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USE OF EMULSIONS IN PRODUCTION RESTAURANTS AND FOOD INDUSTRY

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Abstract: *The paper focuses on the application of hydrocolloids, which are stabilizers, emulsifiers, gum arabic and starch technology aromatic emulsions. The regularities of their transfer to the active emulsion and stabilization of emulsion state laws and the formation and stabilization of emulsions to ensure their stability during storage were investigated. Grounded rational prescription content, main components and technological parameters of the production of emulsions are presented with in this research.Thus, the technology and range of aromatic emulsions and drinks with their use were studied hereby. The complex of consumable and technological properties, reasonably terms and conditions. Regulatory and technological documentation, introduction of new technologies implemented in institutions restaurant industry, the economic effect of their introduction were developed and approved.*

Keywords: *aromatic emulsions, hydrocolloids, stabilizers, starch, gum arabic, particle size*

1.Introduction

The key point of the efficiency of the institutions restaurant industry and food industry is the introduction of resource-saving and competitive technologies based on the use of high quality components of food and beverages (aromatic emulsions). A special group of products consists of drinks. In restaurants and industry exclusive approaches are used for their manufacture. The use of emulsions in the manufacture of food and beverages is associated with the possibility of reducing the length of the production process while reducing power consumption compared to traditional production methods. This difference is particularly useful in restaurants and food industry because emulsions are necessary ingredients that provide food with flavor, color and aroma, thus making greatly easier their production technology. The use of aromatic emulsions and food additives as ingredients or represented as aromatic essences and extracts that have a short shelf life involves much more expensive price.

Having in view the major trends of the food market, this situation is a deterrent and requires substantial improvement in terms of product range. Market analysis of ingredients and food additives indicates that the production of emulsions that can be used in foods and their promotion on the food market Ukraine is constrained by insufficient levels of basic and applied research related mainly to the support of their colloidal stability during storage. This leads to the need for scientific and applied research aimed at using and implementing functional and technological properties of the components of the prescription components - and structure-stabilizer (emulsifier) emulsions, aromatic oils, flavors, narrowing agents, dyes, preservatives, acids. The studies made by Phillips G.O., Williams P.A.[1-2], Rebinder P.A. [3], Kremnev L.A., Soskin

S.A., Kuprika B.C.[4-6], P.STEPHEN[7], A. Aymesonand others [8-10], A.B.Horalchuk [12], highlight the scientific foundations and practical aspects of the production of emulsions. But systematic studies aimed at obtaining stable emulsions based on these ingredients have not been found. Not the basic patterns of their formation and technological parameters of production, there are no recommendations for their use.

Having in view the development of science-based technologies aromatic emulsions based on specified raw materials, which ensure the stability of food product during shelf life, significant improvement of efficiency of ZRH-food industry and their implementation, one may state that the existing range of food and beverages using aromatic emulsion will expand the range of culinary and industrial products with their use.

2.Material and methods

Construct Implement quality control parameters emulsions at all stages of the process according to TU 10.8-02070938-209: 2015 "Emulsions aromatic food industry." Raw analyzed at reception by qualitative indicators of regulatory documents and certificates of quality from producers under water GOST "Drinking Water" 4077-2001. Sampling - according to ISO 4856, preparation of samples for testing - for laboratory tests in accordance with GOST 26671, to determine the content of toxic elements in accordance with ISO 7670. The quality of packaging and labeling checks visual aspects. Test methods for Quality - organoleptic properties and volume according to ISO 7099 pH - GOST 26188physico-chemical characteristics of the emulsion must meet the requirements by TU 10.8-02070938-209: 2015. Determination of toxic elements carried out according to the methods specified in Table 4 TU 10.8-02070938-209: 2015. Sampling for microbiological analysis - according to GOST 26668, preparation of samples - according to GOST 26669, methods of culturing microorganisms - according to GOST 26670, preparation of solutions, reagents, culture media - according to ISO 5093, microbiological tests carried out according to the methods specified pursuant TU 10.8-02070938-209: 2015. Control of preservatives and artificial colors carried out in accordance with methods approved.

To determine pH we used a laboratory pH meter (Anion 4100), density - laboratory density meter (hydrometer purpose AON-1, 2-AON, AON-3, 4-AON, AON-5); turbidity emulsions were determined using (2100 P), and viscosity - Brookfield viscometer temperature - electronic terometrom HTC-2. The average particle size was investigated microscope EASTCOLIGHT 92012-ES (100x, 250x, 550x, 750 x) and measured flatware LS ™ 13 320 by laser granulometry.

The data worked out methods of mathematical statistics using software MathCad, XL.

3. Results and discussion

By experimental research on emulsification technology homogenization two immiscible liquids with the use of Arabic gum (E 414) proved the feasibility of using Arabic gum as an emulsifier, which is a carrier of functional and technological components Arabian galantines protein fractions, which gives emulsion stability. Accordingly the developed innovative strategy should ensure stability of emulsions protein-polysaccharide complexes. They generated a controlled transfer of dryness in the water-soluble active state to form steric barriers on the border of two distribution phases oil- water, ensuring their functional and technological properties in the formation of direct emulsions with desired characteristics. On the basis of innovative strategies formulated a working hypothesis, which is that the use of Arabic gum as an emulsifier, a source of polysaccharides and proteins, provided directional regulation of functional and technological properties - solubility, the ability of protein-polysaccharide complex formation and stability during storage, surface activity, emulsifying, complexing ability of its major constituents (polysaccharides, proteins) will provide a stable emulsion.

Gum Arabic is characterized by a highly branched structure with arabinohalaktan protein fraction in the center, thus forming a solution that provides high-quality emulsifying properties. Studies have shown that acacia gum containing monomers D-galactose linked β - (1,3)-hlykozyd connection with numerous ramifications, which consist of α- and β-galactose and other sugars or uronic acids. In instant and highly purified form, it absorbs moisture and rapidly dissolves in water.

It is proved that the transfer of gum arabic is soluble active state, requires a two-stage process - preparation of pre emulsion is formed by mixing oil and water phase of the emulsion particle size, more than 3 microns. (fist stage), crushing her to obtain a stable emulsion by homogenization to enhance the content and complexing ability (CP) gum arabic to give an emulsion with a particle size of less than 1 micron (second stage).

It has been proved that mixing two liquids oil-water carried through the use of an emulsifier gum arabic reduces the value of the surface tension on the surface phase distribution, oil, water, providing better mixing of oil and water phases. Temperature, time, speed and mixing respective phases affect the degree of dissolution and foaming ingredients.

The emulsions based on citrus oil were used for the investigations. Gum-arabic (produced by CNI, France) and modified starch (National Starch, Germany) were the stabilizers.

To study the emulsifying properties different types of emulsions were prepared. According to the specification [10] the emulsions contain gum-arabic of high purity (4–7 wt %) and oil phase of 8–14 wt %. The emulsions with starch contain 8–14 wt % of E1450 and 8–14 wt % of oil phase. The emulsions contain different amount of oil phase and constant amount of stabilizer (Tables 1 and 3), as well as constant amount of oil phase with variable amount of stabilizer (Tables 2 and 4).

Table 1

Emulsions with different amount of oil phase and constant amount of gum-arabic

Emulsion ingredients	Ingredients content, wt %				
	Emulsion number				
	1	2	3	4	5
Citrus oil	6.000	6.000	6.000	6.000	7.000
Resingum (E445)	2.000	4.000	5.000	6.000	7.000
Gum-arabic (E414)	5.000	5.000	5.000	5.000	5.000
Citric acid (E330)	0.500	0.500	0.500	0.500	0.500
Sodium benzoate (E211)	0.250	0.250	0.250	0.250	0.250
Dye (E124)	0.150	0.150	0.150	0.150	0.150
Dye (E110)	1.400	1.400	1.400	1.400	1.400
Antioxidant (E320, E321)	0.003	0.003	0.003	0.003	0.003
Water	84.698	82.698	81.698	80.698	78.698
Total	100.000	100.000	100.000	100.000	100.000

Table 2

Emulsions with constant amount of oil phase and different amount of gum-arabic

Emulsion ingredients	Ingredients content, wt%				
	Emulsion number				
	6	7	8	9	10
Citrus oil	6.000	6.000	6.000	6.000	6.000
Resingum (E445)	4.000	4.000	4.000	4.000	4.000
Gum-arabic (E414)	4.000	5.000	5.500	6.000	7.000
Citric acid (E330)	0.500	0.500	0.500	0.500	0.500
Sodium benzoate (E211)	0.250	0.250	0.250	0.250	0.250
Dye (E124)	0.150	0.150	0.150	0.150	0.150
Dye (E110)	1.400	1.400	1.400	1.400	1.400
Antioxidant (E320, E321)	0.003	0.003	0.003	0.003	0.003
Water	83.698	82.698	82.198	81.698	80.698
Total	100.000	100.000	100.000	100.000	100.000

Table 3

Emulsions with different amount of oil phase and constant amount of starch

Emulsion ingredients	Ingredients content, wt%				
	Emulsion number				
	1	2	3	4	5
Citrus oil	4.000	5.000	5.500	6.000	7.000
Resingum (E445)	4.000	5.000	5.500	6.000	7.000
Starch (E1450)	12.000	12.000	12.000	12.000	12.000
Citric acid (E330)	0.500	0.500	0.500	0.500	0.500
Sodium benzoate (E211)	0.250	0.250	0.250	0.250	0.250
Dye (E124)	0.150	0.150	0.150	0.150	0.150
Dye (E110)	1.400	1.400	1.400	1.400	1.400
Antioxidant (E320, E321)	0.003	0.003	0.003	0.003	0.003
Water	77.698	75.698	74.698	73.698	71.698
Total	100.000	100.000	100.000	100.000	100.000

Table 4

Emulsions with constant amount of oil phase and different amount of starch

Emulsion ingredients	Ingredients content, wt %				
	Emulsion number				
	6	7	8	9	10
Citrus oil	5.500	5.500	5.500	5.500	5.500
Resingum (E445)	5.500	5.500	5.500	5.500	5.500
Starch (E1450)	8.000	10.000	11.000	12.000	14.000
Citric acid (E330)	0.500	0.500	0.500	0.500	0.500
Sodium benzoate (E211)	0.250	0.250	0.250	0.250	0.250
Dye (E124)	0.150	0.150	0.150	0.150	0.150
Dye (E110)	1.400	1.400	1.400	1.400	1.400
Antioxidant (E320, E321)	0.003	0.003	0.003	0.003	0.003
Water	78.698	76.698	75.698	74.698	72.698
Total	100.000	100.000	100.000	100.000	100.000

We determined that the effective dissolution rates are gum arabic solution temperature increase heating gum arabic from 20 ° C to 25 ... 30 ° C, providing the increase of soluble gum arabic of 3 ± 0,03% to 5,03%. Established rational dissolving gum arabic zone temperature - 25 ... 30 ° C, the rate of mixing an aqueous solution of gumarabic50 ... 100 rev / min., which provides a growing share of gum arabic dissolved in 1,5 times. As the temperature of the aqueous phase above the established range 25 ... 30ºC and stirring speed 50-100rev / min., will increase the degree of foaming, resulting in the inability to use the aqueous phase further production increase significantly as the duration of its upholding of 4 ... 5 hours up to 10 hours. With decreasing temperature, stirring speed and time of the aqueous phase, compared to the defined range, decrease the degree of dissolution of the ingredients of the aqueous phase.

When preparing the aqueous phase determined the best water-soluble dye dissolves when it prepared to make in the water and not with emulsifiers, as they are to some extent prevent the dissolution of dyes. Given the fact that the period of introducing sodium benzoate and citric acid is very large, the following sequences were taken in making ingredients in the aqueous phase, preparing (purified) water; sodium benzoate; dyes soluble emulsifier (gum arabic); citric acid. A mixture of gum arabic is used for 4-5 hours until the foam disappears.

We established sequence making oil phase components: the capacity is number of citrus oils - 9-10%, which will ensure the best taste and flavor emulsions compared to the prototype. The increase in the number of citrus oil above this range will result in a need to increase the amount of gum arabic to ensure the stability of the emulsion during storage that will increase greatly its value. The temperature introduction of citrus oil in an oil phase 25 ... 30 ° C is justified by the fact that an increase in the temperature range of cooking oil phases increases as well energy costs. Another added antioxidant which previously dissolved in a little oil and emulsifier is vidvazhena number (The range of Esther or more). The mixing was performed by using the mixer to dissolve components (a solution should be transparent, monitored visually), 1-2 hours.

The preparing of pre-emulsion requires that the temperature of the oil and water phase is in the same temperature range 25 ... 30 ° C.

Thus we mixed water with acacia and oil phases, given the availability of other types of mixers reduce 8000 rev / min. 2500 ... 3000 rev / min. and increase the mixing of 3 minutes and 15 ... 20 min to obtain emulsion particles larger than 3 ... 5 microns.

We also conducted the experimental research technology emulsification and homogenization of the two immiscible fluids using starch (E 1450) based on the working hypothesis; experimental data which developed scientific principles and defined technological parameters of the production of emulsions. The modified starch-emulsifier (E 1450), due to oktenilyantarn acid esterification starch (E 1450) has emulsifying properties [13-14].

The prototype is a method of preparing an emulsion of gum Arabic (9). This method involves preparing the aqueous phase with the addition of emulsifier, cooking oil phase, mixing, double - stage homogenization pressure to obtain a concentrated emulsion, by introducing it in food products.

The disadvantage of this method is the impossibility of complete dissolution of ingredients not listed as dissolution in the respective phases, parameter preparation and homogenization process and the high price of imported gum arabic as an emulsifier.

The invention is based on the task design improvement method of preparation of emulsions with starch by replacing gum arabic at a cheaper price for the starch and the introduction of new process parameters to obtain a stable emulsion with the maximum number of particles as small as 1 micron.

Preparation of emulsion oil/water with starch includes the preparation of the aqueous phase with the addition of emulsifier, cooking oil phase preparation pre-emulsion mixing, double-stage homogenization pressure to obtain a concentrated emulsion, the introduction of a food product according to the invention, the preparation of the aqueous phase is carried out of emulsifier starch in an amount of 8-14% at a temperature of 20-25 ° C, mixing is performed at a rate of mixing 40-50rev / min., the resulting aqueous phase uphold 10-12 hours. to the disappearance of the foam, in the preparation of the oil phase using citrus oil, the process is carried out at a temperature of 25-30 ° C, pre-emulsion preparation is carried out at the speed of stirring 2500-3000 rev / min. for 15-20 min., homogenization is carried out under pressure of 200/50 bar.

Providing mixing two liquids oil-water carried through the use of an emulsifier starch in an amount of 8-14% (according to the technical documentation for this product), which reduces the value of the surface tension on the surface phase distribution, oil, water, providing better mixing and water phases. Temperature, time, speed and mixing respective phases affect the degree of dissolution and foaming ingredients. As the temperature of the aqueous phase above the defined range 20-25ºC and stirring speed 40-50 rev / min., Will increase the degree of foaming, resulting in the inability to use the aqueous phase further production increase significantly as the duration of its assertion of 10-12 hours up to 20 hours. With decreasing temperature, stirring speed and time of the aqueous phase, compared to the defined range, decrease the degree of dissolution of the ingredients of the aqueous phase.

Citrus oil is required to ensure the taste and aroma of citrus emulsion. Temperature introduction of citrus oil in an oil phase of 25-30 ° C is justified by the fact that an increase in the temperature range of cooking oil phases, increasing energy costs. Preparation of pre-demulsify requires that the temperature of the oil and water phase were in a temperature range of 25-27 ° C; to prevent foaming during preparation of pre-emulsion at high speed, we used stirring 2500-3000ob / min. for 15-20 min. Speed mixing 2500-3000ob / min. gives a maximum number of shares emulsion of 3 microns. Speed mixing at least at this range contributes to the formation of particles larger than 3 microns, subsequently; the homogenization will cause the formation of particles larger than 1 micron, and therefore will not be provided with stability during storage of the finished product. Speed mixing above this range increases the foaming system which is not desirable.

The method is presented as follows below.

Preparation of aqueous phase.

The main components for the preparation of the aqueous phase are: water, sodium benzoate, starch, citric acid and other materials according to the recipe 60-70% of water used by prescription. When enabled mixer is set previously sodium benzoate and stirred until dissolved. Soluble dyes are the next ingredient obtained. Starch in an amount of 8-14% is added manually, dispelling it on the water surface when running at low to 40-50 / min., turning the mixer through a funnel, preventing suction of air in the system. The temperature of dissolving starch ranged between20-25 °C. The mixture is stirred until complete dissolution of starch. When enabled mixer given by citric acid. A mixture of starch is to defend for 10-12 hours prior to the disappearance of the foam.

Preparation of oil phase.

In the mixer an amount of 4-7% citrus oil is added, then heated to a temperature of

25-30 ° C, antioxidant previously diluted in a little oil is added, then an amount of 4-7% is weighed. The mixing is done until the components are dissolved (solution should be transparent, monitored visually) 1-2 ours.

Preparation of pre-emulsion.

Preparation of pre-emulsion is made in the tank, which is equipped with high-speed mixer. Aqueous phase is weighed, which fed with constant stirring oil phase. Residual water is added.

Pre-emulsion mixing time is 15-20 minutes at a speed of mixer speed of 2500-3000 rev/min.

Preparation of finely dispersed emulsion (homogenization).

For fine - dispersed emulsion, a mixture is subject to two-stage homogenization process - processing under pressure 200/50 bar. However, due to the sharp drop in head pressure homogenizer, oil crushed particles uniformly distributed in the emulsion stabilizing starch emulsifier. The emulsion is considered stable if the size of the oil particles does not exceed 1mikrona. In the case of non-compliance of product this indicator requires repeated homogenization of a corresponding change in pressure.

The characteristics of the emulsions obtained are shown in Tables 5 and 6.

Table 5

Characteristics of emulsions with gum-arabic

Emulsion number	Viscosity, cP	Dissolution turbidity 0.025 %, NTU	Particles size *D*, μm	Density, g/cm^3	pH
1	14.00	168.00	0.51	1.03	2.70
2	15.00	180.00	0.66	1.06	3.20
3	16.00	192.00	0.71	1.07	3.30
4	17.00	216.00	0.90	1.09	3.70
5	18.00	240.00	1.10	1.10	3.90
6	14.00	192.00	0.75	1.04	2.60
7	**15.00**	**180.00**	**0.66**	**1.06**	**3.20**
8	15.50	174.00	0.60	1.07	3.30
9	16.00	168.00	0.56	1.09	3.40
10	17.00	154.00	0.50	1.10	3.80

Table 6

Characteristics of emulsions with starch

Emulsion number	Viscosity, cP	Dissolution turbidity 0.025 %, NTU	Particles size D, μm	Density, g/cm^3	pH
1	20.00	143.00	0.67	1.03	2.60
2	22.00	156.00	0.73	1.05	3.00
3	23.00	170.00	0.75	1.07	3.30
4	24.00	182.00	0.84	1.09	3.70
5	26.00	196.00	0.97	1.10	4.00
6	19.00	210.00	0.98	1.04	2.70
7	21.00	196.00	0.91	1.06	3.10
8	22.00	184.00	0.83	1.07	3.20
9	**23.00**	**170.00**	**0.75**	**1.07**	**3.30**
10	25.00	157.00	0.68	1.10	3.80

There have been developed and approved the following regulations TU 10.8 - 02070938-2009: 2015 "Emulsions aromatic food industry" in- structure technology of their production, their drinks recipes developed using emulsions. New technologies tested in the restaurant business establishments of "Nautilus".

Its principle of operation and advantages to clarify the parameters of the technological process of water and oil phases, pre emulsions and emulsions, equipment selection, namely homogenizer for qualitative process of emulsification and homogenization, improved water treatment, namely the introduction of mechanical filters and germicidal lamp to obtain stable product in terms of its shelf life storage.

We developed the technological scheme (Fig. 1) and prescription composition of six emulsions "Orange" (pH 6.2 ... 6.4); "Pineapple", "Grapefruit", "Tropic", "Ghost" (pH 5.0 ... 5.2) with shelf life of 180 days in a closed area, protected from getting direct co-rays at room temperature 5 to 18 ° C and relative humidity of 75%.

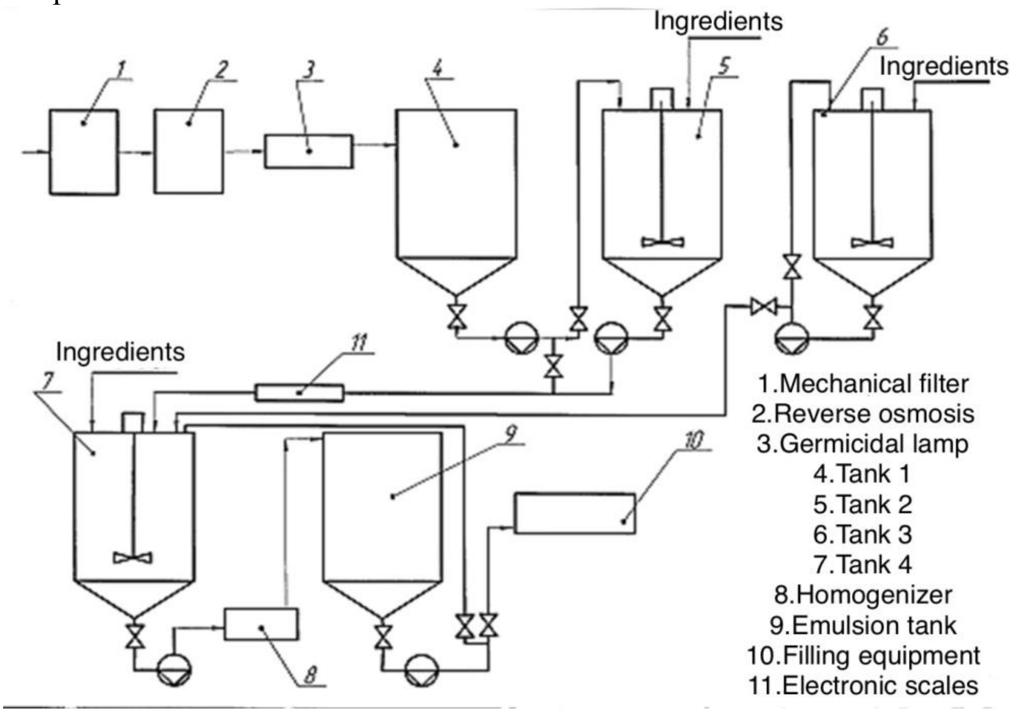

Fig. 1 Technological scheme of emulsions preparation.

Purified water is stored in tanks with a capacity of 1 to 2 m^3 prepared water. The aqueous phase is prepared in a container 2, which is equipped with a stirrer, a log scale and the probe. Oil phase is prepared just before cooking pre emulsion in the tank 3, which is equipped with a stirrer, a log scale and the probe. Oil phase is pumped via pump capacity 3 to 4 capacity with constant stirring. After making the oil phase mixing is necessary for it to rest for 10 minutes. Preparation of pre emulsion is made in a container 4, which is equipped with high-speed stirrer "Silverson" (to 3000ob. / Min), measuring funnel probe.

Its principle of operation and advantages to clarify the parameters of the technological process of water and oil phases, pre emulsions and emulsions, equipment selection, namely homogenizer for qualitative process of emulsification and homogenization, improved water treatment, namely the introduction of mechanical filters and germicidal lamp to obtain product stable for the duration of storage.

4. Conclusion

1. When increasing oil phase content of 8 to 14% of gum arabic emulsion, the average particle size increased from 0.51 to 1.10 microns, viscosity - from 14 to 18 cP, turbidity - from 168 to 240 NTU, density - from 1.03 to 1.10 g / cm3. However, increasing the particle size should be limited the size of 1 micron, as a small number of particles larger than 1 micron, can lead to the formation of unstable emulsion during storage. So, the best emulsion should be selected: № 2 of gum arabic (oil phase 10%). Increasing the amount of oil phase in the system at a constant amount of stabilizer condition occurs when the amount of the stabilizer is not enough to stabilize the emulsion system. It is therefore important to find the optimal concentration of stabilizer, the optimal amount of oil phase. To this end, five samples of emulsions were examined, a constant number of oil phases changing the amount of stabilizer.

2. The research on the effect of the number of characteristics of stabilizer emulsion obtained showed that the increase in the amount of gum arabic from 4 to 7% (the oil phase content 10%) average particle size is reduced from 0.75 to 0.50 microns, turbidity - from 192 to 154 NTU. However emulsion viscosity increases from 14 to 17 cP density - from 1.04 to 1.10 g / cm^3.

Thus, the increase in the number of stabilizer at a constant amount of oil phase emulsion stability improves as particle size decreases, but has little effect on toughness.

However, the increase in the concentration of the stabilizer in the emulsion system leads to increased cost emulsion. Therefore, given the level of stability and moisture product, and taking into account the price of the emulsion obtained, the optimum water content and stabilizer for oil phase emulsions of gum arabic are 5% and 10% emulsion (№ 7) respectively.

3. The third stage of the study is to establish the optimal homogenization pressure for a particular formulation of emulsions with the best performance.

Four identical emulsions according to selected recipes with gum arabic (№ 7) were prepared and homogenized at different pressures. Successive top pressure homogenization, as it affects the particle size and lowers the pressure, the stability of emulsion system remains unchanged. According to the research on four emulsions, the best rates and pressure homogenization of emulsions is defined as the optimum pressure homogenization under these conditions. Optimal performance for homogenization of emulsions of gum arabic pressure first step / second step [bar] - 280/40 [bar], the number of cycles of homogenization - 2; finished emulsion particle size less than 1 micron, since the pressure sinister this range can lead to the formation of particles greater than 1 micron, unstable emulsion is formed, which is stratified during storage. Pressure above this range can lead to the formation of particles less than 0.3 microns, which will reduce moisture emulsion.

By using the proposed method it is possible to ensure complete dissolution of the ingredients by choosing the dissolution temperature conditions, speed and time of mixing the components in the respective phases, obtaining parameters for pre-emulsion and homogenization. This will ensure the reduction of time when preparing emulsions at lower cost of energy compared to the prototype.

4. Emulsions with starch increase the oil phase from 8% to 14%, leading to an increase in the average particle size of 0.67 to 0.97 microns, viscosity - from 20 to 26 cP, turbidity - from 143 to 196 NTU, density - from 1.03 to 1.10 g / cm3. However, increase in the particle size should be limited to the size of 1 micron, as a small number of particles larger than 1 micron, can lead to the formation of unstable emulsion during storage. So, the best performance selected emulsion is № 3 with starch (oil phase 12%). The increase in the amount of oil phase in the system at a constant amount of stabilizer condition occurs when the amount of the stabilizer is not enough to stabilize the emulsion system. It is therefore important to find the optimal concentration of stabilizer, the optimal amount of oil phase.

5. The emulsion with starch, the stabilizer increases from 8 to 14% (if the content of the oil phase is of 11%) leading to a decrease in the average particle size of 0.98 to 0.68 microns, turbidity - from 210 to 157 NTU, the increase in viscosity from 19 to 25 CP and density - from 1.04 to 1.10 g / cm^3.

Thus, increasing the number of stabilizer at a constant amount of oil phase emulsion stability improves as particle size decreases, but has little effect on moisture and toughness.

However, increasing the concentration of the stabilizer in the emulsion system leads to increased cost emulsion. Therefore, given the level of stability and moisture of the product and taking into account the price of the emulsion stabilizer obtained optimum water content and oil phase emulsion of starch is of 12% and 11%, respectively, compounding the emulsion number 9.

6. The third phase of the study is to establish the optimal homogenization pressure for a particular formulation of emulsions with the best performance.

Four identical emulsions according to selected recipes, with starch (№ 9) were prepared and homogenized at different pressures. Successive top pressure homogenization, as it affects the particle size and the lower the pressure, supporting the stability of emulsion system remains unchanged. Step change top pressure of 20 bars. According to the research of four emulsions, the emulsion is elected the best rates and pressure homogenization of emulsions is defined as the optimum pressure homogenization under these conditions. Optimal performance for homogenization of emulsions with starch: pressure first step / second step [bar] - 200/50 [bar], the number of cycles of homogenization - 2; finished emulsion particle size less than 1 micron. Pressure destroying this range can lead to the formation of particles greater than 1 micron, unstable emulsion is formed, which is stratified during storage. Pressure above this range can lead to the formation of particles less than 0.3 microns, which will reduce moisture of emulsion [15-16].

By using the proposed method it is possible to reduce the cost of emulsions by using a cheaper emulsifier starch compared to arabic and ensure complete dissolution of the ingredients by choosing dissolution temperature conditions, speed and time of mixing the components in the respective phases.

This will ensure reduction of time in preparing emulsions at lower energy consumption and reduce the cost of emulsions in comparison with the prototype.

The practical significance of the results. The technology used is based on theoretical and experimental research, including a range of aromatic emulsions, which are regulated by TU 10.8-02070938-209: 2015 "Emulsions aromatic food industry" and technological instructions of their production. Technological recipes for drinks and industry ZRH with aromatic emulsions were used. An organizational and technological measure was used to introduce new products into production. Compliance tests of products from the organoleptic, physico-chemical point of view and safety parameters and indicators were made.

The research was implemented by introducing developed technologies in the production of "Nautilus" (12.01.15). Thus the results of the research were implemented in the educational process NUFT.

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