

Effect of chemical products and providing their safety in cleaning complex oils

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Abstract. Vegetable oil fundamentally differs from other available products in its composition, ingredients and other properties. Ensuring food security and adapting food products to the requirements of a modern market economy is an important and urgent problem. Particular attention in this direction is paid to vegetable oils. Therefore, it is important to conduct scientific research to improve the quality of refined and colored oils, as well as food safety. The paper recommends cleaning methods differ from existing ones in priority and convenience.

1 Introduction

In the oil and fat industry, it is the main consumer product in the world and is used in the organization of rational technological processes. The lack of information about the long-term storage of refined oil and changes in its composition leads to the efforts of specialists in the field of specific scientific work and research. This is due to the fact that various biochemical, microbiological and physico-chemical changes during the storage of oils and fats have received a scientific explanation.

It is advisable to study these changes from a technical and technological point of view and create a basis for ensuring security based on new technologies. It is necessary to accelerate the development of new recommendations with practical results based on scientific and scientific-theoretical studies of the safety of oils before consumption, as well as with the participation of modern technologies.

2 Materials and methods

Modern economic and political relations stages of development of the Republic of Uzbekistan. After gaining independence, Uzbekistan began deep socio-economic reforms aimed at increasing its position and prestige in the world community. The great changes taking place today have radically changed the idea of the economic system, its forms and principles.

At present, the process of liberalization is being carried out in all sectors and branches of the country, economic reforms are deepening. This requires further strengthening of favorable legal conditions, guarantees and economic factors to attract foreign investment in

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the country's economy, especially direct investment. The oil and fat industry is one of the leading sectors of the food industry of the republic. In Uzbekistan, vegetable oil has long been obtained from sesame seeds, flax, indus, maksar seeds, cotton, melons. As a result of the development of the oil and fat industry, new types of products began to be produced [1].

At first, only unrefined (black) cottonseed oil was prepared, then oil refining was introduced and they began to produce refined oil of the highest grade, lard for food and technology, glycerin, fatty acids, margarine, mayonnaise, soap, synthetic detergents, and various varnishes. dye production.

Gossypol and its derivatives are important concomitants of the oil contained in cottonseed oil, and these substances are substances that affect the quality of cottonseed oil, cake and meal.

Technological processing of cotton kernels as a raw material is carried out at the enterprises of the oil and fat industry of the republic, from which vegetable oil is obtained by pressing or extraction. The oil obtained by such methods contains various additives that adversely affect the quality of the product and make it unsuitable for consumption.

Cottonseed oil is refined in various ways to make it into a consumer product. On an industrial scale, an alkaline method is used to purify cottonseed oil from organic compounds, for which a thick solution of sodium hydroxide is used [2].

The consumption of oil obtained by this method is relatively low in terms of consumption and quality, which requires the improvement of its technology. In addition, the shortage of caustic sodium and its purchase abroad requires the introduction of new chemical compounds that replace this alkali. Therefore, the main goal of this work is to introduce and improve the method of cleaning cottonseed oil with a new type of alkaline solution.

The aldehyde group in the gossypol state reacts with ammonia and other amino compounds, protein, phosphatides, aniline, aminobenzoic acid, i.e. This feature is currently used to determine the amount of gossypol in the composition of cotton, oilcake and meal.

The rapid discoloration of refined oil occurs as a result of the adsorption of dyes by alumina, which is formed from sodium aluminate during technological processes. As a result of the introduction of a new technological process, the consumption of caustic soda in the refining process has decreased by 2 ... 2.5 times, and technological costs have also decreased. An increase in the consumption and quality of refined oil has been achieved. As a result of the activation of alkaline solutions in an electromagnetic field, the technological process was improved and energy and heat costs were reduced.

In view of the above, the following new technological system for alkaline processing of cottonseed oil will be introduced:

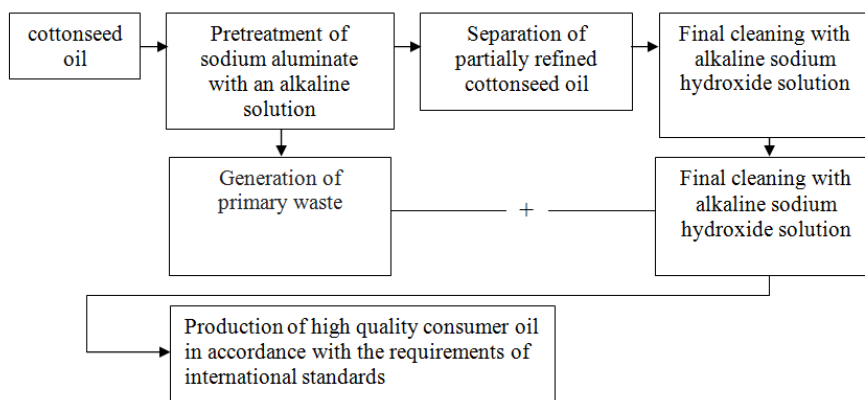


Fig. 1. New technological system for cleaning cottonseed oil under the action of alkalis.

As a result of this proposed process system, a certain part of the sodium hydroxide used in the refining of cottonseed oil is saved from the non-traditional alkali of sodium hydroxide, which is a waste product. The use of sodium hydroxide solution in cottonseed oil refining technology, along with the implementation of the technological process, affects the consumption and quality of refined oil.

The high density of the alkaline solution and its high consumption lead to a decrease in oil consumption and the transfer of neutral oil to the soapstone. Therefore, it is important to introduce new types of alkalis for refining cottonseed oil, substantiate them with research, use the effect of electromagnetic fields to speed up the technological process, and reduce the consumption of basic and auxiliary materials. The use of sodium aluminate in processing technology, the theoretical assessment of its effect on the chemical composition and quality of oil is an important task [3].

Accelerate the refining technology of cottonseed oil stepwise, first activating in an electromagnetic field, first with sodium aluminate, then with sodium hydroxide solutions, to improve the quality and nutritional value of the oil, reduce the consumption of raw materials, energy and heat.

The main goal is to introduce changes in the chemical composition and quality of oil into the cottonseed oil refining technology in a new way, as well as to scientifically substantiate them.

In experiments, for the first time, an increased acceleration and a high degree of bleaching of cottonseed oil with solutions of sodium aluminate (first stage) and alkali (second stage) activated in an electromagnetic field were revealed. In the case of hydrophilic sodium compounds, the main accompanying substances in the form of hydrophilic sodium compounds - free fatty acids, phosphatides, free and dark-colored forms of gossypol - are effectively separated from the oil raw material.

At the first stage of a two-stage cleaning of cotton seeds using an alkaline solution of sodium aluminate, a soap stock with a low content of gossypol is obtained, which is effectively used in the production of white distilled fatty acids and laundry soap (environmentally friendly products). The technology of stepwise refining of cottonseed oil in the presence of sodium aluminate and alkali has been tested, the acceleration of technological processes is based on the activation of alkaline solutions in an electromagnetic field. Costs are reduced by increasing consumption and improving the quality of refined oil under production conditions.

According to the technological system, the process of purification of cottonseed oil by the alkaline method is carried out in two stages, at the first stage, the raw material is partially purified from some of its additives to obtain high-quality and nutritious edible oil. To achieve this goal, in experiments and studies, the process of alkaline purification of cottonseed oil was tested, based on the consistent use of solutions of sodium aluminate and sodium hydroxide.

Production system of cottonseed oil refining technology with solutions of sodium aluminate and alkaline sodium hydroxide.

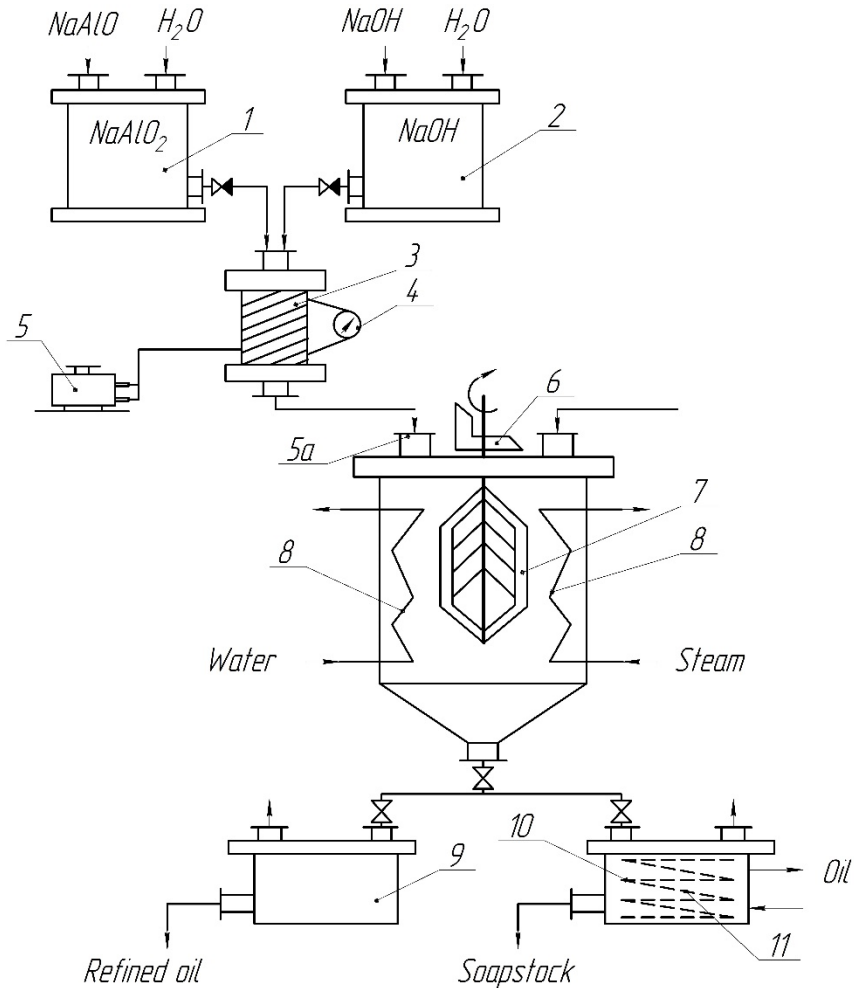
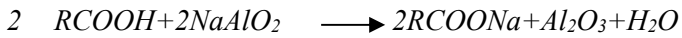
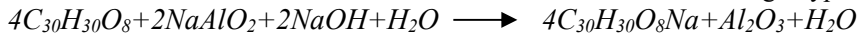


Fig. 2. Production system of technology for refining cottonseed oil with alkaline solutions. 1) Capacity of naalo2 solution; 2) the capacity of the naon solution; 3) electromagnetic device; 4) current amplifier; 5) electric current control device; 5a) corridor; 6) reducer; 7) mixer; 8) refrigerators; 9) capacity for refined oil; 10) soapstock capacity; 11) heater.

1. Chemical reactions of an alkaline solution of sodium aluminate with free fatty acids



Chemical reactions of an alkaline solution of sodium aluminate with free gossypol



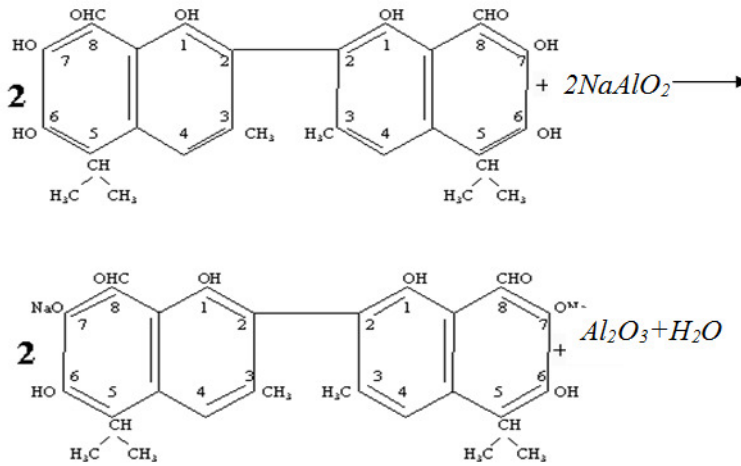


Fig. 3. Formular of chemical reactions of an alkaline solution of sodium aluminate with free gossypol.

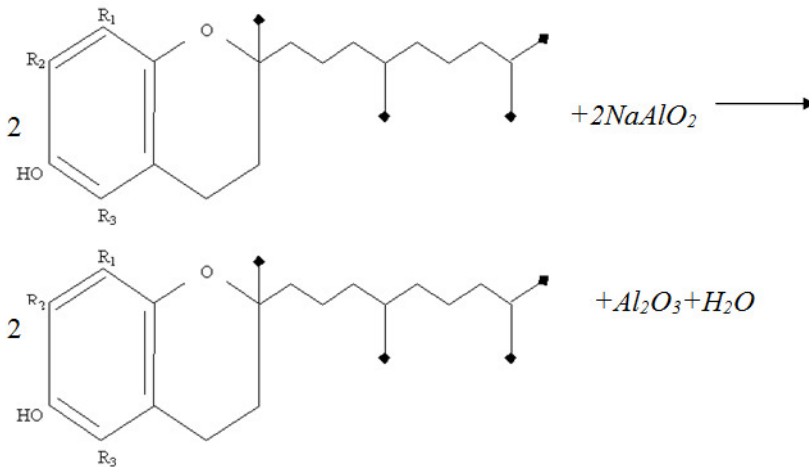
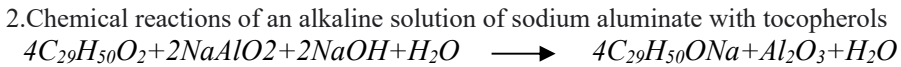


Fig. 4. Formular of chemical reactions of an alkaline solution of sodium aluminate with tocopherols.

In addition, this reaction is used commercially to separate gossypol from oil or mistella in the form of gossypol anthranilate compound.

Gossypol immediately transforms into a rapidly changing form in solution, especially when dissolved oxygen is present in the solution and the ability to react with aniline is lost. When gossypol is heated in the crystalline state, its color changes, but it retains the ability to melt in alkali. When heated, the solution in oil passes into an insoluble state, which indicates the loss of its acidic properties by gossypol, i.e., gossypol passes into an altered state. The transition of gossypol to an altered state is influenced by temperature and time of exposure to temperature.

Table 1. Indicators of the obtained original cottonseed oil under pressure.

Complementary a certain amount of alkali, %	Starting oil values						flow partially neutralized oil in relation to the substance, %
	Acid number, mg KOH/g	Color, red. 35 yellow thick 1sm	Quantity, %				
			phospholi pids	free gossypol	Related gossypol	aluminum nievoe soap	
0	8.6	47	1.2	0.33	0.36	-	-
20	8.0	40	1.0	0.30	0.31	-	98
40	6.3	35	0.8	0.28	0.30	-	97
60	6.0	33	0.7	0.27	0.29	as a re mainder	96
80	5.5	29	0.6	0.27	0.29	as a re mainder	95
100	5.1	27	0.5	0.26	0.29	as a re mainder	94

Table 2. Results of refining partially neutralized cottonseed oils under industrial conditions.

Raw material sample	Indicators of partially neutralized oil		Indicators of the last refined oil				
	Acid number, mg KOH/g	Color, red. 35 yellow thick 1sm	Refining conditions		Acid number, mg KOH/g	Color, red. 35 yellow thick 1sm	Oil yield from raw materials %
			Concentra solution NaOH, g/l	alkaline additive, %			
Forpress oil							
1	2.1	17	95	20	0.07	6	98
2	2.8	21	115	30	0.09	8	97
Extraction oil							
1	2.5	24	150	40	0.19	11	95
2	4.7	35	180	60	0.23	13	92

The higher the temperature, the greater the contact of gossypol with oxygen and the faster it changes. The transition of gossypol to such an altered state is seen in the extraction of oil from cotton seeds. This process is very harmful, the resulting gossypol products are very difficult to separate during the refining of cottonseed oil, a large amount of alkaline solution is used to separate them from the oil, in this case, the modified gossypol is adsorbed only on the surface of cottonseed oil. soapstock. The consumption of a large amount of alkaline solution reduces the yield of refined oil. This is due to the fact that excess alkali also converts neutral oil into soap stock [4].

To evaluate a new technological method for refining cottonseed oil, based on research, modern evaluation methods used in science and industry to assess the quality of raw materials, intermediate and refined oils, as well as their physical and chemical properties, were used. The studies used cottonseed oil, obtained by pressing, with the following initial parameters of various acid numbers: color - 27 in red units, 35 in yellow units and 1 cm in thickness; the amount of phosphatides is 1.57-1.80%, the amount of free hysogenous substance is 0.34-0.52% [5].

In our studies, the quality of refined oil was improved using an electromagnetic field during bleaching processes using an adsorbent such as PU-6. When bleaching oil using an adsorbent, no adsorbent residues remain in the oil, which improves the bleaching process. As a result, the degree of oil processing is increased and the cost of obtaining a better product is reduced. Evaluated the quality and manufacturability of the finished product.

Today, deodorized oils are widely used in the food industry of the world, on the basis of which food, bakery and confectionery products are produced. In order to improve the quality of margarine products and ensure food safety, the modernization of production technology using deodorized oils is of particular importance.

Research is aimed at reducing the properties of highly deodorized oils, the amount of fatty acids in margarine products, optimizing their composition and technological properties, ensuring the quality and safety of edible oils and products from them. In parallel, work is underway to use alternative sources of active mineral additives and fillers to improve the quality of deodorized oils.

An analysis of the available literature shows that there is sufficient data in this area. However, the available data require further expansion and improvement of work in this direction. With this in mind, the main goal in this direction is to improve the quality of refined and tinted cottonseed oil and ensure food safety, in order to achieve this goal, special attention is paid to the use of existing and non-traditional feed additives and flavored oil-soluble additives. substances.

Determination of the role of feed additives and flavors in the formation of quality and nutritional value indicators of refined and dyed cottonseed oil and their scientific analysis. Data on the physicochemical and quality indicators of refined and dyed cottonseed oil, which were initially involved in processing, are given. The data show the presence of nutrients in the original cottonseed oil [6].

Flavorings were used to increase the nutritional value of refined and dyed cottonseed oil. Qualitative and physico-chemical indicators of aromatic oils are given. According to the data obtained, new types of oils are determined by their predominance in terms of performance. The amount of flavors and additives added to the oils was 0.15...0.30%. The presence of trace elements, pesticides and other substances is of particular importance in assessing the food safety of cottonseed oil. With this in mind, all indicators of new types of cottonseed oil are relatively below the accepted standard values. This indicates a high food safety of new varieties of oils. The food safety of an oil is also assessed by its fatty acid content. These data show that the fatty acid composition of the developed cottonseed oil complies with the current regulatory documents [5,6].

Scientific research in the above directions was also carried out in the system of cottonseed oil products (saturated oils).

Thus, the chemical composition of soybean oils obtained from locally grown soybean oilseeds is characterized by specificity. Soybean oil with this chemical composition is easily subjected to deodorization technology. The quality and physico-chemical properties of the deodorizing soybean oil depend on the design of the device used in the pilot study. As a result of experimental studies of soybean oil, distillates containing substances with functional properties in the deodorizing composition have been obtained, which can be used for the production of food and medical products.

Work has been carried out on the components of oils, their effect on the quality and performance of oils, refining methods, alkaline solutions, methods for improving refining technology, and the use of electrophysical effects in technological processes [7].

It is advisable to organize and carry out the storage process of vegetable oils in accordance with the rules, as well as store the oil at a temperature of +2 to -20 ° C in a place protected from light so that its composition does not change.

Based on the foregoing, the processing and storage of oils by new methods and high-quality delivery to consumption is a modern requirement.

The main source was research work carried out by scientists from developed countries to improve research processes. All of these processes can be performed or some of them can be performed depending on the purpose for which they are used. Reduction of costs and expenses for the purchase of products at enterprises, the introduction of new small technologies and the organization of the production of quality products.

3 Conclusions

In order to create healthy and safe working conditions in the production of specialists in various fields on the scientific basis of labor protection, the relevant organizations should pay special attention to working conditions, safety standards and standards for each device and equipment.

The results of scientific research and experiments show that an increase in the physical and chemical composition and quality of oils and the amount of work in the technical and technological direction serve as the basis for increasing the efficiency of the economic indicators of the industry. With this in mind, scientifically recommended ideas about consumer safety serve as a key factor in the culture of human life and its development. It provides consumers around the world with a platform to expand their choices and further develop the industry.

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