

Siberian rose reveals its secret to SibFU scientists

Researchers of the SibFU School for Economics and Commerce have investigated two species of wild rose — cinnamon rose (*R. majalis* Herrm) and prickly rose (*R. acicularis* L.) — as a source of a biologically active antioxidant complex.



The scholars compared the chemical composition of plants collected in three climatic zones of Krasnoyarsk Territory over two years, and concluded that as the rose growing conditions worsen, its antioxidant complex is getting richer in ascorbic acid, carotene, and tocopherol. A comparative analysis of the species showed that prickly rose not only surpasses cinnamon rose in the amount of accumulated nutrients, but also shows great resistance to adverse climatic conditions. According to the researchers, this is the very species of wild rose which is more suitable for cultivation in its natural habitats. The fruit of prickly rose can be used most successfully to obtain vitamin and mineral supplements which enrich the northern diet. The key results of the survey [have been published](#).

The easily recognizable orange-red rose hips contain a lot of pectin, tannins, carotenoids and various vitamins. Plants of this genus are deemed an excellent source of natural vitamin materials for the medical industry. In Krasnoyarsk Territory, the species diversity of roses is small: there are only four wild-growing species, where cinnamon rose (*R. majalis* Herrm.) and prickly rose (*R. acicularis* L.) dominate. Cinnamon rose shrubs are notable for their moderate growth and thin branches, they have single flowers of red hues, blooming in May. The fruit of this plant is spherical or elliptical and smooth and fleshy, but small, with sepals pointing upwards. Prickly rose can grow up to 2-3 meters high. Its fruit is smooth or bristly, oblong-ovoid and with a necking at the apex and narrowing to both ends, rather large, drooping, and forming a tassel of 3-4 berries. This plant is less demanding on growing conditions and can withstand frosts up to -40°C.

‘The therapeutic and dietary value of rose hips has been known since ancient times. The most studied aspect is the content of ascorbic acid in them — here no plant can simply compete with the rose hips. Vitamin C (or more precisely, its reduced form — L-ascorbic acid) affects blood formation, carbohydrate metabolism and cholesterol levels. A person can get this irreplaceable acid only with food. Unfortunately, at present more than 50% of the population of Russia is having C-vitamin deficiency. Another good thing is that rose fruit has many P-active compounds with antihypertensive effect. It is rich in B vitamins that regulate carbohydrate, protein and fat metabolism. These vitamins are especially necessary if carbohydrates prevail in the diet, which is very characteristic of the population of our country. And as for provitamin A, rose hips are second only to apricots, some varieties of carrot and pumpkin!’

Our task was to evaluate the accumulation of the active principle with antioxidant properties in the fruit of cinnamon and prickly roses. We wanted to figure out how life in various climatic zones affects the accumulation of nutrients, in other words, how much rainfall, what soil and temperature create the most useful berries. To do this, we compared the fruit from the harvests of two consecutive years,’ said Olga Starodub, associate professor of the Department of Commodity Science and **Expert Evaluation**.

The fruit was harvested in the subtaiga of Ermakovskoye district, located in the foothills of the Western Sayan, in the forest-steppe zone of Emelyanovo district, as well as in the taiga of Yeniseysk district.

'The most favourable environmentally optimal conditions for rose vegetation have developed in Ermakovskoye district, where winters are mild, and summers and autumns are sunny, abundant in rains. Less favourable ones are the conditions in Emelyanovo district, as the soil there freezes deep in winter, and precipitation is not enough for good moisture. And finally, Yeniseysk district is known for cold windy winters and short moderately warm summers. So the Yeniseysk rose receives no more than 90 days for the growing season, and its life there is quite extreme. But it is the need to defend from harsh conditions and run a full vegetation cycle in the shortest possible time that made the roses living in the northern territories (in our case, the Yeniseysk district of Krasnoyarsk Territory) the champions in accumulating ascorbic acid,' continued the scientist.

The researchers were able to define the average value of organic acids (malic and citric) in rose hips — 3.81 % for cinnamon rose versus 3.14 % for prickly rose. Moreover, during the first year of observations, when the climate was milder and more suitable for plant development, roses stored less useful acids.

'It's the speed of biochemical reactions, that matters,' the scientists explain. *'The warmer, the faster a rose plant spends its acids on various internal processes. When summer turned out to be cool and rainy, the roses immediately switched to accumulation mode.'*

'Our studies confirmed the opinion already expressed by our predecessors: the synthesis of ascorbic acid is the more intense, the worse are the conditions during the period of growth and development of rose plants. Later, in the second year, we observed an increase in the amount of ascorbic acid by 35-70 mg on average in the sample plants from in Emelyanovo district. This was how the plants adapted to lower temperatures and growing rainfall during the formation and ripening of the fruit. We noted the same picture when the roses habitats moved to the northern latitudes. By the way, prickly rose accumulated ascorbic acid 1.3 times more actively than cinnamon rose. We can recommend it as more resistant to harsh environmental conditions,' noted **Ms Starodub**.

Regarding vitamin P (rutin), the researchers gave the garland to the flesh of the fruits of cinnamon rose, living south and north of the "middle" Emelyanovo's forest-steppe. The fact is that this vitamin serves as protection against excessive sunlight, and prevents oxidative overloads caused by UV-rays. This means that it is especially abundant in fruit that has matured under increased ultraviolet radiation.

Another vitamin that is accumulated by roses in abundance is vitamin E (tocopherol). SibFU investigators observed the same pattern in its distribution: the northerner a rose grows, the more vitamin E it has.

'Being one of the most intense natural antioxidants, under adverse conditions, tocopherol protects the plant, preventing excessive oxidative reactions. And although cinnamon rose accumulates tocopherol well (especially if it grows in the southern and northern regions of the Territory, where protection against various adverse factors is turned on to the maximum), it's the prickly rose that turned out to be the record breaker for the content of this vitamin,' the researchers explained.

It is noted that beta-carotene (a precursor of vitamin A) is also accumulated to a greater extent by this species of wild rose, and the farther south the plant lives the greater its amount is. The secret is that

carotene also has photoprotective properties, it means that it protects the plant from sunstroke.

For humans, the daily norm of ascorbic acid is 70–100 mg, and it is best to get it from local plants, for example, from berries of prickly rose, then from foreign citruses. But growing the most useful rose is not an easy task. The content of this acid varies greatly both within the species and in individual plants.

‘Even if you plant a prickly rose in your garden plot, it will give you fruit with the chemical composition varying from year to year, depending on the weather in spring and summer, and rains in autumn. Moreover, having moved the rose bush from the northern latitudes to the south of the Territory, you will get a completely different biochemical composition of its berries,’ the scientists explain.

Rose hips are widely used for the preparation of compotes, jams, syrup, marmalade with a high content of vitamin C, as well as rose vinegar, sweets, marshmallow, kvass, juices and even rosehip honey.

‘In our opinion, it is most advisable to make rosehip extracts and use them as vitamin and mineral supplements to enrich the usual drinks, desserts. Doing so, we can provide the city population with vitamins and minerals, bring our traditional menu in line with the modern requirements of nutrition science. And it will be especially useful for the northern regions of the Russian Federation, where the locals are deficient in vitamins (especially vitamin C), but on the other hand, Siberian roses tempered by nature grow,’ concluded Olga Starodub.

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