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Advantages and Prospects for the Cultivation of Einkorn and Spelt in Bulgaria

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Over the last 10–15 years, in connection with the significant changes that have occurred in Bulgarian agriculture, the interest of a number of private landowners and farmers from various regions of the country has increased towards einkorn – an ancient cereal crop. In addition to specialized agricultural publications, it has also been discussed in programmes on Bulgarian radio and television, where the question is often raised as to what the advantages of einkorn and spelt are in our country and what the prospects are for their cultivation. Part I – einkorn

In 2002, a rather substantial pilot investment project was developed for Bulgaria – Bulfaro, for the cultivation of organically grown wheat of the ancient variety Faro, with guaranteed purchase on the markets of the EU and the USA. The project was presented by “Nord Shipping” Ltd. Ruse, Bulgaria, in cooperation with the Programme for American Investments in Bulgaria – California,

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USA, and the Cereal Research Institute – Rome, Italy. However, for reasons unknown to us, this excellent project did not come into operation.

According to the classification of the Russian scientist K. A. Flaksberger from 1929, supplemented in 1935, the following species of einkorn exist: *wild one-grain einkorn – Triticum aegilopoides Bal. (Link.) = Tr. spontaneum Flaksb., wild two-grain einkorn – Tr. dicocoides Korn., cultivated one-grain einkorn – Tr. monococcum L., cultivated two-grain einkorn – Tr. dicoccum Schubl. (Schrank).*

In Western Europe, the hexaploid wheat spelt – Tr. spelta L. – is also, not entirely justifiably, included in the group of einkorn wheats.

The one-grain einkorn species have 2n = 14 chromosomes with genomic formula AA (diploid), the two-grain einkorn has 2n = 28 chromosomes and genomic formula AABB (tetraploid), while spelt wheat has 2n = 42 chromosomes and genomic formula AABBDD (hexaploid).

One-grain and two-grain einkorn belong to the group of hulled wheats. The species from this group are characterized by a brittle spike rachis, which disintegrates into spikelets at maturity, and during threshing the grains remain enclosed in the glumes.

Here, the two cultivated forms of einkorn will mainly be described: the one-grain (Tr. monococcum) and the two-grain (Tr. dicoccum), as well as (Tr. spelta), since they are of particular interest due to their valuable characteristics.

One-grain einkorn (Tr. monococcum L.). The spikes of this einkorn are small to medium-sized, delicate, dense, flattened with a narrow front side and a wide dorsal side. One of the two-row sides is convex and the other is flat. The spike has a brittle rachis and disintegrates into spikelets at maturity. Usually each spikelet contains one grain. During threshing, the grain is very difficult to separate from the glumes. One-grain einkorn is a small plant which almost does not lodge. Forms that are undemanding with respect to heat and highly drought-tolerant are widespread. Only spring forms are cultivated, which are not demanding in terms of agronomic practices, but winter forms obtained as a result of breeding are also known. It is characterized by high resistance to fungal diseases, for which reason the world-famous Russian geneticist Nikolai Ivanovich Vavilov defines Tr. monococcum as an accumulator of complex immunity.

It is found as an impurity in the crops of two-grain einkorn in Azerbaijan, Armenia, Dagestan and among the crops of Timopheev's wheat in Georgia. In addition, as an admixture with other species, one-grain einkorn has been found in Albania, Serbia, Spain, Morocco, Iran, Asia Minor and others. In our country this species was cultivated in the past independently, on a very limited scale, in the regions of Haskovo, Stara Zagora, Yambol and others, on the poorest soils.

Regardless of the cited advantages, mainly due to its low productivity, difficult threshing and the brittleness of the spike, it cannot be of great interest for production. It is of greater interest for breeding, but due to the difficulty of crossing it with other species, its use is also limited.

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In the last 4–5 years, the cultivation of production crops of one-grain einkorn has been introduced in a number of regions of the country – Sofia region, Plovdiv region, Haskovo region, Stara Zagora region, Nova Zagora, Yambol region, Burgas region, Dobrudzha and others.

Two-grain einkorn (Tr. dicoccum Schrank) is a species towards which geneticists and breeders show great interest due to its wide polymorphism, high vigour and immunity, and particularly its low requirements towards growing conditions. The species is characterized by good earliness. Even ultra-early-maturing accessions have been identified. An important trait is its resistance to diseases – rusts and powdery mildew. Thus, the Indian variety Khapli is a source of immunity to stem rust. Two-grain einkorn is distinguished by its high resistance to loose smut. It is not attacked by the Swedish fly. In addition, it has a high protein content in the grain, reaching up to 23.9%, and some accessions also possess high drought tolerance. Negative traits are the difficult threshing and the brittle spike rachis, as well as the relatively low productivity.

The spikes of this einkorn are compact, with the two-row side being wider than the front side. The spike rachis is brittle, and the individual rachis segments are glabrous or slightly pubescent. Usually there are two grains per spikelet. The grain is flattened and tightly enclosed in the glumes, which are not removed during threshing. It is used for food and for feed. Forms with branched spikes are also found in this wheat. Awned varieties predominate. In terms of density, the spike is similar to that of durum wheat, but is much narrower. Only spring forms of this einkorn are cultivated, but there are also winter forms which have not found wide application in practice.

Due to its valuable traits, two-grain einkorn is of particular interest for wheat breeding. In the world there are a number of varieties of this species, of which the varieties Vernal and Khapli are particularly interesting.

It has been found in Azerbaijan, Bashkiria and Dagestan. It has been cultivated in Spain, India, Iran, Morocco, Ethiopia, Turkey and other Balkan countries, including Bulgaria. Almost everywhere in Europe it has disappeared as a cultivated plant.

Two-grain einkorn should be more productive than one-grain einkorn, but unfortunately I do not have any data from production trials.

From the group of two-grain einkorn, the ancient variety Faro (FARRO) – from pharaoh, since it is believed that in antiquity the pharaohs fed on this wheat and that during the Roman Empire it was the main food of the Roman soldiers – deserves attention. A characteristic feature of this wheat is that it is grown as a semi-primitive, semi-wild species, which makes it extremely resistant to all kinds of diseases and pests, drought, cold, excessive moisture, etc. Nature has perfected this species so that it can survive and it has developed exceptionally good nutritional qualities. Because of its resistance, treatment with herbicides is not necessary. The root system of Faro is much more powerful than that of common wheat. Owing to this, Faro absorbs far more nutrients and moisture from the soil and does not require fertilization. Due to its resistance and vigour, Faro

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can thrive on unpretentious sites – not particularly fertile land and semi-mountainous regions at altitudes of 1200–1400 m.

Because of its disease resistance, annual crop rotation is not necessary for Faro; the following scheme is usually applied: three years Faro, one year another crop, and again three years Faro. Faro wheat is particularly popular in Italy and finds extremely wide application in traditional Italian cuisine for the preparation of soups, protein-rich porridges, for the production of corn flakes and others. The grain is a good alternative to rice and other pulses. It is particularly suitable for children's foods – cereals – due to its high protein content.

In conclusion, I would emphasize that the one-grain and two-grain einkorn species are of particular interest for wheat genetics and breeding mainly due to their exceptionally valuable traits, high protein content, resistance to abiotic and biotic stress factors, for inclusion in distant hybridization with common winter wheat.