

## DESCRIPTION

METHOD FOR PRODUCING EDIBLE OIL AND FAT, AND USE OF SAID

EDIBLE OIL AND FAT

### TECHNICAL FIELD

5 [0001]

The present invention relates to a method for producing an edible oil and fat, and to a use of said edible oil and fat.

### BACKGROUND ART

10 [0002]

Ingesting excessive quantities of trans-fatty acids is known to raise the risk of heart disease. Therefore, it is preferable for the trans-fatty acid content of edible oils and fats to be low. According to guidelines from the Consumer  
15 Affairs Agency, if the trans-fatty acid content is less than 0.3 g per 100 g of a food product, it is possible for an indication to be given that the food product does not contain trans-fatty acids. Thus, oils and fats having a lower trans-fatty acid content are desired from this standpoint as well.

20 [0003]

In relation to features for reducing trans-fatty acid content, a variety of criteria in steps for refining edible oils and fats have been investigated. For example, Patent Document 1 discloses a method for producing refined rapeseed  
25 oil, the method including a deodorization step for deodorizing rapeseed oil, wherein the deodorization step includes a

contacting step in which rapeseed oil and water vapor are brought into contact with one another for 53-100 minutes at a temperature of 205-225°C and a degree of vacuum of 300-800 Pa, the upper limit of the temperature in the deodorization step does not exceed 225°C, the amount of water vapor is 2.5-5.0 mass% relative to the rapeseed oil, and the  $\alpha$ -tocopherol content of the refined rapeseed oil obtained after the contacting step is 172 ppm or greater.

[Related Art Documents]

10 [Patent Documents]

[0004]

[Patent Document 1] Japanese Patent No. 6348685

#### DISCLOSURE OF THE INVENTION

[Problems the Invention is Intended to Solve]

15 [0005]

However, there has yet to be a sufficient investigation into a production method for obtaining an edible oil and fat that has a low trans-fatty acid content and is exceptional in terms of other qualities as well, such as acid value, oxidation stability, and release properties.

[0006]

The present invention was contrived in view of the matter described above, it being an object of the present invention to provide a production method for obtaining an edible oil and fat that has a low trans-fatty acid content and is exceptional in terms of other qualities as well.

[Means for Solving the Problems]

[0007]

According to a first aspect of the present invention,  
there is provided a method for producing an edible oil and fat  
5 by performing a refinement treatment on an unrefined oil  
obtained from an oil and fat raw material, characterized in  
that the refinement treatment includes a deodorization step,  
and the deodorization step is performed while satisfying all  
of the following criteria 1) to 3).

10 1) The temperature is 210°C or higher and 220°C or lower.

2) The degree of vacuum is greater than 2.1 Torr and is  
4.0 Torr or lower.

3) The amount of water vapor supplied to the oil and fat  
on which the deodorization step is implemented is 0.5 mass% or  
15 greater and is less than 2.5 mass%.

[0008]

According to the above-described method for producing an  
edible oil and fat provided by the present invention, it is  
possible to obtain an edible oil and fat that has a low trans-  
20 fatty acid content. It is also possible to obtain an edible  
oil and fat that has a low acid value (AV) and has exceptional  
oxidation stability. This makes it possible to delay  
deterioration of the edible oil and fat, as well as to obtain  
an edible oil and fat that has an exceptional effect for  
25 preventing a material being heated (food ingredient) from

adhering to the surface of a frying pan or other implement for cooking with heat, i.e., has exceptional release properties.

[0009]

In the above-described method for producing an edible oil and fat provided by the present invention, the criterion pertaining to the degree of vacuum in the deodorization step is preferably further limited to be greater than 2.5 Torr and to be 4.0 Torr or less.

[0010]

In the above-described method for producing an edible oil and fat provided by the present invention, the refinement treatment preferably includes a deacidification step, and it is preferable that in the deacidification step, a factor by which an alkaline substance is added relative to a neutralization equivalent of an acidic substance included in the oil and fat on which the deacidification step is implemented is 1.0 or greater and 1.4 or less.

[0011]

According to this mode, it is possible to obtain an edible oil and fat that has a more exceptional effect for preventing a material being heated (food ingredient) from adhering to the surface of a frying pan or other implement for cooking with heat. It is also possible to obtain an edible oil and fat that has a lower AV and more exceptional oxidation stability.

[0012]

In the above-described method for producing an edible oil and fat provided by the present invention, the oil and fat raw material is preferably soybeans or rapeseed.

[0013]

5           According to a second aspect of the present invention, there is provided a use of an edible oil and fat for cooking with heat, the edible oil and fat being produced through the above-described method for producing an edible oil and fat.

[0014]

10           According to the above-described use of an edible oil and fat provided by the present invention, it is possible to reduce the amount of trans-fatty acids included in a food product that is cooked with heat. It is also possible to prevent a material being heated (food ingredient) from  
15   adhering to the surface of a frying pan or other implement for cooking with heat.

[0015]

          In the above-described use of an edible oil and fat provided by the present invention, the cooking with heat is  
20   preferably stir-frying. The cooking with heat is also preferably frying.

[0016]

          According to a third aspect of the present invention, there is provided a method for suppressing adhesion of a food  
25   ingredient to an implement for cooking with heat, the method including a step for stir-frying a food ingredient using an

implement for cooking with heat and using an edible oil and fat produced through the above-described method for producing an edible oil and fat.

[0017]

5 According to the method for suppressing adhesion of a food ingredient to an implement for cooking with heat provided by the present invention, it is possible to prevent a material being heated (food ingredient) from adhering to the surface of a frying pan or other implement for cooking with heat.

10 MODE FOR CARRYING OUT THE INVENTION

[0018]

A preferred embodiment of the present invention is described in detail below.

An edible oil and fat is produced by performing a  
15 refinement treatment on an unrefined oil obtained from an oil and fat raw material. The refinement treatment includes a step for removing, *inter alia*, impurities that are included in the unrefined oil. Examples of the refinement treatment include a degumming step, a deacidification step, a decoloration step,  
20 and a deodorization step.

[0019]

The degumming step involves hydrating and removing a gum substance that is included in the unrefined oil or other raw-material oil and fat and principally contains a phospholipid.

25 The degumming step is not limited and can be performed by, e.g., adding water vapor or water to the unrefined oil or

other raw-material oil and fat and then stirring the resultant combination. The gum substance thereby migrates to a water layer upon being hydrated. Therefore, removing the water layer removes the gum substance from the unrefined oil or other raw-  
5 material oil and fat. The degumming step may be performed by adding a degumming agent. It is possible to use, e.g., a substance composed of an aqueous solution of an organic acid such as oxalic acid, citric acid, or phosphoric acid as the degumming agent.

10 [0020]

The deacidification step involves removing free fatty acids included in the unrefined oil or other raw-material oil and fat as a soap fraction. The deacidification step is not limited and can be performed by, e.g., treating the unrefined  
15 oil or other raw-material oil and fat using an aqueous solution obtained by dissolving an alkaline substance such as sodium carbonate or caustic soda in water. The free fatty acids included in the unrefined oil or other raw-material oil and fat form into a soap due to the aforementioned alkaline  
20 aqueous solution. Therefore, removing the soap removes the free fatty acids from the unrefined oil or other raw-material oil and fat.

[0021]

The decoloration step involves removing pigments included  
25 in the unrefined oil or other raw-material oil and fat. The decoloration step is not limited and can be performed by,

e.g., adsorbing the pigments onto activated white earth, activated carbon, or the like. The activated white earth or the like to which the pigments have bonded is removed through, e.g., reduced-pressure filtration.

5 [0022]

The deodorization step involves removing odoriferous components included in the unrefined oil or other raw-material oil and fat. The deodorization step is not limited and can be performed by, e.g., carrying out steam distillation under  
10 reduced pressure.

[0023]

In the method for producing an edible oil and fat by performing a refinement treatment on an unrefined oil obtained from an oil and fat raw material according to the present  
15 invention, at least the deodorization step is implemented as the refinement treatment.

[0024]

The oil and fat raw material used in the present invention is not particularly limited. Examples thereof  
20 include soybeans, coconuts, palm fruit, rapeseed, rice bran, corn germ, cottonseed, safflower, sunflower, olives, linseed, peanuts, sesame seeds, perilla seeds, pumpkin seeds, almonds, and other vegetable raw materials. Soybeans and rapeseed are preferred as the oil and fat raw material.

25 [0025]

For the unrefined oil used in the present invention, it is permissible to use, e.g., an expressed oil obtained by pressing the oil and fat raw material or an extracted oil obtained through extraction from the oil and fat raw material.

5 It is also permissible to use a mixture of the expressed oil and the extracted oil as the unrefined oil.

[0026]

The pressing of the oil and fat raw material is not limited and can be performed using, *inter alia*, an expeller-  
10 type press composed of a cylindrically formed casing and a screw that is rotatably provided inside the casing.

[0027]

The extraction of the oil and fat raw material is not limited and can be performed by, *inter alia*, bringing a  
15 solvent into contact with a residue that remains after the oil and fat raw material is flattened or pressed, and then distilling away the solvent from a solution obtained through extraction from the resultant material to obtain an oil fraction. Examples of the solvent used during extraction  
20 include hexane and the like.

[0028]

In the present invention, the deodorization step is performed at a temperature of 210°C or higher and 220°C or lower. If the temperature in the deodorization step is less  
25 than 210°C, then the removal of free fatty acids, foul odors, and the like will tend to be insufficient. Conversely, if the

temperature in the deodorization step exceeds 220°C, then trans-fatty acids will tend to be more readily generated. It is even more preferable to perform the deodorization step at a temperature of 215°C or higher and 220°C or lower.

5 [0029]

Additionally, in the present invention, the deodorization step is performed such that the degree of vacuum is greater than 2.1 Torr and is 4.0 Torr or lower. If the degree of vacuum in the deodorization step is outside of this range,  
10 then the removal of free fatty acids, foul odors, and the like will tend to be insufficient. It is more preferable to perform the deodorization step such that the degree of vacuum is greater than 2.5 Torr and is 4.0 Torr or lower, and even more preferable to perform the deodorization step such that the  
15 degree of vacuum is greater than 2.5 Torr and is 3.1 Torr or lower.

[0030]

Moreover, in the present invention, the deodorization step is performed such that the amount of water vapor supplied  
20 to the oil and fat on which the deodorization step is implemented is 0.5 mass% or greater and is less than 2.5 mass%. If the amount of water vapor supplied in the deodorization step is less than 0.5 mass%, then the removal of free fatty acids, foul odors, and the like will tend to be  
25 insufficient, and the quality of the refined oil will tend to decrease. Conversely, if the amount of water vapor supplied in

the deodorization step exceeds 2.5 mass%, then the degree of vacuum in the deodorization step will tend to worsen, and the quality of the refined oil will tend to decrease. It is even more preferable to perform the deodorization step such that the amount of water vapor supplied to the oil and fat on which the deodorization step is implemented is 1.0 mass% or greater and 2.0 mass% or less.

[0031]

The treatment time for the deodorization step is not particularly limited. However, the deodorization step is preferably performed in a treatment time of 25 minutes or more and 100 minutes or less, more preferably performed in a treatment time of 30 minutes or more and 90 minutes or less, and even more preferably performed in a treatment time of 40 minutes or more and 80 minutes or less, from when the temperature of the oil and fat reaches a set temperature.

[0032]

Performing the deodorization step in accordance with the criteria described above makes it possible to reduce the amount of trans-fatty acids generated in the edible oil and fat and to obtain an edible oil and fat having a trans-fatty acid content of preferably 0.3 mass% or lower, and more preferably 0.2 mass% or lower, as well as to obtain an edible oil and fat that not only has a lowered trans-fatty acid content but also has a lowered acid value, exceptional oxidation stability, and exceptional release properties such

that a material being heated (food ingredient) is prevented from adhering to the surface of a frying pan or other implement for cooking with heat.

[0033]

5           In a discretionary non-limited mode of the present invention, as the refinement treatment performed on the unrefined oil obtained from the oil and fat raw material, it is preferable that in the deacidification step, a factor by which an alkaline substance is added relative to a  
10   neutralization equivalent of an acidic substance included in the oil and fat on which the deacidification step is implemented (said factor being abbreviated below as "alkali addition ratio") is 1.0 or greater and 1.4 or less. If the alkali addition ratio is less than 1.0, then the removal of  
15   free fatty acids will tend to be insufficient, and the quality of the refined oil will tend to decrease. Conversely, if the alkali addition ratio exceeds 1.4, then the effect for preventing a material being heated (food ingredient) from adhering to the surface of a frying pan or other implement for  
20   cooking with heat will tend to be insufficient. The alkali addition ratio is more preferably 1.0 or greater and 1.3 or less, and even more preferably 1.1 or greater and 1.3 or less. In the present description, the "neutralization equivalent of an acidic substance included in the oil and fat on which the  
25   deacidification step is implemented" can be measured through, e.g., neutralization titration.

[0034]

Setting the amount of the alkaline substance added in the deacidification step within the aforementioned range makes it possible to obtain an edible oil and fat having a more  
5 exceptional effect for preventing a material being heated (food ingredient) from adhering to the surface of a frying pan or other implement for cooking with heat, as well as to reduce the acid value (AV) of the edible oil and fat. As a result, deterioration of the edible oil and fat can be delayed.

10 [0035]

In the present invention, as described above, it is desirable to perform at least the deodorization step or, if desired, the deacidification step as the refinement treatment on the unrefined oil or other raw-material oil and fat. There  
15 is no particular limitation as to the sequence in which the various refinement treatment steps are performed. However, if the degumming step is performed, it is preferable to perform the degumming step on an unrefined oil prepared through pressing, extraction, or the like, and to perform the  
20 deacidification step after the degumming step. Additionally, if the decoloration step is performed, it is preferable to perform the decoloration step after the deacidification step, and to perform the deodorization step after either the decoloration step or the deacidification step.

25 [0036]

The edible oil and fat provided by the present invention has a low trans-fatty acid content, a low AV, exceptional oxidation stability, and exceptional release properties. Thus, said edible oil and fat is particularly suitable as an edible oil and fat for cooking with heat.

[0037]

Examples of a food product which is cooked with heat and to which the edible oil and fat provided by the present invention is applied include: tempura, French fries, hash browns, croquettes, *kara-age*, fried pork cutlet, fried fish, corn dogs, chicken nuggets, deep-fried tofu, doughnuts, deep-fried bread, fried rice crackers, snack foods, instant ramen, and other deep-fried foods; *yakisoba*, pepper steak, twice-cooked pork, chop suey, Chinese-style fried rice, stir-fried vegetables, and other stir-fried foods; *gyoza*, *okonomiyaki*, *takoyaki*, grilled meat, grilled fish, *tamagoyaki*, grilled rice balls, pancakes, crepes, and other baked foods; and bread loaves, pies, Danish pastries, muffins, tarts, waffles, cakes, and other bakery food products.

[Examples]

[0038]

[Test example 1]

(Preparation of samples)

Degummed soybean oil or degummed rapeseed oil (both made by J-Oil Mills, Inc.) was subjected to a deacidification step,

a decoloration step, and a deodorization step to produce comparative examples 1 to 4 and examples 1 to 5.

[0039]

(Deacidification step)

5           The degummed oil was warmed to 80°C, after which 0.06 mass% of an 85 mass% aqueous solution of phosphoric acid was added to the raw-material oil and fat, and the resultant combination was stirred for 10 minutes. A 15 mass% aqueous solution of sodium hydroxide was then added, and the resultant  
10 combination was stirred for 20 minutes at 80°C. A water phase was centrifuged out, 15 mass% of distilled water was added, the resultant combination was stirred for three minutes at 80°C, and a water phase was again centrifuged out. Table 1 lists, as the alkali addition ratio, factors of addition  
15 relative to a neutralization equivalent of phosphoric acid or another acidic substance included in the oil and fat, i.e., factors by which an alkaline substance is added relative to the neutralization equivalent of an acidic substance included in the oil and fat on which the deacidification step is  
20 implemented.

[0040]

(Decoloration step)

          The deacidified oil that was subjected to the deacidification step was warmed to 80°C, after which 0.8 mass%  
25 of activated white earth (Galleon Earth V2, made by Mizusawa Industrial Chemicals, Ltd.) was added to the deacidified

soybean oil or deacidified rapeseed oil used in comparative examples 1, 2, and 4 and examples 1, 2, 4, and 5, 0.45 mass% of activated white earth (Galleon Earth V2, made by Mizusawa Industrial Chemicals, Ltd.) was added to the deacidified soybean oil used in comparative example 3, or 1.5 mass% of activated white earth (Galleon Earth GSF, made by Mizusawa Industrial Chemicals, Ltd.) was added to the deacidified rapeseed oil used in example 3. The resultant combination was stirred for 30 minutes at 80°C under reduced pressure, after which filtration was performed to obtain a decolored oil.

[0041]

(Deodorization step)

Into a Claisen flask (capacity: 1 L) was introduced 500 g of the decolored oil that was subjected to the decoloration step, and a heating treatment in batches under reduced pressure was performed while water vapor was blown into the oil and fat. In comparative example 3, the deodorization step was performed using a tray-type deodorization device. The amount of vapor listed in table 1 indicates the water content (mass%) blown into the decolored oil in the form of water vapor. The pressure (degree of vacuum) listed in table 1 indicates the pressure during the deodorization step.

[0042]

(Measurement of values for physical properties)

Comparative examples 1 to 4 and examples 1 to 5 were investigated with regard to acid value (AV), trans-fatty acid

(also abbreviated below as "trans acid") content (mass%) (trans acid (%)), oxidation stability (CDM), and release properties.

[0043]

5           The acid value (AV) was measured in conformance with The JOCS Standard Methods for the Analysis of Fats, Oils and Related Materials 2.3.1-2013 (Japan Oil Chemists' Society).

[0044]

10           The trans-fatty acid content (mass%) (trans acid (%)) was measured in conformance with The JOCS Standard Methods for the Analysis of Fats, Oils and Related Materials 2.4.4.3-2013 (Japan Oil Chemists' Society). However, the amount of trans acid was calculated using area percentage rather than an internal standard.

15           [0045]

          The release properties were measured in accordance with the following criteria.

          (Release properties test)

20           (1) A test oil (6 g) was added into a stainless-steel frying pan and heated using an IH heater until the surface temperature at the center reached 230°C.

          (2) Cooked rice (200 g), soy sauce (2 g), and sugar (2 g) were introduced into the frying pan in the stated order and sauteed for 30 seconds.

(3) The cooked rice was spread across the entire frying pan and was heated while being allowed to stand for 1 minute and 30 seconds.

(4) The frying pan was flipped upside-down for 30  
5 seconds.

(5) The weight of the rice remaining in the frying pan was measured.

[0046]

The oxidation stability (CDM) was measured in conformance  
10 with The JOCS Standard Methods for the Analysis of Fats, Oils and Related Materials 2.5.1.2-2013 (Japan Oil Chemists' Society). The measurement was implemented at a temperature of 97.8°C.

[0047]

15 The acid value (AV), trans-fatty acid content (trans acid (%)), oxidation stability (CDM), and release properties measured using the above-described methods are shown in table 1.

[0048]

[Table 1]

|                       | Type of oil  | Deodorization    |           |                 | Deacidification | AV   | Trans acid (%) | CDM (hr) | Release properties (g) |
|-----------------------|--------------|------------------|-----------|-----------------|-----------------|------|----------------|----------|------------------------|
|                       |              | Temperature (°C) | Vapor (%) | Pressure (Torr) |                 |      |                |          |                        |
| Comparative example 1 | Soybean oil  | 200              | 1.5       | 3.0             | 0.8             | 0.36 | 0.17           | 14.0     | 24.5                   |
| Comparative example 2 | Soybean oil  | 200              | 1.5       | 3.0             | 1.5             | 0.09 | 0.18           | 15.7     | 71.3                   |
| Comparative example 3 | Soybean oil  | 247              | 1.3       | 3.75            | 1.3-1.5         | 0.03 | 1.56           | 15.8     | 58.5                   |
| Example 1             | Soybean oil  | 220              | 1.5       | 3.0             | 1.1             | 0.15 | 0.15           | 14.8     | 43.4                   |
| Example 2             | Soybean oil  | 220              | 1.5       | 3.0             | 1.2             | 0.11 | 0.28           | 15.8     | 36.7                   |
| Comparative example 4 | Rapeseed oil | 220              | 0.5       | <2.0            | 1.2             | 0.24 | 0.38           | 22.0     | 23.4                   |
| Example 3             | Rapeseed oil | 220              | 2.0       | 3.0             | 1.3             | 0.17 | 0.08           | 24.7     | 42.2                   |
| Example 4             | Rapeseed oil | 220              | 0.9       | 2.1             | 1.2             | 0.17 | 0.19           | 22.2     | 28.2                   |
| Example 5             | Rapeseed oil | 210              | 2.5       | 4.0             | 1.2             | 0.15 | 0.13           | 22.2     | 19.7                   |

[0049]

As shown in table 1, when a degummed oil obtained from soybeans or rapeseed was subjected to a refinement treatment including a deacidification step, a decoloration step, and a deodorization step to produce an edible oil and fat, performing the deodorization step in accordance with criteria such that the temperature was 210°C or higher and 220°C or lower, the degree of vacuum was greater than 2.1 Torr and was 4.0 Torr or lower, and the amount of water vapor supplied to the oil and fat on which the deodorization step was implemented was 0.5 mass% or greater and was less than 2.5 mass% made it possible to obtain an edible oil and fat that has a low trans-fatty acid content and is exceptional in terms of other qualities as well, such as acid value, oxidation stability, and release properties.

## CLAIMS

1. A method for producing an edible oil and fat by performing a refinement treatment on an unrefined oil obtained from an oil and fat raw material, characterized in that

5 the refinement treatment includes a deodorization step, and

the deodorization step is performed while satisfying all of the following criteria 1) to 3).

1) The temperature is 210°C or higher and 220°C or lower.

10 2) The degree of vacuum is greater than 2.1 Torr and is 4.0 Torr or lower.

3) The amount of water vapor supplied to the oil and fat on which the deodorization step is implemented is 0.5 mass% or greater and is less than 2.5 mass%.

15 2. The method for producing an edible oil and fat according to claim 1, wherein the criterion pertaining to the degree of vacuum in the deodorization step is further limited to be greater than 2.5 Torr and to be 4.0 Torr or less.

3. The method for producing an edible oil and fat  
20 according to claim 1 or 2, wherein

the refinement treatment furthermore includes a deacidification step, and

in the deacidification step, a factor by which an alkaline substance is added relative to a neutralization  
25 equivalent of an acidic substance included in the oil and fat

on which the deacidification step is implemented is 1.0 or greater and 1.4 or less.

4. The method for producing an edible oil and fat according to any of claims 1 to 3, wherein the oil and fat raw material is soybeans or rapeseed.

5. A use of an edible oil and fat for cooking with heat, the edible oil and fat being produced through the method for producing an edible oil and fat according to any of claims 1 to 4.

10 6. The use according to claim 5, wherein the cooking with heat is stir-frying.

7. The use according to claim 5, wherein the cooking with heat is frying.

15 8. A method for suppressing adhesion of a food ingredient to an implement for cooking with heat, the method including a step for stir-frying a food ingredient using an implement for cooking with heat and using an edible oil and fat produced through the method for producing an edible oil and fat according to any of claims 1 to 4.

20