

Virgin Coconut Oil And Production Thereof

Field of the Invention

This invention relates to a method of extracting coconut oil from coconuts, and in particular extracting high quality and purity coconut oil without loss of wholesome nutrients that are naturally present in coconuts.

Background Art

Various processes are in use for obtaining "virgin" coconut oil, all of which suffer one or more shortcomings, including low yield in the order of 8% to 10% maximum by weight. For example, coconut oil has hitherto been obtained by a processes known as "direct micro-expelling", and centrifuging processes. Direct micro-expelling, is a process in which fresh coconut meat is grated, dried to a moisture content of between 9% and 12%, and while still warm from the drying process, undergoes a pressing. Direct micro-expelling results in recovery of an unrefined coconut oil at a low yield, based on calculated available oil in the coconut meat. Centrifuging processes are used in India to recover unrefined virgin coconut oil.

A dry extraction method has been used to produce virgin coconut oil from desiccated coconut, however coconut oils obtained through this process tend to be low quality, and suffer from loss of nutrients.

Also known are traditional fermentation processes for recovering virgin coconut oil, which suffer from hygiene problems. These processes use heat from the sun over a period of three to four days, during which period, oil floats to the top, and is subsequently recovered.

It is an object of the present invention to provide a process which produces a high quality virgin coconut oil, with improved yield over known processes, or at least provides an alternative to known processes for the production of virgin coconut oil.

The preceding discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that except where indicated to the contrary, the discussion is not an acknowledgement or admission that any of the material referred to is part of the common general knowledge in any particular country, as at the priority date of the application.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Disclosure of the Invention

In accordance with the invention there is provided a method of recovering at least one coconut extract including a coconut oil from coconut including steps of:

grinding the coconut and obtaining a liquid therefrom,
if necessary, adjusting the pH of the liquid to a first value at least slightly more alkaline than neutral,

adding a protein enzyme to said liquid,
incubating the liquid and enzyme mixture for a predetermined period of time and at an predetermined elevated temperature of less than 70°C, preferably with at least intermittent agitation,

adjusting the pH of the incubated mixture to a second value of from 3.5 to 5,

heating the pH adjusted incubated mixture to a temperature of at least 75°C for a second predetermined period of time, and

centrifuging the resultant mixture to separate the coconut oil.

Preferably said enzyme is a protease enzyme, and more preferably a peptidase, and more preferably yet a serine endopeptidase. The most preferred enzymes are those belonging to peptidase family S8, otherwise known as the subtilisin

family, with subtilisin Carlsberg being particularly suitable. Subtilisin Carlsberg can be derived from *Bacillus licheniformis*.

It is preferred to use fresh coconut, and the parts of fresh coconut utilised in the method may include one or more of the coconut milk, coconut meat, the outer brown layer immediately adjacent to the meat (the brown testa). Generally, it is best to dehusk the coconut, then deshell the coconut, leaving the milk, meat and testa. The milk can be drained and the meat and testa grated and then added to the milk, before the pH of the mix is adjusted to the first value.

The first value that the coconut extract pH is adjusted to may lie in a range of from 8 to 9, with a pH of about 8.5 being most preferred. The pH may be adjusted using any one or more of NaOH, $\text{Ca}(\text{OH})_2$, Na_2CO_3 , NaHCO_3 , $\text{CaH}_2(\text{CO}_3)_2$ or indeed any alkaline compound that results in a non-toxic biocompatible product, with NaOH being most preferred for convenience.

Preferably the predetermined period of time and the predetermined temperature are in the range of 2 to 4 hours and 55°C to 65°C respectively.

Preferably the predetermined period of time and the predetermined temperature are in the range of 2.5 to 3.5 hours and 57°C to 63°C respectively.

Preferably the predetermined period of time and the predetermined temperature are about 3 hours and 60°C respectively.

Preferably said second value (pH) is from 4.2 to 4.8.

Preferably said second value (pH) is about 4.5.

The pH can be adjusted to the second value using hydrochloric acid, although it is preferred to use citric acid or any other edible acid (dietary acceptable), so that the aqueous component left after recovery of the oil is suitable for consumption.

Preferably the pH adjusted incubated mixture has its temperature raised to from 80°C to 99°C, more preferably from 90°C to 97°C, and most preferably to about 95°C. The second predetermined period of time may lie between 2.5 and 10 minutes, with about 5 minutes proving suitable, prior to centrifuging.

Also in accordance with the invention there is provided a coconut oil produced in accordance with the above described method.

Furthermore, in accordance with the invention there are provided coconut products produced in accordance with the above described method, the products including a coconut oil and an aqueous phase.

The coconut oil that results from the above described method is a fresh, clean, pure oil having a long shelf life, and containing higher levels of Vitamin E and other anti-oxidants than oils produced according to the above described prior art processes. It is of low viscosity, is water-white and crystal-clear, and has a natural coconut scent and flavour. It contains no cholesterol, and has high levels of medium-length chain saturated fatty acids including lauric and capric acids, which have known health-promoting properties. The coconut oil has antibacterial, antifungal, and anti-viral properties. In addition to this, it is easily absorbed through the skin, giving rise to cosmetic applications.

A preferred embodiment of the invention will now be described in the following description of a method of preparing coconut products including a coconut oil and an aqueous coconut product.

Best Mode(s) for Carrying Out the Invention

The method of the embodiment is primarily concerned with extracting a coconut oil, commonly known as virgin coconut oil, from fresh coconuts. In a highly preferred form of the invention the method can also yield an aqueous coconut extract which can be used as a basis for a coconut drink.

The method of the embodiment is carried out in the following manner. Coconuts are dehusked and deshelled and the deshelled coconut (including the outer

brown layer (the testa) that overlies the coconut meat are washed and placed in a receptacle in which clean and hygienic conditions can be maintained. This deshelled coconut can be broken up if necessary (depending upon the requirements of the equipment for the subsequent processing), retaining the coconut milk, and is ground (wet milled) to produce a slurry having finely divided solids content. The coconut milk is collected, and remaining solids are pressed in a screw-press to extract as much liquid therefrom as possible, which is also collected and added to the coconut milk. The collected liquid has a pH typically around 6.0 or slightly higher. The pH is adjusted to 8.5 using 1N (1M) NaOH, and the resultant mix is dosed with subtilisin Carlsberg enzyme at 0.1% by weight of the slurry.

The dosed mix is then incubated at between 55°C and 60°C for three hours with occasional stirring to prevent settling, after which the pH is adjusted to 4.5 with 1N (1/3 M) $C_6H_8O_7$ (citric acid). The emulsion is broken by heating the mix at 95°C for 5 minutes, followed by centrifuging at 4000rpm for 20 minutes, to separate the oil from the aqueous and solid components.

The resultant oil is a fresh, clean, pure oil having a long shelf life, and containing higher levels of Vitamin E and other anti-oxidants than oils produced according to the above described prior art processes. It is of low viscosity, is water-white and crystal-clear, and has a natural coconut scent and flavour.

The use of citric acid results in an aqueous phase (coconut water) which is edible, and may be used in food production, and as a basis for a coconut drink. While hydrochloric acid could be used in place of citric acid, this would result in the presence of some NaCl in the aqueous phase, which is not so desirable for a food application. It should be appreciated that in place of citric acid, any other food acid may be utilised.

It should be appreciated that minor variations may be made to steps in the method without departing from the spirit and scope of the invention, and that the invention is not limited to the specific embodiment described herein.

The Claims Defining the Invention are as Follows

1. A method of recovering at least one coconut extract including a coconut oil from coconut including steps of:
 - grinding the coconut and obtaining a liquid therefrom,
 - if necessary, adjusting the pH of the liquid to a first value at least slightly more alkaline than neutral,
 - adding a protein enzyme to said liquid,
 - incubating the liquid and enzyme mixture for a predetermined period of time and at an predetermined elevated temperature of less than 70°C, preferably with at least intermittent agitation,
 - adjusting the pH of the incubated mixture to a second value of from 3.5 to 5,
 - heating the pH adjusted incubated mixture to a temperature of at least 75°C for a second predetermined period of time, and
 - centrifuging the resultant mixture to separate the coconut oil.
2. A method as claimed in claim 1 wherein said enzyme is a protease enzyme.
3. A method as claimed in claim 1 wherein said enzyme is a peptidase.
4. A method as claimed in claim 1 wherein said enzyme is a serine endopeptidase.
5. A method as claimed in claim 1 wherein said enzyme belongs to peptidase family S8.
6. A method as claimed in claim 1 wherein said enzyme is subtilisin Carlsberg.
7. A method as claimed in any one of the preceding claims utilising coconut milk, coconut meat, and testa from fresh coconut.

8. A method as claimed in any one of the preceding claims wherein the first value (pH) is from 8 to 9.
9. A method as claimed in claim 8 wherein, the first value (pH) is about 8.5.
10. A method as claimed in any one of the preceding claims wherein the predetermined period of time and the predetermined temperature are in the range of 2 to 4 hours and 55°C to 65°C respectively.
11. A method as claimed in claim 10 wherein the predetermined period of time and the predetermined temperature are in the range of 2.5 to 3.5 hours and 57°C to 63°C respectively.
12. A method as claimed in claim 10 wherein the predetermined period of time and the predetermined temperature are about 3 hours and 60°C respectively.
13. A method as claimed in any one of the preceding claims wherein said second value (pH) is from 4.2 to 4.8.
14. A method as claimed in claim 13 wherein said second value (pH) is about 4.5.
15. A method as claimed in any one of the preceding claims wherein the pH is adjusted to the second value using a dietary acceptable acid, and said method also includes recovering an aqueous fraction from said resultant mixture.
16. A method as claimed in any one of the preceding claims wherein the pH adjusted incubated mixture has its temperature raised to from 80°C to 99°C for said second predetermined period of time.

17. A method as claimed in claim 16 wherein the pH adjusted incubated mixture has its temperature raised to from 90°C to 97°C for said second predetermined period of time.
18. A method as claimed in claim 16 wherein the pH adjusted incubated mixture has its temperature raised to about 95°C for said second predetermined period of time.
19. A method as claimed in any one of the preceding claims wherein said second predetermined period of time is from 2.5 minutes to 10 minutes.
20. A method as claimed in claim 19 wherein said second predetermined period of time is about 5 minutes.
21. A coconut oil produced in accordance with any one of the preceding claims.
22. A coconut oil and a coconut aqueous fraction produced in accordance with any one of claims 15 to 20.
23. A method of recovering at least one coconut extract including a coconut oil from fresh coconut, substantially as herein described with reference to the description of the embodiment.