

DESCRIPTION

TITLE OF INVENTION: SOY SAUCE-LIKE SEASONING

5 TECHNICAL FIELD

[0001]

The present invention relates to a soy sauce-like seasoning.

BACKGROUND ART

10 [0002]

Soy sauce is a liquid seasoning produced by fermentation of raw materials such as soybeans, wheat, and a common salt using yeasts or the like. Soy sauce has a wide variety of applications, including a tabletop use where food materials are dipped in soy sauce or soy sauce is dripped over food materials, and cooking of boiled food, broiled food, sauté, and the like. Soy sauce is also used as raw material of soup, sauce, and the like.

[0003]

In order to provide a desirable flavor in food materials and cooked products, soy sauce is required to have lasting *umami* (*oku* attribute (richness)). As techniques for imparting or enhancing *oku* attribute (richness) in soy sauce, a method that produces a brewed light-color soy sauce with rich *umami* with the use of halotolerant lactic acid bacteria, and a method that enhances *oku* attribute (richness) by adding a pyroglutamyl dipeptide or a salt thereof to seasonings such as soy sauce are conventionally known (see, for example, Patent Literatures 1 and 2).

25

CITED REFERENCES

PATENT LITERATURE

[0004]

PTL 1: JP-A-2004-24248

30 PTL 2: JP-A-2012-29616

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005]

However, in addition to the known techniques, alternative means to impart *koku* attribute (richness) to soy sauce are much needed.

[0006]

5 An object of the present invention to provide a novel soy sauce-like seasoning imparted with *koku* attribute (richness).

MEANS FOR SOLVING THE PROBLEMS

[0007]

10 The present inventors conducted intensive studies to find a solution to the foregoing problem, and, after confirming that traditional soy sauces hardly contain α -ketoglutaric acid, found out, rather surprisingly, that a soy sauce-like seasoning containing a certain quantity of α -ketoglutaric acid has a body, in addition to desirable *koku* attribute (richness). The present invention has been completed on the basis of this
15 finding.

[0008]

Specifically, the present invention provides a soy sauce-like seasoning containing at least 0.3 mM of α -ketoglutaric acid. Here, the salt concentration in the soy sauce-like seasoning is preferably 9% (w/v) or less, more preferably 5% (w/v) or
20 less.

[0009]

The soy sauce-like seasoning of the present invention contains at least 0.3 mM of α -ketoglutaric acid, and has desirable *koku* attribute (richness), and a desirable body.

[0010]

25 The present invention also provides a method for imparting *koku* attribute (richness) to a soy sauce-like seasoning, the method including adding at least 0.3 mM of α -ketoglutaric acid to a soy sauce-like seasoning.

EFFECT OF THE INVENTION

30 [0011]

According to the present invention, a soy sauce-like seasoning having desirable *koku* attribute (richness) and a desirable body can be provided. Further, according to the present invention, a method for imparting desirable *koku* attribute (richness) to a soy

sauce-like seasoning can be provided. Furthermore, according to the present invention, a method for imparting a desirable body to a soy sauce-like seasoning can be provided.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

FIG. 1 is a diagram representing the result of a sensory evaluation of the soy sauce-like seasoning of Example 1. In the figure, * means an evaluation item for which the difference was statistically significant ($P < 0.05$), and ** means an evaluation item for which the difference was statistically significant ($P < 0.01$).

FIG. 2 is a diagram representing the result of a sensory evaluation of the soy sauce-like seasoning of Example 2. In the figure, * means an evaluation item for which the difference was statistically significant ($P < 0.05$), and ** means an evaluation item for which the difference was statistically significant ($P < 0.01$).

FIG. 3 is a diagram representing the result of a sensory evaluation of the soy sauce-like seasoning of Example 3. In the figure, * means an evaluation item for which the difference was statistically significant ($P < 0.05$), and ** means an evaluation item for which the difference was statistically significant ($P < 0.01$).

FIG. 4 is a diagram representing the result of a sensory evaluation of the soy sauce-like seasoning of Example 4. In the figure, * means an evaluation item for which the difference was statistically significant ($P < 0.05$), and ** means an evaluation item for which the difference was statistically significant ($P < 0.01$).

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0013]

Embodiments for carrying out the present invention are described below in detail. The present invention, however, is not limited to the following embodiments.

[0014]

As used herein, “mM” means millimolar concentration.

[0015]

As used herein, “soy sauce” means the “soy sauce” defined by The Japanese Agricultural Standards (May 28, 2015, Ministry of Agriculture, Forestry and Fisheries, Notification No. 1387).

[0016]

As used herein, “soy sauce-like seasoning” refers to a liquid seasoning used for the same purposes as the “soy sauce” defined by The Japanese Agricultural Standards, and is a concept including soy sauce, and processed soy sauce products. Raw materials (for example, soybeans, and wheat) derived from a soy sauce *kōji* are not necessarily required to be used for the soy sauce-like seasoning, provided that the soy sauce-like seasoning is used for the same purpose as the “soy sauce”. The soy sauce-like seasoning may contain additives such as a fruit juice, a vegetable juice, extracts, soup stocks, sugars, seasoning blends, alcohol, fermented seasoning blends, acidulants, and flavoring agents. The soy sauce-like seasoning in this specification is preferably “one that is authentically brewed” in the same manner as described for the “soy sauce” defined by The Japanese Agricultural Standards. Also, the soy sauce-like seasoning in this specification is preferably one that uses cereal-derived raw materials (for example, soybeans, barley or wheat, and rice). Preferably, the soy sauce-like seasoning in this specification excludes a chemically processed soy sauce including hydrolyzed vegetable protein. More preferably, the soy sauce-like seasoning excludes soy sauce-like seasonings containing a raw material that has been decomposed with hydrochloric acid, and soy sauce-like seasonings that use chicken as a raw material.

[0017]

As used herein, “*koku* attribute (richness)” means a deep, pleasant flavor with lasting tastes including *umami*, that stays in the mouth after eating or drinking.

[0018]

1. Soy Sauce-Like Seasoning

The soy sauce-like seasoning according to the present embodiment contains α -ketoglutaric acid. The α -ketoglutaric acid may be free form, or may be in the form of a salt available as a food product. Examples of the salts of α -ketoglutaric acid include a sodium salt, and a potassium salt.

[0019]

The soy sauce-like seasoning according to the present embodiment contains α -ketoglutaric acid in a concentration of 0.3 mM or more. In this way, desirable *umami* and *koku* attribute (richness), and a desirable body can be imparted to the soy sauce-like seasoning. The concentration of α -ketoglutaric acid may be appropriately adjusted within a range of 0.3 mM or more, according to the intended use of the soy sauce-like seasoning, the salt concentration, and the like.

[0020]

In the soy sauce-like seasoning according to the present embodiment, the upper limit concentration of α -ketoglutaric acid is not particularly limited. However, in view of cost reduction and flavor (acid taste), the upper limit may be, for example, 10 mM or less. The soy sauce-like seasoning according to the present embodiment contains α -ketoglutaric acid in a concentration of preferably 5 mM or less, more preferably 3 mM or less. In this way, desirable *umami* and *oku* attribute (richness), and a desirable body can be imparted to the soy sauce-like seasoning.

[0021]

Accordingly, the concentration of the α -ketoglutaric acid in the soy sauce-like seasoning according to the present embodiment may be from 0.3 mM to 10 mM, from 0.3 mM to 5 mM, or from 0.3 mM to 3 mM.

[0022]

The concentration of α -ketoglutaric acid may be measured by, for example, liquid chromatography-tandem mass spectrometry (LC/MS/MS), using a polymer reverse-phase chromatography column.

[0023]

The salt concentration in the soy sauce-like seasoning according to the present embodiment is not particularly limited. However, from the view point of exhibiting the effect of the present invention more remarkably, the salt concentration is preferably 9% (w/v) or less, more preferably 5% (w/v) or less.

[0024]

In the soy sauce-like seasoning according to the present embodiment, the lower limit of salt concentration is not particularly limited, and may be 0% (w/v) (salt-free).

[0025]

The salt concentration may be measured by using known methods such as potentiometry and the Mohr's method.

[0026]

The soy sauce-like seasoning according to the present embodiment may be used in the same fashion as the "soy sauce" of The Japanese Agricultural Standards, or may be used by being mixed into any food and beverages. For example, the soy sauce-like seasoning may be used as a raw material of soups, sauces, dressings, and the like, or may be used for cooking of boiled food, broiled food, sauté, and the like.

[0027]

For example, the soy sauce-like seasoning according to the present embodiment can be produced by adding α -ketoglutaric acid to the base soy sauce-like seasoning, and adjusting the content of α -ketoglutaric acid, followed by optional
5 procedures including dilution, concentration (e.g., deaeration, heating, drying, and heating and deaeration under reduced pressure), and addition of various additives. As another example, the soy sauce-like seasoning according to the present embodiment also may be produced by producing α -ketoglutaric in the base soy sauce-like seasoning through microorganism fermentation.

10 [0028]

As the base soy sauce-like seasoning, for example, a soy sauce or a liquid seasoning produced by a known method may be used. From the viewpoint of exhibiting the effect of the present invention more remarkably, it is preferable to use a soy sauce, more preferably a soy sauce having a salt concentration of 9% (w/v) or less, further
15 preferably a soy sauce having a salt concentration of 5% (w/v) or less.

[0029]

A soy sauce having a salt concentration of 9% (w/v) or less, or a soy sauce having a salt concentration of 5% (w/v) or less can be produced by using, for example, a method in which a soy sauce produced by a known method is desalted by electrodialysis
20 using an ion-exchange membrane, a method that dilutes a soy sauce produced by a known method, a method that performs preparation and fermentation under salt-free or low-salt conditions, and the like.

[0030]

The soy sauce-like seasoning thus obtained may be refined. The refining
25 method is not limited, and may be performed by known methods such as a membrane process, diatomaceous earth filtration, centrifugation, aggregation, and sedimentation.

[0031]

The obtained soy sauce-like seasoning may be pasteurized or processed for removal of bacteria. In the case of pasteurization, the process involves a heat
30 pasteurization step. The heating may be performed under the heating conditions used in a known soy sauce production process. Preferably, the soy sauce-like seasoning is heated at from 80 to 85°C for from 20 to 60 minutes, or at from 110 to 120°C for from 5 to 20 seconds, and then cooled. Because the heating may produce sediments, the soy

sauce-like seasoning is allowed to stand for a few days, and the supernatant is separated from the sediment to obtain the product soy sauce-like seasoning. For removal of bacteria, the soy sauce-like seasoning is, for example, filtered using a known MF membrane, and the filtrate is obtained as the product soy sauce-like seasoning.

[0032]

2. Method for Imparting *Koku* attribute (richness) to Soy Sauce-Like Seasoning

The soy sauce-like seasoning according to the present embodiment exhibits an effect of having desirable *oku* attribute (richness). Accordingly, as an embodiment of the present invention, a method for imparting *oku* attribute (richness) to a soy sauce-like seasoning including adding at least 0.3 mM of α -ketoglutaric acid to a soy sauce-like seasoning is provided.

[0033]

3. Method for Imparting Body to Soy Sauce-Like Seasoning

The soy sauce-like seasoning according to the present embodiment exhibits an effect of having desirable body. Accordingly, as an embodiment of the present invention, a method for imparting a body to a soy sauce-like seasoning including adding at least 0.3 mM of α -ketoglutaric acid to a soy sauce-like seasoning is provided.

EXAMPLES

[0034]

The following describes the present invention in greater detail using Examples. The present invention, however, is not limited to the following Examples.

[0035]

Example 1: Soy Sauce-Like Seasoning Having a Salt Concentration of 0% (w/v)

25 Production of Soy Sauce-Like Seasoning Having a Salt Concentration of 0% (w/v)

Steamed and denatured defatted soybeans, and crushed roasted wheat were mixed in equal amounts, and seed starter of *Aspergillus sojae* is inoculated therein. Then, the mixture was processed for 42 hours using an ordinary method to obtain a soy sauce *koji* (*koji*-making).

30 One-hundred parts by mass of the soy sauce *koji* thus obtained was put into one-hundred thirty parts by mass of saline (salt concentration of 26% (w/v)), and the mixture was fermented and aged at 25 to 30°C for 150 days while being appropriately

stirred to control fermentation, using an ordinary method. The aged *moromi* (*moromi*-mash) thus obtained was pressed and filtered to obtain an unheated soy sauce.

The obtained unheated soy sauce was heated at 80°C for 1 hour, and refined by filtration to obtain a soy sauce. The obtained soy sauce was then desalted with an
 5 electro dialyzer (manufactured by Astom Corporation) to obtain a soy sauce having a salt concentration of 0.1% (w/v) (Comparative Example 1).

The α -ketoglutaric acid concentration was below the detection limit (0.01 mM) both in the soy sauce obtained after filtration and refinement, and in the soy sauce having a salt concentration of 0.1% (w/v). The α -ketoglutaric acid concentration was
 10 measured by LC/MS/MS under the following conditions.

Measurement device: Alliance 2695, 2966, Quattro micro API (manufactured by Waters)

Column: YMC-Triart C18, 1.9 μ m, 100 $\times$ 2.0 mm ID (manufactured by YMC Co., Ltd.)

15 Mobile phase: A) 0.1% (v/v) formic acid aqueous solution, B) methanol
 Gradient: 0 - 1 min (B: 0%), 1 - 3 min (B: 0 - 15%), 3 - 8 min (B: 15 - 50%), 8 - 10 min (B: 50-100%)

Flow rate: 0.2 mL/min

Column temperature: 45°C

20 Ionization, analysis: ESI(-), MRM

To the obtained soy sauce having a salt concentration of 0.1% (w/v) was added α -ketoglutaric acid in a concentration of 1 mM, and these were mixed to obtain a soy sauce-like seasoning having a salt concentration of 0.1% (w/v) (Example 1).

[0036]

25 Sensory Evaluation Test

The soy sauce-like seasoning of Example 1, and the soy sauce of Comparative Example 1 were evaluated by sensory evaluation. The sensory evaluation was made by eight panelists having a discrimination ability. The panelists were asked to evaluate *umami*, *koku* attribute (richness), acid taste, body (strength of a taste), and bitterness in
 30 seven levels (7: very strong, 6: strong, 5: slightly strong, 4: no difference, 3: slightly weak, 2: weak, 1: very weak), relative to the soy sauce of Comparative Example 1 at the reference level (level 4), and average values were calculated. The result is shown in FIG. 1.

[0037]

The soy sauce-like seasoning of Example 1 containing α -ketoglutaric acid had significantly improved *koku* attribute (richness) and body as compared to the soy sauce of Comparative Example 1. The soy sauce-like seasoning of Example 1 also had significantly improved *umami* and acid taste, and the overall flavor was more balanced than in the soy sauce of Comparative Example 1.

[0038]

Example 2: Soy Sauce-Like Seasoning Having a Salt Concentration of 5% (w/v)

Production of Soy Sauce-Like Seasoning Having a Salt Concentration of 5% (w/v)

The soy sauce obtained after filtration and refinement in Example 1 was desalted with an electrodialyzer (manufactured by Astom Corporation) to obtain a soy sauce having a salt concentration of 5% (w/v) (Comparative Example 2).

The α -ketoglutaric acid concentration in the obtained soy sauce having a salt concentration of 5% (w/v) was below the detection limit (0.01 mM). The α -ketoglutaric acid concentration was measured in the same manner as in Example 1.

To the obtained soy sauce having a salt concentration of 5% (w/v) was added α -ketoglutaric acid in a concentration of 2.5 mM, and these were mixed to obtain a soy sauce-like seasoning having a salt concentration of 5% (w/v) (Example 2).

[0039]

Sensory Evaluation Test

The soy sauce-like seasoning of Example 2, and the soy sauce of Comparative Example 2 were evaluated in the same manner as in the sensory evaluation described in Example 1, using the soy sauce of Comparative Example 2 as a reference. The result is shown in FIG. 2.

[0040]

The soy sauce-like seasoning of Example 2 containing α -ketoglutaric acid had significantly improved *koku* attribute (richness) and body compared to the soy sauce of Comparative Example 2. The soy sauce-like seasoning of Example 2 also generally had improved *umami* and acid taste, and the overall flavor was more balanced than in the soy sauce of Comparative Example 2.

[0041]

Example 3: Soy Sauce-Like Seasoning Having a Salt Concentration of 8.7% (w/v)

Production of Soy Sauce-Like Seasoning Having a Salt Concentration of 8.7% (w/v)

The soy sauce obtained after filtration and refinement in Example 1 was desalted with an electrodialyzer (manufactured by Astom Corporation) to obtain a soy sauce having a salt concentration of 8.7% (w/v) (Comparative Example 3).

5 To the obtained soy sauce having a salt concentration of 8.7% (w/v) was added α -ketoglutaric acid in a concentration of 5 mM, and these were mixed to obtain a soy sauce-like seasoning having a salt concentration of 8.7% (w/v) (Example 3).

The α -ketoglutaric acid concentration in the soy sauce having a salt concentration of 8.7% (w/v) was below the detection limit (0.01 mM). The α -ketoglutaric acid concentration was measured in the same manner as in Example 1.

10 [0042]

Sensory Evaluation Test

The soy sauce-like seasoning of Example 3, and the soy sauce of Comparative Example 3 were evaluated in the same manner as in the sensory evaluation described in Example 1, using the soy sauce of Comparative Example 3 as a reference. The result is
15 shown in FIG. 3.

[0043]

The soy sauce-like seasoning of Example 3 containing α -ketoglutaric acid had significantly improved *koku* attribute (richness) and body compared to the soy sauce of Comparative Example 3. The soy sauce-like seasoning of Example 3 also generally had
20 improved *umami* and acid taste, and the overall flavor was more balanced than in the soy sauce of Comparative Example 3.

[0044]

Example 4: Soy Sauce-Like Seasoning Having a Salt Concentration of 16% (w/v) Production of Soy Sauce-Like Seasoning Having a Salt Concentration of 16% (w/v)

25 α -Ketoglutaric acid was added in a concentration of 10 mM to a commercially available *koikuchi* (dark-colored) soy sauce having a salt concentration of 16% (w/v) (manufactured by Kikkoman Corporation; Comparative Example 4), and these were mixed to obtain a soy sauce-like seasoning having a salt concentration of 16% (w/v) (Example 4).

30 The α -ketoglutaric acid concentration in the soy sauce having a salt concentration of 16% (w/v) was below the detection limit (0.01 mM). The α -ketoglutaric acid concentration was measured in the same manner as in Example 1.

[0045]

Sensory Evaluation Test

The soy sauce-like seasoning of Example 4, and the soy sauce of Comparative Example 4 were evaluated in the same manner as in the sensory evaluation described in Example 1, using the soy sauce of Comparative Example 4 as a reference. The result is shown in FIG. 4.

[0046]

The soy sauce-like seasoning of Example 4 containing α -ketoglutaric acid had significantly improved *koku* attribute (richness) and body compared to the soy sauce of Comparative Example 4. The soy sauce-like seasoning of Example 4 also generally had improved *umami* and acid taste, and the overall flavor was more balanced than in the soy sauce of Comparative Example 4.

[0047]

Test Example 1: Effect of Organic Acid on Flavor of Soy Sauce-Like Seasoning

Lactic acid, succinic acid, citric acid, fumaric acid, malic acid, adipic acid, or α -ketoglutaric acid was added in a concentration of 0.3 mM to the soy sauce having a salt concentration of 0.1% (w/v) (Comparative Example 1) obtained in Example 1, and these were mixed to obtain seven different soy sauce-like seasonings containing these organic acids.

[0048]

The seven soy sauce-like seasonings thus obtained were evaluated by sensory evaluation. The sensory evaluation was made by five panelists having a discrimination ability. The panelists were asked to evaluate *umami*, *koku* attribute (richness), acid taste, body (strength of a taste), and bitterness in four levels (Excellent: large improvement, Good: improvement, Moderate: slight improvement, Poor: no difference), relative to the soy sauce of Comparative Example 1 used as a reference. The result is presented in Table 1. Incidentally, in Table 1, the evaluation results that were agreed by the largest number of panelists among the five panelists were described, and when different evaluation results were given by the same numbers of panelists, the evaluation result closer to the average was described.

[0049]

[Table 1]

	<i>Umami</i>	<i>Koku</i> attribute (richness)	Acid taste	Body (strength of a taste)	Bitterness	Comment
Lactic acid	Poor	Moderate	Moderate	Poor	Moderate	Mild acid taste, aftertaste is bitter and sour
Succinic acid	Excellent	Poor	Poor	Poor	Poor	Light soft <i>umami</i>
Citric acid	Poor	Poor	Good	Poor	Poor	Clear refreshing acid taste
Fumaric acid	Poor	Moderate	Excellent	Moderate	Moderate	Sharp pungent acid taste and bitterness
Malic acid	Poor	Moderate	Good	Moderate	Good	Sharp acid taste and bitterness
Adipic acid	Poor	Poor	Moderate	Poor	Poor	Mild acid taste with little sharpness in the aftertaste
α -Ketoglutaric acid	Good	Good	Moderate	Good	Poor	Acid taste with <i>umami</i> , long-lasting aftertaste (strong <i>koku</i> attribute (richness))

[0050]

- The soy sauce-like seasoning containing α -ketoglutaric acid had more desirable
- 5 *koku* attribute (richness) and body than the soy sauce-like seasonings containing the other organic acids. The soy sauce-like seasoning containing α -ketoglutaric acid also had more desirable *umami*, and the overall flavor was more balanced.

CLAIMS:

1. A soy sauce-like seasoning comprising at least 0.3 mM of α -ketoglutaric acid, wherein:
 - the soy sauce-like seasoning uses cereal-derived raw materials;
 - the soy sauce-like seasoning is pasteurized or processed for removal of bacteria; and
 - the soy sauce-like seasoning includes soy sauce, and processed soy sauce products,with the proviso that the soy sauce-like seasoning excludes soy sauce-like seasonings containing a raw material that has been decomposed with hydrochloric acid and soy sauce-like seasonings that use chicken as a raw material.
2. The soy sauce-like seasoning according to claim 1, which has a salt concentration of 9% (w/v) or less.
3. The soy sauce-like seasoning according to claim 1, which has a salt concentration of 5% (w/v) or less.
4. The soy sauce-like seasoning according to any one of the preceding claims, wherein the cereal-derived materials are selected from: soybeans, barley, wheat, and rice.
5. The soy sauce-like seasoning according to any one of claims 1 to 4, comprising 0.3 mM to 2.5 mM of α -ketoglutaric acid.
6. A method for imparting *koku* attribute (richness) to a soy sauce-like seasoning, the method comprising:
 - adding at least 0.3 mM of α -ketoglutaric acid to the soy sauce-like seasoning,with the proviso that the soy sauce-like seasoning excludes soy sauce-like seasonings containing a raw material that has been decomposed with hydrochloric acid and soy sauce-like seasonings that use chicken as a raw material,
 - wherein the soy sauce-like seasoning includes soy sauce, and processed soy sauce products.
7. The method according to claim 6, comprising adding 0.3 mM to 2.5 mM of α -ketoglutaric acid to the soy sauce-like seasoning.