

TITLE OF INVENTION: METHOD FOR PRODUCING ALCOHOL-FREE LIQUID SEASONING

TECHNICAL FIELD

[0001] The present invention relates to a method for producing a soy-sauce-like alcohol-free liquid seasoning.

BACKGROUND ART

[0002] Recently, fast food originated in Japan such as noodles like ramen or sushi has become popular globally and a wide variety of Japanese cuisine has been offered in foreign countries. As a result, ingredients and seasonings used in Japanese cuisine have been exported.

[0003] Soy sauce is a typical seasoning used in Japanese cuisine and is usually made through the following process: First, koji mold is inoculated and cultured in a mixture of soybeans and wheat, and soy sauce koji is obtained. It is then mixed with salt solution, fermented and aged, and filtered. The filtered liquid thus obtained is soy sauce. In order to prevent the soy sauce koji from rotting during fermenting and aging process, it is mixed with high density salt solution. As a result of mixing with such high density salt solution, soy sauce as a product normally has salt concentration of 15 wt% to 18 wt%.

[0004] Although salt is an important chemical compound, its excessive intake could increase the risk of diseases such as high blood pressure or a kidney disease etc. Thus cutting down intake of salt, especially sodium, is desired. For this reason, methods for reducing salt in soy sauce have been explored including a method in which soy sauce that is made in the usual manner having salt concentration of 15 wt% to 18 wt% is desalinated by electrodialysis or membrane treatment for producing low-salt soy sauce.

[0005] In such a conventional method for producing low-salt soy sauce,

however, even though salt content can be reduced, taste components other than salt may be reduced as well, resulting in loss of flavor. Therefore, there has been proposed a method for producing low-salt soy sauce containing fish sauce in which salt concentration is adjusted to 2 to 15 % by mixing soy sauce made from soybeans and saltless fish sauce (see Patent Document 1). It has been known that saltless fish sauce can be produced in a shorter period of time by fermenting processed products made from mackerel, for example internal organs of mackerel or fish meat that are wasted at the time of producing salted mackerel in rice-bran paste, at a temperature of 40 degrees C or higher for more than one hour without adding salt, heat-treating it, and filtering it thereby to obtain a clear liquid (see Patent Document 2).

PRIOR ART DOCUMENTS

PATENT DOCUMENT

[0006] Patent Document 1: Japanese Unexamined Patent Application Publication No. 2013-138654

Patent Document 2: Japanese Unexamined Patent Application Publication No. 2011-182663

SUMMARY OF THE INVENTION

PROBLEMS TO BE RESOLVED BY THE INVENTION

[0007] As described in the above-mentioned patent documents, conventional soy sauce undergoes different kinds of processing according to its intended use. With the global popularity of Japanese cuisine, such soy sauce used in Japanese cuisine that conforms to regional characteristics is desired. Particularly, Islam has regulation about food and drink for religious reasons, and drinking alcohol or intake of foods/drinks that include alcohol-containing preservative or seasonings such as *mirin* (alcoholic condiment used as a

seasoning in Japanese cuisine) or cooking sake is prohibited.

[0008] Therefore, Halal certification mark is displayed on a product that is approved as “a processed food product using approved ingredients, and processed appropriately in accordance with Islamic Law”. Halal certification mark can be displayed only on products examined by Halal Authentication Bodies and approved that ingredients, manufacturing processes and product quality etc. are in conformity with Islamic Law. In conventional soy sauce, alcohol is produced during fermenting process so that Halal certification mark cannot be given even if the final product does not contain alcohol. Therefore, there arises a problem that Japanese cuisine using soy sauce cannot be offered in Islam.

[0009] Also, Islamic believers who live in non-Muslim regions avoid food and drink without Halal certification mark and those who travel Japan, for example, cannot eat food in which typical Japanese seasoning soy sauce is used, which is another problem.

[0010] In view of the above problems, it is the object of the present invention to provide a method for producing a soy-sauce-like alcohol-free liquid seasoning in which alcohol is neither contained in the ingredients nor produced during production process.

MEANS OF SOLVING THE PROBLEMS

[0011] The present invention provides a method for producing an alcohol-free liquid seasoning having soy-sauce-like and fish sauce flavor, by mixing fish sauce that does not contain alcohol with a hydrolyzed vegetable protein (HVP), which is found out as a result of earnest efforts. The soy-sauce-like alcohol-free liquid seasoning of the present invention can be produced by mixing alcohol-free fish sauce obtained by fermenting a fishery product at a temperature of 40 degrees C or higher for more than one hour with alcohol-free HVP obtained by

hydrolysis of vegetable protein with acid followed by neutralization, at a mixing ratio so as to contain 10 wt% or more fish sauce.

EFFECTS OF THE INVENTION

[0012] The present invention enables production of a soy-sauce-like alcohol-free liquid seasoning with ease at low cost without requiring any special and expensive device, by merely mixing HVP with fish sauce. In addition, a mixing ratio of HVP and fish sauce can be arbitrarily set and changed. For example, when HVP that contains salt and saltless fish sauce are mixed, an alcohol-free liquid seasoning having corresponding salt concentration may be produced. The fish sauce to be used may be any kind as long as it does not contain alcohol and it may contain salt. Although the final salt concentration may be changed depending on the intended use, it is preferable that the final salt concentration be 5 wt% to 25 wt%, and more preferably, 8 wt% to 15 wt% in view of its taste and preservability. Further, the alcohol-free liquid seasoning according to the present invention has fresh aroma and negligible fishy smell inherent to fish sauce that is generally regarded as unfavorable smell.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] [Fig. 1] Fig. 1 is a graph showing amino acid content of saltless mackerel fish sauce.

[Fig. 2] Fig. 2 is a graph showing amino acid content of HVP that is commercially available.

[Fig. 3] Fig. 3 is a graph showing amino acid content of quick fermented nampla.

[Fig. 4] Fig. 4 is a graph showing amino acid content of herring fish sauce.

[Fig. 5] Fig. 5 is a graph showing amino acid content of sardine fish

sauce.

DETAILED DESCRIPTION OF EMBODIMENTS

[0014] Detailed description of the embodiments of the present invention will be made hereinafter. In the present invention, a liquid seasoning is produced by mixing fish sauce obtained by fermenting an alcohol-free fishery product at a high temperature without adding salt with HVP obtained by hydrolysis of vegetable protein such as soy protein or wheat protein with acid followed by neutralization.

[0015] Fish sauce used in the present invention does not contain alcohol. In addition a fishery product that does not contain alcohol is used as an ingredient, which is fermented at a high temperature of 40 degrees or higher without adding salt, so that growth of yeast is found neither in the ingredients nor in the manufacturing process so that alcohol is not produced.

[0016] In a case where the obtained fish sauce alone is used as an alcohol-free liquid seasoning, salt may be added at the completion of fermentation process. In such a case, it is preferable that salt be added such that salt concentration becomes 5 wt% to 25wt%. Alternatively, fish sauce to which salt has been added may be mixed with HVP.

[0017] Fishery products used as an ingredient may be of any kind and not particularly limited, so that not only those that have been used in conventional fish sauce which usually do not contain alcohol but also those that have not been used in conventional fish sauce may be used, as long as they do not contain alcohol. However, mackerel fish meat is preferable. Kinds of mackerel are not particularly limited and chub mackerel or southern mackerel may be used for example. Either domestic or foreign mackerel may be used and it may be fresh or frozen. Other fishery products that are not close to mackerel family such as sardine, horse mackerel, anchovy, tuna, squid, octopus, salmon, bonito

and herring may be also used.

[0018] Although either whole or any parts of mackerel fish including meat (muscle), internal organs or head etc., may be used, it is preferable that either one of or both internal organs and meat be used. It is more preferable that internal organs be included. Particularly, it is preferable that internal organs and their surrounding meat that are removed at the time of producing processed mackerel products be used. Such mackerel fish meat may be used after being chopped into small pieces with a mincer etc.

[0019] In the case of mackerel fish meat, by fermenting it under an appropriate condition, protein in the fish meat is dissolved and amino acid is released. The dissolution may be caused by autodigestion. An autolyzed enzyme of mackerel exists in internal organs such as pyloric caeca so that it is preferable that a digestive enzyme contained in such internal organs be effectively used. Also, protein may be dissolved by an action of a microorganism or an enzyme that is mixed during fermenting process either naturally or intendedly. In other words, proteolytic enzymes such as a protease or a peptidase, or microorganisms such as koji mold that generate these enzymes may be added from the outside to facilitate fermentation.

[0020] During a fermentation process in the fish sauce manufacturing process, it is preferable that fermentation temperature be 40 degrees C or higher, more preferably 45 degrees C or higher and most preferably 50 degrees C or higher. In view of preventing deactivation of the enzymes, it is preferable that the fermentation temperature be set at 70 degrees C or lower. In view of digestive efficiency, the fermentation temperature is preferably around 55 degrees C. Fermentation time should be more than one hour, and preferably one to 96 hours, and more preferably one to 48 hours, but most preferably it is about 15 hours. Alcohol will not be produced in this fermentation process. Although in the fermentation process salt is not added, it may be added as necessary.

[0021] In the fermentation process, it is preferable that proliferation of bacteria be prevented. Here, bacteria include various microorganisms that proliferate during the production process of fish sauce in the present invention, despite intent of the fish sauce producer. More specifically, bacteria include all kinds of microorganisms other than those that are added intendedly or mixed naturally from the outside that facilitate fermentation. Although fermentation may be continued for about 96 hours, longer fermentation time may increase the risk of proliferation of bacteria depending on fermentation temperature, so that if it is difficult to determine whether bacteria proliferate or not, fermentation may be stopped after 48 hours or so. It is more preferable that fermentation be stopped after 15 hours or so.

[0022] During the fermentation process, water may be added as necessary. Stirring is optional during the fermentation.

[0023] Progress of the fermentation depends on strength of digestive enzyme of mackerel fish meat in use, strength of enzyme or microorganisms to be added, or fermentation temperature etc. Thus it is preferable that progress of the fermentation be checked by measuring concentration of generated amino acid (especially glutamic acid) in the fermentation liquid. When the fermentation is well advanced, glutamic acid concentration in the fermentation liquid is preferably 3 grams per liter or more, and more preferably 5 grams per liter or more.

[0024] After fermentation is completed, heat treatment is performed at a heating temperature of 60 degrees C or higher, more preferably at 80 degrees or higher. Although heating time can be arbitrarily set depending on the heating temperature, it is preferably more than 10 minutes. More than 20 minutes is more preferable, and it may be about 60 minutes. When a heating temperature is 80 degrees C, heating time is preferably about 30 minutes. When a heating temperature is 100 degrees C, heating time may be about 20 minutes. The

purpose of the heat treatment is to insolubilize undegraded protein and in view of sterilization. After the heat treatment, the processing object is left out at a room temperature or lower, more preferably in a low-temperature environment of around 4 degrees C for a few hours to around three days so that insoluble protein is well precipitated.

[0025] In a case where oil is contained in the insoluble matter, it floats upward. Although it is preferable to remove the oil, it may not be removed. If the oil is to be removed, it may be removed with a suctioning device, for example. Also, the insoluble matter may be removed by filtering or centrifugation etc. as necessary. In addition, clear filtrate may be obtained through filtration with Celite (registered trademark) after removing the insoluble matter by these means. The filtrate thus obtained may be used as fish sauce of the present invention.

[0026] HVP used in the present invention is obtained by hydrolysis of vegetable protein such as soy protein, wheat protein etc. using acid such as hydrochloric acid, followed by neutralization with an alkaline solution such as sodium hydroxide etc. Since it contains salt, it has an antiseptic effect. Such HVP is not particularly limited, and commercially available one produced by hydrolysis of soy protein using hydrochloric acid may be usable. In the present invention, fishy smell becomes faint by using HVP. It is more preferable to use HVP obtained by hydrolysis of soy protein with hydrochloric acid followed by neutralization with sodium hydroxide solution. In such HVP, salt is contained so that by mixing it with saltless fish sauce, alcohol-free liquid seasoning with low salt concentration may be easily produced. By using HVP having glutamic acid concentration of 20 grams per liter or more to mix with fish sauce, glutamic acid concentration of a liquid seasoning becomes high and the flavor is enhanced.

[0027] Since HVP is obtained by hydrolysis of alcohol-free vegetable protein with acid, alcohol is neither contained in the ingredients nor generated during production process. For example, where soy protein is hydrolyzed with

hydrochloric acid to obtain HVP, defatted soybeans are used as an ingredient so that alcohol is not contained in it. In addition, during the production process, the defatted soybeans are hydrolyzed with strong hydrochloric acid, neutralized with sodium hydroxide solution and filtered so that alcohol is never generated during the production process.

[0028] It is preferable that HVP used in the present invention be added right after the fish sauce to be used in the present invention is obtained. It is preferable that mixing ratio be set so that 10 wt% or more fish sauce is contained. If HVP obtained by hydrolyzing soy protein with hydrochloric acid is used and more than 50 wt% of HVP is contained in the liquid seasoning, fish sauce flavor becomes weak. Also, salt concentration after mixing is preferably set between 5 wt% to 25 wt%, and more preferably between 8 wt% to 15 wt%. With such salt concentration ratio, effect of suppressing proliferation of bacteria can be expected. If salt concentration in the HVP is high, salt concentration may be adjusted by adding more fish sauce. If salt concentration is low after blending, salt may be arbitrarily added to adjust salt concentration.

[0029] More detailed description of the present invention will be made hereinafter with reference to embodiments. It is to be noted however, that scope of the invention is not limited to the below embodiments.

EMBODIMENTS

[0030] <First Embodiment>

Internal organs of mackerel in the amount of 20 kg that are byproducts of mackerel processed products are chopped into small pieces. After that, presence/absence of alcohol in the chopped internal organs is checked by gas chromatography. It is confirmed that no alcohol is contained there. The internal organs of mackerel are then moved into an incubator in which the temperature is adjusted to 55 degrees C. and fermented without adding salt for 15 hours

while occasionally stirred. After fermentation, the fermentation liquid is inoculated into YPD medium (the composition of YPD is 1% yeast extract, 2% polypeptone, 5% glucose and 2% agar), and cultivated for 72 hours at a temperature of 30 degrees C. No alcohol-producing yeast was detected in it.

[0031] Thereafter, heat treatment is performed at 80 degrees or higher for 15 minutes, and the processing object is left out at a room temperature for being cooled. It is then filtrated with cloth and left out in a low-temperature environment at 4 degrees C to facilitate precipitation of insoluble protein. The cooled liquid thus obtained is again filtrated with filter cloth of fine texture and celite. Clarified liquid as fish sauce in the amount of 12 kg is thus obtained. Presence/absence of alcohol in the obtained fish sauce is checked by gas chromatography, and the result shows no alcohol is contained in it. Analysis of amino acid content in the obtained fish sauce is shown in Fig. 1. The figures in a graph of Fig. 1 are shown in mg/100g.

[0032] HVP used in the present invention is obtained by hydrolysis of defatted soybeans with strong hydrochloric acid, followed by neutralization with sodium hydroxide solution and filtering. Salt concentration of the HVP is approximately 18 wt%, with amino acid content as shown in Fig. 2. The figures in a graph of Fig. 2 are shown in mg/100g. Presence/absence of alcohol in the HVP is checked by gas chromatography, and the result shows no alcohol is contained in it. As described above, the HVP used in the present invention is produced by hydrolyzing defatted soybeans with hydrochloric acid which is then neutralized with sodium hydroxide solution so that alcohol is not present in the ingredient and not produced during production process.

[0033] The fish sauce thus produced is poured into three containers (3 kg each). "Seasoning liquid" in the amount of 3.0 kg, 1.5 kg and 0.75 kg respectively is added into each container and stirred so that liquid seasoning containing 50 wt%, 67 wt% and 80 wt% of fish sauce respectively is obtained.

Salt concentration and amino acid content in each of the liquid seasoning are shown in Table 1. The figures in the table 1 are shown in mg/100g.

[0034]

[Table 1]

	50 wt% of Fish Sauce	67 wt% of Fish Sauce	80 wt% of Fish Sauce
Aspartic acid (Asp)	1688	1430	1250
Threonine (Thr)	550	545	520
Serine (Ser)	767	687	640
Glutamic acid (Glu)	2200	1850	1480
Proline (Pro)	610	465	375
Glycine (Gly)	600	540	495
Alanine (Ala)	835	815	800
Valine (Val)	690	700	710
Methionine (Met)	200	240	265
Isoleucine (Ile)	435	505	546
Leucine (Leu)	763	835	880
Tyrosine (Tyr)	132	152	155
Phenylalanine (Phe)	596	570	538
Histidine (His)	300	285	270
Lysine (Lys)	555	658	788
Arginine (Arg)	850	843	835

[0035] All of the obtained seasonings have good flavor owing to a high

concentration of glutamic acid in addition to fresh aroma. They also have strong flavor of fish sauce. Fish sauce alone may be used as an alcohol-free seasoning liquid by adding salt to it at the completion of fermentation such that salt concentration of the fermentation liquid becomes 5 wt% to 25 wt%.

[0036] <Comparative Example>

After one kilogram of fish sauce obtained in the first embodiment is poured into a container, nine kilograms of HVP used in the first embodiment is added and stirred to obtain liquid seasoning having 10 wt% fish sauce. Although the liquid seasoning has a high concentration of glutamic acid and thus good flavor, the flavor of the HVP is so strong that fish sauce flavor is almost lost.

[0037] <Second Embodiment>

Anchovies (Japanese anchovies) in the amount of ten kilograms are chopped into small pieces and fermented in an incubator for 72 hours at a temperature of 55 degrees C without adding salt. After fermentation, the fermentation liquid is inoculated into YPD medium (the composition of YPD is 1% yeast extract, 2% polypeptone, 5% glucose and 2% agar), and cultivated for 72 hours at a temperature of 30 degrees C. No alcohol-producing yeast is detected in it. Thereafter, salt is added to the fermentation liquid so that it contains 15 wt% salt. Heat treatment is then performed for 15 minutes at a temperature of 80 degrees C or higher. After that the fermentation liquid is filtrated with cloth and left out in a low-temperature environment at 4 degrees C to facilitate precipitation of insoluble protein. The cooled liquid thus obtained is again filtrated with filter cloth of loose texture and celite. Clarified fish sauce (quick fermented nampla) in the amount of 6.3 kg is obtained accordingly. Presence/absence of alcohol in the obtained quick fermented nampla is checked by gas chromatography and the result shows that no alcohol is contained in it. Analysis of amino acid content in the obtained quick fermented nampla is shown in Fig. 3. The figures in a graph of Fig. 3 are shown in

mg/100g.

[0038] <Third Embodiment>

Internal organs of herrings in the amount of ten kilograms that are byproducts of herring processed products are chopped into small pieces, moved into an incubator in which the temperature is adjusted to 55 degrees C. and fermented for 48 hours without adding salt while occasionally stirred. After fermentation, the fermentation liquid is inoculated into YPD medium (the composition of YPD is 1% yeast extract, 2% polypeptone, 5% glucose and 2% agar), and cultivated for 72 hours at a temperature of 30 degrees C. No alcohol-producing yeast is detected in it. After salt is added to the fermentation liquid so that it contains 15 wt% salt, heat treatment is performed for 15 minutes at a temperature of 80 degrees C or higher. The fermentation liquid is left out at a room temperature to precipitate protein that have become insoluble. It is then filtrated with cloth and left out in a low-temperature environment at 4 degrees C to facilitate precipitation of insoluble protein. The cooled liquid thus obtained is again filtrated with filter cloth of fine texture and celite. Clarified liquid in the amount of 5.5 kg is obtained as fish sauce accordingly. Presence/absence of alcohol in the obtained fish sauce is checked by gas chromatography and the result shows no alcohol is contained in it. Analysis of amino acid content in the obtained fish sauce is shown in Fig. 4. The figures in a graph of Fig. 4 are shown in mg/100g.

[0039] <Fourth Embodiment>

Internal organs of sardines in the amount of ten kilograms that are byproducts of sardine processed products are chopped into small pieces, moved into an incubator in which the temperature is adjusted to 55 degrees C. and fermented for 24 hours without adding salt while occasionally stirred. After fermentation, the fermentation liquid is inoculated into YPD medium (the composition of YPD is 1% yeast extract, 2% polypeptone, 5% glucose and 2% agar), and cultivated

for 72 hours at a temperature of 30 degrees C. No alcohol-producing yeast is detected in it. After salt is added to the fermentation liquid so that it contains 15 wt% salt, heat treatment is performed for 15 minutes at a temperature of 80 degrees C or higher. The fermentation liquid is left out at a room temperature to precipitate protein that have become insoluble. It is then filtrated with cloth and left out in a low-temperature environment at 4 degrees C to facilitate precipitation of insoluble protein. The cooled liquid thus obtained is again filtrated with filter cloth of fine texture and celite. Clarified liquid in the amount of 7.2 kg is obtained as fish sauce accordingly. Presence/absence of alcohol in the obtained fish sauce is checked by gas chromatography and the result shows no alcohol is contained in it. Analysis of amino acid content in the obtained fish sauce is shown in Fig. 5. The figures in a graph of Fig. 5 are shown in mg/100g.

[0040] The fish sauce obtained in the second to fourth embodiments alone may be used as an alcohol-free liquid seasoning. Also similarly to the first embodiment, an alcohol-free liquid seasoning having fresh aroma, good flavor owing to a high concentration of glutamic acid and strong flavor of fish sauce may be obtained by mixing saltless fish sauce (obtained from fermentation liquid to which no salt is added) with HVP.

INDUSTRIAL APPLICABILITY

[0041] The soy-sauce-like alcohol-free liquid seasoning of the present invention having the similar flavor as that of soy sauce made from soybeans, may be used just like soy sauce. Since it is a seasoning that may be approved by Halal Authentication Bodies, it may be used without receiving restrictions, as a substitute for soy sauce made from soybeans to offer Japanese cuisine in Islam or to Islamic believers living in Japan. Just like soy sauce made from soybeans with normal salt concentration, it may be used for *sashimi* (sliced raw fish), *tempura* (deep-fried vegetable or seafood) and *tsukemono* (Japanese

pickled vegetables) as a substitute for dipping soy sauce, or for *natto* (fermented soybeans), *tofu* (soybean curd) and the like as a substitute for soy sauce to put in a dish. Furthermore, it may be used to season noodle soup, sauce, dressing or Chinese noodle soup etc. In addition, it may be used in *tsukudani* (food boiled down in soy), seafood paste etc. as a seasoning that substitutes processing soy sauce.

CLAIMS

[Claim 1] A method for producing an alcohol-free liquid seasoning, the method comprising:

producing fish sauce that does not contain alcohol by fermenting a fishery product without adding salt at a temperature of 40 degrees C or higher for more than one hour,

producing a hydrolyzed vegetable protein (HVP) that does not contain alcohol by hydrolysis of vegetable protein using acid followed by neutralization, and

mixing the fish sauce with the HVP with such a ratio that 10 wt% or more fish sauce is contained.

[Claim 2] The method for producing an alcohol-free liquid seasoning according to Claim 1,

wherein said HVP is produced by hydrolysis of a soy bean protein using hydrochloric acid, followed by neutralization using sodium hydroxide solution.

[Claim 3] The method for producing an alcohol-free liquid seasoning according to Claim 1 or 2,

wherein the fish sauce is mixed with the HVP with such a ratio that salt concentration becomes 5 wt% to 25 wt%.

[Claim 4] A method for producing an alcohol-free liquid seasoning, the method comprising:

fermenting a fishery product at a temperature of 40 degrees C or higher for more than one hour in such a condition that alcohol-producing yeast does not grow, and

adding salt to a fermentation liquid such that salt concentration of the fermentation liquid becomes 5 wt% to 25 wt%.

[Claim 5] An alcohol-free liquid seasoning produced by the method according to any of Claims 1 to 4.