[Patent Document 6] JP Patent No. 3,509,566

Summary

Problems to be Solved by the Disclosure

[0005]

When microbial cells such as lactic acid bacteria are to be ingested by means of a beverage, it is preferable that such beverage contain microbial cell powders, so as to increase the range of types of final products. When a biologically active material existing inside the cell is to be ingested, it is preferable that the relevant beverage contain disrupted microbial cell powders. In such a case, however, microbial cell powders sink downward in the beverage during storage. In the case of disrupted microbial cell powders, in particular, cell powders adhere to each other, or cell powders adhere to the bottom of the container, and solid sediment is formed disadvantageously. Thus, ingestion of a biologically active material has been found to be difficult, and relevant beverages have been found to suffer from poor appearance. In the case of a carbonated beverage that is introduced into a bottle that cannot be shaken before it is opened, in particular, such beverage would suffer from a difficulty related to dispersion of sediment at the bottom of the container. At the time of production, also, microbial cell powders (and disrupted microbial cell powders, in particular) aggregate, and a container cannot be filled homogeneously with microbial cells.

[0006]

Under the above circumstances, it is an object of the present disclosure to provide an effective means for improving the dispersibility of a sediment or aggregate of microbial cells generated at the time of production and during storage of a beverage containing microbial cells such as lactic acid bacteria.

Means for Solving the Problem

[0007]

The present inventors have conducted concentrated studies in order to attain the above object. As a result, they discovered that incorporation of powders of microbial

cells such as lactic acid bacteria together with polyglycerin fatty acid ester alone or polyglycerin fatty acid ester in combination with organic acid monoglyceride into the beverage would significantly improve the dispersibility of the sediments or aggregates of microbial cells that are generated at the time of production and during storage of a beverage containing microbial cells such as lactic acid bacteria. This has led to the completion of the present disclosure.

[0007a]

In one aspect, the present disclosure refers to a beverage that contains lactic acid bacterial cells comprising (A) lactic acid bacterial cell powder dispersed in the beverage and (B) polyglycerin fatty acid ester composed of polyglycerin having a polymerization degree of 3 to 10 and fatty acid having 10 to 18 carbon atoms connected by ester bonds.

[0007b]

In another aspect, the present disclosure refers to a method for producing a beverage that contains lactic acid bacterial cells, comprising a step of mixing a solution containing lactic acid bacterial cell powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

[0007c]

In another aspect, the present disclosure refers to a method for producing a beverage that contains lactic acid bacterial cells, comprising a step of mixing a solution containing lactic acid bacterial cells powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

[0007d]

In another aspect, the present disclosure refers to a method for improving the dispersibility of a sediment or aggregate of lactic acid bacterial cells in a food or beverage product by mixing a solution containing lactic acid bacterial cell powders

dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

[0007e]

In yet another aspect, the present disclosure refers to a method for improving the dispersibility of a sediment or aggregate of lactic acid bacterial cells in a food or beverage product by mixing a solution containing lactic acid bacterial cell powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

Specifically, the present disclosure includes the following.

(1) A beverage that contains microbial cells comprising (A) microbial cell powder and (B) polyglycerin fatty acid ester composed of polyglycerin having a polymerization degree of 3 to 10 and fatty acid having 10 to 18 carbon atoms connected by ester bonds.

(2) The beverage that contains microbial cells according to (1), wherein the polyglycerin fatty acid ester is pentaglycerin monolaurate.

(3) The beverage that contains microbial cells according to (1) or (2), wherein the beverage further contains organic acid monoglyceride.

(4) The beverage that contains microbial cells according to (3), wherein an organic acid constituting the organic acid monoglyceride is selected from among acetic acid, lactic acid, citric acid, succinic acid, and diacetyl tartaric acid.

(5) The beverage that contains microbial cells according to (3) or (4), wherein, provided that the polyglycerin fatty acid ester content relative to the total amount of the beverage is designated X and the organic acid monoglyceride content relative to the total amount of the beverage is designated Y, the value of Y/X is 10 or less by mass.

(6) The beverage that contains microbial cells according to any of (3) to (5), wherein the beverage contains pentaglycerin monolaurate and succinic acid ester of glycerin monostearate.

(7) The beverage that contains microbial cells according to any of (3) to (5),

wherein the beverage contains pentaglycerin monomyristate and diacetyl tartaric acid ester of glycerin monostearate.

(8) The beverage that contains microbial cells according to any of (3) to (5), wherein the beverage contains decaglycerin monomyristate, pentaglycerin monolaurate, and succinic acid ester of glycerin monostearate.

(9) The beverage that contains microbial cells according to (1) or (2), wherein the polyglycerin fatty acid ester content in the beverage is 0.001% to 0.2% by mass.

(10) The beverage that contains microbial cells according to any of (3) to (8), wherein the content of polyglycerin fatty acid ester and organic acid monoglyceride in the beverage is 0.001% to 0.2% by mass.

(11) The beverage that contains microbial cells according to any of (1) to (10), wherein the microbial cells are disrupted cells.

(12) The beverage that contains microbial cells according to any of (1) to (11), wherein the microbial cells are lactic acid bacteria.

(13) The beverage that contains microbial cells according to (12), wherein the lactic acid bacteria belong to the genus *Lactobacillus*.

(14) The beverage that contains microbial cells according to any of (1) to (13), wherein the beverage contains milk.

(15) The beverage that contains microbial cells according to any of (1) to (14), wherein the beverage contains carbon dioxide.

(16) A method for producing a beverage that contains microbial cells, comprising a step of mixing a solution containing microbial cell powders with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

(17) A method for producing a beverage that contains microbial cells, comprising a step of mixing a solution containing microbial cell powders with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

(18) The method for producing a beverage that contains microbial cells according to (16) or (17), wherein the microbial cells are disrupted cells.

(19) A method for improving the dispersibility of a sediment or aggregate of microbial cells in a food or beverage product by mixing a solution containing microbial cell powders with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

(20) A method for improving the dispersibility of a sediment or aggregate of microbial cells in a food or beverage product by mixing a solution containing microbial cell powders with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

(21) The method for improving the dispersibility of a sediment or aggregate of microbial cells in a food or beverage product according to (19) or (20), wherein the microbial cells are disrupted cells.

[0009]

This patent application claims priority from Japanese Patent Application No. 2015-247787 filed on December 18, 2015, and it includes part or all of the contents as disclosed in the description thereof.

Effects of the Disclosure

[0010]

The present disclosure provides a beverage that contains microbial cells such as lactic acid bacteria, which are useful as functional components for maintenance and improvement of health and are excellent in stability at the time of production and during storage. In the beverage of the present disclosure, sediments or aggregates of microbial cells generated during storage are sufficiently dispersed, and sediments or aggregates do not adhere to the bottom of the container. According to the present disclosure, therefore, microbial cells such as lactic acid bacteria can be incorporated into a carbonated beverage contained in a bottle that cannot be strongly shaken before it is

opened, so as to disperse the sediment. According to the present disclosure, in addition, microbial cell dispersibility at the time of production can be improved, and the beverage can thus homogeneously contain microbial cells.

Brief Description of the Drawing

[0011]

Fig. 1 shows photographs of the bottoms and the overall appearances of the containers indicating the evaluation standards for sedimentation.

Embodiments for Carrying out the Invention

[0012]

1. Beverage that contains microbial cells and method for producing the same

The beverage of the present invention contains microbial cell powders and an emulsifier that improves the dispersibility of a sediment or aggregate of microbial cells generated at the time of production and during storage. Examples of types of the beverages of the present invention include milk beverages, carbonated beverages, fruit/vegetable juice beverages, tea beverages, coffee beverages, functional beverages, and sports beverages.

[0013]

[Microbial cells]

Representative examples of microbial cells used for the beverage of the present invention are lactic acid bacteria, although microbial cells are not limited thereto. For example, yeast cells may be used. In addition to a lactic acid bacillus and lactic acid cocci, in a broad sense, *Bifidobacterium* is within the scope of lactic acid bacteria. Lactic acid bacteria are not particularly limited, provided that they are generally used for food or beverage products. Examples thereof include those belonging to the genera *Lactobacillus*, *Bifidobacterium*, *Leuconostoc*, *Lactococcus*, *Pediococcus*, *Enterococcus*, *Streptococcus*, and *Weissella*, with lactic acid bacteria belonging to the genus *Lactobacillus* being particularly preferable. Such lactic acid bacteria may be used alone or in combinations of two or more.

[0014]

Examples of lactic acid bacteria belonging to the genus *Lactobacillus* include

CLAIMS

1. A beverage that contains lactic acid bacterial cells comprising (A) lactic acid bacterial cell powder dispersed in the beverage and (B) polyglycerin fatty acid ester composed of polyglycerin having a polymerization degree of 3 to 10 and fatty acid having 10 to 18 carbon atoms connected by ester bonds.

2. The beverage that contains lactic acid bacterial cells according to claim 1, wherein the polyglycerin fatty acid ester is pentaglycerin monolaurate.

3. The beverage that contains lactic acid bacterial cells according to claim 1 or 2, wherein the beverage further contains organic acid monoglyceride.

4. The beverage that contains lactic acid bacterial cells according to claim 3, wherein an organic acid constituting the organic acid monoglyceride is selected from acetic acid, lactic acid, citric acid, succinic acid, and diacetyl tartaric acid.

5. The beverage that contains lactic acid bacterial cells according to claim 3 or 4, wherein, provided that the polyglycerin fatty acid ester content relative to the total amount of the beverage is designated X and the organic acid monoglyceride content relative to the total amount of the beverage is designated Y, the value of Y/X is 10 or less by mass.

6. The beverage that contains lactic acid bacterial cells according to any one of claims 3 to 5, wherein the beverage contains pentaglycerin monolaurate and succinic acid ester of glycerin monostearate.

7. The beverage that contains lactic acid bacterial cells according to any one of claims 3 to 5, wherein the beverage contains pentaglycerin monomyristate and diacetyl tartaric acid ester of glycerin monostearate.

8. The beverage that contains lactic acid bacterial cells according to any one of claims 3 to 5, wherein the beverage contains decaglycerin monomyristate, pentaglycerin monolaurate, and succinic acid ester of glycerin monostearate.

9. The beverage that contains lactic acid bacterial cells according to claim 1 or 2, wherein the polyglycerin fatty acid ester content in the beverage is 0.001% to 0.2% by

mass.

10. The beverage that contains lactic acid bacterial cells according to any one of claims 3 to 8, wherein the content of polyglycerin fatty acid ester and organic acid monoglyceride in the beverage is 0.001% to 0.2% by mass.

11. The beverage that contains lactic acid bacterial cells according to any one of claims 1 to 10, wherein the lactic acid bacterial cells are disrupted cells.

12. The beverage that contains lactic acid bacterial cells according to any one of claims 1 to 11, wherein the lactic acid bacteria belong to the genus *Lactobacillus*.

13. The beverage that contains lactic acid bacterial cells according to any one of claims 1 to 12, wherein the beverage contains milk.

14. The beverage that contains lactic acid bacterial cells according to any one of claims 1 to 13, wherein the beverage contains carbon dioxide.

15. A method for producing a beverage that contains lactic acid bacterial cells, comprising a step of mixing a solution containing lactic acid bacterial cell powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

16. A method for producing a beverage that contains lactic acid bacterial cells, comprising a step of mixing a solution containing lactic acid bacterial cells powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

17. The method for producing a beverage that contains lactic acid bacterial cells according to claim 15 or 16, wherein the lactic acid bacterial cells are disrupted cells.

18. A method for improving the dispersibility of a sediment or aggregate of lactic acid bacterial cells in a food or beverage product by mixing a solution containing lactic acid bacterial cell powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

19. A method for improving the dispersibility of a sediment or aggregate of lactic acid bacterial cells in a food or beverage product by mixing a solution containing lactic acid bacterial cell powders dispersed in the beverage with an emulsifier solution containing polyglycerin fatty acid ester and organic acid monoglyceride dispersed in an alkaline solution at 50°C to 90°C and homogenizing the mixture.

20. The method for improving the dispersibility of a sediment or aggregate of lactic acid bacterial cells in a food or beverage product according to claim 18 or 19, wherein the lactic acid bacterial cells are disrupted cells.