

"PROCESS FOR PRODUCING ENCAPSULATED FOODSTUFF"

The present invention relates to a process for producing a Chlorella-containing foodstuff.

Chlorella is a genus of single cell algae which
5 grow in fresh water. The cells contain protein in a large amount and can be used to promote the growth of animals or microorganisms, to flavour foods and to remove foreign odour from foods. A hot water extract of Chlorella algae has a wide range of applications, because it has such growth
10 promoting and flavouring effects and is liquid.

Various products utilizing Chlorella algae have been developed. Typical of them are products made by blending a dry powder of Chlorella algae with a garlic powder and molding the blend into a tablet; noodles and
15 processed marine products containing a hot water extract of Chlorella algae used as a flavouring component and a quality improving agent during production thereof; and health food products made by incorporating a dry powder or hot water extract of Chlorella algae into vegetable edible fatty oils
20 and encapsulating the resulting material into a gelatin capsule.

In many cases, however, known Chlorella products can be difficult to produce and suffer the disadvantage that the effective ingredients of Chlorella algae are not
25 necessarily retained in a stable manner. When making a health food product using Chlorella algae in combination with other medicinal starting materials, it is important to

stably and effectively retain the medicinal ingredients of individual starting materials.

The invention seeks to provide a process for producing a foodstuff or health product using Chlorella algae in which the effective ingredients of Chlorella algae and other medicinal starting materials are stably retained. Accordingly, the invention provides a process for producing a Chlorella-containing foodstuff which comprises:

(A) preparing dry powders by separately adding a concentrated exudate of hot water extract of Chlorella algae and a concentrated exudate of a hot water fungal extract to separate aliquots of a clathration material, blending and drying;

(B) homogeneously mixing the dry powders from step (A) with, as tonic medicinal vegetable, at least one of garlic, ginseng, aloe, umeboshi (Japanese plum), prickly pear of the family Cactaceae and adlay and Chlorella algae in the presence of vitamin E oil, and an edible fatty oil to provide an oil-suspension; and

(C) encapsulating the oil-suspension to provide a soft capsuled foodstuff.

The process of the present invention is capable of producing a product containing effective ingredients of Chlorella algae, fungi and tonic medicinal vegetables stably retained and preserved therein. Further, the product has a

peculiar property in that the soft capsule cannot be swelled, even if it contains an exudate of a tonic medicinal vegetable having a relatively large content of moisture, because it contains a large amount of an edible fatty oil having a cholesterol reducing effect and each of the ingredients is homogeneously dispersed.

The Chlorella-containing fatty oil foodstuff produced in accordance with the invention can be eaten by itself as a health food, or can be used as a flavouring element for foods or as a cooking material for oily foods. It can be utilised when camping or as an emergency ration since it is readily portable.

In the present invention, an edible fatty oil is suitably used in a relatively large amount with respect to the other starting materials, namely the concentrated exudate of a hot water extract of Chlorella algae, the concentrated exudate of a hot water extract of fungi and the exudate or dry powder of tonic medicinal vegetable, so that the soft capsule is not subjected to a change, such as swelling or dissolution by moisture present in the other starting materials, which might cause the capsule to break. In this way also the product can be made suitable for use in cooking and particularly in frying.

The hot water extract of the Chlorella algae may suitably be produced by subjecting an aqueous suspension of fresh Chlorella algae from an aerobic mass cultivation under light to a heat treatment at a temperature of 80 to 100°C,

- say for 15 to 20 minutes, followed by fractionation of the algae. Typical of the *Chlorella* algae are single cell algae growing in fresh water such as *Chlorella pyrenoidosa*, *Chlorella vulgaris*, *Chlorella ellipsoidea* and *Senedesmus*.
- 5 The hot water extract of *Chlorella* algae contains effective polysaccharides such as N-1, 3 glucan and acidic rhamnan. Alternatively, the hot water extract of *Chlorella* algae may be produced by adding water to *Chlorella* algae powder in an amount about four times more than such powder, and
- 10 subjecting the mixture to a heat treatment at a temperature of 50 to 120°C, say for about one hour or more and then to a slow extraction treatment.

- The hot water fungal extract may be a hot water extract of fungus body, dry fungi or fungus body powder.
- 15 For example, use may be made of a hot water-extract produced by adding water to fungus body powder in an amount four times more than such powder and subjecting the mixture to a prolonged heat treatment at a temperature of 45 to 120°C, preferably for 5 to 7 hours. The word "fungi or fungus"
- 20 refers, for example, to a polypore, kawaratake, shiitake and other edible mushrooms.

- The tonic medicinal vegetable is selected from garlic, ginseng, aloe, ume (Japanese spicet), prickly shrub of the family Aradiaceae, and adlay. The tonic medicinal
- 25 vegetable may be used in the form of the vegetable itself, an exudate or dry powder. The

word "exudate" refers to leached liquids resulting from leaching of a tonic medicinal vegetable by a usual method and slurry-like exudates resulting from grinding in a colloid mill, and the word "dry powder" refers to a powder
5 resulting from a pretreatment of a vegetable, followed by hot air drying, freeze drying or spray drying, or a powder resulting from drying an exudate.

The hot water extracts of the Chlorella algae and fungi can be independently concentrated into a slurry-
10 like concentrated exudate in a concentrator, and each exudate can then be blended in a blender, preferably under a humidified and depressurised condition, together with a separate aliquot of a clathration material, preferably a cyclodextrin, followed by drying to form separate dry
15 powders.

It is preferred that each clathrate blend is used in a pulverised form obtained by drying in a dryer to the extent of a defined moisture content, followed by pulverisation.

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The tonic medicinal vegetable is used in the form of a slurry-like exudate resulting from grinding a vegetable and Chlorella algae in the presence of vitamin E oil.

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Edible oils which may be used include peanut oil,

sesame oil, wheat germ oil, rapeseed oil, soybean oil, coconut oil, safflower oil, beeswax, and other edible fatty oils. These oils may be used singly or as mixtures of two or more of them. When mixtures of the edible oils are used
5 it is preferred that they are used in the form of an oil emulsified material produced by heating a mixture of edible oils, optionally adding a heated and dissolved soybean lecithin thereto, and stirring and mixing the mixture by a homomixer and cooling it to room temperature.

10 To mix the effective ingredient containing materials of Chlorella algae, fungi and tonic medicinal vegetables homogeneously with the edible fatty oil, the dry powders of the clathrate blends, the slurry of the tonic medicinal vegetable and the edible fatty oil may be
15 homogeneously stirred and mixed in a mixer. The sequence in which the individual starting materials are mixed is not particularly limited. Preferably the slurry-like starting material resulting from grinding of the tonic medicinal vegetable, Chlorella algae and vitamin E oil is used it
20 preferably is homogeneously mixed with the edible fatty oil in the presence of a vitamin E oil and then the dry powders of the clathrate blends are homogeneously mixed with the resulting suspension in the oil. Concurrent homogeneous mixing of the various starting materials may also be
25 employed.

Thus-obtained starting mixture is then passed through a proper mesh strainer and degassed in a deaerator, following which the resulting mixture is encapsulated into a soft capsule such as a soft gelatin capsule.

It should be noted that the proportion of each effective ingredient derived from Chlorella algae, fungi and tonic medicinal vegetable relative to the edible fatty oil is not particularly limited.

The present invention will now be described in more detail by way of Examples.

Example 1

Water 300 l was mixed with a powder of light cultured Chlorella 30 kg, and the mixture was subjected to an extraction of effective ingredients in a hot water extractor. Then, the resulting extract was concentrated about 20 times in a concentrator to provide a slurry-like concentrated exudate.

Separately, 400 l of water was mixed with 25 kg of dried kawaratake, and the resulting mixture was subjected to an extraction of effective ingredients in a hot water extractor. The resulting extract was concentrated about 20 times in a concentrator to provide a slurry-like concentrated exudate.

A clathration material, cyclodextrin 4.5 kg, was added to the former of these concentrated exudates, and cyclodextrin 5 kg was added to the latter of these concentrated exudates, and while being warmed and depressurised, each of the resulting mixtures was subjected to clathration blending in a blender. Then, the blends were dried in a drier and then pulverised in a pulveriser to provide 6.5 kg and 7.5 kg of the respective starting exudate materials.

A mixture of 8.5 kg of a dry powder of ginseng, 8.5 kg of an exudate powder of odorless garlic, 15 kg of prickly shrub of the family Aradiaceae and 90 kg of a photo-synthesized Chlorella powder was ground together with 20 kg of a natural vitamin E oil in a colloid mill to provide 142 kg of a slurry-like starting exudate material.

The individual starting materials produced in the above manner were added to 210 kg of an oil-emulsified starting material formed by mixing 28 kg of peanut oil with 15 kg of soybean lecithin in a homomixer and adding 167 kg of safflower oil, and the resulting mixture was homogeneously stirred and mixed to provide 366 kg of an oil suspension. The oil suspension was degassed in a deaerator and then encapsulated with soft gelatin to provide a Chlorella-containing fatty oil encapsulated product.

Example 2

Water 300 l was mixed with a powder of light synthesised Chlorella 30 kg, and the mixture was subjected
5 to an extraction of effective ingredients in a hot water extractor. Then, the resulting extract was concentrated about 20 times in a concentrator to provide a slurry-like starting concentrated exudate material.

Separately, 450 l of water was mixed with 25 kg of
10 dried shiitake and 10 kg of kawaratake, and the resulting mixture was subjected to an extraction of effective ingredients in a hot water extractor. The resulting extract was concentrated about 20 times in a concentrator to provide a slurry-like starting concentrated exudate material.

15 A clathration material, cyclodextrin 5.5 kg, was added to the former of these concentrated exudates, and cyclodextrin 5 kg was added to the latter of these concentrated exudates, and each resulting mixture was subjected to clathration blending in a blender while being
20 warmed and depressurised. Then, each blend was dried in a drier and pulverised in a pulveriser to provide 7.5 kg and 8 kg of the respective starting exudate materials.

Further, a mixture of 130 kg of photo-synthesized Chlorella powder, 9.5 kg of an exudate of garlic, 9.5 kg of
25 an exudate powder of adlay and 10.5 kg of prickly shrub of

the family Aradiaceae was ground little by little together with 25 kg of a natural vitamin E oil in a colloid mill to provide 184.5 kg of a slurry-like starting exudate material.

5 The individual starting materials produced in the
above manner were homogeneously mixed with 226 kg of a
viscous oil mixture, i.e. an oil-emulsified starting
material resulting from heating and mixing of 28 kg of
sesame oil, 28 kg of purified peanut oil, 110 kg of
safflower oil, 42 kg of purified beeswax and 18 kg of
10 soybean lecithin using a homomixer. Then, the mixture was
degassed in a deaerator. 426 kg of the resulting oil-
suspension was encapsulated with soft gelatin to provide an
intended Chlorella-containing fatty oil encapsulated food
product.

15 This application is divided out from
Application No. 9020358.9 as are Applications Nos. 930957.2
and 930959.8.



CLAIMS

1. A process for producing a Chlorella-containing foodstuff which comprises:

(A) preparing dry powders by separately adding a concentrated exudate of hot water extract of Chlorella algae and a concentrated exudate of a hot water fungal extract to separate aliquots of a clathration material, blending and drying;

(B) homogeneously mixing the dry powders from step (A) with a slurry obtained by grinding, as tonic medicinal vegetable, at least one of garlic, ginseng, aloe, ume (Japanese spicet), prickly shrub of the family Aradiaceae and adlay and Chlorella algae in the presence of vitamin E oil, and an edible fatty oil to provide an oil-suspension; and

(C) encapsulating the oil-suspension to provide a soft capsuled foodstuff.

2. A process according to claim 1, wherein the clathration material is a cyclodextrin.

3. A process according to claim 1 or 2 wherein the fungal extract is derived from at least one of kawaratake, polypore and shiitake.

4. A process according to any one of claims 1 to 3 wherein the blending is carried out under a humidified and depressurized condition.

5. A process according to any one of the preceding claims wherein the edible fatty oil is at least one of



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peanut oil, sesame oil, wheat germ oil, rapeseed oil, soybean oil, coconut oil, safflower oil and beeswax.

6. A process according to any one of the preceding claims wherein the edible fatty oil contains a lecithin.

5 7. A process according to claim 1 substantially as described in Example 1 or 2.

8. An encapsulated foodstuff when produced in accordance with a process as claimed in any one of the preceding claims.