цели долгосрочного развития на 2021–2030 гг. «Поддержание стабильной устойчивости развития, в основе которой рост духовно-нравственных ценностей и достижение высокого качества человеческого развития, ускоренное развитие наукоемких производств и услуг, дальнейшее становление «зеленой экономики» при сохранении природного капитала».

Реализация государственной программы будет способствовать достижению на национальном уровне объявленной Генеральной Ассамблеей Организации Объединенных Наций Цели устойчивого развития 15 «Защита и восстановление экосистем суши и содействие их рациональному использованию, рациональное лесопользование, борьба с опустыниванием, прекращение и обращение вспять процесса деградации земель и прекращение процесса утраты биологического разнообразия».

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E. A. Flyurik, ass. prof., candidate of biol. Sciences;
N.V. Bushkevich, postgraduat, master of biol. Sciences;
A. S. Lulya, undergraduate (BSTU, Minsk)

ANTIMICROBIAL PROPERTIES OF PLANTS OF THE REPUBLIC OF BELARUS

Currently, there is a steady growth trend of various diseases caused by microorganism activity. One of the promising directions of safe antimicrobial agents development is their elaboration on the basis of new types of vegetable raw materials.

Application of phytopreparations has a number of advantages in comparison with their synthetic analogues, namely: they do not have sensitization, produce a milder, but quite pronounced therapeutic effect, which is extremely important in the treatment of chronic diseases. It is impossible to imagine modern prevention and therapy of most diseases without medicinal plants.

Unfortunately, the range of phytopreparations with antimicrobial activity is very limited at the present time, so the search for highly active plant raw materials and the development of drugs based on it is a very promising and urgent task.

One way to find antimicrobial agents of plant origin is to analyze the data of folk medicine.

Currently, more than 35 species of medicinal and aromatic plants are cultivated in the Republic, while the State Pharmacopoeia contains more

than 100 species of plants, the cultivation of which is possible in Belarus. More than 20 business entities of different forms of ownership are engaged in the production of medicinal and aromatic crops. Some of the widely cultivated species are *Valeriana officinalis* (all-heal), *Leonurus cardiaca* (mother-wort), *Calendula officinalis* (marigold), *Matricaria chamomilla* (chamomile). In addition, actively mastered is the technology of cultivation of other crops, such as blueberries (*Vaccinium*).

The Department of biotechnology is working on the analysis of antimicrobial activity of higher plants of the Republic of Belarus. Particularly promising, in our opinion, is the use of blueberry fruits and leave extract. Firstly, blueberry leaves are currently not widely used and this type of raw material can be considered a waste of production; secondly, blueberry plantations in the Republic of Belarus are increasing every year, which makes this plant very promising for use not only in the food, but also in the cosmetic and pharmaceutical industries.

In the scientific literature on the antimicrobial properties of blueberries there are only rare publications that do not give a complete picture of the possibility of using this plant on an industrial scale. Therefore, our task is to compare the antimicrobial properties of different varieties of blueberries cultivated within the territory of the Republic of Belarus.

As objects of research were used plant raw materials, presented in the table 1.

Table 1 − Examined plant raw materials

Species name (Russian)	Species name (lat.)	Plant parts	Manufacturer
Брусника обыкновенная	*Vaccinium vitis-idaea*	Leaves, fruit	Leaves – ООО «Падис'с» Fruit – hand-picking
Тимьян ползучий	*Thymus serpyllum*	Grass	ООО «НПК Биотест»
Черная смородина	*Ribes nigrum*	Leaves	Hand-picking
Клюква обыкновенная	*Vaccinium oxycoccos*	Fruit	Hand-picking
Голубика обыкновенная	*Vaccinium uliginosum*	Leaves	Hand-picking

The harvesting of the leaves was carried out during the period of maximum flowering of the plant in dry weather, when the plants dried from the morning dew, since surface water leads to rapid deterioration.

The fruits were harvested without fruitstalks during their ripeness, carefully, without squeezing. Immature, overripe, damaged, etc. ones were removed during the initial handling.

Drying of the leaves and fruits was carried out without artificial heat, in the open air, in the shade, at room temperature. When the upper parts of the leaves dried, they were turned over to the other side.

After drying, the plant material was grinded to sizes specified in the State Pharmacopoeia of Belarus. The particle size of the raw materials was determined using the Bioscan computer application.

To characterize the plant raw material during its analysis, the following technological indicators were determined: specific, bulk and volumetric weights, porosity, nonsolid space, free volume of the raw material layer, extracting agent absorption coefficient.

Plant extracts were prepared by maceration. To obtain the extracts, water and 70% ethyl alcohol solution were used as solvents.

Raw materials correlation: extractant for alcoholic extracts − 1: 5, for aqueous − 1: 7. The extraction time was 3–7 days.

At the end of the exposure, the extracts were filtered through gauze and paper filters, after which they were sterilized using Merck Milipore filters based on nylon and polytetrafluoroethylene (PTFE) with pore diameters of 0.45 μm (pre-purification) and 0.22 μm.

The sterility of plant extracts control was carried out by the pour-plate method.

In the experiment, freshly prepared and lyophilized plant extracts were used (stored at temperatures from 2 to 8 °C for no more than 24 h).

To obtain lyophilized plant extracts, a Cool Safe 100-9 Pro freeze dryer was used. To prevent the antimicrobial effect of ethyl alcohol and to shorten the freeze-drying time, the plant extracts were preliminarily incubated in a water bath.

Table 2 shows the results of determining the content of extractives in plant extracts based on 70% alcohol and aqueous extracts.

Table 2 − Content of extractives in phytoextracts, %

Extractant	Leaves			Fruit		Thyme herb
	blueberry	lingonberry	currants	lingonberry	cranberries	
Water	18,9±0,3	20,9±0,7	19,2±0,4	32,1±0,7	27,8±0,2	26,0±1,2
Alcohol, 70 %	20,5±0,5	21,2±0,8	20,1±0,9	30,1±0,5	32,7±0,6	26,8±0,7

During the analysis of the results obtained, it was found that the largest number of extractives is contained in alcoholic extracts and varies from (20.1 ± 0.9) to (32.7 ± 0.6) %.

It should be noted that, in general, the percentage of biologically active substances in leaves (from 18.9±0.3 (blueberry leaves)) to (19.2±0.4) % (currant leaves)) is significantly lower than in fruits (from 30.1±0.5 (lingonberry fruit)) to (32.7±0.6)% (cranberry fruit)).

After analyzing all the data obtained, plant raw materials for further work were selected – lingonberry leaves, as the most promising one for development of an antimicrobial drug out of the studied ones.