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Improvement of Technology of Emulsified Fats Production

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Introduction

Diversification of foodstuff including fat and oil products is the important problem of the food industry in next years. In this direction ways and measures on overcoming of world financial and economic crisis are considered as the basic program document of Republic of Uzbekistan [1].

Purpose of work

The work is directed on the decision of problem of quality and safety of food fats and products of their processing. It is one of priority directions in realization of the concept of a state policy in the field of healthy food for the republic population.

Research course

For studying of a chemical compound of fats and products of disintegration of the catalyst used selective extraction, gas-liquid and thin-layer chromatography and nuclear magnetic resonance method [2].

The maintenance of trance isomers defined by IR-spectroscopy method, division of triglycerides on molecular weight by the method of high-temperature gas-liquid chromatography [3].

Research of positioned distribution of fat acids in triglycerides was defined by the method of enzymatic hydrolysis with the subsequent calculation of triglyceride structure [4].

Maintenances of monoesters of fat acids, mono- di- and triglycerides were defined by methods of gas-liquid and thin-layer chromatography.

The polymorphic crystal structure of fat was researched by methods of X-ray diffraction and differential-thermal analysis [5].

Results and Discussion

One of perspective directions of development of butter industry is working out and improvement of manufacture butter with lowered fat content. It will be coordinated with requirements of time and the basic tendencies of oil manufacture in the world [6].

Now manufacture of such butter has not found a wide distribution yet. It is connected that decrease in mass fraction of fat in cream promotes deterioration of conditions of process of butter forming, to infringement of its stability and formation of defects of oil consistence (friability, crumbling, exudation of moisture, disconnectedness of structures, etc.). The reason of it is change of physical and chemical properties of the cream, making direct impact on process butter-forming.

At decrease in a mass fraction of fat in cream from 70 to 40% reduction of their effective viscosity and sedimentation stability, increase of maintenance of emulsified fat and decrease of ability to transformation of dispersion of direct type to a dispersion of return type, characteristic for a butter of traditional structure is observed.

One of possible ways of influence on process of butter-forming from dispersions of the lowered fat content is entering into cream of stabilizers of structure-the substances, capable to change physical and chemical properties of cream of the lowered fat content so that they as much as possible approximate to high fatty cream, process of butter-forming which proceeds stably. It is possible to concern emulsifiers (E) and consistence stabilizers (St).

In quality of emulsifiers used the fat-soluble substances possessing high superficial activity owing to presence in them diametrically located hydrophilic and lipophilic groups of atoms. Such structure of emulsifiers causes their ability to concentrate on interfaces of phases, to reduce an interphase tension and to promote formation and stabilization of a fatty dispersion.

Simultaneously also as consistence stabilizers used water-soluble substances possessing expressed hydrophilic properties. Because of this property they allow to keep moisture in a product and keep physical and chemical condition and homogeneity formed at participation of emulsifiers of dispersions.

Positive influence of emulsifiers and consistence stabilizers on process of butter-forming is established at development of sandwich-type fat with mass fraction of 61.5%. It is necessary to note that influence of emulsifiers and stabilizers on cream with lower mass fraction of fat and on process of their transformation to oil are studied insufficiently.

Taking into account are conducted researches of influence of stabilizers of structure on properties of cream with a mass fraction of fat of 40-60% as raw materials for development of oil with the lowered fat content. As the consistence stabilizer used gelatin in quantity from 0 to 2%, as emulsifier-monoglycerides distilled under commodity mark "Palsgaard-0291" in quantity from 0 to 1% [7].

As estimation criteria were used effective viscosity, sedimentation stability of system (cream +St; cream +E; cream +St +E), organoleptic indicators (taste and smell, consistence), maintenance of emulsified fat, ability of system to destruction under the influence of thermo-mechanical processing, microstructure of mixes. As the control was used cream with 70% fat content without structure stabilizers.

Viscosity of cream with 40-50% fat content at entering of emulsifiers changed slightly. At a mass fraction of fat more than 60% entering of emulsifiers in cream promoted increase in their viscosity in 1.4-2.1 times.

Considerable changes of viscosity were observed at entering of stabilizers into cream. Thus viscosity of cream with 50% fat content approximate to viscosity of control samples at entering into them of mix of the stabilizer in quantity of 1% and emulsifiers in quantity of 1%. Viscosity of cream with 40 % fat content with addition of the stabilizer less than 2% was below viscosity of the control sample, and at dose of the stabilizer of 2% or its mixes with emulsifiers (0.5% and 1%) was exceeded by viscosity of the control sample in 1.3-1.9 times. Viscosity of cream with 60% fat content already at entering into them of 0.5% emulsifier was above viscosity of control samples in 1.3 times.

Increase of viscosity of system at addition of stabilizers is caused by formation of additional structural communications in it that is confirmed by microscopic researches on an example of cream with 50 % fat content Figure 1.

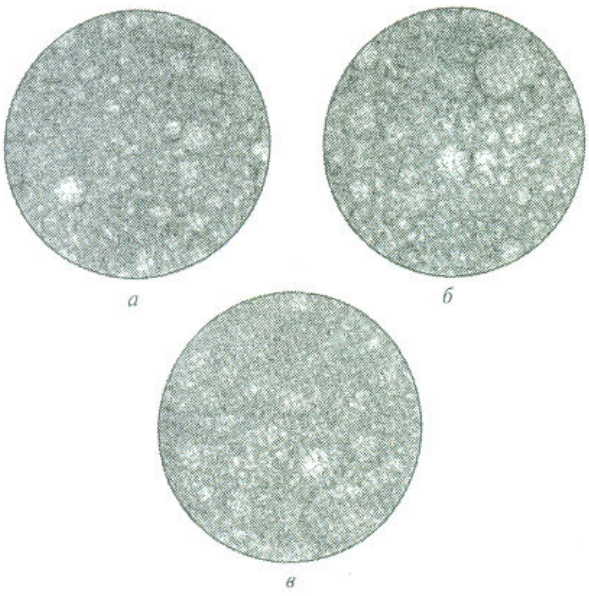

Figure 1. Microstructure change (x 280) of cream at entering into them of structure stabilizers (50% fat content) [a-control sample, b-with addition of 1% emulsifier, c-with addition of the stabilizer of 2%].

At research of sedimentation stability of cream with addition of stabilizers and emulsifiers it is not established any law of its change depending on mass fraction of fat, dose of the stabilizer and emulsifier. In some samples is noted the increase of sedimentation stability in comparison with cream of similar fat content without structure stabilizers, in others, on the contrary, its decrease. Average indexes of sedimentation stability on sediment of fat for cream with 40% fat content with addition of stabilizers of structure have made 81.8%, for cream with 50% fat content - 84.8%, and for cream with 60% fat content-81.9%.

For control cream with 70 % fat content this indicator has made 96.0%. On the average at entering of stabilizers of structure sedimentation stability of cream much lower than at control samples. The maintenance of emulsified fat in cream with 40-60% fat content at entering into them of emulsifiers tends to growth, and at entering of stabilizers to decrease. At sharing of emulsifiers and stabilizers the maintenance of emulsified fat in cream with 40-60% fat content also tend to decrease.

For an estimation of ability of researched cream to destruction under the influence of thermo-mechanical processing of mix after pasteurization mix cooled to temperature of butter-forming and destroyed. In an initial mix and the received product defined the maintenance of emulsified fat and calculated ability of system to destruction on parity of maintenance of emulsified fat in a dispersion before its destruction. It is established that cream with a mass fraction of 40% fat can collapse under the influence of the mechanical and temperature factor on 90% and more only at addition in them of the stabilizer in quantity of 2% (or its mixes with emulsifier). The same degree of destruction of cream with a mass fraction of 50% fat is observed at entering of 1% and more quantity of stabilizer and its mixes with emulsifier. Cream with mass fraction of 60% fat most easily collapse at entering of emulsifier in quantity of 0.5%. The obtained data accurately shows the tendency of increase in ability of cream to destruction, i.e. to transformation to oil, at use of stabilizers and of emulsifiers.

Definition of optimum doses of the stabilizer and emulsifier at which change of initial cream occurs in a direction of reception of system to the indicators close to control cream is spent by a method of the multifactorial analysis of experimental data.

At definition of optimum areas for cream with 42.5-60.0% fat content the taste and smell estimation has appeared less significant. In a range of fat content from 45.0 to 52.5% defining were physical and chemical indicators, i.e. in this range entering of structure stabilizers makes stronger impact on viscosity of cream and ability to destruction, than on their taste, smell and consistence.

For each level of fat content of cream on optimum areas it is possible to define minimum, average and maximum quantity of emulsifier at which addition it is possible to receive cream with the set properties. Optimum values of mass fraction of stabilizer (St) at these portions of emulsifier are presented in Table 1.

Mass fraction of fat (%)	Emin (%)	St (%)	Eav (%)	St (%)	St/E	Emax (%)	St (%)
40.0	0.4	1.82	0.58	1.78 ± 0.02	3.10	0.75	1.70
42.5	0.2	1.75	0.60	1.72 ± 0.10	2.87	1.00	1.55 ± 0.10
45.0	0.0	1.87 ± 0.13	0.50	1.72 ± 0.10	3.44	1.00	1.52 ± 0.13
47.5	0.0	1.83 ± 0.17	0.50	1.63 ± 0.22	3.26	1.00	1.40 ± 0.20
50.0	0.0	1.65 ± 0.30	0.50	1.43 ± 0.28	2.86	1.00	1.20 ± 0.35

52.5	0.0	1.40 ± 0.40	0.50	1.17 ± 0.38	2.34	1.00	1.08 ± 0.27
55.0	0.0	1.08 ± 0.42	0.50	0.87 ± 0.48	1.74	1.00	0.83 ± 0.22
57.5	0.0	0.82 ± 0.30	0.50	0.65 ± 0.22	1.30	1.00	0.63 ± 0.05
60.0	0.0	0.50 ± 0.20	0.38	0.37 ± 0.15	0.99	0.75	0.30

Table 1: The characteristic of dairy-fatty emulsion at technological processing

The minimum value of emulsifier for dispersions with various level of fat content makes from 0 to 0.4%, maximum - from 0.75 to 1.0%. Average value of emulsifier makes from 0.38 to 0.60%. At increase of dose of emulsifier from Emin to Emax (in 2 and more times) the optimum dose of the stabilizer decreases in 1.1-1.6 times. Thus use of dose of emulsifier in limits from minimum to average values is economically more valid.

Conclusion

Conducted researches have allowed to establish influence of emulsifier (distilled monoglycerides) and the stabilizer (gelatin) on change of properties of cream with 40-60 % fat content and to define their optimum doses, allowing to approach properties of cream with the lowered fat content to cream with 70 % fat content (without structure stabilizers) and by that to improve conditions of their transformation to the finished product - butter with the lowered fat content.

References

1. Karimov IA (2009) Global financial-economic crisis, ways and measures on its overcoming in the conditions of Uzbekistan. T: Uzbekistan.
2. Rudakov OB, Vostrov IA, Fedorov SV, Filipov AA, Selemenev VF, et al. (2004) Guide of chromatographer. Voronezh.
3. Cazes J, Scott RPW (2002) Chromatography theory. New York.
4. Tereshuk LV (2006) Dairy-fatty composition: Kemerovo technological institute of food industry-Kemerovo. 209.
5. Polyanskiy KK, Snegiryov CA, Rudakov OB (2004) Differential thermal analysis of food fats. M DeLi print. 85.
6. Sulaymanova GH, Rahimov MN, Majidov KH (2015) The influence of electromagnetic fields on the degree of clarification of cotton oil. Fat Oil Ind Sci J Moscow 5: 18-19.
7. Sulaymanova GH, Majidov KH (2015) Stabilizers and emulsifiers of production of butter with low fat content. Uzbek Chem J Tashkent. 3: 76-79.