

DESCRIPTION

BEVERAGE HAVING ENHANCED SOURNESS

TECHNICAL FIELD

[0001] The present invention relates to a beverage with enhanced sour taste.

BACKGROUND ART

[0002] Wide variety of beverages are on the market for diversification in preferences of consumers and growing health consciousness. As one of them, beverage products that have strong sour taste to refresh consumers through their stimuli of sourness in hot days in summer or when they are tired are on the market. Examples of such products on the market include: "Shakitto-suppai (R) C.C. Lemon (R)" (SUNTORY BEVERAGE & FOOD LIMITED), which was merchandised with a news release stating that concentrated sourness was tasty; "MITSUYA (R) acerola" (ASAHI SOFT DRINKS CO., LTD.), which was merchandised with a news release stating that its sourness was at the highest level in the MITSUYA brand; "MITSUYA (R) green lemon" (ASAHI SOFT DRINKS CO., LTD.), which was merchandised with a news release stating that it was the sourest in the MITSUYA brand; "Sugoku-suppai lemonade" (SEIJO ISHII CO., LTD.); and "Shigekix (R) Chuhai soda taste" (Mitsubishi Shokuhin Co., Ltd), which is an alcohol drink and was merchandised with a statement that its sourness was extremely stimulative. The sour taste of these are enhanced by incorporating a large amount of an acidulant such as citric acid.

[0003] In addition, various methods for enhancing sour taste of a beverage have also been suggested. For example, there are known a method for enhancing sour taste of a beverage, the method including adding sucralose and/or a stevia extract, as well as a fruit flavor (PTL 1), and a method for enhancing sour taste of a beverage (particularly, a beverage with a fruit flavor/taste), the method including adjusting the monoethyl citrate content of the beverage to fall within a specific range (PTL 2).

CITATION LIST

PATENT LITERATURE

[0004] PTL 1: JP 2013-27363A

PTL 2: JP 2020-103152A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] As described above, some techniques for enhancing sour taste of a beverage are known. However, beverages are undergoing diversification in terms of its kinds and flavors/tastes nowadays, and there is a possibility that sour taste cannot be enhanced to every kind of beverages only by conventional techniques. It is desirable to develop novel methods different from conventional techniques to widen, if only a little, the range of the kinds of beverages whose sour taste can be favorably enhanced.

[0006] An object of the present invention is to develop a novel method for effectively enhancing sour taste of a beverage to thereby provide a novel beverage with enhanced sour taste.

SOLUTION TO PROBLEM

[0007] As a result of earnest studies for the above-described object, the present inventors have found that L-ergothioneine can effectively enhance sour taste of a beverage, and have completed the present invention. The present invention encompasses the following aspects, but is not limited thereto.

[1] A beverage containing L-ergothioneine and a sour taste component, wherein the beverage has an acidity X (%) and an L-ergothioneine content Y (w/w%) satisfying the following expressions (i) or (ii):

(i) when $0.03 \leq X$, $Y \geq 0.00005$

(ii) when $0.00001 \leq X < 0.03$, $Y \geq 0.001 \times e^{-100X}$.

[2] The beverage according to [1], wherein the beverage is served for drinking at a temperature equal to or less than an ambient temperature.

[3] The beverage according to [1] or [2], wherein the beverage is a packed beverage.

[4] The beverage according to any one of [1] to [3], wherein the beverage is an instant

drink.

ADVANTAGEOUS EFFECTS OF INVENTION

[0008] According to the present invention, sour taste of a beverage can be effectively enhanced. The present invention enables reduction in the amount of the sour taste component while maintaining the sour taste of the beverage. Accordingly, stimuli to the tongue and acid erosion of tooth due to the sour taste component can be reduced, and also, sufficient sour taste can advantageously be obtained without undue decrease in the pH of the beverage.

BRIEF DESCRIPTION OF DRAWING

[0009] FIG. 1 is a graph on which the results of the grade when the acidity was 0.05% or less in Experiment 3 in Examples are plotted.

DESCRIPTION OF EMBODIMENTS

[0010] Embodiments of the present invention will now be described, but embodiments of the present invention are not limited to examples below.

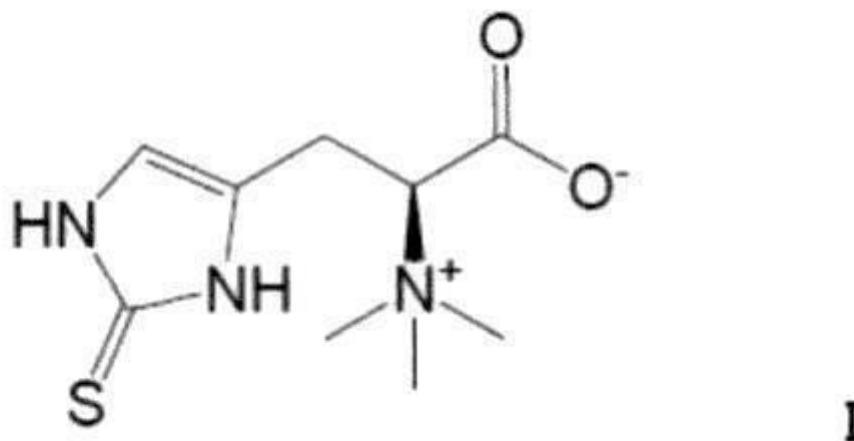
In the present invention, the sour taste of a beverage can be enhanced by allowing the beverage to contain L-ergothioneine as a sour taste-enhancing component. Herein, "sour taste" means a sense of sour as typified by vinegar in an organoleptic test of a beverage in terms of the sense of taste of the beverage.

[0011] (L-Ergothioneine)

In the present invention, sour taste of a beverage can be enhanced by allowing the beverage to contain L-ergothioneine (L-(+)-Ergothioneine (CAS 58511-63-0)) (hereinafter, L-ergothioneine is abbreviated to as EGT) as an active ingredient. EGT itself does not have sour taste at all; however, by adding EGT to a beverage, sour taste of the beverage is enhanced, and the sour taste is thus effectively intensified or emphasized.

[0012] EGT is a compound represented by formula I below.

[0013] [Chemical Formula 1]



[0014] For the beverage of the present invention, a commercially available EGT produced by chemical synthesis may be used, or an extract from, for example, mushroom or sake lees containing EGT or a purified product thereof may be used. Examples of the mushroom that can be used for extracting EGT include Golden/Yellow Oyster mushroom (botanical name: *Pleurotus cornucopiae* var. *citrinopileatus*), which is mushroom of Pleurotaceae, *Pleurotus*; common mushroom (botanical name: *Agaricus bisporus*), such as white button mushroom, cremini mushroom, and Portabella mushroom; Grey Oyster Mushroom (botanical name: *Pleurotus ostreatus*); Shiitake mushroom (botanical name: *Lentinula edodes*); Hen of the Woods (botanical name: *Grifola Frondosa*); Reishi mushroom (botanical name: *Ganoderma lucidum*); lion's mane mushroom (botanical name: *Hericiium erinaceus*); poplar mushroom (botanical name: *Agrocybe aegerita*); golden chanterelle (botanical name: *Cantharellus cibarius*); Porcini (botanical name: *Boletus edulis*); and common morel (botanical name: *Morchella esculenta*). These may be used singly or in combinations of two or more thereof. Among these, Golden/Yellow Oyster mushroom is preferred, which has a large EGT content. In a case where an extract is used as EGT, it is preferably a roughly purified product through deodorization treatment or the like since the aroma/flavor of components other than EGT may affect the beverage.

[0015] (Beverage)

The beverage of the present invention is a beverage having an acidity within a specific range. The "acidity" herein refers to an acidity in terms of citric acid, specifically, a citric acid concentration in weight/volume percent in the assumption that all acids contained in the beverage are regarded as citric acid. The acidity is calculated on the basis of the method for determining an acidity, defined in Japanese Agricultural Standards (Public Notice of the Ministry of Agriculture, Forestry and Fisheries No. 1127, August 8, 2006). A specific determination method will be described in the section "Examples."

[0016] In the present invention, the sour taste of a beverage is effectively enhanced by a synergistic effect of a sour taste component and EGT in the beverage. In a case where a beverage contains a sour taste component in an amount that provides an acidity of 0.03% or more, the effect of the present invention is likely to be exhibited when the EGT concentration of the beverage is 0.00005 w/w% or more. In other words, a beverage satisfying expressions (i) below is one example of suitable modes of the beverage of the present invention, wherein the beverage has an acidity X (%) and an L-ergothioneine content Y (w/w%).

[0017] (i) $0.03 \leq X$ and $Y \geq 0.00005$

The upper limit of the acidity is not particularly limited, and is preferably approximately 2.5% or less, more preferably 2.0% or less, even more preferably 1.5% or less, and particularly preferably 1.0% or less, in view of the effect.

[0018] The EGT concentration is preferably 0.0002 w/w% or more, more preferably 0.0004 w/w% or more, and even more preferably 0.0006 w/w% or more. In light of economical merits, the upper limit of the EGT concentration is approximately 0.05 w/w%, since even adding a larger amount of EGT does not enhance the sour taste-enhancing effect. The EGT concentration is preferably 0.03 w/w% or less, more preferably 0.01 w/w% or less, and even more preferably 0.008 w/w% or less.

[0019] In a case where a beverage contains a sour taste component in an amount that provides an acidity of less than 0.03%, the effect of the present invention is likely to be

exhibited when the acidity X (%) and the L-ergothioneine content Y (w/w%) of the beverage satisfy expressions (ii) below, as demonstrated in Experiment 3 in Examples described later. In expressions (ii), "e" is the base of logarithm natural (Napier's number).

[0020] (ii) $0.00001 \leq X < 0.03$ and $Y \geq 0.001 \times e^{-100X}$

The lower limit of the acidity is 0.00001% or more in view of the effect, and preferably 0.0001% or more, more preferably 0.001% or more, and even more preferably 0.01% or more.

[0021] The beverage of the present invention contains a sour taste component, and the acidity of the beverage of the present invention can be adjusted with the sour taste component. The sour taste component that can be used in the present invention is not particularly limited as long as it is an acid that can be used in beverages, and examples thereof include organic acids such as citric acid, succinic acid, malic acid, acetic acid, tartaric acid, gluconic acid, ascorbic acid, lactic acid, and fumaric acid, and also phosphoric acid. Among these, citric acid, tartaric acid, malic acid, lactic acid, phosphoric acid, and ascorbic acid exhibit the effect of the present invention remarkably. Various salts (e.g., sodium salts) of these acid components can also be used. The above-described acids and salts thereof may be those contained in a fruit juice or fruit extract or a fermented material. Specifically, the beverage of the present invention may contain, as the sour taste component, a fruit juice or fruit extract from, for example, a citrus fruit (grapefruit, lemon, orange, lime, Japanese citrus, etc.), apple, plum, grape, peach, berries, tropical fruit (pineapple, mango, acerola, etc.), or a fermented material, such as apple vinegar, black vinegar, moromi vinegar, grain vinegar, rice vinegar, fermented milk, or fermented whey liquid. In the present invention, a fruit juice or fruit extract from a citrus fruit, apple or plum is more suitably used, and a fruit juice or fruit extract from a citrus fruit is particularly suitably used. The sour taste of a beverage containing a fruit juice or fruit extract is enhanced by the present invention, whereby the original fresh feeling from a fruit juice or fruit extract is improved, and accordingly, a beverage containing a fruit juice or fruit extract is one of suitable modes of the present invention.

[0022] The acidity of the beverage of the present invention can be adjusted with the sour taste component by appropriately incorporating the sour taste component to the beverage, taking the acidity of the sour taste component in the beverage into consideration. In a case where one or more of the acid and/or the salt thereof described above are used as the sour taste component, the beverage may generally contain the sour taste component in a total amount of the acid(s) of approximately 0.0001 to 3 w/w%, preferably 0.001 to 2.5 w/w%, more preferably 0.01 to 2 w/w%, and even more preferably 0.1 to 2 w/w%. In a case where one or more of the fruit juice or fruit extract described above are used as the sour taste component, the beverage may contain the sour taste component in a total amount of approximately 0.01 to 10 w/w%, preferably 0.1 to 9 w/w%, more preferably 1 to 8 w/w%, and even more preferably 1 to 7 w/w%. In a case where any of the various salts of the acid component described above is incorporated, the mass of the salt is converted to the mass of the equimolar free form thereof, and the salt may be appropriately incorporated to the beverage such that the content of the free form is a desired acid content. The acid content of the beverage or a fruit juice or fruit extract can be determined by a conventionally known method such as liquid chromatography method.

[0023] The beverage of the present invention may be a carbonated beverage. It is known that sour taste is felt strongly in a carbonated beverage obtained by incorporating carbon dioxide gas into a beverage. The reason for this is that the stimulus by the carbonic acid activates sour taste-sensitive cells in the oral cavity (Chandrashekar et al., Science, Vol.326, No.5951, 443-445 (2009)). In a case where the beverage of the present invention is a carbonated beverage, the sour taste-enhancing effect of EGT and that of carbonic acid are exhibited in an additive or synergistic manner. Thus, not only the sour taste can be emphasized, but also the stimulus by the carbonic acid can be intensified. There has been a problem of carbonated beverages as follows: after opening, a carbonated beverage becomes a so-called "flat" state due to rapid outgassing of the carbon dioxide gas, so that an intense refreshing stimulus of the carbon dioxide gas, which is essential for carbonated beverages, is weakened, and a sparkling feeling is thus reduced to rapidly impair the palatability after

opening. However, in a case where the beverage of the present invention is a carbonated beverage, the stimulus that contributes the sour taste (stimulus by carbon dioxide) can be also intensified, and the sparkling feeling of the carbonated beverage after opening can thus be advantageously maintained. The carbon dioxide gas pressure of the carbonated beverage of the present invention is 1.0 kgf/cm² or more, preferably 1.5 to 4.5 kgf/cm², and more preferably 2.0 to 4.0 kgf/cm².

[0024] On the other hand, it is known that proteins and lipids have a suppressing effect on sour taste. A beverage containing a protein or lipid has a concern about inhibition of the effect of the present invention. Thus, the protein content and the lipid content of the beverage of the present invention are each preferably 1.5 w/v% or less. The protein content and the lipid content are each more preferably 1.0 w/v% or less, even more preferably 0.5 w/v% or less, and particularly preferably 0 w/v%.

[0025] Furthermore, various additives may be incorporated into the beverage of the present invention as with common beverages, as long as the effect of the present invention is not impaired. Examples of the various additives include flavorings, seasonings, extracts, vitamins, minerals, colorants, pH adjusters, and antioxidants.

[0026] The beverage of the present invention is a beverage containing a specific amount each of the sour taste component and EGT, and having enhanced sour taste derived from the sour taste component. The beverage of the present invention includes beverages in a liquid state, such as soft drinks, fruit juice drinks, vegetable drinks, soy milk drinks, vinegar drinks, citric acid drinks, vitamin drinks, and nutrition-supplement drinks as quasi-pharmaceutical products, and also those in a gel state or a semi-solid state, such as so-called jelly drinks. The beverage of the present invention is preferably a beverage in a liquid state in view of remarkableness of the effect.

[0027] The beverage of the present invention includes those in the form of an instant drink, which is to be dissolved in a liquid such as water, carbonated water, or milk, to form a reconstituted beverage to be served for drinking. The instant drink may be either in the form of a powder (granules) or the form of a concentrated liquid. Examples of the water for

reconstituting the instant drink include ion exchange water, distilled water, natural water, and tap water. As described above, the reconstitution may be carried out by using a liquid other than water, for example a drinkable liquid such as carbonated water or milk. The temperature of the liquid such as water can be appropriately selected, and is, for example, 5 to 100°C. In a case of an instant drink, the effect of the present invention can be exhibited as long as the reconstituted beverage obtained by dissolving the instant drink in a liquid such as water or milk has the features of the beverage of the present invention, and specifically, contains a sour taste component and EGT in an amount within a specific range with relative to the acidity. The reconstitution factor or dilution factor used when the reconstituted beverage is obtained from the instant drink may be the factor instructed in a label or a display on a container of the instant drink product, etc.

[0028] It is known that bitter taste, salty taste, sour taste, and sweet taste are felt strongly in this order, for the four tastes among representative five basic tastes, which are decisive important factors of the taste of a beverage. It is also known that the taste perception varies depending on the temperature of foods and beverages, and sour taste is unlikely to be affected by the temperature while sweet taste, salty taste, and bitter taste are easily affected by the temperature. The beverage of the present invention exhibits the effect more remarkably when it is in cold storage at or less than an ambient temperature, preferably 15°C or less, and more preferably 10°C or less, before served for drinking. Accordingly, a beverage served for drinking at an ambient temperature or less is one example of preferable modes of the present invention.

[0029] According to the study of the present inventors, the sour taste-enhancing effect of EGT is not reduced even if EGT is heated. Accordingly, the form of a heat-sterilized and packed beverage that has a single strength, or in other words, that is RTD (Ready-To-Drink; a beverage that is contained in a container such as a bottle or a can and can be drunk just after opening) is suitable as a convenient form of a beverage served for drinking at an ambient temperature or less. The packed beverage to be provided may be obtained by filling into a common packing container, such as a molded container made mainly of polyethylene

terephthalate (a so-called PET bottle), a metal can, a container made of paper combined with metal foil or a plastic film, and a glass bottle. The method of heat-sterilization for a packed beverage is not particularly limited as long as it is in conformity with the conditions that are provided for in the law to be applied (Food Sanitation Act, in the case of Japan). Examples thereof include a retort sterilization method, a high temperature short time sterilization method (HTST method), and an ultrahigh temperature sterilization method (UHT method). The method of heat-sterilization can be appropriately selected according to the kind of the container of the packed beverage. In a case where the beverage can be heat-sterilized together with the container after filling the beverage thereinto, for example, in a case of using a metal can, a retort sterilization method can be used. For containers that is not resistant to retort sterilization, such as a PET bottle and a paper container, it is possible to use aseptically filling, in which the beverage is heat-sterilized in advance under the sterilization conditions equal to the above described conditions and filled into a container having been sterilized in an aseptic condition, or hot-pack filling, etc.

EXAMPLES

[0030] Details of the present invention will be specifically described by way of Examples given below, but the present invention is not limited thereto. In Examples, the acidity was determined by the following method. For organoleptic evaluations, samples cooled to 10°C were used.

[0031] (Analysis of acidity)

5 to 15 g of a sample is weighed in a 200-ml volume Erlenmeyer flask and diluted appropriately with water, and some drops of a 1% phenolphthalein indicator was added thereto, and the resultant is titrated, under shaken and stirring, with a 0.1 M sodium hydroxide solution placed in a 25-ml burette. The time point when red color lasts for 30 seconds is regarded as the end point. In a case where a hydrogen ion densitometer is used, the titration is carried out in the same manner as above, while stirring with a magnetic stirrer, and the time point when the pH reaches 8.1 is regarded as the end point.

[0032] Then, the acidity is determined using expression (I) below:

$$\text{Acidity (mass\%)} = A \times f \times 100/W \times 0.0064 \dots(I)$$

wherein A represents the amount (ml) titrated with the 0.1 M sodium hydroxide solution, f represents the titer of the 0.1 M sodium hydroxide solution, and W represents the mass (g) of the sample.

(Analysis of organic acids and phosphoric acid)

Organic acids and phosphoric acid in a sample were analyzed using a high performance liquid chromatograph. Conditions for determination were as follows.

- Analyzer: Shimadzu high performance liquid chromatograph LC-10A organic acid-analyzing system
- Column: Shim-pack SCR-102H (8.0 mm i.d. × 300 mm L.)
- Mobile phase: 5 mmol/L p-toluenesulfonic acid
- Detector: electric conductivity detector

(Experiment 1) Sour taste-enhancing effect of EGT (1)

An appropriate amount of citric acid was added to pure water to prepare aqueous citric acid solutions having an acidity shown in Table 1. 0.00005 w/w% (= 0.5 ppm) or 0.001 w/w% (= 10 ppm) of L-ergothioneine (EGT) (manufactured by TETRAHEDRON, purity 99.5% or more) was added to each of a half amount of the aqueous citric acid solutions, followed by stirring for dissolving, to thereby obtain an EGT-containing solution. A drink test was conducted by five expert panelists to organoleptically evaluate the sour taste with reference to an EGT-free aqueous citric acid solution as a control. For each acidity, a pair of the control solution and an EGT-containing beverage was given to the five expert panelists, and the panelists evaluated in which beverage of the pair given they felt sour taste, by two-point discrimination test.

[0033] The results are shown in Table 1. When EGT was just added to pure water having an acidity of 0%, that is, pure water containing no citric acid as a sour taste component, the resultant had no taste and sour taste was not felt therein. However, when 10 ppm of EGT was added to an aqueous citric acid solution having an acidity of 0.00001% or more, sour taste was strongly perceived therein, and the expert panelists commented that the sour taste

component and EGT interacted with each other in a synergistic manner so that in particular, the sour taste felt at or after the middle became sharp and was emphasized. In cases where the acidity was 0.03% or more, all the expert panelists commented that sour taste was enhanced even when the amount of EGT was as small as 0.5 ppm. On the other hand, it was difficult to perceive the sour taste-enhancing effect given by adding EGT in aqueous citric acid solutions having an acidity of 1.5% or more, in which itself exhibited considerable sour taste, and some panelists comments that no change was found.

[0034] [Table 1]

	Kind of acid	Acidity (%)	The number of panelists who pointed out that sour taste was strong as compared to the control (EGT-free)	
			EGT content 0.5 ppm	EGT content 10 ppm
1-1	Citric acid	0	0/5	0/5
1-2		0.00001	0/5	3/5
1-3		0.0001	0/5	4/5
1-4		0.001	0/5	5/5
1-5		0.01	1/5	5/5
1-6		0.03	5/5	5/5
1-7		0.05	5/5	5/5
1-8		0.1	5/5	5/5
1-9		0.3	5/5	5/5
1-10		0.5	5/5	5/5
1-11		1.0	5/5	5/5
1-12		1.5	4/5	5/5
1-13		2.0	4/5	4/5
1-14		2.5	3/5	3/5
1-15		3.0	2/5	2/5

[0035] (Experiment 2) Sour taste-enhancing effect of EGT (2)

An EGT-containing solution was prepared and evaluated in the same manner as in Experiment 1, except that the citric acid was replaced with tartaric acid, malic acid, lactic acid, phosphoric acid, or ascorbic acid. Results are shown in Table 2. The sour taste-enhancing effect of EGT was found as with citric acid, though some panelists commented that when the acidity was 0.001%, it was difficult to perceive the sour taste-enhancing effects for tartaric acid, malic acid, and phosphoric acid, which have tartness or astringency.

[0036] [Table 2]

	Kind of acid	Acidity (%)	The number of panelists who pointed out that sour taste was strong as compared to the control (EGT-free)	
			EGT content 0.5 ppm	EGT content 10 ppm
2-1	Tartaric acid	0	0/5	0/5
2-2		0.0001	0/5	3/5
2-3		0.001	0/5	4/5
2-4		0.01	1/5	5/5
2-5		1.0	5/5	5/5
2-6	Malic acid	0	0/5	0/5
2-7		0.0001	0/5	3/5
2-8		0.001	0/5	4/5
2-9		0.01	1/5	5/5
2-10		1.0	5/5	5/5
2-11	Lactic acid	0	0/5	0/5
2-12		0.0001	0/5	4/5
2-13		0.001	0/5	5/5
2-14		0.01	1/5	5/5
2-15		1.0	5/5	5/5
2-16	Phosphoric acid	0	0/5	0/5
2-17		0.0001	0/5	3/5
2-18		0.001	0/5	4/5
2-19		0.01	1/5	5/5
2-20		1.0	5/5	5/5
2-21	Ascorbic acid	0	0/5	0/5
2-22		0.0001	0/5	5/5
2-23		0.001	0/5	5/5
2-24		0.01	1/5	5/5
2-25		1.0	5/5	5/5

[0037] (Experiment 3) Examination of EGT concentration

Aqueous citric acid solutions having an acidity of 0.00001 to 3.0% were prepared in the same manner as in Experiment 1. 0.3 to 500 ppm (= 0.00003 to 0.05 w/w%) of EGT was added thereto to prepare EGT-containing solutions. It was evaluated whether or not the sour taste of the EGT-containing solution was felt strong as compared to the EGT-free product, as in Experiment 1. A sample in which three or more panelists among five

panelists felt strong sour taste as compared to the EGT-free product was rated ○. A sample in which less than three panelists among five panelists felt strong sour taste as compared to the EGT-free product was rated ×.

[0038] Results are shown in Table 3. In an acidity range of 0.03% or more, the sour taste-enhancing effect was obtained when the EGT concentration was 0.5 ppm (= 0.00005 w/w%), and the effect became greater depending on the EGT concentration in its range up to 100 ppm. The results of the grades when the acidity was 0.05% or less are shown in Fig. 1. From the data of ○, the ranges in which the sour taste-enhancing effect of EGT can be obtained can be represented by the following expressions: when $0.03 \leq X$, $Y \geq 0.00005$; and when $0.00001 \leq X < 0.03$, approximate expression $Y \geq 0.001 \times e^{-100X}$; wherein the acidity and L-ergothioneine content of the sample are designated as X (%) and Y (w/w%), respectively.

[0039] [Table 3]

		Ergothioneine (ppm)										
		0.3	0.5	1	2	4	6	10	50	100	200	500
Acidity (%)	0.00001	×	×					○		○		
	0.0001		×				×	○		○		
	0.001		×			×		○		○	○	
	0.005					×		○				
	0.01		×			○	○	○	○	○	○	
	0.015			×	×	○						
	0.02		×	×	○	○	○					
	0.025		×	○								
	0.03	×	○	○			○	○	○	○	○	
	0.04		○									
	0.05		○				○	○	○	○	○	○
	0.1		○			○	○	○	○	○	○	○
	0.3		○				○	○				
	0.5		○			○	○	○	○	○	○	○
	1.0		○			○	○	○	○	○	○	○
	1.5		○				○	○	○			
	2.0		○				○	○		○		
	2.5		○				○	○				
	3.0		×				×	×				

[0040] (Experiment 4) Sour taste-enhancing effect of EGT in various beverages (1)

Various commercially available packed beverages shown in Table 4 were used. The packed beverage was opened and half the amount thereof was poured into a plastic cup. 6 ppm or 100 ppm of EGT was added thereto and mixed therewith for dissolving, to thereby prepare an EGT-containing beverage. Four expert panelists organoleptically evaluated whether or not the sour taste of this EGT-containing beverage was enhanced as compared to the EGT-free product as the control.

[0041] Results are shown in Table 5. In the table, "4/4" indicates that all four panelists among four panelists commented that the sour taste of the EGT-containing beverage was enhanced as compared to the control beverage. As clear from Table 5, it was found that the sour taste-enhancing effect was exhibited in various beverages by adding EGT.

[0042] [Table 4]

	Kind of beverage	Ingredients	Kind of acid	Acidity	Protein content	Lipid content
				%	g/100 ml	
A	Isotonic beverage	Fruit juice (grapefruit, lemon), fructose, salt, honey, Shekwasha peel, Unshu mandarin orange, dried tomato extract, flavoring	Citric acid, lactic acid, acetic acid, gluconic acid, tartaric acid	0.055	0 (less than 0.5 g)	0 (less than 0.5 g)
B	Flavored water (citrus flavor)	Saccharides (high fructose corn syrup, sugar), orange juice, salt, acidulant, flavoring, vitamin C	Citric acid, ascorbic acid	0.12	0 (less than 0.5 g)	0 (less than 0.5 g)
C	Lactic acid bacterium-containing water	Lactic acid bacteria powder, flavoring, acidulant	Citric acid, lactic acid	0.013	0 (less than 0.5 g)	0 (less than 0.5 g)
D	Flavored water (milk flavor)	Saccharides (high fructose corn syrup, sugar), whey fermented liquid, salt, honey, acidulant, flavoring, vitamin C	Citric acid, lactic acid, gluconic acid, phosphoric acid, ascorbic acid	0.18	0 (less than 0.5 g)	0 (less than 0.5 g)
E	Fruit juice beverage (fruit juice 30%)	Fruit (orange, mandarin orange), saccharides (fructose glucose corn syrup, sugar), acidulant, flavoring, vitamin C	Citric acid, Phosphoric acid, Ascorbic acid	0.39	0 (less than 0.5 g)	0 (less than 0.5 g)
F	Fruit juice beverage (fruit juice 20%)	Apple, saccharides (fructose glucose corn syrup, sugar), acidulant, flavoring, vitamin C	Citric acid, Malic acid, Ascorbic acid	0.24	0 (less than 0.5 g)	0 (less than 0.5 g)
G	Black tea beverage	Black tea, flavoring, vitamin C	Ascorbic acid	0.018	0 (less than 0.5 g)	0 (less than 0.5 g)
H	Flavored carbonated water (gas pressure: 3.5 kg/cm ²)	Organic lemon juice (made in Italy), carbonic acid, flavoring, acidulant, vitamin C	Citric acid, Ascorbic acid	0.16	0 (less than 0.5 g)	0 (less than 0.5 g)
I	Carbonated beverage (gas pressure: 2.3 kg/cm ²)	Saccharides (fructose glucose corn syrup, sugar, glucose), lemon juice, salt, carbonic acid, acidulant, flavoring, vitamin C	Citric acid, Ascorbic acid	0.32	0 (less than 0.5 g)	0 (less than 0.5 g)
J	Carbonated beverage	Grapefruit extract, carbonic acid, flavoring	Citric acid	0.0033	0	0

(gas pressure: 3.5 kg/cm ²)				(less than 0.5 g)	(less than 0.5 g)
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[0043] [Table 5]

		EGT 6 ppm	EGT 100 ppm	Note
A	Isotonic beverage	4/4	4/4	The sour taste was improved to thereby increase the clean feeling and also improve the thirst-quenching feeling.
B	Flavored water (citrus flavor)	4/4	4/4	The sour taste was improved to thereby improve the original fresh feeling from the fruit juice.
C	Lactic acid bacterium- containing water	1/4	4/4	The sour taste was improved to thereby increase the clean feeling and also improve the thirst-quenching feeling.
D	Flavored water(milk flavor)	4/4	4/4	The sour taste was improved to thereby improve the clean feeling and mellow flavor.
E	Fruit juice beverage (fruit juice 30%)	4/4	4/4	The sour taste was improved to thereby improve the original fresh feeling from the fruit juice. Smell due to heat degradation or negative smell characteristic to reconstituted fruit juice from concentrate was decreased to further improve the fresh feeling.
F	Fruit juice beverage (fruit juice 20%)	4/4	4/4	The sour taste was improved to thereby improve the original fresh feeling from the fruit juice. Smell due to heat degradation or negative smell characteristic to reconstituted fruit juice from concentrate was decreased to further improve the fresh feeling.
G	Black tea beverage	0/4	4/4	The sour taste was improved to thereby improve the original fresh feeling from the black tea.
H	Flavored carbonated water (gas pressure: 3.5 kg/cm ²)	4/4	4/4	The sour taste was improved to thereby improve the stimulus by the carbonic acid. In addition, the lasting of the carbonic acid became longer.
I	Carbonated beverage (gas pressure: 2.3 kg/cm ²)	4/4	4/4	The sour taste was improved to thereby improve the stimulus by the carbonic acid. In addition, the lasting of the carbonic acid became longer.
J	Carbonated beverage (gas pressure: 3.5 kg/cm ²)	1/4	4/4	The sour taste was improved to thereby improve the stimulus by the carbonic acid. In addition, the lasting of the carbonic acid became longer.

[0044] (Experiment 5) Sour taste-enhancing effect of EGT in various beverages (2)

EGT was added, followed by evaluation, in the same manner as in Experiment 4, except that a commercially available packed beverage used was a drink yoghurt (ingredients:

dairy products, glucose fructose corn syrup, sugar/stabilizer (pectin), sweetener (stevia)) (acidity (containing lactic acid): 0.52%, protein content: 3.0 g/100 ml, lipid content: 0.6 g/100 ml). All the four panelists commented that sour taste was stronger in the drink with EGT added, and that the drink became easy-to-drink since the smell of milk went away. As compared to beverage D in Experiment 4, the effect exhibited by adding EGT was more remarkable in beverage D, which had smaller protein content and lipid content.

[0045] (Experiment 6) Influence of heating

Beverages A and B with 6 ppm of EGT added in Experiment 4 were each filled into a 190-ml can, followed by retort sterilization at 135°C for 1.5 minutes. After cooling to 10°C, it was organoleptically evaluated whether or not the strength of the sour taste of the resulting beverage was different from that of the beverage before heat sterilization. As a result, the strength of the sour taste was not different, and it was thus found that a favorable sour taste-enhancing effect of EGT was maintained even through heating.

CLAIMS

1. A beverage comprising L-ergothioneine and a sour taste component, wherein the beverage has an acidity X (%) and an L-ergothioneine content Y (w/w%) satisfying the following expressions (i) or (ii):
 - (i) when $0.03 \leq X$, $Y \geq 0.00005$
 - (ii) when $0.00001 \leq X < 0.03$, $Y \geq 0.001 \times e^{-100X}$.
2. The beverage according to claim 1, wherein the beverage is served for drinking at a temperature equal to or less than an ambient temperature.
3. The beverage according to claim 1 or 2, wherein the beverage is a packed beverage.
4. The beverage according to any one of claims 1 to 3, wherein the beverage is an instant drink.