

## ARCHAEOBOTANICAL OVERVIEW OF RYE (*Secale cereale* L.) IN THE CARPATHIAN-BASIN I. FROM THE BEGINNING UNTIL THE ROMAN AGE

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### Abstract

It seems that rye is a twice domesticated cereal. Then, in the course of the Early Iron Age in Central or Eastern Europe, it is again transformed from weed to crop plant. We summarized the development of rye and his spread in the Carpathian Basin based on archaeobotanical data. The grains of the rye were found always in charcoal form. The rye appeared in Carpathian Basin during the Neolithic Age. Sporadic occurrences of rye were also found in Early Bronze Age Bell Beaker-Csepel Group and Early Iron age Scythian cultures. The prehistoric grains were small and longshaped. In the Prehistoric Ages rye should be exist as weed of hulled wheats. His cultivation started in the Roman Age. The grains found in roman sites are always big and reel shaped like recently. Only a few grains were found in the Migration Period. Among cereals of the conquering Hungarians rye is present. Rye became common product in the Late Medieval Ages. It was grown in a big quantity everywhere, but not independently, but mixed with the wheat.

**Keywords:** rye, archaeobotany, macroremains, Carpathian-Basin

### Origin of rye

Rye (*Secale cereale* L.) is a cereal of the temperate zone of the Old World. It is primarily grown in the cooler regions of Northern and Western Europe. Compared to wheat, it is less sensitive to cold and to drought. Moreover, it can survive even in acidic and sandy soils, conditions that would be unsuitable for wheat. It is an allogamous, diploid ( $2n=14$ ) grass pollinated by wind (Evans 1976). Its seeds have high protein content and are suitable for making dough. It was grown as a single crop in Northern and Western Europe, as it is less sensitive to cold and dry winters, survives on acidic soils and it is the grain of sandy soils. In other words, it endures conditions that are not suitable for wheat. The protein content of bread grains is high, therefore suitable for making dough.

The primary gene centre of the *Secale* genus is central and West Asia. Despite the large number of studies, the taxonomical organizing of the genus still open. The earlier ancestor *S. sylvestre* Host. and *S. montanum* Guss. do not cross well with *S. cereale*, so they are unlikely to have been genome donors. Based on cytological, ecological

and morphological studies the cultivated rye developed with introgressive hybridization of *S. montanum* into *S. vavilovii*. The species *Secale vavilovii* derived from *S. sylvestre*. Other wild species: *Secale africanum*, *S. dalmaticum*, *S. ciliatoglume*, *S. kuprijanovii* modified isolated from *S. montanum*. Also known as *S. anatolicum* which is weedy forms of *S. montanum* (Stutz 1972). In fact, *Secale cereale* contains various wild and cultivated subspecies that may produce fertile hybrids with each other.

Within the species *Secale* many subspecies and variety are located, therefore, a generic name. Four main races are distinguished (Hopf et al. 2012):

- cultivated plant: its ear spindle is not fragile, its seeds are large (*S. cereale* subsp. *cereale*).
- weed-type wild plant: its ear spindle is not fragile, it is formed from a weed, *S. segetale* (Zhuk.) Roshev. It also invades bread wheat fields, but in bad years it is the only harvest in Turkey, Syria, Iraq, Iran and the countries of the Balkans.
- weed-type wild plant with semi-fragile ear spindle (only the top part of the ear is fragile). This race includes various populations.

*S. afghanicum* (Vav.) Roshev. occurs in NE-Iran, Afghanistan and Transcaucasia.

- weed-type wild plant with fragile earspindle: *S. ancestrale* Zhuk., and *S. vavilovii* Zoh. occurs in various areas of the Middle East.

From the relative numerous macroremains outlined the history of rye. Rye is indigenous to Near East and migrated to Central and Eastern Europe as weed together with other cereals during the early Neolithic. It first appeared in the early Neolithic in Anatolia but disappeared during the Bronze Age (Behre 1992). Rye appears in Western Europe during the Bronze Age Urnfield culture (Chambers & Jones 1984), but was still cereal weed. At this time, the small rye grain was general. The long period of time as weed in the cereal cultivation and the accompanying processes of selection have resulted the cultivated rye. Rye changed from weed to crop probably in the Iron Age here in Europe. Probably the earliest period of rye cultivation was the late Celtic Age. In the La Tène sites in both large and small grain rye were found. It was cultivated in Roman Age on the conquered territories. In the provinces also appeared on the big grain. Period of intense spread of rye is the Middle Ages rye.

Neolithic and Bronze Age finds of rye in Near East are very rare:

- Tell Abu Hureyra/Northern Syria, epipalaeolithic layer (9000 BC) yielded remains with fragile earspindles, probably *S. montanum* Guss. (Hillman 1975),
- Can Hasan III/Turkey, pre-pottery Neolithic layer yielded primitive cultivated form with nonfragile earspindle (Hillman 1978),
- Alaca Höyük/Northern Middle Anatolia/Turkey: Bronze Age, cultivated rye remains were found (Hillman *ibid.*).
- Asvan Kale/Eastern Anatolia/Turkey: Early Iron Age, cultivated rye (Hillman *ibid.*).

Most important rye remains in prehistoric European sites:

### **Neolithic**

- Marbach/Württemberg, Linearbandkeramik (4440 BC) (Piening 1982),
- Bruchenbrücken near Frankfurt, Linearbandkeramik (Kreuz 1991),
- Vösendorf near Vienna Linearbandkeramik (Werneck 1951),
- Several places in Poland, Linearbandkeramik (Klichowska 1975),
- Runnymede in England, Linearbandkeramik (Greig 1991),
- Myrehead in Scotland, Linearbandkeramik (Barclay & Fairweather 1984),

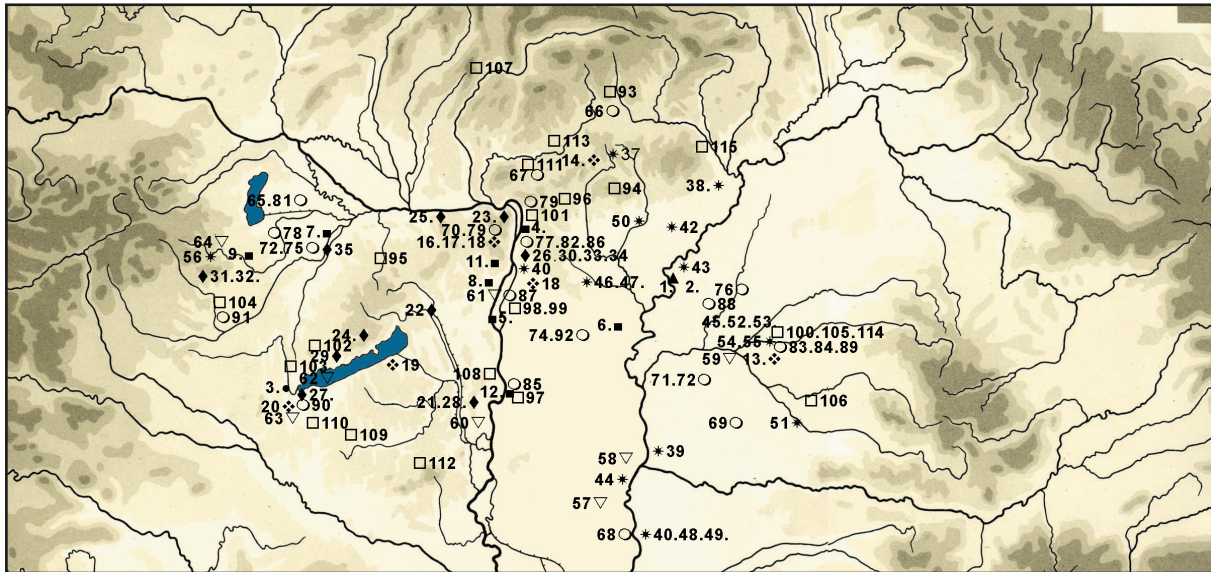
### **Bronze Age**

- Federsee in southern Germany (Hopf & Blankenhorn 1987),
- Nitriansky Hrádok, Rajhrad, Nesovice (Tempír 1966, 1968, 1969),
- Šlapanice near Brno (Kühn 1981),
- Diebeshöhle south Harz, Aunjetitzer culture (2300-1600/1500 BC) (in Behre 1992)
- Mošorin-Feudvár/Tisza, Late Bronze Age Urnfield culture (12<sup>th</sup> to 9<sup>th</sup> centuries BC) (Kroll 1990),
- Rhine area, Late Bronze Age Urnfield culture (Werneck 1954),
- Myrehead in Scotland, Late Bronze Age (Barclay & Fairweather 1984),
- Several places in Georgia, Ukraine, Moldavia, Poland (Wasylikowa et al. 1991),

### **Early Iron Age**

- Thunau/Kamp, Austria, Hallstatt Period, (8<sup>th</sup> century BC) (Werneck 1954),
- Northern Württemberg, Hallstatt Period (Körper-Grohne & Piening 1979),
- Bnin, Hallstatt Period ((Wasylikowa et al. 1991),
- Carrowmore in Ireland (2480 ± 55 BP) (Hjelmqvist 1980),

Figure 1. Rye (*Secale cereale*) remains in the Carpathian Basin



**Neolithic (6000-4300 BC) ▲**

- ▲ 1 Polgár-Ferenci-hát
- ▲ 2 Polgár-Csőszhalom-dűlő

**Eneolithic or Copper Age (4300-3000 BC) ●**

- 3 Keszthely-Fenekpuszta
- 4 Dunakeszi-Székesdűlő
- 5 Szigetszentmiklós-Üdülősor
- 6 Ároktő-Dongóhalom
- 7 Ménfőcsanak-Szeles
- 8 Százhalombatta-Földvár
- 9 Gőr-Kápolnadomb
- 10 Ludas-Varjú-dűlő
- 11 Budapest-Albertfalva Kitérő Street
- 12 Solt-Tételhegy

**Iron Age (900 BC-1<sup>st</sup> century AD) ❖**

- ❖ 13 Ebes Zsong-völgy
- ❖ 14 Miskolc-Hejő
- ❖ 15 Budapest Corvin tér 1.
- ❖ 16 Budapest-Nagytétény „Campona”
- ❖ 17 Budapest-Nagytétény-Érdliget
- ❖ 18 Budapest Hadszereg Street 8-10. (Rác fürdő)
- ❖ 19 Zamárdi-Kútvölgyi-dűlő
- ❖ 20 Keszthely-Fenekpuszta

**Roman Age (1<sup>st</sup>-5<sup>th</sup> century AD) ◆**

- ◆ 21 Dunakömlőd (Lussonium)
- ◆ 22 Tác-Fövenypuszta (Gorsium)
- ◆ 23 Esztergom-Castle
- ◆ 24 Nemesvámos-Balácapuszta
- ◆ 25 Tokod
- ◆ 26 Leányfalu Móríz Zsigmond Street
- ◆ 27 Keszthely-Fenekpuszta
- ◆ 28 Dunaujváros (Intercisa)
- ◆ 29 Kékkút Basilica No. 2.
- ◆ 30 Budapest Lajos Street
- ◆ 31 Sopron Városháza Street
- ◆ 32 Sopron Beloiannisz Square 6.
- ◆ 33 Budakalász-Luppa csárda
- ◆ 34 Budapest-Albertfalva Kitérő Street
- ◆ 35 Győr St. István Street

**Barbaricum (1<sup>st</sup>-5<sup>th</sup> century AD) \***

- \* 36 Garadna

**\* 37 Szirmabesenyő-Sajóparti homokb.**

- \* 38 Zalkod
- \* 39 Gyomaendrőd
- \* 40 Kiskundorozsma-Nagyszék (26/72, 34)
- \* 41 Budapest-Paskál park
- \* 42 Mezőszemere-Kismari-Fenek
- \* 43 Polgár-Kenderföld
- \* 44 Felgyő-Kettőshalmi dűlő
- \* 45 Ebes Zsong-völgy
- \* 46 M0 East Pécel 02.
- \* 47 M0 East Budapest 06. Péceli Street
- \* 48 Szeged-Homokbánya
- \* 49 Szeged-Kiskundorozsma-Daruhalom-dűlő
- \* 50 Balmazújváros-Darucsorda
- \* 51 Berettyóújfalu-Nagy Bócs-dűlő
- \* 52 Debrecen-Józsa Klastrompart
- \* 53 Debrecen-Józsa Józsapláza
- \* 54 Debrecen-Repülőtér
- \* 55 Ebes Zsong-völgy
- \* 56 Sopron-Városháza Street

**Late Migration Period (8<sup>th</sup>-9<sup>th</sup> century AD) ▽**

- ▽ 57 Kistelek
- ▽ 58 Felgyő-Kettőshalmi-dűlő
- ▽ 59 Debrecen-Bordás-tanya
- ▽ 60 Dunaszentgyörgy-Fadd
- ▽ 61 Budapest-Csepel-Sewage
- ▽ 62 Fonyód-Bélatelep
- ▽ 63 Zalavár-Vársziget
- ▽ 64 Sopron Városháza Street

**Hungarian Conquest time and Arpad-Age (9<sup>th</sup>-13<sup>th</sup> century AD) ○**

- 65 Lébény-Billedomb
- 66 Edelény-Borsodi földvár (motte)
- 67 Hont-Ispánsági vár
- 68 Kiskundorozsma-Nagyszék
- 69 Kardoskút
- 70 Esztergom-Kovácsi
- 71 Gyomaendrőd
- 72 Ebes-Zsong-völgy
- 73 Győr-ECE
- 74 Cegléd-Madarászhalom
- 75 Győr-Gabona Square
- 76 Hajdúböszörmény-Téglagyár
- 77 Rákospalota-Ujmajor

- 78 Kapuvár-Feketevár
- 79 Esztergom Kossuth Street
- 80 Vác Széchenyi Street 3-7.
- 81 Lébény-Billedomb
- 82 Budapest-Csepel-Sewage
- 83 Debrecen Kölcsey Cultural Center
- 84 Ebes-Zsong-völgy
- 85 Solt-Tételhegy
- 86 Budapest-Csepel Rákóczi Ferenc Street (Magnex)
- 87 Szigetszentmiklós-Vízmű
- 88 Balmazújváros-Darucsorda
- 89 Debrecen-Józsa-Józsapláza
- 90 Balatonmagyaród-Alsókolon-dűlő
- 91 Gencsapáti-sziget
- 92 Cegléd

**Late Medieval Age (13<sup>th</sup>-17<sup>th</sup> century AD) □**

- 93 Torna-Szadelő-völgy
- 94 Muhi
- 95 Baj-Öregkovács-hegy
- 96 Szarvasgede
- 97 Solt-Tételhegy
- 98 Budapest former Military Headquarters
- 99 Budapest Szent György Square ex Teleki palace
- 100 Debrecen Kölcsey Cultural Centre
- 101 Vác Széchenyi Street
- 102 Nagyvázsöny-Csepely
- 103 Sümeg-Sarvaly
- 104 Gencsapáti-sziget
- 105 Debrecen-Józsa Józsapláza
- 106 Komádi-Gigánytó-dűlő
- 107 Lászlófalva-Szentkirály
- 108 Dunaföldvár-Öregtorony
- 109 Kaposvár-Kaposszentjakab
- 110 Pogány-szentpéter-Kolostor
- 111 Hollókő-Castle
- 112 Pécs-Sebészeti Clinic
- 113 Szécsény-Plébániatemplom
- 114 Debrecen Kölcsey Cultural Centre
- 115 Sárospatak Castle Cannon Foundry

- Malaya Rublevka, left bank of the Dnieper, Scythian, (6<sup>th</sup>-5<sup>th</sup> century BC) (Yanushevich 1976),
- Iwano-Puste, Scythian (Yanushevich 1976),
- Lubimovka on the Dnieper, later Scythian period (4<sup>th</sup>-3<sup>rd</sup> century BC) (Pashkevich 1983),
- Maslini, Panskoye, Ust-Alminkoye and Alman-Kermen from Crimea (Yanushevich 1986),

### **Late Iron Age**

- Kyffhäuser, Frankleben Kr. Merseburg, La Tène (Celtic) (Hopf 1982),
- Manching, Southern Bavaria, Middle and Late Celtic Periods (Küster 1991),
- Vlineves/Melnik, Bohemia, La Tène (Celtic) (3<sup>rd</sup>-2<sup>nd</sup> century BC) (Tempír 1968),
- Stanz/Schwaz, Tirol, La Tène (Celtic) (Werneck 1961),
- Magdalensberg near Klagenfurt, La Tène (Celtic) (1<sup>st</sup> century BC) (Werneck 1969),
- Steinbühl near Northeim (Willerding & Wolf 1990),
- Vlineves/Melnik, Bohemia, La Tène (Celtic) (3<sup>rd</sup>-2<sup>nd</sup> century BC) (Tempír 1968),
- Porz-Lind near Cologne, La Tène (Celtic) (approx. 100 BC) (Knörzer 1987),
- Krivina, Bulgaria, La Tène (Celtic) (1<sup>st</sup> century BC) (Hajnalová 1979),
- Svetjina in Serbia (Borojević 1987),
- Popesti in Romania, La Tène (Celtic) (Cârciumaru 1983),
- Geto-Dacian culture site in Romania, end of 1<sup>st</sup> century BC (Wasylikowa et al. 1991),
- Čuberi and Eceri in Georgia (Schultze-Motel 1988).

Above mentioned macroremains of rye also numerous pollen data are available. Single rye pollen was detected in the Neolithic Linearbandkeramik site of Luttersee near

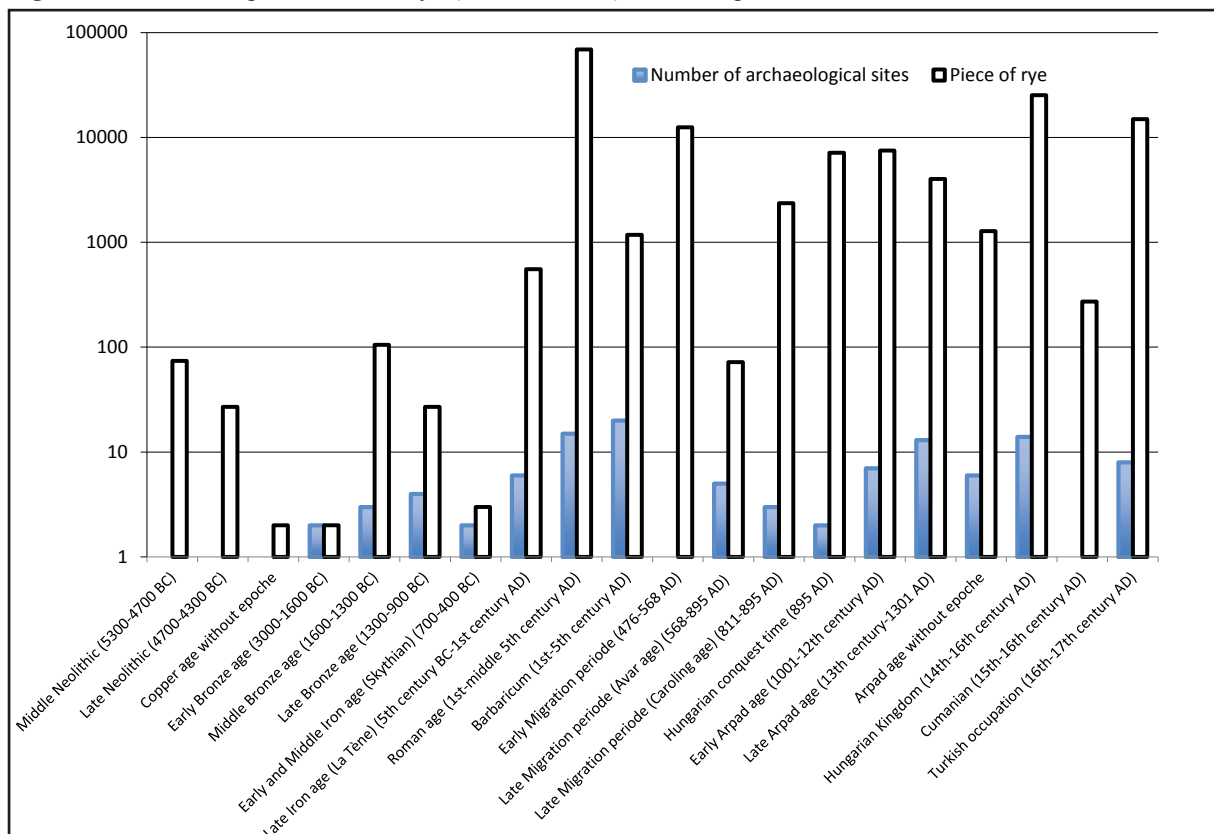
Göttingen (Beug 1986). Several pollen data of rye are known from the Bronze Age, Roman Age and Medieval sites of Europe (Behre 1992).

### **Prehistory of rye in Carpathian-Basin**

The rye originated on the Fertile Crescent area. From there arrived in the Carpathian Basin. Therefore the Carpathian Basin to play a bridging role in the spread of rye cultivation know-how from the region of the Middle East through the Balkans to Central Europe (Fig. 1.). According to palynological data the earliest occurrence of rye in the Carpathian-Basin is the Late Neolithic (VII<sup>th</sup> pollen zone, late Atlantic phase, 4500-3000 BC, medium late, Lengyel culture). Already its presence in the Bronze Age (VIII<sup>th</sup> pollen zone, Subboreal phase, 3000-800 BP, Bronze Age–Early Iron Age) is continuous. From the later ages (IX<sup>th</sup> pollen zone, Subatlantical phase, 800 BC–800 AD, Late Iron Age, Roman Age, Migration Period) is already present in higher amounts. More and more rye pollen was found in the sites of X<sup>th</sup> pollen zone (cultural phase, from 800 AD) (Zólyomi 1971). Rye pollens were found in drilling settlements of Early and Late Iron Age, Roman Age and Migration Period (Medzrihradszky & Járαι-Komlódi 1996). In 2002-ben rye pollens were showed by Elvira Bodor from Early Bronze Age Bell Beaker-Csepel group sites in Budapest-Albertfalva, Hunyadi János Street. But the archaeobotanical macroremains however, much earlier (Fig. 2.). Recently rye pollens were found in Fenékpusztá at Kis-Balatonnál from the beginning of Late Iron Age (Sümegei et al. 2011).

The first occurrence of rye grains in the Carpathian Basin is the Middle Neolithic (Polgár–Ferenci-hát) excavation conducted by P. Raczky in 2001-‘2 (Gyulai 2013). This population of the Alföld Linear Pottery culture which had connections with the Anatolian-Balkans and which conducted farming, animal husbandry, settled in the fertile open lands of the Great Plain near the Danube, avoiding the sandy areas that occur in the region. Here as well in the Late Neolithic Polgár-Csőszhalom-dűlő site (P. Raczky’s excavation

Figure 2. The most important date of rye (*Secale cereale*) in the Carpathian-Basin



between 1994–2005) dozens of rye were found. This prehistoric rye grains found in this area are small and thin (Gyulai *ibid.*).

Although the valuable archaeological collection of the Balatoni Museum at Keszthely was destroyed almost completely by an air raid during World War II while it was being removed from the building, a small quantity of archaeological material did survive. This includes cereal remains collected by Á. Csák at Fenékpusztá in 1905, within the area of the fort and identified as Bronze Age remains. Due to such circumstances, we can only accept this dating provisionally, and we do not know which era of the Copper Age the remains originate from. Grain remains that survived the war were processed by M. Füzes (1990). According to his findings, cultivated hulled wheats dominated, most of all einkorn and emmer. This place should be the oldest find of rye in the Carpathian Basin. However, but it is uncertain data about rye.

During the archaeobotanical examination of the Early Bronze Age Bell Beaker-Csepel group

sites from Dunakeszi-Székesdülő (excavation by A. Endrődi 2004) and Szigetszentmiklós-Üdülősor (excavation by A. Endrődi 2008-'9) and one small rye grains were found in each settlement-objects (Endrődi & Gyulai in print) (Fig. 3.).

Figure 3. Rye (*Secale cereale*) grain found in Early Bronze Age Bell Beaker-Csepel group sites in Szigetszentmiklós-Üdülősor. Photograph by the author.



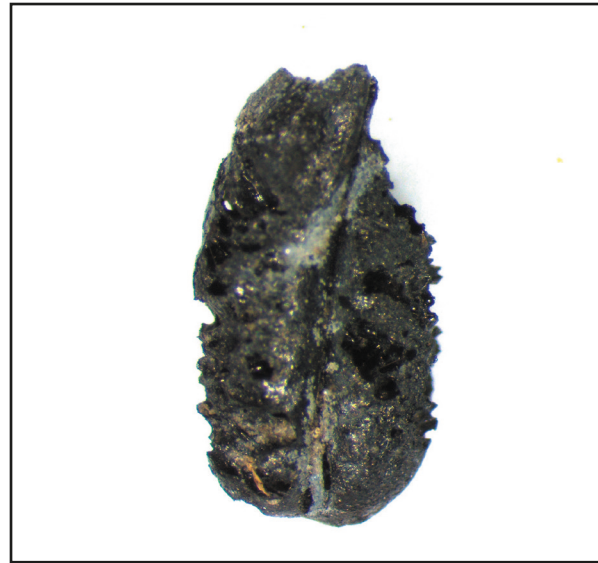
At the Middle Bronze Age site of Ároktő-Dongóhalom, in one of the pits of the tell settlement belonging to the Füzesabony culture excavated by T. Kemenczei, rye grains were found (in a ratio of 1:10) alongside common bread wheat (Hartyányi et al. 1967–68). Also some rye grains were found in Ménfőcsanak-Szeles Limedeposit culture site (excavation by E. Szőnyi 1990-'91) and in Százhalombatta-Földvár Vатья culture site (excavation by I. Poroszlai 1989-'90).

From 1989 to 1993, we floated a significant quantity of Late Bronze Age botanical material at an excavation by G. Ilon at Górkápolnadomb. The samples from prehistoric pits proved very rich in plant remains (Gyulai & Torma 1993). We believe it to be extremely significant that a few grains of rye were also found. Only a few grains known from Ludas-Varjú-dűlő site (Kyjatice culture) (excavation by L. Domboróczky 2001-'3) and from Budapest-Albertfalva Kitérő street site (Urnfield culture) (excavation by A. Endrődi 2004) as well.

Between 2007 and 2009, at the Solt-Tételhegy excavation lead by J. Szentpéteri more than one culturlayer was found. From the Early Bronze Age layer were found two small rye grains near barley and hulled wheat (einkorn and emmer) as well (Gyulai 2014).

Up to now are analysed archaeobotanically only three Scythian sites: Ebes-Zsong-völgy excavated in 2003 by J. Dani, and Miskolc-Hejő site (490-440 and 420-390 cal BC) excavated in 2012 by M. Hajdú (Pósa et al. in print). The most important cereal identified was six-rowed barley followed by common millet. Other grain crops were grown but they were by no means significant. Emmer is the dominant wheat cultivar. Einkorn, naked barley and rye grains account for not more than 1% of the total finds. All this demonstrates that the originally nomad Scythians in the Carpathian Basin are settled, although they did use wheats and grew them in a kind of ancient mixed grain together rye, were preoccupied with the production of barley

Figure 4. Rye (*Secale cereale*) grains from Scythian site Miskolc-Hejő. Photograph by the P. Pósa and Z. Mravcsik



and common millet that better suited their way of life and traditions. In above mentioned site were only three small and elongated rye grains found (Gyulai 2010) (Fig. 4.).

Climatic deterioration in the La Tène Period brought about changes in the quality of land cultivation and technology as well. In a humid and cold climate farming had to facilitate drainage. At the same time, rye and oats, which adapted well to climatic deterioration increased in quantity and importance, but required deeper ploughing (Balassa 1973).

The rye was in the late Iron Age, if only in small quantities, but it is likely to be grown. Botanical residues taken at Corvin Square in Budapest in 1997–98 (excavation by P. Bertin and T. Hable 1997-'98 and St. Jacomet and O. Dálnoki 2001) dated to the Late Celtic Period (La Tène C/D, cca. 1<sup>st</sup> century BC.) confirm the picture drawn about the advanced agriculture of the Celts. The botanical assessment of the samples taken from the Celtic structures at the excavation led by T. Hable was made by the author, then by St. Jacomet and O. Dálnoki. The overwhelming majority of the seeds and crop yields found at the settlement inhabited by the Eraviscus are cereals (Dálnoki 2000; Dálnoki & Jacomet 2002).

At the site of the Budapest-Nagytétény “Campona” shopping centre built in Budapest-Nagytétény in 2001 led by G. Szilas, yet another Celtic settlement was excavated. Preponderant in the diasporas was grain crop. It seems from the ratio of different grains that the most important kind of bread wheat must have been emmer, although einkorn was also known. The large amounts of barley are justified by the fact that barley in this period was also used for human consumption. In the Celtic period, one can also presume the production of rye, as it happened here. Three dozens of rye are known from here and two dozen from Zamárdi-Kút völgyi-dűlő (Dálnoki & Jacomet 2002). Not far from here in Budapest-Nagytétény-Érdliget (excavation by G. Szilas 2005–‘6) where four small and elongated rye were found.

Rye was found recently in Rácz fürdő site (Budapest Hadnagy Street 8-10.) (excavation by B. Maráz 2005-‘6) in larger quantities (Gyulai 2011). The nearly hundred grains found here are without exception small and elongated like in other prehistoric site.

They are mostly naked grains, but some hulled grain and spikelet forks are available as well. Between 1976 and 1983, I. Erdélyi conducted excavations at Keszthely-Fenekpuszta and discovered La Tène period finds. The botanical assemblage is associated with the Late Iron Age climate change, an approximately 200-300 year long transitional, cold period. Besides emmer wheat (*Triticum turgidum* subsp. *dicoccum*) and spelt wheat (*Triticum spelta*), there also emerged much barley (*Hordeum vulgare*), common wheat (*Triticum aestivum* subsp. *vulgare*) and club wheat (*Tr. ae.* subsp. *compactum*), rye (*Secale cereale*), oat (*Avena sativa*), millet (*Panicum miliaceum*) and foxtail millet (*Setaria italica*). Rye adapted well to the worse climate but required deeper tillage. His quantity (three hundred grains and two spikelet forks) is not insignificant, but probably bread wheat and barley were of greater importance besides emmer and spelt wheat and rye (Gyulai & Lakatos 2013).

### Rye in Carpathian-Basin at the beginning of the historical ages

The Romans expanded their rule up to the Danube in the first decades of the 1st century AD. Food requirements of the population and military stationed in Pannonia were mainly met by cereals. Therefore, not surprisingly, the overwhelming majority of seeds and harvested materials found here are cereal grains (Hartyányi et al. 1967–68; Hartyányi & Nováki 1973-74). By the late Emperors’ Age, the key staple cereal was common bread wheat and rye. Their grains were found in substantial amounts at Budakalász-Luppa csárda, Late Roman watchtower, Kékkút Basilica No. 2., Budapest Lajos Street, Dunaújváros, Esztergom-Castle, Leányfalu Móríz Zsigmond Street watchtower, Keszthely-Fenekpuszta, Sopron Beloianisz Square and Városház Street, Tác-Gorsium, Tokod. In finds around Keszthely (Keszthely-Fenekpuszta, Keszthely-Mosóház, Keszthely-Vadaskert). The significance of rye in provisions is proven by the two litres of carbonised rye grains found in the Late Roman watchtower at Budakalász.

The decorative villa built in Nemesvámos-Balácapuszta in the last third of the 1st century AD was inhabited as late as the 4<sup>th</sup> century (B. Thomas 1964). Gy. Rhé, who carried out excavations several times here between 1904 and 1912, explored a plastered pool made of

Figure 5. Rye (*Secale cereale*) grains from the Roman fortress at Fenékpuszta. Photograph by M. Füzes



pure limestone in floorless room 19 in the north-western corner of building No I. The plaster of the building walls contained bread wheat-, rye- and barley straw.

From the archaeobotanical point of view, one of the most researched Roman sites is Keszthely-Fenekpuszta. At the area of the fortified Roman settlement (castrum), known since the 18<sup>th</sup> century. Soil samples of six different excavation periods were analysed during the last century. Altogether near 600 thousand pieces plant remains of 180 taxa were identified. Cereals account for the overwhelming majority of seed and fruit remains coming from the Late Roman Period in Keszthely-Fenekpuszta, naked barley occupying first place among them. There is somewhat less of common bread wheat and rye followed by the rarely seen common millet with common oat least (Hartyányi et al. 1967-68; Gyulai & Kenéz 2009; Kenéz 2014). Three different forms of rye are known

from here: some spikelet forks, few small and elongated grains (559 piece) and many large, that “normal” (Fig. 5.). In this case the rye is similar to common wheat were observed morphological differences: small and large-grain varieties. Unfortunately, rye straw was not found. But it can be assumed that the roof of the houses were covered with rye straw.

The cereals coming from the Dunakömlöd (Lussonium) Late Roman fortress explorations differ in species composition from the Pannonian set of grain remains described above (Gerócs, Kovács & Torma 1995). In terms of number of grains, hulled emmer is ahead of common wheat. One can also find six-rowed barley, rye and oat as well. All these raise the possibility that we might have discovered the plants of another people with different agriculture, maybe those of the indigenous population. However, commercial activities with the Barbaricum might also play a role.

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