Definition indicators of quality of the confectionery semi-finished product with powders from banana and carrot

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Abstract

Introduction. Research of technological properties of powders from the carrots and banana received by cold spray drying, with the purpose of definition the influence of plant raw materials on indicators of quality of a confectionery semi-finished product.

Materials and methods. Determination of dispersion of plant powders carried out by calculation of the sizes of powders particles using an eyepiece micrometer and an optical microscope at increase by 400 times. The research of physical and chemical indicators of quality of the received semi-finished products was defined by standard techniques.

Results and discussion. Determination of dispersion plant powders by microscopic method showed that the largest volume of particles in the studied samples is presented by fraction to 20 microns, this fraction in banana powder contained in volume of 81%, carrot – 78%. That is, the particles in the finished product will not be felt organoleptically.

Powder from banana is homogeneous behind small fractions of particles, presented by segments of spherical shape, uniform in all weight.

Powder from banana holds fat better (0,92 ml/g), which, on the contrary, has smaller water connecting ability (6,33%). The similar return tendency is shown also in powder from carrots: at bigger water absorption and water retention (6,93%) this powder has less ability to hold fat (0,89 ml/g).

When determining influence of the chosen dosages of the studied powders on organoleptic properties of a confectionery semi-finished product as rational was selected the powder dosage from carrots – 5% and powder from banana – 18% to prescription masses that allows to receive a confectionery semi-finished product with high flavoring properties, namely – uniform structure, a plastic consistence, with the taste and a smell inherent in this fruit.

The mass fraction of moisture of a confectionery semi-finished product with powder of carrots is 12,2% and with powder of banana – 11,6%. Mass fraction of fat of 25% and 18% respectively. Content of the reducing substances 4,4% and 4,2% are almost equal in the received semi-finished products. The size of crystals of the main fraction is 10–15 microns.

Conclusions. By results of researches, it is possible to recommend use of fine dispersed plant powders in confectionery production for the purpose of increase in nutrition value and expansion the range of finished goods.

Introduction

Today the chain of restaurant industry gets rapid development. One of the main groups of culinary products that are in demand in the industry are pastry. For their design using various semi-finished products: icing, fondant masses and creams. Considering it, appropriate and necessary to enhance the nutritional value and intensify production of semi-finished products

Fondant mass is prepared by boiling of prescription mix with the subsequent knocking down, tempering and formation. Fondant is a uniform crystalline plastic heterogeneous mass consisting of solid and liquid phases. Sugar fondant prepares from sugar and treacle, and for the corresponding types use certain improvers. Main types of the fondants made in food branch – sugar, dairy, creme brulee. But they have a low nutrition value both high the content of sugar and caloric content. Therefore during creation of new types of products with the raised nutrition value in this field by scientists often use additives from plant raw materials.

High content of moisture in plant raw materials is the reason of their instability at storage, as a result of bacterial, enzymatic and chemical damage. Drying is the most rational way of preserving, as in dried products microbiological processes are slowed down, and the composition of nutritious and biologically valuable substances remains close to natural. Therefore for enrichment the fondant masses expedient and necessary is use of fruit and vegetable powders concentrate that is biologically active compounds [1].

Dried fruit and vegetables are perspective raw materials for use in catering establishments and the food industry as allow avoiding seasonality of their consumption, to simplify operations on machining of raw materials and to reduce duration of technological process of preparation of dishes.

Production of confectionery semifinished products is possible when using dietary plant supplements which raw materials for obtaining can be medicinal plants. Feature of application of medicinal herbs is availability of a complex in them biologically active substances, indiscriminateness to cultivation and a possibility of their industrial procurement.

So, for example Falkovich B. A. for the first time by method of mechanical-chemical activation have received high-disperse systems – nettle pastes with use of effective extractants – alcohol and sunflower oil. It is established that nettle pastes contain biologically active agents in the dissolved condition providing their best assimilation with a human body. He has proved recommended dosages them in confectionery masses (fondant, praline, jelly) from a line item of requirements of organoleptic properties and enrichment by biologically active agents which are confirmed with production testing [2].

Dzhamaldinov B. A. in his scientific work tried to solve this problem using for production powders of semi-finished products wild-growing raw materials of the North Caucasus such as a medlar, a cornel and a wild-growing pear.

Thus he developed a way of receiving fatty paste and candies on the basis of powders of semi-finished products of wild-growing fruits. At the expense of it decrease in content of sugar in products was established [3].

As the moisture-holding agent in case of production fondant chocolates A. Gavva researched fine berry powder with the increased content of food fibers. It consists mainly of covers of berries of blackcurrant and black-fruited mountain ash. Covers contain considerable part of food fibers in relation to other components of berry. Powder has the developed specific surface that causes its capability to adsorption of moisture and swelling.

Moisture-holding substances connect part of free moisture in system, lead to increase in viscosity of candy weight [4].

Skvira M. A. has scientifically and experimentally proved feasibility and efficiency of application of leaves of a walnut and aqueous-alcoholic extract from walnut leaves in case of production sugar and dairy the fomdant confectionery.

It has shown positive influence walnut leaves and aqueous-alcoholic extract from walnut leaves on structural mechanical properties of fondant masses and quality of finished goods, has found positive influence of the brought additives on consumer properties of finished products, including a nutrition value, organoleptic, physical and chemical indicators, and also the impact on quality fondant products during storage.

Also it was revealed clinical efficiency developed the functional fondant candies consisting in normalization of function of a thyroid gland of the person. The found effect of selective accumulating of organic iodine of a thyroid gland, testifies to high quality of iodine in confectionery [5].

Maltsev P. has studied structural and mechanical and hygroscopic properties of food powders (sugar and molasses, apple, beet and dairy) for use in production of confectionery.

It has shown that use of powders on the basis of plant raw materials in production of confectionery allows to reduce a carbohydrate-fat and caloric content, to enrich with functional ingredients (food fibers, vitamins, minerals, organic acids, etc.), to expand the range of products. Powder technologies of confectionery are simple and economic, they allow to receive masses and products from previously set chemical properties and structure and to receive products of a functional purpose [6].

The new technologies based on use of physiologically functional ingredients of a natural origin allow to fill shortage of irreplaceable nutrients and to expand the range of confectionery production and finishing semi-finished products.

Therefore studying of technological properties of the powder from carrots and bananas received by cold spray drying and its influence on organoleptic and physical and chemical indicators of quality of confectionery semi-finished products was the purpose of our research.

Materials and methods

Materials. The subjects of research are plant powder with bananas and carrots, obtained by cold spray drying, manufactured in Switzerland, the company “Naturex AG”. Also, quality of a ready confectionery semi-finished product using plant powders was investigated

Methods. Determination of dispersion of plant powders carried out by calculation of the sizes of powders particles using an eyepiece micrometer and an optical microscope at increase by 400 times. Preparation of samples was carried out by drawing dry samples on glass.

The coefficient of water absorption was defined as follows. Sample of powder (about 2,5 g) was placed in advance dried up glass cup with a capacity of 150 ml. Further the sample was filled in with the distilled water (50 ml) and left for swelling during 1.8×60^3 sec. The funnel with the filter was filled in with water, left on 1.8×60^3 sec, then weighed. Further filtered the glass cup contents via this filter then the funnel with the filter and a product was weighed again

At research of the ability to bind moisture of powder used a weighing method. For this purpose contributed a sample of powder in a centrifugal test tube and added water in the

ratio 1:20. The mixture was stirred and left for swelling at t=40ºC, for 2 hours. Then centrifugation was performed T=15 min with a frequency of rotation of 5000 rpm. Liquid which was formed was merged, previously determined in it the content of solids by the refractometer. The mass of wet sedimen was determined by weighing.

Emulsifying ability is determined by the maximum quantity of oil, it is entered into colloidal system to achievement of a koatservation under certain conditions.

For this purpose the simple of powder of 17 g was placed in a chemical glass with a capacity of 200 ml and during mixing added 100 ml of the distilled water at a temperature of 20 °C. Constantly mixing a sample, added from the burette vegetable oil with a speed of 5 ml/s to visual supervision point of separation of the emulsion (a koatservation point). Having measured volume of added oil, counted a koatservation point in ml/h

The principle of a method of determination of ability to hold fat consists that under certain conditions, oil is added to plant powder and after centrifugation the quantity free oils is defined.

Researches were conducted as follows: in the centrifuge tube brought a simple of powder of 4 g and added 20 ml of sunflower oil. Tube kept in the thermostat at a temperature of 20 °C, periodically mixing suspension within 30 min. After that centrifuged at 15000 rpm within 15 min. Measured volume of supernatant liquid (supernant).

The following physical and chemical indicators of quality of ready semi-finished products are investigated: a mass fraction of moisture by drying method, a mass fraction of fat by a refractometric method, the content of the reducing sugars by a feritsianid method.

Results and discussion

According to the described problem, functional and technological properties of powders from the banana and carrots received by cold spray drying have been studied.The main technological properties of plant powders are:

- Organoleptic properties
- Dispersion
- Renewable, ability to hold fat and emulsifying capacity

It is obvious that introduction of additives will cause the appearance of the finished product kind of color, aroma and taste. Therefore, special attention should be given to research organoleptic properties of powders. Both powders, homogeneous throughout the mass, granular consistency. Have a pleasant aroma, typical for powders from carrot and banana and in accordance orange and light yellow colors.

Table 1

Organoleptic indicators of plant powders

Indicator	Characteristic	
	Powder from banana	Powder from carrot
Appearance and consistence	Finely dispersed powder, homogeneous throughout the mass, granular texture, without visible inclusions and impurities.	
Taste and smell	Pleasant, pure, without notable particles of powder with flavor and taste of banana.	Pleasant, pure, without notable particles of powder with flavor and taste of carrot.
Color	Light yellow, homogeneous for all mass.	Orange, homogeneous for all mass.

Both powders are finely divided, uniform throughout the mass, granular consistency. Have the pleasant smell typical for powders from carrots and banana, and also respectively orange and light yellow colors.

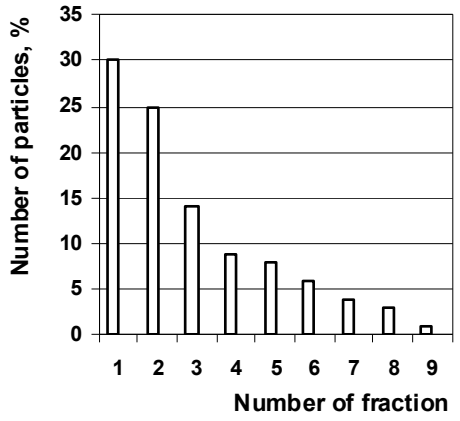

Figure 1. Powder from banan

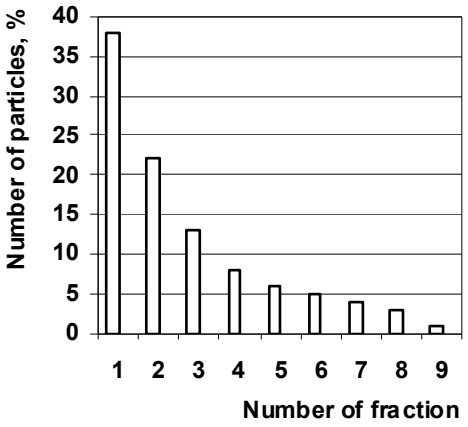

Figure 2. Powder from carrot

With the introduction into confectionery masses advisable to use powders with a particle size to15 microns and maintenance of this faction of 75...80%. Justification of these options is that particles with dimensions over 20...25 microns felt organoleptic and also cause emergence in confectionery masses existence of particles. Therefore, we investigated by microscopic method, dispersion of powders from banana (Figure 1) and carrot (Figure 2)

Numbers of fraction and the size of particles is presented in Table 2.

Table 2

Numbers of fraction and the size of particles

Number of fraction	1	2	3	4	5	6	7	8	9
Dispersion powder, microns	1–5	5–10	10–15	15–20	20–40	40–60	60–80	80–90	90–100

Determination of dispersion plant powders conducted by counting particle size of powders using eyepiece micrometer and optical microscope and an increase of 400 times. Making preparations carried out by drawing a dry sample on a glass slide.

Apparently from these figures, the largest volume of particles in the studied samples is presented by fraction to 20 microns, this fraction in powder from banana contains in the volume of 81%, carrots – 78%.

The structure of powder from banana by means of a microscopic method is investigated (Figure 3–4). Powder from banana is homogeneous by small fractions of particles (increase by 100 times). Powder is presented by segments of spherical shape, uniform in all weight

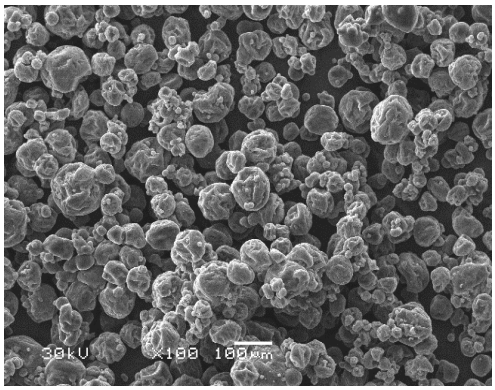

Figure 3. Powder from banana (x 100)

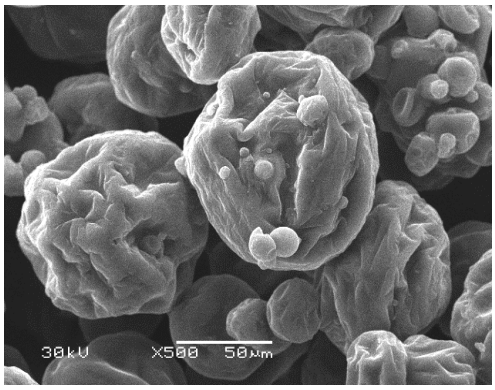

Figure 4. Powder from banana (x 500)

Also technological indicators of plant powders were investigated, namely: the ability to bind moisture, water absorption coefficient, the emulsifying ability and ability to hold fat. The research results are presented in Table 3.

With the above mentioned data it is visible that plant powders have rather high ability to bind moisture. The conducted researches indicate existence of groups OH, which are hydrophilicly active compounds that will promote water absorption of powders. Plant powders in average degree hold fat and have rather high emulsifying ability

Table 3

Technological properties of plant powders

Indicator	Research results	
	Powder from banana	Powder from carrot
Ability to bind moisture, %	6,33	6,93
Coefficient of water absorption, kg/kg	2,92	2,31
Emulsifying ability, ml/g	2,35	2,17
Ability to hold fat, ml/g	0,92	0,89

The best binds moisture is powder with carrots – 6.93%. Banana powder have higher emulsifying capacity 2.35 ml/g.

Better hold a fat is banana powder, which, by contrast, has less ability to bind moisture. A similar inverse tendency is shown for powder from carrots, at higher water absorption and ability to bind moisture this powder is less value hold a fat between researched powders. It is connected, obviously, with the high content of pectin substances in it, wich exhibiting high hydration properties and less value hold a fat.

Considering the above data, these powders were used as a structurant for production of confectionery semi-finished products which includes fondant mass, butter, surfactant and powders from carrot and banana.

In researches mass fractions of powder were defined with carrot 3, 5 and 7% by weight of the formulation. Influence of the chosen dosages on organoleptic properties of confectionery semi-finished product is investigated (Figure 5).

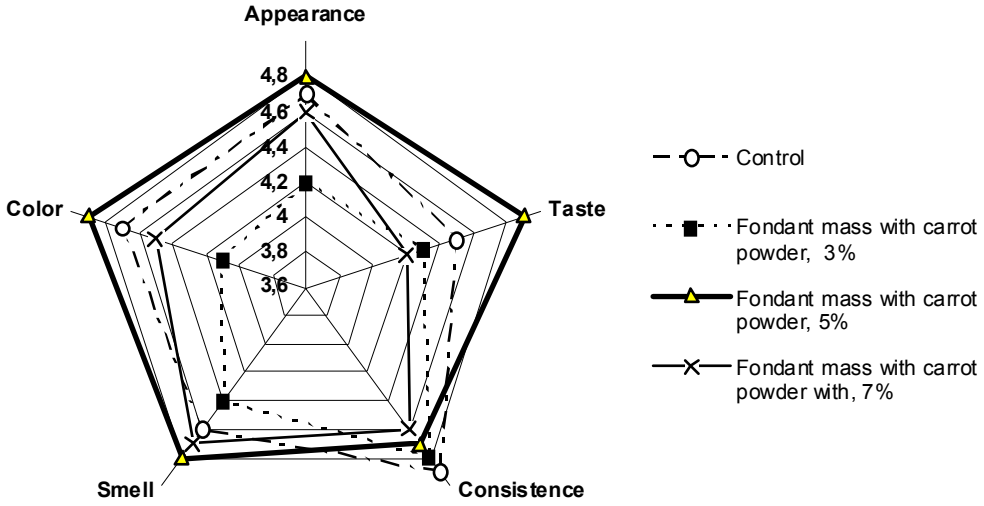

Figure 5. Organoleptic evaluation confectionery semi-finished product with powder from carrot

As can be seen as rational powder dosage can choose with carrot – 5%, that lets confectionery semi-finished product with high taste properties.

In the second case, the dosage was selected from banana powder in an amount of 12, 18 and 24% of the prescription weight. Impact of preferred dosages of the organoleptic properties of semi-finished confectionery (Figure 6)

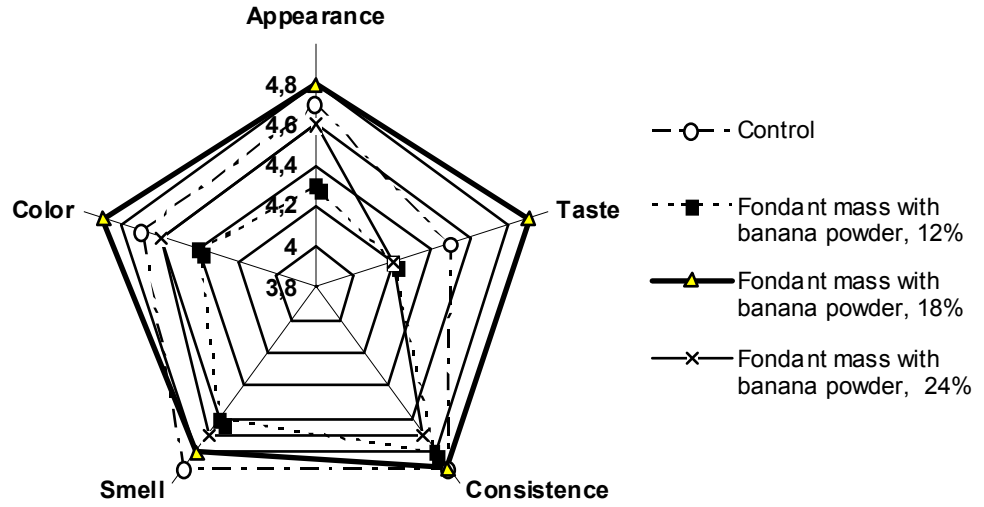

Figure 6. Organoleptic evaluation confectionery semi-finished product with powder from banana

It allowed to receive confectionery semi-finished product with high taste qualities – namely homogeneous structure, plastic texture, with taste and odor characteristic of this fruit

Physico-chemical quality indicators of confectionery semi-finished product with powders are defined: mass fraction of moisture, mass fraction of fat, the content of reducing substances and size of crystals of the main fraction (Table 4).

Table 4

Physical-chemical indicators of quality confectionery semi-finished product with powder from carrot and banana

Indicators	Research results	
	With powder from carrot	With powder from banana
Mass fraction of moisture,%, not more	12,2	11,6
Mass fraction of fat, %	25	18
The content of reducing substances,%, not less	4,4	4,2
Size of crystals of the main fraction, micron	10–15	10–15

The mass fraction of moisture of a confectionery semi-finished product with powder of carrots is 12,2% and with powder from banana – 11,6%. Mass fraction of fat are 25% and 18% respectively. Content of the reducing substances in the received semi-finished products of almost equal 4,4% and 4,2%. The size of crystals of the main fraction – 10–15 microns.

Conclusions

Thus, based on the conducted researches of functional and technological properties of powders from the banana and carrots received by cold spray drying benefits of use of these plant ingredients are shown, due to good organoleptic properties to dispersion, the greatest amount of particles in powders is provided with sizes up to 20 microns, and a high ability to bind moisture and hold the fat.

Application of nonconventional dressers from plant raw materials allows not only to raise a nutrition value of confectionery products, to intensify engineering procedure, but also to give to products of therapeutic and preventative orientation

With respect thereto the actual and perspective direction of development of confectionery production is development of the competitive production technology the fondant masses enriched with physiologically functional ingredients.

Functional and technological properties of powder from carrots and the banana received by cold spray drying are defined.

It is shown that powders from carrots and banana of cold spray drying allows to receive a confectionery semi-finished product with attractive organoleptic properties and corresponding to physical and chemical indicators of quality.

Rational mass fractions of plant powders in prescription composition of confectionery semi-finished products was defined It is shown that the mass fraction of carrot powder – 5%, and banana – 18%, that providing attractive organoleptic properties)

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