International Journal of Advanced Research in Management and Social Sciences
ISSN: 2278-6236
Impact Factor: 7.624

ALKALINE REFINING OF SUNFLOWER OIL WITH A NEW TYPE OF REAGENT

Mamatkulov F.G.*, IsmatovS.Sh., MaidovK.Kh.****

Karshi Engineering-Economical Institute*

Bukhara Engineering-Technological Institute**

Refining technology of sunflower oil with a new type of alkaline reagent has been studied. The use of a new type of reagent allows significantly improving the quality indicators and the physical-chemical characteristics of refined oils.

***Keywords**: sunflower oil, alkaline refining, new reagent, quality indicators, physical-chemical characteristics, separation efficiency.*

INTRODUCTION

Raw vegetable oils and fats contain various accompanying substances in their composition [ ], which must be removed by processing raw materials with alkaline solutions [1-3]. Alkaline refining of oils and fats is carried out using solutions of sodium hydroxide [4-6] of different concentrations depending on the initial acid number of crude oil. In recent years, special attention has been paid to the use of new types of reagents in the technology of alkaline refining of sunflower oils.

In this regard, research aimed at studying new reagents in the technology of alkaline refining of oils and fats seems relevant.

The aim of the work is aimed at alkaline refining of sunflower oil with a new type of reagent.

The objects of the study were crude sunflower oils, alkaline solutions of sodium hydroxide and a new reagent, refining technology, quality indicators of raw materials and products.

Research methods to analyze and evaluate the quality of raw materials and refined oils, modern methods of physico-chemical research were used, indicators of oils and alkaline reagents were determined.

Results and discussion

The main objective of the research was to improve the quality and increase the yield of neutralized sunflower oil by reducing neutral fat waste and improving the efficiency of

the separation process of the emulsion system of the soapstock for a more complete separation of the neutralization oil.

Based on repeated studies, it has been established that nitrilotrimethylenephosphonic acid NTMFC has a number of properties that determine the possibility of its use as a reagent [7].

The technology of neutralization of hydrated sunflower oil with a new reagent consisting of a mixture of NaON and NTMFC in the ratios, respectively, was studied (10:1; 5:1; 3,3:1) and pre-activated water

Studies of the technology of neutralization of free fatty acids of hydrated sunflower oil were carried out at temperatures of 60, 70 and 80 ° C and the estimated amount of reagent - 0.5% aqueous solution in an amount of 0.055 - 0.065% by weight of oil. The soap stock was separated by settling for 45 minutes.

The effective effect of the studied reagent on the neutralization of free fatty acids is associated with the high surface activity of HTMFC molecules, due to the combination of a large number of basic and acid donor centers in them, allowing the formation of complex compounds with free fatty acids, phospholipids and metal cations. This contributed to a decrease in the viscosity properties of the soap stock - neutral oil system and surface tension. In Table 1.the data showing the effect of 0.5% aqueous solution of the reagent in the amount of 0.055 - 0.065% of the oil weight on rheological parameters are presented.

Table 1.

The effect of the studied reagent on the rheological parameters of the soapstock - neutral oil system

Percentageofreagent	Surface tension (m N/m)	Effectiveviscosity (Pa*s)
0	30,7	30,1
0,055	26,5	24,8
0,060	23,0	22,3
0,065	23,9	22,6

After neutralization and phase separation, the oil contains a certain amount of soap, which degrades the taste and subsequent refining processes, the soap residues are removed by washing with hot water.

Therefore, the study of the effect of activated water on the efficiency of washing the neutralized oil was carried out.

Oil was poured into a centrifuge tube, lowered into a water bath, immersed in a stirrer and heated to 90 ° C with constant stirring. Water in the amount of 10% of the oil weight was slowly introduced into it and stirred for 2 minutes, then the mixture was centrifuged for 5 minutes. To increase the efficiency of the process, citric acid was added when rinsed with ordinary water and a mixture of citric and malic acids in an amount of 0.001% by weight of oil when rinsed with prepared water. The washed oil was decanted and the soap content was determined (Table 2.).

Table 2.

The effect of water quality on the efficiency of washing neutralized sunflower oil

Soap content in the oil sample		
Beforewashing	Washed with ordinary water with a hardness of 4.0 mg*eq/l and an alkalinity of 2.9 mg*eq/l	Washed with prepared water with a hardness of 0.1 mg" eq/l and an alkalinity of 0.4mg"eq/l
0,06%	0,01%	—

The analysis of the data obtained shows the effectiveness of the use of activated water, since the residual soap content in the neutralized oil is not detected.

Due to the fact that moisture in the oil contributes to an increase in the acid number, the washed oil was dried. To do this, the oil was poured into a weighted glass and heated with continuous stirring with an agitator until the foam disappeared, and the oil sample remained transparent after cooling the test tube in running water.

Qualitative indicators of sunflower oil neutralized according to traditional and proposed refining technologies, washed and dried are given in Table 3.

Table 3

Physico-chemical parameters of neutralized sunflower oil separated from the soapstock

Nameofindicators	Indicators when using a new reagent, percentage of oil weight			Indicators when using traditional technology
	0,055	0,060	0,065	
At a temperature of 60°C				

Acid number, mg KOH/g	0,23	0,21	0,20	0,28
Massfraction, %:	0,1	0,08	0,07	0,27
phospholipidsoap	0,05	0,04	0,03	0,14
At a temperature of 70°C				
Acid number, mg KOH/g	0,22	0,19	0,19	0,22
Massfraction, %:	0,09	0,07	0,07	0,26
phospholipidsoap	0,04	0,03	0,03	0,13
At a temperature of 80°C				
Acid number, mg KOH/g	0,22	0,20	0,20	0,24
Massfraction, %:	0,08	0,06	0,06	0,24
phospholipidsoap	0,03	0,03	0,03	0,11

To evaluate the results obtained, a control sample of sunflower oil neutralized using traditional technology with NaON was used.

Based on a comparative analysis of the physico-chemical parameters of neutralized sunflower oil separated from the soapstock (Table.4.) and the soapstock itself (Table.5.) obtained during neutralization using traditional and developed technologies, it was found (Fig.8) that during neutralization using the recommended technology, the best results were obtained by adding 0.06% of the reagent by weight of oil at a process temperature of 70 ° C. At the same time, the amount of separated neutralized oil increased by 18% and amounted to 92% of the total volume of the soapstock - neutral oil system. It should be noted that the separation of the soapstock from the neutralized oil occurs 2 times faster in 25 minutes. The concentration of total fat in the soapstock was reduced by 12% with a 2-fold improvement in the ratio of saponified to neutral fat.

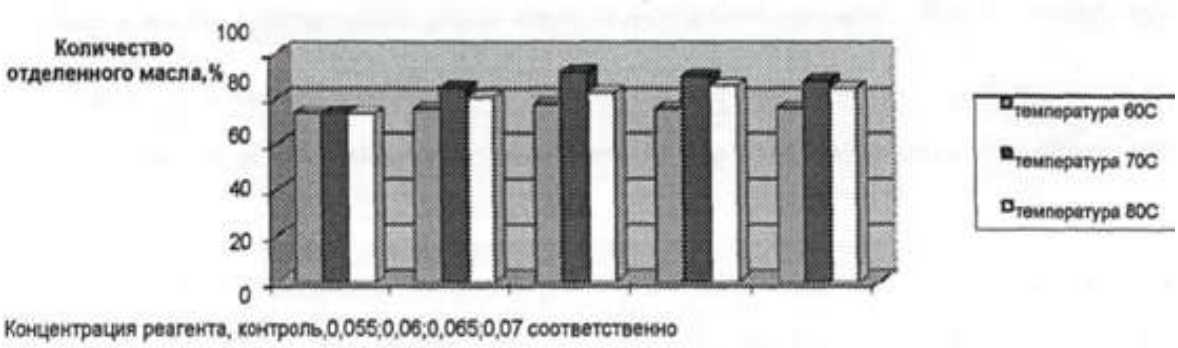

Figure 1. Efficiency of emulsion separation

when applying the reagent

Table 4.

Physic-chemical parameters of the separated soapstock from neutralized sunflower oil

Nameofindicators	Indicators when using a new reagent, percentage of oil weight			Indicators when using traditional technology
	0,055	0,060	0,065	
At a temperature of 60°C				
Mass fraction, %: total fatty acid fat(LC) neutral fat (LV)	17,59	17,06	16,68	19,9
	13,32	13,25	13,10	10,41
	6,03	5,84	5,80	9,02
LCD ratio:LJ	2,21	2,27	2,26	1,15
At a temperature of 70°C				
Mass fraction, %: total fatty acid fat(LC) neutral fat (LV)	17,44	17,12	16,87	19,21
	13,44	13,01	12,94	9,97
	5,69	5,38	5,37	8,80
LCD ratio:LJ	2,38	2,42	2,41	1,13
At a temperature of 80°C				
Mass fraction, %: total fatty acid fat(LC) neutral fat (LV)	17,45	17,10	16,89	18,6
	13,40	13,02	13,01	9,32
	5,61	5,39	5,38	8,51
LCD ratio:LJ	2,39	2,41	2,42	1,09

Table 5

Qualitative indicators of sunflower oil obtained by the proposed technology of neutralization of free fatty acids

Nameofindicators	Indicators of neutralized, washed and dried sunflower oil	
	According to the recommended	Usingtraditionaltechnology

	technology	
1	2	3
Acid number, mg KOH/g	0,18	0,22
Mass fraction, % of soap	-	0,006
phospholipids of moisture and	0,03	0,05
volatile substances	0,07	0,1
Peroxide number mmol 72 O/kg	0,5	1,3
Color number, mg of iodine	8	10
1	2	3
Tocopherolscontent, mg/100g	58	51
Mass fraction of metals, mg/kg:		
Fe		
Cu	0,21	0,96
Mg	0,11	0,64
Na	0,53	0,97
Ca	0,62	2,31
	0,68	1,52

Thus, the conducted studies have shown the effectiveness of using a new reagent in the technology of neutralizing free fatty acids of sunflower oil, consisting of a mixture of sodium hydroxide and nitrilotrimethylene phosphonic acid in a ratio of 5:1 in an amount of 0.06% by weight of oil and pre-prepared water, which allowed:

- to improve the quality indicators of neutralized sunflower oil by reducing the values of acid, peroxide and colored numbers

REFERENCE:

1. M.F.Zainiev, A.V.Jamalov, S.S.Ismatov, K.H.Mazhidov. The effect of the cleaning method on the quality and chemical composition of cottonseed oil. /Special issue "Chemistry of natural compounds", 1998, pp.45-46.

2. Harutyunyan N.S. et al. Technology of processing fats. M.: Pishchepromizdat. 1999.

3. Erov K.B.,Abdullaev R.R., Tozhiddinov R.H., Ismatov S.S., Mazhidov K.H. About the content of substances accompanying oil during processing from cotton seeds.//"Chemistry of natural compounds", Tashkent, 2001, Special Issue, pp.16-17.

4. Mazhidov K.Kh.,IsmatovS.Sh. Improving the quality of refined cottonseed oil.//"Food industry", Moscow, 1996 - No. 4, p.20.

5. Laboratory workshop on fat processing technology. /N.S.Harutyunyan, E.A.Arisheva, L.I.Yanova, M.A.Kamyshan. – M.: Light and food industry, 1883. – 152 p.

6. Guidelines for the technology and processing of vegetable oils and fats / Ed. Col. A.G. Sergeev et al. – L.: VNIIZH, 1975. Vol. II pp. 240-245.

7. Kinshakov K.D. "Improving the technology of refining vegetable oils and creating new emulsion products" Abstract. Dissertation for the degree of Candidate of Technical Sciences.Moscow-2013.