LOW-TEMPERATURE EXTRACTION OF PHOSPHOLIPIDS FROM SUNFLOWER OIL

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Summary: Low-temperature extraction of phospholipids from sunflower oil by consistent implementation of hydration and freezing has been performed. Was detected that consistent implementation of hydration and freezing lets us fully remove oil's phospholipids.
Key words: phospholipids, sunflower oil, low-temperature extraction.

Introduction

Actual problem of oil refining is to obtain purified oils and related materials extraction as the final product with high quality. Non refined oil which was get by pressing and extraction methods is storing up to six month. To prolong the expiry date of oil to two years brought to cleaning or refining. The presence of related substances phospholipids, pigments, volatiles, free fatty acids and waxes - causing oxidative reactions as result of which is the accumulation of free radicals, peroxides, aldehydes, ketones, resulting in damage to the oil. However, phospholipids and pigments are biologically active substances. So tocopherols and carotenoids exhibit vitamin activity and antioxidant effect, phospholipids are components of cell membranes and perform structural function.

Oil refining includes the following modules: hydration, neutralization, bleaching, deodorization, freezing. The first four modules required for refining the classical scheme, as they allow to keep oil for a long period of time and modify it, if necessary. The sequence of the modules refining affect the amount of loss of oil and chemical composition of the waste from.

Technological sequence of cold refining include freezing with neutralization. A solution of acid add to the unrefined oil to hydrate it, then withstand in coagulator, cooled, injected alkaline solution to neutralize the free fatty acids and forwarded to crystallizer for crystallization of waxes and withstand. Then the oil is heated and separated soap stock and wax from oil. Then heated and washed with water to remove soap residue, separating washing water with soap.

Flowsheet wet freezing initially provides spending neutralization with soap stock separation, consistently adding acid solution and then a solution of alkali, after holding, it separates from Soap stock. Then add alkaline solution, cooled and sent to the crystallizer where keep for the crystallization of waxes. Then heated and separated Soap stock and wax from oil. Then heated one more time and washed with water to remove soap residue, separating washing water with soap from oil.

Classic or dry freezing is carried out after hydration, neutralization, bleaching and deodorization in the final stages of refining.

Classic oil refining technology includes the following modules: removal of phospholipids by degumming, neutralization of free fatty acids by alkaline solution,

removal of residual moisture by drying, adsorption of pigments by clay, distillation of volatile aromatic substances from oil, waxes freezing [1]. Freezing may be waived in the event of further industrial processing oil with margarine, mayonnaise and etc. Realization of the processes and their options while refining, for every plant are determined for each available equipment and depend on the future use of oil, and the quality of none refined oil.

To extract oil phospholipids, hold hydration introducing condensation or solution of phosphoric acid [2]. Extraction micelles formed by separation or settling obtaining phospholipid emulsion. Phospholipids have radicals containing an amino group in their composition, so after drying phosphatide concentrate is dark. Dark phosphatide concentrate is not in demand. Because the emulsion is not drying, but adds in soap stock. Also hold hydration and neutralization by alkali. Got soap stock contains phospholipids and soaps. The presence of soap in the food phospholipid emulsion is undesirable. Phospholipids are used as emulsifiers in fat-containing foods: candy, ice cream, spreads.

Material and method

Studying of extraction of phospholipids with wax under the influence of low temperatures was the aim of our research.

Sample pressed sunflower oil after filtration was selected. In the pre-heated to 50°C oil injected dropwise 2 % mass. distilled water for the removal of phospholipids. During the introduction for an additional 15 min. after making water, oil stirred vigorously whipping with broom for protein cream using household kitchen appliance. After hydration phospholipids were not separated, but were freezing waxes by placing samples of oil in the refrigerator at a temperature of 0 – (+4) °C for one day. After exposure of oil for one day at low temperatures it was centrifuged and measured phosphorus content in it. Was conducted parallel control of phospholipids extract by hydration and waxes by freezing separately in the same mode.

In the oil after consistently held hydration and freezing measured phosphorus. Determination of phosphorus in oil was determined by the method of Briggs [3], according to which a sample of oil burned in a muffle furnace, the ash was dissolved in sulphuric acid and the solution was neutralized with alkali. Then carried out a chemical reaction of phosphorus clear solution with ascorbic acid and ammonium molybdate. Then determined the optical density of the sample solution colored in blue at the wavelength of 630 nm in cuvette with a length of facets 5mm. To construct the calibration graph, parallel colorimetric reaction was carried out with solutions that have known phosphorus.

Results and discussions

Each experiment was performed three times. The experimental data were treated by mathematical statistical methods [4]. Research results are given in Table. 1

As is -seen from the reduced data, consistent implementation of hydration and freezing fully removes oil phospholipids. Phospholipids, in the samples which were sequentially hydrated and frozen, you can select not only by centrifugation but decantation. The fact that the largest removal of phospholipids may explain by the consistent removal of phospholipids and waxes that crystallize during freezing. The presence of waxes in phospholipids not reduce the nutritional value of the phospholipids.

Presence of high-melting components will increase hardness of fat-containing foods.

Table. 1. Phosphorus content in oil

A sample of oil	Phosphorus content in terms of P_2O_5, mg/100 g
Initial	131,3±18,3
Hydrated	60,6±18,3
Frozen	127,4±18,3
Consistently hydrated and frozen	29,7±18,3

Conclusions

Thus, the consistent implementation of hydration and freezing allows fully remove phospholipids from vegetable oil.

Reference list (recommended reading)

1. Технология переработки жиров: Учеб. вузов / Арутюнян Н.С., Корнена Е.П., Янова Л.И., Захарова И.И., Мартовщук Е.В., Аришева Е.А., Меламуд Н.Л,, Кривова А.Ю.; Под ред. Н.С. Арутюняна.– 3-е изд.– М.: Пищепромиздат, 1999.– 451 с.
2. Арутюнян Н.С., Корнена Е.П. Фосфолипиды растительных масел: Состав, структура, свойства, получение и применение.– М.: Агропромиздат, 1986.– 256 с.
3. Великая Е.И., Суходол В.Ф. Лабораторный практикум по курсу общей технологии бродильных производств (общие методы контроля): Учеб. пособ. вузов.– Изд. 2-е, перераб. и доп.– М.: Легкая и пищевая промышленность, 1983.– 311 с.
4. Грачев Ю.П. Математические методы планирования экспериментов.– М.: Пищевая промышленность, 1979.– 199 с.