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(54) Title: FERMENTED DRINK

(57) Abrégé/Abstract:

Process for the preparation of a fermented drink in which an aqueous extract is prepared from 0.5- 2% tea or coffee, the aqueous extract, to which sugar is added, is recovered and a fermentation is carried out in one or more stages with at least one yeast strain and at least one bacterial strain, the insolubles are separated from the fermented drink and then it is heat-treated. The invention also relates to the fermented drink obtained using the process.

Abstract

Fermented drink

5        Process for the preparation of a fermented drink in which an aqueous extract is prepared from 0.5-2% tea or coffee, the aqueous extract, to which sugar is added, is recovered and a fermentation is carried out in one or more stages with at least one yeast  
10      strain and at least one bacterial strain, the insolubles are separated from the fermented drink and then it is heat-treated.

The invention also relates to the fermented drink obtained using the process.

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## Fermented drink

The subject of the present invention is a process for the preparation of a fermented drink as well 5 as the fermented drink obtained by this process.

The preparation of fermented drinks, especially tea fermented by a yeast strain and/or a bacterial strain, has been known for a long time.

Traditionally, the fermentation of tea occurs 10 at the surface for about ten days or even longer. The mother is of variable composition; it contains especially polysaccharides and rapidly increases until it becomes cumbersome. Accordingly, by using a traditional process, it is not possible to produce a fermented tea in large quantities. 15

Deutsche Lebensmittel-Rundschau, 83, 286-290, 1987 describes a process for the preparation of fermented drinks, especially a fermented black tea, in which a fermentation is carried out in a single stage 20 from a black tea filtrate by a yeast strain, especially a *Schizosaccharomyces pombe* strain, and a bacterial strain, especially an *Acetobacter xylinum* strain, for six days, so as to obtain a drink with a pleasant taste. The fermentation does not occur at the surface 25 but has the disadvantage of being relatively long.

The aim of the present invention is to provide a process for the preparation of a fermented drink under particularly simple conditions and in a relatively short preparation time thus allowing the production 30 of a fermented drink in large quantities.

To this end, in the process for the preparation of a fermented drink according to the present invention:

- an aqueous extract is prepared from 0.5-2% tea or 35 coffee,
- 4-13% sugar is added to this extract,
- a fermentation is carried out in one or more stages with at least one yeast strain and at least one bacterial strain,

- the insolubles are separated from the fermented drink,
- and then it is heat-treated at 85-140°C for 30 s to 15 min.

5 It was observed, surprisingly, that such a process effectively makes it possible to produce, in large quantities, a fermented drink with a pleasant taste in a short preparation time.

10 To carry out the present process, an aqueous extract is therefore prepared from 0.5-2% tea or coffee.

15 If the aqueous extract is prepared from tea, 0.5-2% black or green tea may be infused in boiling water for 3-30 min for example. To do this, the tea may be infused in a filter bag immersed in boiling water for example. But it is also possible to infuse the tea directly in boiling water and then to carry out a centrifugation or a filtration so as to separate the insolubles from the aqueous extract for example.

20 If the aqueous extract is prepared from coffee, 0.5-2% soluble coffee may be diluted in boiling water for example.

25 Preferably, 4-13% sugar, especially sucrose, is added to the aqueous extract as substrate for the fermentation by at least one yeast strain.

30 There may be inoculated into the aqueous extract, for the fermentation in one or more stages, 0.02-0.2% of a culture containing  $10^7$  to  $10^{10}$  cells of a yeast strain, especially a *Saccharomyces cerevisiae* strain, so as to produce ethanol, and 0.2-1.5% of a culture containing  $10^7$  to  $10^9$  cells of a bacterial strain, especially an *Acetobacter* strain or a *Gluconobacter* strain, so as to acidify the aqueous extract.

35 For the fermentation by at least one yeast strain, there may be used as *Saccharomyces cerevisiae* strain that marketed under the name DCL Spady by The Distillers Company Limited, Collingwood House, Sutton, Surrey SM3 AT England or that marketed under the name

Castelli by Laboratorio Zimotecnico Italiano, via dei Setti Santi 28, IT-Florence, for example.

For the fermentation by at least one bacterial strain, there may be used especially the Acetobacter strain deposited on 16 January 1996, in accordance with the Budapest treaty, at the Collection Nationale de Microorganismes, INSTITUT PASTEUR, 25 Rue du Docteur Roux, F-75724 PARIS CEDEX 15, France, where it received the deposit number CNCM I-1656. It is also possible to use the Gluconobacter suboxydans strain accessible at the Collection DEUTSCH SAMMLUNG VON MIKROORGANISMEN, DE-BRAUNSHEIG, where it received the deposit number DSM 50049 for example.

The fermentation may be carried out in a fermenter under a relative pressure of 50-80 kPa for example. There may be used as fermenter in particular a fermenter of the PAC type - APP fermenter No. 9-273-300-68, marketed by Chemap SA, CH-8604 VOLKETSWIL.

The fermentation may also be carried out in a simple open tank for example.

In a first preferred embodiment of the process according to the present invention, there is inoculated into the aqueous extract simultaneously a yeast strain and a bacterial strain and the fermentation is carried out in a single stage under aerobic conditions, at 27-32°C for 2-10 h.

Preferably, the pH of the aqueous extract is adjusted to a value of 4 to 5.5 before the fermentation, so as to facilitate the fermentation by a yeast strain.

In a second preferred embodiment of the process according to the present invention, the fermentation is carried out under aerobic conditions in two stages. To do this, a yeast strain is first of all inoculated into the aqueous extract and the fermentation is allowed to proceed at 27-32°C, for 15-27 h. Then a bacterial strain is inoculated into the aqueous extract and the fermentation is allowed to proceed at 20-32°C for 3-9 h.

Preferably, the temperature of the medium is adjusted to 17-25°C before inoculating the bacterial strain, so as to slow down the formation of ethanol due to the fermentation by the yeast strain.

5 At the end of the fermentation in one or more stages, the temperature may be decreased to 0-12°C, so as to reduce the production of ethanol due to the fermentation by the yeast strain and the acidification due to the fermentation by the bacterial strain for 10 example.

Then the insolubles may be separated from the fermented drink by centrifugation or by filtration for example.

Preferably, the fermented drink is then heat-15 treated at 85-140°C for 30 s to 15 min, so as to inactivate the yeasts and the bacteria and to eliminate all the pathogenic agents.

The subject of the present invention is also the fermented drink obtained using the said process.

20 The process for the preparation of a fermented drink according to the present invention is described in greater detail in the non-limiting examples below. In these examples, the percentages and parts are given by weight, unless otherwise indicated. The measurements 25 of the ethanol content and of the acetic acid content of the said fermented drinks were obtained by the Boehringer(R) method of enzymatic measurement. Furthermore, the pH was measured with electrodes.

30 Example 1

Fermented tea is prepared.

In a simple open tank, 1% green tea is infused in boiling water for 10 min. To do this, a filter bag containing 1.2 kg of green tea is immersed in boiling 35 water.

The filter bag is removed and 11% sucrose is added to the aqueous extract whose temperature has been previously adjusted to 30°C.

The fermentation is carried out in two stages. To this end, 0.1% of a culture containing  $10^8$  cells of *Saccharomyces cerevisiae* Castelli strain is first of all inoculated into the aqueous extract and the fermentation is allowed to proceed at 30°C for 19 h. The temperature of the aqueous extract is decreased to 20°C, before inoculating into the aqueous extract 1% of a culture containing  $10^8$  cells of the *Acetobacter* strain CNCM I-1656 and the fermentation is allowed to proceed 10 at 20°C for 7 h, while stirring and aerating, so as to provide a supply of oxygen.

At the end of the fermentation, the temperature of the aqueous extract is decreased to 5°C.

Then the fermented tea is isolated by 15 separating the insolubles by filtration.

Finally, the fermented tea which has been prepacked is sterilized at 140°C for 40 s.

A fermented tea with an apple-like taste is thus obtained which has a pH of 3.4 and has an ethanol 20 content of 0.32% and an acetic acid content of 0.36%.

#### Example 2

Fermented tea is prepared.

In a simple open tank, 1% green tea is infused 25 in boiling water for 20 min. To do this, a filter bag containing 1.2 kg of green tea is immersed in boiling water.

The filter bag is removed and 7% sucrose is added to the aqueous extract whose temperature has been 30 previously adjusted to 30°C.

The fermentation is carried out in a single stage. To do this, before the fermentation, the pH of the aqueous extract is adjusted to 5 and then 0.05% of a culture containing  $10^8$  cells of the *Saccharomyces cerevisiae* Castelli strain and 0.5% of a culture containing  $10^8$  cells of the *Gluconobacter suboxydans* strain DSM 50049 are inoculated into the aqueous extract simultaneously and the fermentation is allowed

to proceed at 30°C for 7 h, while stirring and aerating, so as to provide a supply of oxygen.

At the end of the fermentation, the temperature of the aqueous extract is decreased to 5°C.

5 Then, the fermented tea is isolated by separating the insolubles by filtration.

Finally, the fermented tea which has been prepacked is pasteurized at 95°C for 5 min.

10 A sweet fermented tea with an apple-like taste is thus obtained which has a pH of 4.47 and has an ethanol content of 0.05% and an acetic acid content of 0.032%.

#### Example 3

15 The procedure is carried out in the manner described in Example 2, except for the fact that during the fermentation stage, 0.05% of a culture containing  $10^8$  cells of *Saccharomyces cerevisiae* Spady strain and 0.5% of a culture containing  $10^8$  cells of the *Gluconobacter suboxydans* strain DSM 50049 are inoculated.

A fermented tea with an apple-like taste is thus obtained which has a pH of 4.45 and has an acetic acid content of 0.05%. The said fermented tea contains ethanol in trace amounts.

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#### Example 4

1% green tea is infused in boiling water for 10 min. To do this, a filter bag containing 1.2 kg of tea is immersed in boiling water.

30 The filter bag is removed and the aqueous extract, to which 11% sucrose is added, is collected in a fermenter of the PAC type - APP fermenter No. 9-273-300-68, marketed by Chemap SA, CH-8604 VOLKETSWIL.

The fermentation is carried out in two stages. 35 To this end, the temperature of the fermenter is adjusted to 30°C. The pressure is adjusted to 60 kPa so as to have an oxygen concentration of 10 mg/l in the fermentation medium. The injection of air into the fermentation medium is adjusted to 1000 l/h so as to

maintain a stable oxygen concentration. Finally, the stirring of the fermentation medium is adjusted to 400 rpm so that the whole of the aqueous extract is properly oxygenated during the fermentation.

5 Under these conditions, 0.1% of a culture containing  $10^8$  cells of a *Saccharomyces cerevisiae* Castelli strain is inoculated into the aqueous extract and the fermentation is allowed to proceed at 30°C for 19 h. Then the temperature of the aqueous extract is 10 decreased to 20°C and the pressure is adjusted to 70 kPa, before inoculating into the aqueous extract 1% of a culture containing  $10^8$  cells of an *Acetobacter* strain CNCM I-1656 for 7 h.

15 At the end of the fermentation, the temperature of the aqueous extract is decreased to 5°C.

Then the fermented tea is isolated by separating the insolubles by filtration.

Finally, the fermented tea which has been prepacked is sterilized at 140°C for 40 s.

20 A fermented tea with an apple-like taste is thus obtained which has a pH of 3.4 and has an ethanol content of 0.32% and an acetic acid content of 0.36%.

#### Example 5

25 Fermented coffee is prepared.

To do this, 1% soluble coffee is diluted in boiling water.

The temperature of the aqueous extract is adjusted to 30°C before adding 5% sucrose thereto.

30 The fermentation is carried out in a single stage. To do this, before the fermentation, the pH of the aqueous extract is adjusted to 5 and then 0.05% of a culture containing  $10^8$  cells of *Saccharomyces cerevisiae* Castelli and 0.5% of a culture containing 35  $10^8$  cells of the *Acetobacter* strain CNCM I-1656 are inoculated into the aqueous extract simultaneously and the fermentation is allowed to proceed at 30°C for 7 h, while stirring and aerating, so as to provide a supply of oxygen.

At the end of the fermentation, the temperature of the aqueous extract is decreased to 5°C.

Then the fermented coffee is isolated by separating the insolubles by filtration.

5 Finally, the fermented coffee which has been prepacked is pasteurized at 95°C for 5 min.

A fermented coffee with a fruity taste is thus obtained which has a pH of 4.31 and has an acid content of 0.03%. The said fermented coffee contains ethanol in 10 trace amounts.

## Claims

1. Process for the preparation of a fermented drink, in which:

- an aqueous extract is prepared from 0.5-2% tea or coffee,
- 4-13% sugar is added to this extract,
- a fermentation is carried out in one or more stages with at least one yeast strain and at least one bacterial strain in a fermenter under a relative pressure of 50-80 kPa while stirring and aerating,
- the insolubles are separated from the fermented drink,
- and then the fermented drink is heat-treated at 85-140°C for 30 s to 15 min.

2. Process according to Claim 1, in which the aqueous extract is prepared from 0.5-2% black or green tea which is infused in boiling water for 3-30 min.

3. Process according to Claim 1, in which the said fermentation is carried out in a single stage by inoculating a yeast strain and a bacterial strain into the aqueous extract simultaneously, under aerobic conditions, at 27-32°C for 2-10 h.

4. Process according to Claim 2, in which the pH of the said aqueous extract is adjusted to a value of 4 to 5.5 before the fermentation.

5. Process according to Claim 1, in which the said fermentation is carried out under aerobic conditions in two stages by inoculating into the aqueous extract first of all a yeast strain at 27-32°C, for 15-27 h, and then by inoculating into the aqueous extract a bacterial strain at 20-32°C for 3-9 h.

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6. Process according to Claim 3, in which the temperature of the medium is adjusted to 17-25°C before inoculating the bacterial strain.

7. Process according to Claim 1, in which 0.02 - 0.2% of a culture containing  $10^7$  to  $10^{10}$  cells of a yeast strain is inoculated into the aqueous extract for the fermentation in one or more stages.

8. Process according to Claim 1, in which 0.2-1.5% of a culture containing  $10^7$  to  $10^9$  cells of a bacterial strain is inoculated into the aqueous extract for the fermentation in one or more stages.

9. Process according to Claim 1, in which the temperature is decreased to 0-12°C at the end of the fermentation.

10. Fermented drink obtained by the process according to one of Claims 1-9.