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dunaliella algae

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PRODUCTION OF VACUUM-PACKED FOOD CONTAINING
DUNALIELLA ALGAE

The present invention relates to the production of a vacuum-packed food containing Dunaliella algae.

Chlorella algae, which belong to the species of unicellular Chlorophyceae, have been used to prepare food or food additives in the form of the algae per se or the extracted solution thereof. β -Carotene, which is found in large quantities in Dunaliella algae belonging to the same species as Chlorella algae, has been utilized in the form of a suspension in vegetable oil as a natural coloring agent for food, cosmetics or feed or as a nourishing substance. However, no practical proposal had been made concerning a method of utilizing Dunaliella algae per se for health-oriented food without destroying β -carotene occurring therein.

Dunaliella algae contain proteins, sugars, lipids, iron, vitamins and a variety of other physiologically active principles. As to vitamins, Dunaliella algae produce a lot of β -carotene therein when grown in a culture fluid containing a high concentration of saline and a small amount of nitrogen under intense sunlight and other appropriate conditions. β -Carotene, a provitamin A group compound, which has therein conjugated double bond chains,

is not only easily oxidizable but also changeable under the influence of light or heat. 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 process for producing a vacuum-packed food comprising *Dunaliella* algae which comprises

adding from 15 to 50 parts by weight of cyclodextrin to 100 parts by weight of a dried powder of the algae 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 and from 35.50 to 40.60 parts by weight of a binder;

granulating the resulting mixture; and

vacuum-packing the resulting granules in a package made of a plastic film which is impermeable to gas and to light;

said dried powder of the algae being used in an amount such that 300 parts by weight of the granules to be vacuum-packed include from 10 to 240 parts by weight of the dried powder. The granules produced may be packaged, for example into 300 mg quantities.

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 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 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 cell wall and the cell membrane. It is also characteristic of Dunaliella algae that they contain a large quantity of β -carotene. Typical examples of Dunaliella employed in the present invention include Dunaliella bardawil and Dunaliella salina.

The ratio each of other additive materials per 100 parts by weight of the mixture of algae and cyclodextrin mentioned above is as follows:

a lubricant (optionally used)	3.50 parts by weight
an antioxidant	0.10 - 0.25 parts by weight
a binder	35.50 - 40.60 parts by weight

When one package contains 300 parts by weight of the food composed of Dunaliella algae as prepared above, the maximum content of dried powder of Dunaliella algae in the product is 80% of the total food weight per package. From the viewpoint of health, it is desirable to eat two to four packages of this food a day. Above all, 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 are used in the present invention. Among suitable binders are sugars, preferably maltose. Lubricants which are optionally employed in the present invention are talc and ester of sucrose and fatty acid; the latter is more advantageous than the former. Examples of cyclodextins (the term cyclodextrin is hereinafter referred to as "CD") include α -CD, β -CD and γ -CD. With respect to package film, there is no suitable one that is made of a single material and that has properties of both lighttightness and gastightness. Therefore, it is favourable to make use of opaque laminated plastic film obtained by uniting a plastic film and any one or more materials selected from aluminium foil, paper, Cellophane (Registered Trade Mark) and another plastic film.

Example

To 100 parts by weight of dried powder of Dunaliella algae was added 25 parts by weight of CD. These materials were mixed in a V-model mixer for about 5 minutes to obtain a mixture. To 100 parts by weight of the mixture were added 0.2 parts by weight of vitamin E (antioxidant) and 37 parts by weight of powdered thick malt syrup containing maltose (binder). The resulting mixture was granulated to form fine particles by a roller converter. Granulated particles thus prepared were packed by a vacuum-packing machine in plastic film coated by aluminium foil to obtain a vacuum-packed product.

It was confirmed that the content of dried powder of Dunaliella algae was 59% of the total weight of vacuum-packed food thus obtained.

The present invention has made it practicable to obtain vacuum-packed 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 utilizing naturally occurring β -carotene while keeping its activity and such results were never attained by the prior art.

CLAIMS

1. A process for producing a vacuum-packed food comprising *Dunaliella* algae which comprises

adding from 15 to 50 parts by weight of cyclodextrin to 100 parts by weight of a dried powder of the algae 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 and from 35.50 to 40.60 parts by weight of a binder;

granulating the resulting mixture; and

vacuum-packing the resulting granules in a package made of a plastic film which is impermeable to gas and to light;

said dried powder of the algae being used in an amount such that 300 parts by weight of the granules to be vacuum-packed include from 10 to 240 parts by weight of the dried powder.

2. A process according to Claim 1 wherein the granules of food are packaged in 300 mg quantities.

3. A process according to Claim 1 or 2 and substantially as hereinbefore described.

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**** END OF REGISTER ENTRY ****

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