
PROSPECTS FOR THE USE OF ORGANIC DRIED PHYSALIS IN THE PRODUCTION OF FLOUR CONFECTIONERY

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Abstract: The article examines the consumption properties and prospects of using dried organic physalis in the production of flour confectionery products. The research object is dried physalis TM "Navitas". The energy value of this product is 110 kcal/100 g. The fat content is 1 g/100 g; carbohydrates – 20 g/100 g; proteins – 2 g/100 g. Using atomic absorption spectrophotometry on a C-115 PK atomic absorption spectrophotometer, it was established that the potassium content in 100 g of the product is 543 mg, the phosphorus content is 43 mg/100 g. The content of other trace elements is limited. Thus, 100 g of dried organic physalis satisfies the need for potassium per day by 23.16%. Among all vitamins, physalis contains the most vitamin C – 11.7 mg/100 g. Physalis meets the needs of vitamin C by 16.71% and vitamin PP – by 18.50%. Vitamins of group A and B in the product are contained in a limited amount. To study the content of toxic elements in the product, generally accepted methods were used: copper, zinc, lead and cadmium were determined by the atomic absorption method, arsenic by the colorimetric method, mercury by the flameless atomic absorption method. The level of all toxic elements is below the permissible limits. Cadmium was not detected in organic physalis. Such data may indicate the safety of the product. The author has developed a recipe for a new cake made from organic raw materials "Grechanyk", which contains dried physalis at the rate of 54 kg/t of product. Further research will be aimed at studying the consumer properties of the developed product.

Keywords: physalis, organic flour confectionery, safety indicators, nutritional value, energy value.

1. Introduction

Physalis (Physalis) belongs to the nightshade family. Physalis is found in the wild in Central and South America. It is a fairly popular plant in Mexico, Guatemala, Peru, Venezuela, and Colombia, and a significant number of high-yielding varieties adapted to cultivation on the plains and in the mountains have been bred [1]. Since flour confectionery products are in high demand among the population, the issue of improving their biological value is of scientific interest. Traditional raw materials for the production of flour products contain few mineral elements, vitamins, and useful fatty acids. That is why the research of alternative raw materials, which could enrich the products with useful substances, is relevant. Data on the use of physalis for organic flour confectionery in the scientific literature is limited. We have proposed a recipe for a cupcake made from organic raw materials "Grechanyk", which contains dried physalis at the rate of 54 kg/ton of product [2].

2. Literature review

The main part of physalis fruits is water (86.4%), carbohydrates (5.5%), dietary fibers (1.79%), proteins and fats. The number of constituent elements varies depending on the variety of physalis and the method of its cultivation. The energy value of the product is 53 kcal per 100 g of berries [1]. It is known that the juice of physalis fruits contains 0.2% fatty acids. The essential fatty acids consist of linoleic acid, oleic acid, palmitic acid, α -linolenic acid, and palmitoleic acid. In addition, several other fatty acids have been identified, including gadoleic, digomo- α -linolenic, erucic, lignoceric, and nervic acids. There are data that the content of linoleic acid was 70.5%, and oleic acid – 12.87% [3-4]. Physalis grass is also characterized by a fairly high content of flavonoids – almost 1.36%. Physalis contains organic acids – succinic, citric, malic, as well as quercetin and carotenoids. Physalis fruits are shown in Figure 1.



Fig. 1. Physalis fruits

Physalis is valued for its high pectin content (up to 10% of dry weight), the gelling capacity of which is 2 times higher than that of apples. Physalis fruits are pleasant to the taste, they are used both fresh and processed. It is used fresh in salads, soups, and for cooking vegetable caviar. Compotes, jams, marmalade, candied fruit, pie

fillings are prepared from physalis. Physalis fruits are used for the production of jelly-like confectionery products (marmalade, jam, marmalade, fillings, toppings, etc.) [5].

3. Problem statement

The purpose of the study is to analyze the prospects for the use of dried physalis in the production of organic flour confectionery. To achieve the goal, the following tasks were performed:

- to experimentally investigate the content of mineral elements in dried physalis;
- to determine the % satisfaction of the daily need for mineral elements from the consumption of 100 g of dried physalis;
- analyze the content of vitamins in dried physalis and determine the % satisfaction of the daily requirement from the consumption of 100 g of dried physalis;
- to experimentally investigate the safety indicators of dried physalis.

For the production of organic confectionery products, dried organic physalis of the TM “Navitas” was chosen (Fig. 2).



Fig. 2. Dried physalis

Table 1. Shows information according to the labeling of dried physalis.

Table 1
Information according to the labeling of dried physalis.

Requirements for labeling of organic food products [6-7]	Object of study
The name of the food product	Dried organic physalis
List of ingredients	Physalis berries
Any ingredients or processing aids used in manufacturing	Not specified
Amounts of certain ingredients or categories of ingredients	Not specified

Amount of food product in established units of measurement	227 g
Minimum expiration date or "use by" date	Specified
Any special storage conditions	Store at a temperature of less than 25 ⁰ C and a relative humidity of less than 75%.
Name and location of the food market operator	«Navitas», USA
Country of origin or place of origin	USA
Instructions for use	The product is ready for use
Information about the nutritional value of the food product	The energy value of this product is 110 kcal/100 g. The fat content is 1 g/100 g; carbohydrates – 20 g/100 g; proteins – 2 g/100 g.

Also, the name of the organic certification body (USDA Organic) is indicated on the package.

The content of mineral elements was determined by the method of atomic absorption spectrophotometry on the atomic absorption spectrophotometer S-115 PC. To study the content of toxic elements in new cookies, generally accepted methods were used: copper, zinc, lead and cadmium were determined by the atomic absorption method, arsenic by the colorimetric method, mercury – by the method of flameless atomic absorption [8].

4. The main research material

The results of the study of the mineral composition of organic physalis are shown in Table 2.

Table 2
The content of mineral elements in dried organic physalis

The name of the trace element	Content in 100 g, mg
Potassium (K)	579,00
Calcium (Ca)	8,00
Magnesium (Mg)	20,00
Натрій (Na)	3,00
Phosphorus (P)	43,00

As can be seen from Table 2, physalis contains a significant amount of potassium and phosphorus, the content of other mineral elements is limited. Figure 3 shows the % satisfaction of the daily need for mineral elements when consuming 100 g of physalis.

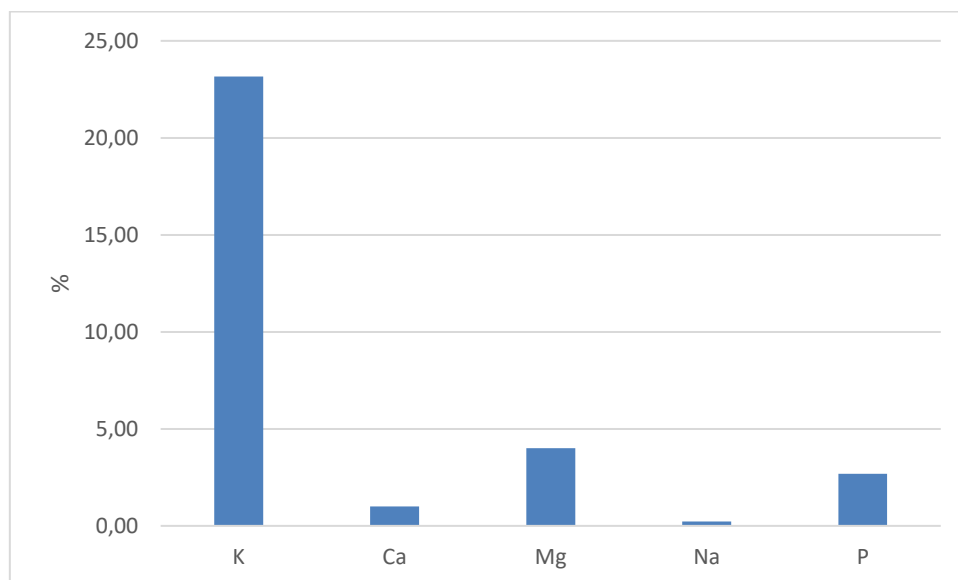


Figure 3. % satisfaction of the daily need for mineral elements from the consumption 100 g of physalis

From the data in Figure 3, it can be seen that 100 g of dried organic physalis most satisfies the need for potassium – by 23.16%. The content of Ca, Mg, Na, P is quite limited. Table 3 shows the vitamin composition of dried physalis, according to [9-11].

Table 3
Vitamin composition of physalis

The name of the vitamin	Content in mg/100 g of product
Vitamin A	0,01
Vitamin B ₁	0,04
Vitamin B ₂	0,04
Vitamin B ₆	0,06
Vitamin B ₉	7,00
Vitamin C	11,70
Vitamin E	0,38
Vitamin PP	1,85

The data in Table 3 show that, among all vitamins, physalis contains the most vitamin C – 11.7 mg/100 g. The % satisfaction of the daily need for vitamins from the consumption of 100 g of physalis is shown in Fig. 4.

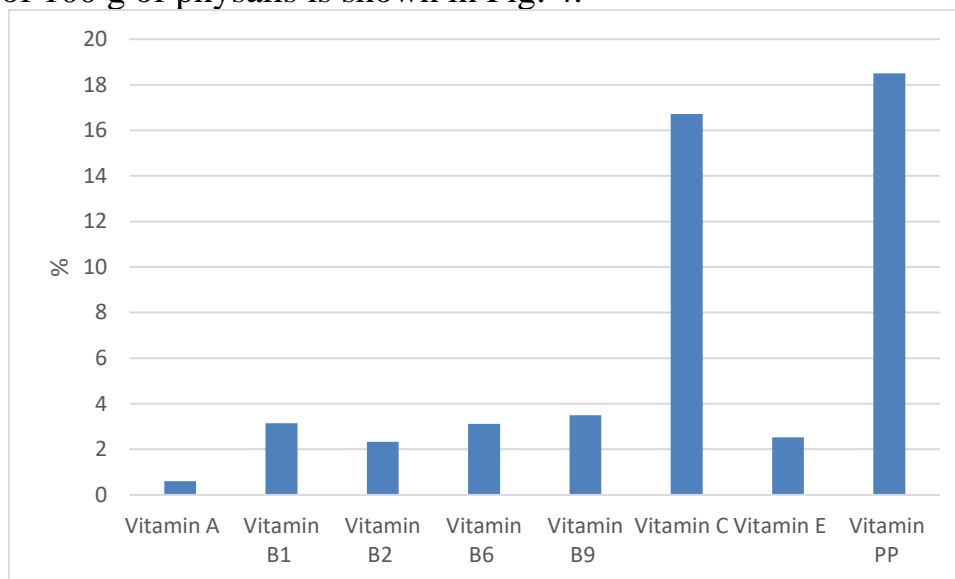


Fig 4. % satisfaction of the daily need for vitamins from the consumption 100 g of physalis

Physalis best meets the needs of vitamin C – by 16.71% and vitamin PP — by 18.50%. Vitamins of group A and B in the product are contained in a limited amount. Unfortunately, when baking at high temperatures, vitamin C is destroyed. Therefore, physalis can be considered a promising component for enriching flour products with vitamin PP. Physalis can also be used to prepare fillings.

Table 4 shows data on the content of toxic elements in organic physalis.

Table 4
The content of toxic elements in organic physalis

The name of the toxic element	The permissible level, mg/kg, is not more than	Level in the studied sample, mg/kg
Plumbum	0,50	0,15
Cadmium	0,10	Not found
Arsenic	0,30	0,10
Mercury	0,02	0,001
Copper	10,00	7,90

As can be seen from Table 4, the level of all toxic elements is below the permissible limits. Cadmium was not detected in organic physalis. This is a very positive fact from the point of view of food security. Cadmium is a toxic heavy metal, the physiological functions of which in the body are unknown, it is toxic at very low levels, it has acute and chronic effects on health. The most dangerous characteristic of Cd is that it accumulates throughout life, has a long biological half-life in the human body of 10 to

30 years. When cadmium enters the body, it has a high migration speed, biochemical activity, is characterized by a polytropic toxic effect and the ability to accumulate in a number of organs and tissues, but, above all, in the kidneys, liver, tubular bones, pancreas, spleen, disrupts metabolic processes and physiological functions, induces processes of carcinogenesis, is an antagonist of a number of vital micro- and macroelements. A feature of the harmful effects of cadmium is its rapid assimilation by the body and slow elimination [12-15].

5. Conclusions

So, dried organic physalis is a promising product for improving the quality of flour confectionery. The fat content is 1 g/100 g; carbohydrates – 20 g/100 g; proteins – 2 g/100 g. 100 g of dried organic physalis satisfies the need for potassium the most - by 23.16%. that the potassium content in 100 g of the product is 543 mg, the phosphorus content is 43 mg/100 g. The content of other trace elements is limited. Thus, 100 g of dried organic physalis satisfies the need for potassium the most – by 23.16%. Among all vitamins, physalis contains the most vitamin C – 11.7 mg/100 g. Physalis best meets the needs of vitamin C – by 16.71% and vitamin PP - by 18.50%. Vitamins of group A and B in the product are contained in a limited amount. Due to the heat-labile nature of vitamin C, it will not be possible to enrich flour confectionery with this vitamin. But physalis can significantly improve the content of vitamin PP in flour products.

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