С. Сейфуллин атындағы Қазақ агротехникалық университетінің **Ғылым Жаршысы// Вестник Науки** Казахского агротехнического университета имени С. Сейфуллина. - 2016. **– № 2(89**). - С.34-39

INTEGRATED USING WHEY, FLAX SEED AND FLOWER POLLEN IN BREADMAKING

Satayeva Zh.I.,Murtayeva A.B.

Annotation:

In this paper we studied the possibility of rational use of whey as a valuable secondary raw material, milled flax seeds and flower pollen to produce new functional products for preventive nutrition; increase in food, biological value of bakery products, cost reduction and expansion of the product range, the solution of environmental problems. Serum enriched bread and bakery products in essential amino acids, calcium and phosphorus.

Keywords: secondary raw material, whey, flax seeds, flower pollen, bakery products.

Currently in the field of healthy nutrition of the population of Kazakhstan of Concept of the state policy is aimed at solving the problems associated with violation of eating structure, deficiency of biologically active substances. Healthy food concept requires the need to ensure the maintenance and intensification of human vital functions essential foods rich in protein and balanced in essential amino acids, fatty acids, vitamins, minerals, trace elements, appropriate age physiological and psychological characteristics of a human [1].

Kazakhstan residents like dairy products - cheese, cottage cheese, sour cream, kefir, yogurt, and despite the fact that milk production is steadily increasing, it is still not enough to cover the needs of dairy plants. Raw material deficiency problem largely can be solved by recycling and the use of regular wastes from dairy production. Directed bioenergy effects on milk as a complex polydisperse system leads to the separation of protein-fat concentrate (cheese, cottage cheese, casein) and the filtrate (whey). Whey - natural by-product in the manufacture of dairy products [2]. But recently its begins is widely process and used in various kinds.

According to results of statistics of the RK whey resources exceed 45 thousand tons annually. For example, According to theoretical calculations, in 2015 year it is more 3000 tons of milk fat, 1850 tons of lactose, 400 tons of protein and 280 tons of minerals, excluding amino acids, vitamins, enzymes and other components. This figure is derived from the calculation of cheese and cottage cheese production in Kazakhstan in 2015 and shown in Figure 1.

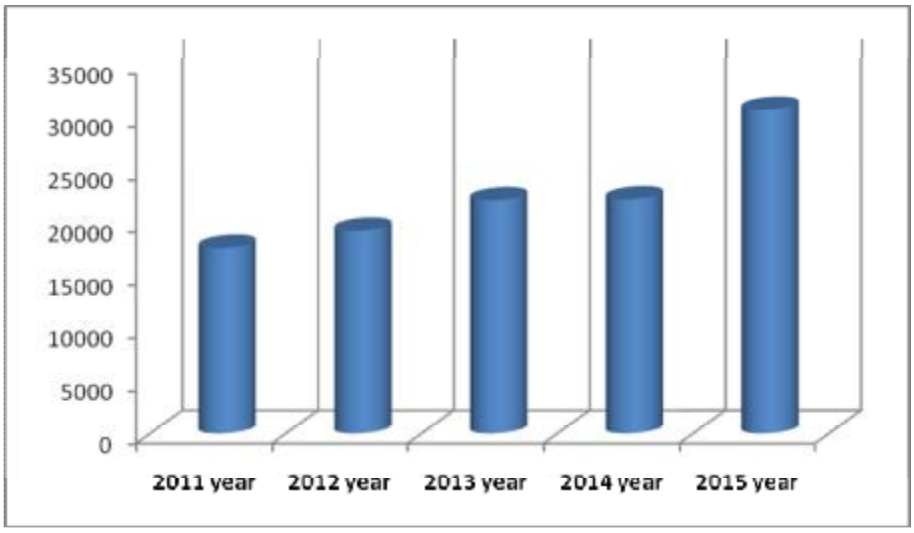

Figure – 1 Production of cottage cheese and cheese in Kazakhstan, tones

Figure 1 shows that the last 5 years production of cheese and cottage cheese is growing in Kazakhstan. Theoretically, taking into account losses, whey output from 1 ton of milk directed to high-protein products, is from 65 to 82%. Depending on the type of main product obtained cheese, curd or casein whey. More than 54% of the production of natural cheese whey is sweet whey. Second place belongs to the acidic cheese whey, less than 1% takes casein whey.

Meanwhile in Kazakhstan on an industrial scale whey not processed. Basically, it discharged into the sewer enters the waste water, which harms the environment. Industrial processing in Russia obtained whey are exposed about 40%, 60% of the world, 80% of Europe, the USA more than 90%.

In the whey as in milk, identified more than 250 compounds, and contains approximately 100,000 molecular structures which are in dissolved (nanolevel) and colloidally dispersed (clusters) states, as well as a suspension (casein dust) and emulsion (milk fat).

The special value of whey as a food product that enhances health, has been recognized only in recent years. On the one hand, the whey is essentially free of fat and therefore low-fat, on the other - is rich with valuable proteins. The sugar contained in whey - is lactose, which is easily absorbed by our body. Daily consumption of 1 liter of whey satisfies 2/3 daily need in calcium, 80% - in the vitamin B2, 1/3 - in vitamins B1, B6, B12, 40% - in potassium [9].

Whey improves kidney function and normalizes liver function, stimulates the activity of the intestines, helps with rheumatism, high blood pressure, improves circulation and prevents the development of atherosclerosis, reduces inflammation, has a calming effect on the nervous system, cleanses the skin, it is very useful for pregnant women. Drink this slightly acidic drink is recommended for the prevention and treatment of many diseases [10].

The composition and properties of cheese and curd whey are shown in table 1.

Table 1 - Composition and properties of whey

Indicators	**Whey**	
	Cheese	**Curd**
Dry matter,%, incl .:	4,5 – 7,2	4,2 – 7,4
Milk fat	0,05 – 0,5	0,05 – 0,4
Protein	0,5 – 1,1	0,5 – 1,4
Lactose	3,9 – 4,9	3,2 – 5,1
Mineral salts	0,3 – 0,8	0,5 – 0,8
Acidity, ° T	15 – 25	50 – 85
Pн	6,3	4,4
Density, kg / m3	1018 – 1027	1019 – 1026

Whey contains such valuable minerals as potassium, calcium, magnesium, phosphorus and many vitamins. Whey helps the body remove toxins and excess fluid, and also to break down harmful deposits without detriment to health, perfectly satisfies hunger, thus can be used as an effective natural means for weight loss and the basis of the different diets. It is useful to drink a whey diet variety.

The most important task of the modern food industry is the development of scientific, theoretical and practical foundations of the new forms of food, as a qualitatively new field of production of food products.

Thus, the aim of our study was to investigate possibility to use milk whey, biologically valuable plant raw material - flax seeds and flower pollen to produce new functional foods designed for therapeutic and preventive nutrition, increased food and biological value of bakery products, cost reduction and expansion of the product range. Bread is one of the most consumed foods, the most appropriate and affordable product, by which to solve the problems preventing a range of diseases and nutritional deficiencies.

The basis of new product - curd whey. To give the drink a biological and functional value in it is planned to introduce milled flax seed. Development of optimal recipes and features of technologies will expand the range of useful functional foods.

Flaxseed, on average, contains 23% of proteins, 35% of fat, nitrogen-free extractives 22%, 9% fiber, 8% of water, 3% of ash. Each of these components is making a valuable contribution to the diet. Flax seeds are rich in dietary fiber, polyunsaturated fatty acids (Omega-3 and Omega-6), vitamins B1, B2, B6, folic acid, antioxidants (lignans), rich in

antioxidants, as well as necessary for the health of trace elements: potassium, calcium, magnesium, zinc and others. Protein of flax seed has a high nutritional and biological value and balanced of amino acid composition is superior of many cereals and legumes proteins. Lignans "plant hormones", which in flax seeds 100 times more than in other plant products, are well known as antioxidants that prevent the development of cancer, they have the antibacterial and antivirus effects. Flax seeds are a source of F vitamin, is actively involved in fat and cholesterol metabolism, vitamins A and E have beneficial effects on the immune system, protect against lipid peroxidation, reduce premature aging. Flax seeds are an important source of selenium, which, in turn, prevents the development of tumors, cleanses the body from heavy metals, helps to improve vision and brain activity [4].

American scientists have received a product containing protein and gluten (mucous part) of flax seeds by cold, then hot pressing, thereby separating the linseed oil. Flax protein product containing 10-20% pentosan and 35-60% protein. This product is perfect as an auxiliary additive to improve the quality of bread: improved dough structure porosity, volume of bread before baking can be frozen, reduced loss, prolonged shelf life, reduced salt content by improving the binding ability of water, do not cause any side tastes [6].

Based on the information, it is obvious that flaxseeds are the richest source of alpha-linolenic acid and lignans. Further, a potential source of soluble fiber, antioxidants, and high-quality protein. He had come a long way from the medicine in ancient times as a source of healthy food [7]. As a result, flax and linseed oil are the preferred ingredients of functional foods and nutraceuticals in the future. Therefore, the use of flaxseed in whole or in ground form can be recommended as a food additive.

Many farmers today in Kazakhstan are engaged in cultivation of flax. The reason for this is the high profitability of production. In Kazakhstan there is a significant increase in acreage under oilseed flax - from 2012 to 2014, they increased from 388 thousand ha to 709 thousand ha...

For example, "Naydorovskoe" LLP supplies flax in 18 countries: 15 European Union countries, including Germany, Belgium, Denmark, Switzerland, the Netherlands. The reason is its quality: high oil content, which makes it suitable for food and medical purposes [5].

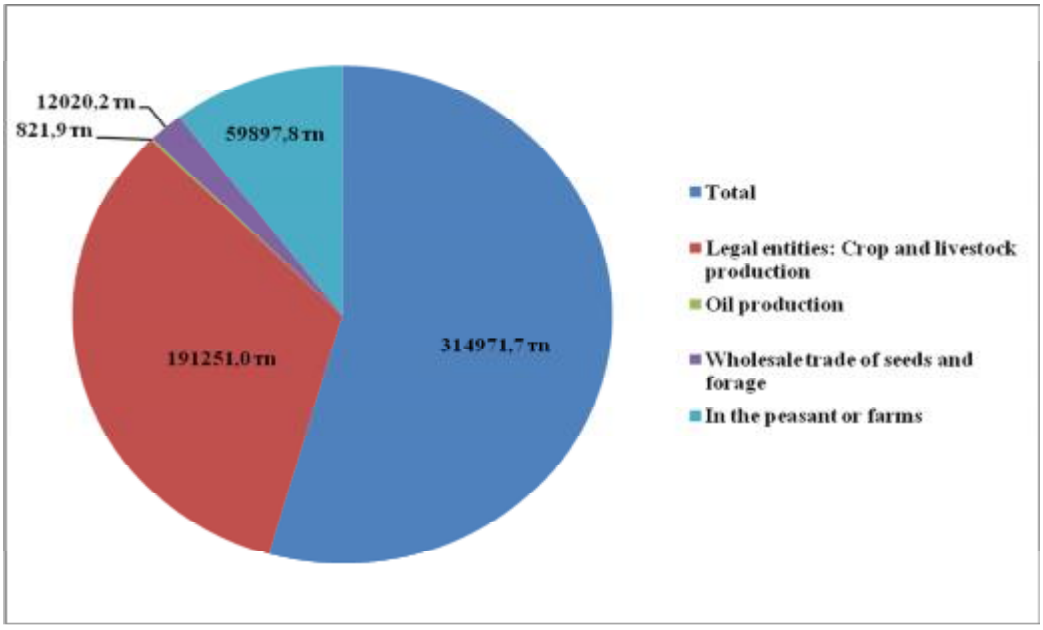

Figure – 2 Presence of flax seeds in Kazakhstan on January 1, 2016

Figure 2 shows that the largest number of flax seeds has legal entities where they are engaged in crop production and is used in animal husbandry. The lowest number of seeds processed for vegetable oils. Hence, it should be noted that flax seeds have great promise for processing and use them for food purposes as a valuable natural resources.

For flax seeds, grown in the Karaganda region LLP "Naydorovskoe" were performed analyzes on the chemical composition and nutritional value at the infrared analyzer FOSS-DS2500 (Table. 2).

Table 2 - Analysis of the chemical composition and nutritional value of flax

Name sample	Moisture, %	Protein, g	Fat, g	Fiber, g	Ash, g
1 replication	3,8	36,1	38,5	18,9	2,1
2 repetition	3,8	36,2	38,5	18,9	2,2
3 replication	3,8	36,2	38,8	18,9	2,3

In the laboratory, we determined the content and quality of wet gluten in the crushed flax seeds. Gluten was good, satisfactory flexibility, a short stretch, elasticity, which has a positive effect on the bread production.

Using flower pollen-pollen as a raw material containing a physiologically functional food ingredients for the production of bakery products is relevant because their application can have a positive effect on the properties of raw materials, semi-finished and finished products, as well as increase the nutritional value of products. Products produced by bees, have a high biological activity. The most valuable chemistry nutritionally have pollen [8].

We in scientific elaboration as enriching additives used biologically active bee products - pollen, pollen. Before making the dough, flower pollen previously dissolved in warm whey. The optimum dosage flower pollen is 5-6% by weight of flour. Adding pollen-pollen gives finished products a specific honey and floral flavor and aroma.

There are many ways to cook tasty and healthy bread, based on the same basic recipe. However, all it based on what raw products and additives we introduce into the formulation. It is adding something useful in a bread recipe, get something entirely new, biologically enriched nutritional supplements that have a beneficial, preventive effects on the human body as a whole.

So, into the baked product functional action developed by us includes: baking pressed yeast, cottage cheese whey, wheat flour, ground flax seeds, flower pollen, salt. The use of whey improves the lift of the yeast, foaming decreases by increasing the acidity. Ground flax seeds are added at a ratio of 12% to the total weight of the flour. To activate the fermentation microflora the water is replaced with whey. Whey, which replaces some of the water will make the texture of the crumb gentler and softer. Flax seed and pollen will give the bread a new character, telling him a light nutty flavor.

Through the use of whey and milled flax seed increases the nutritional value of bakery products due enrichment of bread with vitamins, minerals, essential amino acids (lysine and tryptophan), omega-3 and omega-6 fatty acids; activates fermentative microflora and increases lifting force sponge; intensified the process of preparing the dough; increasing the volume of production output; increases the rate of accumulation of acid in the dough; reduced time of proofing; slows staling of bread and bakery products; improves and enriches the flavor and appearance of bakery products.

Based on the results of laboratory analysis trial baking wheat-flax bakery products based on whey is established:

- Optimum ratio of wheat flour, ground flax seeds for the best quality of finished products;

- Determined the optimal amount entering of flower pollen the weight of the product and its impact on the quality of bakery products;

- The effect of dose on the quality indicators of wheat-flax bakery products based on whey.

We have calculated the nutritional value of bakery products based on whey with added flower pollen, found a significant increase in the nutritional value compared to wheat bread.

Developed wheat and flax bread products based on whey largely satisfy the need of the human body in proteins, fats, polyunsaturated fatty acids, dietary fiber, amino acids, minerals and vitamins and can be recommended as a bakery for healthy nutrition of different population groups.

We have analyzed the main advantages of the introduction of

developed technologies at the enterprises of the dairy and bakery industry. This replacement of traditional prescription components: water + milk serum (up to 100%), sugar (by lactose present in the whey and pollen), stabilizers on the functional ingredients (linseed).

Implementation the proposed technologies on the basis of whey products allows us to give functional features, including synbiotic, lower calorie, increase food and biological value of natural clean and useful products, to expand the range of bakery products of mass consumption.

For dairy companies new technological solutions allow you to implement a closed production cycle, increase the complexity of the processing of whey, ensure economic efficiency and environmental friendliness. The results of scientific research can make a contribution to the development of resource-saving technologies in the food industry.

Undoubtedly, the future behind dairy and bakery products of new generation characterized by preventive properties and provide additional health benefits. [4]

References

1 Оспанов А.А., Тимурбекова А.К. Технология производства полизлаковых продуктов. Учебное пособие. – Алматы: ТОО "Нур-Принт" - 2011. – С. 112.

2 Храмцов А.Г. Молочная сыворотка. - М.: Агропромиздат, 1990. – С. 240

3 Храмцов А.Г. Феномен молочной сыворотки. - Санкт-Петербург: Профессия, 2011. – С. 802.

4 Живетин В.В., Гинзбург Л.Н. Масличный лен и его комплексное использование. - М.: 2000. – С.75.

5 Пономарев А.Н., Мельникова Е.И., Богданова Е.В. Применение молочной сыворотки в функциональном питании // Монография. – Воронеж, 2013. – С. 180.

6 US 5925401 A Flax preparation, its use and production. Barbara Kankaanpaa-Anttila, Markku Anttila. 1999.

7 Ankit Goyal, Vivek Sharma, Neelam Upadhyay, Sandeep Gill, and Manvesh Sihag. Flax and flaxseed oil: an ancient medicine & modern functional food. Journal of Food Science and Technology. Springer/ v.51(9); 2014 Sep. 1633–1653.

8 Якименко Т.П., Утяганов М.В. К вопросу о возможности применения пчелопродуктов в хлебопечении. Фундаментальные и прикладные аспекты создания биосферосовместимых систем: материалы международной научно-технической интернет-конференции (декабрь 2012г., г. Орел), Госуни-верситет – УНПК. – Орел: Госуниверситет – УНПК, 2013. – 191с.

9 Ji, T. Cheddar whey processing and source: I. Effect on composition and functional properties of whey protein concentrates / T. Ji, Z. U. Haque // International Journal of Food Science and Technology. 2003. - 38. - P. 453-461.
10 Gnanasekar R., Balaraman N. Utilization of whey in dairy rations a review // Indian Journal of Dairy Science. - 2001. - V. 54. - P. 3-9.

Түйін

Бұл жұмысты зерттеу барысында екіншілік шикізат ретінде сүт сарысуымен майдаланған зығыр дәндерінен профилактикалық бағытталған, жаңа функционалды өнімді алу үшін нан-тоқаш өнімдерінің тағамдық-биологиялық құндылығын арттыру; өнім ассортименттерін кеңейту және өзіндік құнын төмендету; экологиялық мәселелерін шешу тиімді болып табылады. Сарысу нанды және нантоқаш өнімдерінде кальций және фосфор, алмастырылмайтын амин қышқылдарымен байытады.

Резюме

В данной работе изучены возможности рационального использования молочной сыворотки как ценного вторичного сырья и молотых семян льна для получения новых функциональных продуктов, предназначенных для профилактического питания; повышение пищевой, биологической ценности хлебобулочных продуктов, снижение себестоимости и расширение ассортимента продукции, решение экологических проблем. Сыворотка обогащает хлеб и хлебобулочные изделия незаменимыми аминокислотами, кальцием и фосфором.