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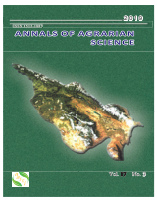

On the issue of industrial use of *Rhododendron caucasicum* Pall. and *Rhododendron ponticum* L.

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A B S T R A C T

The article shows that due to their rich biochemical compositions, Rhododendron caucasicum Pall. and Rhododendron ponticum L. which are widespread in mountain regions of Georgia, can be widely used in medicine, perfumery, ornamental gardening, furniture and leather production. These species are the tertiary relicts, prevent soil erosion and, simultaneously, can be used for avalanche protection purposes. As is known, the attention being paid to plants is increasing daily, and the main source of their production is wild populations, which destroys the invaluable natural treasures - plants that are distinguished both for therapeutic and decorative benefits. Thus to avoid anthropogenic impacts and uncontrolled collection of plants, it is possible to grow the usable plants.

Keywords: Relict, Biochemical composition, Soil erosion, Cultivation, Plant, Industrial use.

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Introduction

In today's world, consumption of food and medicinal plants has been increasing steadily. Today, chemicals are no longer regarded as the sole agent for treating diseases and life extension. The public is now convinced that any chemical drug has usually certain counterindications. That is why today there is a search for possibilities for using different medicinal plants. Modern scolarly research had shown that there is a lot of plants on earth that can be used for both food and medicinal purposes. Pharmacologists, chemists, biochemists and botanists are working on a scientific research to discover new medicinal properties of plants, and to use them in production of environmentally friendly multicomponent therapeutic food products and medicinal agents that ensure timely and full removal of harmful substances and and heavy metals deposits from the human body [1].

In this regard, Rhododendron caucasicum Pall and Rhododendron ponticum L [2-7] that are somewhat common in Georgia and are viewed as promising plant species, deserve more attention [8].

In the Caucasus, the altitudinal area of their complex coincides with the highland meadow s (subalpine, alpine) and includes altitudes of 1800-2800 m. However, it is not uncommon for Rhododendron caucasicum Pall to reach altitudes of 3000-3100 m in massive mountain ranges. In subalpine zones, along with Rhododendron caucasicum Pall, the creation of its cenosis involves also Vaccinium myrtillus L, Empetrum caucasicum Juz.Ribes alpinum L, etc.

Rhododendron caucasicum Pall grows to 160-300 m tall, in the subalpine zone (in birch woods and beech forests), which forms a very tight undergrowth, while in the alpine zone, it forms a thicket on the northern slopes, while Rhododendron ponticum L grows from sea level up to the middle forest belt, which sometimes reaches the subalpine zone.

In western Georgia, the Rhododendron ponticum L cenosis is clearly visible up to 1000-1100 m

above sea level, which was formed from plants such as Rhododendron caucasicum Pall, Rhododendron ungernii Trautv., Vaccinium arctostaphylos L, Lauroserassus officinalis Roem, Viburnum orientale Pall, Hedera colchica(K.Koch) K.Koch, etc.

The herbaceous cover is not rich because shrubbery is quite dense and covers soil. Despite the soil cover, ferns and some cereals are also found.

basic part

It has been established that the use of both Rhododendron caucasicum Pall and Rhododendronponticum L containing large amounts of tannins, is promising for human health. Growth of the shoots of the first plant starts in April and ends in mid-June. The leaves also grow at this time. The development of leaves of the second plant begins in May or June; these leaves will overwinter twice, while the third plant decays in late summer they are deciduous.

According to literary sources [8, 9], the elements identified as a result of biochemical studies on the leaves of Rhododendron Caucasicum Pall and Rhododendron Ponticum L are presented in Table 1.

Data obtained as a result of studying the compositions of catechins, leukoanthocyanins and flavonols in different organs of both plants (Table 2) show that the flavonoid contents in different organs of one plant, as well as their contents in the same organs of other plants are different.

Table 1. *Identified elements from Rhododendron caucasicum and Rhododendron ponticum*

Name of plant	(+)-catechin	(-)-epicatechin	(+)-gallocatechin	Leucopeonidin	Leucopetunidin	Hyperin	Avicularin	Myricetin	Leucocyanidin	Leucodelphinidin	Quercitrin	Quercetine	Isoquercitrin
Rhododendron caucasicum	+	+	+	+	+	+	+	+	+	+	+		
Rhododendron ponticum	+	+	+						+	+	+	+	+

The dynamics of accumulation of catechins, leukoanthocyanidins and flavonols in the leaves of both plants during the vegetation process has also been analyzed by scientists, the total values of which are presented in Fig.

Table 2. *Flavonoid content (mg 1 g on dry weight basis) in different organs of Rhododendron caucasicum and Rhododendron ponticum*

Research subject	Picking time	Catechin	Leucoanthocyanidins	Flavonols	Total
Rhododendron caucasicum					
Vegetative buds	May	42,2	258,7	27,8	328,7
Summer leaf	August	24	147,8	12,9	184,7
Two-year leaf	August	34,5	206,2	33,7	274,4
Three-year leaf	August	35,4	190,1	52	277,5
Sprouts	August	16,8	105,3	6,5	128,6
Stems	August	1,7	21,9	3,7	27,3
Roots	August	11	82,6	6,4	100
Generative buds	May	22	185,6	19,7	227,3
Rhododendronponticum					
Leaves	August	17,3	104,4	6,4	128,1
Sprouts	August	11,2	75,4	5,6	82,2
Stems	June	2,4	16,2	4,2	22,8
Roots	June	9,4	73,9	5,9	89,2
Buds	June	15,3	76,1	13,2	104,6

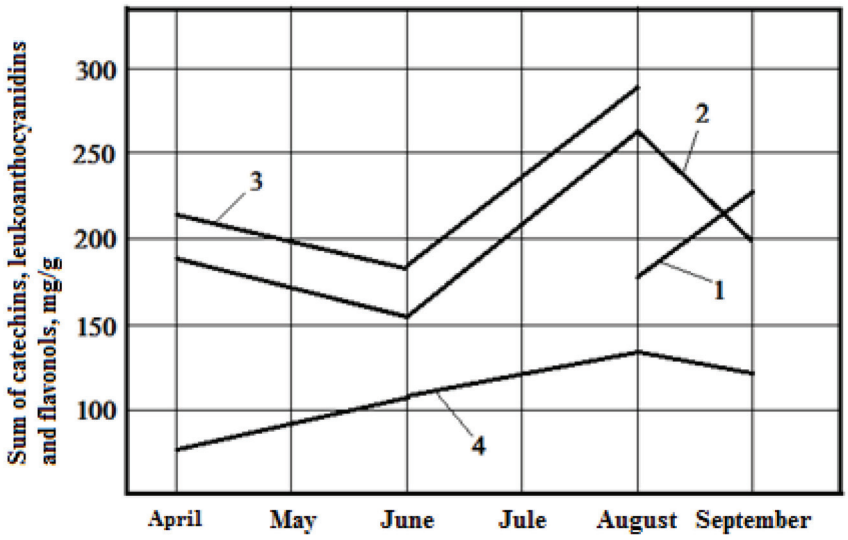

Fig. *Variations of flavonoids totals during the vegetation process*

Rhododendron caucasicum Pall leaveso: 1- summer, 2- two-year, 3- three-yearo, 4- Rhododendron ponticum L leaves

As can be seen in this Figure, the number of these elements depends on the time for the beginning and end of vegetation, as well as on the flowering period. Finally, it has been concluded that the amount of tannins in the leaves of Rhododendron caucasicum Pall. and Rhododendronponticum L increases during summer and decreases in the autumn.

All the elements in the compositions of these plants have medicinal properties, except for glycoside and romedotoxin, which is a powerful organic poison. So, attention should be paid to the amount of Rhododendron caucasicum Pall. taken by humans. However, in the case of recommended daily intake (one cup of tincture per day) Rhododendron caucasicum Pall. is completely harmless.

A brief description of their rich chemical compositions that we provided clearly demonstrates its multiple positive impacts on human health. It is the mentioned chemical composition that leads to its widespread use [10-12] in the treatment of diseases such as cardiovascular problems, viral infections, rheumatism, colitis, vegetative neuroses, female infertility, pelvic inflammatory disease, as well as removal of toxins and heavy elements from the body, as well strengthening the body's immune system.

The plant is also characterized by anti-lipase properties. Its roots contain substances that reduce the body's ability to absorb fats and, in besides, they help to burn fats existing in the body.

In addition to medicine, Rhododendron caucasicum Pall. and Rhododendron ponticum L are also used in perfumery, ornamental gardening, as well as in manufacture of furniture and leather.

For the development of today's economy of Georgia, it is important to revive various sectors of the economy, as well as to start manufacture of new products that are important for the country. These might include Rhododendron caucasicum Pall.

Due to a multiplicity of its useful properties, it is possible to produce numerous types of medicines, ointments, tinctures essential for human health and life extension, which will be sold both domestically and abroad. This will provide a window for opportunity to contribute significantly to the country's economy. In addition, there are job opportunities for people in the mountainous regions of Georgia, and thus for improving their living conditions.

An example of this in Georgia could be provided by the enterprise for processing Rhododendron caucasicum Pall. and Rhododendron ponticum L established in 2016 in the village Barisakho with a grant from the Rural Community Development Agency, which aims to produce and sell tea with mixed different wild-growing plants.

However, such an important issue should not be realized through the deterioration of the ecological status of mountainous regions.

Rhododendron caucasicum Pall. and Rhododendron ponticum L are the anti-erosion shrubby plants growing on the mountain slopes. Its stems that are far-flung on the ground play an important role in avalanche prevention. All this suggests us the need

for rational use of this evergreen shrubby plant [13].

In the case of picking permissible specified quantities of leaves, it is possible to avoid any damage to the environment and, at the same time, to manufacture products that have very beneficial effects for human health, to market them both locally and internationally.

In the context of maintaining the ecological status of high mountain regions, an alternative way to increase their raw materials base is to grow this plant in the regions of Georgia, where the very harsh winter conditions do not allow the cultivation of other agricultural crops.

It is generally believed that they cannot easily be grown. However, there are many species of cultivated plant, whose needs differ significantly from those growing in the wilderness (Table 2). In various countries, the plant has been well adapted to a tough nature, changes in relative air humidity, is not very demanding for soil acidity and withstands the impact of urban pollution; it also does not necessarily require the slopes in the highlands zone, and so on. [14-16].

Based on the above, it can be considered that these plants can be grown in the regions of Georgia where it is not possible or profitable to grow other plants due to local conditions (low temperature, high humidity, steep mountain slopes, etc.). In case of successful cultivation of the plant, the region will be beautified with ornamental plants, the soil will be protected from erosion, the amount of plant raw materials beneficial for human health will be increased and the possibility of its industrial extraction will be realized. At the same time, edible-drug raw materials obtained from the plant can be sold both inside the country and abroad, which will have a positive impact on the country's economy.

Table 3. *Truncation data on the Caucasus mountain bushes*

Countries	Species			
	Rhododendron Caucasicum	Rhododendron ponticum	Rhododendron Smimovii	Rhododendron Ungerni
USA				+
Great Britain	+	+	+	+
Germany	+	+	+	+
France		+	+	
Italy		+	+	
Belgium		+	+	
Poland			+	
Czech Republic	+		+	
Netherlands		+		
Sweden			+	
Austria	+	+	+	+
Denmark		+	+	
Norway			+	
Japan		+		

It should be taken into consideration that it is necessary to avoid the loss of the useful biochemical properties of plant grown in new places, which would require relevant scientific research.

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Conclusion

1.The use of Rhododendron caucasicum Pall. and Rhododendron ponticum L can offer tangible benefits in term of both health improvement and the country's economic development;

2.In order to prevent ecosystem degradation in mountain regions, it is necessary to ensure specified and selective picking of leaves and flowers of the plant;

3.Rhododendron caucasicum Pall. and the use of Rhododendron ponticum L can bring great benefits both for the improvement of human health and for the economic development of the country;

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