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ANTIOXIDANT CHARACTERISTICS OF NATURAL FOOD SUPPLEMENTS OF VEGETABLE ORIGIN

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Abstract: *The article demonstrate the prospects for the use of natural functional ingredients in multicomponent products. Information characterizing the resistance of some natural dyes and antioxidants of plant origin to various modes of heat treatment is presented.*

Key words: *multicomponent products, nutritional supplements, functional ingredient*

Competition in the global food market is increasing every year. Manufacturers are expanding their product assortment, following the provisions of the doctrine of food security and focusing on consumer preferences. The food industry must satisfy not only the growing desire of consumers within the country, but also develop innovative strategic directions for exporting goods to other countries [1, 2].

When modeling formulations recipes for new products, special attention should be paid to their safety, properties of consumer preferences and value added, which will directly affect the competitiveness of the product. Following the concept of healthy eating, most consumers want to obtain products with a minimum amount of artificial ingredients, and manufacturers are taking this into account.

The most natural food supplements are made from plant-based ingredients. The effectiveness of the use of functional components of plant origin is quite high, and the range of their application is very wide. These food additives are used to improve the color, taste, aroma, texture and shelf life of foods.

To reduce the rate of oxidation of fats and proteins contained in products and, consequently, increase their shelf life, it is advisable to use plant-derived antioxidants.

The complexity of the use of natural food additives lies in the instability of their content in raw materials, since these are substances of biological origin, which are affected by many factors, both during plant cultivation and during storage and processing.

Currently, there are a large number of names of substances and preparations that are included in the group of plant antioxidants.

Some natural antioxidants are used in the food industry not only as antioxidants, but also as natural dyes.

Anthocyanins are natural pigments and have antioxidant properties, their highest content is in brightly colored berries, vegetables and fruits. As a dye, anthocyanins are used to give a red color to sauces, soft drinks, and sweets. In a neutral environment, anthocyanins color foods blue-violet, in an alkaline medium they give a yellow-green tint, so their use as dyes is limited in the dairy industry.

The concentration of anthocyanins of plant origin can vary significantly depending on the various types of thermal preparation of raw materials, its processing.

The diagram shows data characterizing a significant change in the amount of anthocyanins in red cabbage, depending on the heat treatment modes (Figure 1).

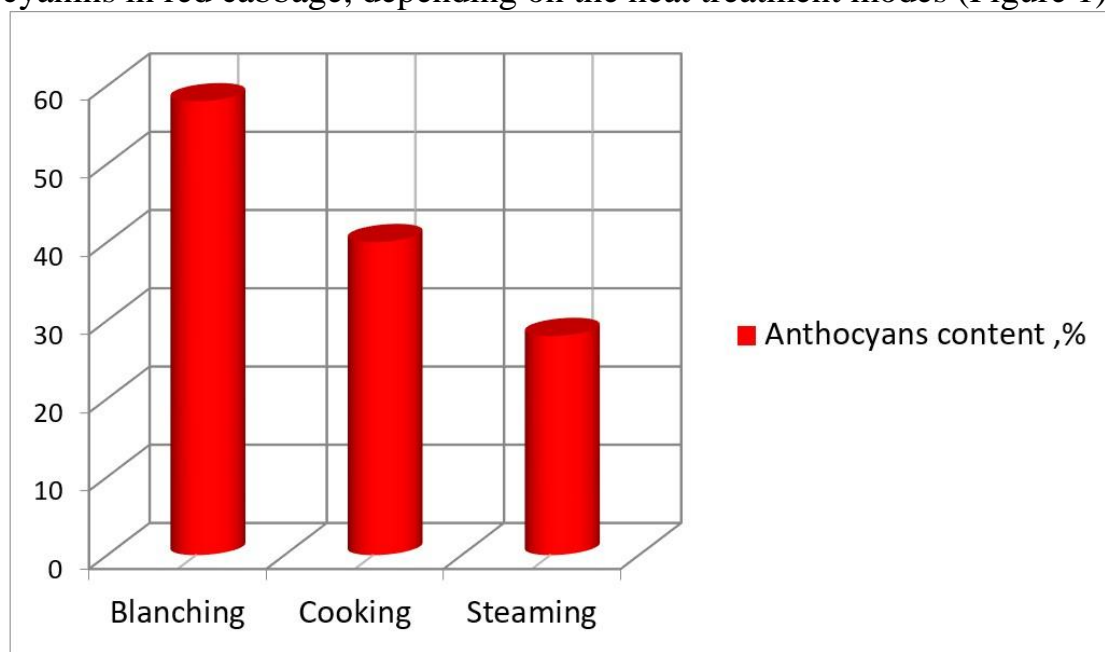


Fig.1. Effect of heat treatment on the content of anthocyanins in red cabbage

Blanching red cabbage retains significantly more anthocyanins than boiling and steaming. Similar results are comparable with published scientific papers [3].

For root crops containing anthocyanins, in order to increase the shelf life, convective, freeze-drying and microwave drying are acceptable. Each type of drying provides for a certain temperature and time of its impact on the product, on which the concentration of anthocyanins depends.

The use of different conditions of moisture removal from purple carrots showed that convective drying minimizes the destruction of anthocyanins compared to freeze-drying and microwave drying (Figure 2).

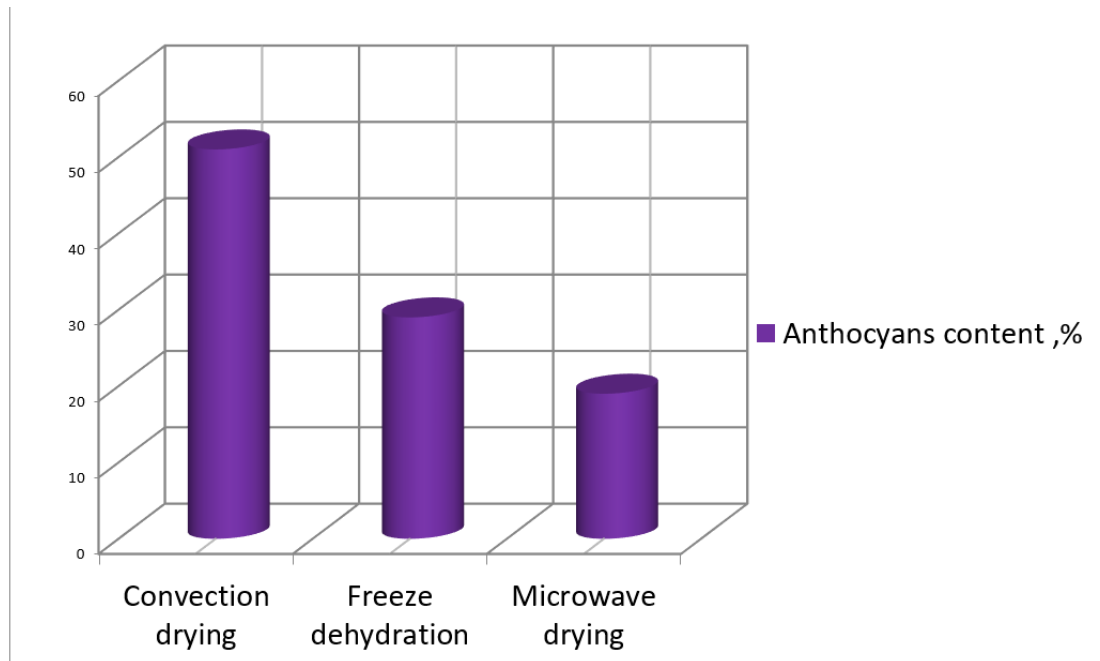


Fig.2. Influence of the heat treatment condition on the content of anthocyanins in purple carrots

These diagrams state that with an increase in temperature, as well as the duration of heat treatment, the amount of anthocyanins in vegetables rich in them decreases. Therefore, it is necessary to select such heat treatment modes in order to preserve the native properties of raw materials and ensure the safety of the finished product.

There are studies confirming that anthocyanins in their pure form, isolated from raw materials, are less heat-resistant than in their natural state in the composition of plants [3].

In this regard, it is rational to develop formulations of polycomponent products containing anthocyanins in their natural state.

The most studied carotenoids are lycopene and carotene, their antioxidant activity depends on the number of conjugated double bonds. The carotenoid beta-carotene is converted into vitamin A as a result of metabolism in the human body [4, 5].

Ascorbic acid is found in rose hips, red pepper, black currant, plays an important role in the absorption of iron, the regulation of hypertension and the prevention of vascular diseases. However, under the influence of light and with the access of oxygen, vitamin C is rapidly destroyed and is not thermostable.

Sauces are used in the meat and fish canning industry, many contain vegetable oil. The access of oxygen and light, non-compliance with temperature conditions causes the oil to burn, which reduces the organoleptic properties and leads to product spoilage.

Vitamin E is fat-soluble and found in vegetable oils, nuts, and under appropriate conditions it exhibits antioxidant properties. A number of studies confirm that in multicomponent products containing water-soluble and fat-soluble vitamins, synergism of some antioxidant substances occurs.

The presence in the product of tocopherol in the fatty component of the product and ascorbic acid in the water-soluble phase enhances the antioxidant effect of these biologically active substances [6].

Thus, to preserve the antioxidant activity of natural substances, the parameters of heat treatment, pH of the medium, reduction of oxygen access, and the amount of bound moisture are important. The addition of herbal ingredients to meat or fish products helps to balance them in terms of vitamin and mineral composition. The consumption of dietary fiber contained in plants allows you to normalize digestion. Bran, vegetables and fruits have different amounts of soluble and insoluble fiber, but both types of dietary fiber must be included in the diet, in the correct ratio. The consumption of multicomponent food products from fish, meat and vegetable raw materials will allow you to get the maximum benefit.

Ensuring proper modes of heat treatment of raw materials rich in antioxidants will allow designing functional products that largely retain these biologically active substances and their antioxidant properties.

Conducting research to determine the antioxidant activity in food systems, matrices, is promising, because anthocyanins interacting with other ingredients, certain polysaccharides, in conditions of low oxygen availability, without increasing pH, will be more thermally stable. Such factors are typical for most natural biologically active substances.

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ИНСТИТУТ САДОВОДСТВА И ЛАНДШАФТНОЙ АРХИТЕКТУРЫ

СЕКЦИЯ «АКТУАЛЬНЫЕ ВОПРОСЫ САДОВОДСТВА И ЛАНДШАФТНОЙ АРХИТЕКТУРЫ»

УДК 576.53

ПОЛУЧЕНИЕ ИЗОЛИРОВАННЫХ ПРОТОПЛАСТОВ КУЛЬТУР РОДА *ALLIUM* ИЗ СУСПЕНЗИОННОЙ КУЛЬТУРЫ КЛЕТОК

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Аннотация: Работа посвящена получению суспензионной культуры *Allium cepa* и *Allium fistulosum*, подбору условий культивирования клеток каллуса в суспензионной культуре и выделению протопластов. В ходе работы изучен плазмолиз и рассчитано осмотическое давление в клетках каллуса репчатого лука и батуна.

Ключевые слова: *Allium cepa*, *Allium fistulosum*, суспензионная культура, протопласты, плазмолиз

Изолированные протопласты являются объектами для ряда технологических процессов, таких как генетическая трансформация, редактирование генома, соматическая гибридизация. Интерес к соматической гибридизации у ряда культур в настоящее время возвращается: исследователей интересует создание цибридных растений, как возможность объединять цитоплазматические гены разных видов в одном генотипе. Создание цибридов дает возможность передачи селекционно-ценных генов цитоплазмы [1], а также создание растений с новыми типами мужской стерильности, что важно для упрощения процесса семеноводства при получении гибридных семян.

Изоляцию протопластов культур рода *Allium* обычно проводят из каллуса, предварительно культивируемого в жидкой питательной среде [2, 3]. Сложности на данном этапе возникают при неподходящем осмотическом давлении