Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2269509 C 2004/12/14

(11)(21) 2 269 509

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1999/04/22

(41) Mise à la disp. pub./Open to Public Insp.: 1999/10/22

(45) Date de délivrance/Issue Date: 2004/12/14

(30) Priorité/Priority: 1998/04/22 (112085) JP

(51) Cl.Int.^{6}/Int.Cl.^{6} A23L 1/223

(72) Inventeur/Inventor:
SADOYAMA, KEIICHI, JP

(73) Propriétaire/Owner:
HATSUK CORPORATION, US

(74) Agent: RIDOUT & MAYBEE LLP

(54) Titre : PROCESSUS DE PREPARATION DE L'UKON COMME ALIMENT
(54) Title: PROCESS FOR PREPARING UKON FOR FOOD

(57) Abrégé/Abstract:
A ginger plant containing curcumin, such as Ukon or turmeric, is enhanced for use as a food by fermenting it with a starch and red yeast. Each 100 weight of Ukon has mixed with it 1.0 to 20.0 weight of starch and 0.1 to 10.0 weight of red yeast. In addition, saccharides of 0.1 to 10.0 weight and minerals of 0.1 to 1.0 weight can be added to the mix. The fermentation process can be regulated by the addition of a mold of the Monascus genus. The water content is adjusted to 50 to 75 weight percent and the mixture is fermented for 5 to 1,000 hours at a temperature of 25 to 40°C. Prior to the addition of red yeast and mold and fermenting, the mixture can be sterilized for 1/2 to 1 1/2 hours at 110 to 130°C under a pressure of 1.05 to 1.15 atmospheres and, after fermenting, the mixture can be heat treated for 0.1 to 100 hours at 60 to 100°C.

ABSTRACT

A ginger plant containing curcumin, such as Ukon or turmeric, is enhanced for use as a food by fermenting it with a starch and red yeast. Each 100 weight of Ukon has mixed with it 1.0 to 20.0 weight of starch and 0.1 to 10.0 weight of red yeast. In addition, saccharides of 0.1 to 10.0 weight and minerals of 0.1 to 1.0 weight can be added to the mix. The fermentation process can be regulated by the addition of a mold of the Monascus genus. The water content is adjusted to 50 to 75 weight percent and the mixture is fermented for 5 to 1,000 hours at a temperature of 25 to 40°C. Prior to the addition of red yeast and mold and fermenting, the mixture can be sterilized for 1/2 to 1½ hours at 110 to 130°C under a pressure of 1.05 to 1.15 atmospheres and, after fermenting, the mixture can be heat treated for 0.1 to 100 hours at 60 to 100°C.

PROCESS FOR PREPARING UKON FOR FOOD

BACKGROUND OF THE INVENTION

Field of the Invention

The bitterness of Ukon or turmeric derivatives are removed by fermenting it with red yeast and a starch to break down the water insoluble essential oil components and other macromolecular substances into water soluble lower molecular weight substances, while maintaining its beneficial effect on liver functions, increasing antioxidant characteristics, and retaining curcumin.

Description of Related Art

Ukon or turmeric is a plant of the ginger family, that includes curcumin, cultivated in places such as India, South East Asia, China and Okinawa. In recent years, accompanying the sophistication of the diet and foods consumed, is an increase in the active oxygen generated in our bodies. The result has been an increase in the formation of oxidant lipids and the like. It has been observed that patients with metabolic disorders, arteriosclerosis and the like are increasing. Accordingly, there is a pressing need to provide methods for preventing these disorders.

Ukon or turmeric has been used as the principal ingredient of curry powder. It has been the focus in recent years as a natural plant material that has efficacy in improving liver and other body functions. Ukon is a hardy or long-lived plant which is cultivated mainly in the tropical to

semitropical regions of India, Southeast Asia, China, Okinawa and the like. Ukon includes components of curcumin, and essential oils. It has been used as a type of eastern medicine for a long time as a remedy for hepatitis, nephritis, cholangitis, cholecystolithiasis, gastritis and the like. However, Ukon has a characteristic bitter component, and the problem is that it is difficult to eat it as it is and to use it over a long period of time.

In Japanese Laid Open patent publication 8-214825, a manufacturing method for Ukon foodstuff discloses that residue from refined grains and saccharides can be added to Ukon, after which lactic acid bacteria or lactic acid bacteria and yeast are added as a culture medium that causes fermentation. Specifically, the root stalk of Ukon is dried, and residue from refined grains of rice bran, wheat bran, and the like are added to it along with saccharides; lactic acid bacteria of Streptococcus, Samofirus, and Lactobacillus, or lactic acid bacteria and yeast as a culture medium for fermenting the Ukon. After fermentation, it is heat dried. There are problems in this production method. There is insufficient removal of the bitter component characteristic of Ukon, the amount of curcumin, which is presumed to have an improved effect on the liver functions, is reduced, and the lactic acid bacteria used for fermenting the Ukon is easily polluted by other bacteria, that kills or easily destroys it. Because of this, the fermentation process needs to be performed in a short period of time. Also, the fermentation process using lactic acid bacteria results in a Ukon foodstuff which does not have a good anti-oxidant characteristic, it does not control active oxygen.

SUMMARY OF THE INVENTION

By fermenting plants such as Ukon or turmeric with the addition of varieties of starch and red yeast, and with the further addition of saccharides, minerals, and the like, the amount of curcumin retained is increased; the components causing the bitter taste are removed; the beneficial effects on the liver are retained; and beneficial anti-oxidant characteristics are added.

The fermentation process breaks down the essential oil components and macromolecular molecules into smaller water-soluble molecules. The red yeast has an anti-oxidant effect and provides an excellent control over active oxygen. The red yeast used as the fermentation culture medium has a high rate of survival. This reduces the need for close production supervision as the fermentation can be performed over a long period of time. The fermentation is regulated by mold of the Monascus genus, giving a superior fermentation efficiency and control of active oxygen. The red yeast allows the use of higher fermentation temperatures. The addition of saccharides and minerals assists the fermentation process and also helps to reduce the amount of curcumin lost. The enzyme amylase protease and the like break up the large molecules. The Ukon foodstuff can be used as a tea and can be added to bread, candy, crackers and the like giving added health benefits to these foods.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The basic materials or ingredients used in the present process include a member of the ginger family, starch and a red yeast. A mineral and a saccharide can be added to the basic mix.. The primary ginger plant of interest is the Ukon or turmeric plant. The Ukon used is not limited to any particular species as long as it is a plant of the ginger family that includes curcumin.

While the starch used is not limited to a specific variety it is preferred that the starch be from at least one of the groups consisting of polished rice, whole-grained rice, wheat, millet, kaoliang, buckwheat, corn, soybean, azuki bean along with their derivatives, e.g. sugars, bran, and germ. The starch variety generates saccharides by hydrolysis with red yeast and activates or continues the fermentation of Ukon for a long time.

The red yeast used is not limited to any particular form. The red yeast used can be dried, pulverized, and used in a powder form. It is also possible to mix the red yeast with high molecular materials, liquid particles and the like, and use it in the configuration of an excipient, as an alternative vehicle or mass. It is preferred that the red yeast fermentation process be regulated by a mold of the Monascus genus. More specific types of mold that can be used include Monascus anka, ,Monascus pilosus, Monascus ruber and the like. These molds can be independently used for regulating the red yeast, or two or more mold types can be mixed together for regulating the red yeast.

The saccharides that can be used in the present invention are not particularly restricted as long as they are monosaccharides and polysaccharides. Examples that can be used are glucose, fructose, sucrose, galactose, molasses and the like. These saccharides can be used independently or two or more can be mixed together and used.

The minerals that can be used include Magnesium Sulfate ($MgSO_4$-$7H_2O$), Potassium Nitrate (KNO_3) and the like.

To 100 weight units of Ukon, starch within the range of 1.0 to 20.0 weight units and red yeast within the range of 0.1 to 10.0 weight units are mixed and fermented. If the amount of starch added is within this range, the starch will not break up with the addition of water, and there is little concern that it will remain behind after fermentation. The fermentation of the Ukon performed by the red yeast can be extended over a long period of time.

The red yeast used can be manufactured and regulated by ordinary manufacturing processes. These methods can include the solid leaven methods (scattering or pounding) or liquid leaven methods. The red yeast can be obtained by cultivation in a favorable environment for 2 to 14 days. It is preferred that a liquid culture medium with an injection extract of rice bran or the like be the principal component.

Saccharides can be added to the mix. To 100 weight units of Ukon 0.1 to 10.0 weight units of saccharides can be added to the Ukon before it is fermented. The addition of saccharides assists fermentation. In this range the saccharides are all used up during fermentation.

Minerals can be added to the mixture. To each 100 weight units of Ukon 0.1 to 1.0 weight units of minerals can be added. The minerals assist in maintaining the activity of the red yeast.

For fermentation, the first step is to prepare the plant, such as Ukon. The Ukon root stem is washed with water and sectioned into small pieces. The small pieces are heated using hot air to prepare them for pulverization. After the water content is brought down to about 10 weight percent, they are placed in a pulverizer. After pulverization, the Ukon can be divided into particulate form having an average particle size of from 2 to 4 mm for a more even fermentation. In this form, there is a more efficient removal of the bitter components of the Ukon.

The second step is to mix the ingredients. A blender is used to mix the Ukon, starch, mineral and saccharide into an even consistency. It is preferred that the moisture content of the mixture be controlled during the fermentation process. The water should compose from 50 to 75 weight percent of the mixture. By controlling the amount of water included in the mixture, the efficiency of the fermentation process is increased. The ideal amount of water is within the range

of 65 to 68 weight percent. Water, heated to about 55 to 65°C, is added to the mixture until it makes up about 60% of the total mixture.

The next step is to sterilize the mixture. This is done in a pressure cooker. Sterilization is performed at from 115 to 125°C under 1.05 to 1.15 atmospheres for from 1/2 to 1½ hours. It is preferred that the mixture be placed in a gazette bag under 1.1 atmospheres at 120°C for one hour. This sterilization will kill miscellaneous bacteria and the like that are present on or in the Ukon.

After sterilization, the mixture is cooled to room temperature. The mixture is then injected or inoculated with a prescribed amount of red yeast as the culture medium. The mixture can be injected with a mold of the monascus genus such as monascus anka, monascus pilosus, monascus ruber and the like.

The fermentation conditions using the red yeast are not particularly critical. The fermentation process can occur at from 25 to 40°C for from 5 to 1,000 hours. Under these fermentation conditions, the bitter components of the Ukon are removed with little concern for destruction of the red yeast. It is preferred that the Ukon be fermented at a temperature of from 28 to 30°C for from 10 to 600 hours. As an example, the Ukon fermented product was obtained by fermenting for 30 days in the culture or gazette bag at a temperature of from 25 to 30°C with a 60 weight percent water present in the fermentation medium.

Upon completing the fermentation process, it is advantageous to heat treat the fermented mixture. The heat treatment more efficiently maintains the improved effect of the Ukon on the liver functions. The heat treatment of the mixture can be conducted at a temperature of from 60 to 100°C for from 0.5 to 100 hours. The preferred treatment is conducted at a temperature of from 70 to 90°C for from 1 to 10 hours. The resulting fermented Ukon product is dried at 70 to 80°C for about 8 hours until the amount of water drops to about 3%. This is used as the raw material for food.

As a specific use of the invention, a combination of Ukon, starch, magnesium sulfate (MgSO4) and glucose are mixed and fermented according to Examples 1 through 9 with the raw food material pulverized and used to make tea bags. Prior art Examples 11 and 12 are included for comparison purposes.

Example 1

Ukon root stems were washed in water, sliced and processed. The root stem was then dried using hot air. The dried root stem was then pulverized into particles having an average diameter of about 2 to 4 mm. The pulverized Ukon was then mixed with 5.0 g of rice bran, 0.5 g of Magnesium Sulfate ($MgSO_4$) and 10.0 g of glucose for each 100 g of Ukon. Water heated to 60°C was added to the mixture until the water made up 60% of the total weight of the mixture. The mixture was placed in a gazette culture bag and sterilized at 120° C under 1.1 atmosphere pressure for 1 hour. The mixture was then cooled to room temperature. A red yeast was

prepared in a liquid culture medium using rice bran injection extract as the principal component. The red yeast and mold, monascus anka, were injected into the mixture. The mixture was then fermented in the culture bag for 30 days at a temperature of 25 to 30°C. After fermentation, the mixture was heat dried at 70 to 80°C for 8 hours until the water content dropped to about 3% forming the raw material for a Ukon tea. The raw material of the Ukon tea was then heat dried and pulverized and placed in bags.

TABLE 1

The Ukon tea produced by Example 1 was analyzed. A 100 g sample of the tea was found to have the following ingredient composition:

Ingredient Name	Amount
Water	2.0 g
Protein	17.3 g
Saccharides	47.7 g
Lipids	7.3 g
Fiber	14.7 g
Ash Content	8.3 g
Tanic Acid	2.7 g
Curcumin	3.2 g
Calcium	1,200 mg
Sodium	29 mg
Magnesium	458 mg
Potassium	1,760 mg
Phosphorus	592 mg
Manganese	4 mg
Iodine	not detected
Iron	112 mg
Zinc	1.42 mg
Copper	2.0 mg
Selenium	7 µg

An evaluation was made of the resulting Ukon tea for the three basic concerns: smell, antioxidant activity and curcumin content.

The smell test used was simply to smell the resulting tea to see if the strong Ukon smell, directly associated with the bitter taste, could be detected. Response was broken down into four categories (1) no Ukon smell, (2) a tiny or faint Ukon smell, (3) Ukon could be smelled, (4) a very strong Ukon smell.

The DPPH method was used to test for antioxidant activity of the Ukon tea. The DPPH test measures the antioxidant activity performance. A 50 to 1 weight ratio of Ukon to Tris was used. A Tris salt buffer solution that includes DPPH (1,1 - diphenyl -2- picrylhydrazyl) was added to the Ukon tea. The rate at which DPPH radicals were removed was measured using a spectrophotometer.

The value of DPPH absorption in Ukon without a fermentation processing is generally within a range of 80 to 98%. There is a general acceptance that, if the DPPH absorption is 50% or less, there is superior antioxidant activity. The DPPH absorption in the Ukon fermented according to the process set forth in Example 1 was 12%.

The antioxidant activity performance was evaluated on absorption ability. (1) A DPPH absorption of less than 25%. (2) A DPPH absorption between 25% and 40%. (3) A DPPH absorption between 40% and 75%. (4) A DPPH absorption of 75% or more.

The curcumin content in the Ukon tea was measured using high pressure performance liquid chromatography (HPLC). It is generally accepted that in its natural state, without fermentation, the curcumin content in Ukon is about 44 g per Kg of Ukon. The curcumin content of the Ukon prepared in accordance with Example 1 was 32 g per Kg of Ukon.

The curcumin content was evaluated on the amount present in 1 Kg of the resulting fermented and prepared Ukon. The results were based on general content. (1) There was 30 g or more of curcumin. (2) There was 25 to 30 g of curcumin (3) There was 20 to 25 g of curcumin. (4) There was less than 20 g curcumin.

Example 2

The same process was used as in Example 1 except that Monascus pilousus rather than Monascus anka was used as the mold.

Example 3

The same process was used as in Example 1 except that Monascus ruber was used rather than Monascus anka as the mold.

Example 4

The same process was used as in Example 1 except that Monascus anka and Monascus pilousus in a 1 to 1 weight ratio was used.

Example 5

The same process was used as in Example 1 except that Monascus anka and Monascus ruber in a 1 to 1 weight ratio was used.

Example 6

The same process was used as in Example 1 except that the starch used was wheat bran rather than rice bran.

Example 7

The same process was used as in Example 1 except that the starch used was whole-grained rice.

Example 8

The same process was used as in Example 1 except that the starch used was a mixture of soy bean and rice bran.

Example 9

The same process was used as in Example 1 except that the saccharide used was galactose rather than glucose.

Example 10

The same process was used as in Example 1 except that, for comparative purposes, the lactic acid bacteria Streptococcus thermophilus was substituted for the red yeast and Monascus anka. Because of the concern that the lactic acid bacteria might be destroyed during fermentation, the temperature of the culture bag was strictly kept at 30°C and cultured for 7 days.

Example 11

The same process was used as in Example 1 except that the lactic acid bacteria Lactobacillus plantarum and Bacillus Subtilis in a 1 to 1 ratio was used.

The composition comparison of the Ukon tea produced by the procedures set forth in Examples 1 to 11 is set forth in Table 2. The Ukon Tea samples were prepared by pouring 500 ml of hot water (100°C) over a 2 g bag of Ukon tea. The table lists the culture medium, smell, DDPH absorbance % and curcumin content for a 100 g sample of Ukon.

Table 2

	Mold Medium	Evaluation 1 (Smell)	Evaluation 2 (DPPH absorbency / %)	Evaluation 3 (amount of curcumin)
Example 1	Monascus Anka	(1)	(1)	(1)
Example 2	Monascus Pilousus	(1)	(1)	(1)
Example 3	Monascus Ruber	(1)	(1)	(1)
Example 4	Monascus Anka/ Monascus Pilousus	(1)	(1)	(1)
Example 5	Monascus Anka/ Monascus Ruber	(1)	(1)	(1)
Example 6	Monascus Anka	(1)	(1)	(1)
Example 7	Monascus Anka	(1)	(1)	(1)
Example 8	Monascus Anka	(1)	(1)	(1)
Example 9	Monascus Anka	(1)	(1)	(1)
Example 10	Streputcoccus thermophilus	(4)	(4)	(4)
Example 11	Lactobacillus plantarum / Bacillus Sub.tilis	(4)	(4)	(4)

As can clearly be seen in the chart, all of the examples following the process of the invention are within the preferred range for smell, indicating the removal of the bitter components; DPPH absorbance percentage, indicating good oxidation characteristics, and had large amounts of curcumin remaining, indicating that the procedure did not remove significant amounts of curcumin from the starting Ukon or turmeric plant materials. The same test using the prior lactic

acid bacteria as the culture medium indicates that the smell, antioxidant characteristics and curcumin content were not acceptable after fermentation.

It is believed that the procedures, construction, operation and advantages of this invention will be apparent to those skilled in the art. It is to be understood that the present disclosure is illustrative only and that changes, variations, substitutions, modifications and equivalents will be readily apparent to one skilled in the art and that such may be made without departing from the spirit of the invention as defined by the following claims.

CLAIMS:

1. A process for preparing a member of the ginger family containing curcumin for use as a food including the steps of:

providing an amount of said ginger family member;

mixing said ginger family member with an amount of starch to obtain a mixture;

adding to said mixture an amount of red yeast; and

fermenting said mixture to obtain a fermented mixture.

2. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1, wherein said starch is selected from the group consisting of rice, wheat, millet, kaoliang, buckwheat, corn, soybean, azuki bean and a derivative thereof.

3. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

adding a mold to said mixture prior to fermentation, said mold being selected from the group consisting of Monascus anka, Monascus ruber and Monascus pilousus.

4. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

adding a mineral to said mixture prior to fermentation of said mixture.

5. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 4, wherein said mineral is selected from the group consisting of Magnesium Sulfate and Potassium Nitrate.

6. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

adding a saccharide to said mixture prior to said fermentation of said mixture.

7. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 6, wherein said saccharide is selected from the group consisting of monosaccharides and polysaccharides.

8. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 6, wherein said saccharide is selected from the group consisting of glucose, fructose, sucrose, galactose and molasses.

9. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 2 including:

adding a mold to said mixture prior to fermentation, said mold being selected from the group consisting of Monascus anka, Monascus ruber and Monascus pilousus;

adding a mineral to said mixture prior to fermentation, said mineral being selected from the group consisting of Magnesium Sulfate and Potassium Nitrate; and

adding a saccharide to said mixture prior to fermentation, said saccharide being selected from the group consisting of monosaccharides and polysaccharides.

10. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

adding water to said mixture, prior to fermenting said mixture, until said mixture has a total water content of from 50 to 75%.

11. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

providing said ginger family member in the amount of 100 weight units;

mixing said amount of starch in the range of 1.0 to 20.0 weight units; and

adding to said mixture said red yeast amount in the range of 0.1 to 10.0 weight units.

12. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 11 including:

adding a mineral to said mixture prior to fermenting said mixture;

adding a saccharide to said mixture prior to fermentation of said mixture; and

adding water to said mixture, prior to fermenting said mixture, until said mixture has a total water content of from 50 to 75%.

13. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

sterilizing said mixture to eliminate unwanted bacteria prior to addition of said red yeast and fermentation of said mixture.

14. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 13 including:

carrying out said sterilization for from ½ to 1½ hours at a temperature of from 110 to 130°C under a pressure of from 1.05 to 1.15 atmospheres.

15. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

post-heat treating said fermented mixture at a temperature of from 60 to 100°C for from ½ to 100 hours.

16. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 11 including:

adding a mold to said mixture prior to fermentation of said mixture, said mold being selected from the group consisting of Monascus anka, Monascus ruber and Monascus pilousus;

adding a mineral to said mixture prior to fermentation of said mixture, said mineral being selected from the group consisting of Magnesium Sulfate and Potassium Nitrate; and

adding a saccharide to said mixture prior to fermentation of said mixture, said saccharide being selected from the group consisting of monosaccharides and polysaccharides.

17. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 16 including:

adding water to said mixture, prior to fermenting said mixture, until said mixture has a total water content of from 50 to 75%.

18. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 1 including:

sterilizing said mixture to eliminate unwanted bacteria prior to said addition of said red yeast and fermentation of said mixture;

adding water at from 55 to 65°C to said mixture, prior to fermenting said mixture, until said mixture has a total water content of from 50 to 75%; and

carrying out said fermentation for 10 to 600 hours at a temperature of from 28 to 30°C.

19. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 18 including:

post-heat treating said fermented mixture at a temperature of from 60 to 100°C for from ½ to 100 hours.

20. The process for preparing a member of the ginger family containing curcumin for use as a food as in claim 19 including:

providing said ginger family member in the amount of 100 weight units;

mixing said amount of starch in the range of 1.0 to 20.0 weight units; and

adding to said mixture said red yeast amount in the range of 0.1 to 10.0 weight units.