storage at a temperature equal to or below normal temperature for a certain period of time, for example 1 to 90 days, for example 7 days, regardless of the fact that the viscosity of the composition before heat treatment is markedly lower than the viscosity of a composition in which the

container or package for storage of the nutritional composition in accordance with the desired dripping rate.

[0105]

In contrast, the dripping rate of the nutritional composition of the present invention can readily be controlled since the viscosity of said composition of the present invention is less affected by the dripping rate. Accordingly, the nutritional composition of the present invention can be used with any gastrostomy tube and container or package for storage of the nutritional composition, irrespective of the type of gastrostomy tube (tube type, button type, balloon type, bumper type, and the like) as well as the size, form, and type of the container or package for storage of the nutritional composition. Further, diarrhea and the like can be prevented by adjusting the dosing rate even when the nutritional composition has high osmotic pressure; therefore, it is also possible to maintain the quality of life (QOL) of patients receiving nutritional compositions.

[0106]

(Examples)

Example 1 Soybean dietary fiber

The effect of a water-absorbing dietary fiber on the viscosity of a nutritional composition was tested by adding a certain amount of a water-absorbing dietary fiber to the composition. Raw materials were stirred and mixed in accordance with the recipe in the upper table in Table 1 to formulate various nutritional compositions (Production Examples 1 and 2, and the like). The resulting nutritional compositions were subjected to homogenization treatment under the conditions of 50 to 60°C and a homogenization treatment pressure of 20 MPa, followed by homogenization treatment at 50 to 60°C and 30 MPa. The specific gravities of Production Examples 1 to 2 and Comparative Example 1 were all measured to be 1.14 by a density and specific gravity ~~weight~~ meter at 20°C. After the viscosity of these nutritional compositions was measured [before retort sterilization], they were filled and sealed in containers and then subjected to retort sterilization under the conditions of 121 to 123.5°C for 5 to 20 minutes. The nutritional compositions after retort sterilization were stored at 15°C for one week, and the viscosity was measured again [after

retort sterilization]. It should be noted that the viscosity was measured using a spindle type rotational ~~B-type~~ viscometer under the conditions of 12 rpm, 20°C or 50°C. Also, the milk-derived protein used in the present Example was a combination of 1.9% by weight of MPC, 3.8% by weight of casein sodium, and 1.5% of degradation products of milk protein, the water-absorbing dietary fiber used in the present Example was an insoluble fiber of soybean dietary fiber, and the emulsifier used in the present Example was diacetyl tartaric (acid) ester of monoglyceride (DATEM). A thickening agent was not used. Also, the composition of Production Examples 1 and 2 and Comparative Example 1 is shown in Table 1-2.

[Table 1-1]

	Production Example 1	Production Example 2	Comparative Example 1
Raw material	Formulation ratio (w/w%)	Formulation ratio (w/w%)	Formulation ratio (w/w%)
Milk-derived protein	7.2	7.2	7.2
Dextrin	22.5	22.5	22.5
Dietary fiber			
Indigestible dextrin	0.73	1.1	0
Insoluble soybean dietary fiber	1.47	1.1	0
Sucrose	1.6	1.6	1.6
Mineral mixture	1.3	1.3	1.3
pH Adjuster	0.16	0.16	0.16
Prepared fat	4.23	4.23	4.23
Vitamin mixture	0.18	0.18	0.18
Fragrance	0.18	0.18	0.18
Emulsifier	Diacetyl tartaric (acid) ester of monoglyceride (DATEM)	Diacetyl tartaric (acid) ester of monoglyceride (DATEM)	Diacetyl tartaric (acid) ester of monoglyceride (DATEM)
	0.64	0.64	0.64
Thickening agent	None	None	None
Water	59.81	59.81	62.01

Viscosity prior to retort sterilization mPa·s	270(20°C)	120(20°C)	65(20°C)
Viscosity post retort sterilization mPa·s 20°C	1600	940	52

(Formulations 3 and 4), and the resulting nutritional compositions were subjected to homogenization treatment under the conditions of 50 to 60°C and a homogenization treatment pressure of 20 MPa, followed by homogenization treatment at 50 to 60°C and 30 MPa. Also, the specific gravities of Formulations 3 and 4 were both measured to be 1.14 by a density and specific gravity~~weight~~ meter at 20°C. After the viscosity of these nutritional compositions was measured [before retort sterilization], they were filled and sealed in containers and then subjected to retort sterilization under the conditions of 121 to 123.5°C for 5 to 20 minutes. The nutritional compositions after retort sterilization were stored at 15°C for three days, and the viscosity was measured again [after retort sterilization]. It should be noted that the viscosity was measured using a spindle type rotational ~~B-type~~ viscometer under the conditions of 12 rpm, 20°C or 50°C. Also, the starch not having been pregelatinized in advance used in the present Example was waxy corn starch (trade name "Suehiro 200", the product of OJI CORNSTARCH Co., Ltd.), the milk-derived protein used in the present Example was a combination of 1.9% by weight of MPC, 3.7% by weight of casein sodium, and 1.5% of degradation products of milk protein, and the emulsifier used in the present Example was diacetyl tartaric (acid) ester of monoglyceride (DATEM). A thickening agent was not used. Also, the composition of Formulations 3 and 4 is shown in Table 2-2.

[Table 2-1]

after heat sterilization was increased to approximately 24 times as high as the viscosity before heat sterilization.

[0111]

From the above results, it was found that the viscosity of the composition after retort sterilization could be dramatically increased even in the absence of a thickening agent or in the presence of only a small amount of a thickening agent by using a starch not having been pregelatinized in advance in the nutritional composition of the present invention.

[0112]

Further, based on the observation that these nutritional compositions had a certain degree of viscosity even in the absence of a thickening agent or in the presence of only a small amount of a thickening agent, it was speculated that the Newtonian fluidity was improved. In light of this, the following test was conducted to reveal the fluidization characteristics of these nutritional compositions.

[0113]

Example 3

The shear rate-dependent viscosity of the nutritional composition of the present invention was measured. Also, a dripping test was performed using a percutaneous endoscopic gastrostomy catheter.

[0114]

Nutritional composition

Formulations 1 to 4 were prepared in accordance with Table 2-1 (Example 2) and Table 3-1. The composition of Formulations 1 and 2 is shown in Table 3-2. The specific gravities of Formulations 1 to 4 were all measured to be 1.14 by a density and specific gravity~~weight~~ meter at 20°C. Also, as a Comparative Example, a commercially available liquid food (trade name "F2 Light", the product of TERUMO CORPORATION) was used. It should be noted that the milk-derived protein used in the present Example was a combination of 1.9% by weight of MPC, 3.7% by weight of casein sodium, and 1.5% of degradation products of milk protein in Formulations 3 and 4, while that was a combination of 1.9% by weight of MPC, 3.8% by weight of casein sodium, and 1.5% of degradation products of milk protein in

Formulations 1 and 2, and the emulsifier used in the present Example was diacetyl tartaric (acid) ester of monoglyceride (DATEM), and as to carrageenan, λ-carrageenan was used. For specific gravity~~weight~~, an actual measurement value obtained by a hydrometer was recorded.

[0115]

The commercially available liquid food is assumed to have the nutritional components and specific gravity~~weight~~ as shown in Table 3-3 based on the information of the nutritional components and physical property values of the trade name "F2 light" as listed in the pamphlet of this commercially available liquid food.

[0116]

For Formulations 1 to 4, the raw materials were stirred and mixed and homogenization treatment was performed under the conditions of 50 to 60°C and a homogenization treatment pressure of 20 MPa, followed by homogenization treatment at 50 to 60°C and 30 MPa. Formulations 1 to 4 after homogenization treatment were each filled and sealed in containers and subjected to retort sterilization under the conditions of 121 to 123.5°C for 10 to 20 minutes. Thereafter, the resulting products were stored at 15°C for one week and then subjected to viscosity measurement and a dripping test.

[0117]

Measurement method for shear rate-dependent viscosity

The nutritional compositions of the present invention (Formulations 1 to 4 and Production Examples 1 and 2, and a commercially available liquid food) were tested. When the viscosity was measured at varied shear rates, the measurement was made under the conditions of a gap of 1 mm, 25°C, a shear rate of 1 to 100/s using the rheometer Physica MCR301 (Anton Paar) with a cone plate having a diameter of 25 mm.

[0118]

Dripping test method

The nutritional compositions of the present invention (Formulations 1 and 2, and a commercially available liquid food) were tested.

The following apparatus or samples were used in this experiment:

CLAIMS

[Claim 1]

A nutritional composition having a fluidization characteristic comprising a water-absorbing dietary fiber in an amount of 0.10 to 1.50% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, wherein the water-absorbing dietary fiber is an insoluble dietary fiber.

[Claim 2]

A nutritional composition having a fluidization characteristic comprising a water-absorbing dietary fiber in an amount of 0.10 to 1.50% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s or more, wherein the water-absorbing dietary fiber is an insoluble dietary fiber.

[Claim 3]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the insoluble dietary fiber is an insoluble fiber of a *fusuma* bran dietary fiber of a cereal.

[Claim 4]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the insoluble dietary fiber is an insoluble fiber of soybean dietary

fiber and/or soybean *fusuma* bran.

[Claim 5]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, comprising one or more from the group consisting of protein, lipid, and sugar, wherein the specific gravity of the composition is 1.06 to 1.5.

[Claim 6]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, comprising one or more from the group consisting of a thickening agent and an emulsifier.

[Claim 7]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the viscosity of the composition is 5 to 300 mPa·s, wherein the viscosity of the composition is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer.

[Claim 8]

A nutritional composition having a fluidization characteristic comprising an adjuvant selected from the group consisting of a water-absorbing dietary fiber in an amount of 0.10 to 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of 0.10 to 1.50% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of 0.10 to 1.50% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more,

wherein a homogenization treatment is performed prior to a heat treatment by adjusting the homogenization treatment pressure to 10 to 100 MPa, and wherein said heat treatment is used to produce the nutritional composition.

[Claim 9]

A nutritional composition having a fluidization characteristic comprising an adjuvant selected from the group consisting of a water-absorbing dietary fiber in an amount of 0.10 to 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of 0.10 to 1.50% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of 0.10 to 1.50% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s or more,

wherein a homogenization treatment is performed prior to a heat treatment by adjusting the homogenization treatment pressure to 10 to 100 MPa, and wherein said heat treatment is used to produce the nutritional composition.

[Claim 10]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the viscosity of the composition reaches 300 to 3000 mPa·s by subjecting the composition to a heat treatment and then to storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days, wherein the viscosity of the composition is measured at 20°C and 12 rpm using a spindle type rotational viscometer, wherein said heat treatment is used to produce the nutritional composition.

[Claim 11]

A method for producing a nutritional composition having a fluidization characteristic comprising an adjuvant, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,
the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, comprising the steps of:
i) preparing an adjuvant selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,
ii) applying pressure treatment for homogenization, and
iii) applying heat treatment,
wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.

[Claim 12]

A method for producing a nutritional composition having a fluidization characteristic, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,
the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s, comprising the steps of:
i) preparing an adjuvant selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in

advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.

CLAIMS

[Claim 1]

A nutritional composition having a fluidization characteristic comprising an adjuvant selected from the group consisting of a water-absorbing dietary fiber in an amount of from 0.10 or more to less than 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of from 0.10 or more to less than 5.00% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of from 0.10 to 5.00% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more.

[Claim 2]

A nutritional composition having a fluidization characteristic comprising an adjuvant selected from the group consisting of a water-absorbing dietary fiber in an amount of 0.10 or more to less than 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of 0.10 or more to less than 5.00% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of 0.10 to 5.00% by weight of the nutritional composition, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s or more.

[Claim 3]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the water-absorbing dietary fiber is an insoluble dietary fiber.

[Claim 4]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the water-absorbing dietary fiber is an insoluble fiber of a *fusuma* bran dietary fiber of a cereal.

[Claim 5]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the water-absorbing dietary fiber is an insoluble fiber of soybean dietary fiber and/or soybean *fusuma* bran.

[Claim 6]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the thickening agent that does not have a network structure in an aqueous solution is a thickening agent selected from the group consisting of ι-carrageenan, λ-carrageenan, locust bean gum, guar gum, psyllium seed gum, and tamarind seed gum.

[Claim 7]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, comprising one or more from the group consisting of protein, lipid, and sugar, wherein the specific gravity of the composition is 1.06 to 1.5.

[Claim 8]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, comprising one or more from the group consisting of a thickening agent and an emulsifier.

[Claim 9]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the viscosity of the composition is 5 to 300 mPa·s, wherein the viscosity of the composition is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer.

[Claim 10]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein a homogenization treatment is performed prior to a heat treatment by adjusting the homogenization treatment pressure to 10 to 100 MPa, and wherein said heat treatment is used to produce the nutritional composition.

[Claim 11]

The nutritional composition having a fluidization characteristic according to claim 1 or 2, wherein the viscosity of the composition reaches 300 to 3000 mPa·s by subjecting the composition to a heat treatment and then to storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days, wherein the viscosity of the composition is measured at 20°C and 12 rpm using a spindle type rotational viscometer, wherein said heat treatment is used to produce the nutritional composition.

[Claim 12]

A nutritional composition having a fluidization characteristic comprising an adjuvant according to claim 1 or 2, wherein the adjuvant is selected from the group consisting of a water-absorbing dietary fiber in an amount of 0.10 or more to less than 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of 0.10 or more to less than 5.00% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of 0.10 to 5.00% by weight of the nutritional composition and wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, and

wherein the composition has been subjected to a heat treatment and then stored at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days, wherein said heat treatment is used to produce the nutritional composition.

[Claim 13]

A nutritional composition having a fluidization characteristic comprising an adjuvant according to claim 1 or 2, wherein the adjuvant is selected from the group consisting of a water-absorbing dietary fiber in an amount of 0.10 or more to less than 1.50% by weight of the nutritional composition, a thickening agent that does not have a network structure in an aqueous solution in an amount of 0.10 or more to less than 5.00% by weight of the nutritional composition, and a starch not having been subjected to pregelatinization treatment in advance in an amount of 0.10 to 5.00% by weight of the nutritional composition and wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, and

wherein the composition has been subjected to a heat treatment and then stored at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days, wherein said heat treatment is used to produce the nutritional composition.

[Claim 14]

A method for producing a viscous nutritional composition, comprising the steps of:

i) preparing a starch not having been subjected to pregelatinization treatment in advance, wherein said starch not having been subjected to pregelatinization treatment in advance is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or

below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.

[Claim 15]

A method for producing a viscous nutritional composition, comprising the steps of:

i) preparing a starch not having been subjected to pregelatinization treatment in advance, wherein said starch not having been subjected to pregelatinization treatment in advance is 0.10 to 5.00% by weight relative to the nutritional composition,

ii) applying pressure treatment for homogenization, and

iii) applying heat treatment,

wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.

[Claim 16]

A method for producing a nutritional composition having a fluidization characteristic comprising an adjuvant, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 1000/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,

the value of n is 0.3 to 1.0 and the viscosity at a shear rate of 10/s (25°C) is 150 mPa·s or more, comprising the steps of:

i) preparing an adjuvant selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional

composition,
ii) applying pressure treatment for homogenization, and
iii) applying heat treatment,
wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.

[Claim 17]

A method for producing a nutritional composition having a fluidization characteristic, wherein the composition is prepared so that when results of measurement of shear stress and shear rate at any two or more measurement points in a shear rate range of shear rate of 0.1/s to 100/s are expressed by the following viscous property formula:

$P = \mu D^n$

wherein, P represents a shear stress (Pa), D represents a shear rate (1/s), μ represents a non-Newtonian viscosity coefficient, and n represents a non-Newtonian viscosity index,
the value of n is 0.4 to 0.8 and the viscosity at a shear rate of 10/s (25°C) is 150 to 1000 mPa·s, comprising the steps of:
i) preparing an adjuvant selected from the group consisting of a water-absorbing dietary fiber, a thickening agent that does not have a network structure in an aqueous solution, and a starch not having been subjected to pregelatinization treatment in advance, wherein said adjuvant is 0.10 to 5.00% by weight relative to the nutritional composition,
ii) applying pressure treatment for homogenization, and
iii) applying heat treatment,
wherein the viscosity of the composition prior to the heat treatment is 5 to 300 mPa·s, wherein the viscosity of the composition prior to the heat treatment is measured at 45 to 85°C and 12 rpm using a spindle type rotational viscometer, and the homogenization treatment pressure in the step of applying pressure treatment for homogenization is 10 to 100 MPa, and the viscosity of the composition after the heat

treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is 300 to 3000 mPa·s, wherein the viscosity of the composition after the heat treatment and storage at a temperature equal to or below normal temperature of 15 to 25°C for 1 to 90 days is measured at 20°C and 12 rpm using a spindle type rotational viscometer.