

TITLE OF THE INVENTION

PROCESS FOR PRODUCING EFFERVESCENT BREWAGE USING
NON OF BARLEY, WHEAT AND MALT AND EFFERVESCENT BREWAGE
PRODUCED BY THE PROCESS

5

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to a
brewed alcoholic beverage with foaming properties
10 which does not use barley, wheat and malt.
Especially, this invention relates to the brewed
alcoholic beverage with foaming properties which can
improve flavor and the durability of flavor not
using barley, wheat and malt but using a rice mash.

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2. Description of the Related Art

Conventionally, there are alcoholic
beverages such as beer and low-malt beer which use
barley, wheat and malt as materials. Malt alcoholic
20 beverages such as beer and low-malt beer use barley
malt as main material. The ratio of malt in beer
and low-malt beer is defined by the weight% of malt
out of all materials except water under the Liquor
Tax Act in Japan. Beer or low-malt beer uses
25 adjuncts (starch like rice, corn and starch) besides
malt. Starches of these adjuncts are made into mash
due to an active enzyme of malt, then the mash is
fermented and decomposed into alcohol and carbon
dioxide gas; thereby beer and low-malt beer as
30 alcoholic beverages can be obtained.

However, a flavor, the durability (time
changing) of flavor or the foaming properties are
different depending on variable ratios of malt even
for beer and low-malt beer which use the same malt
35 as one of their materials. Especially, the flavor
and the durability of the flavor have great
differences depending on a ratio of malt when the

ratio of malt is much different in low-malt beer. For example, when the ratio of malt is low, a specific smell like sulfide smell or a specific flavor like a smell that is oxidized is provided for low-malt beer. Also, when the ratio of malt is low, there is a tendency for the durability of a flavor to be deteriorated. Thus, the change of flavor and the durability of flavor are due to amino acids including malt as nutrient for brewers' yeast performing the alcoholic fermentation during the production of malt alcoholic beverages. A physiological state of the yeast changes depending on the amount of amino acids, and it is thought that properties of the final product of malt alcoholic beverages have been changing under the influence.

However, for malt alcoholic beverages like low-malt beer, the above problem of the flavor or the durability of the flavor is improved by changing a part or all of adjuncts into rice decompositions, that is a rice mash is made into mash including amino acids and minerals obtained by enzymatic decomposition using glycolysis enzyme and proteolytic enzyme (for example, see patent document 1).

On the other hand, beer-taste alcoholic beverages with foaming properties without using barley, wheat and malt have been developed and are selling in the market place, but there is also a problem like the above problem of the flavor or the durability of flavor. For malt alcoholic beverages, the above problem is overcome by using a rice mash as adjuncts in addition to using malt. However, more improvement is needed for beer-taste alcoholic beverages with foaming properties without using barley, wheat and malt in order to solve the above problems.

SUMMARY OF THE INVENTION

It is an object of the present invention
5 to provide a brewed alcoholic beverage with foaming
properties which does not use barley, wheat and malt,
in which the flavor becomes more mild and the
durability of the flavor is more increased; and the
brewed alcoholic beverage obtained by using the
10 above method.

In order to achieve the above-mentioned
object, there is provided according to one aspect of
the present invention a processing method of a
brewed alcoholic beverage with foaming properties
15 which does not use barley, wheat and malt
comprising:

a process for processing a pre-
fermentation liquid using at least a syrup
containing sources of carbon, sources of nitrogen,
20 hops and water as raw materials and

a process for fermenting the pre-
fermentation liquid using a brewers' yeast,
wherein a ratio which expresses a rice
mash contained in the syrup is between 5 and 50
25 weight %.

According to this, the processing method
of the brewed alcoholic beverage with foaming
properties which does not use barley, wheat and malt,
in which the flavor becomes more mild and the
30 durability of the flavor is more increased, can be
provided by using the rice mash whose ratio in the
total syrup is between 5 and 50 weight %, even
though malt is not used in the processing method.

There is provided according to another
35 aspect of the present invention a processing method
of a brewed alcoholic beverage with foaming
properties which does not use barley, wheat and malt

comprising:

a process for processing a pre-fermentation liquid using at least a syrup containing sources of carbon, sources of nitrogen,
5 hops, an improving substance for generating foam and for foam stability and water as raw materials and

a process for fermenting the pre-fermentation liquid using a brewers' yeast,
wherein a ratio which expresses a rice
10 mash contained in the syrup is between 5 and 50 weight %.

According to this, the brewed alcoholic beverage with foaming properties which does not use barley, wheat and malt, in which the flavor becomes
15 more mild and the durability of the flavor is more increased and also the foam stability is improved by adding the improving substance for generating foam and for foam stability, can be provided by using the rice mash whose ratio in the total syrup is between
20 5 and 50 weight %, even though malt is not used in the processing method.

There is also provided according to another aspect of the present invention a brewed alcoholic beverage with foaming properties processed
25 by the processing method as described above.

According to this, the brewed alcoholic beverage with foaming properties which does not use barley, wheat and malt, in which the flavor becomes more mild and the durability of the flavor is more
30 increased and also the foam stability is improved by adding the improving substance for generating foam and for foam stability, can be provided without using malt in the processing method.

There is also provided according to
35 another aspect of the present invention a brewed alcoholic beverage with foaming properties processed by the processing method as described above, wherein

a concentration of remaining extract (intrinsic extract concentration) is less than 2 weight %.

According to this, the brewed alcoholic beverage with foaming properties manufactured by the above processing methods, in which the concentration of remaining extract (intrinsic extract concentration) is less than 2 weight %, that is spirits, can be provided by using a new method without distilling from a starting alcoholic beverage.

According to the present invention, there is provided a brewed alcoholic beverage with foaming properties which does not use barley, wheat and malt, in which the flavor becomes more mild and the durability of the flavor is more increased; thereby the brewed alcoholic beverage having superior flavor can be obtained without using malt.

Other objects, features and advantages of the present invention will become more apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a graph of comparative fermentation period for processing of other miscellaneous alcoholic beverages described in an example 1;

Fig. 2 is a graph of comparative fermentation period for processing of other miscellaneous alcoholic beverages described in an example 2;

Fig. 3 is a graph of comparative fermentation periods for processing of "sprits"

which is described in example 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 A description will now be given, with
reference to the embodiments according to the
present invention. Below, the best mode of the
present invention is described with preferred
embodiments of the brewed alcoholic beverage with
foaming properties which does not use barley, wheat
10 and malt, that is one embodiment of beer-taste other
miscellaneous alcoholic beverages (hereafter, it is
described as other miscellaneous alcoholic
beverages).

15 First of all, a general production method
of other miscellaneous alcoholic beverages of the
present invention is described.

First, hot water is added to materials of
syrup containing sources of carbon, sources of
nitrogen as amino acids content materials other than
20 wheat or malt, hop, coloring matter, and an
improving substance for generating foam and for foam
stability and they are made into a solution
including ingredients of sugar and amino acids.
Then, after the solution is boiled, spent hops are
25 removed from the solution and the solution is
chilled so that the solution is made to be a pre-
fermentation liquid. The pre-fermentation liquid
which is produced as described above is fermented
using brewers' yeast like an enzyme for beer, the as
30 same as the usual production step of beer production,
then the produced liquid is stored. By doing the
above steps, another miscellaneous alcoholic
beverage the same as beer can be obtained without
using starch materials like barley, wheat and malt.
35 Also, in general, a flavor adding beer taste,
dietary fibers adding functionality and herbs adding
characteristics to the flavor can be added after the

fermentation, as necessary. The produced other
miscellaneous alcoholic beverage has the same flavor
as beer and also has foaming properties of carbon
dioxide, so that the brewed alcoholic beverage with
5 superior foaming properties is provided.

The above description is a general
production method of other miscellaneous alcoholic
beverages.

The characteristics of the present
10 invention are such that the rice mash, in which
total amino acid content is 6 times greater than the
conventional rice mash, is used for the above
production method of other miscellaneous alcoholic
beverages.

15 Here, the rice mash which is used in the
present invention will be described. As described
above, "the rice mash" is a mash obtained such that
a liquid solution of rice is digested enzymatically
using glycolysis enzyme and proteolytic enzyme as
20 described in the patent document 1. Also, the rice
mash includes amino acids and minerals having
suitable composition for brewers' yeast used for
producing the malt alcoholic beverages compared to a
conventional mash made from corn. In the invention
25 of the patent document 1, the total amino acid
content is 1963 mg/L (total value of each amino acid
ingredient shown in table 1); moreover, these amino
acid ingredients are fermentable by the brewers'
yeast and these are effective as nutrients for
30 enzymatic activity of the brewers' yeast
(hereinafter, it is described as the conventional
rice mash). In the below examples, the rice mash
which has increased total amino acid content up to
12147 mg/L was used (hereinafter, it is described as
35 the improved rice mash) (table 1). In addition,
the improved rice mash include amino acid ingredients (AspNH₂,
GluNH₂, G-ABA) which

have been recently recognized for their importance in alcoholic beverages with foaming properties respectively (582 mg/L, 224 mg/L, 115 mg/L) and it is clear that the improved rice mash is extremely useful. Also, about sugar, especially,

- 5 monosaccharose and disaccharose ingredients, which contribute to the fermentation, are included in the same ratio as well as corn mash for either rice mash. In this point, the rice mash is highly suitable as a material for malt alcoholic beverages.

10

TABLE 1

AMINO ACID ANALYSIS(mg/L)

No.	SAMPLE	IMPROVED RICE MASH
1	Glu	756
2	Asp	566
3	Ser	644
4	Thr	463
5	Lys	572
6	Arg	1951
7	Val	971
8	Met	393
9	Leu	1622
10	Ile	731
11	His	289
12	Gly	292
13	Phe	1076
14	Tyr	753
15	Ala	758
16	Trp	159
17	Pro	153
	合計	12149

- 15 In addition, as a result of examination by the present inventor, it is recognized that the adding amount ratio of rice decompositions is between 5 and 50 weight% of the total amount of syrup used, by which adding amount ratio at least a predetermined effect of the flavor and the

durability of the flavor of the produced brewed alcoholic beverage with foaming properties becomes effective.

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EXAMPLES

Below, examples that were carried out according to the processing method of the present invention are described.

10 Here, brewing examinations for alcoholic beverages which were carried out using the rice mash will be described. Regarding these examinations, the following will be described.

15 In example 1, other miscellaneous alcoholic beverages processed with the improved rice mash and other miscellaneous alcoholic beverages processed with the conventional method are compared;

20 In example 2, other miscellaneous alcoholic beverages were processed by changing the amount of the improved rice mash, and a suitable range of the amount of the improved rice mash was determined;

In example 3, new types of sprits were processed by applying the above described other miscellaneous alcoholic beverages.

25 For examples 1-3, examinations for an evaluation of fermentability and comparative taste evaluation of flavor were performed.

30 Facilities for performing: these examples were experimentally carried out in 400 liter-sized brewing facilities.

Example 1

35 Used materials: in order to process the other miscellaneous alcoholic beverages, materials were syrup 69 kg (75% of solid parts, the syrup used the rice mash or the product of DE50 and they are commercially available.). The ratio of the rice mash contained in materials was as shown in the

following:

0 weight% (#1-1, none);

0 weight% (#1-2, adding 240 g of amino acid powder);

5 10 weight% (#1-3, 6.9 kg of the conventional rice mash); and

10 weight% (#1-4, 6.9 kg of the improved rice mash).

Specifically, 300-350 L of hot water was added to 240 g of caramel coloring matter, 400 g of hop pellets and 2000 g of pea protein; the syrup was dissolved further, and this mixture was boiled for 60-90 minutes. Then, spent hops, etc., were removed from the mixture by the settling tank called Whirlpool, the remaining mixture was cooled by the plate cooler to 10 °C, and the pre-fermentation liquid was obtained. The brewers' yeast was added in this pre-fermentation liquid, and it was made to ferment at 6-15 °C (its fermentation period will be indicated below.). Then, it was stored at -1 °C.

Using a kieselguhr, the fermentation liquid was filtrated, the yeast removed, and 4 types of final other miscellaneous alcoholic beverages were obtained.

As described above, 4 types of other miscellaneous alcoholic beverages were processed and the taste evaluation was performed for these experiments in the present example.

TABLE 2

	#1-1	#1-2	#1-3	#1-4
THE SMELL OF SULFIDE	3	1	0	0
THE SCENT OF ESTER	0	2	3	3
AFTERTASTE	0	1	2	3

For every item, the valuation basis of Table 2 is as follows, and was set as 3-stage evaluations.

The smell of sulfide: 0 (weak), 1 (average), 2 (slightly strong), 3 (more strong)

The scent of ester: 0 (weak), 1 (average), 2 (slightly strong), 3 (more strong)

5 Aftertaste: 0 (no refreshing drinkability), 1 (average), 2 (slightly refreshing drinkability), 3 (more refreshing drinkability)

The evaluation standard for the taste evaluation of Table 2 was based on #1-1 without using the rice mash. As described below, since #1-1 did not have any sources of nitrogen added during the processing, the fermentation was terminated during processing and there were more residual extracts than predetermined for #1-1 which did not use the rice mash or corn protein powder. As a result of performing the taste evaluation by 10 panelists, compared with #1-1 and #1-2, the smell of sulfide was more reduced and also the scent of ester was increased for #1-3 which used the conventional rice mash and #1-4 which used the improved rice mash. Especially, refreshing drinkability was increased in aftertaste for #1-4 which used the improved rice mash; thus the desirable characteristics for malt alcoholic beverages, such as beer and low-malt beer, were reinforced.

Figure 1 is a graph of comparative fermentation periods for processing of other miscellaneous alcoholic beverages described in the example 1. The fermentation period aimed at the period until the extract of pre-fermentation liquid becomes 2.5% from 12.50% with the apparent extract, but it decreased to 4.00% with the apparent extract for #1-1. The apparent extract is an extract led from the specific gravity of the alcohol produced from sugars in the pre-fermentation liquid by fermenting and sugars which have not fermented. More specifically, the apparent extract was

extracted from the fermentation liquid in the fermentation process, and measured with a densitometer. Although the usual fermentation period is seven to nine days, without regard to whether there is fermentable sugar which the yeast can make into fermentation liquid in this embodiment, as for fermentation, the apparent extract stopped at 4%. As a result, #1-4 which used the improved rice mash shows a wide range of extracts compared to #1-1, #1-2 and #1-3. Thus, it is recognized that the improved rice mash is suitable as a nutrient for the brewers' yeast. Especially, because the fermentation of #1-1 which did not use the rice mash or the corn protein powder was terminated, it can be recognized that the improved rice mash acts as a nourishment source of supply making up for the nourishment source of the brewers' yeast and leads to an increase of the alcoholic fermentation of alcoholic beverages without using malt, like the present invention. As a result, the improved rice mash contributes to the processing method of alcoholic beverages that have preferable flavor. In addition, this is corresponding to the examination result of the example 1.

Example 2

Used materials: in order to process the other miscellaneous alcoholic beverages, materials were set to syrup 69 kg (75% of solid parts, the syrup used the improved rice mash or the product of DE50 and they are commercially available.). The ratio of the improved rice mash contained in materials was as shown in the following:

- 5 weight% (#2-1, 3.5 kg of the improved rice mash);
- 10 weight% (#2-2, 6.9 kg of the improved rice mash);
- 20 weight% (#2-3, 13.8 kg of the improved rice

mash);

30 weight% (#2-4, 20.7 kg of the improved rice mash);

5 50 weight% (#2-5, 34.5 kg of the improved rice mash); and

70 weight% (#2-6, 48.3 kg of the improved rice mash).

Then, the other miscellaneous alcoholic beverage was processed following the above described processing method in the preferred embodiment. Specifically, 300-350 L of hot water was added to 240 g of caramel coloring matter, 400 g of hop pellets and 2000 g of pea protein, the syrup was dissolved further, and this mixture was boiled for 60-90 minutes. Then, spent hops, etc., were removed from the mixture by the settling tank called Whirlpool, the remaining mixture was cooled by the plate cooler to 10 °C, and the pre-fermentation liquid was obtained. The brewers' yeast was added in this pre-fermentation liquid, and it was made to ferment at 6-15 °C (its fermentation period will be indicated below.). Then, it was stored at -1 °C.

Using the kieselguhr, the fermentation liquid was filtrated, the yeast removed, and six final other miscellaneous alcoholic beverages were obtained.

As described above, 6 types of other miscellaneous alcoholic beverages were processed and the taste evaluation was performed for these experiments in the present example.

TABLE 3

	#2-1	#2-2	#2-3	#2-4	#2-5	#2-6
THE SMELL OF SULFIDE	0	0	0	0	0	0
THE SCENT OF ESTER	3	3	3	3	3	3
AFTERTASTE	3	3	3	3	2	1

For every item, the valuation basis of

Table 2 is as follows, and was set as 3 stage evaluations.

The smell of sulfide: 0 (weak), 1 (average), 2 (slightly strong), 3 (more strong)

5 The scent of ester: 0 (weak), 1 (average), 2 (slightly strong), 3 (more strong)

Aftertaste: 0 (no refreshing drinkability), 1 (average), 2 (slightly refreshing drinkability), 3 (more refreshing drinkability)

10 The evaluation standard for the taste evaluation of Table 3 was based on #2-2 which used 10 weight% of the improved rice mash compared to the conventional technique in the example 1. As a result of performing the taste evaluation by 10
15 panelists, refreshing drinkability was increased in aftertaste for #2-1, #2-3 and #2-4 as well as #2-2, thus the desirable characteristics for malt alcoholic beverages, such as beer and low-malt beer, were reinforced. Regarding #2-5 which used 50
20 weight% of the improved rice mash, even it has a little bit strange taste compared to #2-1 and #2-4 about the aftertaste according to some panelists' evaluation but its aftertaste was generally good. Also, regarding #2-6 which used 70 weight% of the
25 improved rice mash, it has slightly mild flavor and has an increased richness in taste other than refreshing drinkability. However, the evaluation of #2-6 was low because the refreshing drinkability was inferior compared to the rest of this type of other
30 miscellaneous alcoholic beverages like alcoholic beverage having good refreshing taste.

Figure 2 is a graph of comparative fermentation periods for processing of other miscellaneous alcoholic beverages described in the
35 example 2. As shown from the result of figure 2, the fermentation period is suitable and the fermentability is improved by using 5 weight% or

above of the improved rice mash in the syrup. From a result of the taste evaluation and a progress of extract, a suitable range for usage of the improved rice mash is between 5 and 50 weight%.

5 From the above-mentioned results, it is advantageous to add much more amino acids concerning other miscellaneous alcoholic beverages. In this point, the same effect can be obtained by using a large amount of the conventional rice mash, but
10 there is an upper limit to the suitable amount of the rice mash to be used and, on the contrary, an excessive use beyond the upper limit of the conventional rice mash makes the flavor deteriorate, as seen from the result of the example 2. Therefore,
15 the rice mash having large amount of amino acid content can decrease the amount to use, prevent the flavor from deteriorating, and shorten the fermentation period.

Example 3

20 In the usual method, spirits are distilled from a material alcohol. However, a very peculiar processing method of spirits is developed by applying the processing method of other miscellaneous alcoholic beverages which are
25 mentioned above.

 Used materials: in order to process spirits, materials were syrup 69 kg (75% of solid parts, the syrup used the improved rice mash or the product of DE50 which has high maltose ratio and
30 they are commercially available.). The ratio of the improved rice mash contained in all materials was 5 weight% (#3, 3.5 kg of the improved rice mash). Specifically, 300-350 L of hot water was added to 240 g of caramel coloring matter, 400 g of hop
35 pellets and 2000 g of pea protein, the syrup was dissolved further, and this mixture was boiled for 60-90 minutes. Then, spent hops, etc., were removed

from the mixture by the settling tank called Whirlpool, the remaining mixture was cooled by the plate cooler to 10 °C, and the pre-fermentation liquid was obtained. The brewers' yeast was added
5 in this pre-fermentation liquid, and it was made to ferment at 6-15 °C (its fermentation period will be indicated below.). Then, it was stored at -1 °C.

Using the kieselguhr, the fermentation liquid was filtrated, the yeast removed, and final
10 other miscellaneous alcoholic beverages were obtained.

For sprits, there is a pre-adjustable method of extract concentration of pre-fermentation mash liquid by using materials including highly
15 fermented maltose, fructose, syrup having high glucose ratio or syrup having DE50 so that an intrinsic extract may become less than 2.00%, which is the definition of spirits of the Liquor Tax Law in Japan. Moreover, if miscellaneous alcoholic
20 beverages are made into less than 2.00% of intrinsic extract at the time of filtration, it can be diverted to the spirits. The intrinsic extract is an extract that excludes the influence of the specific gravity by alcohol from the false extract
25 mentioned above, and the intrinsic extract shows a more accurate extract than the false extract.

Figure 3 is a graph to show the fermentation period for processing of #3 of the example 3. As shown from this result, an
30 appropriate fermentation was done by using 5 weight % of the improved rice mash in the syrup.

In the final product of #3, the alcoholic concentration was adjusted to 5.00 volume % and the intrinsic extract was 1.93 weight %. This intrinsic
35 extract fulfills the requirement of the definition of the spirits under the Liquor Tax Act in Japan, in which the intrinsic extract is less than 2.00

weight %. Generally, the product of #3 and its
production method are totally different from a
production method of the spirits that are distilled
from the brewed alcoholic beverage, and it is
5 recognized that the production method in the example
3 is an extremely unique method and has novelty.
Moreover, after finishing the fermentation, a
liqueur can be obtained when the intrinsic extract
is 2.00 weight % or above by adding a flavor, sugar
10 and so on.

As a result of performing the taste
evaluation by 10 panelists, for the evaluation of
flavor, the refreshing drinkability was increased in
aftertaste, the taste of the example 3 is light
15 tasted and it was easy to drink because the example
3 had increased alcohol fermentation and the
intrinsic extract was low. As a result, it is
recognized that an alcoholic beverage having
preferable flavor can be obtained due to the taste
20 evaluation of the above and this corresponds to the
examination result of the above example 3.

In addition, the richness and the mildness
of the flavor and the durability of the flavor can
be provided when the present invention is applied to
25 alcoholic beverages such as beer and low-malt beer
which use barley, wheat and malt as materials.

The present invention is not limited to
the specifically disclosed embodiment, and
variations and modifications may be made without
30 departing from the scope of the present invention.

The present application is based on
Japanese priority application No.2004-151575 filed
on May 21, 2005, the entire contents of which are
hereby incorporated by references.

WHAT IS CLAIMED IS:

1. A processing method of a brewed alcoholic beverage with foaming properties which does not use barley, wheat and malt comprising the steps of:

processing a pre-fermentation liquid using at least a syrup containing sources of carbon, sources of nitrogen, hops and water as raw materials; and

fermenting the pre-fermentation liquid using a brewers' yeast;

wherein the syrup contains a rice mash obtained such that a liquid solution of rice is digested enzymatically using glycolysis enzyme and proteolytic enzyme and a ratio which expresses the rice mash contained in the syrup is between 5 and 50 weight %.

2. A processing method of a brewed alcoholic beverage with foaming properties which does not use barley, wheat and malt comprising the steps of:

processing a pre-fermentation liquid using at least a syrup containing sources of carbon, sources of nitrogen, hops, an improving substance for generating foam and for the foam stability and water as raw materials; and

fermenting the pre-fermentation liquid using a brewers' yeast;

wherein the syrup contains a rice mash obtained such that a liquid solution of rice is digested enzymatically using glycolysis enzyme and proteolytic enzyme and a ratio which expresses the rice mash contained in the syrup is between 5 and 50 weight %.

3. A processing method of a brewed alcoholic beverage with foaming properties as claimed in claim 1, wherein the rice mash contains amino acid gradients of AspNH₂, GluNH₂ and G-ABA.

4. A processing method of a brewed alcoholic beverage with foaming properties as claimed in claim 2, wherein the rice mash contains amino acid gradients of AspNH₂, GluNH₂ and G-ABA.

5. A brewed alcoholic beverage with foaming properties processed by the processing method as claimed in any one of claims 1 to 4.

6. A brewed alcoholic beverage with foaming properties processed by the processing

method as claimed in any one of claims 1 to 4, wherein a concentration of remaining extract (intrinsic extract concentration) is less than 2 weight %.