TECHNOLOGY OF REFINING FLAXSEED OIL

Feruza Abdullayeva Bayjon qizi*
Master's student, Department of Food Technology, Faculty of Chemical Technology, Urgench State University

Umid Boltayev Satimbayevich
Faculty of Chemical Technology, Department of Food Technology, PhD

Sanobar Achilova Sabirovna
Faculty of Chemical Technology, Department of Food Technology, PhD

Nadira Sabirova Kamiljanovna
Department "Food Technology", Urgench State University

ABSTRACT

This article gives insights into the physicochemical properties of unrefined flaxseed oil and the selection of a rational alkaline reagent in order to neutralize free fatty acids. The main parameters of caustic soda were compared with sodium silicate, and the optimal consumption of sodium silicate for alkaline refining of linseed oil was determined. The use of sodium silicate solves two tasks: neutralization of free fatty acids and physical neutralization of coloring pigments, etc., as well as increases the yield of refined linseed oil by an average of 2.7%.

Keywords: linseed oil, caustic soda, sodium silicate, acid count, refining.

INTRODUCTION

Nowadays, refining in the oil industry of the CIS countries, including Uzbekistan, contains various physical and chemical processes, using it allows to separate the associated substances from the oil. The nature of these processes is determined by the nature of the oil and the quality of the refined oil. The refining method should be chosen in such a way that the triglyceride content of the oil remains unchanged and the maximum amount of valuable by-products (phosphatides) is released from the oil. The refining process must ensure the complete elimination of toxic and carcinogenic substances. There are several requirements for refined oils, depending on the purpose for which they are used. Edible oils must be refined by a complete cycle: the separation of phosphatides and waxes, free fatty acids, pigmented flaxseed oils are widely used in the food industry, medicine and perfumery. [1, 2]. This research work is relevant to the oil and fat industry and can be used to process flaxseed oil. The aim of the research is to create a highly efficient method of processing flaxseed oil. Solution of flaxseed oil processing by removal of phospholipids, free fatty acids, colorants, separation of sediment from processed oil and filtration of processed oil, removal of phospholipids, free fatty acids, etc. And coloring is carried out by processing crude linseed oil at a temperature of 20-30 ° C in an aqueous solution of sodium silicate with a concentration of 5-8%. [3] Refined flaxseed oil should be clean, transparent, without sediment, greenish-yellow color, the taste and smell should be slightly clear. Taste and smell clean, bitter, sediment (by weight): in class 1 - no more than 0.05%, in class 2 - 0.1%. The moisture and volatile content of both varieties does not exceed 0.3%. Flaxseed oil goes through a complete stage of processing for further production. The shortcomings mentioned above underscore the importance of finding a more selective alkaline reagent for refining food fats. In this regard, sodium silicate ($Na_2O \cdot n\ SiO_2$) stands out, which has shown positive results in the refining of vegetable oils (sunflower, soybean, legumes, etc.) [7].

METHODS

The main advantage of sodium silicate solution is due to its selective interaction with free fatty acids, almost complete washing of triglycerides (with soap) and the absence of fat-soluble acidic soaps, which results in repeated washing of linseed oil and reduces subsequent processes involving drying. Changing the type of alkaline reagent, such as replacing a conventional caustic soda solution (NaOH) with a sodium silicate solution ($n\ Na_2O \cdot mSiO_2$), requires consideration of the composition and properties of the latter.

In practice, the density of its solution is used to calculate the amount of sodium silicate required to neutralize fatty acids, but given the complexity of the chemical composition of sodium silicate, this value is not always adequately reflected in its sodium ion concentration. The latter is a decisive factor in calculating the amount of alkali theoretically required to neutralize flaxseed oil. Therefore, we prepared an aqueous solution of sodium silicate by boiling a piece of silicate with a known modulus of three.

The density of the resulting solution was then determined and then titrated with a standard 0.1 N solution of hydrochloric acid. The rate of sodium silicate solution was calculated according to the following formula:

$$N_1V_1 - N_2V_2 \qquad (1)$$

here, N1vaV1 is the normality and volume of the titrated sodium silicate solution;

N2 and V2 are the normality and volume used to titrate the hydrochloric acid solution.

Given that the modulus of sodium silicate used is three, the molecular mass of the Na2O · 3SiO2 compound was calculated and then the concentration of the solution was determined in g / l. For the convenience of further work, a mathematical model of the dependence of the density of sodium silicate solutions on their concentration in g / l has been proposed, which has the following form.

Therefore, for the optimal consumption of alkali in the refining of vegetable oils, it is recommended to use Equation (2), taking into account the color of the original and refined linseed oil. The chemical interaction between sodium silicate and free fatty acids proceeds according to the following reaction [7].

$$\mathbf{Na_2O{\cdot}n{\cdot}SiO_2 = x{\cdot}N_2O = 2RSOON = 2RSOONa = n{\cdot}SiO_2\ (x=1)\ N_2O}$$

where silicate (in our case, n = 2.4).

A characteristic feature of this reaction, which is derived from conventional sodium hydroxide, is the formation of polychloric acids, which exhibit adsorption properties on the refining of refined linseed oil. It is known that the study of kinetics, ie the speed of the process of refining food oil, allows you to choose an effective alkaline solution and methods of its use in accordance with the requirements of the standard, ensuring the quality of the product [8].

With this in mind, we refined flaxseed oil using conventional caustic soda (NaOH) with a concentration of 100 g/l and the recommended sodium silicate solution (Na2O · n · SiO2) at a concentration of 60 g/l at 20 ° C. experiments were carried out. The intensity was maintained at 3 m/s during the oil mixing process. The experiments were carried out as follows: a reactor with a volume of 1.0 l was loaded with 500 g of unrefined reactor 2 and heated to 50-60 ° C with slow stirring, then the stirrer speed was increased to 100 cir/min with an alkaline reagent solution (caustic soda). or sodium silicate) was calculated and the excess amount (depending on the color of the unrefined oil) was added and the oil mixture was continued to be mixed with the alkali for 60 minutes. The soapstock formed after alkaline refining was separated from the oil mass by precipitation and filtration. The resulting product was then washed with distilled water to pH-7.0 and dried under vacuum at a temperature of 70-85 ° C until constant weight of salomas. The obtained linseed oil was analyzed in accordance with the requirements of applicable standards. However, such parameters, which may change during the refining of flaxseed oil, have been investigated.

The results are presented in Table 1.

Physicochemical properties of flaxseed oil refined in an aqueous solution of caustic soda (control) and sodium silicate

Table 1

Indicators	Pressed linseed oil	Refining oil	
		As required	Certain methods
Mass fraction of phospholipids, %	0.30	-	-
Acid number, mg KOH / g	4.27	1.7	2.7
Unit of colour, mg J2	70	52	55
Humidity,%	0.2	0.09	0.14

As can be seen from the table, the replacement of traditional caustic soda with an aqueous solution of sodium silicate improves the quality of refined oils derived from linseed oil, as well as increases their profitability by 2.6 and 2.8%, respectively. This is because the recommended sodium silicate, containing silica (SiO2), acts as an adsorbent in the purification of coloring pigments.

Thus, research suggests that sodium silicate can be recommended for practical use instead of traditional caustic soda. The use of sodium silicate solves two problems: the neutralization of free fatty acids and the removal of coloring pigments. In addition, from an economic point of view, the use of sodium silicate in the refining of food saliva allows to increase the yield of refined oil products by an average of 2.7%.

DISCUSSION

Flaxseed oil and its refining method, including separation of phospholipids, free fatty acids, dyes, separation of soap stock from refined oil and filtration of neutralized oil, removal of phospholipids, free fatty acids and dyes It is characterized by the fact that it is made by sequential refining of unrefined linseed oil at a temperature of 20-30°C.

CONCLUSION

Studies have shown that the use of sodium silicate in the refining of flaxseed oil improves the quality of the oil. During the refining process, the oil was removed from the accompanying substances and this method was used to obtain a clean and edible product.

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