Stability studies of inulin and olihofructose in the drink

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ABSTRACT

Inulin and oligofructose are high quality ingredients for the production of dietetic foods. Inulin and oligofructose can be used as a pure dietary ingredients to create functional foods with different stated properties, and as ingredients that improve the taste and texture and allows replacement of sugar and fat. The best results are obtained with a combination of dietary and technological concepts, which enables the development of high quality innovative food products.

The work purpose – stability research inulin and olihofructose depend on pH size, temperature and a storage time of foodstuff in which they were used.

As object of researches soft drink with the maintenance in solids of 10,0 % have been used. In the drink changed value pH environments, temperature and endurance time.

In the results it has been established that hydrolysis olihofructose degree changes with various intensity in different values of temperature and pH.

In the conditions of the sour environment and the raised temperatures hydrolysis (which have been brought in products with the technological purpose) increase. It leads to partial or full loss of their dietary properties, and, in certain cases, to slight increase of sweet of a ready product. Hydrolysis inulin and olihofructose degree depends on level pH and the raised temperatures.

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Дослідження стабільності інуліну і олігофруктози в напоях

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Introduction

It is known that certain food additives that are used in the manufacture of food products can change their functional and other properties during storage and distribution.

Additives such as inulin and olihofructose are high quality ingredients for dietary foods because they:

• full of vegetable origin;

• have special dietary properties that allow you to position prepared foods made with their use as dietary, functional or treatment and prevention;

• have low calorie;

• suitable diabetic and low -calorie diets (they do not affect the blood glucose and insulin levels);

• have unique technological properties.

Inulin and olihofructose can be used as dietary ingredients for the creation of functional foods with different properties, and as ingredients that improve the taste and texture that allows replacement of sugar and fat. The best results are obtained with a combination of dietary and technological concepts, which enables the development of high quality innovative food products.

There are two groups of inulin – native (standard), which have the same structure and differ only by the properties of the particles, and which are derived from long-chain inulin standard by removing the low molecular weight fraction and which also differ from each other only by the properties of the particles.

The main technological properties of inulin are:

1) Ability to replace fat in foods with the presence of the aqueous phase;

2) Ability to improve the taste of low-fat products, bringing them to the properties of normal fat content of products;

3) Ability to act as a texturing agent, emulsion stabilizer and thickener.

Olihofructose is a natural polysaccharide having the same molecule structure as inulin but shorter in length. Olihofructose is a natural component of natural inulin. Olihofructose produced by partial hydrolysis of inulin. This technology is also similar to the processes in the sugar and starch industry.

It is known that the solubility of olihofructose exceeds the solubility of sucrose, making it the soluble dietary fiber in the world. Olihofructose does not crystallize any precipitate and leaves the mouth dry and sandy taste. Olihofructose is not destroyed in the majority of high-temperature processes. Moderate reducing ability of olihofructose may lead to the formation of a weak brownish colour due to the reaction of melanoidin producing.

It has a neutral slightly sweet flavour, without foreign taste and aftertaste. Its sweetness profile is very similar to the profile of sweetness of sucrose (Pic 1). Therefore, the main technological feature is that it can replace sugar in various formulations, which allows not only to obtain foods low in sugar or sugar-free, but also to seek to reduce total energy product.

Since olihofructose has little sweetness, it is usually used in combination with intense sweeteners or fructose. However, it masks the unpleasant aftertaste of intense sweeteners and sharp sweetness of fructose, improves taste and gives the food a mild, uniform taste.

Distinctive of olihofructose is its ability to show synergy with intense sweeteners, which allows you to reduce the dosage of these sweeteners while maintaining the desired level of sweetness. This effect, as well as the ability to enhance the fruit flavour, is widely used in the manufacture of soft drinks.

It is known that in acidic medium and high temperature inulin and olihofructose can be hydrolysed to form shorter chains and fructose, resulting in partial or complete loss of their dietary properties, and, in some cases, to enhance sweetness of the finished product.

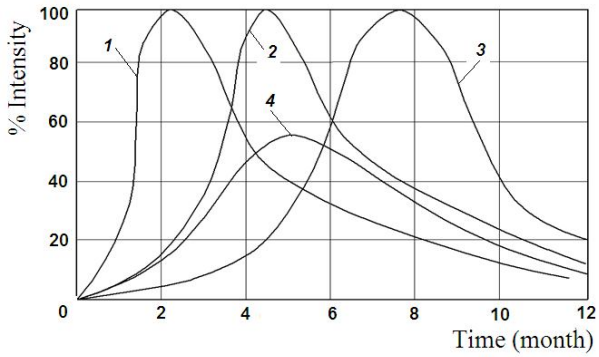

Fig. 1. Intensity profile:
1 – Acesulfame-K; 2-Saccharose; 3-Aspartame; 4-Olihofructose

Results and discussion

A stability study of inulin and oligofructose in the drinks was conducted according to standard laboratory methods: varying the acidity of the drink, changed the pH, the temperature changes by heating, and storage time - by putting a drink on the resistance. Using standard laboratory equipment: pH meter, saccharimeter and thermometer.

The soft drink with dry matter content 10.0% have been used as the object of studies in beverages alter the pH value of the medium, temperature and holding time.

We studied the effect of pH and temperature on the degree of hydrolysis of olihofructose. Samples were prepared beverage containing olihofructose 20% and 40%. Results are presented in Table 1 and 2.

The pH and temperature effect dependence in olihofructose hydrolysis degree (the beverage 20% content).

Table 1

Temperature, ° C	Machining time, min	Degree of hydrolysis olihofructose at different pH values,%		
		pH = 6.0	pH = 4.0	pH = 3.5
85,0	2,0	0	<1,0	5,0
85,0	5,0	0	<1,0	6,0
90,0	5,0	0	<1,0	10,0
95,0	2,0	0	1,0	10,0
95,0	5,0	0	1,0	16,0

From the data table shows that the pH equal to or above 4.0 the hydrolysis occur slightly at all temperatures. While reducing the pH becomes more critical. Thus, at pH 3.5 and 95 ° C for 5 min is na16% hydrolysis.

The same trend is observed in beverages containing 40% olihofructose. The data are presented in Table 2.

The dependence of the effect of pH and temperature on the degree of hydrolysis olihofructose (the content of the beverage 20%)

Table2

Temperature, ° C	Machining time, min	Degree of hydrolysis olihofructose at different pH values,%		
		pH = 6.0	pH = 4.0	pH = 3.5
85,0	2,0	0	<1,0	4,0
85,0	5,0	0	<2,0	5,0
90,0	5,0	0	<2,0	9,0
95,0	2,0	0	<2,0	10,0
95,0	5,0	0	<2,0	15,0

Further investigate the influence of pH and temperature on the degree of hydrolysis of inulin. We prepared alcoholic beverages containing 10% inulin. Results are presented in Table 3.

The pH and temperature effect dependence on the degree of hydrolysis of inulin (the content of the beverage 20%).

Table 3

Temperature, ° C	Machining time, min	Degree of hydrolysis of inulin at different pH values,%			
		pH = 6.5	pH = 4.0	pH = 3.5	pH = 3.0
70,0	5,0	0	<1,0	<1,5	1,0
	15,0	0	<1,0	<1,5	5,0
	30,0	0	<1,0	<2,0	7,0
	60,0	0	<2,0	<2,5	13,0
90,0	5,0	0	<2,0	<3,0	17,0

From the data table shows the effect of pH and temperature on the degree of hydrolysis of inulin. If the pH is higher or equal to 4.0, the total hydrolysis at all temperatures low. At lower pH, the temperature is an important parameter. Thus, at 70 ° C for 60 min is 13%, at 90 ° C in 17%.

Later the stability has been established of inulin and olihofructose in storage drinks. For this purpose, we used non-alcoholic beverages containing 10% dry matter and various dosages of olihofructose and inulin. Results are presented in Fig. 2 and 3.

Pic 2 shows that the degree of hydrolysis of olihofructose can be quite high in beverages with pH 4.0 and a shelf life of up to 6 months to produce 20% probability overdose olihofructose to compensate for its acid hydrolysis.

Fig. 3 shows the change in the degree of hydrolysis of inulin during storage of non-alcoholic beverages for 12 months at 20 ° C.

It follows that inulin is more suitable as an ingredient, such as fiber and acid drinks with long shelf life. Thus, pH 4.0 hydrolysis after 6 months of storage does not exceed 15%, which can be easily compensated 15% overdose of inulin. This ensures consumers claimed dietary fiber content for the duration of life. Hydrolysis products do not cause changes in taste due to a low enough concentration of inulin, no more than 2% of the recommended for this application.

On the basis of these studies found that the degree of hydrolysis of olihofructose at different temperatures and pH, changes with different intensities.

Thus, at a pH equal to or above 4.0 and a temperature of 85-90 ° C, the hydrolysis of olihofructose is low. In the case where the pH is reduced, and the temperature rises, the hydrolysis process is increasing dramatically. Thus, at pH 3.5 and 95 ° C the degree of hydrolysis of the olihofructose in the product increased by about three times.

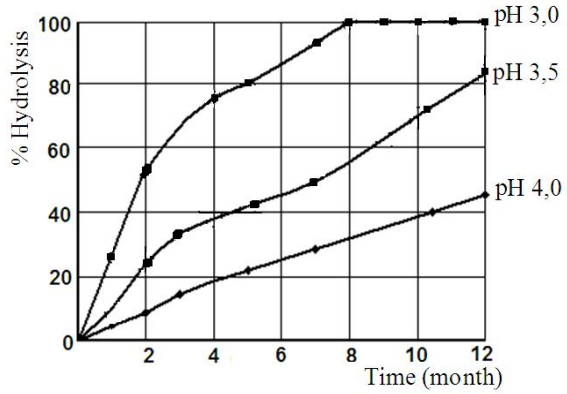

Fig. 2 Hydrolysis olihofructose during storage for 12 months at 20 ° C and different values in pH

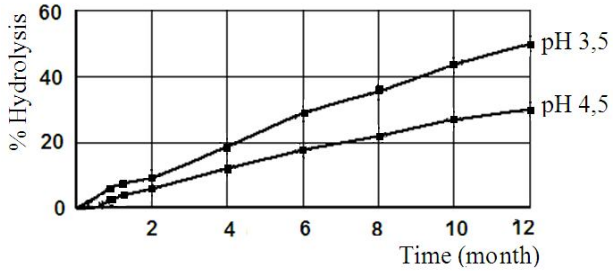

Fig. 3 Hydrolysis inulin during storage for 12 months at 20 ° C and different values in pH

Conclusion

In the study of the degree of hydrolysis of inulin at 70-90 ° C in an acidic environment, it was found that at pH = 4.0 and above, hydrolysis is negligible. However, with a decrease in pH and the temperature rises to 95 ° C, the hydrolysis of inulin increased approximately two-fold. In addition, slight with increase in sweetness of the finished product without degrading its consumer properties have been showed.

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