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DEVELOPMENT OF COMPOSITE SAUCES FOR PASTEURIZED PRODUCTS

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Abstract: *The analysis of the market and trends in the sauce segment shows the orientation of consumers to healthy eating and the desire to consume environmentally friendly products. There is an active update of the range of sauces, because today the bulk of sauces produced by industry, falls on the segment of mayonnaise.*

Fruit-based emulsion sauce formulations have been developed. The possibility of regulating the emulsifying ability and stability of emulsions using different types of dispersion was studied (Pasichnyi V, Marynin A, & Moroz O, 2015). The pH value for plum-based sauces varies depending on the recipe 3.2-3.5, after heat treatment, at a temperature of 85°C the values do not change (Pasichnyi V, Khorunzha T & Polumbryk M. 2020, Pourkomailian B. 2000).

For tomato-based sauces, the pH value is 4.6-4.9, after heating it decreases slightly.

Stability of technological indicators of sauces at heating allows to recommend them for production of pasteurized products, including pasteurized sausages and canned meat (Khorunzha T., Pasichnyi V., Rudiuk V. & Guts V. 2019).

Keywords: *sauce, pasteurization, emulsion*

INTRODUCTION

The analysis of the market and trends in the sauce segment shows the orientation of consumers to healthy eating and desire to consume environmentally friendly products. There is an active renewal of the range of sauces, because today the main share of sauces produced by industry falls on the segment of mayonnaise sauces - more than 60%, a third - on the segment of ketchup and tomato-based sauces and up to 10% on the production of mustard and other sauces (Pasichnyi, Marynin, A., Moroz, & Geredchuk, 2015).

According to the data (Zhukevych O & Rudavska, 2012) in the market of sauces there is a tendency to increase consumer demand for high quality natural raw materials, without the use of artificial components, thus, the urgent task is to develop and expand the range and improve the technology of sauces. Analysis of modern directions of development of technologies of sauce products, range of emulsion food systems used in the production of sauces of this category. Justifies the feasibility of using emulsion systems, as the main component for the production of multifunctional fat-based foods, can be used plant concentrates and extracts that increase the content of biologically active substances (BAS). The use of fat bases significantly reduces the time for cooking sauce products, improves its quality, allows to improve existing technologies for the production of emulsion products and expand the range of sauces, dressings, pastes and more.

Today there is a growing popularity of sauces and increasing demand for sauce products. Special attention is paid to emulsion sauces based on fruit, berry and vegetable, which are used to provide certain taste properties to meat, fish, cereals or desserts as in restaurants, and at home. They are able to adjust the chemical composition of food, increase its caloric and nutritional value, digestibility, as well as improve sensory performance (Pasichnyi, Khorunzha. & Polumbryk, 2020; Vylushhak, & Petrychenko, 2020).

Due to the high fat content in emulsion sauces, inhomogeneity of the product consistency can be observed. Therefore, it would be advisable to use different methods of mechanical impact. For example, ultrasonic homogenization, which is based on the cavitation of a liquid caused in machines with an electromechanical pathogen, using a vibrating element. The main advantages are the ease of regulating the degree of homogenization; the ability to create machines with almost any performance (Vylushhak, & Petrychenko, 2020).

Also, additional stabilization of emulsions can be achieved with the help of surfactants (surfactants) and plant composites (Pasichnyi, Yushchenko, Mykoliv, & Kuzmyk, 2015), which allows to increase the content of biologically active substances (BAS) in food products (Topchij, Kotlyar, & Kyshenko, 2014**)**. Such substances include nanocomposite of silicon dioxin. Silica (E551) is a loose bluish-white powder without taste and odor, which is used as a food additive that prevents caking of bulk products (Pourkomailian, 2000).

On its basis, medical drugs of adsorption action, carriers of biologically active substances (BAS), food mixtures are used, which are used as a thickener of liquid dispersion media (Khorunzha, Pasichnyi, Rudiuk, & Guts, 2019).

Silicon and its compounds are safe for the human body, because in nature it constantly enters living organisms with food and water, enters the respiratory system along with dust, aerosol particles. All this leads to the migration of silicon compounds in the body, to their accumulation in many tissues and participation in metabolic processes (Kravchenko, 2010).

Despite a number of positive properties, the use of silicon dioxide in food technology has hardly been studied, which confirms the relevance and necessity of selected areas of research. From the data (Pasichnyi, & Geredchuk, 2015**)**, we can conclude that silica has the ability to stabilize emulsions.

EXPOSITION

In the first phase of the study of sauces for use in combination with meat products, model sour-sweet sauces based on fat were investigated (Table 1) without the use of surfactants.

Table 1. Model recipes for sweet and sour sauces

Ingredients of the recipe	The content in the recipe,%			
	Recipe 1	Recipe 2	Recipe 3	Recipe 4
Flavored plum vinegar	30	30	-	-
Sugar	8,0	8,0	-	-
Fat base (vegetable oil)	40	50	60	70
Salt	2,0	2,0	-	-
Tomato paste	-	-	30	30
Water	20	10	10	-

The possibility of regulating the emulsifying ability and stability of emulsions using different types of dispersion was studied. The emulsifying ability was determined by fixing the volumes of the phases separated after centrifugation (Antypova, Glotova, & Rogov, 2001). Sauces with different recipe composition and different shelf life were studied. The phase distribution of the sauce was studied and its emulsifying ability was determined.

The pH values determined by the traditional method (Kyshenko, Starchova, & Goncharov, 2010) of all experimental samples of sauces based on flavored plum vinegar were in the same range for all sauce samples at the product level of 5.5-5.6 pH values.

Table 2 presents the indicators of freshly made sauces.

Table 2. Nutritional properties of freshly made sauces

Phase distribution	Recipe 1,%	Recipe 2, %	Recipe 3, %	Recipe 4, %
Aqueous phase	8,3	5,5	7,9	2,0
Emulsified phase	33,3	70,9	60,3	62,0
Fat phase	58,4	23,7	31,8	36,0

As can be seen from table 1, the highest emulsifying ability has a formulation 2, this formulation has the lowest oil content, and formulation 3 has the highest emulsifying ability, the oil content in this formulation is 50%, the formulation with the highest oil content has a slightly lower emulsifying ability - 62 %.

The effect of ultrasonic mixing on the emulsifying ability of sauces was investigated (table 3).

Table 3. Nutritional properties of sauces, after ultrasonic treatment

Phase distribution	Recipe 1,%	Recipe 2, %	Recipe 3, %	Recipe 4, %
Aqueous phase	37,1	31,9	66,7	1,8
Emulsified phase	55,5	63,8	22,2	17,8
Fat phase	7,4	4,3	11,1	80,4

As you can see, after ultrasonic treatment, the emulsifying ability of sauces decreased and the aqueous phase of the product increased, in the formulation №4, with the highest fat content significantly increased the fat phase.

Sauces according to the above recipes were re-examined after storage for 14 days. The research results are shown in table 4.

Table 4. Nutritional properties of sauces during storage for 14 days

Phase distribution	Recipe 1,%	Recipe 2, %	Recipe 3, %	Recipe 4, %
Aqueous phase	42,9	17,2	54,5	57,6
Emulsified phase	50,0	74,1	36,4	9,6
Fat phase	7,14	8,7	9,1	32,8

After storage, the highest value of emulsifying ability remained in the formulation №2, the lowest value in the formulation №4.

Sauces, after storage were also subjected to ultrasonic treatment. The results are shown in table №5.

Table 5. Nutritional properties of sauces during storage14 days after ultrasonic treatment

Phase distribution	Recipe 1,%	Recipe 2, %	Recipe 3, %	Recipe 4, %
Aqueous phase	20,0	13,6	20,0	20,0
Emulsified phase	40,0	45,5	40,0	40,0
Fat phase	40,0	40,9	40,0	40,0

After the ultrasonic treatment, the emulsifying ability decreased, therefore, the use of ultrasonic treatment is impractical.

The obtained results confirm the possibility of regulating the functional parameters of sauces and the need for additional stabilization of emulsions using surfactants.

In the second stage, flavored plum sauces with different fat content were investigated, with the addition of surfactants - silica and whey powder. Model formulations are shown in table 6.

Table 6. Model recipes for plum sauces

Recipe №	Plum sauce, %	Silica, %	Dry whey, %	Vegetable oil, %
1	90	1,5	6,5	2,0
2	60	1,5	6,5	32
3	90	0,5	6,5	2,0
4	60	0,5	6,5	32
5	90	1,5	2,5	2,0
6	60	1,5	2,5	32
7	90	0,5	2,5	2,0
8	60	0,5	2,5	32

The phase distribution of sauces, according to the above recipes, is shown in table 7.

Table 7. Nutritional properties of sauces

Recipe	Aqueous phase,%	Emulsified phase, %	Fat phase, %
1	3,3	72,2	24,5
2	-	100,0	-
3	-	73,3	26,7
4	-	100,0	-
5	4,8	95,2	-
6	-	100,0	-
7	9,1	90,9	-
8	16,7	83,3	-

From the data shown in table 7 it is seen that with the change of the formulation, the emulsified phase in the sauce increased, with a fat base content of 32%, the value of the emulsifying ability was equal to 100%.

The technology of production and subsequent use of sauces involves pre-pasteurization, so the experimental samples of sauces were subjected to pasteurization, namely exposure in a water bath for 15 minutes at 85 °C.

Table 8 shows the phase separation of the sauce depending on the recipes.

Table 8. Indicators of sauces after pasteurization

Recipe	Aqueous phase,%	Emulsified phase, %	Fat phase, %
1	-	61,9	38,1
2	-	100,0	-
3	-	75,9	24,1
4	-	100,0	-
5	33,3	53,3	13,4
6	-	100,0	-
7	16,1	83,9	-
8	44,4	55,6	-

From the data of table 8 it is seen that the developed formulations of compositions with an oil content of 32% have a higher emulsifying ability and retain it after pasteurization. This is due to the property of whey to envelop the fat, which prevents them from merging and stabilizes the emulsion. The positive effect of silica on the stability of the emulsion and the emulsifying ability is also monitored.

CONCLUSIONS

According to the obtained results, we can conclude that in the development of emulsion sauces, without the addition of surfactants, we have a fairly low rate of emulsifying ability. When using in the recipes of silica sauces in the amount of 0.5-1.5% and whey powder not less than 2.5-6.5% and oil content at the level of 32%, the required level of thermal stability of the sauce emulsion is achieved. This confirms the possibility of using this sauce base for the production of pasteurized foods.

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