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(19) (CA) **CANADIAN PATENT** (12)

(54) METHOD FOR THE PROCESSING OF KRILL TO PRODUCE PROTEIN,  
LIPIDS AND CHITIN

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ABSTRACT OF THE DISCLOSURE

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The method for the processing of ~~krill~~<sup>krill</sup> to produce protein, lipids and chitin comprises emulsification of lipids by intensively stirring ~~krill~~<sup>krill</sup> in an aqueous medium. The resultant emulsion of lipids is separated from the ~~krill~~<sup>krill</sup> mass and from the ~~krill~~<sup>krill</sup> mass proteins are extracted at a pH of 10 to 12. The alkaline extract of proteins is separated from chitin integuments and protein is separated therefrom.

METHOD FOR THE PROCESSING OF KRILL  
TO PRODUCE PROTEIN, LIPIDS AND CHITIN

The present invention relates to methods for the processing of krill to produce protein, lipids and chitin. Krill is a prospective source of food protein and other practically useful products such as chitin and lipids which find wide application in different branches of the national economy -- the food industry, textile and paint and varnish industry, in agriculture and medicine.

Known in the art is a method for the production of a proteinaceous nutritive substance from krill residing in comminuting and pressing fresh or frozen and then defrosted krill. The liquid separated during pressing is heated for 10 to 15 minutes at a temperature of 90 to 95°C for coagulation of proteins contained therein. The proteinaceous coagulate is separated from the broth by filtration or centrifugation to produce a mass which is used in the USSR under a trade name of the Okean protein paste.

A disadvantage of said method for the processing of krill is loss of nutritive substances, particularly protein, and an insufficiently full utilization of other components of krill. The broth containing a considerable amount of nutritive substances is not processed and is poured off. The yield of protein is 35 to 40%. It should be pointed out that the Okean paste is a perishable product and should be stored only when frozen at a temperature not exceeding -18°C for not more than 12 to 14 months. The thermally denatured protein contained in the Okean paste possesses low functional properties (foam-forming and gel-forming properties, a water-holding capacity, etc.) which makes its processing and use difficult.

proteins, lipids and chitin integuments can at present be processed and used only as feed meal.

Known in the art is a method for the production of a protein concentrate from frozen krill kept at a temperature of  $-20^{\circ}\text{C}$  comprising defrostation, comminution of krill, extraction with isopropanol with subsequent removal of the solvent, and drying under vacuum at  $70^{\circ}\text{C}$ .

Using the present method a proteinaceous concentrate is produced with a content of protein of 710 to 775%, lipids  
10 of 0.3%, and chitin of 5.8 to 6.4% (as calculated for dry substance). Said method has the following disadvantages. The use of organic solvent makes the production more difficult. In addition, the solvent itself and the process for the removal thereof may deteriorate the quality of the protein. The proteinaceous concentrate has a comparatively low content of protein and a high chitin content.

It is an object of the present invention to develop such a method for the processing of krill which would make it possible to produce protein, lipids and chitin with a high  
20 yield and quality.

The method for the processing krill to produce protein, lipids and chitin, according to the invention, is characterized in comprising emulsification of lipids of krill in an aqueous medium; separation of the emulsion of lipids from the krill mass; alkaline extraction of proteins from the krill mass at a pH of 10 to 12; separation of the protein extract produced from chitin integuments; separation of protein from the protein extract.

The invention makes it possible to obtain a protein  
30 product with a content of protein of up to 95% by weight as calculated for dry substance.

According to the invention, the first stage of the

processing of krill provides for extraction of lipids. This extraction of lipids is effected by emulsification using various techniques such as intensive stirring in an apparatus with a stirrer, or an ultrasonic method. Used as a medium in which emulsification is conducted is water or aqueous solutions of salts. To reduce losses of protein in the process of emulsification the pH of the emulsifying medium should be maintained within 4.5 to 5.0. In emulsification lipids are separated with a yield of up to 95% by weight.

10           The krill after separation of lipids therefrom is treated with an alkaline solution with a pH of 10 to 12 for extraction of proteins therefrom. A two-phase system is formed comprising an aqueous-alkaline solution containing protein, and a solid residue containing chitin integuments and other insoluble substances. The aqueous-alkaline solution containing protein is separated from the solid residue by filtration or centrifugation. Protein is separated from the resultant aqueous-alkaline solution by various methods, for example, by precipitation with alcohol or ultrafiltration, precipitation  
20           in the isoelectric point, or thermal coagulation. The isoelectric precipitation is carried out by food acids at a pH of 4 to 5. A curdled, easily settling precipitate of protein is formed which is separated and washed with 2 to 5 volumes of water. The washed precipitate is dried. As a result a product is obtained with a protein content of up to 95% by weight as calculated for dry substance.

          Thus, the proposed method for the processing of krill makes it possible to produce such valuable substances as protein, lipids and chitin.

30           The simple technology and the availability of the reactants used make the process commercially profitable.

          For a better understanding of the present invention

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