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SUGAR COATED TABLETS CONTAINING DUNALIELLA
ALGAE AND PROCESS FOR THE PRODUCTION THEREOF

The present invention relates to sugar-coated tablets containing Dunaliella algae and a process for their
5 production.

Chlorella algae, which belong to the species of unicellular Chlorophyceae, have been used to prepare daily food or health food in the form of a tablet.

Dunaliella algae are known to produce a lot of β -
10 carotene when grown in a culture fluid containing a high concentration of saline and a small amount of nitrogen under intense light and other appropriate conditions. Natural β -carotene derived from Dunaliella algae has been utilized in the form of a suspension in vegetable oil as a
15 natural coloring agent for food, cosmetics or feed or as material regulating vital function such as a nourishing diet supplement. However, no practical proposal had been made concerning a method of fully utilizing Dunaliella algae per se for health-oriented food without destroying β -
20 carotene.

Dunaliella algae contain proteins, lipids, mineral matters such as iron, sugars, vitamins and a variety of other physiologically active ingredients. Among these nutrients, β -carotene, a provitamin A group compound, is
25 easily oxidizable because it has therein conjugated double bond chains. This presents a serious problem in the

manufacture of health food containing Dunaliella algae. It has therefore been strongly desired to develop a method by which the algae can be processed without destroying natural β -carotene and the product obtained can also be preserved in a stable state.

According to the invention, there is provided a food in the form of a sugar coated tablet comprising 100 parts by weight of a mixture comprising Dunaliella algae in dry powder form and a cyclodextrin, from 0.10 to 0.25 parts by weight of an antioxidant, from 3.5 to 4.5 parts by weight of a lubricant, and from 35.5 to 40.6 parts by weight of a binder; wherein 300 parts by weight of uncoated tablet include 10 to 240 parts by weight of the algae in dry powder form, and wherein the sugar coating is not light-transparent. The sugar coating material may comprise a colouring agent, which may itself be non-light-transparent. The colouring agent may be, for example, paprika, oleoresin, caramel or annatto.

The invention further provides a process for producing a food comprising Dunaliella algae which comprises adding from 15 to 50 parts by weight of cyclodextrin to 100 parts by weight of Dunaliella algae in dried powder form and blending the two to form a mixture; adding to 100 parts by weight of the mixture from 0.10 to 0.25 parts by weight of an antioxidant, from 3.5 to 4.5 parts by weight of a lubricant and from 35.5 to 40.6

parts by weight of a binder;

granulating the resulting mixture;

compressing the granules thus formed into tablets;

and

5 coating the tablets with a sugar coating which includes a colouring agent that is not light-transparent. The uncoated tablets may conveniently be prepared weighing 300 mg each.

10 The dried powder of Dunaliella algae used as a starting material in the present invention means such powder as is obtained by the steps of :

(1) preliminarily removing about 50 % by weight of water gradually from the culture fluid of Dunaliella algae by a dehydrator such as a centrifuge so as to make it
15 easier to dry the fluid; (2) adding to the dehydrated culture fluid a right amount each of an anti-caking agent, preferably dextrin, an antioxidant, preferably vitamin E, and other suitable additives and (3) spray-drying, vacuum-drying or freeze-drying the mixture thus
20 prepared.

Dunaliella algae are morphologically characterized by the absence of a hard cell wall composed of polysaccharides although the algae have a thin cell membrane, whereas the other green algae, such as Chlorella algae, have both the
25 cell wall and the cell membrane. It is also characteristic of Dunaliella algae that they contain a large amount of β -

carotene. Typical examples of *Dunaliella* employed in the present invention include *Dunaliella bardawil* and *Dunaliella salina*.

In accordance with the present invention, 10 ~ 240 parts by weight of dried powder of *Dunaliella* algae is included in an uncoated tablet which weighs 300 parts by weight. In order to obtain a mixture of the dried powder and cyclodextrin, the latter is used in an amount ranging from 15 to 50 parts by weight per 100 parts by weight of the former. The ratio of each other additive material per 100 parts by weight of the mixture thus prepared is as follows:

a	lubricant	3.50 ~ 4.50	parts by weight
an	antioxidant	0.10 ~ 0.25	"
15	a	binder	35.50 ~ 40.60 "

When an uncoated tablet contains about 300 parts by weight (for example, 300 mg), the maximum content of dried powder of *Dunaliella* algae is 80 % of the total weight per tablet. From the viewpoint of health, it would be desirable to eat two or three tablets a day. Especially if the product contains a large amount of β -carotene, its full usefulness can be secured.

Vitamins C and E are illustrative of suitable antioxidants which can be used in the present invention.

25 Among suitable binders are chitosan, starch or sugars, preferably maltose. Lubricants employed in the

present invention are talc and an ester formed by reaction of sucrose with fatty acid; the latter is more advantageous than the former. Examples of cyclodextrins (cyclodextrin is hereinafter referred to as "CD") include α -CD, β -CD and
5 γ -CD.

Example

To culture fluid of Dunaliella algae was added a proper quantity each of CD as anti-caking agent and vitamin E as antioxidant. The mixture obtained was spray-dried to
10 prepare dried powder of Dunaliella algae. To 100 mg of the dried powder was added 25 mg of CD and both were blended by a Model-V mixer at 28 rpm for ten minutes to form a mixture of both. To 100 mg of the mixture were added 0.2 mg of vitamin E, 37 mg of powdered thick malt syrup of maltose
15 and 3.9 mg of an ester formed by reaction of sucrose with fatty acid. The mixture was blended and kneaded at 28 rpm for five minutes, and granulated in the form of fine particles by a roller converter. Granulated particles thus prepared were compressed to obtain uncoated tablets. The
20 resulting uncoated tablets were coated with a lighttight agent, namely sugar solution to which caramel, annatto, paprika or oleoresin was added. Thus, food containing Dunaliella algae was obtained in the form of sugarcoated tablets.

25 The present invention has made it practicable to obtain novel solid health food containing active

ingredients of Dunaliella algae without destroying β -carotene in dried powder of the algae or gradually diminishing the β -carotene content. In other words, the present invention has produced remarkably good results
5 utilizing naturally occurring β -carotene while keeping its activity and such results could not be attained by the prior art.



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CLAIMS

1. A food in the form of a sugar coated tablet comprising 100 parts by weight of a mixture comprising Dunaliella algae in dry powder form and a cyclodextrin, from 0.10 to 0.25 parts by weight of an antioxidant, from 3.5 to 4.5 parts by weight of a lubricant, and from 35.5 to 40.6 parts by weight of a binder; wherein 300 parts by weight of uncoated tablet include 10 to 240 parts by weight of the algae in dry powder form, and wherein the sugar coating is not light-transparent.

2. A food according to Claim 1 wherein the mixture of cyclodextrin and Dunaliella algae in dry powder form comprises these two ingredients in a weight ratio of from 15:100 to 50:100.

3. A food according to Claim 1 or 2 in which the sugar coating material comprises a colouring agent which is not light-transparent.

4. A food according to Claim 1 and substantially as hereinbefore described.

5. A process for producing a food comprising Dunaliella algae which comprises adding from 15 to 50 parts by weight of cyclodextrin to 100 parts by weight of Dunaliella algae in dried powder form and blending the two to form a mixture;

adding to 100 parts by weight of the mixture from 0.10 to 0.25 of an antioxidant, parts by weight from 3.5 to



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4.5 parts by weight of a lubricant and from 35.5 to 40.6
parts by weight of a binder;

granulating the resulting mixture;

compressing the granules thus formed into tablets;

5 and

coating the tablets with a sugar coating which
includes a colouring agent that is not light-transparent.

6. A process according to Claim 5 wherein the
antioxidant comprises vitamin C or vitamin E.

10 7. A process according to Claim 5 or 6 wherein
the colouring agent comprises paprika, oleoresin, caramel
or annatto.

8. A process according to any one of Claims 5 to
7 wherein the binder comprises chitosan, starch or sugar.

15 9. A process according to Claim 8 in which the
sugar is maltose.

10. A process according to any one of claims 5 to
9 in which the lubricant is talc or and ester of sucrose
with a fatty acid.

20 11. A process according to any one of Claims 5 to
10 wherein 300 parts by weight of uncoated tablet produced
includes from 10 to 240 parts by weight of dried powder of
algae.

12. A process according to claim 5 and substantially as
25 hereinbefore described.
