THE INNOVATION TECHNOLOGY OF HIGH-LEVEL PROCESSING OF LEGUMINOUS RAW MATERIALS UNDER THE CONDITIONS OF IMPORTS PHASE-OUT

[a]KAZANCEVA IRINA LEONIDOVNA, [b]BUTOVA SVETLANA NIKOLAEVNA, [c]NIKOLAEVA JULIA VLADIMIROVNA, [d]TARASOVA VERONIKA VLADIMIROVNA, [e]IVANOVA LYUDMILA AFANASEVNA

[a]*Faculty of technical sciences, Department of Research of Materials, Substances and Products Federal Budgetary Institution Saratov Forensic Laboratory of the Ministry of Justice of the Russian Federation, 410003, Saratov, Kutyakova street, 10, Russia*
[b] *Faculty of technical sciences, «Biotechnology and technology of bioorganic synthesis products», Russia*
Moscow State University of Food Production, 125080, Moscow, Volokolamskoe avenue, 11, Russia
[c] *«Biotechnology and technology of bioorganic synthesis products» Moscow State University of Food Production, Russia*
125080, Moscow, Volokolamskoe avenue, 11, Russia
[d]*Faculty of technical sciences, «Biotechnology and technology of bioorganic synthesis products» Moscow State University of Food Production*
125080, Moscow, Volokolamskoe avenue, 11, Russia
[e]*Faculty of technical sciences, «Biotechnology and technology of bioorganic synthesis products»Moscow State University of Food Production*
125080, Moscow, Volokolamskoe avenue,Russia
Email: [a]kazantsevail@rambler.ru, [b]vbutov@bk.ru, [c]organikamgupp@mail.ru, [d]sod@bk.ru, [e]biotech@mgupp.ru

Abstract: Now the perspective direction of the food industry is processing of chick-pea and use of products of processing of chick-pea (flour, proteinaceous isolate) in compoundings of various food systems. Development of scientific and technological bases of complex, deep processing of chick-pea is directed to decrease in deficiency of protein and other valuable substances in a population food allowance, expansion of a range of products of healthy food, on active replacement of import grain products and development of capacity of domestic agro-industrial complex. Data of chemical composition for chick-pea of domestic grades «Krasnokutsky 28» are provided and «Privo-1», amino-acid it is fast proteins, Trypsinum - the inhibiting activity. By results of definition of chemical composition of beans of chick-pea of the specified grades it is established that the prevailing fractions are starchy and proteinaceous. It is also established that seeds of chick-pea of the studied grades are characterized by low level of activity of inhibitors of Trypsinum: Trypsinum - the inhibiting activity is 2,33 and 5,56 mg/g for grade chick-pea «Krasnokutsky 28» and «Privo-1» respectively. In envelopes of seeds of chick-pea the least activity of inhibitors of Trypsinum of 0,68 mg/g is found. The obtained data of fractional composition of proteins allowed to recommend proteinaceous products of processing of chick-pea for application in technology of food with the under content of gluten. Results of researches on expansion of a range of products of a healthy delivery on the basis of products of processing of chick-pea are presented: flour and sugary confectionery, vegetable canned food and sauces, mayonnaise sauces are offered. Chemical composition of afterproducts of processing of chick-pea is defined: envelopes of by-product of technology of traveling flour, rest meal after selection of proteinaceous isolate. The perspective directions of their application are designated.

Keywords: chick-pea, chickpeas flour, isolate of chickpeas protein, products of a healthy delivery, processing afterproducts.

1 Introduction

The leading role in the modern structure of world resources of food protein is occupied by vegetable raw materials. Traditional sources for production of proteinaceous products are soy and wheat. The factor limiting application of proteinaceous products from wheat is presence of allergenic potential of wheat protein – recently physicians note prevalence of a Gee's disease. Among bean, processed in the commercial scale, the forefront is come by soy, however products of deep processing (concentrates, isolates) come to Russia on import.

Now development of technology of complex processing of chick-pea with receiving new types of products of a healthy delivery and also additives of high nutrition value with the increased protein content is perspective that promotes replacement of import grain products and development of capacity of domestic agro-industrial complex.

Therefore as the priority direction of investment activities of agro-industrial complex of Russia the direction of deep processing of high-protein crops is allocated. One of the chief representatives bean, grown up in the territory of Russia, is leguminous culture chick-pea. Thanks to good productivity, high drought resistance, resistance to defeat by the majority of causative agents of diseases and wreckers interest in this culture from agricultural producers of area increases. Its value also consists in improvement of fertility of the soil due to enrichment by its nitrogen therefore chick-pea is an excellent predecessor of grain crops. For example, according to data of the Ministry of Agriculture of the Saratov region from 2009 for 2013 the size of acreage under chick-pea increased from 63,9 thousand to 216,5 thousand hectares, and harvest volume – from 17,4 to 153,9 thousand tons. Seed of chick-pea surpasses many traditional grain crops in protein content (to 32% for page of century depending on a grade), irreplaceable amino acids, vitamins, macro - and minerals (Skurihin, I.M. 1987, Mosolov, V.V. 1971).

2 Work purpose

Development of technology of complex processing of chick-pea with receiving new types of products of a healthy delivery and also additives of high nutrition value with the increased protein content is represented relevant.

3 Research course

As object of a research served seeds of food chick-pea the most extended for the last few years among agricultural producers of the Saratov region of grades «Krasnokutsky 28» and «Privo-1».

The quantitative amino-acid analysis of proteins of chick-pea was made on a liquid chromatography of the L-8800 model (Hitachi, Japan). Fractional composition of proteins from chick-pea seeds on solubility was determined by Osborne's method; activity of inhibitors of Trypsinum in chick-pea with use of a caseinolytic method. The Zhirnokislotny structure of the fatty phase allocated from chick-pea was analyzed in accordance with GOST 31663 (GOST P 52173-2003 Raw materials and foodstuff. A method of identification of the genetically the modified sources ,2005) on a gas chromatograph «Crystal 2000M», a column capillary HP FFAP (USA) by 50 m*0,32 mm*0,52 mkm.

Additional benefit of chick-pea is that this culture was not exposed to gene manipulations. The method of polymerase chain reaction executed in accordance with GOST P 52173 (Krilova, V.B. 1998) confirmed lack of recombinant DNA in beans of chick-pea of the studied grades.

By results of definition of chemical composition of beans of chick-pea of the specified grades it is established that the prevailing fractions are starchy and proteinaceous (table 1).

Table 1 Chemical composition of chick-pea of the studied grades (in %)

Index	«Krasnokutsky 28»	«Privo-1»
Mass fraction of moisture	9,0±0,5	8,5±0,5
Mass fraction of protein on a dry basis	24,0±0,2	20,7±0,2
Mass fraction of fat	3,7 ±0,3	4,3±0,3
Mass fraction of ashes	3,30 ±0,03	3,15±0,03
Mass fraction amylum on a dry basis	46,0±1,3	41,8±1,3
Mass fraction of a fat	3,6 ±1,1	3,9±1,1

On the basis of a research of their physical and chemical characteristics it is established that higher content of protein (24%) and separate amino acids and smaller tripsiningibiruyushchy activity (2,33 mg/g) is characteristic of grade chick-pea «Krasnokutsky 28». In this regard, for production of proteinaceous products (flour, isolate) it is preferable to use grade chick-pea «Krasnokutsky 28».

Calculation of amino-acid it is fast demonstrates that the limiting amino acids for chick-pea of a grade of «Privo-1» are methionine and cystine (30,9%), valine (80%), isoleucine (84,8%), threonine (93,5%); for grade chick-pea «Krasnokutsky 28» – methionine and cystine (39,1%).

Fractional composition of proteins from chick-pea seeds on solubility: the cooperative maintenance of albuminous and globulinovy proteinaceous fractions makes 96,6 – 98,0%, the maintenance of prolamines – 0,29–1,34%, glutelins – 1,63–2,01%. The analysis of fractional composition of proteins of chick-pea of grades «Krasnokutsky 28» and «Privo-1» allowed to recommend proteinaceous products of processing of chick-pea for application in technology of food with the under content of gluten.

It is known that seeds of family bean contain anti-nutrients – inhibitors of proteases and a lektina. Anti-alimentary substances make the negative impact on an organism, reducing digestion of some nutrients if not to destroy them by the corresponding processing. From all range of anti-alimentary factors inhibitors of proteinases because of their wide spread occurance and high content in the reserving parts of plants seeds are of the greatest interest. Inhibitors of proteinases have property to significantly reduce catalytic activity of proteolytic enzymes (Trypsinum and chymotrypsin) of digestive tract of alive organisms, forming with them inactive complexes. Among plants the highest activity of inkgibitor of Trypsinum is found in seeds of bean cultures. According to various references, the activity of inhibitors of Trypsinum in seeds bean depending on high-quality features and conditions of cultivation is: for ranks – 8,8 mg/g, peanut – 0,4–6,2 mg/g, haricots – 0,5–4,6 mg/g, peas – 0,2–4,5 mg/g, soy – from 6,9 to 38,6 (Petibskaya, V.S.2012; Pashenko, L.P. 2006), 45 (Rudik, F.Ia.2012) and 21,1–61,3 mg/g (TR TS 021/2011 2012).

For the purpose of perfecting of technology of deep processing of chick-pea the possibility of application of electrochemical methods by combination of methods of electroflotation and an electrocoagulation is considered. The phizikokhimichesky processes taking place in the elektroflotokoagulyatsionny camera include the electrolytic oscillation of gas bubbles, adhesion of gas bubbles on protein particles with the adsorbed layer of ions, transportation of the formed units «vial of gas-a ionization proteinaceous particle» on the surface of solution, coagulation of such proteinaceous units and their loss in a deposit. Larger advantage of methods elektrofloto-and electrocoagulations is low concentration of electrolyte of the hum noise entered into solution for ensuring necessary conductivity, and selection of a particular design of a cell (electrolytic bath) and particular arrangement of electrodes allows to provide collateral course of processes of electroflotation and an electrocoagulation and to provide higher percent of extraction of protein.

When developing technology solutions of extraction of proteinaceous isolate with application of a method of an elektroflotokoagulyation a rational process conditions is defined:

- structure and concentration of electrolyte (0,1% solution of sodium hydroxide);
- an elektroflotokoagulyator design (a cell (electrolytic bath) of an express three-electrode design with strictly given vertical arrangement of three electrodes: two cathodes and one anode, it is strict on the center between cathodes);
- material of electrodes (in installation the electrodes from a graphite foil of GF-100 in the form of plates 0,8 mm thick placed in a separator from the polypropylene fabric are used);
- a current density (with increase in protein content in solution from 7±1 mg/ml to 15±1 mg/ml the current density providing the maximal exit makes 60-65 and 100-105 A/m^2, respectively);
- process duration (30 minutes).

It is established that change of temperature of electrolyte in range from 20 to 50 °C does not exert the considerable impact on a protein exit. It can be explained with minor change of an electrical conductivity of the environment in the studied interval of temperatures.

Comparison of effectiveness of the combined elektroflotokoagulyatsionny method of extraction of chickpeas protein with traditional (chemical) demonstrates that on a protein exit (80–85%) the method of an elektroflotokoagulyation does not concede to a classical method, and favourably differs in the fact that allows to exclude from a production cycle a number of stages and use of chemical reagent for achievement of an isoelectric condition of protein.

When determining activity of inhibitors of Trypsinum in chick-pea it is established that seeds of chick-pea of the studied grades are characterized by low level of activity of inhibitors of Trypsinum: Trypsinum - the inhibiting activity is respectively 2,33 and 5,56 mg/g for chick-pea of grades «Krasnokutsky 28» and «Privo-1». In envelopes of seeds of chick-pea the least activity of inhibitors of Trypsinum – 0,68 mg/g is found. Now the given indicator is normalized only for soy proteinaceous products. According to Technical regulations (Vegetable protein / 1991) the maintenance of an inhibitor of Trypsinum in them should not exceed 0,5%. The obtained data for chick-pea (0,23–0,56%) demonstrate that the inactivation or a destruction of inhibitors of Trypsinum when processing chick-pea is not required. This circumstance it is possible to carry to advantages of culture chick-pea in comparison with soy as from all known processing methods of an inactivation of anti-nutrients influence of high temperatures is most widespread. At the same time not only anti-nutritious, but also useful components of seeds collapse (including sulfur-containing amino acids) and their biological value decreases.

It is also necessary to note that proteins of chick-pea favourably differ from proteins of others bean, for example, haricots, peas, in the level of maintenance of lektin. Lektina represent the glycoproteins capable to reversibly connect the connections containing the carbohydrate fragments located on a surface of membranes of cages; they cause aggregation or agglutination. The maintenance of lektin varies at different types of plants and makes for haricot 3200-6400, for lentil – 400–800, peas – 100–400, chick-pea 25-100 the gemagglyutininovykh of piece/mg (Kazanceva, I.L. 2012).

Carotinum is the main provitamin of vitamin A which, in turn, is necessary for prevention of infectious, skin and oncological diseases. Especially important advantage of chick-pea is selenium availability – 28,5 mkg in 100 g. A selenium is one of the key minerals providing normal function of enzymatic antioxidatic system of an organism β-Carotinum (0,09 mg/kg); β-Carotinum is the main provitamin of vitamin A which, in turn, is necessary for prevention of infectious, skin and oncological diseases. Especially important advantage of chick-pea is selenium availability – 28,5 mkg in 100 g. A selenium is one of the key minerals providing normal function of enzymatic antioxidatic system of an organism.

The analysis of the experimental datas of lipide structure confirms the high content of unsaturated fatty acids (about 87%) that is an indicator of high physiological value, at the same time the linoleic acid prevails (51,7–56,9 %).

The specified advantages of culture chick-pea define prospects of development of scientific and practical bases of its complex, deep processing directed to decrease in deficiency of protein and other valuable substances in a population food allowance,

expansion of a range of products of a healthy delivery on the fissile replacement of import grain products and development of capacity of domestic agro-industrial complex. And creations of the combined products for decrease in deficiency of protein in a delivery has the prospect of practical application in various food systems as a product of simple processing of chick-pea (chickpeas flour), and deep (isolates and concentrates). The main directions of use of chickpeas flour in compoundings of food systems – as gel-forming additive, a moisture-holding component, for increase in protein content in a compounding of flour and sugary confectionery, sauces and mayonnaise, vegetable canned food (Tyrsin, Yu.A. 2015). The isolate of chickpeas protein possessing high functional rates can be recommended for use as emulsifier and also for increase water - and zhirouderzhivayushchy ability of food systems (Tyrsin, Yu.A. 2012;Tyrsin, Yu.A. 2014,Turchaninov, D.V. 2015).

Results of the developed technology solutions are given in table 2 by production of new types of food products on the basis of products of processing of chick-pea – flour and sugary confectionery, vegetable canned food and sauces, both for broad consumer demand, and for specialized groups of the population (with the under content of gluten). At generalization of results (tab. 2) it is possible to draw a conclusion that introduction of products of processing of chick-pea to compoundings of the specified food systems we allow to increase protein content and mineral substances in a finished stock and also biological value. On protein content in a disposable portion of a product from the recommended standard daily rate of consumption these products cannot be referred to category enriched, however in general the developed systems can be carried to products of a healthy delivery. So, mayonnaise sauce in which compounding and isolate of chickpeas protein is used as emulsifier and instead of a part of egg powder is characterized by the under content of fat and cholesterin. Vegetable sauce which compounding included proteinaceous components of a phytogenesis – chickpeas flour and/or isolate of chickpeas protein falls into to group the bezglyutenovykh of products. At the same time the combination of components obeskpechivat high organoleptic characteristics of sauce, good smooth consistence and balance on nutrition and biological value. Introduction of chickpeas flour to a compounding of sugary confectionery instead of a part of granulated sugar allows to reduce power consumption, and high moisture-holding properties of flour from chick-pea promote extension of a shelf-life of finished products. Use of chickpeas flour instead of a part wheat in a compounding of flour confectionery promotes balancing of amino-acid structure and increase in biological value.

Table 2 Influence of additive of products of processing of chick-pea on protein content and mineral substances, power and biological value of foodstuff

Indicator *	Confectionery				Canned vegetables		Mayonnaise production
	flour		sugary				
	cracker	gingerbread	candies	sherbet	caviar	sauce	mayonnaise sauce
PPN content, % mass.	9,0	39,0–52,5	4,8	4,5	5,0	3,5–7,5	1,1–3,2
protein content, g:							
in 100 g of a product (*D* = ± 0,20 %):							
Monitoring	8,79	5,6	1,40	8,75	1,70	2,10	2,76
Experience	11,20	9,2–10,6	2,20	11,74	2,39	4,40	3,25–4,22
in a disposable portion of a product:							
Monitoring	2,64	5,6	0,21	1,30	2,60	1,10–1,60	0,90
Experience	3,36	9,2–10,6	0,33	1,80	3,60	2,20–3,30	1,10–1,50
% of RSNP (75 g) on protein:							
Monitoring	3,5	9,7	0,3	1,8	3,4	1,4–2,1	1,3
Experience	4,5	14,1	0,4	2,3	4,8	2,9–4,4	1,5–2,0
Biological value, %:							
monitoring	65,0	64,0	78,9	82,5	77,2	82,6	82,9
experience	70,2	80,1–77,5	79,7	83,2	79,4	84,4	81,1–88,3
Content of mineral substances (ashes), % (D = ± 0,03 %):							
monitoring	1,01	0,3	0,49	0,83	0,85	1,70	0,61
experience	1,67	0,7–1,1	0,65	1,16	0,88	1,90	0,85–1,35
Power value, kcal / 100 product g:							
monitoring	443,1	365,2	381,1	490,0	130,0	147,2	624,5
experience	438,1	353,7–57,7	375,4	466,0	149,0	103,6	616.3–619,8

* PPN – product of processing of chick-pea; D – definition error; RSNP – the recommended standard daily rate of consumption

For the purpose of complex deep processing of chick-pea the composition of afterproducts – meal (the insoluble rest after protein selection) and envelopes (tab. 3) is studied. These tables 3 demonstrate that meal contains residual amount of protein and in it the starchy fraction (about 70% for nonvolatile solid) prevails. At a mikroskopirovaniye of an exemplar of meal aggregate size of Amylum (15–25 microns) and their form are established (oval). The technology of processing of meal with receiving Amylum including a series of washings and divisions on bolters is offered. It is shown that starchy afterproduct (meal) can be also used after an exsiccation in an integral form as fodder product. The exchange energy makes it about 12,8-13,0 MDzh/kg of nonvolatile solid (for KRS).

Table 3 Chemical composition of afterproducts of processing of chick-pea (in %)

Index	Meal after selection of isolate of protein	Envelopes of beans of chick-pea
Mass fraction of moisture	9,9±0,5	11,1±0,5
Mass fraction of protein on a dry basis	7,8±0,2	6,1±0,2
Mass fraction of fat	0,80±0,10	0,20±0,03
Mass fraction of ashes	1,16±0,03	4,20±0,03
Mass fraction amylum on a dry basis	68,5±0,5	1.4±0,3
Mass fraction of a fat	3,8±0,2	37,9±2,8

Covers of beans of chick-pea are perspective raw materials for receiving food fibers which main advantage is a digestion normalization. Food fibers well connect water, bulk up, absorb organic molecules, bilious acids, promote exchange of cations. Water-retaining power (VUS) of the flour received from envelopes of beans of chick-pea in model conditions of an intestinal path is estimated. The highest VUS for flour from envelopes of beans of chick-pea is noted at pH 8,7 (401±9%). According to classification of food fibers by VUS of an envelope of beans of chick-pea it is possible to carry to srednevodosvyazyvayushchy (2–8 g of water on 1 g of food fibers).

Confectionery are in stable great demand and among adult population, and for children: in Russia retails reach 7,7 kg on one inhabitant. It is rather high rate in comparison with other East European countries (Savenkova, T.V. 2007).

Lack of confectionery is their imbalance on mikronutriyentny structure against the background of high power value. The analysis of the nomenclature of domestic confectionery production which is carried out by specialists of scientific research institute of the Confectionery industry (Evpatchenko, Yu.V. 2011) shows on need of correction of its chemical composition what is caused by the following factors: the high power value (460–590 kcal) at 35% of confectionery, about 260-390 kcal have only 6% of total amount of products, the significant amount of protein practically in all confectionery (no more than 2-8 g on 100 g of a product at norm for adults to 75 g a day, children – up to 110 g a day); about 40% of production with the high content of fat (20–40 g / 100 g); almost at 60% of confectionery for 100 g of a product 70 g of carbohydrates on average are necessary.

Chickpeas flour is the perspective enriching component for creation of confectionery with the adjustable and in advance set properties, nutrition and biological value.

When developing new confectionery were guided by the recommendations of Scientific Research Institute GPU of a delivery of the Russian Academy of Medical Science in the light of the concept of a healthy delivery: decrease in content of sucrose, saturated fatty acids, trans-isomers of fatty acids and increase in content of substitutes of sugar, PNZhK, food fibers, essential minerals and vitamins, the biologically fissile connections having versatile physiological effect in minimum concentration including phytoestrogen, flavonoids, a selenium (Ivanchenko, O.B. 2008;Kurchaeva, E.E. 2011).

Cracker – the flour confectionery with the high content of fat differing in lamination and fragility. The cracker is made from wheat flour of the premium therefore in finished products the deficiency of such irreplaceable amino acids as a lysine and threonine is observed. The comparative analysis of amino-acid composition of the main raw materials – wheat flour and chickpeas shows that on the content of all irreplaceable acids of a squirrel of wheat flour considerably concede to chickpeas (fig. 1) (Ivanchenko, O.B. 2008;GOST 31663-2012 Vegetable oils and animal fats. 2010).

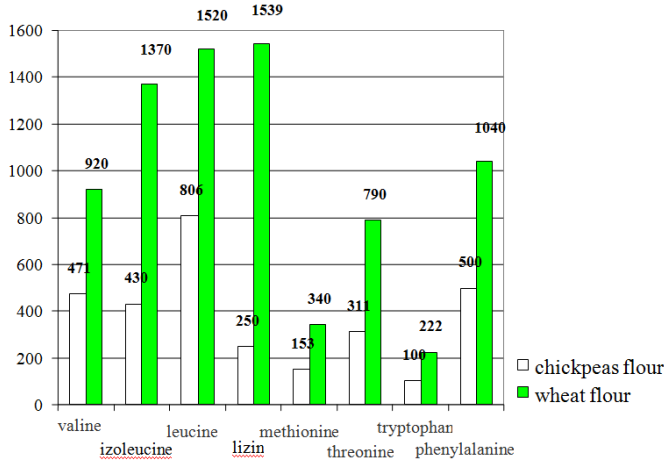

Figure 1: Content of irreplaceable amino acids in wheat and chickpeas flour,mg in 100 g of a product

Besides, wheat flour in comparison with chickpeas is characterized by lower content of micronutrients (fig. 2).

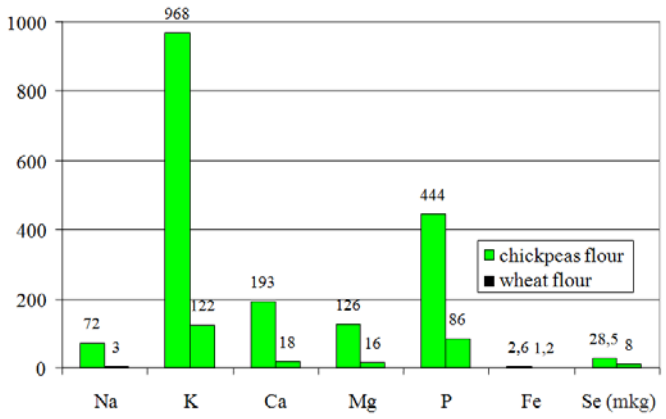

Figure 2: Makro - and micronutrients in structure wheat and chickpeas flour, mg on 100 g (96)

On purpose, increases in content of food fibers, crackers at preparation and baking of test pieces in a compounding of crackers tselnosmoloty chickpeas flour from grade chick-pea beans «Krasnokutsky 28» was used. Extent of replacement of wheat flour chickpeas made 5–15%.

It is established that at an importation (5–10) % of chickpeas flour organoleptic indicators of a cracker did not worsen. Increase in additive of flour from chick-pea up to 15% gives to a finished product specific smack of a bitter taste and bean aftertaste and worsens organoleptic indicators of cookies.

Besides, it is noted that at preparation of test pieces of a cracker with additive of 15% of chickpeas flour dough loses an elasticity and begins to be torn that is inexpedient for technological process. Apparently, it is bound to decrease in content of gluten in composite flour as the quantity and quality of gluten substantially define structural mechanical characteristics of the test.

4 Results and their discussion

Thus, chick-pea is ecologically safe nonconventional raw resource of a phytogenesis for creation of products of a healthy delivery. On the basis of a research of physical and chemical characteristics of beans of chick-pea of grades «Krasnokutsky 28» and «Privo-1» it is established that higher content of protein (24%) and separate amino acids and smaller Trypsinum - the inhibiting activity (2,33 mg/g) is characteristic of grade chick-pea «Krasnokutsky 28». In this regard for production of proteinaceous products (flour, isolate) it is preferable to use grade chick-pea «Krasnokutsky 28».

The analysis of fractional composition of proteins of chick-pea of grades «Krasnokutsky 28» and «Privo-1» allowed to recommend proteinaceous products of processing of chick-pea for application in technology of food with the under content of gluten (albuminous and globulinovy proteinaceous fractions, the maintenance of prolamines of 0,29 - 1,34%, the maintenance of glutelins of 1,63-2,01% prevail). And creations of the combined products for decrease in deficiency of protein in a delivery has the prospect of practical application in various food systems as a product of simple processing of chick-pea (chickpeas flour), and deep (isolates and concentrates).

Technology solutions on receiving new types of foodstuff – crackers are developed. The nutrition value, organoleptic, physical and chemical, microbiological indexes of a new type of foodstuff are investigated. Technical documentation on a new type of food products on the basis of products of processing of chick-pea is developed.

5 Conclusion

The complex characteristic of physical and chemical and functional properties is given, to nutrition value of products of processing of chick-pea – torments and isolate. The technology solutions of use of products of processing of chick-pea proposed in work by production of new types of food products allow to expand a range of flour and sugary confectionery, vegetable canned food and sauces both for broad consumer demand, and for specialized groups of the population.

The article is written on the basis of the results of scientific research conducted within the framework of the state task of the State Educational Establishment of Higher Professional Education in the Moscow State University of Food Production for 2017-2019 on the theme 14.7404.2017 / BCh «Scientific and applied basis of application of traditional and non-traditional plant raw materials and secondary products of its processing (fruit, berry, grain, legume, oilseed, essential oil, herbs) in the technology of specialized products of food industry, cosmetology and pharmaceutics».

Literature:

1. Anikeeva, N.V. *The prospects of application of proteinaceous products from chick-pea seeds* / N.V. Anikeeva // News of higher education institutions. Food technologies. – 2007. – № 5–6. – P. 33–35.
2. Evpatchenko, Yu.V. *Development of technology and compounding of sauce of the functional purpose with pumpkin powder use* / Yu.V. Evpatchenko, N.M. Ptichkina // Storage and processing of agricultural raw materials. – 2011. – № 8. – P. 34–36.
3. GOST 31663-2012 Vegetable oils and animal fats. Definition by method of gas chromatography of a mass fraction of methyl air of fatty acids. – Introduction 1983–01–01. – M.: Standartinform, 2010. – 8 p.
4. GOST P 52173-2003 Raw materials and foodstuff. A method of identification of the genetically the modified sources (GMS) of a phytogenesis – GMO. – Introduction. 2005–01–01. – M.: Gosstandart Russia, 2005. – 15 p.
5. Ivanchenko, O.B. *Raw materials with the low content of gluten in technology of brewing* / O.B. Ivanchenko, N.A. Petrova, M.M. Danina // News StPBGUNiPT. – 2008. – № 4. – P. 42–47.
6. Kazanceva, I.L. *Chickpeas flour – perspective and safe ingredient of food systems* / I.L. Kazanceva // News of higher education institutions. Food technologies. – № 5–6. – P. 13–16.
7. Krilova, V.B. *Receiving proteinaceous medicines of lentil, their property and application* / V.B. Krilova // Food industry. – 1998. – № 3. – P. 26–27.
8. Kurchaeva, E.E. *Use of lyupinovy flour for production of the functional products* / E.E. Kurchaeva, T.N. Tertichnaya, I.V. Maksimov // Storage and processing of agricultural raw materials. – 2011. – № 11. – P. 63–64.
9. Skurihin, I.M. *Chemical composition of foodstuff. Book 2. Reference tables of content of amino acids, fatty acids, vitamins, macro - and minerals, organic acids and carbohydrates* / I.M. Skurihin, M.N. Volgarev. – M.: Agropromizdat, 1987. – P. 35–42.

10. Mosolov, V.V. *Proteolytic enzymes* / V.V. Mosolov. – M.: Science, 1971. – P. 301–309.
11. Petibskaya, V.S. *Soy: chemical composition and use* / V.S. Petibskaya. – Maykop: Polygraph-South, 2012. – P. 20–21.
12. Pashenko, L.P. *Application of a hydroheat treatment of seeds of chick-pea in technology of bakery products* / L.P. Pashenko, Yu.A. Kulakova // Storage and processing of agricultural raw materials. – 2006. – № 2. – P. 57–60.
13. Rudik, F.Ia. *Increase in fodder value of grain of soy deep wet processing* / F.Ia. Rudik, Yu.A. Kodatskiy // Storage and processing of agricultural raw materials. – 2012. – № 1. – P. 41–42.
14. Savenkova, T.V. *Scientific principles of creation of productions technology of the functional confectionery* / T.V. Savenkova // Confectionery production. – 2007. – № 6. – P. 28.
15. TR TS 021/2011 *About safety of food products. –Decision of the Commission of the Customs union 2011-12-09 № 880*. – Elektrostal: Reglament, 2012. – 242 p.
16. Vegetable protein / *Under the editorship of T.P. Mikulovich*. – M.: Agropromizdat, 1991. – P. 346.
17. Tyrsin, Yu.A. *Use of chickpeas flour in a compounding of vegetable sauces with the low content of gluten* / Yu.A. Tyrsin, I.L. Kazanceva, I.I. Timofeev // News of higher education institutions. Food technologies. – 2015. – № 4. – P. 42–46.
18. Tyrsin, Yu.A. *Technology of mayonnaise and mayonnaise sauces on the basis of proteinaceous isolates from chick-pea* / Yu.A. Tyrsin, I.L. Kazanceva, L.F. Ramazaeva. – Fat and oil industry. – 2012. – № 1. – P. 19–25.
19. Tyrsin, Yu.A. *Canned meat with proteinaceous additives* / Yu.A. Tyrsin, I.L. Kazanceva. – Meat industry. – 2014. – № 6. – P. 27–29.
20. Turchaninov, D.V. *Воздействие питания и образа жизни на здоровье населения* / D.V. Turchaninov, E.A. Vil'yams, L.A. Boyarskaya // Food industry. – 2015. – № 1. – P. 8 – 11.

Primary Paper Section: G

Secondary Paper Section: EF, GE, GAGC