**Defatting of the "Okean" protein food paste** ("Ocean" – foodstuff)

In Russia, the protein foodstuff "Okean" in the form of a frozen protein paste is prepared from Antarctic krill with the use of the technology developed at the All-Union Research Institute of Fish Industry and Oceanography. However, "Okean" paste can be stored at –18 ºC for no longer than 12 months. Spoilage of the paste is associated with the presence of unsaturated fatty acids in its composition, which make up more than 70% of the total including up to 30% of 18-carbon fatty acids and up to 16% of 20-carbon fatty acids. These can oxidize at the double bond sites, which leads to spoilage of the product.

In order to extend the storage life of the paste and to expand its application, the VNIIKOP conducted a study on the defatting of "Okean" protein paste with organic solvents, specifically light petroleum ether and 91% isopropyl alcohol.

Extractions of dried and wet paste were carried out at room temperature in one or more steps. The results are presented in the Table.

Prior to the extraction, the sample was mixed with the organic solvent and infused for 1 – 2 hours. The prepared extract was separated from the solid portion by filtration. The investigations showed that the extraction of fat from the wet paste using petroleum ether was difficult without preliminary drying (tests No. 8 and 9). The extraction of fat from the dried paste was accompanied by discoloration due to the dissolution of the contained carotenoids and their migration into the solution phase. The prepared powder retained the aroma of shrimp.

It was established that the optimal mode to provide nearly complete removal of fat from the "Okean" paste was extraction from the wet paste with isopropyl alcohol (ratio of 1:3) over 2 hours in four steps of 30 min each (test No. 12). In this case, in addition to the extraction of fat, dewatering of the paste also took place. The isopropyl alcohol residues could be removed by processing the paste with steam and drying it at a temperature of 50 ºC.

After additional mincing, the prepared product was an odorless, white colored powder with a violet tinge. The content of protein in the dried defatted paste had increased from 57.17 to 93.75%.

The dried defatted paste can be added to various dishes and pastries as a colorless protein additive with no fishy smell. It also should find wide application in manufacture of food concentrates.

Table

| Test No. | Raw materials | Solvent used and ratio | Duration of extraction, h | Number of processing steps | Amount of extracted fat, % of dry weight | Amount of residual fat, % of dry weight | Organoleptic properties of defatted powder | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | color | aroma |
| 1 | Dried paste | Petroleum ether (1:9) | 1 | One step | 25.0 | - | White | Shrimp |
| 2 | " | " (1:9) | 1 | " | 28.4 | - | " | " |
| 3 | " | " (1:9) | 1 | " | 25.2 | - | " | " |
| 4 | " | Isopropyl alcohol (1:9) | 2 | Two steps, each 1 h | 27.7 | - | " | " |

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|---|---|---|---|---|---|---|---|---|
| 5 | “ | As above (1:10) | 1 | One step | 23.0 | 4.0 | “ | “ |
| 6 | “ | “ (1:10) | 2 | Two steps, each 1 h | 27.4 | - | “ | “ |
| 7 | “ | “ (1:10) | 1 | Two steps, each 1 h | 24.0 | 3.0 | “ | “ |
| 8 | Wet paste | Petroleum ether (1:3) | 2 | One step | 6.6 | 16.0 | Orange | “ |
| 9 | “ | “ (1:3) | 2 | Two steps, each 1 h | 10.0 | 13.0 | “ | “ |
| 10 | “ | Isopropyl alcohol (1:3) | 2 | One step | - | - | “ | “ |
| 11 | “ | As above (1:3) | 2 | Two steps, each 1 h | - | - | “ | “ |
| 21 | “ | “ (1:3) | 2 | Four steps, each 30 min | 27.0 | Traces | White with violet tinge | No aroma |