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The walnut – a valuable fruit and forest crop

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The walnut ranks first in area and production within the group of nut-bearing crops both worldwide and in our country. It is among the most valuable fruit and forest fruit crops. The walnut is a complex heterozygous, monoecious, dioecious, cross-pollinated, anemophilous, woody fruit plant.

Walnut kernels are a concentrated, complete, high-quality food for humans. Their high biological value is determined by the rich content of fats, proteins, vitamins and mineral salts. In 100 g of kernels there are:

- 62.7% - 79.95% vegetable oil, including the fatty acids omega 3, 6 and 9, which are essential for human health and can be obtained only from food. Their total content in the kernels is 84%, of which 5% omega 3, 51% omega 5 and 28% omega 9;

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- 54% - 64% of the total fat content is represented by linoleic acid (vitamin F), while the content of palmitic, stearic, oleic, linolenic and other acids is also high;

- proteins, providing the 18 essential amino acids required by the human body, amount to 12.3% - 22.3%;
- total sugars – 2.73% - 3.98%, of which sucrose – 1.92% - 3.15% and invert sugar – 0.40% - 0.80%;
- up to 2.73% mineral salts, of which potassium salts reach 322 mg%, magnesium – 134 mg%, phosphorus – 358 mg%, iron – 21 mg% and calcium – 89 mg%;
- a rich content of vitamins E, PP, group B, carotene and vitamin C;
- tannins from 0.68% - 0.85%.

The medicinal properties of walnut kernels have been well known and proven since ancient times and by modern medicine. Their consumption ensures normal heart and brain function, activates the immune system, reduces cholesterol levels, enhances thyroid function, lowers blood sugar and blood pressure, helps overcome radiation exposure, etc.

Despite the high nutritional and medicinal value of the kernels, annual consumption in our country is very low – 1-2 kg per capita, whereas in a number of European countries annual consumption reaches 6 kg per capita.

Green fruits have a high content of vitamin C – over 300 mg%. They are used for preparing sweets and beverages. The shells of the fruits are used to prepare a special extract against cough, and the green husk of the fruits serves for specific dyeing of fabrics and yarns.

Walnut timber is among the most valuable raw materials in the furniture industry, which is why it is sold at high prices on the international market, and the furniture produced from it is among the most sought after.

The production of walnuts is characterized by lower labor and material costs compared to other fruit crops. Production processes, including the most labor-intensive one – harvesting, are subject to mechanization, which reduces costs and facilitates producers. The high transportability and storability of the fruits allow the establishment of plantations in the most remote locations. No special expensive facilities are required for storing the fruits, whose marketing can take place at the most advantageous market moment.

As a woody fruit species that relatively less requires plant protection measures, it is among the most suitable for the production of environmentally friendly fruit products. It can be grown as single trees in yards, along roads, alleys, pastures, etc.

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In 2017, global walnut consumption amounted to 2.2 million tons, with a stable upward trend. The average annual growth of global consumption for the period 2007-2017 is 7.1%. China is the largest producer and consumer of walnuts in the world. In 2017, 1.06 million tons of walnuts (fruits in shell) were produced in the country, representing 48% of total world production. Per capita walnut consumption in China increased sharply – from 0.17 kg in 1995 to 1.8 kg in 2017. The growth in consumption for the indicated period is 24%, while the average global growth rate is 5.8%. The USA ranks second in walnut production in the world. In 2017, 607.81 thousand tons of walnuts (whole fruits) were produced in the country, which accounts for almost one third of global production. The main part of the walnut production in the USA is concentrated in the state of California. In China and the USA nearly 75% of the world's walnuts are produced. The European Union member states as a whole, Iran, Ukraine, Chile, Turkey, Moldova, Serbia, France, Italy and Spain are the other major walnut-producing countries. In Iran, annual walnut production amounts to 242 thousand tons, which is more than twice the total production of the EU countries, amounting to 113 thousand tons. Turkey produces 127 thousand tons annually, and Ukraine 110 thousand tons – almost as much as the EU. Chilean production amounts to 100 thousand tons annually, and that of Moldova – 31 thousand tons. Bulgaria ranks 16th in the world with an annual walnut production of 1,000 tons. In the leading walnut-producing countries, average yields per decare range between 190 and 330 kg, while in our country they vary between 30 and 100 kg per decare.

Among the complex of factors for increasing walnut production and improving its quality, the cultivar is the main and dynamic tool. Therefore, the correct choice of the most suitable cultivars for the respective growing sites is the most important and most responsible task when establishing new plantations. Walnut trees are the most long-lived, and mistakes made are detected late. They are difficult to correct and cause major losses. The first requirement that walnut cultivars must meet is high productivity.

In Bulgaria, 29 walnut cultivars have been officially recognized, 21 of which were developed at the Fruit Growing Institute in Plovdiv by a breeding team led by Prof. DSc Nedyu Nedev. A large part of the walnut cultivars developed in Bulgaria have, at various times and for different periods, been listed in the Official Variety List of the country, as well as in the variety lists of companies and associations of fruit planting material producers. A number of Bulgarian walnut cultivars have been introduced on a large scale into domestic production. For nearly four decades, and still today, the profile of walnut production in our country is determined by the cultivars Izvor 10, Sheinovo and Dryanovski. The walnut cultivars Slivenski, Silistrenski, Perushtinski, Kuklenski, Proslavski and others have also been widely introduced in commercial orchards. The cultivar Sheinovo is the national standard cultivar for Bulgaria and Serbia, but today Izvor 10 serves as the standard in our country. The newest generation of Bulgarian walnuts was recognized in the period 2005-2012 and includes the cultivars Vasden, Diamin, Yubileen 80, Vanmar, Meveden and Srednogorski. The candidate cultivars Nedev, Trakiyski and

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Uspeshen have been submitted for official recognition. A large part of the new walnut cultivars are propagated in the nursery of Prof. Dr. Argir Zhivondov near Plovdiv. These are already being successfully introduced in new plantations in the country, where they have proven their advantages.

Studies conducted at the Fruit Growing Institute over many years have established that their productivity is determined by a complex of factors – the number of fruiting shoots, the fruit set percentage and the grouping of fruits in a single inflorescence. It has been proven that cultivars characterized by very good and excellent productivity are those that form a greater number of lateral fruiting shoots, a greater number of fruits in a single inflorescence and a higher percentage of retained effective fruit set. These biological characteristics are specific to each cultivar, and the indicated parameters vary over different years, throughout the fruiting period of the trees and especially depending on the vigor of the annual shoots. During the initial fruiting period, the percentage of lateral fruiting shoots is higher, while during the more advanced age of the trees and their full fruiting it is lower, since the formation of fruit buds occurs mainly on weaker fruiting shoots.

Local walnut cultivars

Some of them have been identified from the plant genetic resources of our country through selection within local populations, i.e. from the great morphological diversity created by open pollination under natural conditions. This group includes the cultivars: Sheinovo, Silistrenski, Kuklenski, Perushtinski, Bachkovski, Dryanovski, Slivenski, Dzhinovski, Proslavski, Izvor 10, Konkurent, Kardzhali, Alvanovo, Probuda, Targovishte, Mirkovski and others. For the current and promising cultivars from this group, which we propose for distribution, we present a brief pomological and economic description. Others are the result of controlled sexual hybridization carried out at the Fruit Growing Institute – Plovdiv, involving both Bulgarian and foreign cultivars. This group includes the cultivars: Lyubimets, Plovdivski, Raykov, Vasden, Diamin, Yubileen 80, Vanmar, Meveden, Rupchir and Srednogorski. For this group of cultivars we provide a brief description, as they are subject to further testing and practical introduction. Three new candidate cultivars have been proposed for approval and recognition: Trakiyski, Uspeshen and Nedev. They are also the result of controlled hybridization with the participation of Bulgarian cultivars.

The need to introduce new cultivars into walnut production arises from the rapid changes in the varietal composition, the implementation of new technologies for establishing and growing walnut orchards, as well as from the increased requirements of producers and consumers.