

**Project name: IRN AP14871765 Development of BIO-AP biologically active additive with the production of micronutrients complex based on plant raw materials for food enrichment**

**Importance:**

Lots of consumers are switching to a healthy lifestyle and begin to include functional foods in their diet. Many well-known companies route their work to the production of proper nutrition products by adding healthy ingredients to products, enriching food. Various dietary supplements also help to increase the awareness of customers about this type of products.

In this regard, food producers of our country and consumers have a need for domestic biologically active additives, the use of which in food products should have the following scientifically substantiated facts:

Their positive impact on human health;

Absence of negative effects on finished products;

Positive effect on the quality and consumer properties of the finished product.

The problem is that there is a low range of food products (meat and dairy products) enriched with biologically active additives (hereinafter dietary supplements) at present days in the Republic of Kazakhstan. There are a few studies on the use of dietary supplements in food production, their impact on finished products. That is why we see insufficient number of implemented into production studies on the development of food technology with useful ingredients, that positively affect human health.

The solution of the problem is the development of a biologically active additive with the production of micronutrient complexes based on plant raw materials for food enrichment.

**Aim:**

The aim of the project is to develop a biologically active additive BIH-AP with the production of micronutrient complexes made from natural plant raw materials (*Portulaca oleracea*), saskatoon berries (*Amelanchier*), to enrich and improve the effectiveness of healthy food products.

**Expected results:**

According to the expected results there will be:

- Monitoring and systematization of literary data and patent information on the research topic in the world practice will be carried out.
- The use of *Portulaca oleracea* and saskatoon berries (*Amelanchier*) as raw materials for the production of dietary supplements as a component of functional products will be justified.
- The technology of obtaining BIH-AP biologically active additive from *Portulaca oleracea* and saskatoon berries (*Amelanchier*) in the laboratory will be developed.

- Organoleptic, physico-chemical parameters, as well as safety indicators of dietary supplements from Portulaca (*Portulaca oleracea*) and saskatoon berries (*Amelanchier*) will be studied.
- The composition of functional ingredients of dietary supplements from Portulaca (*Portulaca oleracea*) and saskatoon berries (*Amelanchier*) will be studied.
- The formulation and technological modes of food production with the addition of biologically active additives will be developed (fermented milk products: yogurt, cottage cheese; meat products: boiled sausage, dietary sausages).
- An assessment of organoleptic and physico-chemical indicators, as well as safety indicators of the developed functional products will be given.
- The calculation of the economic efficiency of the developed biologically active additive (nutraceutical group), capable of competing in its quality indicators with various foreign types of dietary supplements, will be carried out.
- Regulatory and technical documentation of the developed dietary supplements (nutraceuticals group) will be developed and approved (organization standard, technological instructions).
- According to the results of the project implementation during the entire implementation period, at least 3 (three) for articles and (or) reviews in peer-reviewed scientific publications will be published in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five); as well as at least 2 (two) articles or reviews in a peer-reviewed foreign or domestic publication recommended by COXON; 4 manuscript at an international conference.

### **The results obtained:**

The analysis of existing and developed technologies of biologically active additives in the world and their use in the production of dairy and meat products is carried out.

Biologically active food additives have become widespread among various groups of the population due to the need to prevent alimentary diseases and preserve health. In all economically developed countries, the production and turnover of functional nutrition products is one of the dynamically developing sectors of the economy and trade. A significant part contains plant and animal raw materials in its composition as sources of biologically active substances, which makes it possible to give this group of food products a different functional orientation.

Hayes et. al scientists have proved the influence of nutraceutical dietary supplements of plant origin on the quality and stability of the shelf life of raw and boiled pork sausages. In addition, sesamol, ellagic acid, olive leaf extract (Sesamol, ellagic acid, olive leaf extract) contained in the supplement provide bioactive components (for example, antioxidant polyphenols), and also satisfy consumers' requests for healthier functional meat products. Rahman et.al the complex effects of black cumin (*Nigella sativa*) on the quality of beef patties were

investigated. The results showed that black cumin extract is a source of excellent antioxidant potential, increased the shelf life of semi-finished products by 15 days, due to increased lipid stability. In addition, the addition of black cumin extract to beef patties improved the nutritional value of the products. This indicates the practical importance in the field of healthy and functional nutrition. Madane, P. et al. investigated the effectiveness of moringa flower extract (MF) for the development of a functional chicken meat product. The addition of a functional ingredient increased the antioxidant activity of the product, improved the nutritional value and technological properties of the finished product. Jeong, Y., & Han, Y. conducted a study with the addition of Wanggasi-Chunnyuncho fruit powders (*Opuntia humifusa* F.jeollaensis) to sausage products in order to improve the functional and technological properties of the finished product. Scientists of the Kemerovo Institute of Technology of the Food Industry have developed a biologically active additive from the pulp of sea buckthorn, with the aim of further use in the production of special and medicinal butter and other dairy and fat products. Dikhanbayeva F.T. et al. an *in vivo* experiment was conducted, with the help of which it was found that the addition of flaxseed flour to the curd mass increased the angular fat metabolism, curd mass with the addition of celery root powder prevents the appearance of low-density lipoprotein plaques in the artery.

Thus, the analysis of scientific literature has shown that this scientific direction is relevant from the standpoint of improving meat and dairy products in order to give therapeutic and prophylactic, immunostimulating, functional purpose, enrichment of products with micronutrients. In addition, we see that the use of biologically active additives can have a positive effect not only on human health, but also there is a positive effect on the consumer properties of finished products (improvement of organoleptic parameters, structural and mechanical properties, increased shelf life).

Northern Kazakhstan has extensive plantings of the irgi shrub. This type of berries is common in Akmola and Kokshetau regions. To date, studies of the physico-chemical composition and technological properties of irgi berries have not been conducted, since the processing of plant raw materials is generally poorly developed in the northern regions of Kazakhstan. Therefore, one of the main tasks is an in-depth study of the composition and properties of irgi berries and the study of processing methods for use as a biologically active additive.

As a result of the research, the following factors were established:

The physico-chemical parameters of irgi berries and the juice of irgi berries were studied. Considering that the collection of irgi berries is 2 weeks (end of July and beginning of August), the berries were frozen. The juices were obtained, under laboratory conditions, from pre-thawed irgi berries of the 2022 harvest. The yield of juice from 1 kg of berries was  $350 \pm 20$  g, and the yield of pomace was  $570 \pm 20$  g. Berry squeezes will be studied in further studies.

Considering that the juices of irgi berries will be used as a biologically active additive, the effect of heat treatment on the properties of the juice was investigated. Optimal modes of pasteurization of irgi juices have been established: the pasteurization temperature is  $70^\circ\text{C}$ , the duration is 10 minutes. The effect of

pasteurization on the titrated acidity and pH of the juice was determined. Titrated acidity of juices after pasteurization decreased by 0.5 g / dm<sup>3</sup>, which is not a significant loss of titrated acids in the juice. The pH level of the juices has not changed and is 4.1.

The mass fraction of suspensions in juices, the content of extractive substances by relative density, dry substances and the mass concentration of sugars were studied. These indicators determine the qualitative characteristics of juices. Studies have also been conducted before and after juice pasteurization. The amount of suspensions after pasteurization decreased from 12.88 to 6.79 g / 100 cm<sup>3</sup>, which is a positive factor, since suspensions give the juices turbidity and uneven consistency. Extractive substances, due to the influence of temperature, increased from 179.3 g/dm<sup>3</sup> to 189.8 g/dm<sup>3</sup>, which had a positive effect on the taste of the juice.

The effect of pasteurization on the dry matter content and the mass concentration of sugars in juices has been investigated. A significant increase in these indicators has been established. The dry matter content increased by 1.2%, the mass concentration of sugars increased by 10 g/ 100 cm<sup>3</sup>.

The physico-chemical parameters of irgi juice were determined, the amount of proteins was 0.44%, carbohydrates 10.2%, moisture 75.2%, the data obtained comply with the requirements of GOST 32101-2013 "Juice products".

Thus, the juice obtained from irgi berries has positive organoleptic characteristics, such as pleasant taste, smell, rich color. The use of heat treatment under optimal conditions leads to an increase in extractive substances and the mass concentration of sugars, which excludes the possibility of adding artificial food additives to the product: dyes, sweeteners and flavors, which makes it possible to create natural products.

The vegetable raw material purslane has also been studied, this plant thrives in many biogeographic places around the world and adapts well to many adverse conditions, such as drought, salinity and conditions with a shortage of nutrients. The chemical composition of *Portulaca* (*Portulaca oleracea*) was studied, according to the data obtained, the calorie content is 1.2% of the norm, proteins, fats, carbohydrates are 2.6%, 0.7% and 1.6%, respectively. The antioxidant content and nutritional value of purslane are important for human consumption. It has a huge nutritional potential for the use of this vegetable raw material.

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#### **Information for potential users:**

A technology for the production of biologically active additives with the production of micronutrient complexes based on plant raw materials for food enrichment will be developed. Based on the data obtained, a technology for the production of meat and dairy products with the use of biologically active additives from vegetable raw materials will be developed.