

"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 a dry powder by adding a concentrated exudate of hot water extract of Chlorella algae and a concentrated exudate of a hot water fungal extract to a clathration material, blending and drying;

(B) homogeneously mixing the dry powder from step (A) with an exudate or dry powder of, as tonic medicinal vegetable, at least one of garlic, ginseng, aloe, ume (Japanese spicet), prickly shrub of the family Araliaceae and adlay, 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
5 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
10 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
15 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, dry powder of tonic medicinal vegetable, so that the soft capsule is not subjected to a change, such
20 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
25 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 used is at least one medicinal vegetable which has a nutritive tonic effect selected from garlic, ginseng, aloe, ume

- 25 (Japanese spicet), prickly shrub of the family Araliaceae, and adlay. The tonic medicinal 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.

Each of the hot water extracts of the Chlorella algae and fungi can be independently concentrated into a
10 slurry-like concentrated exudate in a concentrator, and the exudates can then be blended in a blender, preferably under a humidified and depressurised condition, together with a clathration material, preferably a cyclodextrin, to form a clathrate blend. The blend is dried to provide a dry powder.

15 The tonic medicinal vegetable preferably is used in the form of a slurry-like exudate resulting from grinding each vegetable or its exudate powder in the optional presence of vitamin E oil in a colloid mill.

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 powder of the clathrate blend the exudate or dry powder of the tonic medicinal vegetable and the edible
15 fatty oil may be homogeneously stirred and mixed in a mixer. The sequence in which the individual starting materials are mixed is not particularly limited, but when the material containing the tonic medicinal vegetable is an exudate, it is preferred that the exudate is homogeneously mixed with
20 the edible fatty oil and the resulting suspension is then mixed with the dry powder of the clathrate blend. When the material containing the tonic medicinal vegetable is a dry powder, it is preferred that the dry powder is mixed with the dry powder of the clathrate blend and
25 then the resulting mixture is homogeneously mixed with the edible fatty oil.

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.

5 When the exudate of the tonic medicinal vegetable is a leached liquid, it can be also used as a spray-dried material, but this is expensive, because water is present in a large amount in the leached liquid. Therefore, it is preferred that with or without dry powders of Chlorella
10 algae and/or tonic medicinal vegetable added, the leached liquid is adsorbed to an edible powder such as lactose or starch and the resulting material is powdered. The edible powder such as lactose or starch is used in order to absorb water in the leached liquid and has no adverse effect on the
15 soft capsule, but serves merely as a bulking filler and an excipient.

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
20 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
5 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.

Separately, 400 l of water was mixed with 25 kg of
10 dried kawaratake, and the resulting mixture was subject 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.

15 A clathration material, cyclodextrin 9.5 kg, was added to these concentrated exudates, and the resulting mixture was subjected to clathration blending in a blender. The blend was dried in a drier and pulverised in a pulveriser to provide a starting mixed exudate material.

20 A mixture of 8.5 kg of a dry powder of ginseng and 8.5 kg of an exudate powder of odorless garlic was ground together with 15 kg of a natural vitamin E oil in a colloid mill to provide 32 kg of a slurry-like exudate starting material.

25 The individual starting materials produced in the above manner were added to 210 kg of peanut oil containing 15 kg of soybean lecithin added thereto, and the resulting

mixture was stirred and mixed to provide a material to be encapsulated. The resulting oil-suspension was encapsulated with soft gelatin to provide an encapsulated product.

Example 2

5 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. The resulting extract was concentrated about 20 times in a concentrator to provide a slurry-like
10 concentrated exudate.

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

 A clathration material, cyclodextrin 9.5 kg, was added to these concentrated exudates, and the resulting mixture was subjected to clathration blending in a blender.

20 The blend was dried in a drier and pulverised in a pulveriser to provide a starting mixed exudate material.

 A mixture of 9.5 kg of an exudate of garlic and 9.5. kg of an exudate powder of adlay was ground together with 20 kg of a natural vitamin E oil in a colloid mill to
25 provide 39 kg of a slurry-like starting exudate material.

 The individual starting materials produced in the above manner were mixed with an oil-emulsified material

resulting from addition of soybean lecithin to a heated mixture of sesame oil and peanut oil to provide a homogeneous mixture which was then degassed in a deaerator. The resulting oil-suspension was encapsulated with soft
5 gelatin to provide an encapsulated product.



CLAIMS

1. A process for producing a Chlorella-containing foodstuff which comprises:
 - (A) preparing a dry powder by adding a concentrated
5 exudate of hot water extract of Chlorella algae and a concentrated exudate of a hot water fungal extract to a clathration material, blending and drying;
 - (B) homogeneously mixing the dry powder from step
10 (A) with an exudate or dry powder of, as tonic medicinal vegetable, at least one of garlic, ginseng, aloe, ume (Japanese spicet), prickly shrub of the family Araliaceae and adlay and an edible fatty oil to provide an oil-suspension; and
 - (C) encapsulating the oil-suspension to provide a
15 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
20 fungal extract is derived from at least one of kawatake, polypore and shiitake.
4. A process according to any one of the 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
25 claims wherein the edible fatty oil is at least one of peanut oil, sesame oil, wheat germ oil, rapeseed oil, soybean oil, coconut oil, safflower oil and beeswax.



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

7. A process according to any one of the preceding claims wherein the edible fatty oil used in step (B)

5 contains vitamin E oil.

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

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

10 claims.
