Section 5. Technical sciences

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Akhmedov Ulug Karimovich,
Doctor of Chemical Sciences, Professor
Institute of General and Inorganic Chemistry
of the Academy of Sciences of the Republic of Uzbekistan
Head of the laboratory "Surfactants"

Kurambaev Sherzod Raimberganovich,
Doctor of Technical Sciences, Urgench State University
Associate Professor of the Department of Food Technology

Bakhtiyarov Sardorbek Bakhtiyarovich,
PhD of Technical Sciences, Urgench State University
Senior Lecturer of the Department of Food Technology

OBTAINING COTTONSEED OIL THAT MEETS THE REQUIREMENTS OF FOOD SAFETY OF THE POPULATION

Abstract. Access to sufficient, safe and nutritious vegetable oil-based food is essential to sustain life and improve the health of the population. Adsorbents for the adsorption purification of vegetable oils, in particular cottonseed oil, are brought to the oil and fat plants of Uzbekistan from abroad.

In order to obtain a highly effective adsorbent from natural kaolin Sultan-Uvays, the authors developed a technology for modifying kaolin, the resulting modified adsorbent was used in the adsorption purification of cottonseed oil in miscella, and positive results were obtained in terms of the degree of purification and yield of finished cottonseed oil.

Keywords: Safe, vegetable, natural, mineral, adsorbent, modification, degree, soapstock, organoleptic, physico-chemical.

Introduction

Obtaining cottonseed oil by extraction that meets safety requirements is the most important factor for maintaining life and improving the health of the population. Unsafe vegetable oils containing disease-causing concomitant substances or harmful chemicals are the cause of many diseases.

Every year in low- and middle-income countries, the economic cost of lost productivity due to employee illness and subsequent medical costs increases.

Issues of food safety with vegetable oils and food products based on them are inextricably linked. Unsafe vegetable oils give rise to various diseases when they are fed, which especially affects all generations of the world's population. Foodborne diseases are an obstacle to social and economic development.

National businesses and agencies responsible for ensuring food safety play a key role in ensuring that every population can eat safe food. Through appropriate food safety regulations, in particular cottonseed oil, they can assist in the management of food safety issues at all stages of the food chain.

Because proper processing, storage, and safety of vegetable oils preserves their nutritional value, minimizes spoilage, and ensures food safety.

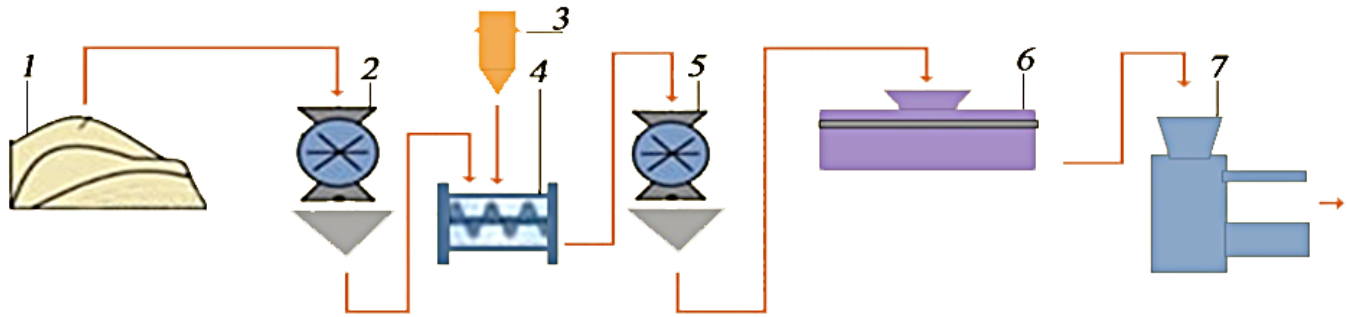
Objective of work.

Adsorbents for the adsorption purification of vegetable oils in oil and fat plants of Uzbekistan are brought from abroad. In Uzbekistan, there are deposits of natural minerals that are rich in kaolin, bentonite, flask and others. The natural mineral kaolin Sultan-Uvays has not yet found its practical application in the adsorption purification of cottonseed oil [1, p. 183–184].

The adsorption properties of natural Sultan-Uvays kaolin in its natural form are low. To obtain a highly effective adsorbent from natural kaolin Sultan-Uvays, the authors developed a technology for modifying kaolin. The resulting modified adsorbent from kaolin was used in the adsorption purification of cottonseed oil in miscella. At the same time, positive results were obtained in terms of the degree of purification and the yield of finished cottonseed oil [2, p 61–65].

Materials and methods.

To accomplish this task, the authors decided to use the natural mineral kaolin Sultan-Uvays in the adsorption purification of cottonseed oil. For the adsorption purification of cottonseed oil in a miscella obtained by the extraction method, a modified adsorbent from natural kaolin Sultan-Uvays was obtained, the technological scheme of which is given in Drawing No. 1.



Drawing 1.

Drawing No. 1. Technological scheme for obtaining a modified adsorbent from natural kaolin Sultan-Uvays. 1.Natural kaolin Sultan-Uvays. 2. Chopper. 3. Storage tank for whey from curdled milk. 4. Bake. 5. Chopper. 6. Separator. 7. Packing machine.

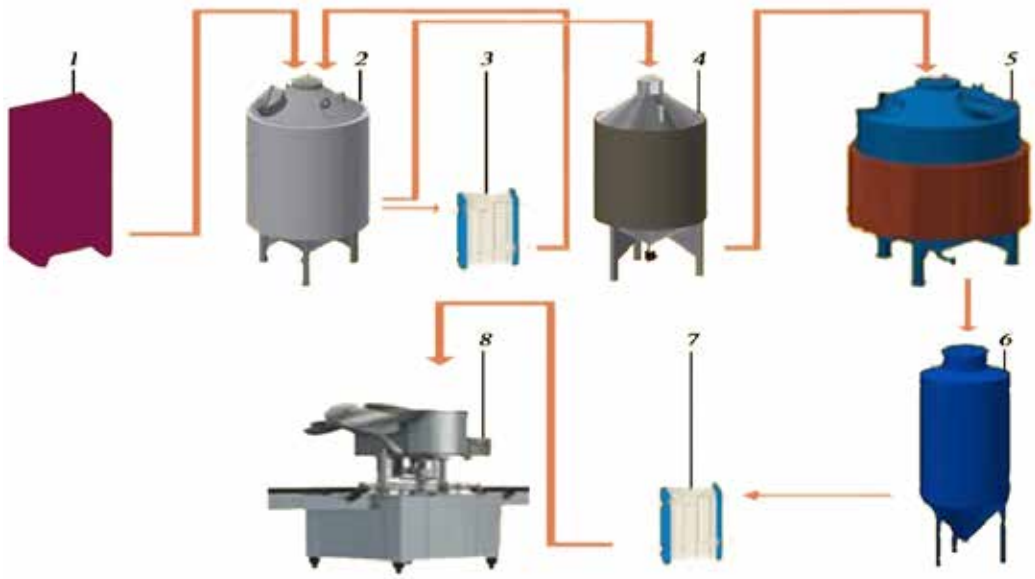
The technological processes for obtaining a modified adsorbent are as follows: grinding of natural kaolin, adding filtered whey from curdled milk to kaolin, followed by drying, grinding and sifting, and packaging of the resulting modified adsorbent.

Also, the authors have developed an effective technology for improving the refining and deodorization of cottonseed oil obtained by the extraction method, which is given in Drawing No. 2.

Drawing No. 2. Technological scheme for improving the refining and deodorization of cottonseed oil obtained by the extraction method. 1. Tank for miscella. 2. Bleach separator. 3. Filter press. 4. Distiller. 5. Deodorizer. 6.Oil cooler. 7. Filter press. 8. Packing machine.

The technological processes for improving the refining and deodorization of cottonseed oil obtained by the extraction method are as follows: cottonseed oil miscella receiving, adsorption purification by the proposed modified adsorbent, oil filtering to separate the adsorbent, alkaline refining, miscella distillation, deodorization, oil cooling, filtering, container packing of ready-made cottonseed oil that meets the

requirements of the standard. In this improvement technology, adsorption refining is applied to the 60% concentration miscella instead of the traditional 35–40% concentration miscella, to save time and energy, and increase productivity. During adsorption treatment with the proposed modified adsorbent, the adsorbent is introduced in an amount of up to 1–8% by weight of the miscella.



Drawing 2.

Results and discussions.

Using the technology for improving the refining and deodorization of cottonseed oil, the authors determined the color indices of the miscella before and after adsorption purification with a modified adsorbent, the indices of which are given in Table No. 1.

Table 1.– Color indices of the miscella before and after adsorption purification with a modified adsorbent

№	Color of the miscella before adsorption purification, red units	The color of the miscella after adsorption purification with a modified adsorbent, red units	The color of the miscella after adsorption cleaning with the control adsorbent, red units
1	Sample № 1. 21	17	18
2	Sample № 2. 32	28	30

According to (table 1), we can conclude that the modified adsorbent and the control adsorbent reduced the amount of coloring pigments of cottonseed oil, which affects the decrease in the color of cottonseed oil miscella samples. Table 1 shows the average values of cotton miscella samples. The modified adsorbent is introduced into the miscella of cottonseed oil in an amount of 1–8% by weight of the miscella until the required color of the oil is obtained during the subsequent alkaline refining, since the adsorption efficiency of the proposed modified adsorbent affects the optimization of further alkaline refining and distillation. Since the impact of the external environment on cotton seeds during their long-term storage affected the change in the quality indicators of cottonseed oil, the proposed modified adsorbent is introduced in an increased amount over the course of the year [3, p. 93–96, 4, p. 51–52].

The authors determined the final indicators after alkaline refining of cottonseed oil, which has undergone adsorption refining, the indicators of which are given in (table 2).

Table 2.– Indicators after alkaline refining of cottonseed oil purified by the proposed modified adsorbent

№	The name of indicators	Indicators of cottonseed oil not passed adsorption purification	Indicators of cottonseed oil not passed adsorption purification	Indicators of cottonseed oil that passed adsorption cleaning with a control adsorbent
1	Chromaticity, red units at 35 yellow	10	4–5	9
2	Soapsock quantity, %	5.2–8.5	1.8–3.6	3.4–7.2

According to the indicators of table No. 2, we can conclude that adsorption cleaning with a modified adsorbent had a positive effect on the further process of alkaline refining. The color of cottonseed oil meets the safety requirements, the amount of soap stock is the smallest compared to other samples [5, p 45].

Organoleptic and physico-chemical parameters of cottonseed oil obtained by the extraction method, refined and deodorized by the proposed technology, are given in (Tables 3 and 4).

Table 3.– Organoleptic characteristics of cottonseed oil obtained by the extraction method, refined and deodorized by the proposed technology

№	The name of indicators	Indicators for refined, deodorized cottonseed oil of the highest grade, norm according to GOST	Indicators of cottonseed oil obtained by the proposed technology
1	Smell	Without smell	Without smell
2	Taste	no taste	no taste
3	Transparency	Transparent	Transparent

From (table 3), we can conclude that the use of technology to improve the refining and deodorization of cottonseed oil obtained by the extraction method gave positive results in terms of organoleptic indicators.

Table 4.– Physical and chemical indicators of cottonseed oil obtained by the extraction method, refined and deodorized by the proposed technology

№	The name of indicators	Indicators for cottonseed oil of the highest grade, standard according to GOST	Oil indicators obtained by the proposed technology
1	Chromaticity, no more than red units, with 35 yellow units	5	4–5
2	Acidity, mg KOH/gr, no more	0.2	0.15
3	Moisture and volatile substances,%, no more	0.1	0.08
4	Mass fraction of non-fatty substances, (sediment by mass)%, no more	Absent	Absent
5	Soap (quality indicators)	Absent	Absent
6	Unsaponifiable substances,% no more	1.0	0.7
7	Peroxide value, mmol/kg, ½ «O», no more	10	4.5
8	Flash point, ^{0}C no more	Absent	Absent
9	Determination of solvent (gasoline) in oil	Absent	Absent

From table No. 4 we can conclude that the use of technology for improving the refining and deodorization of cottonseed oil obtained by the extraction method gave positive indicators in terms of the degree of clarification and in all physicochemical parameters [6, p. 5–6].

Conclusion

During the adsorption purification of cottonseed oil in miscella, a modified adsorbent obtained from natural kaolin Sultan-Uvays was used.

The use of technology to improve the refining and deodorization of cottonseed oil obtained by the extraction method gave positive results in terms of organoleptic indicators, according to the degree of clarification and according to all physical and chemical indicators to obtain cottonseed oil that meets the requirements of food safety of the population.

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