

The walnut in our country – significant questions, unambiguous answers

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The walnut occupies first place within the group of nut-bearing crops both worldwide and in our country. This is due to the rich nutritional, valuable dietary and medicinal properties of walnut kernels. Depending on the cultivar, the kernel accounts for between 35 and 60% of the fruit weight and has a high energy value (525–622 kcal/100 g). It is an important source of nutrients necessary for the vital functions of the human organism (containing up to 74% vegetable oil and up to 24% protein (Zakhov, 1960; Nedev et al., 1983), and according to Komanich (1989) this oil reaches up to 78.8%. The amino acids are in an appropriate ratio, and the oil is rich in linoleic acid (vitamin E), which the human body obtains solely from vegetable oils. In addition, walnut kernels contain up to 25% carbohydrates, as well as 1.5–2% mineral salts, vitamins A, C, E, P and group B (Tsurkan et al., 1984; Dzhuvinov and Bozhkova, 2004). In the oil of some cultivars linoleic acid reaches 64%, and the total number of essential amino acids is 18 (Vishanska and Petrova, 1980; Nedev et al., 1983). This biological value of walnut kernels (high protein and oil content) makes them an indispensable food. The medicinal value of walnut fruits is

also well known. They tone the blood and digestive system, lower blood sugar and blood pressure, cleanse the blood vessels and prevent atherosclerosis thanks to the antioxidant vitamin E, i.e. they improve cardiac and brain function (Germain et al., 1999). Research conducted so far provides grounds to assume that ellagic acid (a phenolic acid) binds to carcinogens and thus neutralizes them and stimulates the formation of antitoxic enzymes. From a practical point of view, almost all organs of the walnut tree can be used. Vitamin C and other biologically highly active substances are extracted from the green leaves, and from the green walnuts, in addition to vitamin C, iodine and juglone are obtained (Tsurkan et al., 1984). It is also known that walnut trees can successfully be used for stabilizing landslides and sloping terrains, for reducing wind force and wind erosion as shelterbelts, etc. Moreover, walnut production is cheaper compared to other tree fruit species, and walnut fruits have a long storage life and can be transported over long distances. It is needless to mention that walnut timber is among the most valuable in the furniture, arms and automotive industries, for which reason it commands a high price on international markets. All this answers the question why their demand on the domestic and international market and their production worldwide are continuously increasing.

Walnut production worldwide

According to FAO data, for the period 1961–1965 more than 601,000 t were obtained worldwide, of which in Europe – 45.1%, in Asia – 18.6%, in North America – 12.6%, in Africa – 1.0%, and in South America – 0.8%. Production reached 753,500 t in 1974–1978, i.e. an increase of more than 150,000 t was observed over a period of about ten years. Among the individual producing countries, the largest increase was recorded in the USA – 222%, Argentina – 188%, Turkey – 157%, the USSR – 155%, and Greece – 125%.

On the eve of the 21st century (1995) **world walnut production** had already exceeded the threshold of one million tonnes – 1,061,000 t, reaching 1,292,000 t in 2000 and 1,793,000 t in 2005. In 2011 world production achieved the record 3,423,000 tonnes.

It is interesting to note that over the last 10 years the leaders in this production have been China, the USA, Iran and Turkey, and among the continents Asia is in the lead, followed by America and Europe.

It is noteworthy that in the European countries with modern walnut production – France, Italy and Spain – in the first years of the 21st century production stabilized at 28–33 thousand t in France, 15–16 thousand t in Italy and 8–13 thousand t in Spain, with a slight upward trend. Data for 2011 show an upward trend in Romania and Greece in this production, if we look at the data for 2011.

Within the European Union for the period 2000–2011, between 168–194 thousand t were obtained, which indicates a relatively stable production with a tendency to increase. An exception is 2004 (152,000 t), probably due to unfavourable climatic conditions during the flowering and fertilization of walnut in some EU Member States.

Production in Turkey and Serbia is also significant. In recent years Iran has displaced the USA from second place in the world ranking of walnut-producing countries.

The expected increase in walnut production worldwide is based on the **total area of bearing orchards**, which was 616,517 ha in 2000 and reached 721,671 ha in 2007.

Supporting this are the data on the average yield in the world, which from 209 kg/ha in 2000 reached 354 kg/ha in 2011.

From the figures cited it can be seen that the leading countries in terms of average yields are Iran, the USA, Italy, China, France and Turkey.

About 100,000 t of walnuts are imported into Europe annually from California to meet the needs of the continent.

There is a general trend towards continuous yield increases in most producing countries, which clearly shows that high-yielding cultivars are being used and modern cultivation technologies are being applied. Therefore, an average yield of 250–300 kg/ha is absolutely normal for modern walnut orchards.

Walnut production in our country

Until the mid-1950s walnut cultivation in Bulgaria was mainly amateur, distributed as single trees in vineyards, arable land, along roads, canals and as ornamental trees in larger parks (Velkov et al., 1951) and more rarely as independent orchards, which were recorded in statistics for the first time in 1952 (Nedev et al., 1983).

According to Nedev et al. (1983), the development of walnut production in our country is divided into two periods – the first from 1956, when the plantations covered 1,840.7 ha and increased to 4,400.2 ha in 1966.

During this period the number of single trees increased from 553,000 to 919,000, and the area of bearing plantations increased from 420 ha to 920 ha, or from 22.8% it decreased to 20.9% of the total area. For single trees, the relative share of bearing trees remained almost unchanged – 97.5% and 96.2%, respectively. If we look at the data for the total production obtained, we will see that from 14,192 t it reached 22,076 t for the two years mentioned above. From single trees during this period 13,808 t and 21,718 t were obtained, respectively, i.e. they accounted for 97.3% and 95.4% of the total production for 1956 and 1966, which shows that single trees during the period in question determined the profile of walnut production obtained in our country.

The data on average yield show that from 90.7 kg/ha in 1956 it decreased to 38.3 kg in 1966, with boundary values of 19.3 kg in 1957 and 64.2 kg in 1958. In this respect, the yield per tree was 25.6 and 24.6 kg, respectively, for the years indicated. This gives us grounds to conclude that during this first stage walnut production in our country was based mainly on single trees, where yields were relatively stable and about twice lower than those obtained from compact orchards.

The second period after 1966 is characterized by the establishment of new industrial-commercial plantations – blocks of several thousand decares in selected regions of the country such as Plovdiv, Stara Zagora, Veliko Tarnovo, Haskovo, Ruse and other districts, mainly with the cultivars Dryanovski and Sheinovo. This period is characterized by the planting of both seedlings and grafted trees, thanks to the technology introduced by the

Fruit Growing Institute in Plovdiv for chip budding using the “window” method, as well as the two cultivars mentioned, which are the result of studies on local walnut resources in our country.

It should also be noted here that the area of plantations in the districts of Veliko Tarnovo, Ruse, Targovishte, Shumen, Razgrad and Pleven, Plovdiv, Stara Zagora and Haskovo accounted for 65.5% of the total walnut area in the country as of 1980, which indicates a concentration of walnut production in our country thanks to the then economic structures – agro-industrial complexes. Of secondary importance were the districts of Burgas, Varna, Lovech, Kardzhali and Montana, with a combined relative share of 14.3%.

For this period Nedev et al. (1983) also note that mainly during 1968–1977, 12,600 ha of new walnut plantations were established, but unfortunately only 47% of the total number of trees were grafted, i.e. the orchards were predominantly composed of seedlings from open pollination with undetermined fruit quality. Furthermore, the same authors note that during the socialist restructuring of agriculture a significant number of single trees were uprooted, decreasing by almost half, i.e. from 1,113,000 trees in 1948 to 553,000 in 1956, of which 97.5% were bearing.

At that time the government policy was to develop nut-bearing crops in the country, thanks to which the planting of single trees also began. Thus, their number increased from 924,000 in 1976 to 1,249,000 in 1980, thereby reaching the level of 1948 also in terms of the relative share of bearing single trees.

In order to assess more accurately the state and development of walnut production in our country during the stage of concentration and specialization in the 1970s and 1980s, we will focus on the data on the relative share of bearing orchards and the average yields obtained. Unfortunately, the bearing areas from 22.8% in 1956 decreased to 17.4% in 1960 and remained at this level almost until 1970 – 18.1%, decreasing to 12.4% in 1975 and later, in 1980, increasing to 32.8%.

All this shows that the balance between bearing and young plantations was severely disrupted, which under optimal ratios should be 75–80% : 20–25%. Supporting this are the yields obtained, which from 90.7 kg/ha in 1956 decreased to 32.2 kg in 1970, falling to a level of 10.1 kg/ha in 1980, while the yield from single trees was in the range of 22.3 kg in 1980 and 27.4 kg/tree in 1965. Here we should mention that average yields of up to 20 kg/ha were obtained in the districts of Razgrad, Dobrich and Shumen, from 20 to 40 kg in Vratsa, Haskovo and Yambol, and over 40 kg/ha – in the districts of Varna, Stara Zagora and Silistra (Nedev et al., 1983).

From this follows the conclusion that **our walnut production developed along an extensive path** during the period mentioned above, regardless of the concentration and specialization in the fruit-growing subsector, including walnut, because this did not lead to an increase in the number of trees per hectare, nor in the average yields.

It is also necessary to add the strongly reduced level of agronomic practices for the cultivation of these large walnut blocks, both before and especially during the transition period after 1989. Therefore, we consider that this

development period continued until 1989, i.e. until the onset of the political and economic changes in our country.

Ten years after the beginning of the transition to a market economy, the total area of walnut plantations in our country decreased drastically, as was the case with all other tree fruit crops.

With a total area of 19,250 ha and 6,320 ha (32.8%) bearing orchards in 1980 (according to FAOSTAT data), in 1999 the bearing walnut orchards in our country were 7,197 ha, which decreased to 3,703 ha in 2001. In this case, the increase in the relative share of bearing orchards did not lead to an increase in total production or in average yields in the country.